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Extremes in Denture Adaptation - Clinical and Psychological Influences

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Abstract During evolutionary stages of different living organisms, new and challenging environments has prompted the development of adaptations that may be structural, physiological and behavioral. The clinical success of denture prosthesis treatment largely rests on patient's ability to adapt which is time dependent. While the usual outcome by most of the patients is either an adaptation or maladaptation, it is rare to observe patients adapted to extremely faulty prosthesis. This article in the form of two case reports presents unique cases of extreme adaptation to the partial denture prosthesis. Both patients had their respective partial dentures resulted in the loss of their natural abutment tooth to which they were attached. In both cases the respective abutment teeth were dangling within the prosthesis. The extent of damage to the respective abutments were to the level of the apex of the root with one case being that of maxillary canine (longest root). Removal of the denture prosthesis led to the loss of natural tooth in both cases. Psychological aspects of such extreme denture adaptation have also been discussed.

Keywords: *partial denture, denture adaptation, abutment, faulty prosthesis, interim denture*

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1. Introduction

The success of a dental prosthesis depends primarily and largely on the patient's ability to adapt to the denture prosthesis. Denture adaptation is defined as the degree of a fit between a prosthesis and its supporting structures. [1] Biologically, it is the progressive adjusting changes in sensitivity that regularly accompany continuous sensory stimulation or lack of stimulation. While the body as a whole has to adapt to a foreign body like a denture, but it is the sensitive oral mucosa that stays exposed to the denture stimulus. The capability of the oral mucosa to either adapt to a denture or declare denture stimulus as a complication is largely dependent on the interstitial fluid pressure (IFP) or the hydrostatic pressure. [2] Mucosal pain sensation is the first, most direct, competent and versatile indication of maladaptive denture provided the denture creates pressure contact enough to elicit pain. In case the pain is absent and is merely a discomfort, the mucosa reacts locally by improving its bearing capacity to undesirable stimulus. Depending upon the stimulus, the adaptation takes place. Oral sensory ability (stereognosis) of the mucosa at the same time plays the most vital role in masticatory performance with the denture prosthesis. [3] It also forms a protective mechanism within the oral mucosa to counter and/or alarm the body of harmful objects. [4] Biological adaptations in humans have also led to either genetic or physiological changes. Adaptation in lower animals leads to the development of unique characteristics and can be typed as structural, physiological and behavioural. Clinically, adaptation to a denture prosthesis can be either normal or maladaptive. The term extreme denture adaptation has been used in this case presentation of two rare and unique cases and is defined as the mucosal changes around a denture that fail to invoke a sensory stimulus that is good enough to prompt the individual to take decisive action. Both cases literally took adaptation to the limits which makes this report unique. Factors determining such response and decision making have also been discussed.

2. Case 1

An elderly male patient aged 71 years was referred to the Prosthodontic department from the department of oral diagnosis for removal of a faulty prosthesis in both maxillary and mandibular arches. The patient was a farmer by profession, had five children and did not report any medical problem ever, except minor illness like common cold or gastric problem. The patient did not report use of any medication other than during routine illness. The patient had got a maxillary and mandibular anterior partial denture fabricated by a village dentist (non-qualified) seven years back. Both partial dentures were limited to the anterior region since his concern was

more about aesthetics rather than other functions. Extra oral examination showed normal clinical parameters while intra oral examination revealed an acrylic partial denture fixed with stainless steel wire between maxillary right first and second premolar to left canine (Figure 1A, B).

The partial denture was literally hanging by the natural abutment tooth to which it was mechanically attached. Mandibular partial denture was replacing mandibular central incisors and left lateral incisor (Figure 1C). The maxillary partial denture was mobile along with maxillary right first and second premolar. Treatment plan presented to the patient was removal of both faulty prostheses followed by evaluation of remaining teeth, which would be followed by either an overdenture or a complete denture. The patient did not consent the removal of the mandibular partial denture since it did not create any problem as such. The maxillary partial denture was removed along with extraction of mobile first and second maxillary right premolars. The patient did not turn up for any further treatment

3. Case 2

An elderly male patient aged 68 years reported to the department of Prosthodontics with chief complaint of a mobile maxillary partial denture which he had got fabricated about three years back in his village. The patient was a farmer by profession and had seven children. The patient did not report any history of systemic illness except he had developed pain in his right knee after a recent fall from his bicycle. The patient was not taking any medication and reported not to have even shown any injury to any doctor during his lifetime. The patient reported that due to the loss of anterior teeth, he had got the denture made for roadside as there were no dentists in his village. Extra oral examination revealed normal clinical features while intra oral examination revealed a maxillary and mandibular anterior acrylic partial denture replacing missing maxillary incisors and mandibular anteriors (Figure 2 A). Both the dentures were fixed by extending self-cure acrylic resin over the buccal surface of the teeth and into the interdental areas of the natural teeth. The acrylic was blended with the adjacent and underlying soft tissue contours of the vestibular region. The maxillary denture was fastened onto the left canine which was denuded to the extent of its root apex (Figure 2 B). Maxillary partial denture was mobile and would move the canine along within its socket. The patient did not have any pain, although the only discomfort was its mobility which was severe over the last one month. The treatment option presented to the patient was the removal of the faulty prosthesis in both arches followed by a clinical revaluation of remaining natural teeth. The patient consented to removal of maxillary denture. The maxillary denture was removed along with the maxillary left canine (Figure 2 C). There was no sign of bleeding from the soft tissues that held the canine (Figure 2 D). The mucosa in the region of the maxillary left canine was cleaned and debrided following which it was left as such for healing.

When superimposed (Figure 2 D), the root of the canine fitted into the socket prepared by the hanging canine over the period of time. The patient did not return for further treatment since it was made clear that no treatment will be initiated unless the mandibular faulty prosthesis was not removed.

4. Discussion

The normal functioning of mucosa is dependent on many factors and the complexity of interaction between them is presented in Figure 3. The intrinsic factors include the influence of various major body systems like cardiovascular, immunologic, metabolic, neural and endocrine primarily besides minor influences by the condition of excretory, respiratory, digestive and lymphatic systems. [5] Each body system in turn has a genetic and environmental influence, the difference between the two being that genetic is predetermined and one within an individual, although it may change through generations while the environment is a two-way track in which changes take place dynamically and is time dependant.

Figure 1. (A) Partial denture attached to natural tooth (B) Natural tooth that served as abutment extracted along with the faulty prosthesis (C) Intra oral view after removal of maxillary partial denture along with the mandibular faulty prosthesis

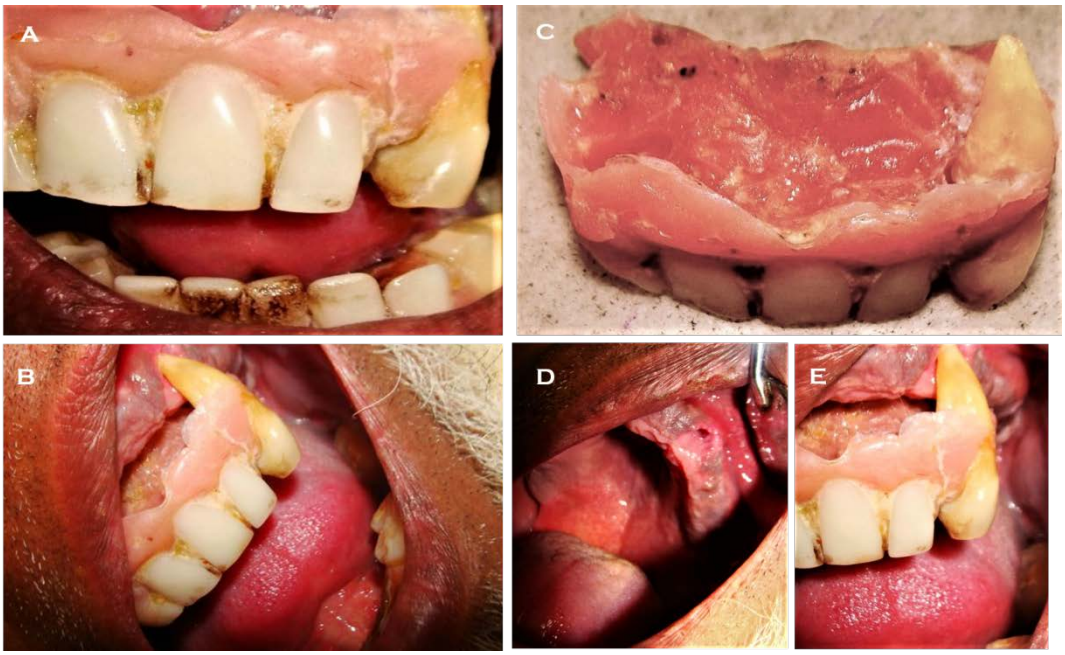

Figure 2. (A) Maxillary and mandibular faulty prosthesis (B) The prosthesis hanging by the canine (C) Removed prosthesis (D) Tissue around the apex of the canine root (E) Superimposed partial denture showing the relation of canine root apex to the tissue socket

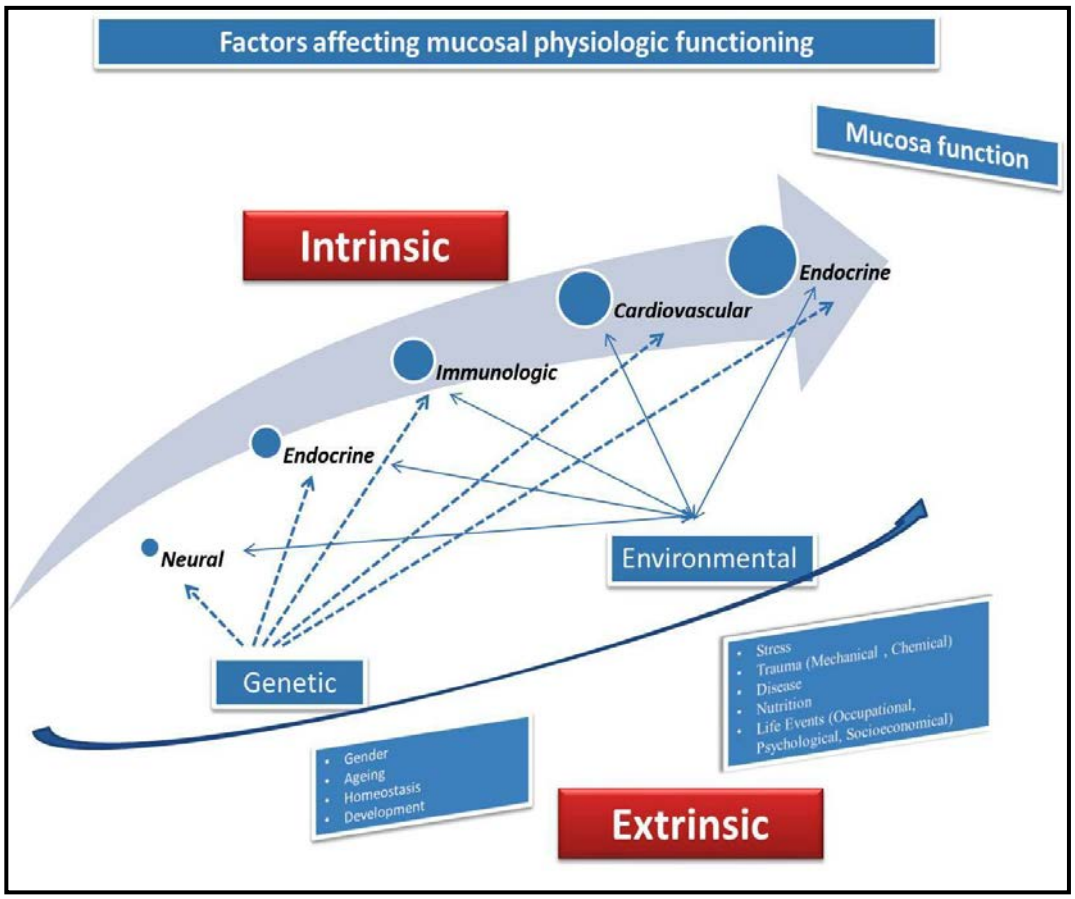

Figure 3. Schematic presentation of intrinsic and extrinsic factors that affect mucosal functioning related to denture adaptation

Adding to this complex functioning, is the individual role of extrinsic influences on both genetic and environmental factors. Both environmental and genetic factors on local and systemic influences are influenced by intrinsic and extrinsic factors. Each body system that influences normal physiologic mucosal function is in turn influenced by genetic (gender, ageing, homeostasis and development) and environmental (stress, mechanical or chemical trauma, disease condition, nutrition, life events). While some of these factors like trauma acts directly on mucosal function there are times when these determinants act indirectly by influencing the intrinsic process as in the case of genetic abnormalities occurring as a result of environmental insults. [6] At the cellular level, the

mucosal cell lacks a stiff wall, therefore changes in volume cannot be resisted without undergoing volumetric changes in the cell itself. Both pressure within the cell and outside the cell are important for cellular functioning and various body systems play a direct or indirect role in regulating it. [7] Clinical complications associated with denture prosthesis are mainly caused when changes in interstitial fluid pressure take place. [2], [8] The relation between pressure and elicited pain is the basis of denture adaptation. The pressure pain threshold determines whether individual accepts or rejects the wearing of a prosthesis at a particular time. Normal denture induced pressures are below the measured pain thresholds, [9] unless the pressure is high enough to seek correction. In the absence of high contact pressure pain is not elicited and pain sensation is the direct indication of a maladapted denture. [10] This explains that why the patient in both cases had adapted to a faulty prosthesis since the pressure caused by both prosthesis was not high and did not elicit any discomfort or pain. While both partial dentures were retained using natural abutment teeth, at no time they were able to develop enough mucosal pressure. At one point of time, when the roots of the natural abutment teeth in both cases were within their respective sockets, horizontal movement of the prosthesis would have elicited pressure, but because the teeth were mobile, such pressure was interpreted as harmless and did not cause much discomfort. The role of bone resorption in patients who adapt to ill-fitting dentures seems also important and has yet to be investigated. In both cases the faulty prosthesis was opposing each other and only one of them had failed in terms of causing damage to the adjacent abutment and the underlying bone. Both cases showed resorption under one denture only, while the mandibular denture was still serving without any evidence of mobility. In both cases the periodontium around the affected abutment had reached to the level of the apex and in both cases only one side of the natural teeth were affected. Bone resorption is a protective mechanism for mucosa since it allows more space for mucosa to increase its thickness and improve tolerance to overlying local influence. [11]

Presence of pain caused by a denture prosthesis impairs the patient's ability to adapt to them. Absence of pain despite wearing a faulty prosthesis seems to be the driving factor in extreme denture adaptation in both cases. There are however other factors that could describe the adaptation process and are mainly psychological in nature. Genetically similar individuals have been reported to elicit different mental attitudes towards dental treatment. [12] Psychological distress within an individual has been found to lead in degradation of decision making and judgement lapses at individual and team levels. [13] The psychological changes in such cases become maladaptive, as a result of which symptoms like social withdrawal or depression may ensue. Social conditions (poverty) and interpersonal conflicts can lead to depression, which in turn results in decreased motivation and morale. In such individuals, the adaptation of the prosthesis by local tissue in spite of the presence of local discomfort may not prompt an individual to seek prosthesis correction. It is plausible that in both cases presented in this article psychological factors played major role in such extreme adaptation. Both patients presented a social history of farmers, which by local standards is considered to be a poor socioeconomic status. Both patients were not found to be suffering from any neuromuscular problems. Adaptation to new prosthesis has been reported to be cumbersome in individuals with neuromuscular conditions. [14] Both denture prosthesis emanated bad odour due to the presence of large amount of biofilm supported plaque and calculus. Social problems do arise in such cases, but due to lack of motivation both patients never sought ways to correct it. The quality of acrylic resin used in the denture has been found to influence the deposition of biofilm in terms of quantity and quality. Both dentures were made of self-cure denture base resin which has been reported to have the ability to collect more biofilm than heat cure denture base resin. [15] It is also worthwhile to notice that in both cases the dentures were partially or totally non-functional in terms of imparting masticatory efficiency. Also in both cases the maxillary teeth were severely affected in terms of periodontal involvement. This is explained on the basis of the natural arrangement of teeth in which maxillary anteriors are placed slightly anteriorly to form the necessary overjet and overbite. Such feature allows one to have a mutually protected occlusion with anterior guidance that is efficient in discluding the posterior teeth during protrusion and lateral mandibular movements. [16] This arrangement is considered essential to protect anterior and posterior teeth during various mandibular movements. Since the maxillary partial dentures were constantly subjected to lateral forces by the mandibular teeth, most of the biological changes occurred in the maxillary arch and not mandibular arch. Despite having a similar prosthesis in the mandibular arch, the abutment teeth did not show any signs of mobility.

5. Conclusion

The two case reports presented in the article depict cases of denture adaptation that takes human adaptation to extremes. Psychological factors do influence such behaviour which must be investigated. Such factors also influence the long term treatment outcome and should be considered when planning treatment in such cases.

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