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FOREWORD



Dear colleagues,

The scientific seminar organized within the framework of the project "Center for Specialist Training and Oral Rehabilitation Resources", contract no POSDRU/87/1.3/S/62208, manager Prof. Dr. Norina Forna, brought together on March 1, 2012, in Iasi, lectures and debates on "Oral Rehabilitation from A to Z".

The seminar provided the opportunity for constructive discussions on aligning curricula of oral rehabilitation in dental medicine to the existing European standards.

According to the project scope and to the European trends, approximations will be minimized in dental practice by using high-tech equipment for dento-maxillar investigations (computer axiography and 3D computerized navigation). These new instruments will be indispensable, both to dental practitioners and dental technicians, in creating high precision prosthetics.

In the field of dentistry, a unique moment in Romania and Europe will be marked by the acquisition and use of 3D navigation and robotics in implant therapy.

These two systems unique to Romania dental practice are main focus of the practical work carried out within the "Training Center and Resource Specialists in Oral Rehabilitation" (no. agreement POSDRU/87/1.3/S/62208).

Implementation of these acquisitions will result in an appropriate treatment, with high precision prosthetics, based on high quality evaluation, whose prime beneficiary will be the Romanian patient.

Prof. PhD. Norina FORNA

COMPARATIVE STUDY BETWEEN APICECTOMY AND CONSERVATIVE ENDODONTIC TREATMENT IN MOLAR TEETH WITH PERIAPICAL PATHOLOGY

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ABSTRACT

To choose between conventional and surgical treatment is sometimes a dilemma faced by many clinicians. Modern endodontic therapy can achieve success predictably. Molar surgery is not so simple and the alternative methods have to be well evaluated and recommended. The purpose of this work was to compare the clinical and radiographic outcomes of nonsurgical treatment with those of endodontic surgery to determine what modalities offer more favourable outcomes into molars in a period of 4 years follow up. The modern endodontic therapy using ultrasound irrigation showed that healing process occurred in 95% of the treated molars compared to apicectomy or traditional endodontic therapy where only 89% or 86% of the molars presented no sign of relapse after 4 years.

Key words: endodontic surgery, manual/rotary instrumentation, ultrasounds irrigation, apical periodontitis

INTRODUCTION

Apical periodontitis can be treated by several methods: orthograde treatment / retreatment, apical surgery, intentional replantation, hemisection / radicular amputation, or ultimately, extraction of the tooth. Evidence based dentistry recommends selection of alternate treatment options on the basis of the best available evidence [1]. Approximately 80% of endodontic periradicular lesions can heal satisfactorily after proper root canal therapy [2]. The size of the periapical lesions (>5mm) is a negative factor for the prognosis in endodontic treatment [3].

Surgical treatment for molar teeth with periapical lesions is one of the most challenge therapies for both surgeon and patients, due to the high frequency of possible complications.

It is highly recommended a correct analysis of the health status of the patient, regional conditions, long term tooth prognosis, personal experience of the surgeon and the possibility of an alternative conservative therapy. The informed consent of the patient is mandatory regarding the risk/ benefice ratio⁴.

Aim of the study

The purpose of this work was to compare the clinical and radiographic outcomes of nonsurgical treatment with those of endodontic surgery to determine which modalities offer more favourable outcomes to the molars in a period of 4 years follow up.

MATERIALS AND METHODS

We performed a retrospective study and evaluated the effectiveness of apical surgery

versus manual/ rotary instrumentation and the manual/rotary /ultrasounds for mandibular and maxillary molars after 4 years for 3 patient groups (with 3 different methods) who were treated for apical periodontitis.

We selected for the study only patients with apical lesions between 5 and 8 mm without any previous treatment and without any risk factors as short roots or furcation lesions or tooth severe mobility.

The first group (1) consisted of 23 surgically treated molars, the second (2) and the third group (3) presented molar teeth treated by a dentist using two different endodontic methods.

Surgical techniques of molar apicectomy: The patients in the first group were anesthetized with 2% lidocaine with 1: 80000 epinephrine; sulcular or mucogingival incisions were performed depending on the clinical case. The tissue was reflected toward the apical area with a periosteal elevator and a retractor was placed to hold the flap. Osteotomies were performed via buccal on mandibular molars and via buccal and/or palatal side at the maxillary molars with Lindemann burs under irrigation with a saline solution and after apicectomy the periradicular curettage was done. The root canal was filled with gutta-percha and ZOE cement when was necessary and also possibly a retrograde cavities was done and filled with IMR. After saline irrigation and a last bone curettage, the wound site was closed and sutured with 4x0 monofilament sutures, and a postoperative radiograph was taken. The patients were instructed regarding postoperative care, sutures were removed 7 days postoperatively. Patients were recalled after 4 years to assess clinical and radiographic signs of healing.

The second (2) and the third (3) group of patients have the same selected criteria (apical periodontitis of the molars not previously treated, with lesions between 5

and 8 mm, affecting one or both or all three roots) were treated by the same dentist in a dental office with 2 different methods:

All 19 patients from the second group (2) were treated endodontic only manual and rotary instrumentation and for the third group (3) of 24 patients we used ultrasound irrigation. The following materials were used for endodontic treatment: 3%NaOCl solution, EDTA gel or solution, Calcium Hydroxide paste/saline. The instrumentation of the root canal was performed using the following method: first we increased the preparation of the mesial root canal manual/rotary until it reached the size 30/35 and 40/45 for distal root canal. For the irrigations it was used the 3% NaOCl solution after each instrumentation, EDTA gel or solution. Intracanal medication was Calcium Hydroxide paste which was replaced every 10 days. For the teeth of the third study group (3) the canal instrumentation was supplemented with ultrasounds irrigation in repeated series of 20 seconds each [2-3].

Assessment: The criteria for successful outcomes were done after 4 years and included for all patients the absence of clinical signs and/or symptoms and radiographic evidence of complete or partial healing. The criteria for failure included any clinical signs or symptoms and radiographic evidence of unsatisfactory healing.

RESULTS AND DISCUSSIONS

The first group taken into study consisted of 23 molar teeth with periapical lesions treated by apicectomy. 43% were maxillary molars and 57% were mandibular ones. For 22% the surgical procedure was performed only on one root, in 60% of the total molars two roots were involved and 18% of the maxillary molars all three roots were surgically treated.

Most of the patients in group 1 were women (65%) from urban area (86%). The

mean age of the patients in group 1 was 34 years.

After 4 years follow up, 11% of the patients surgically treated presented with failure of the applied treatment represented by tooth mobility (44%), relapse of the periapical lesion (32%) and pain (22%). In 89% patients from group 1 we considered to be complete healing after 4 years, based on the absence of clinical and radiological pathologic changes.

The total number of patients treated by means of endodontic therapy was 43, 19 women (45%) and 24 men (55%), mean age 45. The following criteria were considered for the assessment of treated molars: the

radiological image of the periapical area, the degree of tooth mobility and pain.

In group 2, where the endodontic treatment was performed using traditional endodontic procedures, we reported 86% rate of success after 4 years. In group 3, where the endodontic treatment involved ultrasound irrigation, we found a favourable response in 95% of the treated molars.

In conclusion, where ever is possible, the best therapy for molar periapical lesions is the modern endodontic therapy, with a failure rate of 5%, followed by apicectomy, failure rate of 11% and traditional endodontic treatment.

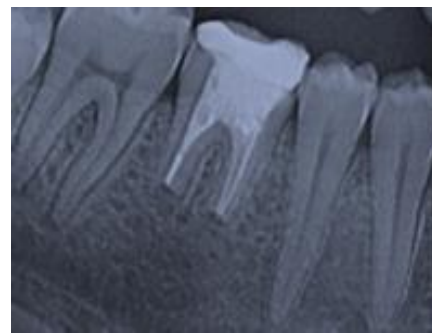


Fig. 1. Bone healing after apicectomy 46



Fig. 2. Bone healing after modern endodontic treatment 46

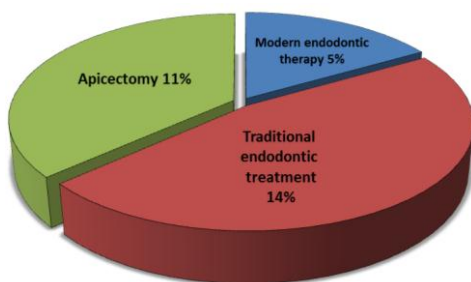


Fig. 3. The failure rate for discussed methods

of treatment

CONCLUSIONS

The apicectomy is an alternative and ultimate solution for failures of the endodontic therapy. The ultrasound endodontic method registered the highest degree of success in the periapical pathology, compared to traditional root canal treatment.

Further research will be continued using reliability of our present findings.
larger study groups in order to confirm the

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EVALUATION NEUTROPHIL CHEMOTAXIS DYSFUNCTION TO AGGRESSIVE AND CHRONIC PERIODONTITIS

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ABSTRACT

Aim: In this study, we attempted to identify the proteins involved in aggressive periodontitis and chronic periodontitis associated with neutrophil chemotaxis dysfunction. **Material and Methods:** method were examined in neutrophils from four types of subjects using the real-time polymerase chain reaction: twenty patients suffering from aggressive periodontitis with or without the dysfunction, 15 patients with chronic periodontitis, and 15 controls. A two-dimensional fluorescence difference gel electrophoresis system was used to detect differences in protein expression between neutrophils from four patients suffering from aggressive periodontitis combined with neutrophil chemotaxis dysfunction and those from four controls. **Results:** Four proteins, displayed a higher protein expression level in the neutrophils from the patients suffering from aggressive periodontitis combined with the neutrophil dysfunction than in those from the control group. The caldesmon mRNA levels in the neutrophils from the patients suffering from aggressive periodontitis combined with the neutrophil dysfunction were high compared with those in the neutrophils from the patients suffering from the other two types of periodontitis and those from the control group. **Conclusion:** The levels of protein production in neutrophils from aggressive periodontitis patients with the dysfunction were higher than those in neutrophils from the control group. In particular, caldesmon is a candidate marker of aggressive periodontitis combined with neutrophil chemotaxis dysfunction.

Key words: Aggressive periodontitis; caldesmon; neutrophil chemotaxis dysfunction;

INTRODUCTION

Periodontitis is an inflammatory disease caused by periodontopathogenic bacteria. Periodontitis is generally classified into aggressive periodontitis (Ag-P) and chronic periodontitis (Ch-P). More host factors are thought to be related to the onset and progression of Ag-P than are associated with Ch-P. Furthermore, the intrinsic factors promoting periodontal tissue destruction in Ag-P patients may differ among patients. Ag-P has been investigated in relation to neutrophil dysfunction [1-8], familial background [9], single nucleotide polymorphisms [10].

Defective neutrophil chemotaxis is one of the dysfunctions observed in Ag-P patients. Neutrophil chemotaxis is the first step in host

defence and plays a significant role in the host defence against bacterial infection. Understanding the mechanism of chemotaxis is helpful for investigating neutrophil dysfunction in Ag-P. Various mechanisms have been suggested to explain this pathology, including reduced calcium influx [3], diacylglycerol (DAG) accumulation [11], reduced DAG kinase activity [12], reduced protein kinase activity [13], elevated nitric oxide synthase activity [14], elevated superoxide production [16], and reduced levels of calcium influx factor [15]. However, there has been no sufficiently detailed study on defective neutrophil chemotaxis in Ag-P.

We hypothesized that neutrophils from patients suffering from Ag-P combined with neutrophil chemotaxis dysfunction express

characteristic proteins. To prove our hypothesis, we compared the proteins expression levels of neutrophils from patients suffering from Ag-P combined with the neutrophil chemotaxis dysfunction with those of neutrophils from a control group using a two-dimensional fluorescence difference gel electrophoresis system and matrix-assisted laser desorption ionization-time of flight mass spectrometry.

MATERIALS AND METHODS

The diagnostic criteria for Ag-P and Ch-P were defined in accordance with the classification agreed at the World Workshop for Periodontics and The American Academy of Periodontology (1999). Ag-P was indicated in subjects, in whom more than eight teeth demonstrated attachment loss (AL) of ≥ 5 mm and a probing depth (PD) of ≥ 6 mm, providing at least three affected teeth were not first molars or incisors. Ch-P was indicated in subjects with AL of ≥ 5 mm in more than one tooth and more than three sites displaying a PD of ≥ 6 mm including more than one tooth in each quadrant. There were twenty patients with Ag-P (12 males and 8 females) and 15 patients with chronic Ch-P (10 males and 5 females). Informed consent was obtained before the collection of peripheral venous blood. Fifteen controls (11 males and 4 females) with no evidence of AL at more than one site or a PD of ≥ 3 mm were enrolled.

All participants in this study non-smokers and had no history or current symptoms of

systemic disease. The periodontal measurements of all participants in this study are shown in (Fig. 1-2).

Methods (Noriyoshi Mizuno-2010)

Peripheral venous blood was collected into vacutainer tubes containing 25 U/ml heparin. Neutrophils were separated from the peripheral blood by Histopaque gradient centrifugation, according to the manufacturer's instructions. After the neutrophil fraction had been collected and contaminating erythrocytes had been lysed, the isolated neutrophils were suspended in Hank's balanced salt solution. Cell viability was continuously assessed, and 99% of the cells were trypan blue negative during incubation and stimulation.

The chemotactic migration assay was performed as described previously [16]. Neutrophils were suspended in Gey's balanced salt solution supplemented with 2% BSA at a concentration of 2.5 ± 10^6 cells/ml. The cell migration response was evaluated by enumeration of the cells on the distal surface of the filter after 2 h incubation in a 37°C humidified air chamber. The chemotactic migration assay was performed at two different times for each of the 20 Ag-P patients (Ag-P 1–20). The chemotactic migration of neutrophils from the 20 Ag-P patients was expressed as the mean percentage of neutrophils displaying chemotactic migration compared with that of the neutrophils from the matched control group.

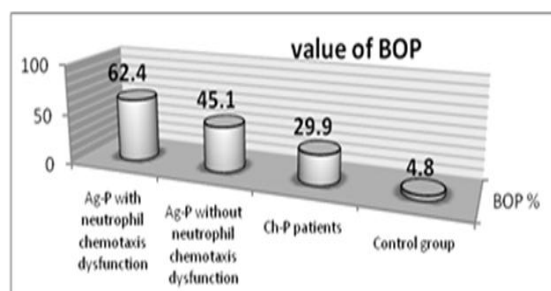


Fig. 1. Values of BOP are increased to Ag-P patients compared to patients with chronic periodontitis

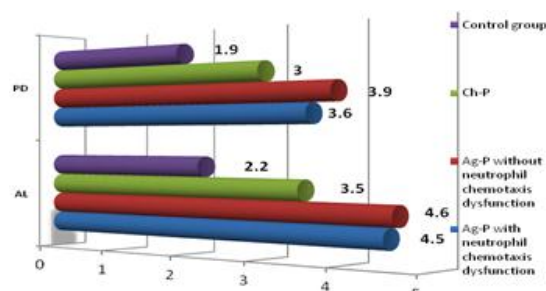


Fig. 2. Level of PD and AL to all groups. The values are not different significantly in Ag-P group and in Ch-P group

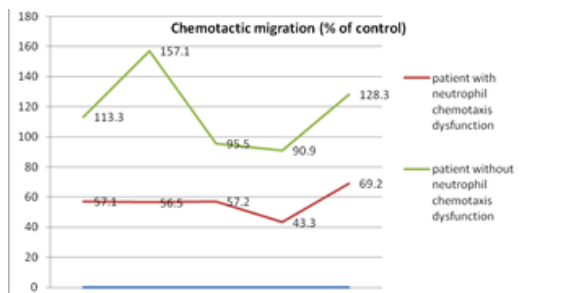


Fig. 3 Chemotaxis migration

Ag-P 1–10 and Ag-P 11–20 were classified into Ag-P with neutrophil chemotaxis dysfunction and Ag-P without neutrophil chemotaxis dysfunction, respectively (Fig. 3).

Neutrophils from Ag-P 1–4 were used as neutrophils that displayed defective chemotaxis in the 2D-DIGE.

2D electrophoresis. The samples were subjected to isoelectric focusing (IEF) using an IPGphor (GE Healthcare) and Immobiline Dry- Strips (pH 3–10 nl, 24 cm) (GE Healthcare).

The strips were then rehydrated for 12 h at 20°C, before IEF was carried out for 1 h (500 v), 1 h (1000 v), and 8.2 h (8000 v). Equilibrated strips were placed on top of a 1-mm-thick 12.5% SDS-polyacrylamide gel electrophoresis gel, and electrophoresis was carried out for 30 min.

Image analysis and data evaluation Gel 5 was stained using Deep Purple Total Protein Strain (GE Healthcare). All of the images were visualized using a Typhoon 9400 Variable Mode Imager (GE Healthcare).

Mass spectrometry The samples were spotted onto an MTP 384 massive target gold-plated T using a saturated solution of α -cyano- 4-hydroxycinnamic acid. MALDI spectra were obtained in the positive ion mode using a Bruker Daltonics Biflex IV MALDI-TOF mass spectrometer.

Database search. The peptide mass fingerprints obtained using MALDI-TOF were analysed using Mascot Software and the Swissprot database.

Isolation of total RNA Neutrophils from

10 Ag-P patients (Ag- P 1–10) with neutrophil chemotaxis dysfunction, 10 Ag-P patients (Ag-P 11–20) without the dysfunction, 15 Ch-P patients, and 15 controls were incubated with 4×10^{-8} M FMLP for 15 min. at 37°C.

Real-time polymerase chain reaction (PCR). Real-time PCR was performed with an ABI 7700 system. The reactions were carried out using a Core Reagent Kit, according to the manufacturer's protocol. The TaqMan probe, sense primers, and anti-sense primers used for the detection of caldesmon. Commercially available human glyceraldehyde-3- phosphate dehydrogenase (GAPDH)

Statistical analysis. The Mann–Whitney U-test and Student's t-test were used for comparative evaluations as indicated. Probability values of <0.05 were considered to be statistically significant.

RESULTS

Neutrophils from 4 Ag-P patients with neutrophil chemotaxis dysfunction and four controls were used for the proteome analysis. Fluorescent images were analysed using the BIA and BVA programs of the DeCyder software. Two thousand and sixty-four spots were detected using a 2D-DIGE system (Fig. 4).

Seven spots were found to show statistically significant differences ($p < 0.05$) in expression across all gels ($n=4$). All seven spots showed an increased expression in the neutrophils from the Ag-P patients with neutrophil chemotaxis dysfunction compared with their levels in the neutrophils from the control group. Of these seven protein spots, four spots produced a successful protein match. The four identified spots were lactoferrin, caldesmon, heat shock protein (HSP) 70, and stac. The mean ratio value shows the degree of difference in the standardized abundance between a spot group and the control value.

Because caldesmon was thought to be the most involved in neutrophil chemotaxis among the identified four proteins, the correlation between caldesmon mRNA levels and neutrophil chemotaxis in the Ag-P patients was analysed.

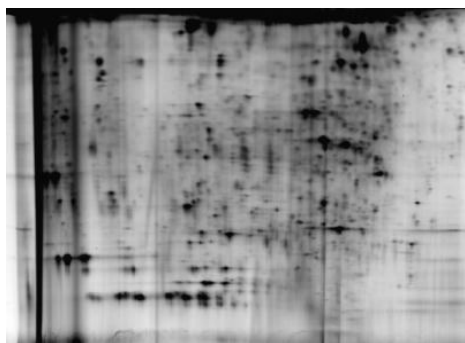


Fig. 4. Deep Purple-stained two-dimensional (2D) gel image. A 2D electrophoresis was performed using 24 cm, pH 3–10 linear IPG strips and 12.5% SDS-PAGE.

The caldesmon mRNA levels in the neutrophils from the Ag-P patients were negatively correlated with chemotactic activity to FMLP ($r^2 = -0.5746$)

The caldesmon mRNA expression levels were significantly higher in the neutrophils from the Ag-P patients with neutrophil chemotaxis dysfunction than in those from the Ag-P patients without the dysfunction, Ch-P patients, and control group. However, the neutrophils from some Ag-P patients with the dysfunction did not highly express caldesmon mRNA compared with those from the Ag-P patients without the dysfunction, Ch-P patients, and the control group.

DISCUSSION

We used FMLP as a neutrophil stimulant. FMLP, a synthetic molecule, can directly elicit neutrophil chemotaxis, enzyme release, and oxidant-free radical production at an inflammatory site. As the functions of neutrophils are disordered in some Ag-P patients [1-8], FMLP-induced proteins may be related to the disordered functioning of

neutrophils. In this study, by including an internal standard and running neutrophil proteins from Ag-P patients with neutrophil chemotaxis dysfunction and the control group on the same gel, we were able to use the Ettan DIGE system to reduce the variability in the gel and simplify protein spot matching by amplifying the difference in the protein level [17]. We identified four proteins (lactoferrin, caldesmon, HSP70, and stac) whose expression was upregulated in the neutrophils from the Ag-P patients with the dysfunction compared with those from the control group. However, in this study, we did not detect any proteins whose expression was downregulated in the neutrophils from the Ag-P patients with the dysfunction compared with those from the control group. If neutrophils from more Ag-P patients had been used, proteins whose expression was downregulated in neutrophils from Ag-P patients with neutrophil chemotaxis dysfunction might have been detected.

Lactoferrin is a member of the transferring family of 80 kDa iron-binding proteins and is present in exocrine secretions, such as milk, tears, and saliva. Lactoferrin is released from neutrophils during inflammatory responses [18] and demonstrates bacteriostatic activity against a wide range of bacteria using a mechanism that is dependent on chelate iron, which is essential for bacterial growth. In addition, lactoferrin exhibits non-iron-dependent antibacterial, anti-inflammatory, and immunoregulatory activities [19]. A recent study showed that lactoferrin effectively inhibits biofilm formation and reduces the size of the biofilms produced by periodontopathic bacteria at physiological concentrations [20]. In the present study, the lactoferrin levels in the neutrophils from the Ag-P patients with neutrophil chemotaxis dysfunction were higher than those in the neutrophils from the control group. The present finding is not consistent with previous

reports that found that lactoferrin levels were not increased in Ag-P patients. Further studies are necessary to elucidate a role of lactoferrin in the onset and progression of periodontal disease.

In response to LPS-stimulation, the HSP70 level is increased, and thereafter, the production of pro-inflammatory cytokines is increased [21]. Moreover, *Porphyromonas gingivalis* lipopolysaccharide stimulation of THP-1 human monocytic cells upregulated the expression of HSP70 [22]. This phenomenon may explain our finding that the expression of HSP70 was upregulated in the neutrophils from the Ag-P patients with the dysfunction compared with those from the control group. HSP has been shown to be present in periodontal tissues from patients with periodontitis. Stac was cloned as a neuron-specific gene encoding a 47 kDa cytosolic protein with a cysteine-rich domain and a src homology three domain, suggesting that it functions as an adapter in a signal transduction cascade [23]. However, its exact function remains unclear.

Caldesmon is an actin- and myosinbinding protein that participates in the regulation of actomyosin ATPase [24]. Caldesmon is an essential component of the cytoskeleton in smooth muscle and non-muscle cells. It has been reported that caldesmon is related to cell migratory responses, contraction, and division. A recent study showed that caldesmon plays a pivotal role in cell migration via reorganization of the actin cytoskeleton in response to glucocorticoids [25]. The binding of caldesmon to actin-inhibited actomyosin interactions and resulted in the inhibition of many cellular processes (migration, adhesion, and proliferation) [26]. In neutrophils from Ag-P patients with

neutrophil chemotaxis dysfunction, caldesmon may suppress their motility by stabilizing structures composed of filamentous actin.

From the reports mentioned above, among the four identified proteins, caldesmon is most likely to be involved in neutrophil chemotaxis. Furthermore, the caldesmon mRNA expression levels in neutrophils from Ag-P patients with neutrophil chemotaxis dysfunction were higher than those in neutrophils from Ag-P patients without the dysfunction, Ch-P patients, and the control group. A high expression level of caldesmon may be an important determinant of neutrophil dysfunction in Ag-P patients. However, some Ag-P patients with the neutrophil chemotaxis dysfunction did not show a high level of caldesmon mRNA expression. It is assumed that the levels of other proteins are also related to neutrophil chemotaxis dysfunction in Ag-P patients. Moreover, it remains unclear whether abnormal caldesmon production is the primary pathogenic mechanism in Ag-P patients and how increased levels of caldesmon are involved in other signal transduction abnormalities in neutrophils.

CONCLUSIONS

In conclusion, we have examined protein production in neutrophils from Ag-P patients with neutrophil chemotaxis dysfunction and a control group using proteome analysis. The levels of caldesmon, lactoferrin, HSP70, and stac in neutrophils from Ag-P patients with the dysfunction were higher than those in neutrophils from the control group. In particular, caldesmon is a candidate marker of Ag-P combined with neutrophil chemotaxis dysfunction.

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FOOD ALLERGY IN CHILDREN

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ABSTRACT

Food allergy is understood as all the adverse reactions to food products triggered by the immunological mechanism. The immunological reactions include the mediated IgE mechanisms and non-Ig-E mechanisms. It is estimated that the frequency of food allergies in general population is of 3.5-4% and usually come out in patients showing also other atopic disorders. The gastro-intestinal barrier is made up of epithelial cells, mucin cells (IgA secreting), proteolytic enzymes and biliary salts. The factors influencing the digestive tolerance are classified in antigenic factors and factors related to the host. The most important food products determining the most of allergies during childhood are: milk, eggs, nuts, flour and soya. The clinical manifestations in food allergies are the anaphylactic reaction, respiratory, cutaneous and digestive manifestations. The paraclinical diagnosis is different depending on the mediated immunologic mechanism, and the exclusion of the involved allergen is the key element in managing the food allergies.

Key words: food allergy, anaphylactic reaction, allergen

The allergy represents a complex world leading to many interpretations, many conditions being interpreted as allergic disorders. By *food allergy* is understood all the adverse reactions to food products triggered by the immunological mechanism. The adverse reactions to food products include the food allergy and the non-allergic causes. The immunological reactions include mediated IgE mechanisms and non-Ig-E mechanisms. The non-allergic reactions include the *digestive intolerances* due to certain enzymatic deficiencies, intolerance to lactose and intolerance to fructose. The toxic food reactions represent a separate category, they are the result of mediated-histamine reactions caused by the various food toxins. [1]

1. Prevalence

The perception in general population is that

the food allergy prevalence is much higher, but in fact, they affect about 6-8% children of 0-3 years of age. [2] The researchers in their trying to determine a prevalence of food allergies in a certain population, on a group of 1834 subjects, children and adults, found out a 16.6% frequency.

An early survey carried out on a group of 480 children showed that the prevalence of food allergies was 8%, although 28% of the subjects showed allergic type non-specific symptomatology. [2]

In a recent survey carried out on two patient groups, a group with ages to 11 years and the other one with ages to 15 years, showed a frequency of 11.6% and respectively 12.4% of food allergy reactions. Out of these, the cutaneous tests were positive only on 5.1%, respectively 4.9%, and the

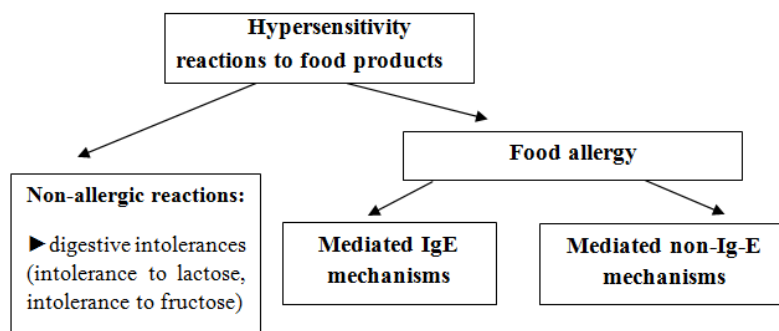


Fig. 1 Food allergy classification

exposure to food allergens indicated a frequency of 2.3% in both groups. [3]

Concluding we may estimate that the food allergy frequency in general population is 3.5-4%.

The allergy to cow milk proteins affects about 2.5-2.8% of children in their 1st year of life (2, 6, 7), the mediated Ig-E type reactions were present only in 60% of cases. The allergy to eggs affects about 1.3% of children [8] and the allergy to nuts affects about 0.8%. Worth mentioning is the fact that after the age of 5, the frequency of allergy to nuts is doubled. [5] The persistence of allergic symptoms varies depending on the involved food product. In case of allergy to milk, 85% of children have no symptomatology after the age of 8, and in the case of allergy to eggs, 66% of children have no allergic reactions after the age of 5. [6] Regarding the allergy to nuts, 20% of children have no symptoms after the age 10 (14-15) and 9% of the subjects recover at the age of adolescence [7].

The allergy to pollen named also *the oral allergy syndrome* represents a complex syndrome which appears by a crossing reaction following exposure to a thermally unstable protein, ingested with the unprepared fruits and vegetables. Of the patients with allergic rhinitis, 23-76% presents also the oral allergy syndrome to at least one food product [7].

The food allergies usually appear on patients with other atopic disorders. A third of the patients with moderate-severe *atopic*

dermatitis, shows food allergies by mediated Ig-E mechanisms and some surveys have indicated a correlation between the atopic dermatitis severity and the food allergy frequency.

The food allergy presence increases the probability of developing an allergic respiratory disorder; the most frequent correlation is with the *recurrent wheezing* [8].

2. Physiopathology

The food allergy represents an atypical response of the immune system at the level of the gastro-intestinal mucosa appeared following its interactions with ingested antigens. The immunological homeostasis is maintained by the immune and non-immune cells and by cytokines within a physical non-specific barrier at the level of the gastro-intestinal mucosa.

The gastro-intestinal barrier is made of *epithelial cells, cells with mucin* (IgA secreting), *proteolytic enzymes* and *billiary salts*. The immune response is mediated by *Peyer patches* (lymphoid structures organized at the level of the small intestine and rectum), IgA secreting, dendrite cells, macrophages showing antigen, the major histocompatibility complex (MHC) class I (MHC I), class II (MHC II), T lymphocytes, intestinal epithelial cells and other cytokine producing cells.

The stimulation of the immune system and the production of IgE type antibodies are determined by the intact food protein intake. During childhood, this phenomenon is

avored by a series of factors: increased intestinal permeability (immaturity of the gastro-intestinal barrier), insufficient production of gastric acid, reduced pancreatic and intestinal enzymatic activity [9].

The factors influencing the digestive tolerance are classified in antigenic factors and factors related to the host (age, genetic factors, gastro-intestinal flora). The most important antigenic factors are the antigen form (the soluble form increases the tolerance) and the dose (the increased sole dose and repeated small doses increase the tolerance). The cells involved in mediating the immune response are the T lymphocytes CD4+, CD8+, NK1.

The breastfed children develop an important immune response to food proteins in the first months of life, fact proved by the rapid increase of circulating antibodies together with the introduction in alimentation of milk and soya formulas.

The genetic factor influencing the digestive tolerance is sustained by surveys showing an increased concordance of the allergy to nuts in the case of monozygote twins [10].

The role of intestinal flora in digestive tolerance is demonstrated by the favorable clinical evolution of the patients with allergic diseases to which probiotics were administrated. The recent surveys show the fact that the breastfed children naturally fed by their mothers receiving probiotics much rarely develop allergic diseases, especially atopic dermatitis [11].

3. Food allergens

The most important food products determining the most of allergies during *childhood* period are: *milk, eggs, nuts, flour and soya*. Regarding *adults*, the most allergic food products are *nuts, walnuts, fish and clams* [1]. There are two important classes of *food allergens* determining the mediated IgE reactions.

Class I contains allergens sensitizing the GI mucosa; they are thermally stable and have a weight range between 10-70 kDa. This class comprises milk casein, nuts allergens, ovalbumin [12].

Class II contains thermally unstable allergens that can be ingested with the unprepared fruits and vegetables [13]. This class of allergens affects mainly the adolescents and adults

It was demonstrated the existence of a similarity between the tridimensional structure of the pollen epitope and of the epitopes from certain fruits and vegetables, explaining in this way the appearance of the oral allergy syndrome by mediated IgE crossing reaction [14].

4. Reaction mechanisms

There are 3 main reaction mechanisms:

4.1. Mediated IgE type reactions

In an allergic reaction, by coupling the IgE antibody to Fc fraction of receptors at the level of mastocitary and basophil cells, chemical mediators are released such as histamine, leucotriens, cytokines, chemokines and protease [15].

The mediated IgE reactions have *two phases*:

- immediate from several minutes to 1 hour;
- latent from 6 hours to 24 hours after allergen exposure

4.2. *Mediated non-IgE reactions*, where T lymphocytes have the main role (mediated by cells);

4.3. *Mixed reactions* mediated both by cells (LyT) and humoral (IgE).

5. Clinical manifestations in food allergies

5.1 Anaphylactic reaction

It represents a very severe systemic allergic reaction with fatal potential. The anaphylactic reaction is accompanied in most of the cases by cutaneous symptoms such as: rash, angioedema, erythema but the absence of these reactions does not include the

diagnosis. For example, the cardio-vascular collapse cases can appear without cutaneous reactions [16]. As any other mediated IgE mechanism, the anaphylactic reaction may comprise the 2 immediate and latent phases (in children, 6% of reactions are two-phased) but it could not be demonstrated a correlation between the final severity and the intensity of initial symptoms.

5.2 Cutaneous manifestations

5.2.1 *Acute rash and angioedema* are the result of a mediated IgE mechanism, being the most frequent manifestations of food allergy [1]. They can have an evolution to become chronic in case the symptoms persist more than 6 weeks.

5.2.2 *The atopic dermatitis* is the consequence of an immunological mixed reaction – IgE and cellular. Usually it begins in childhood and it is characterized by periods of acutization and remission. The lesions are maculo-erythematous and papulovesicular with pruriginous character located at the face, scalp and extension areas level. A third of the children with moderate severe atopic dermatitis show also food allergies. The most frequent allergic food products associated with atopic dermatitis are the eggs, milk, flour, nuts, walnuts and soya. Two thirds of the children with atopic dermatitis and food allergies show intolerance to eggs.

5.2.3 *Herpetiform dermatitis* appears by the cellular mediated mechanism. The cutaneous lesions are polymorph, pruriginous, characterized by erythema, placards, papules and vesicles. It is frequently associated to intolerance to gluten (celiac disease) and the patients with herpetiform dermatitis may show IgA type anti-transglutaminase antibodies [17].

5.2.4 *Contact dermatitis* is a cellular mediated cutaneous manifestation that can be triggered by exposure to food products.

5.3 *Respiratory manifestations* are carried out by the 3 immunological mechanisms.

The main manifestations through mediated IgE mechanism are: rhinoconjunctivitis, larynx edema, cough and bronchospasm. The bronchial asthma is carried out by mixed mechanism and represents an increased risk factor in the emergence of the anaphylactic reaction. The respiratory manifestations can appear during inhalation of food antigens present in the vapors resulted following heat preparation of food products.

The Heiner syndrome appears following a mediated non-IgE reaction, the main involved allergen being the proteins from milk and consists of recurrent pneumonia, haemosiderosis, digestive hemorrhage, iron deficiency anemia and growth fail. The removal of milk from alimentation leads to symptom disappearance [18].

5.4 Gastro-intestinal manifestations:

5.4.1 *Immediate gastro-intestinal hypersensitivity reaction* is carried out by mediated IgE mechanism and includes acute symptoms such as nausea, abdominal pain, colic, vomit and diarrhea. The patients that associate the atopic dermatitis and food allergies with chronic exposure to antigen can show chronic vomits and growth fail.

5.4.2 *Oral allergy syndrome (Pollen-food allergy syndrome)* is a mediated IgE type manifestation appearing by a cross reaction due to the structural similarity between the pollen epitopes and some proteins from thermal unprepared fruits and vegetables. The allergy to the birch pollen can give a cross reaction with the proteins from apples, carrots, tomatoes, celery, kiwi, pairs, chestnut, almonds and nuts. The grass allergy can give cross reactions with tomatoes, watermelon and kiwi [19]. The main symptoms have a rapid debut, are of short duration and consist of oral pruritus, angiodema of lips, tongue, palate and pharynx;

5.4.3 *Eosinophilic esophagitis* appears by a cellular and humoral mixed mechanism and represents the most frequent type of

eosinophilic gastro-enteropathy. It is manifested by dysphagia, intermittent vomits, food refusal, abdominal pain, irritability, sleep disorders. The certitude diagnosis is morphopathologically applied (more than 24 Eo on field) [20].

5.4.4 *Allergic eosinophilic gastro-enteritis* appears by a mixed mechanism and can start at any age with the following manifestations: diarrhea, abdominal pain, anorexia, nausea, vomits, weight loss and growth fail [20]. Some patients have anemia and hypoalbuminemia, secondary to digestive hemorrhage and to exudative enteropathy. The biopsy reveals important eosinophilic infiltrate at the mucosa level.

5.4.5. *Allergic procto-colitis* is mediated non-IgE and appears during the first weeks of life. The symptomatology includes blood in stools and mucus to an apparently healthy child, the usual triggers being the cow milk and soya proteins.

5.4.6 *Enterocolitis induced by food proteins* appears via a mediated non-IgE mechanism. Most frequently, it starts in the first months of life. The involved proteins are casein, β -lactoglobulin, soya proteins but can also be involved other food products like rice, oat, chicken and fish meat. The symptomatology includes irritability, severe vomits, diarrhea, mucus and blood in stools, so that in breastfed children dehydration, lethargy, acidosis, hyponatremia appears. In severe cases, methemoglobinemia may appear. About 50% of the breastfed children allergic to cow milk proteins have allergy also to soya [21].

5.4.7 *Celiac disease* represents a chronic inflammation of the small intestine carried out by cellular immune response to gluten. The main haplotypes associated with celiac disease are HLA-DQ2 and HLA-DQ8. It is frequently associated with herpetiform dermatitis and the patients have a high risk to develop type I diabetes mellitus and auto-

immune thyroiditis [22]. Children with celiac disease not observing a strict gluten free diet have a high risk to develop non-Hodgkin lymphoma with T cells [22]. The symptoms include vomits, diarrhea, anorexia, growth fail and the disease can evolve in severe or subclinical forms. The certitude diagnosis is carried out by duodenal biopsy indicating the villositary atrophy, crypt hyperplasia and lymphoplasmocitary infiltrate.

6. Diagnosis

The positive diagnosis involves the clinical diagnosis and paraclinical diagnosis.

Clinical diagnosis is carried out a rigorous anamnesis (history of atopic disorders, disease history, symptomatology association with ingestion of a food allergen etc) and objective examination (signs and symptoms specific to cutaneous, respiratory and digestive affection).

Paraclinical diagnosis

For mediated IgE type reactions a skin-prick test is carried out; the specific IgE antibodies dosage (23), RAST radio-alergo-sorbent-test), oral food load test.

For mediated non-IgE type reactions - patch test, diet of eliminating the involved allergen, oral load test, biopsy.

Other tests: Upper digestive endoscopy, intake tests, stool analysis.

7. Therapeutic conduct

The elimination of the involved allergen is the key element in food allergy management. The main food allergens are: milk, eggs, nuts, walnuts, flour, soya, clams and fish. The parent and patient training in order to detect the hidden allergens is very important as 50% of the allergen ingestion is accidental (24).

Medication therapy in acute allergic manifestation consists in epinephrine manifestation (anaphylactic shock – 0.01 mg/Kgc), corticotherapy and antihistamines in cutaneous and oral manifestations.

Immunostimulation with allergen can be subcutaneously and sublingually carried out.

Future therapy consists in monoclonal anti-IgE antibodies, immunotherapy with recombined proteins and traditional Chinese medicine.

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COMPARATIVE ANALYSIS REGARDING TWO METHODS FOR PREDICTING LOWER THIRD MOLAR IMPACTION

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ABSTRACT

Third lower molar is a major controversy in dental practice. The purpose of this study is to compare the reliability of two radiographic methods used to predict third lower molar prognosis of eruption or impaction. 109 children, with ages between 12 and 19 years were enrolled in our study. For all subjects we measured the retromolar available space and lower third molar inclination on the orthopantomograms and lateral cephalometric films. The measurement of the retromolar space has similar predictive value on both films, especially for those third molars with 100% chances of impaction or eruption. The correlation analysis for the angle between the long axis of the lower third molar and the mandibular plane measured on orthopantomograms, respectively on lateral cephalometric film showed that $R^2 = 0.439$, which means significantly statistic direct correlation between this two variables.

Key words: third molar; prediction; impaction

INTRODUCTION

The mandibular third molar is a major problem facing the dental profession and it is by far the most frequently impacted tooth. One explanation for the high impaction rate might be insufficient development of the retromolar space. If the remodelling resorbtion at the anterior mandibular ramus is limited, the eruption of the mandibular third molars could be blocked. The variation in resorbtion is correlated with the direction of condylar growth [1]; vertical condylar growth is associated with reduced resorbtion at the anterior aspect of the ramus and forward growth rotation of the mandible, whereas more backward-directed growth at the condyles is associated with increased resorbtion and posterior growth rotation.

Richardson [2] found that another explanation for mandibular third molar

impaction might be an unfavourable path of eruption. Although the third molar bud is mesially angulated during the initial stages of calcification and root development, it should upright properly in order to be able to erupt. There are indications that excessive initial mesial angulation and minimal uprighting might increase the likelihood of impaction.

Many attempts have been made to analyse the predictive value of the adolescent eruption space for mandibular third molar impaction. Most of the authors considered that the orthopantomogram is the most useful exam for third molar prediction of eruption [3, 4, 5], while others used the lateral cephalometrics for third lower molars assessment [2, 6]. In our study we used both methods for measuring the available molar space and third molar angulation according to mandibular plane in order to establish if any

correlation exists between linear and angular parameters on orthopantomogram and lateral cephalometrics.

MATERIAL AND METHODS

The study population consisted of 109 subjects (72 girls and 37 boys) seen in the Department of Orthodontics and Dentofacial Orthopedics, University of Medicine and Pharmacy "Gr. T. Popa" - Iasi, Romania and in a private dental office. None of the subjects had received orthodontic treatment before. The mean age of the subjects was 13,52 years (range 12 to 19 years). Orthopantomograms and lateral cephalograms were taken through use of a standardized technique by means of an X-ray device (Strato X, Villa Sistemi Medicali). The magnification of the orthopantomograms is x1.2. All cephalograms were made with a standard focus-to-object distance of 1.5 m. The film cassette was adjustable in a lateral direction and was typically placed as closed to the cephalostat as possible. The radiographs were traced on overlying acetate paper and analysed by a single observer. The reproducibility of the measurements was assessed by statistically analyzing the difference between double measurements taken at least 1 week apart on 10 subjects randomly selected.

Dimensional radiographic measurements of the third molar and mandible were carried as follows:

A. On the orthopantomograms (Fig. 1)

1. The retromolar available space was measured as the distance between the distal aspect of the lower second molar and the anterior border of the mandible along the occlusal plane. Considering that most of our subjects are during a growth period and for more accurate results, we considered the expected retromolar space by adding 1.5 mm/year up to 15 years for girls and up to 17 years for boys [7].
2. The mesiodistal diameter of the lower

third molar was measured as the distance from the mesial to the distal contact points. We calculated the difference between the expected retromolar space and the lower third molar diameter. Mesioangular inclination of the third molars measured as the angle formed between the long axis of the tooth and the lower border of the mandible (angle β).

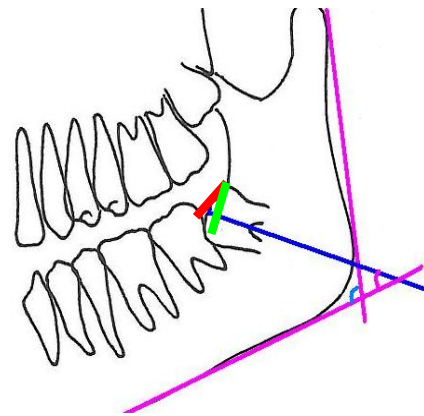


Fig. 4. Radiographic measurements for lower third molar on the orthopantomograms

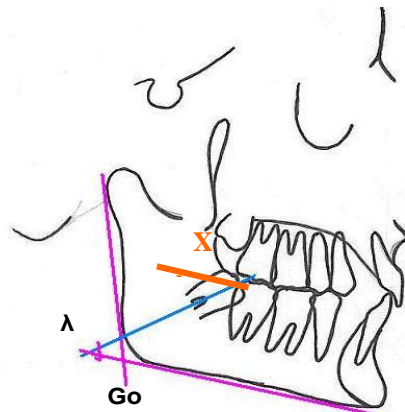


Fig. 5. Radiographic measurements for lower third molar on lateral cephalometrics

B. On the lateral cephalometrics (Fig. 2)

1. Distance between the distal aspect of the lower second molar and point Xi, the geometric center of the mandibular ramus (DXi). According to Ricketts [8] this is the best measurement for the evaluation of the posterior space on lateral cephalometrics. Mesioangular inclination of the lower third molar measured by the angle formed

between its long axis and the mandibular border (Angle λ).

A statistical analysis was carried out of the relationship between measurement values obtained on orthopantomograms and lateral cephalometrics using ANOVA analysis of variance and Pearson correlation analysis in SPSS software 17.0 for Windows.

RESULTS

The study sample consisted of 109 subjects, 72 girls and 37 boys with ages between 12 and 19 years, mean age 13.52. Most of the children were 12 years old (40 subjects) which is the appropriate age for the beginning of the normal orthodontic treatment. Furthermore, according to Richardson, the crown of the third molar is visible on the X-ray films after the age of 12. The number of the lower third molars taken into study was 185.

The differences between the estimated retromolar space and the mesio-distal diameter of the lower third molar measured on orthopantomograms were divided in 4 groups:

a) $\Delta L < -2$ mm; b) $-2 \leq \Delta L < 0$ mm; c) $0 \leq \Delta L < 2$ mm; d) $\Delta L > 2$ mm

According to Hattab [3] and Venta [9] the lower third molar has great chances for normal eruption if the retromolar space is more than 16 mm, and the difference is more than 2 mm. Poor prognosis for eruption and great probability of impaction have those molars for which the retromolar space is less than 11 mm, and the difference between the retromolar space and the mesiodistal diameter is less than -2mm.

The distances between the distal aspect of the lower second molar and point Xi, the geometric center of the mandibular ramus (DXi) measured on lateral cephalograms were divided also in 5 groups:

a) $DXi < 20$ mm; b) $20 \leq DXi < 23$ mm; c) $23 \leq DXi < 25$ mm; d) $25 \leq DXi < 28$ mm; e) $DXi > 28$ mm.

Tulley and Schullhof [10] concluded in their previous studies that for a distance DXi greater than 28mm the lower third molar has good prognosis for eruption, while for DXi less than 19 mm there are 100% chances for impaction.

			ΔL				Total
			< -2	[-2, 0)	[0-2)	> 2	
Dxi	< 20	Number	18	5	3	1	27
		%	66.7%	18.5%	11.1%	3.7%	100.0%
	[20, 23)	Number	34	16	7	11	68
		%	50.0%	23.5%	10.3%	16.2%	100.0%
	[23, 25)	Number	9	9	8	12	38
		%	23.7%	23.7%	21.1%	31.6%	100.0%
	[25, 28)	Number	7	14	5	12	38
		%	18.4%	36.8%	13.2%	31.6%	100.0%
	> = 28	Number	2	1	0	11	14
		%	14.3%	7.1%	.0%	78.6%	100.0%
	Total	Number	70	45	23	47	185
		%	37.8%	24.3%	12.4%	25.4%	100.0%

Table 1. Crosstabulation - distance DXi on lateral cephalograms / ΔL calculated on orthopantomogram

For growing subjects we used in our analysis the estimated Xi value, according to Langlade [11], who found that the Xi point moves in a backwards and downwards direction with 1mm/year up to 15 years for girls and 17 years for boys due to the growth of the mandibular ramus.

Correlation between ΔL , the difference between the expected retromolar space and mesiodistal diameter of lower third molar measured on orthopantomogram and DXi, the distance between the distal aspect of the lower second molar and point Xi, measured on lateral cephalograms (Table 1 and Fig. 3).

Correlation between angle β and angle λ formed by the long axis of the lower third

molar and the mandibular plane measured on orthopantomograms and on lateral cephalograms (Table 2).

		Angle β	Angle λ
Angle β	Pearson Correlation	1	.662(**)
	Sig. (2-tailed)		.000
	N	185	185

Table 2. Chi – square test angle β and angle λ

$p < 0.005$ means that there is a direct proportional correlation of low intensity between this two variables. The regression coefficient $R^2 = 0.439$, which means that 43% of the β angle values correlate significantly statistic with λ angle values (Fig. 4).

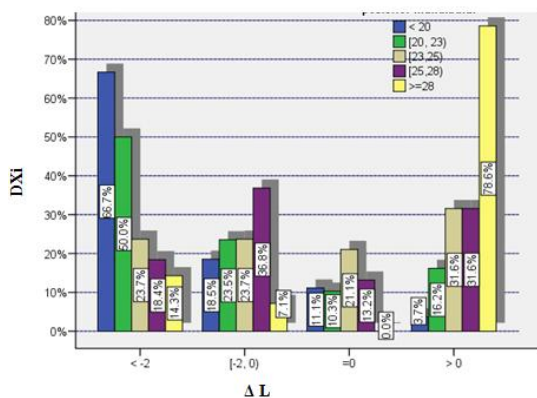


Fig. 6. Correlation DXi / ΔL

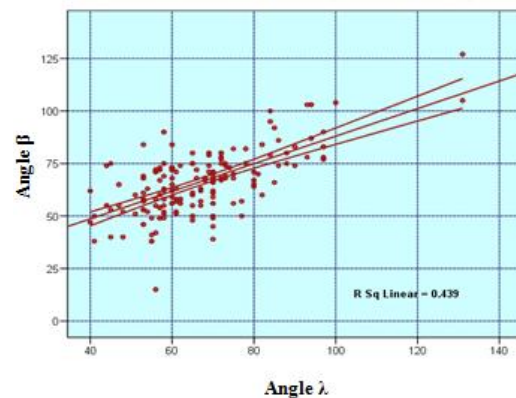


Fig. 7. Correlation angle β and angle λ

DISCUSSIONS

The lower third molar remains a current controversy in dental practice. There has been considerable research regarding the more accurate methods for predicting lower third molar eruption or impaction. Some authors, such as Hattab [3], Venta [9], Altonen [6] advocated that orthopantomogram is the most reliable exam for early prediction of lower third molar prognosis of eruption by measuring the retromolar space and mesioangular inclination of the tooth in relation to lower second molar axis, mandibular and oclussal plane. Others, such as Richardson [2], Ricketts [8]) Tulley [10] and Merrifield [7] found that lateral

cephalograms are relevant for measuring the available space and third molar angulation.

In our research we studied the relationship between correspondent variables measured separately on orthopantomograms and lateral cephalograms for the same subjects. Hattab [3] found that if the difference between the retromolar space and the mesiodistal width of the lower third molar measured on orthopantomogram is less than -2 mm there is 100% prognosis for third molar impaction. Similar findings are described by Tulley [10] and Ricketts [8] for a distance DXi less than 20 mm on the lateral cephalometrics. Our results showed in figure 3 that 66,7% of the third molars in which $\Delta L < -2$ mm have DXi

< 20 mm. Furthermore, 78,7% of the third molars with $\Delta L > 0$ mm, which means a good prognosis of eruption, have $DXi > 28$ mm. There some uncertain results in group $\Delta L = [-2-0]$ mm (low chances for third molar eruption) where 38,6% of the lower third molars have $DXi = [25-28]$ mm, which means 75% chances for eruption evaluated on lateral cephalograms. These results could be explained by the errors raised during the process of accurate identification of the lower third molars on lateral cephalometric film.

The angle formed by the lower third molar long axis with the mandibular plane measured on orthopantomogram and lateral cephalometric film showed significant similar predictive values, despite the changes in the inclination of the mandibular baseline in the panoramic technique.

CONCLUSIONS

The lower third molar prediction remains a

subject of research for orthodontists, surgeons and dental practitioners. There are two common available methods for lower third molar prediction, one of them using measurements made on orthopantomogram and the other one using measurements on lateral cephalogram, but none of them can give an accurate prognosis for third molar eruption or impaction. The orthopantomogram is more reliable for the assessment of lower third molar available space and the lateral cephalogram allows for better angular measurements. The major disadvantage of the lateral cephalogram is the superposition of the two lower third molars and the difficulty in the interpretation of the measurements.

Further research is needed in order to develop new techniques and measurements for third lower molar prediction of eruption or impaction.

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MODIFICATION OF SOME SALIVARY PARAMETERS IN DIFFERENT GENERAL STATES OF DISEASE

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ABSTRACT

Salivary modifications can be the most often oral expression of systemic disease. The aim of the study was to evaluate certain modifications of some salivary parameters in different general affecting conditions. **Materials and methods** Base salivary flow, stimulated salivary flow and pH were evaluated on 27 patients with high blood pressure and diabetes, 23 with radiotherapy treatment and 15 with general satisfactory clinic condition. **Results** All the evaluated indicators were lower compared to the control group study. **Conclusion** Both medication and radiotherapy treatment affect the salivary glands inducing changes in the quality and quantity of oral fluid.

INTRODUCTION

Salivary modifications can be the most often oral expression of systemic disease. Many of the oral modifications in systemic alteration (carious lesion, oral mucosa infections, chewing or swallowing difficulties) can be related to salivary dysfunction. Old age conditions and nutritional status are directly related: common illnesses (cancer, osteoporosis, hypertension, diabetes and others) cause food intake disturbance, but at the same time an adequate nutritional diet improves the symptoms and slows the evolution of these diseases.

Our main goal was to evaluate certain modifications of some salivary parameters in different general affecting conditions.

METHODS AND MATERIALS

We developed a study regarding the salivary modifications upon 65 patients aged between 65 to 80 years old, selected from the Oral and-Maxillofacial Surgery Clinic and the Odontology and Periodontology Clinic of The Dental Medicine Faculty "Gr. T. Popa", Iasi,

as well as from the Medical Clinic of CFR Hospital Iasi and the Oncology Clinic of "Sf. Spiridon" Hospital Iasi, during 2005-2009.

Of the total, 27 individuals had two associated general affections (high blood pressure-HBP and diabetes), and 23 followed radiotherapy treatment for oral and maxillofacial neoplasm. The patients have been included in three groups:

- Group A: 15 patients with no records of systemic disease and general satisfactory clinic condition (control group)
- Group B: 27 patients with general diseases that displayed quantitative and qualitative salivary changes
- Group C: 23 patients with cervico-facial radiotherapeutic history.

Considering the gender of the patients, the distribution in groups consisted of a total 29 women, of which, 18 in the general systemic diseases group, 4 in the radiotherapy group and 7 in the control group; 36 men in total, of which 18 in the general diseases group (high blood pressure-HBP, diabetes), 9 in the radiotherapy group and 9 in the control group.

In all studied groups the base salivary flow rate (BFR), stimulated salivary rate flow (SFR) and salivary pH were evaluated.

The results were statistically processed and analysed through ANOVA and Newman-Keuls tests.

The determination of the base salivary flow rate was achieved using the following method: The patient sits in the dental chair with head slightly bent forward and asked to swallow saliva that has accumulated in the oral cavity, and then begin timing. The patient removes accumulated saliva from 2 to 2 minutes or more often in a beaker. After 5 minutes, the volume of collected saliva is measured. Normal: 0.4 to 0.6 ml/min.

For the determination of stimulated salivary flow rate the following method was used: the patient is placed in the dental chair as in the previous test and asked to chew a piece of paraffin for 60 seconds and then to swallow the accumulated saliva. Starting from that point, the patient will gradually evacuate saliva into a container for 5 minutes. The volume is expressed in ml/min. Normal values: 1-2 ml / min.

Dentobuff method was used for determining the pH saliva; it takes a Dentobuff strips, a pipette, paraffin, tube and a stopwatch. The saliva test was collected as above. With a pipette a small drop of stimulated saliva is taken and placed on a test strips that contains

an acid and a pH indicator. pH will be initially low, but if the saliva can neutralize the acid, the pH will increase. After 2 minutes, the test strips colour was compared with the manufacturers' provided scale.

RESULTS AND DISCUSSIONS

Compared to control, the base salivary flow rate (BFR) recorded significant different values in all studied groups. There were low values of the base salivary flow rate in the radiotherapy group ($M_{BFR}=0.11$) and in those with systemic disease group ($M_{BFR}=0.31$) (Table 1).

The reduced values of the base salivary flow (BFR) in patients with cervico-facial radiotherapy history is partly explained by the alterations of the salivary gland parenchyma, resulting in altered microvascularization, oedema and glandular swelling, the patients experiencing difficulties when chewing, swallowing and speaking [1]. When exposure to radiation that exceeds 50 Gy, there is a sharp and permanent drop of salivary flow, with a 90% amount decrease [2].

Concerning the stimulated salivary rate flow (Table 2), our study recorded significant modifications in the radiotherapy group ($M_{SFR}=0.513$), as well as in the general diseases group ($M_{SFR}=0.741$), much smaller compared to the control group values ($M_{SFR}=1.475$).

Group	Average	Average		Std.dev	Std.er	Min	Max
		-95%	-95%				
Control group	0.50	0.46	0.54	0.07	0.02	0.40	0.60
Radiotherapy	0.11	0.09	0.13	0.05	0.01	0.03	0.16
HBP, Diabetes	0.31	0.25	0.38	0.24	0.03	0.10	0.80

Table 1. Statistic indicators of the BFR – Base salivary flow (ml/min)

Group	Average	Average		Std. dev	Std. er	Min	Max
		-95%	-95%				
HBP, Diabetes	0.741	0.691	0.792	0.214	0.025	0.400	1.100
Radiotherapy	0.513	0.321	0.706	0.387	0.091	0.150	1.130
Control group	1.475 0.813	1.309	1.641	0.311	0.078	1.000	2.000

Table 2. Statistic indicators of the SFR– stimulated salivary flow rate (ml/min)

Patients with systemic diseases included in this study recorded reduced levels of base salivary flow rate, due to the xerostomic medication (antihypertensive drugs) or the disease itself (diabetes) factors determining significant dehydration and dry mouth sensation [3].

In patients with radiotherapy, low SFR is explained by deep secretory hypofunction, severe acinary atrophy, interstitial fibrosis and parenchyma loss, with ductal widening and proliferation, and abnormal secretory acinary cells, characterized by atypical large hyperchromatic nuclei [4]

In the general diseases patients group, SFR is also low compared to the control group, probably due to the action of pharmacological agents which can mimic or

influence numerous aspects which adjust salivation, affecting at the same time the salivary flow rate as well as its composition [5]. The pH values are lower within this group category ($M_{pH}=4.58$) compared to the control group ($M_{pH}=6.26$), probably because some of the blood pressure reducing agents can contain substances with acid pH (or, by contrast, the acid pH is the result of high salivary glucose levels as in the case of diabetes) (Table 3).

The low pH values recorded in patients with general diseases can be partly explained by insufficient metabolized carbohydrate intake, which can result in changes of the bacterial plaque as well as saliva pH, toward acidic mean values.

Group	Average	Average		Std.dev	Std.er	Min	Max
		-95%	-95%				
<i>Control group</i>	6.26	6.18	6.34	0.15	0.04	6.00	6.50
<i>Radiotherapy</i>	5.33	5.15	5.51	0.58	0.09	4.00	6.00
<i>HBP, Diabetes</i>	4.58	4.06	5.10	1.05	0.25	3.00	5.50

Table 3. Statistic indicators of salivary pH

It is well known that radiotherapy induces acinary atrophy and chronic inflammation in salivary glands. Timely response is due to secretory cells atrophy but without inflammation, and can be caused by radiation - induced apoptosis. In contrast, the late response with inflammation can be the result of radiation - induced necrosis. The “dry mouth” symptom seems to be just partly related to symptoms specific for salivary gland dysfunction. Xerostomia, through secondary symptoms: explosive dental caries, chewing, swallowing and speech difficulty, as well as the increase of oral candidiasis, can have a negative effect on the oral health.

It is important that elderly people are questioned clearly and carefully about their health status. Medical, dental and social accidents bring important clues regarding physiological, psycho-social and environment

problems that can interfere with dietary habits and nutritional status. Clinically manifest deficient nutritional status is just the last stage of an inadequate nutrition, because only the most severe deficiencies are manifested clinically. Most biochemical modifications, low resistance to infection and many other clinical features resulted from low plasmatic values of nutritional substances, occur before clinic expression. Therefore nutritional deficiencies should be taken into consideration in individuals with poor diet, but no clear clinical signs of the mentioned disorder.

CONCLUSIONS

Salivary function is essential for the dental integrity and oral tissue protection. In patients with general diseases and especially in those with cervico-facial radiotherapy, oral disease

management (caries and periodontitis) should include the evaluation of salivary functions.

Our results confirm previous observation that certifies that different general diseases (in our study diabetes, high blood pressure) or cervico-facial radiation therapy mainly affect parotid salivary glands, the source of most organic salivary compounds (amylase, total proteins).

Variation of these organic compounds in saliva has repercussions on the protective effect of saliva against cariogenic microbial

agents and can determine eventually, the increase of the carious risk.

Using saliva for oral cavity disease diagnosis reason, carious risk determination and oral pathology monitoring is already an area of active investigation.

General aging processes determine a series of characteristics that belong to biologic, psychological, social phenomena, with a general particular pathology and expression at the oral level.

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THE GASTROESOPHAGEAL REFLUX DISEASE IN CHILDREN – 5 YEARS CASES REPORT

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ABSTRACT

Objectives The study is investigating the gastroesophageal reflux disease in children using the gold standard method – the 24hour pH-metry. **Methods** 197 children underwent the 24 hours pH-metry between January 2006 and December 2010 in the Vth Clinic of Paediatrics, „St. Mary” Children Emergency Hospital, Iasi. The patients were selected based on the typical or atypical reflux symptoms: regurgitations, recurrent vomiting, asthma, recurrent wheezing, chronic cough, recurrent respiratory infections. The 24 hours pH-metry results were interpreted with the Boix Ochoa score. **Results** The reflux was present at 146 children (74.11%), 95 males and 51 females. For the age group 0-1 year, pH-metry was performed in 48 children, and the reflux was present in 34 cases (70.83%). Between 1-3 years old, out of 51 studied cases, 41 (80.39%) had reflux; between 3-10years old, 55 children (71.05%) out of 76 had reflux; and over 10 years old, in 16 cases out of 22 studied, the reflux was demonstrated. Over 50% of the children in the study presented only atypical reflux symptoms, especially respiratory. These children received antireflux treatment with a very good control of the symptoms. **Conclusions** The oesophageal pH-metry has a decisive role in the diagnosis of gastro oesophageal reflux especially for the children with atypical symptoms of reflux. A correct diagnosis through pH-metry allows a better therapeutical approach. The high percentage of positive pH-metry reflects a good selection based on clinical criteria mainly and on the poor response at the antiasthmatic therapy.

Key words: gastro oesophageal reflux, oesophageal pH-metry, children

INTRODUCTION

The gastro-oesophageal reflux disease (GERD) is a frequent disease in the paediatric practice. It is assessed to be the most frequent oesophagus disease in infants. It features abnormal and recurrent passage of the gastric acid content in the oesophagus, having as result digestive, breathing and/or neurobehavioral manifestations. An infant showing recurrent vomiting must be immediately examined for gastro-oesophageal reflux as well, in particular if the infant growth is not satisfying. [1]

In infants, the recurrent regurgitations and vomiting are typical while in children, the heterogeneous symptomatology raises

diagnosis-related issues. Signs such as recurrent wheezing, unexplained apnoea crises, chronic cough, recurrent bronchopneumopathies, and asthma crises are the consequence of complicated gastroesophageal reflux. [2]

The GERD diagnosis is even more laborious when atypical signs are present, which takes the disease out of the gastroenterology field, including it in the general paediatric pathology. The paraclinical investigations have the role of proving the presence of the gastroesophageal reflux and to highlight the lesions induced by the acid reflux on the lower oesophagus. Direct and indirect tests are performed, their sensitivity

and specificity varying depending on the method.

The oesophageal pH monitoring or pH measurement is the investigation technique with the highest sensitivity and specificity in the gastroesophageal reflux detecting and quantification. In the GERD diagnosis, it is the “gold-standard” method. It is based on the principle according to which, the passage of the acid gastric content into the oesophagus during the reflux determine a decrease of the intraesophageal pH [3]. It became a reference method after 1958, when it was recommended for the first time by Tuttle and Grossman, and the first successful measurement was performed by Spencer in 1969. The method consists of the pH recording in the lower oesophagus for a determined period of time: either 3-4 hours (short test), or 24 hours (long test) by the transnasal placement of a microelectrode, 5 cm above the cardia, which is connected to a computerized device analysing the different requested parameters, depending on which the graphic representation of the pH curves are made. The position of the electrode is radiological or manometrical controlled or it is established based on tables depending on the child’s age and height. With small probes, the method can be used in the premature born infant, being well tolerated. The first electrodes were bipolar and made of glass, but of larger sizes, so they could not be used in children; after 1970, unipolar smaller, flexible electrodes appeared that can be easily introduced nasally, being used in children, as well. But the small glass made electrodes have relatively high impedance and are instable for long time use. More recently, small electrodes with antimony crystals appeared, with lower impedance, suitable to the children. [4]

The method is able to supply information on the following parameters:

– the number of refluxes within 24 hours;

- the duration of the longest reflux;
- the number of refluxes taking more than 5 minutes;
- the average and the maximum duration of the esophageal clearance;
- the correlation between the acid “peaks” and the clinical symptoms: cough, regurgitation, apnea crises etc.

During recording, the main events are noticed:

- time and duration of lunches,
- sleeping time,
- the patient’s change of position,
- crying time,
- active and passive exposure to tobacco;
- but in particular, the previously mentioned symptoms which the patient or the subject is trained to monitor. [5]

In interpreting the results the following parameters are considered:

- the total number of reflux episodes (normal – below 2 episodes in average per hour);
- the number of reflux episodes with a duration higher than 5 minutes (normal – below 8 episodes);
- the duration of the longest reflux episode (in minutes);
- the reflux index (RI) = the ratio between the total number of reflux episodes and the duration of recording (normal – below 4);
- the Euler score = $x + 4y$, in which:
 - x – no. of reflux episodes cu $\text{pH} < 4$ longer than 1 minute;
 - y – no. of episodes with $\text{pH} < 4$ longer than 5 minutes.

A pathological reflux is discussed when:

- there are more than 2 reflux episodes in average per hour,
- the time summed up with $\text{pH} < 4$ is above 5% of the total period in which the determination was made.

The duration of the pH monitoring depends on the desired information.

The short duration pH measurement is conducted in clinostatism, in fasting conditions, in order to avoid reflux frequent episodes occurring immediately postprandial. It is also called the acid reflux test and it highlights the presence of spontaneous or induced oesophageal reflux. The test is positive if within 30 minutes, two episodes of oesophageal pH decrease occur. The disadvantage is that it does not report the alkaline reflux. [6]

The long duration or continuous, 24 hours pH measurement, allows prolonged monitoring and thoroughly details the events associated to reflux.

The indications of the oesophageal pH measurement:

- gastro-oesophageal reflux,
- dysphagia,
- recurrent vomiting,
- recurrent laryngitis,
- chronic cough and recurrent wheezing,
- growth failure,
- assessment of treatment results.

The counter indications of the oesophageal pH measurement:

a) absolute:

- higher nasopharyngeal or oesophageal obstructions,
- severe oromaxillofacial trauma,
- difficult to control coagulopathies.

b) relative:

- oesophageal ulcerations,
- oesophageal varices,
- recent surgeries in the esophagogastric area,
- low patient or subject compliance,
- impossibility of monitoring during testing.

Although it is an invasive investigation method, the pH-metry remains the most used diagnosis and assessment method in children with typical or atypical symptoms of GERD. [1].

OBJECTIVE

The study is investigating the presence of GERD in children, both in the cases with typical symptoms of reflux and with atypical signs.

MATERIAL AND METHOD

The study involved 197 children with the suspicion of gastro-oesophageal reflux diagnosis. The 24 hours oesophageal pH-metry was performed for all of them in the V-th Clinic of Paediatrics, Emergency Clinical Hospital for Children "Sf. Maria" of Iasi, throughout 5 years (January 2006 – December 2010). The children were selected based on the typical reflux symptoms (recurrent regurgitations, recurrent vomiting, dysphagia) and on the atypical symptoms, particularly breathing signs (chronic cough, recurrent wheezing, recurrent higher airways infections, recurrent pneumopathies, bronchial asthma), cases which were admitted to the V-th and II-nd Clinic of Paediatrics. In the selected cases, 24 hours continuous oesophageal pH-metry was performed with the Medtronic Digitrapper device and the results were interpreted based on the calculation of the Boix Ochoa score.

RESULTS AND DISCUSSIONS

Out of the 197 children selected for the study, the reflux was proved by esophageal continuous pH-metry in 146 of them, summing up a percentage of 74.11%. Similarly to the literature data, a prevalence of the males compared to the females was noticed, both in the cases selected in the study (123 boys, 74 girls) and the cases in which the reflux was highlighted upon the pH-metry determination (95 boys, 51 girls). As the environment, most of the cases are from the urban area, compared to the rural area (126, 71 respectively), explaining the more increased referral of the population in the cities to the specialist physician, mainly the

cases with reflux atypical symptoms (e.g. respiratory signs) which do not respond to the classic symptomatic outpatient treatment and which requires the enlargement of the investigation area. Regarding the age of the studied cases, they were divided on 4 age categories: 0-1 year, 1-3 years, 3-10 years and over 10 years. In the 0-1 year age group, the pH-metry was conducted in 48 children and the reflux was present in 34 cases (70.83%). Between 1-3 years, out of 51 analysed cases, 41 children (80.39%) had proven reflux at pH-metry; between 3-10 years, 55 children (71.05%) out of the 76 studied children, showed reflux and over 10 years, in 16 cases out of the 22 analysed, reflux was proved by pH-metry.

The large number of cases studied in the 0-1 year age group is correlated to the increased incidence of recurrent regurgitations and vomiting in that age. After the age of 1, the atypical signs of reflux increased, in particular the respiratory signs. In 68% of the cases with pH-metry proven reflux, with atypical symptoms of reflux (particularly respiratory), the starting of anti-reflux

specific treatment determined the improvement of the signs. The enrolment in the study group based on the presence of symptoms which raised the suspicion of GERD, proving the reflux by pH-metry in only 146 of the studied cases and its invalidation in 51 cases, shows the possibility of diagnosis traps, that is why the determination of the oesophageal pH imposes in all suspected cases of having GERD.

CONCLUSIONS

The esophageal pH-metry has a decisive role in the GERD diagnosis, in particular in children with atypical signs of reflux.

The continuous pH monitoring for 24 hours is the preferable method, allowing for the careful assessment of the events associated with the reflux.

The oesophageal pH-metry should be performed in all children in whom there is the clinical suspicion of pathological reflux.

The big advantage of the oesophageal pH-metry is the possibility of out patient monitoring of children with GERD.

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THE ANALYZE BY FINITE ELEMENT OF STRAINS IN PERIODONTAL LIGAMENT AND ALVEOLAR BONE DURING ORTHODONTIC TOOTH MOVEMENT

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ABSTRACT

Orthodontic tooth movement (OTM) is achieved by applying an orthodontic force system to the brackets. The (re)modeling processes of the alveolar support structures are triggered by alterations in the stress / strain distribution in the periodontium. The aim of the present investigation was therefore to use the FEM, for to determine the influence of force magnitude in the stress and strain distribution in the alveolar support structures. Human jaws segments obtained from autopsy were micro CT-scanned and sample-specific finite element (FE) models were generated. The material behaviour of the PDL was considered to be nonlinear and non-symmetric and the alveolar bone was modeled according to its actual morphology. A series of Fe-analyses investigated the influence of the moment-to-force ratio, force magnitude, and chewing forces on the stress / strain in the alveolar support structures and OTM. Stress / strain findings were dependent on alveolar bone's morphology. Because of the nonlinear behaviour of the PDL, distinct areas of tension, and compression could not be detected. Secondary load transfer mechanisms were activated and the stress / strain distribution in the periodontium was concealed by occlusal forces. The finite element method (FEM) has proved to be a valid and reliable technique for the calculation of the local state of deformation and loading of complex structures. Because roots and alveolar bone morphology are patient specific, FE-analysis of orthodontic loading regime should not be based on general models.

Key words: finite element analysis; orthodontics; periodontal ligament; tooth movement

INTRODUCTION

Orthodontic tooth movement (OTM) occurs as a result of site-specific resorption and formation of the alveolar bone. The remodelling processes of the alveolar support structures are triggered by alterations in the stress / strain distribution in the periodontium caused by the intra-alveolar displacement of the roots within the intra-alveolar space. According to the classical OTM theories, symmetric zones of compression and tension are present in the periodontium, but these do

not consider the complex mechanical properties of the PDL, the alveolar structures' morphology, and the magnitude of the force applied.

A common goal for all orthodontists has been to define a force that results in a maximal rate of tooth movement with minimal iatrogenic side-effects. The finite element method (FEM) has proved to be a valid and reliable technique for the calculation of the local state of deformation and loading of complex structures.

However, the validity of the results of FE-analyses is totally dependent on the ability to model the complexity of morphology and tissues material properties of the structures analysed [1, 2].

The aim of the present investigation was therefore to use the FEM: 1) to describe the orthodontic load transfer from the teeth to the alveolus; 2) to determine the influence of force magnitude in the stress and strain distribution in the alveolar support structures; and 3) to study the interactions of occlusal and orthodontic forces.

MATERIALS AND METHODS

A simplified FE-model of a tooth from an experiment described previously (14) was used to evaluate the shape of the tooth socket wall when a translation movement was simulated. Using a microCT (ICT) scanner (ICT40; Scanco Medical, Bassersdorf, Switzerland) two three-dimensional (3D) datasets of the alveolar bone were generated. Using a procedure described previously (12), 3D FE-models were generated comprised alveolar bone, PDL, and for the first sample, canine and first premolar, and for the second sample, first and second molars.

In the simplified model, the force magnitude was set at 100cN and a pure translation movement was achieved by constraining root movement to the mesial-distal direction. For the human-based FE-models, a range of orthodontic loading regimes were simulated in accordance with clinical practice. In the first series of analyzes, the effects of a force of 100cN acting on a buccal-lingual direction and two different moment-to-force (M/F) ratio were analysed.

The force was acting in a buccal direction on the premolar and second molar, and lingual on the canine and first molar. The M/F ratio for the canine, first and second molar was chosen to be either 0 or 11, whilst for the

premolar 0 or 9 [3, 4]. In the second series of analyses, the influence of force magnitude on the load transfer mechanism was evaluated. A fixed M/F ratio of zero was used for the first premolar, the canine and first molar, whereas the force magnitude was progressively increased up to 400cN in steps of 50cN. In the third series of analyses, occlusal vertical forces ranging from 0 to 20 000cN were superimposed to an orthodontic force of 100cN and a M/F of 0. For each series of analyses the stress and strain distribution in the periodontium, and the resulting tooth movements were ascertained.

Movement was suppressed in all directions for the nodes situated on the bottom edge of each bone segments [5, 6].

RESULTS

The FE-analysis showed that the deformation of the alveolar wall in a buccal-lingual cross-section occurred mostly on the tension side (Fig. 1B, C, upper-right quadrant). The concavity of the alveolar wall was decreasing at X (the area where bone apposition occurs) but it is increasing at Y. When bending of the alveolar bone in a buccal-lingual section was assessed, the deformation at the cervical level was below 1 μ strain in case of tipping (fig. 1, lower-left quadrant) and was approximately 0.1 μ strain in case of translation (Fig. 1, lower-right quadrant).

1) When a M/F = 0 was simulated and the force level kept at 100cN, all the teeth displayed uncontrolled tipping.

Regions of compressive and tensile normal stresses could be identified in the PDL. However, the magnitude of the tensile stresses was significantly higher than the compressive stresses. This was consistent for all the teeth (Fig. 2).

The accompanying strains in the PDL were in the range of 20% to 14%.

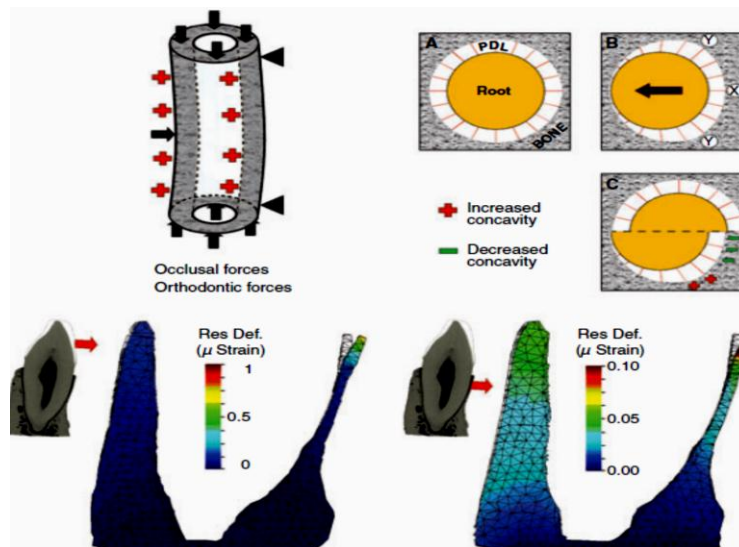


Fig. 1. Sample-specific FE-models – orthodontic loading

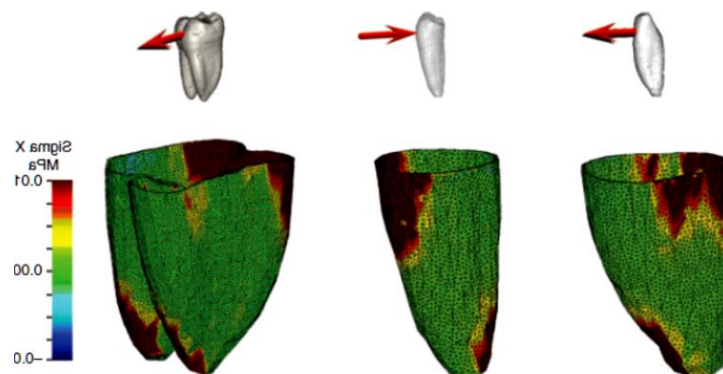


Fig. 2. Compressive and tensile normal stresses.

The distinct compression and tension areas seen in the PDL were not present in the adjacent areas of the alveolar bone, except for a thin layer of bone in close contact with the PDL. Areas of tensile stress were well recognizable in the lingual-cervical and buccal-apical alveolar bone. In the buccal-cervical area of the alveolar bone the compressive stresses are barely detectable. The same is seen on the lingual-apical portion of the alveolar bone.

When M/F's of 9 and 11 at 100cN were simulated, all teeth displayed almost perfect translation. As a consequence, the overall displacements of the teeth were smaller than in the case of uncontrolled tipping. In the lingual section of the PDL of the canine and first molar, and on the buccal section in case

of the premolar, a nearly uniform distribution of tensile stresses were present, whereas a very mild compression was present on the opposed side of the PDL. In the alveolar bone on the tension' side the tensile stresses were uniformly distributed with a maximum value of about 0.02MPa (for the premolar), whilst on the opposite side the compressive stresses were by far lower with a maximum value of about 0.001MPa (for the canine).

2) In the second series of experiments, the force level was gradually increased. When the force magnitude was below 150cN, the state of stress / strain and deformation in the PDL was mimicking what had been found in the first series of analyses. In contrast, when force magnitude became larger than 200cN, a small area of compression started to appear in

the PDL at the level of the crest of alveolar bone and in the direction of the force. At a level of 400cN, the peak value of compressive stresses was similar to what was found on the tensile side, nevertheless, the area did not substantially increased in size (Fig. 3). At a force level of 400cN the PDL in the buccal- and lingual-cervical level has been deformed more than 80%. The area

where compressive stresses were present was immediately bordered by areas where no compression could be detected.

The compressive stresses in the PDL were transferred to the adjacent alveolar bone, where they were transformed into compressive as well as tensile hoop stresses, as demonstrated in a previous research [7, 8] (Fig. 3, lower row).

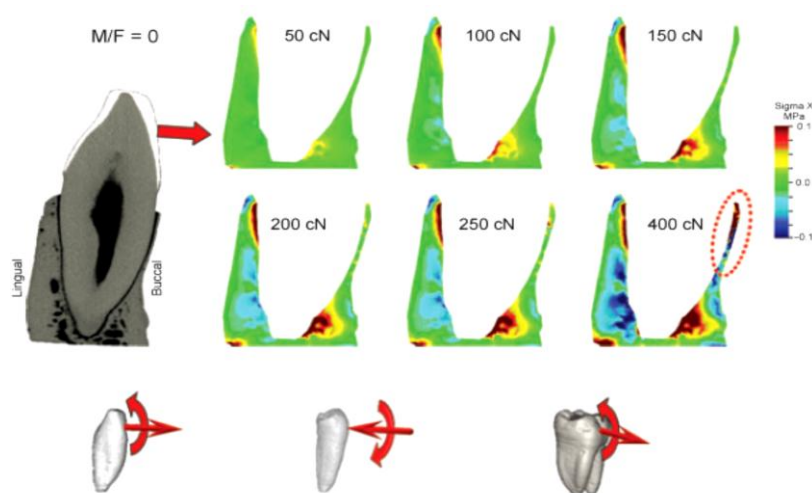


Fig. 3. The force level was gradually increased

In the last series of analyses, the influence of the occlusal forces on the stress and strain distribution in the PDL was investigated. When the vertical-occlusive force reached a magnitude up to approximately 500cN, no substantial changes could be detected in the PDL from the scenario where only the orthodontic loading forces were applied. Beyond this level, the loading of the PDL and of the alveolar structures in general became completely different, changing from uncontrolled tipping (because of the orthodontic forces) to pure intrusive movement (because of occlusal forces).

DISCUSSION

Changes in the stress and strain distribution are the triggers for bone modeling that allow the teeth to move when an orthodontic loading regime is applied at the bracket. The present investigation describes

how the loading pattern influences the first steps of the mechanotransduction mechanism leading to PDL re-arrangement and bone resorption and formation in relation to OTM.

These findings do not corroborate the simplified view of having tensile and compressive stresses in separate areas of the PDL and alveolar bone [7] which characterized the classical pressure – tension' theory [8]. Bone formation related to an increased concavity of the alveolar bone wall also could not be confirmed. Moreover, the change in curvature of the alveolar socket could not be compared with long bones [9]. What is presented in this study corroborates what was previously speculated: bone formation is the result of an increase state of load in the alveolar bone and in the stretched PDL fibres, while bone resorption is the results of either an unload state (i.e. direct resorption) or as a consequence of

hyalinization (i.e. indirect or undermining resorption) in the area where the PDL is undergoing large compressive deformation and the underlying alveolar bone is subjected to local high stress and strain [10].

The present study showed that small forces were enough to produce deformations in the PDL, yet the associated compressive stresses were very mild. However, by increasing force magnitude during uncontrolled tipping the compressive stresses in the PDL increased considerably and compressive forces were transferred to the cervical portion of the alveolar bone. In the present study, an approximation of the true physical properties of PDL was used, where its basic shape with a low-stiffness toe region and a high stiffness slope closely resembled both experimentally (3) and mathematically determined relationships [11].

A limitation of the present study is that the

results could not be directly compared with *in vivo* loading; nevertheless, the calculated amount of deflection of the teeth reflects what has been reported in experimental studies. Nevertheless, a fine tuning of the FE-models and of the material properties of the various tissues is necessary in order to better determine the stress and strain distributions within the whole periodontium and the transition between low and high forces under orthodontic loading.

CONCLUSIONS

The present FE-analyses indicate that following the application of an orthodontics loading regime, alveolar bone modeling cannot be based on the simplified, yet generally accepted, concept of resorption caused by compression, and formation caused by tension.

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DENTISTS ERGONOMIC KNOWLEDGE AND ATTITUDES IN NORTH-EST REGION, ROMANIA

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ABSTRACT

The ergonomic education of the dental health-care personnel must focus on the considerable occupational health risks. **Aim.** The aim of this study was to assess the dentists' knowledge and attitudes towards ergonomics during dental health-care. **Methods** A questionnaire-based study was conducted including 152 dentists (72,4%-females, 27,6%-males) aged between 25-65 years, from North-Est Region, Romania. The questionnaire included 13 questions related to ergonomic practices in the dental office. Data were statistically analysed using the SPSS 14.0 program and chi-square test ($p < 0.05$). **Results** 51,3% of the dentists work 4 to 7 hours and 34,9% work over 7 hours per day. The majority of the subjects appreciate that ergonomics does not imply loss of working time-70,4%. 50,4 % of the dentists collaborate with a dental assistant which is involved in the application of the Four Handed Dentistry in 38,8% of cases. 83,6% of the subjects consider that post-graduated courses are important for their ergonomic education. One third of the dentists-30,9% adopt a orthostatic position and 19,1% use the sitting position during 90% of the time of the working day. The patient is positioned in sitting or horizontally position over 90% of the working time by 17,8% and respectively 14,5% of the dentists. The subjects indicated musculoskeletal disorders affecting the cervical spine-52,0%, the lombar spine-52,0%, the right shoulder-26,3% and the right arm-8,6%. The main symptoms included pain-71,7% and functional limitation-27,0% and imposed medical examination-39,5%, medication-33,6% and rest for one or more days-29,6%. 44,1% of the dentists practice physical exercises once and 33,6% twice a week. **Conclusions** Dentists' knowledge and attitudes towards ergonomics should be improved and updated by educational programmes in order to reduce the incidence of occupational pathology and improve the quality of the dental health-care.

Key words: ergonomics, occupational health risks

INTRODUCTION

Ergonomics implies the study and analysis of human capabilities and limitations during the professional work including anatomic and psychological aspects and must involve all the members of the dental personnel [1]. The ergonomic elements which must be discussed in relation to the occupational environment in the dental office refer to the dental team positioning, the design of the working area and dental equipment and the collaboration between the dentist and the dental assistant within Four Handed Dentistry [2]. The ergonomic risk factors include extended workdays, repetitive and forceful work, prolonged static and

unsupported sitting [3]. The particular risk for the dentists to develop musculoskeletal disorders that involve nerves, tendons and muscles must be reduced by educational interventions for maximum efficiency and safety with a positive impact for dentists throughout their professional life. [4, 5]

The aim of this study was to assess the dentists' knowledge and attitudes towards ergonomic principles during dental health-care in the dental offices in the North-Est Region, Romania.

MATERIALS AND METHODS

In order to evaluate the knowledge and

attitudes towards ergonomics a questionnaire-based study was conducted including 152 dentists (72,4% females and 27,6% males) aged between 25 and 65 years, from 6 counties North-East Region in Romania: Iasi, Bacău, Botoșani, Suceava, Vaslui, Neamț. The questionnaire included 13 questions related to ergonomic practices in the dental office: dentist' working position, patient position, number of working hours, musculoskeletal pathology, collaboration with the dental assistant. The results were processed by age, gender and experience in work. Data were statistically analysed using the SPSS 14.0 program and compared with chi-square test ($p < 0.05$).

RESULTS

The results of the present study demonstrate that 51,3% of the dentists work 4 to 7 hours, 34,9% work over 7 hours and 13,2% work 1 to 4 hours per day (Fig.1). The majority of the subjects appreciate that ergonomics does not imply loss of work (70,4%).

The majority of the dentists appreciate that the Universities must provide a most substantial education in ergonomics by curriculum and post-graduated courses (83,6%) but 7,2% of them are not sure about their utility (3,9% females and 3,3% males). 25,0% of the subjects which do not appreciate the importance of the ergonomics education belong to the group of 0 to 5 years working experience.

50,4 % of the dentists collaborate with a

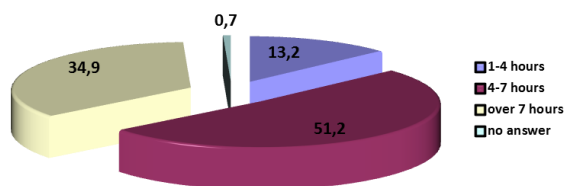


Fig. 1. Dentists' working hours per day

dental assistant which is involved in the application of the Four Handed Dentistry in 38,8% of the dental offices, provides the necessary materials (59,2%), helps in performing some clinical procedures (48,0%), performs patients scheduling (52,6%) and answers the phone (53,3%).

Regarding the working position one third of the dentists (30,9%) declare that they adopt a orthostatic posture position during 90% of the time of the working day, 23,7% use orthostatic position in 70% of the day and a sitting position for 30% of the working time and 19,1% use the sitting position over 90% of the time (Fig. 2). No subject in the group over 65 years old use the orthostatic position over 90% of the working time but they declare to adopt this position in 70% of the time. The younger dentists (age group of 25-35 years and 35-45 years) prefer the sitting position for over the 90% of the time (10,5%, respectively 8,6%). Female prefer the sitting position over 90% of time in proportion of 15,8% unlike males (3,3%).

The patient is positioned in sitting position by the 17,8% of the dentists. The horizontal position of the patient over 90% of the working time is used by 14,5% of them. The dentists with 10 to 20 years working experience prefer the orthostatic position for 70% of the time (15,1%). The semi-sited position is preferred by the 25-35 and 35-45 groups of age (16,4% respectively 30,3%), Females prefer the horizontal position (12,5%) unlike man (2,0%).

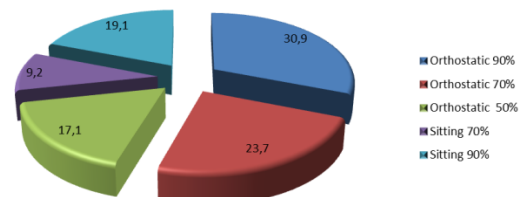


Fig. 2. Dentists' position during dental procedures

The subjects indicated musculoskeletal disorders located in the cervical spine (52,0%), the lumbar spine (52,0%), the right shoulder (26,3%) and the right arm (8,6%). (Fig.3). The disorders located in the right arm are reported by 66,4% of female subjects and 24,3% of male subjects. 27,6% of the dentists in the 35-45 group of age claimed a cervical spine pathology. Significant more female subjects are affected by the cervical spine symptoms than male subjects (44,1% and respectively 7,9%) ($p < 0.05$). 11,8% of the 10 to 20 years work experience dentists declare that they suffer by disorders located in the right shoulder. The lumbar spine was affected in 24,3% of the 35-45 group of age, 21,7% of 10 to 20 years working experience and 38,8% of female subjects.

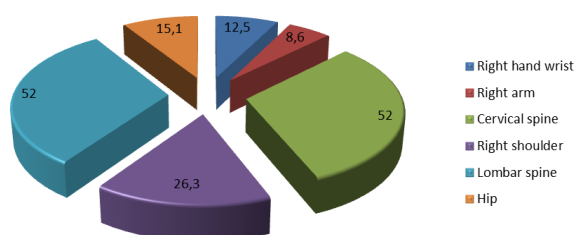


Fig. 3. Dentists' musculoskeletal disorders

The main claimed symptoms included pain (71,7%), functional limitation (27,0%), paraesthesia (15,8%) and muscular spasm (28,3%). The musculoskeletal disorders imposed medical examination (39,5%), medication (33,6%), physiotherapy (36,2%), rest at home for one or more days (29,6%) and hospitalisation (2,6%).

44,1% of the dentists practice physical exercises once and 33,6% twice a week.

DISCUSSIONS

In the scientific literature the number of hours worked varies among dentists. Most of them work 4 or 5 days a week, between 35 and 40 hours a week. (6) In the present study half of the subjects declare that they work 4 to 7 hours and one third of them work over 7

hours per day.

As expected the older dentists prefer the orthostatic common position in 70% of the working time and the younger dentists and female subjects prefer the sitting position for over the 90% of the time.

The primary objective of dental ergonomics is the prevention of the symptoms of work-related musculoskeletal disorders [7, 8]. The dentists' education regarding ergonomic principles represents the most important action for improving the quality of the medical act and professional life [9]. In our study, regardless gender, the majority of the dentists appreciate the importance of education in this domain in the Dental Universities but 25% of the subjects are not interested by those aspects.

Four-handed dentistry is ergonomically the optimal way to provide dental care, to increase efficiency and productivity, to reduce stress and fatigue and to increase the safety of the dental treatments [10]. In our study half of the dentists collaborate with a dental assistant which is involved in the application of the Four Handed Dentistry only in one third of the dental offices.

Regarding musculoskeletal disorders the results of the present study correspond to those reported by a survey of Danish dentists for the low back pain (50%), but are lower for the disorders located in the right shoulder (65%) [11]. Similarly prevalence was reported in Israel (Ratzon 2000) [5]: 55% musculoskeletal symptoms in the lower back and Australia (Legat 2006): 54% for low back pain. [11]

In the present study the musculoskeletal symptoms determined rest at home for one or more days in almost one third of the subjects, a much higher percentage compared to the results of the study developed by Leggat in which 9.1 % dentists reported taking leave in the previous 12 months because of an musculoskeletal disorder. [11]

CONCLUSIONS

Dentists' knowledge and attitudes towards ergonomics should be improved and updated by educational programmes in order to increase awareness, reduce the incidence of occupational pathology and improve the quality of the dental health-care.

ACKNOWLEDGEMENTS

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CLINICAL PERFORMANCE OF CLASS II COMPOSITE RESINS DIRECT RESTORATIONS RELATED TO RESTORATIVE TECHNIQUE: 12 MONTHS LONGITUDINAL STUDY

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ABSTRACT

The aim of the study was to assess the clinical performance of class II composite resins restorations performed using different restorative techniques. **Materials and methods** The study group included 37 patients aged between 18-42 years. A number of 60 class II direct restorations were performed by a single practitioner using adhesive preparation design with margin bevelling and hybrid composite resin Herculite XRV (Kerr) as restorative material. The teeth included in the study were divided in three groups (n=20) accordingly to restorative technique: I. centripetal build-up; II. oblique layering technique; III. horizontal layering technique. The class II composite resins restorations were assessed after 12 months using United States Public Health Services (USPHS) criteria. **Results and discussions** The centripetal build-up technique presented the score A for marginal adaptation in 60%, for marginal discoloration in 70% and for anatomical form in 80% of the restorations. The horizontal layering technique presents the score A for marginal adaptation in 40%, for marginal discoloration in 50% and for anatomical form in 50% of the restorations. The oblique layering technique presented the score A for marginal adaptation in 80%, for marginal discoloration in 90% and for anatomical form in 60% of the restorations. **Conclusions** Statistical differences between groups were found regarding marginal adaptation (oblique layering technique versus horizontal layering technique), marginal discoloration (oblique layering technique versus horizontal layering technique) and anatomical form (centripetal build-up technique versus horizontal layering technique).

Key words: composite resin, class II direct restorations, centripetal build-up technique, horizontal layering technique, oblique layering technique

INTRODUCTION

Academic European of Operative Dentistry considers that acceptance of composite resins restorations among dental professionals, particularly for restoring

posterior teeth, is due to factors as improvement in resin-based composite technology, amalgam rejection, desire of patients for aesthetic restorations and conservative preparation of cavities. The

restorative technique is regarded as a major factor of influence for clinical performance of class II composite resins fillings.

Aim of study

The study aimed to assess the clinical performance of class II composite resins restorations in posterior teeth related to different techniques used for restoration.

MATERIALS AND METHOD

The study group included 37 patients (age 18-42). The selection criteria were as follows: low cariogenic risk, good hygiene, medium occlusal forces, the presence of one or more proximal carious lesions in molar mandibular teeth and treatment indication for conventional class II cavities. The exclusion criteria were as follows: high cariogenic risk, poor hygiene, high occlusal forces, and bruxism. Written patient consent was obtained at the beginning of the treatment.

60 class II direct restorations were performed by a single practitioner using adhesive preparation design with bevelled margins, restored with a hybrid composite resin (Herculite XRV - Kerr). The teeth included in study were divided in three groups (n=20) accordingly to restorative technique:

- I. Centripetal build-up
- II. Oblique layering technique
- III. Horizontal layering technique

The operating field was isolated using cotton rolls, retraction cord and saliva ejector was used. The cavity preparation was done using tungsten carbide burs. All enamel and cavosurface margins were acid etched and coated with bonding agent according to manufacturer's recommendations. Prior to restoring class II preparation a sectional matrix band (Kerr Hawe) was applied, contoured and firmly wedged to closely adapt the matrix to the gingival margin of preparation and to achieve a degree of tooth separation in order to compensate the matrix width. For each restorative technique, the

increments of composite resin were no more than 2mm. Light curing was done for 40 seconds with (OPM-LED.G., Ritter, 575mW/cm²). The orientation of light beam was different accordingly to the specific features of each restorative technique. The contouring and polishing of restorations were accomplished using fine diamond burs, aluminium oxide discs (Sof-Lex Pop-on Discs, 3M Dental), and abrasive strips.

The clinical parameters of class II composite resins restorations were assessed at an interval of 12 months using United States Public Health Services (USPHS) criteria by two trained clinicians. In case of disagreement the final decision was made after reevaluation. The recorded data were processed using statistical test Kruskal-Wallis.

RESULTS AND DISCUSSIONS

The graphs presented in the next figures presents the scores for Ryge criteria at an interval of 12 months for direct restorations performed using centripetal build-up technique, horizontal layering technique and oblique layering technique (Fig. 1-5).

The centripetal build-up technique presented the score A for colour match in 80% of the restorations, for marginal adaptation in 60%, for marginal discoloration in 70%, for anatomical form (proximal) in 80% and for surface texture in 60% of the restorations. The horizontal layering technique presented the score A for colour match in 70%, for marginal adaptation in 40%, for marginal discoloration in 50%, for anatomical form (proximal) in 50% and for surface texture in 70% of the restorations. The oblique layering technique presented the score A for colour match in 70%, for marginal adaptation in 80%, for marginal discoloration in 90%, for anatomical form (proximal) in 60% and for surface texture in 70% of the restorations. 10% of the restorations using centripetal build-up

technique and 20% of the restorations using horizontal layering technique were associated with score C for marginal adaptation and marginal discoloration. The restorations performed using horizontal layering technique presented poor results regarding anatomical contour of proximal surface and contact point (20% scored C).

Statistical analysis was performed using Kruskal-Wallis test to compare restorative techniques regarding the criteria of marginal adaptation, marginal discoloration and anatomical form (Tables 1.a-b., 2).

Statistical differences between groups were found regarding marginal adaptation (oblique layering technique versus horizontal layering technique; $p=0.028$), marginal

discoloration (oblique layering technique versus horizontal layering technique; $p=0.005$) and anatomical form (centripetal build-up technique versus horizontal layering technique; $p=0.029$).

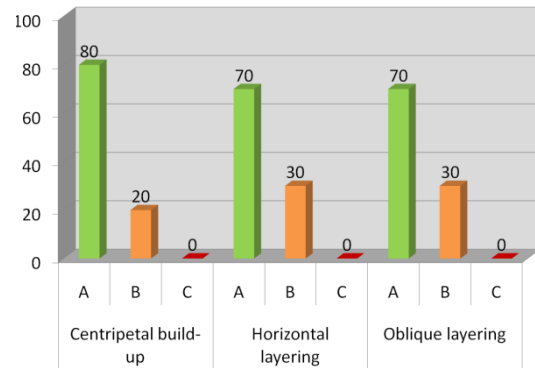


Fig. 1. Colour match

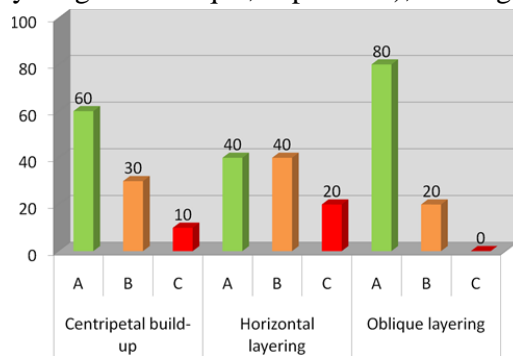


Fig. 2. Marginal adaptation

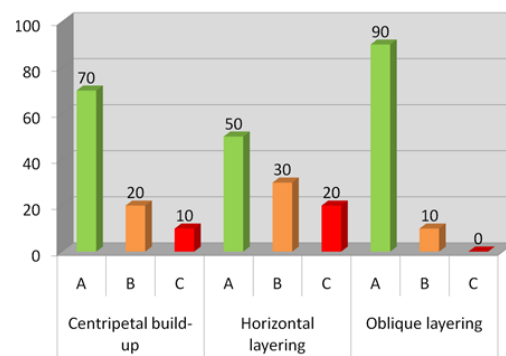


Fig. 3. Marginal discoloration

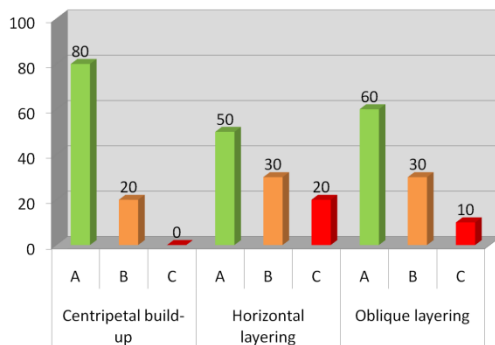


Fig. 4. Anatomical form (proximal)

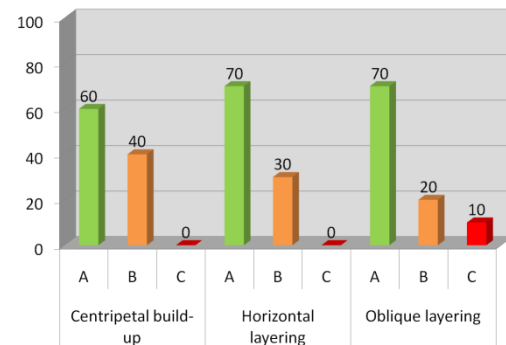


Fig. 5. Surface texture

Ranks			
	Restorative techniques	N	Mean Rank
Marginal_adaptation	Centripetal build-up	20	29.60
	Oblique layering	20	25.60
	Horizontal layering	20	36.30
	Total	60	
Marginal_discoloration	Centripetal build-up	20	30.50
	Oblique layering	20	24.20
	Horizontal layering	20	36.80
	Total	60	
Anatomical_form	Centripetal build-up	20	24.90
	Oblique layering	20	31.40
	Horizontal layering	20	35.20
	Total	60	

Test Statistics ^{a,b}			
	Marginal_adaptation	Marginal_discoloration	Anatomical_form
Chi-Square	4.913	8.031	4.900
df	2	2	2
Asy mp. Sig.	.086	.018	.086

a. Kruskal Wallis Test

b. Grouping Variable: Restorative_techniques

Table 1.a-b. Kruskal-Wallis Test (marginal adaptation, marginal discoloration, anatomical form)

Marginal adaptation	Centripetal build-up/Oblique layering	p=0,4	ns
	Centripetal build-up/Horizontal layering	p=0,191	ns
	Oblique layering /Horizontal layering	p=0,028	s
Marginal discoloration	Centripetal build-up/Oblique layering	p=0,103	ns
	Centripetal build-up/Horizontal layering	p=0,195	ns
	Oblique layering /Horizontal layering	p=0,005	s
Anatomical form	Centripetal build-up/Oblique layering	p=0,137	ns
	Centripetal build-up/Horizontal layering	p=0,029	s
	Oblique layering /Horizontal layering	p=0,433	ns

Table 2. Statistical comparison between restorative techniques (marginal adaptation, marginal discoloration, anatomical form)

DISCUSSIONS

The complexity of some oral variables like occlusal stress, pH and temperature changes makes simulation of oral conditions difficult [1]. The conditions simulated in vitro studies vary considerably from those in vivo. Therefore, only clinical studies may be determinant in assessing specific restorative techniques [2].

Several studies have been focused on the influence of restorative technique on marginal adaptation and marginal discolorations in cervical area and accuracy of proximal contact point reconstruction. The loss of integrity at the level of interface between restoration and dental tissues is considered the major reason for direct restorations replacement (marginal fracture, secondary dental caries, pulp inflammation). The poor reconstruction of proximal contact point results in initiation of periodontal inflammation. The oblique layering technique prevents the microleakage of the cervical interface because this technique uses a special way for light-curing of the first two oblique layers (buccal-cervical, lingual-cervical) placed in the initial stage. The horizontal

layering technique is considered a technique easy-to-use however it has a major disadvantage related to the poor cervical marginal sealing because of the shrinkage location determined by the specific light-curing of the horizontal layers from occlusal direction. The centripetal build-up technique allows perfect reconstruction of proximal contact point and good results regarding marginal sealing of cervical areas. The results of in vitro and in vivo studies suggest that it would be better to use either centripetal build-up or oblique layering technique in class II composite resin restorations [3-10].

CONCLUSION

Our study support the results of previous studies regarding clinical performances of class II composite restorations performed with different restorative techniques. Statistical differences between groups were found regarding marginal adaptation (oblique layering versus horizontal layering), marginal discoloration (oblique layering versus horizontal layering) and anatomical form (centripetal build-up versus horizontal layering).

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CLINICAL STUDY REGARDING THE EVALUATION OF THE THERAPEUTIC EFFICIENCY OF CERTAIN REMEDIES IN ORAL HALITOSIS

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ABSTRACT

Halitosis can be determined by oral, systemic or physiological conditions. The complexity of halitosis has imposed the development of a treatment system – the NT Necessary of Treatment. The purpose of this study is that of assessing the efficiency of a complex of therapeutic measures, according to the necessary of treatment grid NT1 and NT1 in a batch of patients diagnosed with forms of physiological halitosis and oral pathological halitosis. These patients have benefited from therapeutic measures according to the NT1 necessary of treatment, respectively NT1, according to the type of halitosis. The efficiency of the applied treatment was assessed at an interval of 3 months after the main examination and comprised the same methods of assessment as at the beginning. As a result of the analysis of data obtained after the therapeutic measures applied in our study, we can speak about major favourable modifications as regards the quality of the oral breath of the patients who participated in the research. We have noticed a clear improvement in all the patients assessed. The scores diagnosed through the halitosis detector substantially decreased, becoming favourable, indicating the absence of halitosis.

Key words: assessment, oral pathological halitosis, necessary of treatment.

INTRODUCTION

Although statistically speaking, the proper halitosis has a frequency of 50%, very few patients ask for treatment. This proves that these patients, even those with a real disorder, have a different psychological perception on their own breath [2, 3, 8].

The negative psychological aspects can be intensified through an inadequate treatment

management. That is why it is important to establish a precise treatment protocol even when the halitosis is difficult to detect [1, 6]. Halitosis can be determined by oral, systemic or physiological conditions. The complexity of halitosis has imposed the development of a system of treatment – the NT Necessary of Treatment [5].

Classification	Necessary of treatment
1. The proper halitosis 1. Physiological halitosis 2. Pathological halitosis - Oral - Extra-oral	NT – 1 NT – 1 and NT – 2 NT – 1 and NT – 3 NT – 1 and NT – 4 NT – 1 and NT – 5
2. Pseudo-halitosis	
3. Halitophobia	

Table 1. The classification of halitosis and the necessary of treatment

Category	Description
NT-1	Explaining and instructing the patient in the oral hygiene (his/her awareness)
NT-2	Oral prophylaxis, professional methods of sanitation and the treatment of oral disorders, especially of periodontal ones
NT-3	The interest of a doctor or a specialist physician
NT-4	Awareness, explaining, instruction, education
NT-5	Collaboration with a psychologist, psychiatrist

Table 2. The need of treatment (NT) for halitosis

At the beginning, all the patients with halitophobia are diagnosed with oral or extra-oral pathological halitosis or with pseudo-halitosis [4]. The patients will be treated according to the corresponding NT. After the treatment ending, the patients are re-examined for the halitosis. If the examiner can confirm that there is no physical or social evidence of halitosis, but only the patient claims that the smell persists, he/she can be diagnosed with halitophobia.

The treatment of the proper halitosis

NT – 1 represents the basis of the treatment for halitosis. The tongue cleaning reduces the sulphur volatile compounds (CVS) – the desquamated epithelial cells, sanguine cells and bacteria are reduced [7, 9]. Although the brushing and the use of the dental floss are not very efficient in reducing the halitosis, these procedures obtain a good oral hygiene and will prevent the periodontal

disease, the main cause of oral halitosis. Some mouthwashes and toothpastes are efficient in reducing the oral smell [10].

An odontal-periodontal periodical treatment is necessary, these disorders being the main cause of the oral pathological halitosis. **NT – 2**

The principle of the management protocol is:

The practitioner must establish a connection between him/her and the patient, through an attitude of acceptance, sympathy, support and safety. He/she must not argue with the patient on the existence or inexistence of halitosis. The doctor must explain the patient that the avoidance behaviour of the people around him/her is not due to halitosis. The patient must be trained in NT-1. The patient must be aware that he/she must not think of halitosis according to the attitude of the people around him/her.

NT 1 = Instructions for patients
Hygiene of the tongue
Brushing and the dental floss
Mouthwash and toothpaste
Periodical examinations and dental measurements
Other methods

Tabel 3. Physiological halitosis NT - 1

The necessary of treatment 2
A. Periodontal treatment
- Odontal treatments
- Endodontic
- Restorative
B. Surgical and medical treatments
- Extractions
- Treatment of ulcerations
- Treatment of xerostomy
C. Prosthesis

Tabel 5. NT – 2: Oral pathological halitosis

The treatment of the patients with halitosis of systemic or psychological cause is difficult, requiring medical or psychological therapy. NT-1 refers especially to physiological halitosis, but can be also applied to all the cases that can belong to NT-2 to NT-4. That is why, all the patients diagnosed with extra-oral or halitophobic pathological halitosis must go through the stages NT-1, supervised by the dental medical doctor, for their own sanitary education and for a better oral hygiene. NT-1 represents the most important necessary of treatment for halitosis [11].

The purpose of this study it to assess the efficiency of a complex of therapeutic measures, according to the grid of the necessary of treatment NT1 and NT2 in a batch of patients diagnosed with forms of oral physiological halitosis and pathological halitosis.

MATERIAL AND METHOD

Within a batch composed of 123 students (VI year) and 64 patients who requested specialty examination within the Chair of Odontology and Periodontology from "M. Kogălniceanu" Dental Clinical Basis, with ages comprised between 24-76 years, evaluated in view of establishing the halitosis diagnosis, we selected 22 persons divided in four lots of study, whom, after a detailed clinical examination: odontal and periodontal, after the oral hygiene tests, the periodontal indices, the evaluation of saliva from the quantitative and qualitative point of view, after testing the halitosis degree with a halitosis detector and an especially conceived questionnaire, we diagnosed with oral physiological halitosis or pathological halitosis of odontal-periodontal nature. These patients benefited from therapeutic measures according to the necessary of treatment NT1, respectively NT2, according to the type of halitosis. The efficiency of the treatment

applied was assessed at an interval of 3 months from the primary examination and comprised the same methods of assessment as at the beginning. Both in the physiological halitosis and in the oral pathological halitosis, TetroBreath products were used. The batches were formed in the following manner:

- 4 patients diagnosed with physiological halitosis benefited from therapeutic measures NT1: explaining and instructing the patient in view of an appropriate oral hygiene (his awareness raising) with the use of the TetroBreath introductory kit.
- patients diagnosed with oral pathological halitosis of odontal nature benefited from therapeutic measures NT1- NT2: explaining and instructing the patient in view of an appropriate oral hygiene (his/her awareness raising). Oral prophylaxis, professional hygiene methods and the treatment of odontal disorders, plus the use of TetroBreath Plus introductory kit
- 5 patients diagnosed with oral pathological halitosis of periodontal nature have benefited from NT1-NT2 therapeutic measures: explaining and instructing the patient in view of an appropriate oral hygiene (his awareness raising). Oral prophylaxis, professional hygiene methods and the treatment of odontal and periodontal disorders, with the use of Tetro Breath Perio Therapy introductory kit.
- patients diagnosed with oral pathological halitosis of mix odontal-periodontal nature have benefited from NT1-NT2 therapeutic measures: explaining and instructing the patient in view of an appropriate oral hygiene (his awareness raising). Oral prophylaxis, professional hygiene methods and the treatment of odontal and periodontal disorders, with the use of Tetro Breath Perio Therapy introductory kit alternatively with the TetroBreath Plus

kit.

The parameters assessed in the study:

- | | |
|--|---|
| <ol style="list-style-type: none"> 1 Assessment of the salivary parameters; 2 Assessment of the salivary flow at rest and of the stimulated flow 3 Assessment of the saliva viscosity | <ol style="list-style-type: none"> 4 Periodontal assessment 5 CPITN (Community Periodontal Index Treatment Needs), periodontal indices 6 Gingival bleeding indices 7 Halitosis degree (Halitosis Detector). |
|--|---|

RESULTS

1. The variations of the cariogenicity of the bacterial biofilm (Hardwick J.L., Manly E.B. test)
2. The values of the PI bacterial plaque (Silness and Loe).
3. The evaluation of the salivary RFR / RFS parameters.
4. CPITN (Community Periodontal Index Treatment Needs) periodontal indices
5. Gingival bleeding indices
6. Halitosis degree (Halitosis Detector)

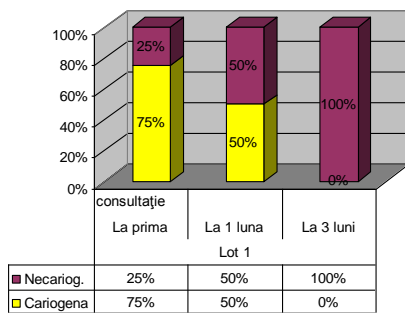


Fig. 1. The variations of the cariogenicity of the bacterial biofilm (Hardwick J.L., Manly E.B. test). Lot 1

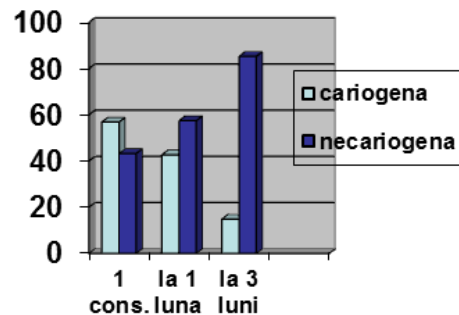


Fig. 2. The variations of the cariogenicity of the bacterial biofilm (Hardwick J.L., Manly E.B. test). Lot 2

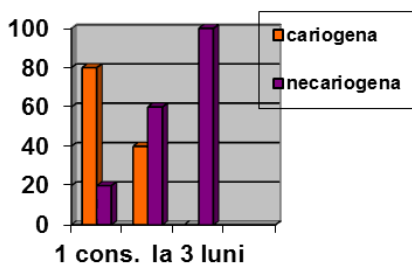


Fig. 3. The variations of the cariogenicity of the bacterial biofilm (Hardwick J.L., Manly E.B. test). Lot 3

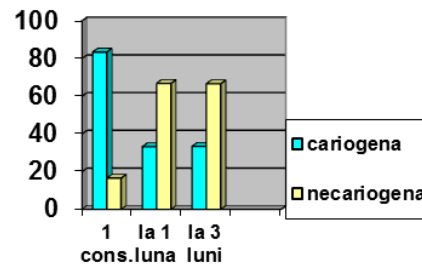


Fig. 4. The variations of the cariogenicity of the bacterial biofilm (Hardwick J.L., Manly E.B. test). Lot 4

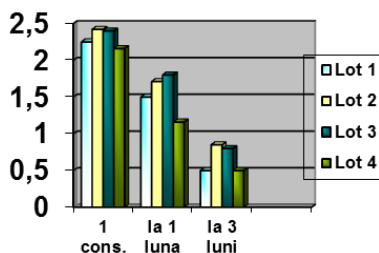


Fig. 5. The values of the PI bacterial plaque index (Silness and Loe)

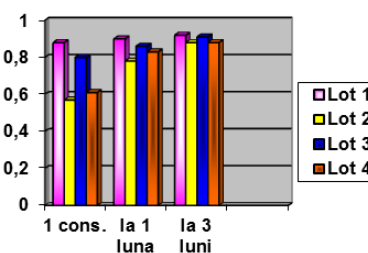


Fig.6. Assessment of the stimulated salivary flow (1 examination at 1 month/3 months)

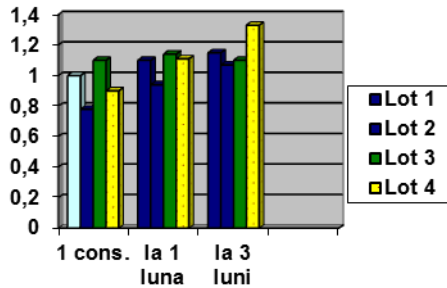


Fig. 7. Assessment of the stimulated salivary flow (1 examination at 1 month/3 months)

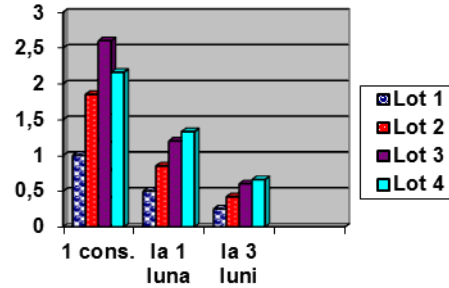


Fig. 8. Assessment of the CPITN indices (1 examination at 1 month/3 months)

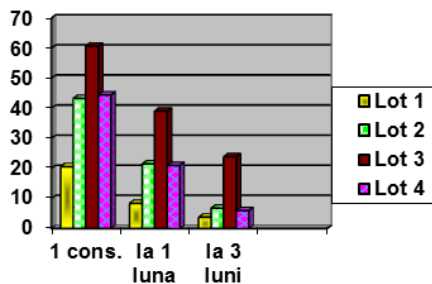


Fig. 9. Assessment of gingival bleeding indices (1 examination at 1 month/3 months)

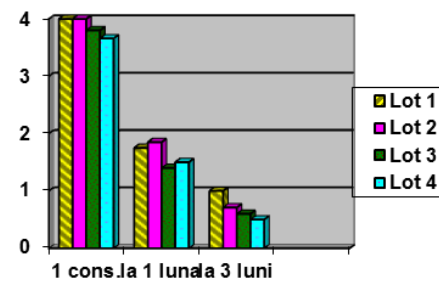


Fig.10. Assessment of the halitosis degree

DISCUSSIONS

In the treatment of physiologic halitosis, the main question that persists is how do we treat and what products are efficient? The dental practitioner usually searches in the studies published in specialty magazines, and the patient guides himself/herself based on the advice offered by the mass media, internet, commercials etc. When evaluating the specialty literature, we will take into account that the *in vitro* studies are not practical for examining the abilities of products to reduce the halitosis, it is much better to guide ourselves based on the *in vivo* tests [12, 13, 14]. The best method of determining the efficacy of products is represented by the CVS measurement from the air expired through the mouth. Silwood reports a 16.8 % reduction of CVS by using a mouthwash with chlorine dioxide - their clinical results are doubtful. Frascela used a monitor for registering the sulphites – registers a reduction of 4% by using the mouthwash with chlorine dioxin. Solid

clinical studies were carried out only on the mouthwashes that contain Zink, CHK, significant alcohol and hydrogen peroxide concentrations; which prove their efficiency in reducing halitosis. The dental prophylaxis represents a basic measure from NT-1. All the patients must be aware of the importance of periodical dental examinations. We notice similar results with those from our study in a recent study within the businesspersons from Tokyo and New York regarding oral hygiene. They reveal that: only 38% of the Japanese businesspersons periodically go to the dentist and only % are satisfied with their oral hygiene, the main source of discomfort (70%) is represented by halitosis.

Another study carried out in America shows that: 79% of the Americans investigated go to the dentist periodically, 69% being satisfied with their oral hygiene (absence of halitosis and the cosmetic effect of their denture). The practitioners reached the conclusion that if the patients go to the dentists periodically, motivated only by the

presence of halitosis, the state of their oral health can be improved.

As regards the **oral pathological halitosis**: Otaki establishes the fact that the active cavities, the secondary or the radicular surface cavities can be the cause of halitosis, specific dental treatments being necessary: restorations, endodontic treatments, extractions.

Kleinberg shows that a reduction of the saliva fluidity determines an increase of the bacterial density. In every masticating cycle, the residual saliva from the palate and from other oral mucosae is replaced by the saliva from the anterior oral area. The residual saliva at the level of the posterior palate is reduced in those with hyposalivation. The "Savage mouth" or the "savage breath" is caused by a reduction of salivation during the sleep. Kawaguchi recommends patients

exercises for the tongue to stimulate the salivary secretion.

The extra-oral pathological halitosis, as regards its treatments is not the dental medical doctor's appanage. If the practitioner diagnoses or suspects such a disorder, the patient will be sent to a specialist physician (NT-3).

As a result of the analysis of data obtained after the therapeutic measures applied in our study, we can speak about major favourable modifications as regards the quality of the oral breath of the patients participating in the research. We have noticed a clear improvement of all the assessed parameters. The scores diagnosed through the halitosis detector substantially diminished, becoming favourable, indicating the absence of halitosis.

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DIRECT LATERAL WINDOW APPROACH SINUS AUGMENTATION PROCEDURE

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ABSTRACT

The aim of the present study was to assess long-term changes in sinus-graft height after maxillary sinus floor augmentation. A total of 32 patients who underwent maxillary sinus floor augmentation were radiographically followed for up to about 2 years. The dental implants were applied in each case 6 months after the sinus augmentation. A 2:1:1 mixture of autogenous bone and bovine xenograft (PepGenP15 and PepGenFlow) was used as the graft material. Sinus-graft height was measured using 72 panoramic images immediately after augmentation and up to 24 months subsequently. Changes in sinus-graft height were calculated with respect to the marker diameter, the implant length and original sinus height. After 2 years, the grafted sinus floor was level with or slightly below the implant apex. This relationship was maintained over the long term. Sinus-graft height decreased significantly and approached original sinus height. The clinical survival rate of implants was 94.2%. All implant losses occurred within 2 years after augmentation. We conclude that progressive sinus pneumatization occurs after augmentation with a 2:1:1 autogenous bone/xenograft mixture of PepGenP15 and PepGenFlow, and long-term stability of sinus-graft height represents an important factor for implant success.

Key words: sinus lifting, augmentation, implant site

INTRODUCTION

Loss of maxillary molar teeth leads to rapid loss of bone in the maxillary sinus floor and increases the size of the maxillary sinus. Bone loss can extend to the alveolar process, leaving only a thin wall of bone between the maxillary sinus and the oral cavity. The placement and integration of endosseous implants in such patients requires augmentation of the maxillary sinus floor. The classic procedure for maxillary sinus floor augmentation entails preparation of a trap door including the Schneiderian membrane in the lateral sinus wall. The space created beneath the lifted trapdoor and the sinus mucosa is filled with autogenous bone, bone substitute, or a mixture of these materials. Implants can be placed

simultaneously with the grafting procedure or after a primary healing period.

Numerous clinical studies have reported the clinical outcomes of placing implants in the augmented maxillary sinus. Tong et al. (1998) evaluated the survival of implants 6–60 months after placement in patients who underwent sinus lift procedures using various graft materials. Clinical and radiographic outcomes of grafts have been studied for 3–5 years [1] and for 12–24 months. Of particular interest is whether height and volume of the graft is maintained over the long term. However, apart from a few short-term studies (Forum et al. 1998; Hallman et al. 2002), long-term changes in sinus-graft height have not been evaluated.

The aim of the present study was

radiographically to evaluate long-term changes in sinus-graft height after maxillary sinus floor augmentation with a 2:1:1 mixture of autogenous bone and xenograft (PepGenP15 and PepGenFlow).

MATERIALS AND METHODS

We selected a study group comprising 32 patients, 17 women with a mean age of $43 \pm 2,3$ years and 15 men with a mean age of $46 \pm 3,6$ years. The posterior portions of maxillae were edentulous and lacked sufficient bone for implant placement without sinus augmentation.

No patients displayed signs and symptoms of sinus or intraoral diseases, as confirmed by clinical examination and radiographic assessment immediately prior to maxillary sinus floor augmentation. All implant sites

were Class C according to the site classification proposed by Jensen (1994), with 4–6mm of bone available for implant stabilization. Written informed consent was obtained from all patients.

The posterior part of the maxilla was exposed via a crestal incision and elevation of a muco-periosteal flap. Implant sites were marked using a surgical stain, and osteotomy was performed at the lateral aspect of the sinus wall. The sinus mucosa was carefully lifted (Fig. 1, 2).

The autogenous bone was milled and mixed with bovine xenogenic bone graft material PepGenP15 and PepGenFlow. The sinus was then filled with graft mixture, and the mucoperiosteal flap was repositioned and sutured (Fig. 3, 4).



Fig. 1, 2. Elevation of the mucoperiosteal flap and conforming the lateral bone window



Fig. 3, 4. Inserting and condensing the bone grafting material

Radiographic evaluation

Panoramic radiographs were taken using a Toredux Ortropantomograph (Finland) (Fig. 5).

We used trays with markers having a 5 mm diameter for the the initial evaluations and the implant length for the ones done after

the implant placement. After augmentation, the first radiograph was taken within 6 months before implant placement.

Subsequently, at least two radiographs were taken, one immediately after and the other up to 18 months after abutment connection.



Fig. 5. Preoperative OPG

Indistinct radiographs or those of unsuitable head positions were excluded from the present study. Panoramic images were available for measurement for a total of 31 patients. For the measurements we used a silk sieve with the strings going from 0.1 to 0.1 mm. The measurements were undertaken by a single investigator who was not involved in the treatment of patients. To evaluate the change in height of grafted sinus floor in the maxillary sinus, the variables were: *original sinus height* (OSH), defined as the distance from the intraoral marginal bone to the lowest point of the original sinus floor, and *grafted sinus height* (GSH), defined as the distance from the intraoral marginal bone to the grafted sinus floor directly above the lowest point of the OSH.

RESULTS

The total mean GSH/OSH was 2.29 ± 1.46 mm during approximately 2 years after augmentation. GSH/OSH significantly decreased between 0–6 months (3.53 ± 1.74) and 7–12 months (2.20 ± 0.99), ($p < 0.01$), displaying no significant change thereafter. GSH/OSH was not less than 1 for up to 36 months after augmentation, indicating that the grafted sinus floor was higher than the original sinus floor.

Various graft materials have been used for sinus augmentation, including autografts, allografts, and synthetic bone grafts [2, 3]. Autogenous bone is the material of choice, but its use is limited by donor-site morbidity,

sparse availability, and uncontrolled resorption [1].

Non-resorbable graft materials will not remodel and functionally adapt to surrounding bone. Changes in the sinus floor in our study might reflect adaptation to implant loading and maxillary sinus ventilation [1]. A combination of graft materials may therefore promote both osteogenesis and remodelling to accommodate to implants and preserve sinus function. The overall height of bone graft decreased during the first 2–3 years after augmentation. Thereafter, only minor changes occurred.

These findings suggest that implant loading promotes osteogenesis over the long term.

Implant loading may exert a stabilizing effect on the maintenance of bone graft height, consistent with the findings of Listrom & Symington (1988). The absence of implant loss after about 3 years may be associated with the stability of sinus-graft height. Panoramic radiographs have previously been used to study the grafted sinus floor and its relationships with dental implants [5, 6]. However, the position of the maxillary sinus floor may be difficult to assess on two-dimensional radiographs, due to poor visualization. Use of computed tomography is recommended to identify the outline of the grafted sinus floor and to measure the height and volume of bone available for implant placement.

CONCLUSIONS

We conclude that good long-term results can be achieved using a 2:1:1 autogenous bone/xenograft mixture for maxillary sinus floor augmentation

Overall, graft height decreased during the first 2 years after augmentation, but subsequent changes were minimal. Our results suggest that long-term stability of sinus-graft height represents an important factor for implant success.

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SPORTS RELATED DENTAL TRAUMA IN MIXED DENTITION IN BUCHAREST

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ABSTRACT

Children and adolescents present a high risk of dental injury during sports activities. The aim of the study was to gather epidemiological data about dental trauma in mixed dentition children who practice organized sport activities. **Material and methods** The study group consisted of 348 children (76.43 boys, 23.57% girls) aged 6-13 years, examined in the period January-July 2011 at the Sportsmen Ambulatory in Bucharest. Consent for the examination was obtained from the coaches/parents. Data was statistically analysed using SPSS 10 for Windows (SPSS Inc., Chicago, USA). Level of significance was set at $p < 0.05$. **Results** The prevalence of dental trauma was 14.36%. The male/female ratio was 6.14/1 (43 boys/7girls). The 50 traumatized children had 65 teeth coronar fracture (1.3 affected teeth per children). The most common type of dental injury was the enamel fracture (66.15%).The maxillary central incisors were found to be the most affected, followed by lower central incisors. **Conclusions** Epidemiological data for this sample seems to fit between the few reported values from the literature. The high prevalence of sports related dental trauma advocates the use of oral protectors as efficient means in preventing these events.

Key words: dental trauma, mixed dentition, sport activities

INTRODUCTION

Head is a vulnerable area of the body and is usually less protected. 11-40% [1] of all the sports injuries involved the face, the dento-alveolar injuries being the most frequent [2]. The sports injuries can be caused either directly or indirectly, and can occur in both contact and non-contact sports. Some sports are correlated with a very high risk of dental injuries, most of dento-alveolar trauma resulting following impact with high-velocity objects or from falls and collision with other persons [3]. The loss or damage of teeth structures involves, beside aesthetic problems, high financial expenses immediately or in time.

Children and adolescents present a high risk of dental injury during sports activities,

39% of traumas taking place in these periods. Mixed dentition period presents the highest prevalence of dental injuries [4, 5, 6, 7] and the consequences of trauma with pulp involvement may interfere with apexogenesis in young permanent teeth.

The epidemiological data and the knowledge of coaches and parents on sport related trauma management are almost not investigated in Romania.

In this respect, the aim of the study was to gather epidemiological data about dental trauma in mixed dentition children who practice sport activities.

MATERIAL AND METHODS

The study group consisted of 348 children participating in organized sports activities.

The children were examined in the period January-July 2011 during the annual clinical evaluation at the Sportsmen Ambulatory in Bucharest. Consent for the examination was obtained from the coaches/parents.

The children were examined seated, under natural light, in a physician's office, using common instruments, without drying of dental surfaces. The traumatic dental injuries were assessed according to IADT's criteria [8]. The children were asked about their history of dental trauma. Data was statistically analysed using SPSS 10 for Windows (SPSS Inc., Chicago, Illinois, USA). Level of significance was set at $p < 0.05$. Graphics were realized using MS Excel.

RESULTS

The 348 examined children were aged 6 to 13 years, (mean age: 10.24 ± 1.97 years). 76.43% were boys (mean age: 10.27 ± 2.1 years) and 23.57% girls (mean age: 10.88 ± 2.18 years). The children practiced the following sports: gymnastics, tennis, taekwon do, rugby, football, judo, karate, sports dance, table tennis, basketball and fencing. Percentual distribution according to the type of sport is presented in table 1.

Tennis and dance sport were practiced exclusively by girls, boys representing the taekwon do and rugby samples.

The football sub-sample is almost exclusively represented by males (98.69%). Gymnastics, judo, karate, fencing, basketball and table tennis subsamples were balanced regarding gender distribution (Fig. 1).

14.36% ($n=50$) of the children had dental trauma. The male/female ratio was 6.14/1 (43 boys/7 girls). Prevalence of children with dental trauma, according to the sports type is presented in figure 2.

The mean age of the traumatized children was 11.25 ± 1.40 years, the unaffected children having a mean age of 10.07 ± 2.02 years ($SS; p < 0.05$). The age distribution of traumatized children is represented in figure 3.

The 50 traumatized children had 65 teeth crown fracture that means 1.3 affected teeth per children. In 76% of cases, only one tooth was affected. The other ones had 2 teeth involved and in two cases there were 3, respectively 4 teeth fractured (Fig. 4). The number of affected tooth according to sports activities was 1.5 in gymnastics, 1.42 in rugby, 1.3 in football, 1.16 in judo and 1 in basketball and fencing.

The maxillary central incisors were found to be the most affected (68%) followed by lower central incisors (21%). The upper lateral incisors were less injured than lower lateral ones.

Table 1. Sample distribution according to sport type

Gymnastics	Tennis	Tae kwon do	Rugby	Football	Judo	Karate	Dance sport	Table tennis	Basket ball	Fencing
12.06	0.86	2.58	8.90	43.96	12.35	4.59	0.57	0.86	7.75	5.45

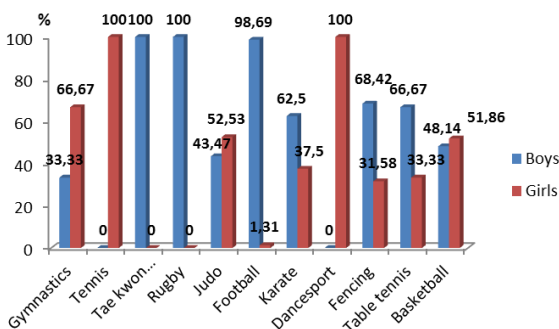


Fig. 1. Gender and sport type distribution

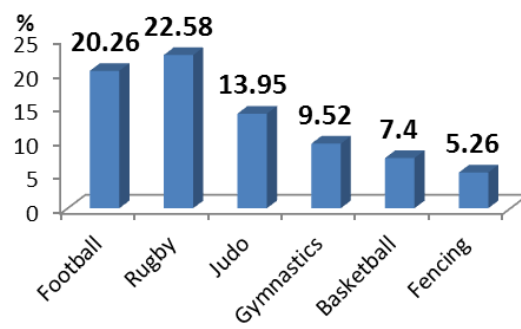


Fig. 2. Children with dental trauma (%)

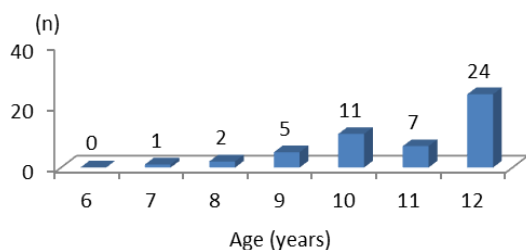


Fig. 3. Age distribution of traumatized children

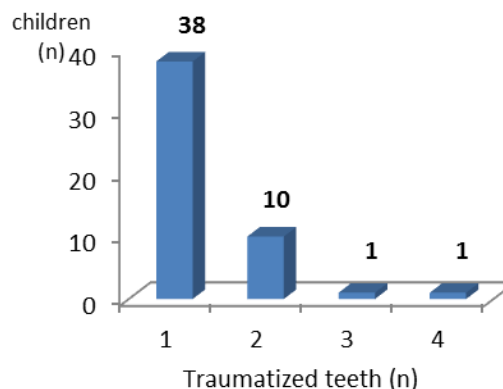


Fig. 4. Number of injured teeth in traumatized child

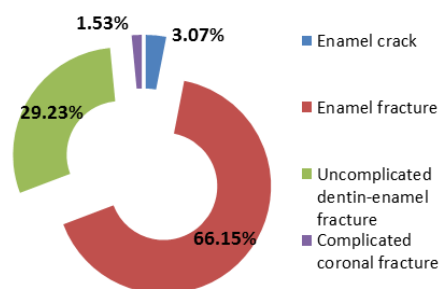


Fig. 5. Distribution of trauma types

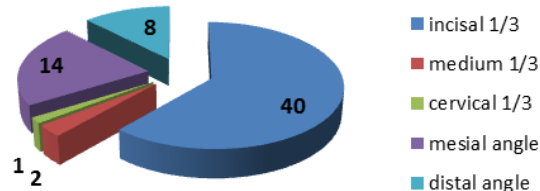


Fig. 6. Topographic distribution of dental traumas (n)

The most common type of dental injury was the enamel fracture (66.15%), followed by the uncomplicated dentin-enamel fracture (29.23%) (Fig 5).

Most of dental injuries are located at the incisal third (Fig. 6) and the upper central incisors are mostly affected.

Most of traumas were produced while practising organized sport (74%) and the rest in aggression, play and domestic accidents, bicycle accidents and accidental falls.

DISCUSSIONS

Our results show a 14.36% prevalence of dental trauma of children involved in organized sports. A somewhat similar value (10.63%) was reported by Tuğba et al. [9] (2008) in a study on children aged 7-9 and 11-13 years. Moreover, Tuğba's results are close to ours regarding the most affected tooth (upper central incisor), also confirming the higher prevalence in older children.

The current study shows that sports

accompanied by the highest trauma prevalence are rugby, football and judo, disciplines which involve close body contact. Biagi et al. [10] (2010) evaluate the awareness of sports as risk factors of dental injuries in a children population attending Sports Societies in Isernia, Italy. The sample consisted in 200 children (147 boys and 53 girls) aged 8-15-years-old practising football, martial arts, tennis, swimming, volleyball, basketball and cycling. 8.5% of the children reported previous appointment at the dentist's office for dental trauma. The overall self-reported trauma prevalence of this study is lower than our values regarding dento-alveolar trauma, but there is a possibility of children forgetting minor traumatic episodes.

Other authors (Persic at al., 2006 [11]; Flander and Bhat, 1995 [12]) reported high prevalence values of oral injuries in uncommon types of sport for Romania, such as squash and baseball.

It is interesting to point out that

male/female ratio is much higher in sport practising children than in children in general population, 6/1 respectively 2/1.

Most of the injuries were enamel fractures followed by uncomplicated enamel-dentine fractures. Periodontal trauma was not described during interviews but it is possible that they occur in reduced proportion.

Given the risk of dento-periodontal trauma in children with organized sports activities it is worthy to use prevention means, such as mouth guards.

There are studies which demonstrate a decrease of oral trauma prevalence from 50% to 1% by orofacial protectors use, while practising limited contact sports (basket, football) without mouth guards increases trauma prevalence from 14% to 34% (Sane, 1988 [13]).

AAPD [14] recommends a comprehensive program of reducing oral trauma containing assessment of patient's sport or activity regarding intensity level and frequency, followed by the fabrication of a well-fitted mouthguard.

Members of the Academy for Sports Dentistry in the USA consider the use of mouthguards in American football, boxing, ice hockey and martial arts an obligatory preventive measure. Participants in other

sports which are traditionally considered as non-contact sports, such as basketball, baseball, cycling, rollerblading, football, wrestling, squash, surfing and windsurfing should also wear interdental mouthguards [15]. None of the children in our study wear a mouthguard.

In sports, risk from injury should be limited or completely diminished. Most of sports injuries occur from predictable reasons and therefore prevention can be accomplished. Prevention and adequate training of athletes are essential elements for reducing injuries related to sport. Therefore, coaches have a very important role as well as doctors, parents and the athletes themselves [16].

CONCLUSIONS

Epidemiological data for this sample seems to fit between the few reported values from the literature. Although enamel-dentine fractures without pulpal involvement are most frequent, it is important to remember that, in mixed dentition period, young permanent incisors have open apices. Even in minor traumas, the absence of treatment can lead to further complications. The high prevalence of sports related dental trauma advocates the use of oral protectors as efficient means in preventing these events.

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MANDIBULAR CORTICALLY THICKNESS AS INDICATOR IN OSTEOPOROSIS SCREENING

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ABSTRACT

Systemic bone density variations have also echoed in maxillary bones, those being affected by osteoporosis with rest of the skeleton and radiological changes in their morphology are identifiable with panoramic radiographs.

Purpose Correlation between assessments of age in women patients with the presence and the level of osteoporosis degree, and also with the impaired level of osseous edge at mandible. **Material and methods** In this study we selected two groups: first group study consisted in 12 postmenopausal women patients, aged between 54 and 71 years, diagnosed with osteoporosis and the second group, as group control, included 13 women patients, aged between 55 and 78 years, also in postmenopausal status health, but without osteoporosis. The osteoporosis diagnosis was based on non-invasive methods (ultrasonography at distal phalanges of the hand), and other laboratory investigations which results were significant in the quantification of bone mineral density. Clinical periodontal health indicators assessments were recorded in datasheets, by medical transcriptions, and all cases were submitted for panoramic digital radiographs examination. Correlations between age woman's patient, the presence of osteoporosis and the impaired level of osseous edge at mandible were analysed using linear regression and a t-test (two-tailed). **Results and discussion** After mandible cortical thickness measurements (MCT) for each patient in both study groups, we've obtained the thickness average at 3.5 mm (0.4 OR) for control group (group 1) and thickness average at 2.3 mm (0.5OR) for the group with osteoporosis (group 2), and each group could be classified in one of the erosion categories C1 - C3 in infraosseous mandible basal bone. **Conclusions** Determination for MCT can be used as a method in patients' selection with postmenopausal osteoporosis or prone to osteopenia.

Keywords: osteoporosis, menopause, bone maxillary, mandible cortex thickness

INTRODUCTION

Dental radiographs are widely used in dental treatments. Therefore, a radiological method for assessing bone mineral density can be used as a screening tool in detecting forms of osteopenia or osteoporosis echoed in maxillary bones [1, 3, 4].

Osteoporosis is not an etiologic factor for periodontal disease but is a cofactor, which may aggravate periodontitis [3]. Severe osteoporosis that drastically reduces bone mineral content of the maxillary bones is directly related to level of epithelial insertion

loss in case of periodontal damage [7].

Generalized bone loss can involve maxillary, leading to accelerated resorption of alveolar bone [8]. At patient with osteoporosis, compromised bone mass and osseous density may be associated with bone loss rounded to teeth, or into edentulous ridge [9-11].

Recent studies support the hypothesis that systemic bone loss may contribute to tooth loss in healthy individuals, and that women with low bone density appears to have fewer restant teeth in dental arches, than the control

group [12, 13]. Basically it was found that women with increased postmenopausal symptoms have three times greater risk to becoming edentulous than control group [4].

Although, alveolar resorption was initially regarded as local issues, favoured by local inflammation and mechanical factors, in the light of recent studies, the implications of systemic factors it was observed more and more [5], with a close relationship between alveolar bone loss and osteoporosis [5, 6].

To study the morphological changes of the mandible colligated with osteoporosis [7], the assessments for basilar edge thickness and integrity, this means internal resorption, infraosseous and cortically resorption.

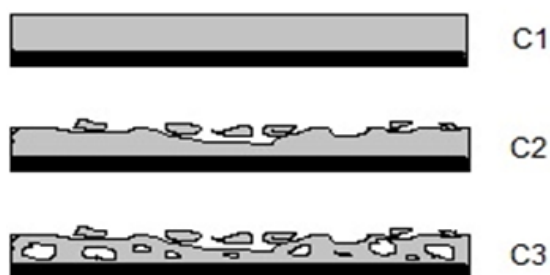
Some bone parameters, the height of alveolar bone and trabecular bone architecture are less studied. Internal and cortical trabecular resorption related with osteoporosis is a widely known phenomenon in the rest of the skeleton [17].

Purpose

The purpose of this study is to present the relevance of qualitative method for assessing bone mineral density of maxillary bones.

MATERIAL AND METHOD

We selected a group of 12 postmenopausal women patients, aged between 54 and 71 years old, diagnosed with osteoporosis and another group patients as control group were included 13 women patients, aged between 55 and 78 years old, without postmenopausal



Mandible cortical index (Fig. 1) quantifies

osteoporosis. The osteoporosis diagnosis was performed in a separate medical centre, based on non-invasive methods (ultrasonography at distal phalanges of the hand), and other laboratory investigations which results were significant in the quantification of bone mineral density. Were excluded from study all patients with pathological history that could influence bone mineral density, hyper or hypo hyperthyroidism, diabetes type I and II, osteomalacia, fluorosis, thyrotoxicosis and chronic renal failure. Patients consented to participate in this study and submit to required laboratory examinations, and give a personal written consent.

Clinical radiological assessment

We used a type Planmeca Promax 3D OPG at 15 mA, 54 - 84kV for 12s in a private radiology centre in Bucharest.

Clinical periodontal health indicators assessments we recorded in datasheets, by medical transcriptions, and all cases were submitted for panoramic digital radiographs examination. We used the same device in all patients, with digital image recording, for a more accurate reference.

For radiological evaluation of jaw morphology, following indicators are used [16]:

- Cortical thickness lower menton hole (MI)
- Panoramic mandible index (PMI)
- Gonium index (GI)
- Mandible cortical index (MCI)
- Ante-gonium index (AI)
- Bone quality index (BQI)

Fig. 1 Mandible cortical index (MCI) of internal edge (intracortically)

C1 – internal edge (endosteal) of cortical is regular and smooth on both sides

C2 – endosteal edge semi lunar defects (lacunars resorption) or seems to form cortical remnants (one, two or three layers) on one side or both

C3 - cortical layer formed cortical endosteal important residues and is clearly porous [17]

mandible basilar erosion. Women patients with

osteoporosis have an increased frequency of basilar erosion than the rest [14, 15]. *Klemetti et al* [1993] classify the basilar edge aspect of the mandible, as it appears on panoramic radiographs, distally to the foramen menton, as follows (quality evaluation).

A specialized software supplied with digital OPG x-rays permitted us to make measurements for the thickness of the basilar - MCI (mandible cortical thickness) as (quantitative assessment). The results were collated in the table 1.

Next figures reveal in comparative situation (right-left) a porous appearance of the edge in the endosteal mandible (C3) with reduced thickness associated (1.9 mm) in a patient with postmenopausal osteoporosis (right figure), and in left, a patient in menopause onset, with more homogeneous endosteal mandible edge (C1) and more thick (3.9 mm).

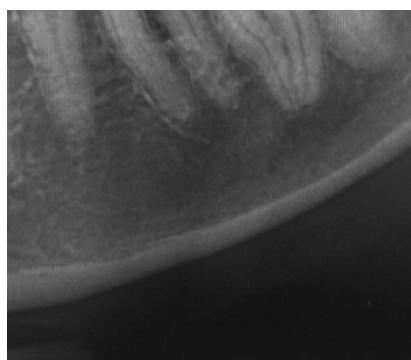


Fig. 2. MCT image without basal osteoporosis 4.1 mm (C1)

Table 1. Mandible cortical thickness in the two groups studied

No.	Lot without osteoporosis		Lot with osteoporosis	
	Age (years)	MCI (mm)	Age (years)	MCI (mm)
1	54	4,2	56	2,9
2	56	4,1	58	2,9
3	57	3,9	62	3,1
4	57	3,4	62	2,7
5	58	3,7	65	1,7
6	61	3,6	67	2,4
7	63	3,6	69	2,2
8	64	2,9	71	1,8
9	66	3,4	73	1,9
10	69	3,8	75	2,1
11	70	3,2	77	2,5
12	70	3,5	78	1,5
13	71	2,9		

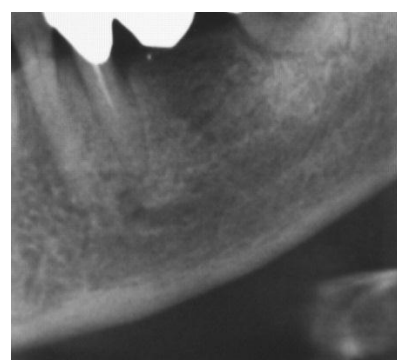


Fig. 3. MCT image with basal osteoporosis 1.9 mm (C3)

RESULTS AND DISCUSSION

Relations between age, osteoporosis manifestation of and impaired level of endosteal edge in mandible were analysed using linear regression and a t-test (2-tailed).

The main peculiarities of the studied group are presented in the table 1. The study group included a total of 25 women patients, at postmenopausal status, among them 13 were without osteoporosis phenomena, and 12 with

osteoporosis phenomena. The age average was 62.8 ± 6 years in postmenopausal group without osteoporosis phenomena and 68 ± 7.2 years in group with osteoporosis. The weight average was ranged around 58.7 ± 5.1 kg in normal group, and 54.0 ± 4.2 kg, in the group with osteoporosis. Also, the height average was 162.2 ± 7.9 cm in the first group and 161.1 ± 7.2 in the second group.

The average for mandible cortex thickness measured in each group, was at 3.5 mm (0.4 SD) for normal group (group 1) and 2.3 mm

(0.5 SD) for the group with osteoporosis (group 2). The average calculated for group 2 (with osteoporosis) it is obviously lower.

Both indices capacity, MCI (mandible cortical index) and MCT (mandible cortical thickness), to differentiate the groups considering osteoporosis are indicated in the Table 3.

As it is shown in Table 3, in 8 women patients mandible cortical index was normal at C1, that means integrity of cortical internal edge mandible, with average mean at 3.8 mm MCT (0.3 SD), in 4 women patients the index MCT was at C2 type, with mean average at 3.3 mm (0.3 SD) and one case with MCT at C3 type (thickness of 2.9mm).

Meanwhile, in postmenopausal patients group with osteoporosis we found only 2 of them with MCI at C1 (endosteal edge of the mandible integral), MCT average mean at 3.0 mm (0.1 SD), 6 women patients had type C2, with MCI average at 2.3 mm (0.4 SD) and 4 women patients had MCI at C3 type with 2.0

mm (0.4 SD) media MCT.

Considering that after analysing data obtained for the two groups with and without osteoporosis showed that there is a difference statistically significant mandible cortical thickness, relative to their morphological types ($p < 0.05$).

With a linear regression analysis for mandible cortical thickness colligated with age, we obtained its' evolutions trend, noting that with age increasing, MCT tends to decrease for both groups, normal and with osteoporosis.

This study aimed to put in evidence a simple way to reach the practitioner, for achieving a screening type in patients for the presence of osteoporosis, with a guide through qualitative and quantitative characteristics of basilar mandible, and in suspicions cases, to use one of the established methods for determining bone mineral density, such as ultrasound or DEXA (Dual Energy X-ray Absortimetry).

Table 2. Mean average mandible cortex thickness in the two groups studied

Lot Features	Lot menopause	Lot menopause
	without osteoporosis	with osteoporosis
No. of patients	13	12
Age	62,8±6,0	68±7,2
Height	162,2±7,9	161,1±7,2
Weight	58,7±5,1	54,0±4,2
MCT	3,5±0,4	2,3±0,5

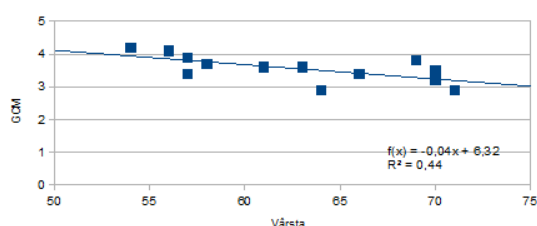


Fig. 4. MCT values according to age group without osteoporosis

Devlin et al [23] showed that the MCT

Table 3 – MCT mean average and statistically significant correlation in the two groups studied

Cortex Md	No. women patients	Average MCT ± SD (mm)	P value	
C1	Normal	8	3,8±0,3	0,00*
	Osteoporosis	2	3,0±0,1	
C2	Normal	4	3,3±0,3	0,00*
	Osteoporosis	6	2,3±0,4	
C3	Normal	1	2,9±0	0,00*
	Osteoporosis	4	2,0±0,4	

*Correlation is statistically significant at $p < 0.05$.

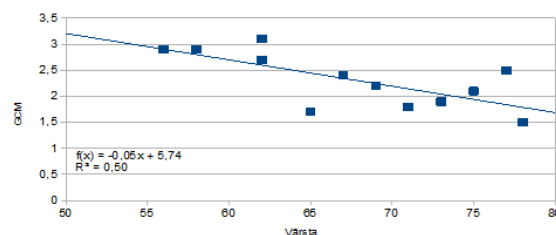


Fig. 5. MCT values according to age group with osteoporosis

efficiency was higher than MCI to detect

osteoporosis on a panoramic radiograph and that there is no additional benefit in the combination of the two methods of investigation. The authors argue that only patients with MCT <3mm should follow the more detailed investigations on osteoporosis and bone mineral density.

Horner et al [24] demonstrated that mandible cortical thinning rounded to menton hole below 3mm, measured on a panoramic radiograph; it is associated with osteopenia or vertebral level measured at the femoral neck.

As other authors have shown [12], general dentist should refer patients to a specialized center for determining bone mineral density in postmenopausal women patients that are suspected osteoporosis dental panoramic radiographs based on the analysis.

CONCLUSIONS

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EPIDEMIOLOGICAL ASPECTS RELATED TO THE DENTAL HEALTH OF CHILDREN VICTIMS OF ABUSE, VIOLENCE AND DENTAL NEGLECT

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ABSTRACT

Child abuse and neglect implies a multitude of experiences that are threatening or harmful to the child and are the outcome of commisive or omissive acts on the part of a responsible caretaker. Child maltreatment affects millions of children worldwide and has become a serious epidemiological factor related to the paediatric oral health. **Aim** The purpose of this study is to identify the regional ampleness of child maltreatment using statistical legal medicine data. Secondly we intend to ascertain the main risk-factors epidemiologically related to child abuse and to suggest some measures that may meliorate the oral health status connected to child maltreatment. **Material and Methods** For our analysis we used a group of 591 children that received medico-legal certificates issued by the Institute of Legal Medicine, Iasi, during the 16th of January 2007 and the 30th of September 2008. 54,1% (320) of the group presented oral trauma, 87,5% (280) of whom were victims of abuse and violence. Nevertheless we examined various laws related to this field and tried to discover countermeasures against child maltreatment. **Results and Discussion** The result was the correlation between all the parameters in the observed group using statistical methods as the Square-Chi test or the Spearman Rank. Furthermore, we tried to analyze the implication of the legal and social background as etiological factors for child abuse. **Conclusions** Child maltreatment is a frequent reality in the analyzed group. Not only physical abuse, but also sexual, emotional or verbal abuse and neglect are forms of child maltreatment. Domestic violence and negligence are social disorders that have many implications in the pediatric oral health. Nevertheless, there are some points where the penal law should be changed in order to positively affect this situation.

Key words: child abuse, oral trauma, dental neglect.

INTRODUCTION

Child abuse and neglect implies a multitude of experiences that are threatening or harmful to the child and are the outcome of commisive or omissive acts on the part of a responsible caretaker [1]. Not only medically but also socially and juridically is child abuse a point of interest nowadays.

Child maltreatment affects millions of children worldwide and has become a serious epidemiological factor related to the pediatric oral health [2]. This brings importance to our study. It is the first statistical medical inquiry

relative to this field locally preformed and therefore we consider it very significant both for the medical complexity of dental traumatology but also statistically.

Aim

The purpose of this study is to identify the regional ampleness of child maltreatment using statistical legal medicine data.

Secondarily we intend to ascertain the main risk-factors epidemiologically related to child abuse and to suggest some measures that may meliorate the oral health status connected to child maltreatment.

MATERIAL AND METHODS

For our analysis we used a group of 591 children that received medico-legal certificates issued by the Institute of Legal Medicine, Iasi, during the 16th of January 2007 and the 30th of September 2008.

Generically we used statistical methods such as the Square-Chi test or the Spearman Rank and the *Statistica* Software. Furthermore, we tried to analyze the implication of the legal and social background as etiological factors for child abuse. Nevertheless we examined various laws related to this field and tried to discover countermeasures against child maltreatment.

RESULTS AND DISCUSSION

The result was the correlation between all the parameters in the observed group and the statistical analysis secondary to social, demographic and etiological parameters. 54,1% (320) of the group presented oral trauma, 87.5% (280) of whom were victims of abuse and violence. In this group, it should be observed that the density of trauma among

boys is greater than that among girls (Table 2).

It is to be considered that both in boys and girls, most traumas occur around the age of 17 (Fig. 1. Histogram of ages and frequency), and there are also no significant differences between the mean ages in boys and girls – ANOVA Test (F=1.65, p=1996, 9% CI).

In what the social origin is concerned, cases of abuse in the rural environment (5.11%) are more frequent as those in urban environment (1.09%). Aggression is the trauma mechanism in which most child abuse occurred (84.69%), followed by neglect and accidents (12.5%) and sexual abuse (2.81%), (Fig. 2, Case repartition depending on trauma mechanism).

Relative to the trauma mechanism, there is no significant association between the social origin and the ways in which the trauma occurred. Both the Square-Chi signification test (5.88, p=0.05275, 95%CI) and the Spearman Rank (r=0.26, p=0.072) non parametric correlation test sustain this conclusion (Fig. 3, Case repartition relative to social origin and trauma mechanism).

Patients with Forensic Certificates	Cases	%
Adults	4809	89.1%
Children	591	10.9%
Children presenting oral trauma	320	54.1%
Children presenting other trauma	271	45.9%
Total	5400	

Table 1. Case structure

	Cases	%
Boys	247	77.2%
Girls	73	22.8%
Total	320	

Table 2. Sex repartition of cases

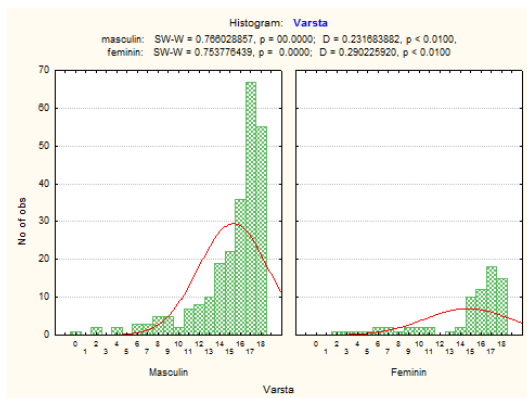


Fig. 1. Histogram of ages and frequency

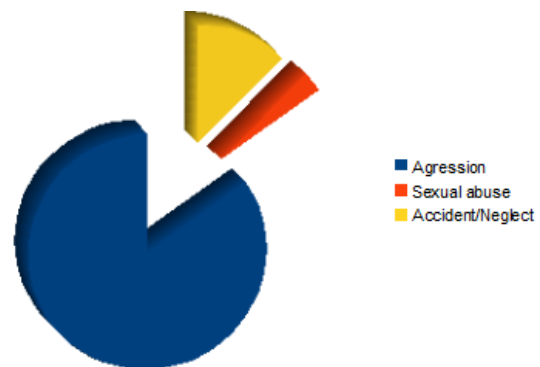


Fig. 2. Case repartition depending on trauma mechanism

	Cases	%
Agression	271	84.69%
Sexual Abuse	9	2.81%
Accident/ Neglect	40	12.50%
Total	320	

Table 3. Case repartition on Trauma Mechanism

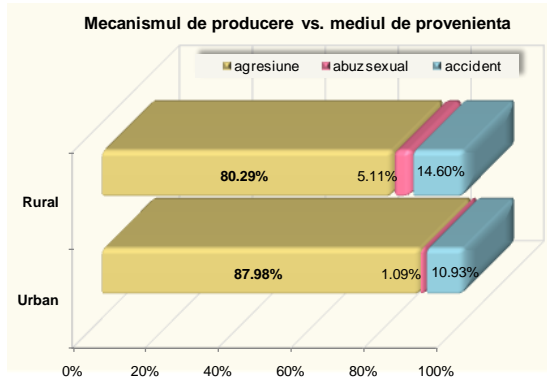


Fig. 3. Case repartition relative to social origin and trauma mechanism

The comparative analysis Post-Hoc implies serious dissimilarities between two groups of patients involved in the multiple analyses.

It should be acknowledged that even if there is approximately no distinction between the ages of those who suffered aggressions and those sexual abused ($p=0.561$, 95% CI), there are visible contradistinctions between the ages of patients with accident trauma and all the others ($p<<0.01$, 95% CI), (Fig. 3, Mean values, standard deviation for age vs. trauma mechanism).

Nevertheless, independently on the trauma mechanism, age, origin or sex, it must be acknowledged that all cases of oral trauma together with any other evidence or biologic samples must be sent to a certified forensic laboratory for prompt analysis and legal certification [3].

	P - 95% CI
Agression vs. Sexual abuse	0.561422
Sexual abuse vs. Accident	0.000118
Accident vs. Agression	0.000000

Table 5. Post-Hoc Analysis

	Square-Chi	P 95% CI
Pearson Square-Chi	5.884665	0.05275
M-LChi-square	5.961731	0.05075
Correlation coefficient (Spearman Rank R)	0.2629912	0.07427

Table 4. Square-Chi Test

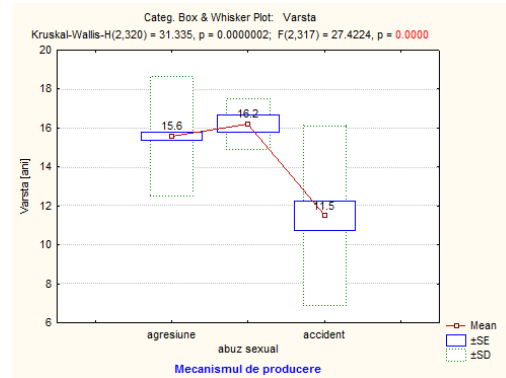


Fig. 4. Mean values, standard deviation for age (vertical) vs. trauma mechanism (horizontal)

CONCLUSIONS

Dental neglect, in the definition given by the American Academy of Pediatric Dentistry, consists in the willful failure of parent or guardian to seek and follow through with treatment necessary to ensure a level of oral health essential for adequate function and freedom from pain and infection [4]. Child maltreatment is thus a frequent reality in the analyzed group. Not only physical abuse, but also sexual, emotional or verbal abuse and neglect are forms of child maltreatment. Domestic violence (aggressions) and negligence (domestic accidents) are the main social disorders that have many implications in the pediatric oral health. Not the least, considering the undesirable outcomes that can secondary affect learning, communication, nutrition or even growth and development [5], there should be some points where the penalty law is to be changed in order to positively affect this situation.

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POSTURE AND VERTEBRAL PATHOLOGY ISSUES IN DENTAL PRACTICE

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ABSTRACT

Both posture and professional movement in a dental office are shaping the behaviour of the musculoskeletal system, particularly the spine. Two different postural methods are commonly used by dental practitioners, including sitting and standing postures. While sitting is considered as ergonomic, the standing position is considered non-ergonomic, with significant consequences on vertebral structures. Objectives: to realize a complex analysis of the disco-vertebral and muscular pathology in relation with either orthostatic or sitting posture in the real life dental practice. Materials and methods: prospective observational trial on 142 dentists classified into groups based on the predominant position during medical activity, either orthostatic or sitting on ergonomic chair. Results: there is no ideal working posture for the dentist; both orthostatic and sitting position with three subtypes (ischiatric, ischio-femoral, ischio-sacral support) result in significant spine morbidity, meaning an increased number of degenerative disco-vertebral pathology identified clinically (local or irradiated pain, restriction of mobility, impaired tolerance for standing position) and imagistic (X-rays, computed tomography, magnetic resonance imaging). Conclusion: It is widely promoted the recurrent alternation of posture in dental practice and an ergonomic attitude at the workplace. An individualized, strictly monitored kinetic activity is mandatory for both prevention and management of static and dynamic spine abnormalities due to repetitive postural stress in dental practice.

Keywords: ergonomics, dental working posture, spine

INTRODUCTION

Since the entire spine, known as the flexible but robust axis of the trunk, is permanently engaged in dental working, ergonomic research is actually dedicated not only to the complex knowledge of vertebral biomechanics, but also to prevention of spine morbidity. On the other hand, it is widely recognized that mechanical conditions of the spine such as disk pathology and osteoarthritis frequently present with substantial and persistent clinical features with subsequent impairment of work

effectiveness, discomfort and depression; moreover, certain complications related on nerves paralysis can easily and significantly interfere with current dental activities.

Ergonomics in dental medicine aims to establish efficient measures in order to remove trigger or risk factors for musculoskeletal pathology, to increase physical and mental wellbeing of the practitioner and to increase the work efficiency by modeling with ability the activity environment.

Within the ergonomic system, the best

relationship between the practitioner and the patient is currently advanced, to obtain a maximal medical quality.

One of the major determinants of the professional performance is directly linked to the fatigue and the wear generated by the postures adopted by dentist during the professional work. Therefore, the specificity of dental work should combine harmoniously with both axial and peripheral joints posture.

Two essential ways to conduct professional activity are currently recognized in dentistry, including the orthostatic and the sitting position, with three different subsets based on the preferred support (ischiodic, ischio-femoral, ischio-sacral).

Recent concerns of ergonomics have brought into attention the attitude of spine during the professional act and the potential relation with musculoskeletal, particularly vertebral, pathology.

Aim

The primary end point of our study was to realize a complex analysis of the disco-vertebral and muscular pathology in relation with either orthostatic or sitting posture in the real life dental practice.

MATERIAL AND METHODS

We have performed a prospective observational study on 142 dentists aged between 25 and 57 years old classified in two main groups based on the posture adopted during current professional practice, comprising either predominant orthostatic position (68 cases, group I) or sitting position (with support ischiatic, ischio-femoral, ischio-sacral) on a ergonomic chair (74 cases, group II).

All subjects were evaluated according to a standard protocol including different clinical parameters related to potential spine involvement (pain, functional limitation, muscle spasm and tolerance of standing position) and imaging parameters (classical

X-rays and modern imaging techniques such as CT scan and MRI scan); the design of the current study has followed the preliminary study performed on 90 cases whose results have already been presented [5].

The following clinical parameters were recorded:

1. *low back pain*, assessing the following items: type (mechanical, inflammatory), irradiation (radiculopathy) and intensity of pain on a 10-cm Visual Analogue Scale (VAS), "0" meaning no pain and "10" the worst pain;
2. *attitude of the spine*, assessing both sagittal and frontal deviations, namely hyperlordosis, kyphosis, scoliosis, kyphoscoliosis;
3. *segmental spine mobility*, especially for the lumbar segment, assessing both flexion (Schober's test) and extension (extension Schober's test), side laterality (index-knee test) and side rotation (right / left);
4. *paravertebral muscle spasm*;
5. *orthostatic tolerance*, classified as maintained (pain present at 2 hours after initiation activity), impaired (pain present 1 hour of activity) and lost (less than half an hour).

Subjects with history of vertebral surgery, rheumatic conditions involving lower limb, sequelae of fracture of the lower limbs and venous pathology were excluded from the study.

Statistical analysis was done in SAS 4.3 software.

RESULTS

Age and sex distribution among groups was comparable: 15 subjects aged between 25 and 30, 19 subjects aged between 30 and 40 years, 14 subjects aged between 40 and 50 and 20 subjects aged over 50 years old have been enrolled in group I, while group II has been made of 20 subjects aged between 25-30 years, 20 subjects aged between 30 and 40, 17

subjects between 40 and 50 years and 17 aged over 50 years.

The clinical analysis was mainly based on physical and functional examination of the spine, the general exam of the musculoskeletal system focusing on the attitude and walking was also performed in all subjects.

Pain

According to a 10-cm pain scale, three main categories have been defined giving a relevant image on posture as the trigger factor for vertebral pain: mild (score of 2 or 3), moderate (score of 5 or 6) and severe pain (score of 9 or 10).

Therefore, regardless of the posture adopted by the dentist during professional activity, a small percentage of participants in this study had a high intensity painful vertebral syndrome (11.76% in group I and 8.1% in group II), while more than one third of the doctors enrolled in group I (35.29%) and about half (47.29%) of those belonging to group II showed moderate score for axial pain. Moreover, a comparable distribution of moderate and mild pain scores (47.29% and 44.61%) in doctors who preferred to carry out the activity in a seated position has also been reported (Fig. 1).

Up to 84% of cases in group I (57 cases) and about half (51.35%, 38 cases) of those from group II have reported mechanical low back pain.

Mono-radicular pain distribution, either L3 and L4 radiculopathy or L5 and S1

radiculopathy, has been identified in one out of 4 physicians who preferred to work in a standing position (25%, 17 cases) and in about one third (31.08%, 23 cases) of those who worked in a seated position. However, distal paresthesia has been reported in up to 10% in both groups (8.82% in group I and 9.45% in group II, respectively).

Attitude of the spine

The abnormal attitude of the spine has been reported in both groups. Thus, comparable data has been demonstrated (t, p<0.05) as follows: upper dorsal kyphosis with small range of curvature in 33.82% cases belonging to the first group and 33.78% of doctors in the second group; scoliosis, the lateral deviation of the spine, in 27.94% cases in group I and 20.27% subjects in group II; kyphoscoliosis, a complex deviation, in 10.29% of doctors working in orthostatic position and 6.75% of those practicing in a seated position; loss of normal lumbar lordosis in 5.88% cases in group I and 9.45% cases in group II, while hyperlordosis has been encountered in only 2.94% and 1.35%, respectively, of physicians enrolled in group I and group II.

Hence, regardless of the position adopted in daily medical activity, orthostatic or sitting, the most requested vertebral segment is the dorsal spine (upper back kyphosis), whereas the lumbar segment is minimally affected in order to strengthen its physiological curvature (Fig. 2).

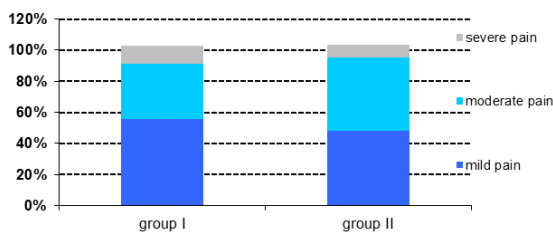


Fig. 1. The distribution of vertebral pain among groups

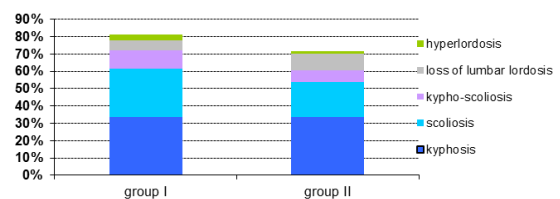


Fig. 2. The changes of the vertebral curves among groups

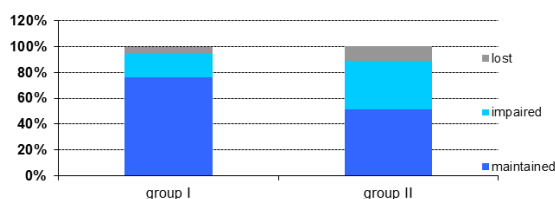


Fig. 3. The orthostatic tolerance based on working position among groups

Segmental spine mobility

Testing the spine mobility has demonstrated the influence of different working postures, especially for the lumbar segment; Schober's test showed moderate restriction (2 to 3 cm) in 35.29% cases practicing in orthostatic position and 39.18% cases in sitting position, while side and rotational movements were minimal intercepted, regardless of study groups.

Paravertebral muscle spasm, either uni- or bilateral, has been demonstrated in up to 17.64% of physicians in group I and 24.32% in group II.

Orthostatic tolerance

Classified as maintained, impaired and lost, the pattern of orthostatic tolerance has been evaluated in all cases as follows: 76.48% maintained, 17.64% impaired and 5.88% lost for standing activity (group I) and 51.35% good, 37.83% impaired and 10.82% lost, respectively for professional activity predominantly performed in a seated position (group II) (Fig. 3).

Several distinct clinical entities have been recognized as a consequence of a complex clinical and imaging study including: chronic low back in 42.64% dentists from group I and 33.78% in group II, respectively, L3 and L4 radiculopathy in 2.94% cases in group I and 8.1% cases in group II, L5 and S1 radiculopathy in 1.47% cases in group I and 4.05% in group II. Myofascial pain syndromes were found in 7.35% of cases in group I and 11.35% in group II B, the data are

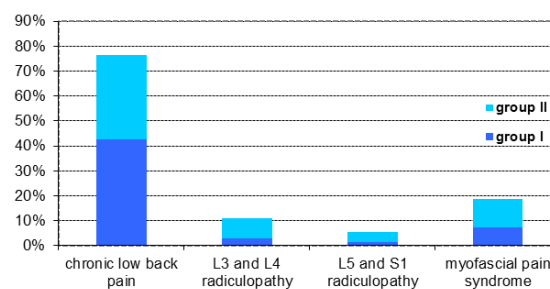


Fig. 4. Clinical entities diagnosed among groups

systematized in figure 4.

On the other hand, conventional radiological assessment revealed the multifactorial etiology of the above mentioned clinical entities, based on degenerative lesions in up to 48.52% of cases working in standing position and 56.75% in cases working predominantly in sitting posture; disco-vertebral pathology such as narrowing of the inter-vertebral space, bone spurs, marginal sclerosis, transitional vertebrae and spina bifida have been commonly reported in our study.

Modern imaging techniques such as CT and MRI have been advocated in persistent clinically significant vertebral syndrome (severe pain and dysfunctional syndrome), validating the disco-radicular conflict in more than half of patients in both groups (52.94%).

DISCUSSION

It is now widely accepted that the neutral attitude of the spine is the position that involves the maintenance of physiological curves regardless the static or dynamic condition, promoting the balance between the flexors and extensors muscle of the spine and subsequently balanced forces on the ligaments, musculoskeletal and articular structures.

Moreover, a properly performed orthostatic position, meaning slightly distant legs and flat abdomen (by abdominal muscle contraction) promote not only the balance between flexors and extensors of the spine,

but also the normal alignment of the spine. Conversely, the sitting position with its three subsets based on the main support (ischiatric, ischio-femoral and ischio-sacral) is generally more challenging for the spine, generating a 150% loading at L3 disk level, higher than those occurring in standing posture (100% load).

On the other hand, vicious postures usually result in distinct vertebral signs and symptoms as the main clinical expression of vertebral pathology, low back pain being actually recognized as the most common musculo-skeletal issue in the professional activity and a leading cause of work-related disability.

Since both static and dynamic postures during daily activities have significant interferences with the axial segment, behavioral principles are essential for dental practice.

The current study based on potential influences of the posture adopted during the dental working on spine has allowed the identification of certain conditions with particular relevance for the current practice. Thus, we have defined a high percentage of cases with vertebral pathology among dentists. Besides, three main clinical entities have been identified among our groups including low back pain, L3 and L4 radiculopathy, L5 and S1 radiculopathy and myofascial pain syndromes.

Regardless of the position adopted in current practice (standing or sitting), significant abnormalities static and dynamic vertebral abnormalities have been subsequently reported. Upper dorsal kyphosis and mixed, both frontal and sagittal deformities were commonly reported in both study groups. Furthermore, vertebral mobility

was globally affected attesting the presence of different pathological conditions of the spine; data were comparable for both analyzed postures. As well, muscle spasm reflecting a pathological spine, was equally identified in any evaluated posture.

The assessment of orthostatic tolerance, a parameter with major connotation on three main aspects of work (performance, effectiveness and productivity) has retained high percentages in both groups, especially in dentists working in sitting posture. Besides, the sitting position with ischiatic support was preferred if impaired orthostatic tolerance, minimizing the negative influence on spine.

Hence, an emerging theory of cyclical employment of both standing and sitting posture during dental practice is currently promoted, based on the complex interrelation posture-vertebral pathology.

CONCLUSIONS

There is no ideal working posture for the dentist, both orthostatic and sitting position (with its three variants of support) being equally challenging for the spine. However, the optimal working posture is the position causing a minimum mechanical stress at axial level and, consequently, minimum fatigue. It is widely promoted the recurrent alternation of posture in dental practice, at intervals not exceeding one hour; moreover, organization of a correct posture program is giving rise to the premises of ergonomic attitude at the workplace.

An individualized, strictly monitored postural training is mandatory for both prevention and management of static and dynamic spine abnormalities due to repetitive postural stress in dental practice.

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THE DETERMINATION OF THE ELASTICITY CONSTANTS OF THE MATERIALS FOR REMOVABLE PARTIAL DENTURES

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ABSTRACT

The knowledge of the elastic characteristic of the constituting materials of the dentures is necessary in the calculation of strength, strains and stability, in the experimental stress analysis and in the finite element method usage. **Purpose** the study establishes the material constants: the coefficients of elasticity and Poisson coefficients. **Materials:** we used 4 specimens from specific biomaterials of removable denture. **Materials and method** The four specimens were tested to determine the tensile strength using the Instron testing machine. **Results** The material constants determination is necessary in biomechanical behaviour of removable dentures analyses. **Conclusion** The models can be considered linear elastic bodies.

INTRODUCTION

The connection between the removable partial denture design and the features of the prosthetic field is a key element in achieving of an individualized prosthesis [1, 2]. The failure of this link lead over time to excessive effort demands for the prosthetic field components, but also will create stresses and strains inside the denture's elements and thus to its instability.

Aim

The study aims to analyse the mechanical behaviour of biomaterials used in removable partial dentures construction by establishing of the material constants: the coefficients of elasticity and Poisson coefficients. The biomaterials were studied by tensile tests (until the breakage), and hardness testing.

MATERIALS AND METHOD

Were made a number of 4 specimens, in the form of slim and rectangular plaques, with the longitudinal dimension of 10 cm, width of about 2 cm, with a thickness ranged from 0.5

to 2.5mm (Fig. 1). The specimens were prepared in the dental laboratory according to the manufacturer indications, using biomaterials from Bredent Company Germany. The mechanical tests were performed on a machine type WDW50 (50kN) and on an Instron machine (± 100 kN).

The elastic constants determination

In calculation of strength, strain and stability, in experimental stress analysis and in finite element method using, the knowledge of the elastic characteristics of the materials constituting the dentures is necessary [3, 4]. In the current work will be experimentally determined, based on the tensile test, the **conventional linear module E** and **Poisson's coefficient ν** .

The conventional linear elasticity module is defined as the ratio of the stress and the specific lengthening for the metals having a linear portion of the tensile characteristic curve (relation 1).

The characteristic curve from the tensile test, Poisson's coefficient or the transverse

contraction coefficient is the ratio of the transversal specific elongation and the longitudinal specific elongation (relation 2). Both elastic constants are determined on specimens made in the laboratory, tested to the static traction.



Fig. 1. The specimens

The determination of the elasticity module E and of the Poisson's coefficient ν , will be based on the electrical resistive stress-measurement, having the possibility of measuring the longitudinal and transversal specific strains, with a high precision. To determine the specific strains on a flat shape traction specimen, with cross-sectional area equal with S_0 , two-way electro-stress gauge transducers are mounted. The electro-strain gauge transducers are introduced in measurement circuits type Wheatstone bridge in half-bridge configuration, having the strain marks on the both sides of the specimen. The output signals from the Wheatstone bridges are processed by a data acquisition system. The data processing is performed to obtain the elastic constants values of the material in both directions: a) longitudinal elasticity module E (**Young module**) is determined as the slope of the approximation line of the graph represented in coordinates: normal stress (σ) / specific longitudinal strain (ϵ), through the points determined from the signals resulting from the longitudinal transducers; b) transversal contraction coefficient ν (**Poisson's coefficient**) which was determined from the curve mapped in coordinates: transversal specific strain (*etr.*)/longitudinal specific strain (*elong.*), using the signals obtained from both

longitudinal and transversal transducers. The elasticity module is a main elasticity constant of the material. As shown in equation (1), between two identical specimens as dimensions but from different materials, loaded with equal strains, the specimen with the material elasticity module lower will be most deformed: the material with E module value higher is more "rigid" [6].

$$E = \frac{\Delta\sigma}{\Delta\epsilon_L} \quad (1) [6]$$

Where the ratio $\epsilon = \Delta l/l_0$ is called the specific elongation and the ratio $\sigma = F_e/S_0$ is known as the normal stretching strain or unitary effort. Poisson's ratio (coefficient) is:

$$\mu = -\frac{\Delta\epsilon_T}{\Delta\epsilon_L}, \quad (2) [6]$$

Means: the ratio of the transverse specific elongation and the longitudinal specific elongation. These constants were determined by tensile testing of specimens made, equipped with electro-strain gauge transducers (TER) (Fig. 2), longitudinal oriented (tensile force direction) and transversal oriented. The clamping ends of plastic specimens were reinforced with metal plates to provide a large enough resistance of the area caught in the test machine jaws.

The tests were made assisted by the computer on the WDW50 machine (Fig.4), from Material Strength Department testing laboratory, from Mechanical Faculty of University of Science "Gh. Asachi" from Iasi. The forces-time data recording was done on the computer of the machine WDW50 and the strains supplied by the TER record (relative to time) was done on the Vishay bridge P3 (Fig. 3). The data processing was done in Excel, aiming to put in correspondence the recorded, at the same moment, data. The Vishay bridge made records every one second and WDW-50 machine software made 17 records per second.

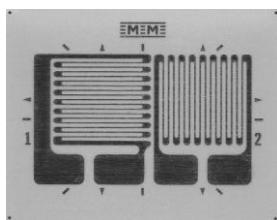


Fig. 2. TER type rosettes EA-06-125TM-120, manufactured by Vishay, used to determine the elastic constants



Fig. 3. The Wheatstone bridge, P3 model, manufactured by Vishay



Fig. 4. The universal tensile tests machine WDW-50

The high precision and the accuracy of the recording devices allowed for a small number of experiments. With these data were determined the elastic constants as the slopes of the approximation lines of the curves constructed using Excel. The universal tensile machine WDW-50 is designed to do the mechanical tests of the materials in compliance with the standards: SR EN 10002-4, ASTM E4, ASTM E9, ASTM A720, ISO 75000-1, ISO 6892. The machine is controlled by the PC by closed loop for any experimental data: the speed of test's loading (the force), the speed of the machine beam's displacement and the speed of sample's deformation.

The determination of the studied materials' tensile strength

The four specimens were tested to determine the tensile strength using the Instron testing machine, which has the capacity to be loaded up to 100kN. Steps leading to determine the tensile strength of the studied materials were as follows:

- Preparation of the P3 Vishay bridge;
- The mounting of specimens in the machine's clamping system (Fig. 5, Fig. VI. 6)
- Results reading.

RESULTS AND DISCUSSION

1. The determination of the elasticity coefficients of the biomaterials used for partial removable dentures making

The clamping ends of the 4 studied specimens were reinforced with metal plates to provide enough resistance to the portions from the test machine jaws. On their surfaces were attached rosettes of the electro-stress transducers (TER) longitudinal oriented (as per tensile force direction) and also transversal oriented (Fig. 7, Fig. 8).

Using these specimens on the device WDW-50 we obtained the following results:

a. The coefficient of elasticity determination for the acrylic specimen

From the test made on the acrylic specimen has been resulted a characteristic curve $\sigma-\varepsilon$ with a linearly appearance, almost confused with the approximation line. The loading level was low, to avoid the breakage. The slope of this line defines the longitudinal module of the acrylic material: (Fig. 9) $E=3357,3 \text{ MPa}=3,3573 \text{ GPa}$.

The transversal contraction coefficient of acrylate, $\mu=0.4038$, resulting from the curve $\varepsilon_T-\varepsilon_L$ in the figure below (Fig. 10).

b. The elasticity coefficient determination for the Cr-Co alloy specimen

The Cr-Co alloy specimen is very hard. The characteristic curve $\sigma-\varepsilon$ has a quasi-linear aspect and the line of approximation drawn by Excel, shown us an equivalent slope with the longitudinal elasticity module: $E=136892 \text{ MPa}=136.892 \text{ GPa}$ (Fig. 11).



Fig. 5. Cr-Co alloy specimen with holes mounted in the Instron Machine

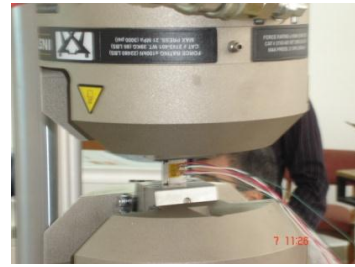


Fig. 6. The compact plate specimen mounted in the Instron machine



Fig. 7. The specimens instrumented with rosettes TER 125TM



Fig. 8. Samples preparation for material constants determination

The feature $\varepsilon_T - \varepsilon_L$ allowed us to calculate a very low transversal contraction coefficient: $\mu = 0.171$ (Fig.12).

c. The elasticity coefficient determination for the specimen of acrylic and metal

From the characteristic curve $\sigma - \varepsilon$ built for the composite material obtained from acrylate reinforced with metal, the specimen loaded at a level of stress under 9MPa, we can observe a relatively linear dependence. We obtained accordingly an elasticity module $E = 45039\text{MPa} = 45.039\text{GPa}$ (Fig. 13).

From the next figure we can see that the relationship $\varepsilon_T - \varepsilon_L$ (the specific transversal elongation versus the longitudinal specific

elongation) is quasi-linear and from the approximation line results a transversal contraction coefficient (Poisson): $\mu = 0.2545$ (Fig. 14). It is noted that the both specific extensional strains are expressed in $\mu\varepsilon$ - expression established in the specific strains measurements (equivalent to $\mu\text{m/m}$).

2. Determination of tensile strength for the studied biomaterials

The determination of the tensile strength of specimens with transducers mounted on the specimen's surface, was performed using the Instron testing machine, which has the loading capacity up to 100kN (Fig. 15).

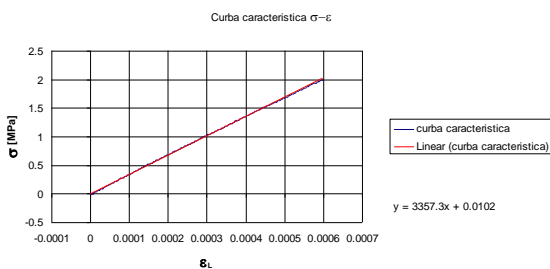


Fig. 9. The longitudinal module of elasticity of the acrylic material

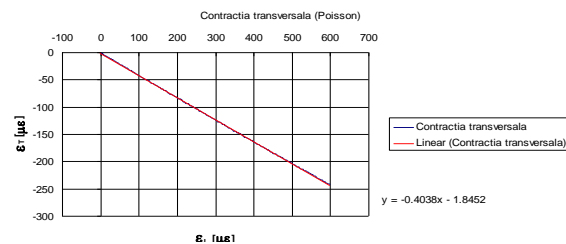


Fig. 10. The transversal contraction coefficient determination of the acrylic material

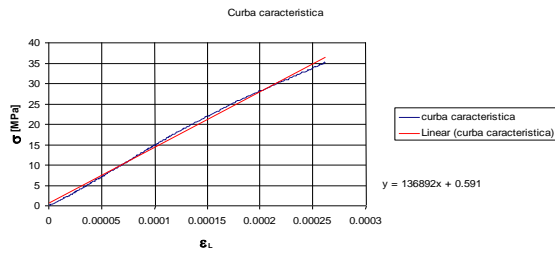


Fig. 11. The longitudinal elasticity module determination for the Cr-Co alloy specimen

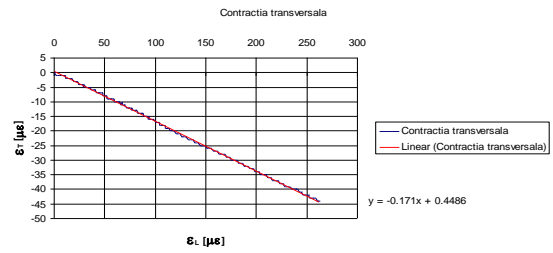


Fig. 12. The transversal contraction coefficient determination for Cr-Co alloy specimen

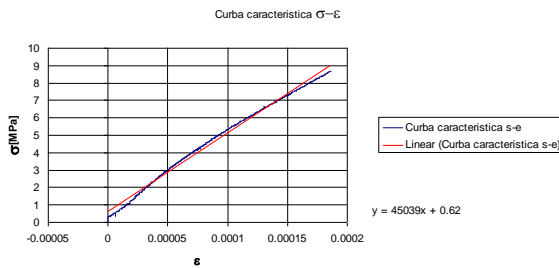


Fig. 13. The longitudinal elasticity module determination for the specimen of acrylate and metal

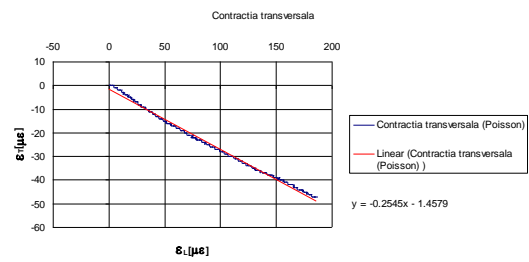


Fig. 14. The specific transversal elongation versus the longitudinal specific elongation

a. The tensile strength determination of the metal Cr-Co alloy specimen

The force-elongation curve of the compact metallic specimen drawn by Instron machine software is represented below (Fig. 16).

On this specimen was glued the TER rosette and was made strain's measurements up to breaking. A linear behaviour was observed, with $E=149,99\text{GPa}$, up to a level of loading of about 350MPa (versus the value of $E=136.892\text{GPa}$, determined on the WDW-50 machine for a loading level under 35MPa) (Fig. 17). We can see the breaking strength resulting from the measurement by TER: $R_m=640\text{MPa}$ (roughly) (Fig. 18).

From the transversal contraction characteristic to near breakdown is found that the Poisson coefficient $\mu=0.1443$ is stored on

almost entire field.

b. The tensile strength determination of a metal specimen presenting retentions for the acrylic component

This specimen provided a force-elongation curve presenting two distinct areas: the initial area, quasi-linear (the elastic region) up to 9kN and the harden area (elasto-plastic) after 11kN up to breaking (Fig. 19).

The coefficients of elasticity and Poisson coefficients for the biomaterials are represented in Tabel 1.

The data processing was done in Excel, aiming to put in correspondence the recorded data in the same moment, the Vishay bridge making the records every one second and WDW-50 machine software making 17 records per second. (Tabel. 2)

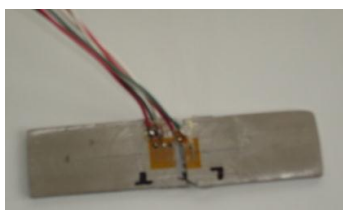


Fig. 15. Metal specimens broken

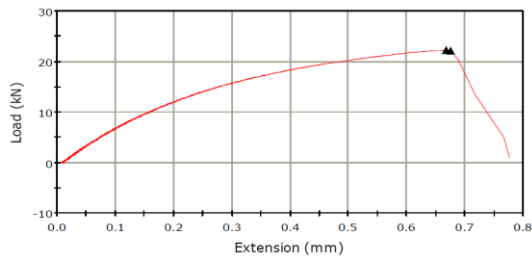


Fig. 16. The force-elongation graph for the compact metallic specimen

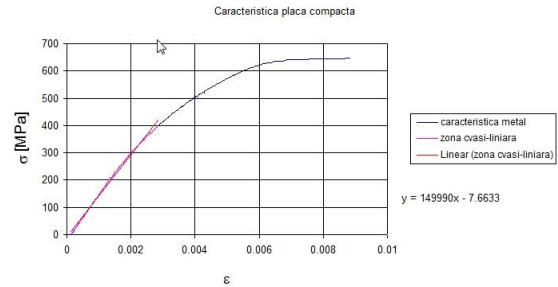


Fig. 17. The characteristic graph drawn based on tests made by Instron machine

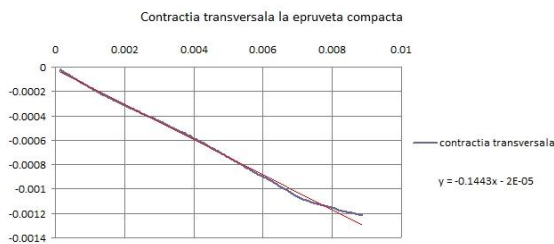


Fig. 18. Transverse contraction characteristic for an area close to breaking

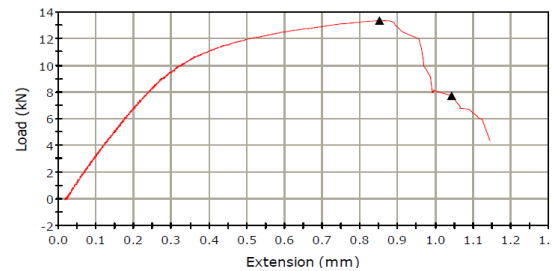


Fig. 19. The test graph of the specimen with holes

Nr. Crt.	Material	E(GPa)	μ	Maximum limit σ_{max} (MPa)
1.	Acrylate	3.3573	0.4038	2
2.	Cr-Co alloy	136.892	0.171	30
3.	Acrylate with metallic structure	45.039	0.2545	9
4.	Cr-Co alloy – discontinuous, with holes	45*	0.254*	9

Tabel 1

	Load at Break (Standard) (N)	Tensile extension at Break (Standard) (mm)	Tensile stress at Break (Standard) (MPa)
1	7733.30927	1.02297	209.00836
	Extension at Break (Standard) (mm)	Energy at Break (Standard) (J)	Tensile strain at Break (Standard) (mm/mm)
1	1.04180	10.23111	0.02556
	Tensile stress at Tensile Strength (MPa)	Load at Tensile Strength (kN)	
1	360.85876	13.35177	

Tabel 2

From this last table results the following data: strength at breaking: $R_m=209.00\text{MPa}$ and the elongation at breaking: $\Delta l_R=1.0229\text{mm}$. The presence of holes changes the global behaviour of the structure (relative to the compact plate) making it more deformable, with a higher energy absorption capacity, but decreasing its tensile strength.

CONCLUSIONS

1. The knowledge of the elastic characteristic of the constituting materials of the dentures is necessary in the calculation of strength, strains and stability, in the experimental stress analysis and in the finite element method usage.

2. The need to overcome the maximum

convexity of the tooth is important and this depends on the length and width and also depends by the material that the clasps are made. In addition, the chewing affects the clasps by bending and it having a great importance in producing wear. If there is no wear to the maximum convexity of the tooth, we can assess that the fracture due to metal wear in the case of Cobalt-Chromium inactive clasps may take about 5-7 years of use. The dentures clasps' wear level is based on their strength in the moment of insertion and un-insertion in the oral cavity and when the clasp exceeds the maximum convexity of the tooth.

3. The Cobalt-Chromium alloys are often used as removable partial denture alloys for their mechanical properties which were demonstrated in several studies, but unfortunately, only a few studies have dealt with the wear of these alloys.

4. The linear behaviour of the materials tested, for the acceptable effort domain, is an

important assumption in the mathematical models achieving from the finite element analysis. The determined elasticity constants (E and μ) are constant for a wide enough field of application, so that the models can be considered linear elastic bodies.

5. The Cr-Co alloy and acrylate specimen constants can be obtained from Cr-Co alloy specimen with holes loading, because the metallic structure is the element which provides the material rigidity to heavy loads.

6. Using the electro-stress transducers introduced in the Wheatstone bridge in a half-bridge configuration we managed to determine the specific elastic constants of the materials, the transversal elasticity modulus (E) and the transverse contraction coefficient (Poisson's coefficient μ) on the specimens tested on static traction, obtaining the following values, which can be introduced in the subsequent calculations:

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CERVICAL PROXIMAL REST ACTING AS A SUPPORT FOR POLYAMIDE REMOVABLE PARTIAL DENTURES

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ABSTRACT

Removable dentures may cause damage to the periodontium of the teeth that limit the edentation. Most of the RPD's should be designed with a rest for a better distribution of forces on both the edentulous crest and the remaining teeth. Polyamide dentures that have no metal framework may be designed with occlusal rests on neighbouring teeth but the flexibility of the material is a disadvantage for the stability of the denture. The cervical proximal rest (CPR) may be a solution in such cases as it is placed on the proximal surface of one or more remaining teeth, thus ensuring a good stability of the denture without compromising the aesthetics as it is practically invisible. The CPR can be an appendix of a metal-ceramic or metal composite crown, or it can be resin-bonded to one of the remaining teeth.

Keywords: rest, polyamide, removable partial denture

INTRODUCTION

Rest seats are stable, regardless of the material on which they are prepared (amalgam, resin, enamel, composite) [1, 2] but the difficulty in prescribing them and in doing the right intraoral preparations remains an issue for GDP's. [3]

Another problem of most of the rests is that they are visible; therefore different solutions have been suggested to improve aesthetics. [4]

Most of the times, rests are associated with metal clasps which are visible on the buccal side of the teeth; Orsi et al. showed that resin-bonded extracoronary attachments may be indicated for the abutment teeth of removable partial dentures, especially for anterior teeth when a cingulum rest must be provided. This type of treatment has a series of advantages such as minimal tooth reduction, supragingival margins, favourable stress distribution, and improved aesthetic appearance. [5]

Shimizu et al. reported a case in which

they used resin-bonded castings with a cingulum rest seat and a guide plane for a removable partial denture. [6]

In an in vivo experiment, Kawata et al. used a force-measuring device with a piezoelectric transducer mounted on the mandibular right second premolar of a subject with an edentulous maxilla. The experiment showed that the magnitude of the forces was higher and the direction was more posterior without the RPD in place. The direction was most posterior with an RPD with a distal rest only and most anterior with an RPD with a mesial rest only. The 3-dimensional forces exerted on an abutment tooth thus depend on both the presence of a denture and the rest location. [7] To counteract this displacement one would want to place the rests on the side of the abutment where there is either a neighbouring tooth or a limited edentation.

Having a long clinical experience with polyamide RPD's we noted that a rest is needed in order to prevent bone resorption around the teeth that limit the edentation,

especially in Kennedy class I cases in which a good distribution of forces and long saddles of the denture are generally regarded as compulsory requirements.

The cervical proximal rest is (as seen from the occlusal plane) a triangle shape proximal cantilever of not more than 2 mm (Fig. 1).

The first case described (Fig. 2) is a 47 year old female patient having the following remaining teeth in the mandible:

- the four incisors,
- the right canine and the right first premolar covered by 2 united crowns, with a cervical proximal rest on the distal surface of the premolar
- the left canine - cervical proximal rest on the distal surface,
- the right third molar that had a completely destroyed crown and had to be restored with a casted metal post and a juxtagingival plate, in order to act as a rest under the saddle of the RPD,
- the left third molar, covered by a metal ceramic crown with a mesio-occlusal rest seat.

The denture was made with TCS polyamide and has a favourable aesthetic appearance (Fig. 3).

In the following case (60 year old female patient) the remaining teeth in the mandible were from left canine to right first premolar. The lower right canine and the right first premolar had previously been covered by metal-composite crowns. The first right premolar was restored with carbon fiber post and core material (Fig. 4).

The treatment plane was to cover them with metal ceramic crowns with a cervical proximal rest on the distal of the first premolar and to make a MOD preparation on the lower left canine for a resin bonded cervical proximal rest on the distal surface (Fig. 5). The cervical proximal rest can be cast with the crown of the abutment tooth or it can be resin bonded to it.

The rest has a highly polished mucosal

surface and a convex shape in contact to the gum in order to avoid plaque accumulation (Fig. 6).

An overall image after the cementation of the fixed restorations is shown in Fig. 7.



Fig. 1. Cervical proximal rest on first left lower premolar. Occlusal view.



Fig. 2. Case 1 after cementation of metal-ceramic crowns (crown on first left lower premolar and crown on lower right canine united with crown on first right lower premolar). Cervical proximal rest is seen on the distal side of the first left lower premolar; the same type of rest is placed on the distal side of the first right lower premolar.



Fig. 3. Flexible removable denture in place.



Fig. 4. Kennedy class I edentation. Two abutments in the right quadrant prepared for crowns (united) and cervical proximal rest on the distal of the premolar; cervical proximal rest to be resin-bonded on minimally prepared left canine. Treatment plan: polyamide RPD.

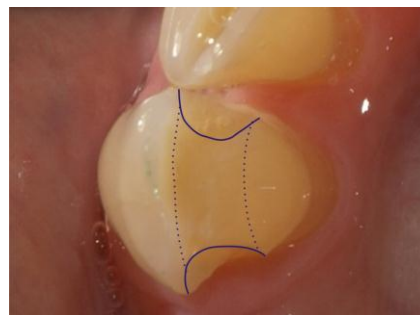


Fig. 5. Design of the preparation of the left canine detailed. Please see the next image – the metal frame to be resin-bonded to the tooth.



Fig. 6. Metal framework of the cervical proximal rest to be resin-bonded to the left lower canine.



Fig. 7. Fixed restorations cemented. Note the two cervical proximal rests.

DISCUSSIONS

If bonded to the teeth limiting the edentation, the cervical proximal rest is a minimal invasive solution ensuring the protection of the marginal periodontium and a good stability of the RPD. Contrary to most of the extra coronal attachments, the forces exerted on the tooth in case of crest resorption are minimal, as the polyamide clasps are extremely gentle and highly elastic.

An even better prognosis for the abutment teeth is achieved if there are two crowns united and cervical proximal rests associated. The rest and the polyamide clasp act similar

to an extra coronal attachment that does not wear, nor exerts damaging forces on the abutments.

CONCLUSIONS

Further tests should be carried out with resin bonded zirconia cervical proximal rests, that will ensure better aesthetics and will be better tolerated by the gums. Cementation of zirconia implies the use of organophosphate primers. Organophosphates should be applied to the entire surface of the zirconia restoration to avoid water sorption.

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COMPUTER APPLICATION FOR THE EVALUATION OF THE DENTO-SOMATO-FACIAL AESTHETIC BALANCE

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ABSTRACT

DSF (Dento-Stomato-Facial) Aesthetic Software is an application that focuses on aesthetic evaluation based on the following inter-related directions: body aesthetics, dental-facial aesthetics, dento-gingival aesthetics, dental-dental aesthetic and dental aesthetics. The application employs different images processing technics and the modern .net development platform. The application contributes to a better identification and use of the dento-facial and somatic aesthetic evaluation criteria. The software can display all the determined measurements or only those which diverge from the normal ones. The final reports can be presented either superimposed on the patient picture showing the deviated segments or on a standard image from the software library which can be also access at any time though the help function. Although the application can reveal the deviated values from the normal ones, thus pointing towards a diagnostic, the final interpretation however belongs to the dentist. The practitioner will establish the final diagnostic by correlating the data obtained from the computer application with that from clinical and paraclinical evaluation which is necessary for a complete and complex approach of the case.

INTRODUCTION

Today, as a consequence of the evolution and development of numerous technics and aesthetic materials, dentistry is considered, more than ever, an art. As in most art forms, the final results of the dental technics have to be also very pleasant. However, unlike other art forms, the aesthetics cannot be only the contribution of the artist. The concept of the dental aesthetics is subject of numerous variations which has to do with the personal interpretation and individual perception. Although the final result is controlled by the dental practitioner, the patient has to directly contribute to the decision making process.

This paper proposes a new approach of the dento-somato-facial aesthetics by focusing on the following interconnected elements: body aesthetics, dental-facial aesthetics, dento-gingival aesthetics, dental-dental aesthetic and

dental aesthetics. At the same time, the paper presents a novel computer application for the assessment of the dento-somato-facial balance.

The original contribution of this software is the approach of the aesthetics disequilibrium from the somatic point of view as well as facial and dental point of view, unlike other software that focus only on the facial and dental aspect.

The reason of this enhanced approach resides in a profound knowledge of the stomatognathic disequilibrium, each component, including the somatic one, playing an important part in achieving the desired harmony on the whole.

MATERIAL AND METHODS

Computers demonstrate their utility in all the clinic-technological phases of the therapeutic algorithm and also in the dental

training of the future practitioners. DSF aesthetic soft is an application that employs different image processing technics and modern data base systems and development platform for a better identification and usage of the dento-facial and somatic aesthetic evaluation criteria.

This application runs on Windows XP, Windows Vista and Windows 7 and for generation reports Microsoft Office (2003, 2007 or 2010) is required.

The goal is to process different images and to make measurements, angle calculations, planes drawings which are all specific to aesthetic balance assessment. The application uses Microsoft Access Database.



Fig. 1. DSF Aesthetic Soft splash screen

RESULTS AND DISCUSSIONS

The software is based on the following modules:

1. Patient management

Like most of the dental software designed for dental practices, DSF Aesthetic Soft contains a patient management module. It can create, edit, delete, load and save patient data. Patient data are saved in data based which can be used in other platforms or can be imported in other dental applications.

The database is structured on several tables, containing specific data. For patient management, the patient table is used containing information like first name, last name, birth date, address, phone, email, ID etc.

Already existing patient data can be loaded and the evaluation process can be continued or restarted by adding new measurements or re-measuring some parameters. New patients can also be created.

Already existing patient data can be loaded and the evaluation of the patient can continue by adding new measurements or modifying existing ones. Also patient data can only be visualised.

Using the application new patients can be added.

2. Application options

This software focuses on the esthetical evaluation on 3 levels: somatic balance, facial balance and dento-facial balance.

a. Somatic balance

This type of evaluation requires 2 pictures: one from front and one from the side.

The pictures include the whole body because measurements of different segments of the skeleton are desired (from the shoulder, waist, elbows, iliac crest, knee etc.)

b. Facial balance

For this evaluation 2 pictures are required: picture from the front with closed mouth, one from the side also with the closed mouth. The pictures must include only the head of the patient, because the points of the interest are trichion, ophrion, nasion, menton, etc.

c. Dental -facial balance

For this type of evaluation six pictures are required: front picture with smile, front picture with a wide smile, front picture with evident dental arches, side pictures with smile, side picture with wide smile, side picture with dental arches.

3. Images selection

Patients images should be grouped in folders as follows: in the application folder one subfolder for each patient should be created. Inside this folder, 3 different folders should be created, one for each evaluation type (somatic, facial, dento-facial). Other images could be created like whole body front picture. The best images can be selected having as criteria the image quality and the visibility of the important elements which are at the base of the evaluation.

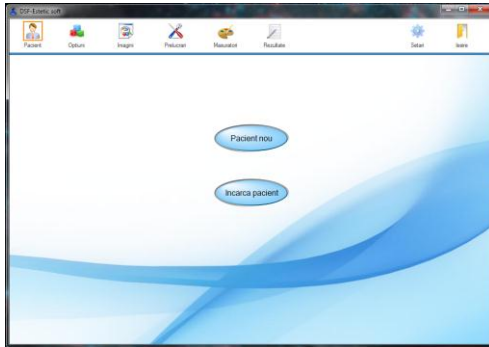


Fig. 2. Patient module functions

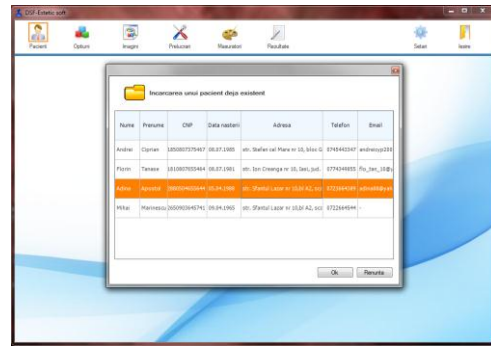


Fig. 3. Loading patient data

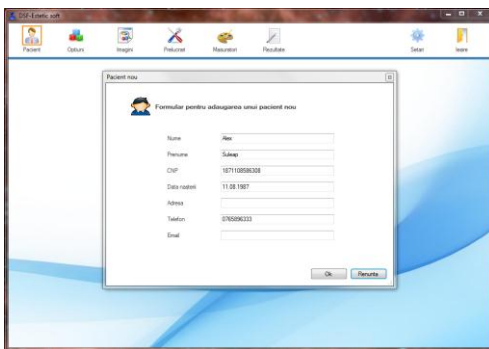


Fig. 4. Adding new patients

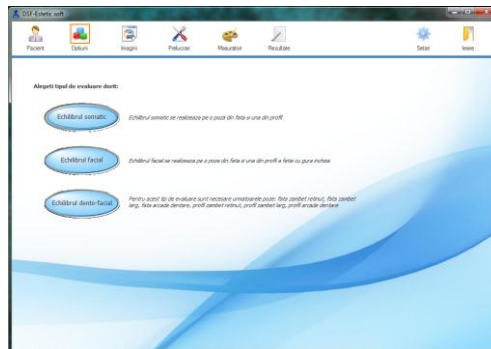


Fig. 5. Evaluation types

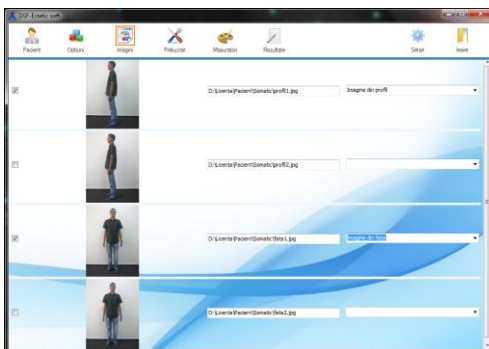


Fig. 6. Image selection

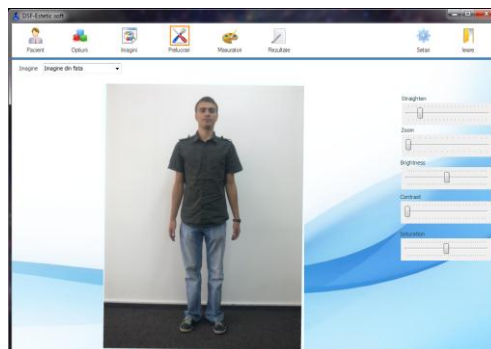


Fig. 7. Image processing

The used images and their purpose are stored in the data base. The table pictures contain information like: the folder where the picture file is located, picture file name and usage of the picture (if it is a front whole body picture or a picture of the dental arches).

The user has to select the source folder which contains the desired images and then select the images that will be used for the evaluations.

4. Standard image processing

As in the case of image processing applications standard image processing is required also in this software.

One of the most important features is

image rotation which is needed for setting the subject in vertical position. The picture can be rotated with an angle between -10 to 10 degrees. This is an important step for standardising the image which will ensure more precise measurements. The "zoom" feature is useful for visually amplifying some elements contained in the picture.

Other functions like brightness contrast have the role of enhancing the quality of the picture which will help the measurement process.

The most important role of these image processing functions is to create high quality image of the subject. However a picture that

not contains the necessary information cannot be greatly improved by the image processing technics. This is way the image acquisition is very important in the first place. Proper lighting and a good resolution are recommended. If the acquired image is of poor quality, then retaking that picture might be the best option, instead of processing it.

5. Measurements

This is the most important step for the evaluation process. At this stage the user has already selected a patient and the type of the desired evaluation, has important the necessary images and performed the necessary image processing. If at this point the images have not the necessary quality for starting the images process, then all the above steps have to be repeated. In this module the user will define certain guide points on the body which will help in measuring distances, ratios, angles etc.

Every guide point is saved in the data base, in the table points using the xy coordinates which will define the point location in 2-dimensional space. These points define different elements like left shoulder, right knee etc. These points that the user has to define are grouped in several section based on the desired evaluation type. However, for each picture some reference points have to be defined. These pints are not used in the actual

computation but are essential for the evaluation. Some of these points define the marker line.

The marker line is the line for which the real size is known. This is necessary for calculating the ratio between the image dimensions and the real world dimensions. The marker line could be any element not necessary related to the subject body. It could be also an object visible in the image.

In the image below we used the forearm which is parallel to the image plane. In the above example we used somatic evaluation, based on the front image. The symmetry based on the median line is analysed. This means the reference is the median plane. For this the user has to select one point and then draw the vertical line that runs through it. Next all the points from the displayed list have to be defined: left shoulder, right shoulder, left elbow etc. If one point is skipped some evaluation will not be possible. In the example bellow the display points have to be defined for evaluating the segments: vertex, menton, shoulder etc. For each point a horizontal line is drawn dividing the subject's body into several sections.

For defining a point, reference image can also be used.

Other examples for defining points for facial evaluation front and side images are showed below.

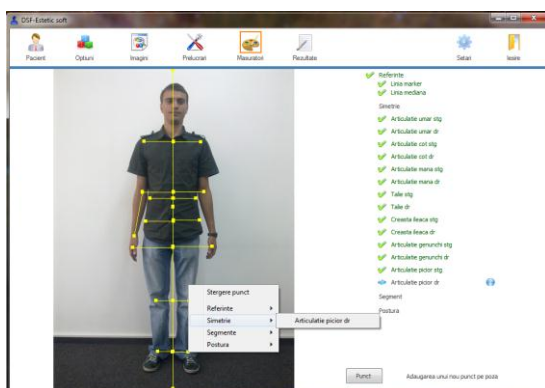


Fig. 8. Defining points

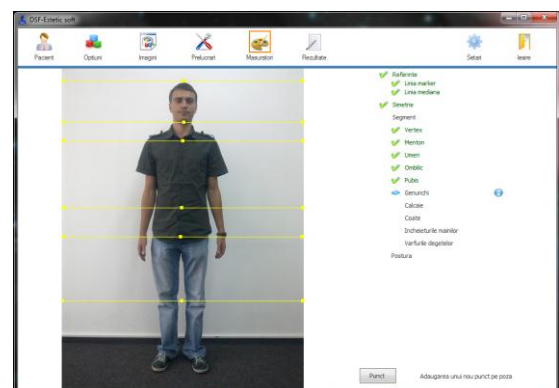


Fig. 9. Defining segments

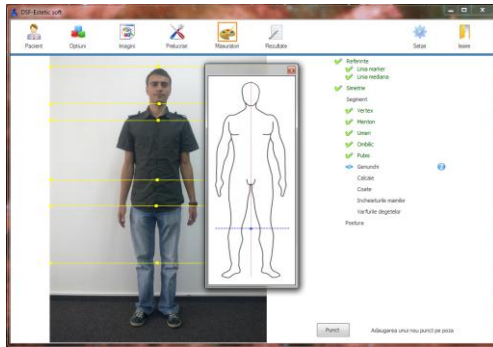


Fig. 10. Reference image

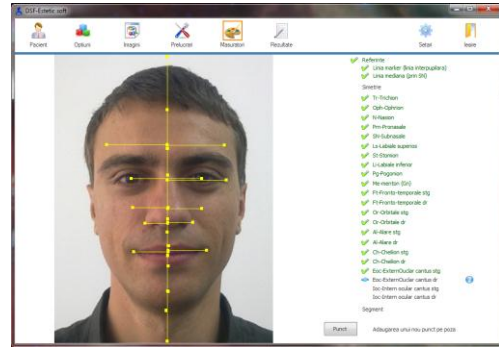


Fig. 11. Reference points front image

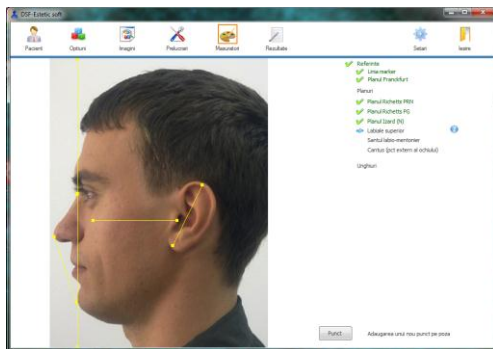


Fig. 12. Reference points side image

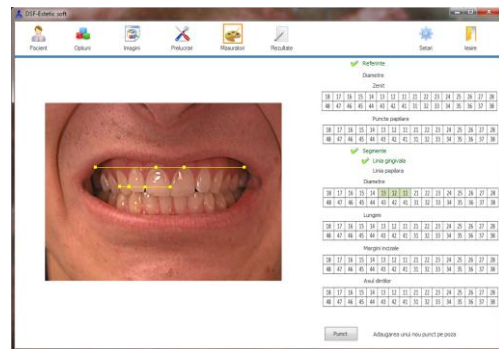


Fig. 12. Reference points dental image

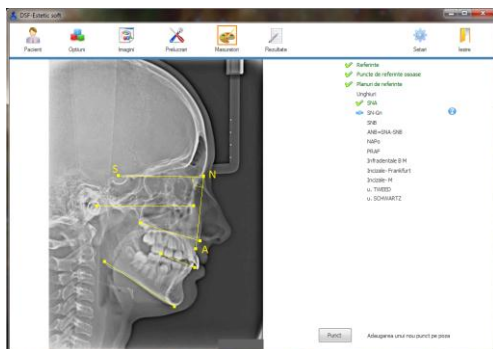


Fig. 13. X-ray measurements

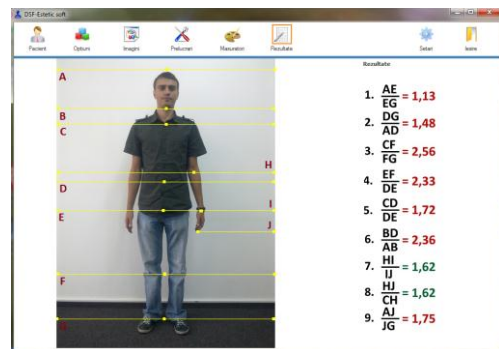


Fig. 14. Full body ratio calculations

A necessary stage in diagnosis is the analyses of cephalogram. The specialist can draw the necessary planes and angles in order to establish the type of the dental facial imbalance.

6. Reporting

Once the points, segments and planes of interest, the software automatically performs the data processing. This consists of comparison between similar sections, distance calculation between different points and reference planes, ratio calculation and comparisons with references values.

In the images above, symmetries based on

the median line are evaluated for the full body as well as for face and dental arches. Similarities and ratios between the segments are also evaluated.

On user request, the software will display all the resulting values or only those who lie outside the normal range. The final reports can be shown over imposed on the patient's image pointing out the deviating segments or on a standard image from the own library. These standard images can also be accessed through the help menu.

Even though the software reveals the abnormal geometrical relations, guiding the specialist towards diagnosis, the final

interpretation belongs to the medical expert who will establish the final diagnosis. This is achieved by correlating data from the computer application with information obtained through clinical and paraclinical evaluation which are obligatory in a complex and complete approach of the case.

It is more and more obvious that to be a high standard medical specialist requires not only good training in theoretical and practical aspects of a specific medical area but much more. "No doubt, Pius Servien used to say, you have to be born for science and for art as well". It requires besides of vast medical culture, the knowledge of ethical and moral principles in general, and also sound intellectual qualities. Beyond that the specialist has to nurture his or her aesthetic sensibility good taste and artistic refinement. How the medical specialist could otherwise perceive and understand the abnormal situations, the disease which affects the beauty and harmony of a healthy human body? Without all these qualities the personality of a specialist appears cold and sterile, transforming him / her into a repository of scientific knowledge.

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CONCLUSIONS

1. This paper proposes the approach of the dento-somato-aesthetics based on the following the interrelated directions: body aesthetics, facial aesthetics, dento-facial aesthetics, dento-gingival aesthetics, dento-dental aesthetics and dental aesthetics.
2. We present a computer application for evaluating dento-somato-facial balance. The original contribution of this application is the software concept that proposes the approach of aesthetic imbalances not only from dental and facial point of view, but also from somatic point of view.
3. The motivation of this concept resides in a profound knowledge of the stomathognath system imbalances. Each component, including the somatic one plays a very important role in the overall harmony.
4. The main characteristic of this paper is the interdisciplinary way of thinking by correlating anthropometric and orthopaedic data, different dental specialities and computer processing, resulting in a software with immediate clinical and educational applicability.