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Prosthetic emergencies due to attacks on the different component elements of the stomatognathic system

Urgencias protésicas por agresiones a los diferentes elementos componentes del sistema estomatognático

Emergências protéticas devido a ataques aos diferentes elementos componentes do sistema estomatognático

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Abstract

An observational, descriptive and cross-sectional study was carried out in the Güines stomatological clinic, from September 2018 to October 2020 with the aim of identifying the main injuries according to the assaulted element for which patients request immediate attention. Out of a total of 9,750 patients, a study population of 320 patients with prostheses with attacks on the paraprosthetic organ was obtained. The interrogation, the oral examination and the temporomandibular joint were carried out. Data were collected on a spreadsheet and χ^2 and Duncan were used for statistical analysis. The mucosa was the most affected element (73.44%) while inflammatory states (2.50%), periodontal pain (2.81%), grade II sub-prosthetic stomatitis (36.88%), myalgias (5.94%) and combinations of joint symptoms and signs (5.94%) were the main injuries for which patients requested emergency treatment.

Keywords: Prosthetic emergencies, prosthetic aggression, prosthetic organ, stomatognathic system.

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Resumen

Se realizó un estudio observacional, descriptivo y transversal en la clínica estomatológica de Güines, República de Cuba, desde Septiembre de 2018 a Octubre del 2020 con el objetivo de identificar las principales lesiones según el elemento agredido por las cuales los pacientes solicitan atención inmediata. De un total de 9750 pacientes, se obtuvo una población objeto de estudio de 320 pacientes portadores de prótesis con agresiones al órgano paraprotésico. Se realizó el interrogatorio, el examen bucal y de la articulación temporomandibular. Los datos se recogieron en una planilla. Se usó χ^2 y Duncan para el análisis estadístico. La mucosa resultó ser el elemento más agredido (73,44%) mientras que los estados inflamatorios (2,50 %), el dolor periodontal (2,81 %), la estomatitis subprótesis grado II (36,88 %), las mialgias (5,94 %) y las combinaciones de síntomas y signos articulares (5,94 %) fueron las principales lesiones por las que se solicitó tratamiento.

Palabras clave: Urgencias protésicas, agresión protésica, órgano paraprotésico, sistema estomatognático.

Resumo

Foi realizado um estudo observacional, descritivo e transversal na Clínica de Estomatologia Güines, de setembro de 2018 a outubro de 2020, com o objetivo de identificar as principais lesões de acordo com o elemento agredido para o qual os pacientes solicitam atendimento imediato. Pacientes, foi obtida uma população de estudo de 320 pacientes com próteses com ataques ao órgão paraprotético. O interrogatório, o exame oral e a articulação temporomandibular foram realizados. Os dados foram coletados em planilha e χ^2 e Duncan foram utilizados para análise estatística. A mucosa foi o elemento mais afetado (73,44%) enquanto estados inflamatórios (2,50%), dor periodontal (2,81%), estomatite subprotética grau II (36,88%), mialgias (5,94%) e combinações de sintomas e sinais articulares (5,94%) foram as principais lesões para as quais os pacientes solicitaram atendimento de urgência.

Palavras-chave: Emergências protéticas, agressão protética, órgão protético, sistema estomatognático.

Introduction and background

The paraprosthodontic organ is defined by Reboisio⁽¹⁾ as the synergic or simultaneous actions that stomatognathic system components undergo as a result of direct or indirect action of prosthetic dental devices. This includes the remaining teeth, the attached and protection gingiva, the residual ridges, the oral mucosa, the temporomandibular joints, the muscles, the vessels, and the nerves.

In brief, it is formed by all the tissues related to the stomatological prosthesis.⁽²⁾

This concept shows the need to guarantee the quality of the artificial denture for patients who

need rehabilitation because when the appliances are poorly made or inadequately preserved, their continuous use can cause painful discomfort as a response to the aggression to the paraprosthodontic organ. This forces patients to seek urgent care.⁽³⁾

Stomatological prostheses can be an aggressor because they act as a local traumatic factor and remain in contact with the tissues for an extended period. The appliances may sustain physiological changes over the years and others determined by chronic conditions. Additional local factors may aggravate this situation.⁽⁴⁾

Emergencies due to aggression to the paraprosthodontic organ are not frequent. However, patients

do request treatment for this reason and seek care from stomatological prostheses services as they have not been diagnosed or treated by primary care stomatology professionals.

We have insufficient knowledge and studies on this subject. Patients suffering from discomfort and pain caused by prostheses are poorly treated. Additionally, if the lesions become malignant, they might lead to serious consequences. Therefore, it is necessary to conduct this research to better understand the emergencies due to aggression to the paraprosthetic organ, since this relevant is insufficiently disseminated among stomatologists.

Methods

An observational, descriptive, and cross-sectional study was conducted in the Stomatological Prosthesis Service at the “Andrés Ortiz Junco” teaching stomatological clinic, Municipality of Güines, Mayabeque Province, between January 2018 and October 2020.

From the 9750 patients with prostheses who sought emergency care at the service, we selected a study population of 320 people of both sexes who sought emergency care for aggression to the paraprosthetic organ. They did not have an appointment and met the inclusion criteria.

Inclusion criteria:

- Patients aged 15 and older.
- Prosthesis users who sought emergency care due to aggression to and response of the paraprosthetic organ.
- Patients who agreed to participate in the study.

Exclusion criteria:

- Prosthesis users under 15 years old.
- Prosthesis users who needed emergency care due to a fall, damage, or deterioration of the prosthetic device.
- Patients who had some discomfort during the fitting period.
- Patients who had some physical and/or mental disability that prevented them from providing relevant data.

- Patients who did not agree to participate in the study.

Data were collected through an individual questionnaire and a thorough oral cavity examination. This was done with the clinical diagnostic set, including an oral mirror, cotton pliers, and a probe. In addition, the relevant structures were palpated, and periapical X-rays were taken according to individual requirements.

The procedure was as follows: we examined the inner part of the upper lip, the lower lip, the corresponding alveolar ridges, the cheeks, and the bottom of the sulcus (always starting from the right side). Next, the hard and soft palate, dorsal and ventral surfaces of the tongue, and finally, the floor of the mouth were examined.

Oral mucosal lesions were classified according to their clinical characteristics into:

- Traumatic ulcer: continuity of the tissue with loss of substance or tissue necrosis, grayish-white in color, with indurated or irregular edges and circumscribed by an erythematous area.
- Epulis fissuratum: a single or lobulated soft, elongated, loose, fibrous tissue mass at the bottom of the alveolar sulcus.
- Sub-prosthesis stomatitis: inflammatory changes restricted to the mucosa covered by the removable prosthesis with different forms of presentation according to severity:
 - Grade I: isolated hyperthermic areas.
 - Grade II: diffuse erythema outlining the prosthesis contour.
 - Grade III: digitiform papilla projections with redness and swelling.

Patients were asked if they suffered spontaneous muscle pain or an unpleasant sensation in the masticatory muscles: temporalis, masseter, medial pterygoid, sternocleidomastoid, and cervical muscles. These areas were palpated with the pressure pain method with the tip of the index finger. A standard force was applied, and anatomical features, origin, and insertion were considered, as well as potential muscle contractures. These muscles were evaluated to determine po-

tential pathological conditions. It was considered positive when the patient reported pain or discomfort. The patient's head was positioned for this examination to facilitate mandibular movements with the mouth partially open. Force was applied gradually and halted when the pain began. The resistance test was performed on opening, closing, lateral, protrusive, and retrusive excursions.

Finally, the TMJ was palpated bimanually, 13 mm in front of the tragus at rest and in motion, with and without tooth contact. The patient was auscultated for joint noises (clicking or crackling), and functional analysis of the mandibular movements was performed in terms of amplitude and specific characteristics. This analysis would help the practitioners to diagnose dysfunction through signs and symptoms.

The examiners considered opening ≥ 40 mm and laterality and protrusion ≥ 8 mm movements. The movement was considered restricted below these figures. The trajectory of the mandibular movement was analyzed. The examiners observed the opening and closing trajectories to detect deviations of the mandible in zigzag shape or other movements. They determined that there was a deviation when both midlines were aligned at the end of the opening and a deflection when the trajectory of the lateral movement caused it to move en bloc towards the affected side, not returning to the midline.

The stomatognathic elements in this study were selected according to Rebossio⁽¹⁾ and González.⁽²⁾ The information was collected in a data collec-

tion form prepared for this purpose, and the data were subsequently processed. An electronic database was created with Microsoft Access. Contingency analysis was performed with the χ^2 test. In the cases with significant differences ($P < 0.05$, $P < 0.01$, and $P < 0.001$), the researchers applied the Duncan multiple comparison test, and the multiple range test. These are known as "multistage tests."

The results are shown in tables using the percentage as the summary unit. The results of each table were analyzed and compared with the findings of other authors based on an inductive and deductive analysis. This allowed the researchers to meet their objectives and draw conclusions.

The study was approved by the Director of the "Andrés Ortiz Junco" Stomatology Clinic and the Institutional Medical Ethics Committee. In addition, the ethical principles established in the informed consent were observed.

Results

Table 1 shows 320 individuals who sought emergency care for aggression and response to the elements of the stomatognathic system. The oral mucosa presented the highest figure (73.44%) and highly significant differences compared to other areas, which showed similar statistical behavior.

The other injured areas have low figures. Therefore, TMJ dysfunction only reached 8.44%, followed by periodontal lesions with 7.19%, while muscles and natural teeth have the lowest figures: 5.94% and 5.00%.

Table 1: Stomatognathic system components injured after aggression to and response of the paraprosthetic organ. Güines, 2020

Injured stomatognathic components	Number	
	No.	%
Natural teeth	16	5,00b
Periodontium	23	7,19b
Mucosa	235	73,44a
Muscles	19	5,94b
Temporomandibular joint	27	8,44b

Temporomandibular joint	27	8,44b
SE and Sign	$\pm 2,24^{***}$	
Total	320	100,00
EE: Error estándar Sign: Significación estadística *** $P < 0,001$ a, b Superíndices diferentes indican diferencias significativas según Duncan (1955)		

The figures are low for teeth and periodontium alterations due to stomatological prosthetic aggressions, as shown in Table 2. They do not reach 3% in any case, and no significant statistical differences were found.

In natural teeth, inflammatory conditions reach the highest figures with only 2.50%, followed by

1.88% in combinations. Crown fractures have the lowest figure: 0.94%.

In the case of the periodontium, pain shows the highest values, followed by gingival bleeding with 2.81% and 1.88%, respectively. In turn, gingival retraction is very rare, with only 0.94%.

Table 2: Teeth and periodontium alterations after the aggression to and response of the paraprosthodontic organ. Güines, 2020

Teeth and periodontium alterations	Number	
	No.	%
Natural teeth		
•Crown fracture	3	0,94
• Root fracture	5	1,56
• Inflammation	8	2,50
• Combinations	6	1,88
Periodontium		
• Mobility	5	1,56
• Pain	9	2,81
• Gingival retraction	3	0,94
• Gingival bleeding	6	1,88
• Combinations	4	1,25
EE y Sign	±0,72 NS	
SE: Standard error Sign: Statistical significance NS P>0.05		

Table 3 shows the oral mucosa alterations due to prosthesis aggression. The highest values correspond to grade II sub-prosthesis stomatitis (36.88%), with highly significant statistical differences ($P < 0.001$) compared to grade I sub-prosthesis stomatitis (16.56%) and the other alterations diagnosed.

The following components in decreasing order and with a similar statistical behavior among are traumatic ulcers (10.00%), grade III sub-prosthesis (5.94%), combinations (5.00%), and epulis fissuratum (4.06%).

Table 3: Oral mucosa alterations after the aggression to and response of the paraprosthetic organ. Güines, 2020.

Alteraciones de la mucosa bucal		Cantidad	
		No.	%
• Úlcera traumática		32	10,00c
Estomatitis subprotesis	Grado I	53	16,56b
	Grado II	118	36,88a
	Grado III	19	5,94c
• Épulis fisurado		13	4,06c
• Combinaciones		16	5,00c
EE y Sign		±1,88 ***	
SE: Standard error Sign: Statistical significance ***P<0.001 a, b Different superscripts indicate significant differences according to Duncan (1955).			

Table 4 shows that pain in the muscles and combinations of the primary joint injuries in the TMJ reached the highest figures—5.94%—in each category. There are highly significant statistical differences compared to the other alterations. No patient was diagnosed with muscle contracture.

The other TMJ alterations are infrequent and have the same statistical behavior: joint noises (3.44%) and dysfunctions and pain: 2.50% and 2.19%, respectively. Reduced mouth opening had a low percentage: 0.31%.

Table 4. Muscle and periodontium alterations after the aggression to and response of the paraprosthetic organ. Güines, 2020.

Muscle alterations and TMJ alterations	Number	
	No.	%
Muscles		
• Pain	19	5,94a
Articulación témporomandibular		
• Pain	7	2,19b
• Joint noise	11	3,44ab
• Reduced mouth opening	1	0,31b
Dysfunction	8	2,50b
Combinations	19	5,94a
SE and Sign	±1,01***	
SE: Standard error Sign: Statistical significance ***P<0.001 a, b Different superscripts indicate significant differences, according to Duncan (1955).		

Discussion

Numerous studies have analyzed the aggressions to the oral mucosa caused by defective stomatological prostheses.^(5,6) Some studies^(7,8) report that the oral mucosa is the most attacked component.

Some authors⁽⁹⁾ report a high percentage of periodontal disorders (19.5%). Their figures are higher than those in this study, reaching only 7.19%. Other authors^(10,11) report that temporomandibular disorders are more frequent. In this study, these disorders were only surpassed by oral mucosa lesions.

Dental prostheses are artificial elements used to ensure the functions of the stomatognathic system. Covering the support areas can irritate them by affecting the adaptive balance and causing inflammatory reactions that lead to oral mucosa lesions. This is the case because this component has the largest surface in contact with the prostheses, increasing the likelihood of aggression during use.

Prosthesis users erroneously believe that the retainers and other elements of prosthetic devices cause inflammation and caries. However, the enamel is much harder (343 Khn) than cobalt-chrome (330 Khn), so the devices cannot cause tooth wear.⁽²⁾

In this study, the predominance of pulp inflammation, especially and more frequently in the abutment teeth, can be attributed to the fact that during mastication, the tongue, the perioral muscles, and food perform self-cleaning actions on the adamantine surface. However, when the retainers, connectors, or occlusal devices partially cover the dental crown, cleaning is not completed satisfactorily. This causes the proliferation of dentobacterial plaque, which is exacerbated without correct oral hygiene habits, which contributes to decalcification, dental caries, and the resulting pulp irritation.

These results are similar to those obtained in a study⁽⁸⁾ in which natural teeth lesions are rare with prostheses, and inflammatory conditions

are the most frequent lesions.

Partially edentulous patients rehabilitated with an incorrect prosthesis in terms of occlusal-articular relationships and/or who have tension in the retainers tend to have periodontal lesions. This occurs because of an inadequate load distribution on the dental structures, which causes pain due to inflammation of the periodontal ligament. This is similar to what was found in this study, where the pain was the most common response of the periodontal tissues to prosthetic aggression, especially in the abutment teeth.

This result is similar to that reported in an educational intervention⁽¹²⁾ in which patients with removable metal partial dentures sought emergency care frequently for dental pain. The result also aligns with another study⁽¹³⁾ that states that the most common periodontal disorder is pain in the abutment teeth (1.45%).

Other authors^(7,14) suggest that periodontal damage is a consequence of prosthetic aggressions, but without specifying the type of response. However, a recent study⁽⁸⁾ reports pain, bleeding, and combinations as the most frequent periodontium responses. This result agrees with the findings of this study.

Stomatological prostheses are a foreign body that increases the risk of lesions in the oral mucosa, especially when they are not well made or have lost retention, stability, and good occlusal relations. Sub-prosthesis stomatitis is one of the most prevalent conditions in the rehabilitated population, as confirmed in this study, where the highest values correspond to grade II sub-prosthesis stomatitis.

Studies conducted in Cuba^(4-6,15,16) and other parts of the world agree that oral mucosa alterations are frequent or have a higher incidence among denture users, as reflected in a study⁽¹⁷⁾ carried out in 65 patients (with total or partial rehabilitation). The most prevalent oral pathology was sub-prosthesis stomatitis. Other authors^(7,8 13,14) also obtained similar results in patients seeking emergency care.

In a study⁽⁶⁾ on oral lesions in geriatric patients with prosthetic rehabilitation, the most frequent mucosa alterations were grade II sub-prosthesis stomatitis (33.19%) and traumatic ulcer (24.34%), similar to what was found in this study. Muscular and temporomandibular disorders are urgent matters due to the pain they can cause. They have different manifestations in the stomatognathic system components and affect one or more structures. A non-functional stomatological prosthesis is one of many factors that can lead to injuries due to an incorrect craniomandibular relationship or increased or decreased vertical dimensions.

A study⁽¹⁸⁾ conducted at the School of Stomatology, Havana, including 40 patients with temporomandibular disorders who attended the Department of Stomatological Prosthesis shows that 57.5% sought care for musculoskeletal pain. This figure is similar to the results of this study on muscles, where the primary response was pain but different from the figure for joint noises, the most usual condition.

Joint noises are mainly caused by anatomical variations, osteoarthritis, lack of muscle coordination, and most commonly, abnormal disc displacement. Prostheses might play a role when the craniomandibular relationship is not correct

or when there are inadequate occlusal contacts at maximum intercuspation. This causes severe muscular and joint disorders. For this sign, our results agree with those of other researchers,^(19,20) who report it as the main sign in their populations.

These results are comparable with those published in a previous study⁽⁸⁾ on paraprosthetic organ injuries in emergency patients where pain was the most frequent muscle injury and combinations of joint signs and TMJ symptoms, reaching 4.92% and 4.97%, respectively.

Conclusions

- The oral mucosa was the most frequently attacked stomatognathic system component due to aggression to and response of the paraprosthetic organ.
- Inflammation and periodontal pain were the main alterations in teeth and the periodontium after prosthetic aggression.
- Grade II sub-prosthesis stomatitis was the most frequently diagnosed mucosal lesion, followed by traumatic ulcers.
- Myalgia and joint combinations were the primary muscle and temporomandibular joint disorders for which patients sought immediate care.

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Authorship contribution

1. Conception and design of study
2. Acquisition of data
3. Data analysis
4. Discussion of results
5. Drafting of the manuscript
6. Approval of the final version of the manuscript

SEG ha contribuido en 1, 2, 3, 4, 5 and 6.

AMR has contributed in: 2, 3, 4, and 6.

VOR has contributed in: 3, 4, 5, and 6.

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