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PROSTHODONTIC REHABILITATION OF COMPLETELY EDENTULOUS PATIENTS WITH RESORBED MANDIBULAR RIDGE: CASE SERIES

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Abstract:

Prosthodontic rehabilitation with complete denture in compromised edentulous ridges through standard, customary techniques is a difficult task. Treatment procedures require remodeling as per the patient's desire for esthetics and functionality. This article presents a case series of various techniques used for administering compromised ridges. These techniques have been found helpful in enhancing stability of denture and masticating ability by changing the pattern of teeth arrangement.

Key words: Compromised ridge, lingualized occlusion, neutral zone, piezography technique.

Introduction:

The crucial determinant for a successful denture therapy involves carrying out of the treatment plan with utmost precision, based on comprehensive history and through oral inspection. This kind of a treatment plan should be based on Devan's[1] rehabilitation principles that is, preserving what already exists and not just replacing what is missing. Ridge atrophy poses many clinical challenges in the fabrication of an effective prosthesis. Residual ridge resorption is a complex process and a common occurrence following extraction of teeth. It is most striking during the initial period of tooth loss, subsequently leading to slower but continuous rate of resorption.[2] Factors influencing rate of resorption are divided into anatomic, metabolic, functional, and prosthetic factors.[3] Anatomic factors comprise of the shape, size, and density of ridges as also the thickness and the distinctive features of the mucosa. Cellular activity of osteoblasts and osteoclasts is influenced by metabolic factors which include nutritional status and hormonal balance. Frequency, duration, severity and direction of forces are other functional factors which are responsible for cellular activity. Prosthetic factors consist of various methods, materials, concepts and principles, that are practiced during prosthetic procedures.

According to the concept presented by Fish and Mathew the neutral zone is stated to be that part in the mouth where the outward forces of the tongue are negated by the cheeks and lips forces pressing inwards. (GPT-9)[4]. When the alveolar ridge is lost to a great extent, the steadfastness and the firm hold of the denture rely upon the proper position of the teeth and outline of the external surfaces of the dentures. Forces acting upon the buccal

surfaces of the teeth and the polished surfaces of the denture are in horizontal position. When the teeth are not in contact, the direction and extent of forces and the position of impression surface defines the stability of denture.[5] The lip influences the lower denture stability and is essential as the ridge resorption becomes more or as the patient grows old. As the alveolar ridge resorbs, it has been seen that the ridge crest falls below the origin of the mentalis muscle. As a result the neutral zone is positioned posteriorly and it becomes necessary to position the lower anterior teeth further lingually as compared to original position of the natural teeth.[6]

The forces of displacement act on the lower denture through tongue, the lower lip and the modiolus. If the denture is positioned in the region in such a manner that it balances these displacing forces, then the denture will become more stable when in function. If the denture stays outside the neutral zone it will be not remain firm and secure while talking, swallowing and masticating.[7] The neutral zone technique has many advantages which are (1) increased strength and grasp (2) the rear teeth will be placed in correct position to provide enough tongue space; (3)minimized food trapping close to the molar teeth; and (4) enhanced face appeal because of facial support. Piezography and lingualized occlusion are other techniques which help in providing stable denture base in compromised ridges.[8]

Klein[9,10] in 1974 introduced a method, named piezography, which recorded the prosthodontic space for teeth placement using speech. It is used for fabrication of complete denture in a patient with long-standing edentulism and severely resorbed mandibular ridge. The theory behind placement of artificial teeth in the neutral zone has two aims: Firstly, the teeth will not restrict the normal functioning of the muscle and secondly, the forces exerted by the musculature against the dentures will be make it more stable and will have more retention. Piezography helps to record the neutral zone. speech is employed for recording the denture space.[11,12,13]

Payne & Pound first suggested the basic concepts of lingualized occlusion[14] It is an endeavor to safeguard the esthetic and food-penetration benefits of the anatomic form while retaining the mechanical independence of the non anatomic form. For maxillary denture the lingualized concept uses anatomic teeth and nonanatomic teeth for the mandibular denture.[14] In case of severe resorption, narrow occlusal table is preferred.[14] Various case reports are discussed below based on different techniques for better stability of mandibular denture with resorbed ridge.

Case Report -1

A male patient aged 54 visited Manav Rachna Dental College, Faridabad, Haryana. He had been suffering from edentulism for the last 6-7 years. On intraoral examination it was found that his maxillary ridge was in favourable condition, but the mandibular ridge was not in a good functional state due to excessive resorption. According to Atwood classification it fall under Order-4.(Figure-1) Then it was decided to fabricate lower complete denture by Neutral zone impression technique.

Procedure

Diagnostic impression is made with impression compound (DPI) followed by border moulding with green stick compound (DPI) and final impressions with zinc oxide eugenol paste (DPI). Later record bases were fabricated, and their stability was evaluated. Wax rim is contoured on the upper denture base conventionally. Fox plane is essentially used for orientation of the maxillary rim, followed by the establishment of the occlusal plane. Later midline, distal of canines, and smile line was marked on the maxillary rim. Tentative jaw relation is done followed by articulation (Fig 2).

Soften the green stick compound uniformly and place it on the lower record base. Then the record

base is inserted in the patient's mouth and the patient is then asked to suck and swallow so that the green impression compound (DPI) is moulded into the neutral zone area[8,9] (Figure 3). Record base is removed and inspected. Record base is then placed in the articulator and an index is made for fabrication of new wax occlusal rim according to the index (Figure 4). Teeth arrangement is done on the articulator and verified with the index (Figure-5), later it is tried in patients mouth. Denture is fabricated in conventional way (Figure-6)

Case Report -2

A male patient aged 62 years, visited the Prosthodontic department of Manav Rachna Dental college, mainly complaining of edentulism and inability to chew. On oral examination it was seen that the patient had a severely resorbed mandibular ridge, loss of vertical dimension, collapse of facial profile and loss of muscle tonicity. Lack of nutrition was also evident due to inability to chew food properly. Due to severe resorption, conventional method was not considered and was decided to implement piezographic technique to manage the case.

Procedure

Primary impressions were made using admixed technique in which impression compound (DPI, Pinnacle) and green tracing stick compound (DPI)

Figure 1 Intraoral view

Figure 2 Establishment of vertical jaw relation

Figure 3 Neutral zone establishment using green stick compound

Figure 4 Putty index

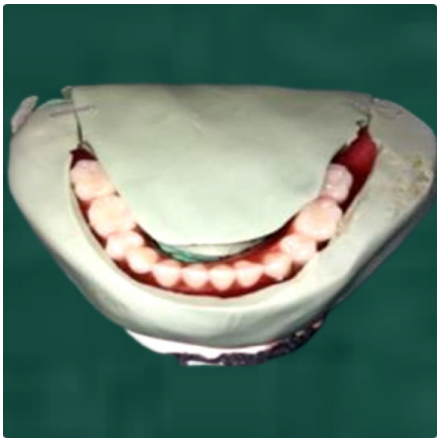

Figure 5 Verification of teeth arrangement with putty index

Figure 6 Post denture insertion

were used in 3:7 parts by weight then primary cast were obtained. Custom trays were fabricated and final impressions were made using zinc oxide eugenol impression paste (DPI) for both the maxillary and mandibular ridges.

Occlusal rims were fabricated. The upper rim was adjusted parallel to the Camper's line and 2 mm visibility was established. The vertical dimension both at occlusion and at rest was recorded. A freeway space of 2 mm was maintained (Figure 7). On a mean value articulator wax rim along with cast assembly was mounted. The piezographic method was carried out from this position onwards. Since the technique was based on phonetics, the patient was made to practice pronouncing certain phonemes before actually implementing it. The speech exercise helped mold the material that was inserted in the mouth providing the prosthodontic space.

Another record base was fabricated from self-cure acrylic resin (DPI). Grooves were made on the external surface and vertical v shaped slots were made with orthodontic wire so that the moldable material can adhere to the acrylic and those slots provide retention to the material[11] (Figure 8).

A silicon-based self-polymerizing temporary soft liner was used (Dentsply visco-gel). Prior to placement of the base plate in the mouth, silicon adhesive was generously applied on top of the

Figure 7 Establishment of vertical jaw relation

Figure 8 Peizography record base

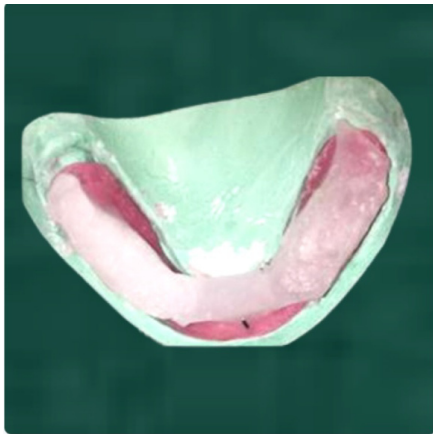

Figure 9 peizography record attained

Figure 10 Putty index for duplication of peizographic record

Figure 11 Verification of teeth arrangement with putty index

Figure 12 Post denture insertion

base plate for better adhesion.

The maxillary rim was placed in the mouth. Upper anterior teeth were arranged as they help in improved speech during the pronunciation of phonemes

Initially, the soft liner was first placed on either right or the left side and the patient was instructed to pronounce the phonemes. Once the material set, the piezographic record was checked and the same was done for the contra lateral side

The patient was asked to say 'SIS' four times followed by a strong 'TO' in order to obtain the posterior molding.[11] After the posterior dam was obtained, moldable material was placed anteriorly. Anterior piezography was obtained by asking the patient to pronounce T, D, M, P five times in a sequence clearly and vigorously.[11]

Excess was removed with a knife and adjusted to the required height (Figure 9). Later this record base is put on articulator and putty index was made so as to obtain new rim for teeth arrangement The wax rim was adjusted to the predetermined vertical dimension and placed in the articulator. The posterior teeth were now arranged in the newly obtained space (Figure 11).

The waxed up teeth arrangement was tried intra orally to evaluate esthetics and speech. Dentures were fabricated conventionally and inserted. Occlusion was satisfactory. Facial profile improved drastically and the denture was stable functionally.

Case Report-3

A male patient aged 59 came to the department, primarily complaining about inefficiency to chew properly and he wanted a new denture. Based on oral examination, it seemed that lower alveolar ridge was in resorbed condition. Conventional method was not considered and we decided to implement lingualized occlusion technique to manage the case

Procedure

Impression compound (DPI, Pinnacle) was used to make preliminary impression. Custom trays were then prepared on primary cast. After border moulding was completed then final impressions were made in (Zhermack Zetaplus) light body impression material (Figure13). Maxillo-mandibular relation was recorded using the conventional method based on Camper's plane. Mounting on semi adjustable articulator was done (Figure 14).

Artificial teeth were arranged in lingualized occlusion comprising maxillary anatomic teeth while mandibular non anatomic posteriors. In this only maxillary palatal cusps should contact with mandibular central fossa in centric occlusion, maxillary buccal cusp should not touch[15,16,17]. This arrangement allows the food bolus to get excellent penetration. Bilateral equilibrium is maintained mainly by the maxillary lingual cusp which establishes contact during excursions with

Figure 13 Final impressions

Figure 14 Mount on semiadjustable articulator

Figure15 Post denture insertion

Figure 16 Occlusion intraorally

the inclines and central fossae of the mandibular cusps[17]. Maxillary anatomic teeth preserves aesthetics and maintains chewing capacity while mandibular non anatomic teeth reduces horizontal forces. Moreover Vertical forces are directed more centrally on the mandibular alveolar ridge, which gives more stability to the lower denture.[17] Later dentures were fabricated by the conventional method.

Discussion

The one difficulty faced while fabricating the severely resorbed mandibular denture is stability. This problem can be taken care of when dentures are constructed with outlines harmonizing with neutral zone. Neutral zone technique aims at creating a denture in muscle balance.[18] It is not necessary to place the teeth on the crest of ridge as it is majorly dictated by the action of the muscles and differs from patient to patient. Tooth position and flange contour will establish how stable a denture is. The stability of the polished denture surface depends upon the action of buccinators, orbicularis oris and the contraction of the muscles of tongue, cheeks and lips.[18] The shape of this complicated surface, more than the outline of the denture, decides whether the movements of the muscles will displace or stabilize the dentures. The buccinators and tongue muscles exert retentive force on the well designed dentures, resulting in better control of the patient on the dentures even in resorbed condition.[19,20] The buccinator muscle and the tongue give the bracing effect to the flanges of the lower denture when extended underneath. The mandibular denture should be narrow in the premolar area, that is the region of modiolus, to prevent the denture from being raised while in function, and the posterior teeth must not infringe on the tongue posteriorly.[20] The neutral zone is dictated by width, form and intraoral position which varies from one person to another. Also the neutral zone is impacted by numerous techniques, material, muscle tone and period of edentulism. Therefore in atrophic ridges it is greatly recommended to record neutral zone in fabrication of complete denture.

Conclusion:

A successful prosthodontic treatment of a patient with a poor mandibular alveolar ridge, is dependent on many factors. It is important for a prosthodontist to understand the constraints of the patient, the prosthodontic treatment methods available, the limitations of the oral surgeon, and the capabilities of the laboratory technician. The prosthodontist may decide upon a more traditional or customary methods of treatment or may use more advanced prosthodontic techniques using sophisticated instrumentation or the oral surgeon's discretion to perform extensive and augmentive procedures upon the patient. The severely resorbed mandibular ridge can be restored to a level of masticatory function although the task is challenging.

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