A Clinical-statistical Study of Oral Mucosa Pathology Induced by the Acrylic Resins from Removable Dentures in Older Patients

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The puropose of this paper was the approaching the patology of the oral mucosa in older patients, induced by acrylic resins in removable dentures. Prosthetics resolves many problems in older adults (mastication, aesthetics, phonation, etc.) but the wearing of dentures has consequences on all the living tissues in contact with them. The reactions of buccal mucosa are the result of mechanic irritations, plaque build-up and of toxic and/or allergic action of the denture materials, therefore the field cannot be neglected. An essential aspect of the clinic goal of removable prosthetic restorations is the consistency between the biomaterials used, their biological integration, the approached technological line, and the particularity of the prosthetic field of the older patient.

Keywords: oral mucosa, acrylic resins, removable dentures, irritating toxic phenomena, biocompatible

Choosing an aesthetic material ideal for dental restorations led to significant improvement of available materials and techniques; the material should be biocompatible; show similar properties to the enamel, dentin and other tissue; be resistant, without any signs of tiredness to masticatory forces, wear (attrition and abrasion), and chemical injuries (erosion); offer thermic insulation of the vital dental tissues against the thermic changes; and permanently adhere to the structure of the tooth.

Resin-based composite materials are the most important and aesthetic restoring materials due to their universal use, minimal loss of dental structure, and their ability to be applied directly.

Acrylic resins have been dominating the technology of single dentures for several decades. They have been used to manufacture bases, artificial teeth, facets and even unidental prostheses, provisional dentures, etc. During time, several deficiencies of these materials have been highlighted, especially when used as cladding materials, unidental prostheses and artificial teeth.

New types of acrylic resins have been created, as well as new polymers: diacrylic, epoxy, polycarbonate, epiminic, polyoxyethylene resins, etc.

Acrylic resins have three forms: industrial polymerized acrylates in final forms; industrial polymerized acrylates in prefinal forms – thermoplastic, usually presented as platforms which through heating and pressing can become bases for dentures or orthodontic devices; acrylates polymerizable in laboratory or dental office – bicomponent systems: liquid and powder (monomer is the liquid, while the polymer of methyl methacrylate is the powder).

Acrylic resins, offering similar features as the teeth, such as similar appearance, insolubility in oral fluids, ease of manipulation, and reduced costs, replaced the silicates, because the silicate restorations showed dissolution in oral fluids (2, 3). Yet, the excessive expansion and contraction of the acrylic resins caused stress on the cavity margins, leading to an early clinical failure (2).

It is possible to arise air bubbles of various sizes in the structure of the resin, discernible macroscopically (porosity of the denture). These bubbles are caused by dosage, manipulation and manufacture errors, affecting the mechanical and biological properties.

Intolerance-related buccal manifestations (prosthetic stomatopathy) to these resins are quite rare. The allergic manifestations are shown as chronic inflammation of the mucosa that supports the acrylic denture (adjunct). Excess monomer, bacterial plaque on the denture, and mechanical irritation trigger defence reactions of the buccal mucosa. It is an immunity reaction caused by bacterial antigens. It is necessary to instruct the patient to take care of the hygiene of the denture and buccal mucosa (massaging the supporting mucosa with the toothbrush). The monomer has 100% cytotoxicity, but in dentures manufactured from thermopolymerizable resins, usually, there is no residual monomer.

Dentures are meant for people who lost a great part of their teeth; they can be total or partial, fixed or removable. Total dentures replace all the teeth, while partial dentures are usually attached to the remaining natural teeth, most of the times being necessary to apply dental crowns. Dentures can be made from acrylic resins.

Mobile partial dentures are mobile appliances for very few remaining teeth on the dental arch; they can be acrylic or skeletal.

When there are few remaining teeth on the arch and they don't have a prosthetic importance, they are extracted, and then the mobile total dentures are manufactured. They can have acrylic artificial teeth.

Experimental part

Materials and methods

Dentures are made from acrylic resins, which are powerful and long-lasting plastic materials. For dentures with a natural appearance, various degrees of acryl are available. High quality acrylic resins are more expensive, and the dentures can be used up to five years or more. The plastic tooth model can imitate the exact shape and size

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of the original tooth and can give the partial denture a more uniform appearance, if inserted next to a natural tooth. The denture base, or the pink gum, is also manufactured from an acrylic material.

In the oral environment, the materials should be: non-irritant, non-allergic, noncarcinogenic.

Before manufacturing a dental material, biological tests (biocompatibility tests) are conducted.

In the oral environment, the material should be non-aggressive (nontoxic) for the pulp; should not contain substances that are diffusible in general circulation; should not contain substances that can trigger allergic reactions; should not contain substances with carcinogenic effect. The material should have an (initial) adaptation phase and a plastic working phase (carving); should not dilate or contract; should not dissolve in the buccal environment; should adhere in marginal areas of the cavity, (ideally, chemical adherence); should have low values, close to the ones of the hard dental tissues in order to stop the heat transfer to the pulp; identical or close colour to the natural teeth, mechanical resistance similar to the hard tissues (enamel) – ceramic, resistance to abrasion.

Oral mucosa has the following forms: mucosa of the soft palate, floor of the mouth, ventral surface of the tongue, alveolar mucosa and the mucosa in the buccal vestibule; masticatory mucosa, on hard and gingival palate; specialized mucosa, on the dorsal surface of the tongue, containing most of the taste buds; it suffers from atrophy, with a thinner epithelium, hardly differentiated, with a thickening of the collagen in the underlying connective tissue. The keratinization processes of the palate mucosa and gum diminish or, on the contrary, lead to a hyperkeratinisation tendency.

The materials used in a denture can further function as a research benchmark; not only can their mechanical resistance be improved, but they can also contribute to maintaining a better health of the oral mucosa.

The clinical and paraclinical study regarding diagnosis of oral pathology comprised 268 older patients 60-85 years old (average age – 72.5 years old), presented in Oral – Dental Diagnosis Service and Gerontostomatology, in 01 January 2012- 30 December 2013.

If at birth and in the first half of life there are fewer females due to more male new-born babies, in older ages, there are proportionally more females than males, especially due to over-mortality of males, but also due to social and behavioural factors that point out the differences in life span of the two genders.

Results and discussions

Functional and especially physiognomic changes have always been associated with the early ageing phenomenon.

After 45 years of age the periodontal disease takes over the causality of dental losses, which increases the percentage with age, generally affecting a group of teeth or the entire arch with a slower or more rapid progress, depending of the complexity of the causes.

The rather complex therapeutic arsenal of this disease, the uncertain outcomes and the long treatment periods diminish the patient attention and concern for the disease, leading to a fatalist acceptance of its slow progress, less dramatic in symptoms, but invading though its consequences on a high degree of tooth loss. Total denture wearers have the highest salivary microbial content and the most microorganisms originating in oral cavity.

Oral health is an important component of quality of life, general health and nutritional status of older adults. In order to properly treat the oral health of an older adult, it is necessary to have a comprehensive, multidisciplinary approach, reducing the barriers between the elderly and the oral health care services.

The elderly are regarded as a category of population at risk for increase of incidence and severity of various infections.

It is important to set up an "emotional bridge" during the very first contact with the patient, so that he/she is sure of the physician's competence and professionalism.

The elderly are uncooperative, aloof, hostile, showing difficulties in communication due to low reactivity, decrease of auditory and visual acuity, and fatigue. There will be a weakened memory and attention. The oral cavity can be seen as an ecosystem that contains a multitude of microbial species developing antagonistic activities.

The main factors responsible for the etiology of periodontal disease are the bacteria in dental plaque, associated with genetic and environmental factors. Dental plaque can be defined as an adherent microbial deposit formed on hard dental surfaces, made from lining and dead bacteria and their products, together with the components of the host, which derive from the saliva and the gingival liquid. The bacterial plaque is a colourless pellicle, adherent, made from bacteria and sugar, continuously building up on teeth. It is the main cause of the dental caries and gingival diseases, and if not removed daily, it leads to the formation of calculi. A good oral care, even without chemical substances, even if not performed daily, reduces the bacterial, viral, and fungal oral charge.

Many patients are equipped with dentures, even if they have acrylate intolerance and orient the base of the denture made from acrylic resins.

Here are some general factors favouring the onset of pathologic changes of the mucosa: old ages and decrease of local and general reactivity, diseases (diabetes, hematopathy, hepatic diseases, endocrine diseases, avitaminosis, arthrosclerosis, etc.) which, among other things, have an impact upon the resistance and trophicity of buccal mucosa, together with nutritional disorders.

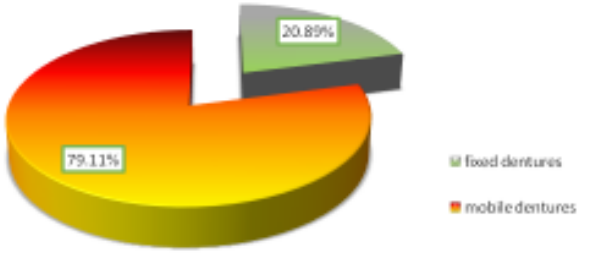
The buccal mucosa, part of the prosthetic field, is not adapted to bear the stresses resulted from wearing the mobile, classical dentures, especially during mastication. As a result, the mucosa undergoes a keratinization or hyperkeratinisation process, favourable responses to the stresses of the dentures. Yet, several general and local factors interfere, which make that, by applying the denture, the mucosa undergoes pathological changes and further microbial and fungal infections, allergies, bacterial plaque, etc.

Acrylic resins might act through the remaining free monomer after polymerization, the pigments and stabilizers in the structure or other chemical compounds released by the ageing of the material; they can generate contact atopic allergic reactions on the contact areas with the mucosa, which can extend to the neighbouring teguments, and, rarely, can trigger contact lichenoid lesions.

Out of those 268 cases, 56 cases (20.89%) are patients with fixed dentures, while 212 cases (79.11%) have mobile dentures.

The patients with *classical dentures* (56 cases – 20.89%) have the gingival mucosa with superficial exudate and red cells and mycelium like filamental structures. The gingival epithelium is disintegrated with necrobiosis. The local factors that favour the modification of the buccal mucosa are represented by a series of mechanical irritations caused by the dentures, which act either on a less resistant

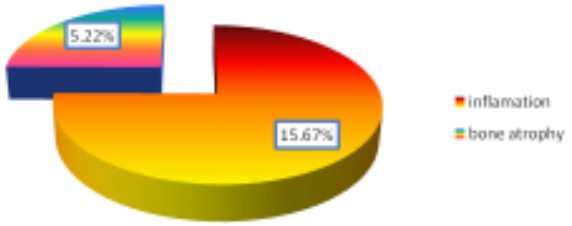
Case distribution on types of prosthetic treatment



mucosa, because of the general factors mentioned above, causing the inflammation in a shorter period of time or on a healthy mucosa. In this case, with the passage of time, it leads to the apparition of inflammation – 42 cases (15.67%) and bone atrophy – 14 cases (5/22%).

The mucosal traumas caused by mobile dentures favour the apparition of prosthetic stomatitis, but taken individually, they can cause only localized inflammations and rarely generalized. Most patients with dentures (79.11%) present histological modifications of the buccal mucosa in contact with the dentures, and the modifications decrease the defence capacity of the epithelium.

Pathological signs in patients with classical dentures



Mobile dentures are made only of acrylic resins specially created to adjust perfectly to the gum. The resins are fixed between the surface of the dentures and the surface of the dental mucosa. They are recommended to patients with no natural teeth, counting on the cupping effect of the mouth and allowing its extraction. Nowadays there is the possibility of supporting the dentures with implants, artificial titanium roots fixed in the bone.

a)Dentures that can move on the prosthetic field – small displacements with irritating effect on the mucosa; inability of maintaining it, denture instability and tipping; must be foreseen with the most effective methods to maintain it, providing support and stability – 7 cases (3.27%)

b)Vertical dimension of over-valued occlusion is one of the most severe mistakes in the prosthetic treatment, leading to excessive, long lasting pressure on the muco-osseous support – 4 cases (1.86%).

c)Absence of perfect occlusal balance which leads to denture displacement and causes exagerate pressure on some areas of the prosthetic field; perfect balance of dental contacts is recommended – 9 cases (4.20%).

d)Rugosities of the mucosal surface of the denture. Many dentures come with sharp asperities due to an imperfect model. Many times, the maxillary torus foliation area remains in the denture as a room with sharp walls that are also irritating for the mucosa. The foliation for the maxillary torus is performed by the technician on the work surface respecting the model drawn by the dentist who usually increases the surface of the torus. After the foliation it results a cavity with the effect of a vacuum chamber causing, in time, the irritant absorption of the mucosa as well as food retention. This situation appears mainly when the thickness of the layer is higher than the height of the torus. Lack of foliation or insufficient foliation determines lesions of the mucosa on the torus and lateral tipping of the denture. If the denture was made after recent extractions, on the mucosal surface of the denture, at the unhealed sockets there are acrylic prominences that must be removed – 147 cases (68.69%).

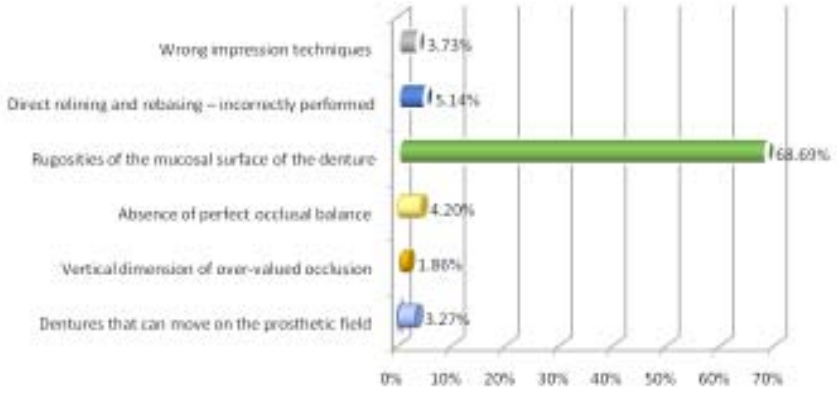
e)Direct relining and rebasing – incorrectly performed. Apart from the toxic, irritating local action of the monomer that is amplified by the exothermal reaction during polymerization, the mucosal asperities are added which are not smooth after relining. The self-polymerizable layer of acrylate does not adhere intimately to the entire surface leading to retention areas for food and microorganisms, between the self-polymerizable acrylate and the denture base – 11 cases (5.14%).

f)Wrong impression techniques as incorrect technical steps in making the denture can lead to incongruences between the prosthetic field and the denture base which favours denture displacements, high pressure in certain areas of the prosthetic field, food retention – 8 cases (3.73%).

g)Compression and blockage of the canals and orifices used to eliminate the saliva by the base of the denture that can lead to inflammation. In these situations, the inflammation should be more obvious in the posterior surface of the hard palate (glandular area). The pressure on the mucosa appears only during mastication and swallowing, being intermittent and brief, and stimulating for the tissues. Only in bruxism and certain parafunctions, this pressure on the mucosa is long lasting and intense having the capacity to influence both blood circulation and salivary secretion, favouring inflammation. Juxta-commissural folds become more evident as well as the nasolabial groove because of the maxillary crests atrophy. The juxta-commissural folds just like the commissures become intertriginous and the presence of the saliva represents an additional factor that causes epithelium maceration upon which the Candida infection appears. The right vertical dimension as well as the recreation of the contour of the upper lip using artificial teeth and saddles placed correctly recreates the architecture of the oral cavity preventing the saliva from flowing towards the commissures and thus the effects mentioned – 12 cases (5.60%)

We must point out that prosthetic stomatitis was present, in a very high number of cases of flexible dentures. This requires the dentist and especially the prosthodontist to have special medical training, necessary for establishing the correct diagnosis and performing an effective treatment that answers both the causes and the local and general favouring factors.

The quality of removable dentures influences the lesion type causing a large number of erythema-congestive stomatopathies followed by ulcerative stomatopathies in the first weeks after putting the dentures on. The clinical forms that proliferate stomatopathies are more frequent in patients with many years of wearing dentures.



The allergic manifestations of the oral cavity in case of removable dentures were represented by stomatitis, with the following forms:

a) Erythematous stomatitis that manifest themselves through diffuse or localized erythema associated with oral mucosa edema, especially of the tongue (macroglossy) and lips (macrocheilitis). Sometimes, the edema is discreet, manifesting itself as the imprint of the teeth on the margin of the tongue and on the internal surface of the cheeks and by emphasizing the gingival festoon – 47 cases (17.53%).

b) Ulcerous stomatitis that manifested themselves as ulcerations localized at the level of the tongue, lips, and gingival festoon, generally having median, anterior position. There were two cases with necrotic aspect – 21 cases (7.83%).

c) Aphthous, vesicular, bullous stomatitis generally manifested as gingivitis or atrophic, diffuse, edematous glossitis, diffuse cheilitis or isolated candidiatis angulus – 19 cases (7.08%). These types of stomatitis are due to the reaction of the antigen with the circulating antibodies.

d) Contact stomatitis describes the allergic manifestations of the buccal mucosa in the contact area with the antigen. A series of dental materials along with the tissue proteins from the contact area can give birth to an antigen which, at his turn produces non-circulating (tissue) antibodies which participate at the normal antigen-antibody reaction – 39 cases (14.55%).

Contact allergies must be differentiated from chronic traumatic irritations that are frequently present in the oral cavity and can have a similar aspect. The most frequent causal allergens are of food origin or come from the hygiene products used, cinnamon (cinnamaldehyde) or menthol being the most frequent ones. Eugenol and propolis also have high allergenic potential. The methyl methacrylate monomer that remained free after an incomplete polymerization of acrylic dentures can also cause contact atopic reactions.

Gingivitis or plasmocytic glossitis represents a particular type of contact allergy, although this clinical manifestation can also have other etiologies. It manifests itself by intense erythema and sometimes generalized edema of the gingival mucosa or of the tongue, along the margins, the tip and the dorsal surface.

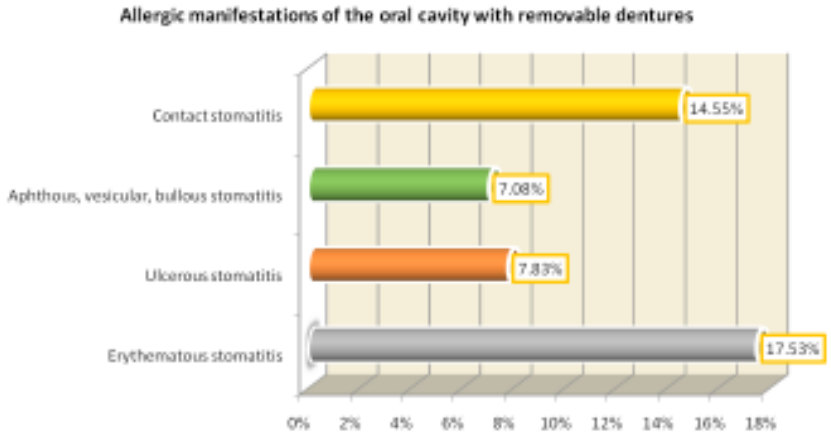
The beginning of this stomatitis is accompanied by erythema and edema, and the sensation of itching and burning. Bladders and afterwards ulcerations can appear, both painful. Oral allergies can also be accompanied by the general manifestations mentioned before, skin eruptions being the most frequent ones.

The poor oral hygiene as well as the poor hygiene of dentures often brings along microbial colonization with negative effects on the heath of the oral mucosa.

A special mention must be made when referring to Candida Albicans that has a great power of allergen independent of the pathogenic activity. The allergy to Candida is a manifestation that appears at a distance from the primitive oral localization. The allergic manifestations reach an extreme polymorphism, which are due to the so-called candida (sterile fungi) – 27 cases (10.07%).

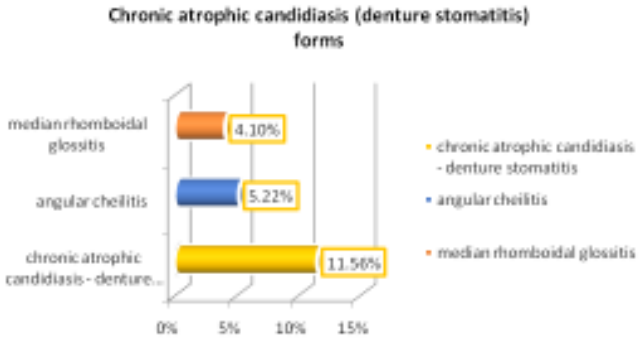
The presence of the infection requires the presence of certain events, beginning with the attachment of the fungus to the epithelial cells, followed by intracellular insertion through proteases secretion, more precisely aspartyl proteases and phospholipase B. For the Candida species to colonize and infect the oral tissue the defence mechanisms must be damaged locally or generally.

Chronic atrophic candidiasis (denture stomatitis) appears to the old wearers of removable dentures; the



chronic atrophic form includes the following: chronic atrophic candidiasis - denture stomatitis (31 cases – 11.56%), angular cheilitis (14 cases – 5.22%), median rhomboidal glossitis (11 cases – 4.10%).

Denture stomatitis include 31 cases (11.56%) and is present at the wearers of old removable dentures. The causes for the apparition of candidosis are the absence of correct hygiene of the dentures and the oral cavity; not removing the dentures during the night and chronic traumatism caused by the denture on the mucosa. The



acrylate from removable dentures has a porous surface capable of retaining microorganisms.

From a clinical point of view, it presents a congested, atrophied mucosa with red punctiform areas that represent the inflammation of the salivary glands, then a diffuse erythema that can be accompanied by epithelial desquamation and inflammatory papillary hyperplasia, sensation of burning and itching.

Angular cheilitis includes 14 cases (5.22%) it is a painful chronic form, is located at the labial commissures and it is caused by Candida Albicans. Clinically, it presents itself as fissured, erythematous areas, the surrounding integument being macerated, covered with crusts. Bleedings are rare and sometimes some brownish - yellow granulomatous nodules can be noticed.

The relation between candidosis and angular cheilitis has not been confirmed in all the situations in which the lesions characteristic to this disease were present.

It manifests itself as ulcerous fissures or cracks at oral commissures.

The factor predisposing to angular cheilitis is the existence of a macerated epithelium, with folds at mouth commissure. The saliva has the tendency to add up at the commissure and then it can be infested by microorganisms, especially Candida Albicans. Numerous cases of folded, macerated commissures are due to mandible closing disorders, as it is the case of edentulous persons with improper facial height (vertical dimension).

The pain mentioned are the sensation of burn and pain in the oral commissures region. The fissures and the cracks tend to bleed and form a superficial exudative crust. The lesions indicate a spontaneous alleviation tendency. The subsequent exacerbation is frequent while the complete disappearance of lesions is rare.

The infected and macerated commissures can be clinically diagnosed and confirmed using culture tests.

Median rhomboidal glossitis is present in 11 cases (4.10%) and presents a lesion resembling a soft denuded red spot, without any filiform papillae situated on the median line of the dorsal surface of the tongue, anterior to the circumvolved papillae. It is asymptomatic, easy to recognize because of its clinical aspect and characteristic position. This form of candidosis is also known as central papillary atrophy of the tongue. During the clinical examination it is noticed the lesion from the dorsal surface of the tongue that is lacking filiform papillae. It has the aspect of a soft denuded red spot that in time becomes granular, lobular and hard. It can be oval or rhomboidal, clearly delimited with rounded margins. It is located on the dorsal surface of the tongue, on the median line, anterior to the circumvolved papillae. The lesion is asymptomatic.

The differential diagnosis is conducted with traumatic and chemical ulcerations; nutritional deficiencies.

Jainkittivong (2010) identified the ulcerative type traumatic lesions, denture stomatitis and angular cheilitis as being the most frequent mucosal injuries in older patients.

Among the organism's defence mechanisms at the level of the oral cavity, we can mention:

a)The properties of saliva, both qualitative and quantitative that perform the mechanical debridement that is facilitated by mucin and proteoglycans; the neutral pH reduces the capacity of fungi to adhere to the epithelial surfaces; the saliva consists of different anti-infectious factors as lysosome, lactoferrin, histamines, leukocytes, immunoglobulins.

b)Keratocytes that inhibit the development of candida, creating a physical barrier against Candida infection and at the same time they secret growth factors and cytokines that play an important role in the inflammatory answer.

c)The action of T helper/CD4+ cells that answer to the inflammatory attack and at the same time determine the growth of monocytes/macrophages level and PMNs to eliminate oropharyngeal candidosis.

When the organism's defence mechanisms are affected, Candida, which is an opportunistic saprophyte, adheres and proliferates at the epithelium of the mucosa and determines infection with candida.

The allergic reaction can appear in the oral cavity and in this case, the differential diagnosis must be conducted with the lesions caused by the toxic-caustic or irritant actions of some dental products, fixed or mobile dentures or with other pathological manifestations of the oral mucosa that have an infectious cause or derive from general disorders. At the same time, attention must be given to the fact that dental materials and drugs can cause allergic reactions in any part of the organism and then the patient generally goes to the dermatologist who rarely suspects the true cause of these manifestations that cannot be cured with any treatment. Many times, even a common substance like nicotine can cause powerful allergies when in contact with prosthetic materials.

Conclusions

Due to the fact that the etiology of oral mucosa diseases in older patients is not entirely known yet, and their treatment sometimes fails, it is necessary to study the acrylic materials used in removable prosthetics, which, either because of the components, or because of the surface state, might trigger a risk for toxic, irritating or traumatic phenomena. Thus, their biological quality must be tested prior to their use.

The biological aspect must always be considered as it is related to the ageing processes that generate specific pathologies, the development of certain chronic diseases as well as the psycho-social factors correlated to the involution of some psychic functions. It must also be related to the effects of all these disorders on the elderly and their environment.The change of the self-image because of cognitive and affective disorders, the dramatic decrease of sensory functions and mobility have negative consequences on the daily competences, the assessment of bio-psycho-social factors having a positive or negative

prognosis on the evolution of the state of health in older people.

References

1.FORNA N, URSACHE M, ANDRONACHE M, PLENOVICI L - Aspecte secundare în protezarea parţial amovibilă –Conferinţa Naţională 30 de învăţământ în medicina de ambulator la Iaşi", 27-29 sept. 2002, ediţia Tehnică şi Didactică "Cermi" Iaşi şi ediţia Academică "V. Voiculescu" Buzău.

2.RAWLS RH, Esquivel-Upshaw JF. Restorative resins. In: Anusavice KJ, ed. Phillips' Science of Dental Materials. 11th ed. St. Louis, MO: Saunders: 2003:399-442.

3.*** Resin composite restorative materials. In: Powers JM, Sakaguchi RL, eds. Craig's Restorative Dental Materials. 12th ed. St. Louis, MO: Mosby; 2007:189-192.

4.ONG RJ, DAWLEY JT, CLEM PG - submitted to Journal of Materials Research 2003. Ursache M, Forna N, Untu C, Monica Mihaela Scutariu - Aspecte ale biocompatibilităţii materialelor acrilice utilizate în protezarea amovibilă , Al II-lea Simpozion National de Biomateriale - Prezent şi perspective, Bucureşti, 21-22 iunie 2001.

5.OH WON-SUK, SAGLIK B.,Provisional Prosthetic Management of Mobile Teeth in Conjunction with a Removable Partial Denture Using Orthodontic Wire, Journal of Prosthodontics, 2009.

6.OHLMANN B, ROHSTOCK K, KUGLER J, GILDE H, DREYHAUPT J, STOBER T - Influences on clinical wear of acrylic denture teeth: a pilot study, The International journal of prosthodontics, 2007.

7.FORNA N, URSACHE M, ANTOHE M, ANDRONACHE M, TIPAU T, IOVU C, GARTAN M - Impactul psihologic al protezei parţiale amovibile, Volumele editate cu prilejul Zilei Facultăţii de Medicină Dentară, Supliment al Revistei de Medicină Stomatologică, Ediţia a IX-a, 4-6 martie 2005.

8.FORNA N, STADOLEANU C, ANDRONACHE M, BAHRIM D, BEJAN C Protezarea de tranziţie în edentaţia parţială întinsă , -Supliment al Revistei "Medicina Stomatologică", vol. 7, nr. 1, Vol. I editat cu ocazia Zilelor Facultăţii de Medicină Stomatologică, Ediţia a VII-a, 28 februarie -1 martie 2003

9.FORNA N, BAHRIM D, ANDRONACHE M, ANTOHE M, GHEBAN E, TIPAU T -Elemente de biomecanică în protezarea parţial amovibilă, Vol. editat cu ocazia Zilelor Româno-Belgiene, 5-8 noiembrie 2003.

10.FORNA N, STADOLEANU C, BUDAIE D, SUCIU D, ANDRONACHE M, AELENEI D, TĂNĂSUC L- Evaluarea solicitărilor biomecanice în protezarea amovibilă, Analele Ştiinţifice ale USMF "Nicolae Testemiţanu" vol. 3, "Probleme clinico-chirurgicale ale sănătăţii mamei şi copilului", Zilele Universităţii 17-18 oct. 2002, ediţia III, Chişinău, 2002.

11.FORNA N, STADOLEANU C, BUDAIE D, SUCIU D, ANDRONACHE M, AELENEI D, TĂNĂSUC L – Evaluarea solicitărilor biomecanice în protezarea parţial amovibilă, Ziua Facultăţii de Medicină Stomatologică, Iaşi, 1 martie 2001.

12.FORNA N, ANDRONACHE M - Manifestări orale ale acţiunii factorilor generali, loco-regionali şi locali în protezarea parţial amovibilă- În volumul"30 de ani de învăţământ în medicina de ambulator la Iaşi", 27-29 septembrie 2001.

13.URSACHE M, AMENCIA, AO, MUNTEANU F.,Uzura dentară, aspecte clinice şi tribologice, Supliment nr.1.Rev. Medico-chirurgicală mai, 2006 vol. 110, nr.2, p.213-221.

14.MARINESCU E.,Gerontologie medico- socială şi patologie gerontologică, Editura Samia Iaşi, 2006.

15.FORNA,N.C., Abordări interdisciplinare în medicina dentară, ghiduri terapeutice, Casa Editorială Demiurg, 2013.

16.HOSHI N, MORI H,TAGUCHI H, TANIGUCHI M, AOKI H, SAWADA T, KAWABATA M, KUWABARA A,OONO A, TANAKA K, HORI N, TOYODA M, KIMOTO K,Management of oral candidiasiss in denture Wearers. J.Prosthodont Res. 2011 Jan; 55 (1):48-52.

17.TOMIŢĂ DI, URSACHE M, DRAGOMIRESCU C, DULHARU A, IRIMIA T**.,** Aspecte privind percepţia igienei orale la vârstnici-Supliment nr.1.Rev. Medico-chirurgicală mai, 2006, vol 110 nr.2, p.198-201.

18.NICOLAE V, URSACHE M, SCRIECIU M, Gerontostomatologie, Edit.Univ. Lucian Blaga, Sibiu, 2011

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