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"Monday Morning Pearls of Practice by Bobby Baig"

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Edentulous patient: Implant supported prosthetics: Pre-Prosthetic Space assessment and planning considerations: Part A

By Bobby Baig

Introduction:

Adequacy of restorative space is an important consideration in successful implant overdenture therapy. Often mistaken for interarch distance. Restorative space can be defined as the 3-dimensional (3-D) oral space available to receive the proposed prosthodontic restoration. In edentulous patients, available restorative space is bounded by the following:

1. Occlusal plane,
2. Supporting tissues of the edentulous jaw,
3. Facial tissues (cheeks and lips), and the tongue.

For implant over denture patients, this space must accommodate the following;

1. A denture base of sufficient dimensions,
2. Appropriately positioned denture teeth,
3. An implant attachment system.

Fig 1-3: Case 1: Six implants are placed in maxilla with inadequate implant planning, spacing, implants angulations, locator attachments are have been placed with an assumption that these will support a maxillary over denture. Fig 1-3. Patient has received 3 different prosthesis in the last 8 months with multiple prosthetic problems which include lack of retention, support and stability. In this case the minimum consideration is made for pre-prosthetic space assessment and case planning.

Fig 1

Fig 2

Fig 3

Fig 4-5: Case 2: implants are placed in maxilla and in the mandible, implant abutments are visible when patient smiles, with great difficulty a poorly designed maxillary prosthesis is delivered fig 5, an attempt was made to fabricate a mandibular overdenture the attempt was not successful, after this patient is referred for prosthodontic consultation.

Fig 4

Fig 5

Space evaluation and assessment in diagnostic phase of treatment:

Is of prime essence for successful treatment outcome, critical evaluation of available restorative space during the diagnostic phase of implant overdenture therapy is very important. Which is missing in the above both the cases, All too often, this important factor is first assessed following implant placement (case 2), when prosthodontic alternatives are limited. Attempts to fabricate prostheses with inadequate restorative space may result in the following; (case 2)

1. Physiologically inappropriate contours,
2. Structurally weak prostheses,
3. Esthetic compromise,
4. Encroachment into interocclusal rest space.

Maxilla vs mandible prosthetic planning:

Patients are more likely to wear and accommodate to a maxillary denture compared to its mandibular counterpart. Aesthetics are satisfactory and the greater retention, support and stability are also well documented. Patients are also more likely to wear a maxillary prosthesis for longer periods of time before complications arise.
When implant rehabilitation of the edentulous maxilla was required the principles followed the same as that of the edentulous mandible. Screw retained prostheses were fabricated with cantilever pontics. When there was excessive resorption, long standard abutments were installed which entered the oral cavity and the prosthesis was built on top of that. These procedures were acceptable for the mandibular prostheses however the open interproximal spaces in the maxilla would compromise both the aesthetics and function.

Anatomical limitations and prosthetic planning in maxilla:

1. Following the same prosthetic concepts for the maxilla as existed in the mandible is not feasible.
2. The long term prognosis for implants in the maxilla is less secure than that of the edentulous mandible.
3. Following tooth extraction in the anterior part of the maxilla horizontal bone resorption is almost twice as pronounced as vertical resorption.
4. The vertical distance between the alveolar crest and the base of the nasal sinuses provides a limiting factor for placement of implants.
5. In the posterior maxilla vertical and horizontal atrophy occur at about the same rate, in addition there is pneumatisation of the maxillary sinuses. The width of the ridge is usually sufficient; however, the limiting factor is the vertical distance between the crest and the base of the sinuses. The reduced quantity and quality of bone in the maxilla together with increased aesthetic demands makes treatment planning more complex.
6. A different approach based on the ultimate aesthetic outcome is required compared to that of the edentulous mandible where function is the more critical factor.

The restorative dentist must be equipped with clinical tools and diagnostic procedures that define available restorative space. These procedures should be implemented prior to implant placement, when treatment options are being considered.

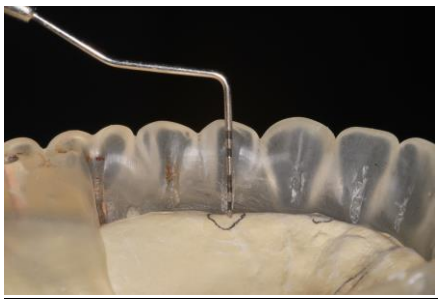
The purpose of this report is to evaluate the available procedures for diagnostic restorative space for implant

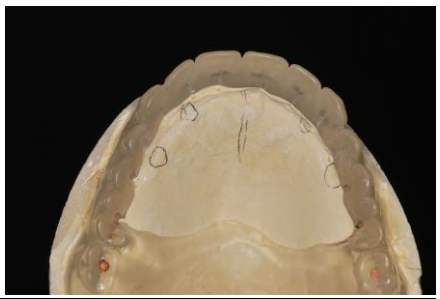
over dentures prior to implant placement.

Technique 1: Matrix capture of denture teeth:
With patient-approved wax trial dentures on their respective articulator- mounted casts, fabricate 1 of 2 denture tooth matrixes: a facial matrix or an occlusal matrix. To fabricate a facial denture tooth matrix, use either dental stone or putty matrix. The vertical and horizontal restorative space can be assessed using a measuring tool, such as a periodontal probe. Denture tooth matrixes do not permit direct visualization of available osseous structures necessary to accurately coordinate implant position and trajectory with available restorative space. Ahuja et al 2010.



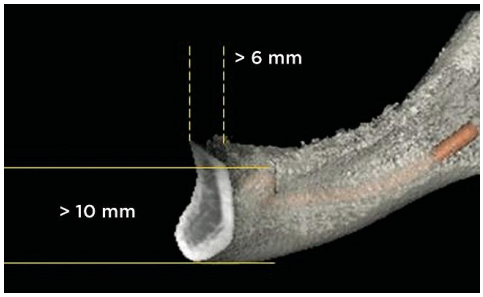
Technique 2: Implant Placement Guide:
Conventional (Prosthetic) Surgical guides are routinely provided to the surgeon, these guides provides information regarding surgical implant placement, location, spacing, additional benefits are vertical height space assessment.



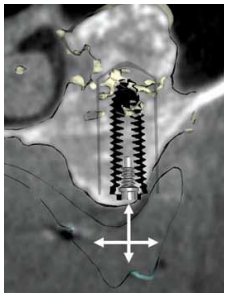


Technique 3: CBCT and computer based planning:
Computer-based diagnosis and treatment planning tools permit:
(1) Visualization of osseous structures in various 3-D and cross sectional perspectives;
(2) Visualization of the planned prosthesis in 3 dimensions and its relationship to underlying bone;
(3) Visualization of available restorative space in 3 dimensions to assist in prosthesis design and attachment selection, based on the vertical prosthetic height (Prosthetic space).
(4) Virtual placement of dental implants in bone; and
(5) Fabrication of accurate and stable surgical templates.


Radiographic guide



Bone anatomy


CBCT cross-sectional view

Technique 4: Other methods of space assessment:

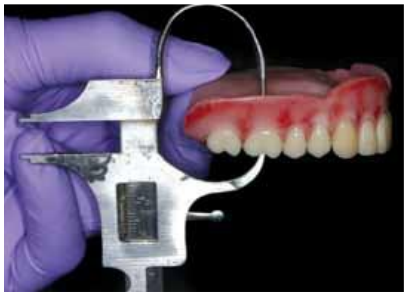
There are other methods of assessing vertical restorative space that involve the use of measuring tools, such as a Boley gauge, and existing complete dentures, wax rims, or wax trial dentures. With these methods it is critical

that the tips of the measuring caliper simultaneously contact the intaglio surface of the denture or record base and the deepest aspect of the overlying occlusal surface or the wax rim. Though these direct measurement techniques are expedient they yield information descriptive of the vertical restorative space only. The lack of a true, 3-D

understanding of available restorative space may mislead the operator during treatment planning and prosthesis design prior to implant placement. Additionally, these methods are incapable of enabling direct visualization of available osseous structures.

Mounted casts with adjusted wax rims or wax trial dentures can also be used to measure available restorative space. Again, these methods are incapable of providing a detailed understanding of the 3-D restorative space and incapable of yielding direct visualization of available bone for implant placement (A-B). Ahuja et al 2010.

C): Diagnostic tooth setup for a immediate extraction and immediate implant placement. Measurements are made to fabricate a surgical guide and fabricate a guide that provides the details to the surgeon to identify the amount of osteotomy needed at the time of implant surgery prior to implant placement.



A)

B)

C)

Conclusion:

1. Diagnosis is important in successful implant dentistry.
2. Use of the techniques described here will aid in accurate diagnostics and surgical placement of implants with the definitive prosthesis in mind.
3. Substantial diagnostic control is gained when CBCT information is appropriately acquired prior to implant placement.
4. CBCT based implant diagnosis and treatment planning permit detailed 3-D visualization of available restorative space and its relationship to available osseous structures.
5. Supported by clinical fabrication of a radiographic template that accurately represents planned prosthesis contours, predictable implant placement and accurate definitive prosthesis fabrication are possible.

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