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ABSTRACT:
A case report of 40 year old male with UR4 root stump, and prosthetic rehabilitation of the same. In this case adjunctive orthodontics was used to achieve planned alveolar support and thereby ensuring long term prognosis of Implant supported prosthesis.

Key words: pre restorative orthodontics, adjunctive orthodontics, orthodontic extrusion, One piece implant, KOS onepiece immediate load implant, immediate load implant.

INTRODUCTION:
Levels of alveolar bone crest dictate gingival levels and eventually dictate periodontal esthetics. Teeth that are compromised beyond the scope of periodontal treatment can be used to develop the alveolar bone in that region, through orthodontic traction, to allow the subsequent use of implants. This ‘forced orthodontic eruption’ of such a hopeless tooth causes an alteration in the soft tissue architecture of the periodontium as well as improving the amount and quality of bone available for implant placement.1 A case is presented here where in a root stump was utilized to regain alveolar bone levels and deliver a site very conducive for dental implant placement and related pink esthetics.

Case report
A male 40 year old reported with root stump UR4 and wanted the replacement of same. Patient has no significant medical/dental history, and otherwise was healthy. Tooth was decayed upon clinical examination. Radiographic investigation confirmed apical periodontitis with no abscess.

Caries portion was removed and RCT was done in UR4. Obturation was done using calcium hydroxide as sealant. Coronal access was sealed with Glass Ionomer Cement, in order to gain chemical bonding with remaining tooth tissue. Core build up was done using composite resin.
After 2 weeks, edgewise bracket of .022 slot were bonded to the UR3 and UR5 in a passive position that will not cause any orthodontic movement of the anchor teeth, a rectangular wire of .017X .025 was placed and a ligature wire was used to create the tractional force on the UR4. Over 8 weeks, the tooth was extruded and there was significant alveolar bone lengthening, obvious clinically. (See fig1 and 2) The forces used, varied depending on the physiologic response of the patient, moreover, the extent of the forces exerted could only be approximated, since it was difficult to quantify the forces applied although an average range of 20-25 g was noted. The tissue was allowed to remodel in the next 2 months prior to the implant placement. The radiographic evidence for the case which are shown in Fig.3. It was determined radiographically that 7-8mm of bone was regenerated.
Then a one piece KOS implant (15,5) was placed. This was followed by placement of an acrylic temporary crown with relieved occlusion (Fig 5). And the patient was then advised to go for a permanent PFM crown after six months (for bone maturation and healing). The KOS system suggests splinting for immediate loading cases, to distribute forces of occlusion. However, in this case no splinting was attempted; rather the patient’s temporary crown was relived with occlusion. The aesthetic concerns were fulfilled and at the same time adjacent teeth were maintained in their pristine condition.

Routine post and core was not feasible due to gross destruction of supra alveolar tooth tissue. There was bone deficiency both in vertical and horizontal plane. Patient was not willing to undergo bone grafting surgery, so extrusion was attempted to counterbalance vertical deficiency. Horizontal deficiency persisted though. Conventional FPD could also be given after extrusion as the vertical deficiency was minimal. Alexandra et al proposed that provisional crown should be given prior extrusion. In this case it was not viable option due to financial constrain. Temporary is not made up to perfection to generate desirable soft tissue contours, especially distal aspect. Since bone was deficient there already and tissue grafting was out of question, we have to compromise there.
Conclusion:
Orthodontic forced eruption may be a suitable adjunct in providing for aesthetic and functional restorations.4,5 Attachment to the root fragment for orthodontic extrusion might be difficult sometimes because of the lack of tooth tissue available for bonding and difficulties in isolating the bonding interface from gingival crevicular fluid and blood. In this case alveolar bone regeneration capacity was utilized to avoid bone grafting surgery and has yielded satisfactory results. This case shows how orthodontic extrusion was used to promote coronal proliferation of the interproximal bone and overlying gingival tissue. (Note: The Author wishes to inform the readers that this case was done in the year 2006-07)

References:


Fixed Prosthesis Treatment planning in conjunction with Pre-Restorative Orthodontics
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ABSTRACT:
In course of time, teeth adjacent to missing teeth change its position, owing to the physiological forces acting upon them. Prosthodontist face challenges in planning of the replacement yet being conservative. This paper focuses on various clinical situations, in which pre-restorative orthodontics intervention entail minimal possible preparation required for replacement of teeth.

KEY WORDS: Pre-restorative orthodontics, orthodontics-Prosthodontics relation, missing teeth, crown lengthening, furcation defect, extrusion, Cleft lip and palate, Bruxism, traumatic Incisal relationship, cross bite.

INTRODUCTION:
Pre-restorative Orthodontics is used quite frequently in dental practice. The goal is to achieve a favorable positioning of teeth/segment, which usually abridge treatment planning.

General Benefits
1. Axial Loading
As teeth are aligned, the destructive horizontal forces of occlusion are minimized, thereby ensuring better periodontal health.4

2. Periodontal health
The oral hygiene measures are often difficult to implement in crowded arch, resulting in plaque accumulation and subsequent calculus deposition especially in mandibular anterior region.4 Orthodontic intervention will certainly aid in enforcement of periodontal health.

3. Longevity of Tooth and supporting bone
If teeth are not susceptible to caries and patient is able to maintain adequate oral hygiene, & teeth may lasts long.

4. Thick Cementum Graber et al advocates because of thick cementum in adults protect the tooth and bodily movements are possible in favorable form.
General Risks

1. Root Resorption
   As per Graber et al\textsuperscript{8}, apparently d/t penetration of cementoid layer and the inability of the cells in this area, with their reduced vitality (as compared with the young growing child), to deposit new cementoid layer and protect resorbing root. Therefore it is very important to use light forces.

2. Pulpal Necrosis
   As root development is complete and apical foramen is closed, and so entering nerves and vessels are easily damaged in adults.

3. Relapse
   In case of unfavorable position of tooth and inadequate retention\textsuperscript{10}, relapse is expected.

4. Caries
   Probable risk of caries, if patient has high susceptibility or poor oral hygiene. In later case, ortho-treatment should be started only after proper hygiene enforcement. Topical fluoride application is also beneficial, if applied before active treatment phase.

Caution

- Active Periodontal Diseases: If orthodontic treatment is attempted, will result in accelerated CAL\textsuperscript{4}
- In case of advance periodontal involved teeth and altered CL: RL ratio; It may require equilibration and modified bracket placement\textsuperscript{4,5}(guided by bone level rather than clinical crown) is crucial, to prevent inducing iatrogenic unfavorable forces.
Types:\(^{10}\):

<table>
<thead>
<tr>
<th>Type</th>
<th>Adjunctive</th>
<th>Comprehensive</th>
</tr>
</thead>
<tbody>
<tr>
<td>Objectives</td>
<td>Limited</td>
<td>Wide</td>
</tr>
<tr>
<td>Goal</td>
<td>To make replacement easier or more effective</td>
<td>Specific Occlusal Goals: To produce the best combination of dental occlusion, dental and facial appearance, and stability of the result to maximize benefits to the patient</td>
</tr>
<tr>
<td>Time</td>
<td>Few months/ one year</td>
<td>Up to 3 years</td>
</tr>
<tr>
<td>Extent</td>
<td>Small part of arch</td>
<td>Usually both arches</td>
</tr>
<tr>
<td>Retention</td>
<td>Usually by Restoration, done afterwards</td>
<td></td>
</tr>
<tr>
<td>Type</td>
<td>Usually removable/fixed appliance</td>
<td>Fixed multibanded appliance</td>
</tr>
</tbody>
</table>

**Clinical Situations:**

1. **Tilted Teeth adjacent to Edentulous space:**\(^{6,7,9}\)
2. Drifted Anterior teeth d/t active periodontal disease

- Assess the clinical situation, if drifting is active or static
• Assess periodontal health to control active disease, if any.\textsuperscript{3,4}

• After possible retraction, it may be possible to restore teeth resulting in more esthetic results

3. Rotated teeth prior restoration

Instead of cutting down excessive tooth structure, better alternative is to align tooth, that it will require minimum possible preparation.\textsuperscript{4,10}

4. Space closure.\textsuperscript{9}

In hypodontia, microdontia; It is ideal to close space using pre restorative orthodontics as often teeth are diminutive. It will simplify restorative plan.
5. Congenital absence of teeth \textsuperscript{4,5,10}

Congenital absence of teeth (e.g. missing lateral incisor), usually result in inadequate space
(either too much or too little), which can be corrected by orthodontic therapy.

6. Clinical crown Lengthening:
   As suggested by Rosential et al\textsuperscript{6} Orthodontic crown lengthening procedure result in favourable
CL: RL ratio contrary to Surgical lengthening. It will also give benefit of gingival contouring and alveolar bone formation at crest.\textsuperscript{4,6,9,10}

7. Extrusion of Teeth:
Improve access to fractured tooth/ traumatized intruded tooth\textsuperscript{1,2,8,10}
8. Bruxism
Excessive forces causes significant occlusal wear, which results in decreased VDO.D/t over closure of mandible, which causes mandibular anterior teeth wear mainly in incisal region.⁸
Bite plates can be used to restore vertical and prevent over eruption of mandibular anterior.

Before definitive restorations, deep bite associated is relieved and partly also address to TMJ problems it might have caused.

9. Diagnostic splints in TMD

Frequently in TMD patients, diagnostic splints can be used to substantiate the clinical judgment before proceeding to definitive phase of treatment. It will ascertain the clinical diagnosis too, and conviction of patient. However, Profitt et al\textsuperscript{10} states that adjunctive orthodontics may not be useful in TMD cases, and it is better to treated by reduction in crown height of anteriors.

10. Midline Diastema with Peg Laterals:

Orthodontic treatment will close the midline space and definitive restoration on peg lateral will
act as permanent retainers.

11. Traumatic Incisal end to end relationship

In this case end to end relationship can be accomplished by;\textsuperscript{2,3}
• Extraction of one mandibular teeth and retraction

• Expansion of maxillary arch (provided basal bone width permits this)

Then the associated TSL can be restored

12. CLP

Buccal segment collapses due to inadequate arch form and missing teeth. Orthodontic treatment can be useful to gradually open space in buccal/labial segment and then restorations can be placed in more esthetic zone.²

D/t missing teeth patient may develop tongue thrusting habit, which may need to be addressed during initial phases of treatment.

13. Partially Impacted Canine

In case, it has to be used as abutment, orthodontic intervention can be utilized for forced eruption

14. Cross Bit

a. Single tooth anterior: Inclined plane can be used⁸,¹⁰

b. Single tooth posterior: Brackets utilizing cross elastics can be used²,³

c. Bilateral anterior: can be treated like end to end traumatic bite. (See point 11)

d. Bilateral posterior: Expansion of arch
ANTERIOR CROSS BITE

11, m cross bite

Missing 42, 43

2 implant placement will subject to abnormal prolabiate forces

Correction of cross bite

2 no interference during mandibular movements

Ensure implant stability
Aforementioned can significantly enhance stability of prosthesis, by producing more favourable forces of occlusion.

15. Enhancement of Gingival contours prior implant placement

Several authors\textsuperscript{1,2,3} proposes extrusion of root stumps or traumatized unrestorable teeth can be done prior implant placement, to achieve more optimum gingival contours and bone support chiefly facial alveolar bone.
Significant
Alveolar Bone loss
due to trauma

Orthodontic extrusion
is recommended

Advantages:
1) Bone apposition at labial and interdental areas
   more solid foundation for implant placement.
2) Enhance surgical contours post ortho treatment
Importance of Provisional Crown during Forced Tooth Extraction

Placed as cervical as possible

Undesirable forces may result in unfavourable angulation of adjacent teeth.

Place as close to gingival margin as possible

Full contour crown will maintain appropriate proximal contacts.

Prevent tipping of adjacent teeth.

Provisional restoration for restoration

CAUTION

- 2-3 mm overcorrection is done, keeping in view anticipatory gingival margin recession post-implant placement.
- 4-6 weeks active therapy should be stabilised for 6-12 weeks before definitive treatment.

As rest crown, incisal edge has to be adjusted so as to eliminate possible interference with lower teeth during various jaw movements.
16. Furcation Defects

Class III defects which are difficult to maintain can be hemisectioned. Two separate crowns can be made afterwards. Not only will this result in an area more amenable to oral hygiene measures but also can be utilized for abutment for future, if needed.\(^4\)
Conclusion:
Orthodontic intervention can be utilized for various clinical situations to significantly enhance final restoration result, minimizing tooth preparation and facilitating better esthetics in long term.

Abbreviations used

TMD: Temporomandibular dysfunction
CLP: Cleft Lip palate
d/t: due to
CAL: Clinical Attachment loss
TSL: Tooth surface loss
CL: RL: crown length: root; length

References: