Journal Homepage: -www.journalijar.com
INTERNATIONAL JOURNAL OF ADVANCED RESEARCH (IJAR)
Article DOI:10.21474/IJAR01/6939
DOI URL: http://dx.doi.org/10.21474/IJAR01/6939

RESEARCH ARTICLE

DESIGNING OCCLUSION IN PERIODONTALLY COMPROMISED DENTITION.

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Manuscript Info

Manuscript History

Received: 13 February 2018
Final Accepted: 15 March 2018
Published: April 2018

Keywords:-
perio –prosthetic therapy, Nyman and Lindhe scheme

Abstract

Prosthetic replacement is often necessary to restore function and aesthetics in the periodontally compromised dentition.Fixed bridges can be placed and successfully maintained on a minimal number of abutment teeth with reduced periodontal support, provided the prosthodontic treatment is planned and performed in a proper way.Establishing an occlusion in such conditions are much more than designing the occlusal surfaces of posterior teeth.A favourable distribution of the masticatory load along the entire arch will prevent overloading of abutment teeth with reduced periodontal support.To a great extent the success of prosthesis depend on oral hygiene maintenance by the patient.

Introduction:-

The aims of perio - prosthodontic therapy are to restore missing teeth,restore masticatory function,improve aesthetics, preserve and improve periodontal health.. The remaining teeth in periodontally compromised dentition are often mobile and may require splinting to enhance patient comfort[1].Due to the severe loss of periodontal support, such teeth cannot function individually.When splinted they can survive for a considerable time provided the periodontal infection is under control. Fixed bridges of a cross-arch design provide a degree of rigidity and result in a more favourable distribution of the masticatory load along the entire arch, rather than on individual units, therefore preventing overloading of abutment teeth with reduced periodontal support[2].

Patient management and treatment sequence in perio-prosthetic therapy:-

Direct patient involvement throughout the clinical stages of the treatment and during the maintenance phase is a prerequisite for a successful outcome.So appropriate patient selection is a critical factor. Patients not only have to understand and appreciate what is required of them during treatment,but also perform plaque control measures and overall care of the prosthesis appropriately[3].

The sequence of management:-

1. Baseline examination/diagnosis/prognosis/patient motivation
2. Preliminary treatment plan/initial therapy
3. Re-examination after three to six months
4. Definitive treatment plan/corrective therapy:
5. Extraction of hopeless teeth and replacement with a temporary cross-arch bridge
6. Periodontal surgery for pocket elimination and/or crown lengthening
7. Supportive periodontal therapy for three to six months
8. Reassessment
9. Provision of the final cross-arch bridge

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10. Maintenance therapy (three to six month recall).

Nyman and Lindhe scheme:-

The periodontal prosthesis commonly known as the Lindhe / Nyman bridge is a technique developed by the two leading periodontists of the 1970's, Jan Lindhe and Stu Nyman in Gothenburg.Their technique allows multiple pontic replacement in fixed bridgework often on severely mobile, compromised and reduced number of abutment teeth.

The clinical studies date back to articles published in the Journal of Periodontology in 1979. 299 individuals who had lost 50% or more of the periodontal tissue support who were grouped into "non-bridge treatment group and "the bridge treatment group". The results showed that following a combined prosthetic / periodontal treatment, periodontal health can be maintained in patients enrolled in a controlled oral hygiene program[4].

The reasons for technical failures which were described as *loss of retention of retainer crowns from abutment teeth, Fracture of bridgework ,Fracture of abutment teeth* .All of these potential failures were of technical nature and could be reduced by further adaptation of the bridge design and construction techniques.

According to Nyman and Lindhe Scheme for extremely advanced periodontitis cases even contact should be provided in the intercuspal position. The type of contacts are not specified.When distal support is present, anterior disclusion should be provided. When there are long tooth-borne cantilevered restorations, aim is to achieve simultaneous working and non-working side contacts on the cantilever as in balanced occlusion. Semi-adjustable articulators with average settings should be used to fabricate restorations. Supragingival margin placement is advisable for hygiene maintainance[5].

The technique relies on good oral hygiene, a reduced but healthy periodontal condition, multiple cantilevers often with three pontics cantilevered off the last remaining abutment, supra gingival margins, acrylic or composite veneering material on a metal framework and with a balanced form of occlusion .In effect the bridgework acts as a "living denture" and the balanced occlusion stabilizes the mobile bridgework. This type of bridge has increased but not increasing mobility and excellent long term success rates.

Bridge design:-

Ante's law (1926) is generally referred to as safe prosthodontic design for bridges. It states that 'in planning for and designing fixed partial dentures, the pericemental area of the abutment teeth should be equal to or exceed that of the tooth or teeth to be replaced'. This concept has been questioned, since it attaches more importance to the number of teeth to be replaced than to the amount of remaining periodontal tissues supporting the abutments and thus the bridge constructions.

Extensive cross-arch bridges not fulfilling the prerequisites of Ante's law have been successfully provided since the 1970s as a means of rehabilitating periodontally compromised patients. Several long term follow-up studies have shown that fixed bridges can be placed and successfully maintained on a minimal number of abutment teeth with greatly reduced periodontal support, provided the prosthodontic treatment is: 1) preceded by adequate periodontal therapy, and 2) followed by a plaque control programme effective enough to prevent recurrence of periodontal disease. If abutments are well distributed and periodontal infection is under control, as little as 20-30% of the original periodontal tissue support can be sufficient to carry fixed cross-arch bridges. Bridge design can vary from end abutment bridges to cantilevered bridges and often with a 12 unit bridge supported only by two mobile canine abutments.

The indications and contraindications for extensive tooth-supported fixed prosthodontic treatment in periodontally compromised patients are as follows:

Indications:-

1. Mobility of the remaining periodontally treated teeth, affecting patient comfort and/or chewing ability
2. A jaw relationship that permits establishment of anterior occlusal contacts
3. Favourable distribution of potential abutment teeth
4. Existing restorations in need of replacement

5. Adverse conditions for implant treatment, eg medical reasons, lack of appropriate bone dimensions, proximity of anatomical structures (inferior alveolar nerve, maxillary sinus), financial considerations
6. Patients' preference to maintain their own teeth.

Contra-indications:-

1. Lack of patient motivation/compliance
2. Unrealistic aesthetic demands; these constructions are mainly functional and, although excellent aesthetics can be achieved, this is not the primary goal of treatment
3. A jaw relationship that does not permit establishment of anterior occlusal contacts, eg: excessive overjet in Class II division 1 cases
4. Unfavourable abutment distribution, resulting in excessive load over long span bridges or unbounded cantilever segments
5. Inadequate dental laboratory support
6. Financial considerations.

Design of the perio-prosthesis:-

Visualize the final result before commencing treatment by performing a diagnostic wax-up of the intended reconstruction on appropriately mounted diagnostic casts. A semi-adjustable articulator is normally adequate. A vacuum formed template should be fabricated to assist with construction of the provisional restoration at the abutment preparation visit.

Number of abutment teeth/cantilever extensions:-

A 10 or 12-unit bridge is usually aimed for, depending on functional status and aesthetic requirements, eg quantity and quality of potential abutment teeth and remaining periodontal support, occlusal contacts, display of posterior teeth. It is safer to have at least four or six abutment teeth for such bridges.

Distribution of abutment teeth/cantilever extensions:-

Symmetrical distribution of the abutment teeth, eg a situation where maxillary central incisors, canines and second premolars are present and can serve as abutments for a 10 or 12-unit bridge, would be ideal to obtain optimal load distribution to the remaining periodontium. A minimum of 30% remaining periodontal support of the abutment teeth is desirable. A maximum of two cantilever units may be incorporated uni- or bilaterally in cross-arch bridges, for functional and/or aesthetic reasons, provided certain prerequisites are fulfilled. Posterior extension with one or two premolars will ensure occlusal stability by preventing anterior tilting. It is preferable that distal abutment teeth adjacent to cantilever segments are not endodontically treated, to reduce the risk of abutment tooth fracture. If posts are present, a ferrule effect of at least 3 mm should be provided.

Type of restoration margins;-

Often the amount of attachment loss in these cases allows for supra-gingival placement of the restoration margins. This simplifies restorative procedures and facilitates plaque control at the critical restoration-tooth interface by the patient, as well as improved monitoring conditions for the operator during the maintenance phase. Shallow chamfer or even feather-edge preparation margins are more appropriate, since the preparations extend onto the root surfaces and a shoulder or heavy chamfer would result in pulp exposure. Unless the patient has an extremely high smile line there will not be any aesthetic concerns as the margins are normally covered by the soft tissues of the lips and cheeks.

Biomechanical considerations:-

The biomechanical factors that affect long-term prognosis of these extensive reconstructions have been defined by Laurell et al as:

Retention:-

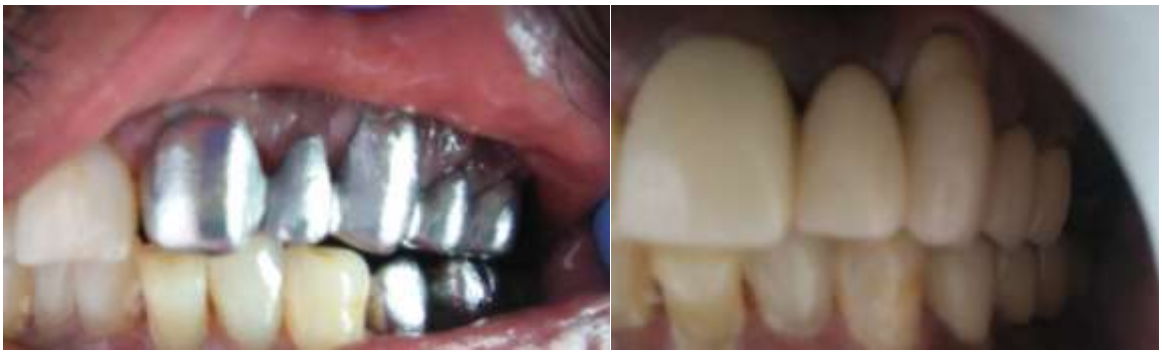
The presence of long clinical crowns in periodontal conditions, as a sequelae of clinical attachment loss and/or pocket elimination periodontal surgery provide favourable retention and resistance forms. Optimal retention is secured by almost parallel preparations of the abutment teeth. The most difficult surfaces to parallel are the distal walls of the posterior abutments in relation to the labial surfaces of the anterior teeth. Surveying of intermediate casts ensures appropriate tooth reduction.

Dimension:-
For the metal framework, at least mesial and distal to the distal retainer crowns are 5 mm in height and 4 mm in width. These dimensions should preferably be observed along the entire construction, to avoid fatigue and material fracture.

Occlusion:-
Even contacts should be established anteriorly as well as posteriorly, with freedom in centric occlusion. The occlusal morphology should guide the occlusal forces in an axial direction. The palatal surfaces of the maxillary anterior teeth are given a functional morphology to ensure axial load direction. Overbite and overjet should be minimal and the steepness of cuspal inclines reduced. Lateral movements should be anterior guided with no contacts on the cantilevers. The occlusal contacts should be monitored regularly and adjusted accordingly during maintenance, as there is a tendency for greater functional wear anteriorly, which might result in premature contacts on the cantilever segments of the bridgework.

Occlusal load and chewing efficiency:-
The magnitude and distribution of occlusal load on cross-arch bridges of different designs (end-abutment, uni- or bilateral cantilever) have been studied extensively.The mean total chewing force on cross-arch bridges of different designs was 55 to 121 N, whereas the mean maximal bite force in 'habitual occlusion' varied from 264 to 320 N.

As the amount of periodontal support of the abutment teeth decreases chewing and biting forces decrease. The chewing ability of subjects with cross-arch bridges was almost as good as that of subjects with complete healthy dentitions.



Fig; a and b:-a case rehabilitated by Nyman and Lindhe scheme

Youdelis scheme:-
Youdelis proposed an occlusal scheme for advanced periodontitis cases in 1971. The author aimed at achieving simultaneous interocclusal contact of posterior teeth in centric relation position (usually coincident with intercuspal position) with forces directed axially.Both fully and semi adjustable articulators can be used for restoration.

Anterior disclusion is provided for protrusive excursions and canine disclusion for lateral excursions. Cuspal anatomy is carved such that when the canine disclusion is lost through wear or tooth movement, the posterior teeth drop into group function. According to this concept centric relation position and intercuspal position should be co-incident (tripod contact). There should be simultaneous contact of posterior teeth in centric relation cuspal position with forces through long axis of teeth. For protrusive, there should be anterior disclusion and canine disclusion for lateral excursions. Lateral contacts must be arranged such that when canine disclusion is lost through wear, posterior teeth drop into group function. For foundation of a healthy periodontium main emphasis is on margin placement and crown contour. This concept is useful where excursive function cannot be controlled or if canine isperiodontally compromised[3].

Conclusion:-
The guidelines for rehabilitating patients with extremely advanced periodontitis according to Nyman and Lindhe can be summarized as:

In cases where distal support is present use anterior guidance for protrusive and canine disclusion for lateral excursions. For long tooth borne cantilever restorations; arrange for balance occlusion i.e. simultaneous working and non working side contacts on the cantilever[6]. Balancing contact gives stability to otherwise mobile bridge especially in cross arch bridges in extremely advanced periodontal cases. Restorations should be fabricated on semi-adjustable articulator with average settings. Supra gingival margins should be given. Care should be taken that centric relation position and inter-cuspal position must have even contact. Monthly recall and clinical follow-up is necessary and is of utmost importance.

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