



RAMAL BONE SCREWS IN ORTHODONTICS –

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Abstract

Skeletal anchorage has changed the paradigm of Contemporary Orthodontics. Temporary Anchorage Devices provides skeletal anchorage without the need of an invasive surgery which is required in mini-plates. There are many of skeletal anchorage systems, including bone screws like inter-radicular, IZC, BSS and Ramal. These mini-implants can perform difficult tooth movement with ease and without draining the anchorage. Ramal bone screws are newer and have several advantages over mini-implant. They have high success rate. They are a game-changer to bring horizontally impacted lower third molars in the arch.

Key words: Anchorage, Skeletal Anchorage system, Temporary Anchorage, Ramal Bone Screws, Mini- implant

Introduction

Anchorage control is the prime reason for use of TADs in Orthodontics. Lower third molars are the most commonly impacted teeth. In many orthodontic cases, third molars are associated with late mandibular crowding and their extraction becomes vital. Some cases with missing mandibular second or first molars; third molars can be translocated to replace the missing molars. These movements are difficult and cannot be performed without the use of Ramal Extra-alveolar screws.

Ramal implant is a 2mm diameter SS screw, 14 mm in length and with an extended collar. The thickness of soft tissue travelled by ramal bone screw is more than that of Buccal Shelf Screw thus, extended collar is needed like that with an Infra Zygomatic Crest Screw. The main concern is the blind nature of placement of Ramal screw as ramus is not a uniplanar structure and proximity of inferior alveolar nerve and blood vessels^{1,2}.

SITE OF PLACEMENT OF RAMAL BONE SCREW

Palpate and locate the external oblique ridge of ramus followed by internal oblique ridge. Midway between the internal and external oblique ridge is the retromolar fossa which is the site of placement^{3,4}.



Figure 2- Area between external and internal oblique ridge

Insert the screw 5-8mm above the occlusal plane in this region to avoid occlusal interferences. As the bone is very dense in this region, implants smaller than 2mm diameter must not be used as they cause risk of fracture. Adequate hygiene measures must be followed for success of these bone screws⁵.



Figure 1. Ramal Bone Screw with extended collar

“N ANGLE” FOR PREDICTABLE INSERTION OF RAMAL BONE SCREWS

An angle of insertion of ramal bone screw was established in a study to serve as a guide for optimum insertion. The purpose is to know the safety margin within which the screw can be inserted avoiding damage to near-by neurovascular bundles¹.

N angle is the angle between the ramal implant line and a line passing tangentially to the buccal surface of the mandibular first and second permanent molars^{6,7}.

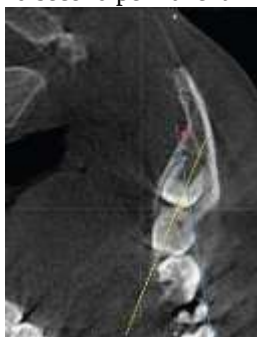


Figure 3- N angle



Figure 4- Schematic representation of N angle

Study was performed on 80 CBCT models to locate the position of inferior alveolar neurovascular bundle and its distance from the most antero-lingual point of ramus. N angle was found to be 19.04 degrees (SD- 6.89) that is at 19.04 degrees from buccal surface to mandibular first and second molars ramal implant can be inserted. It can be inserted 5-8 mm above the occlusal plane; safest at 8 mm^{1,8,9}.

DISCUSSION

Since permanent teeth failure of eruption are hard to spot when they first appear during the mixed dentition period, failure to erupt is a tough diagnostic consideration. Prior studies categorized eruption failure into the broad categories of

1. Primary retention
2. Secondary retention, or
3. Impaction.

Impaction is characterized as a tooth that fails to erupt due to an aberrant eruptive direction, ectopic eruption, or a physical barrier in the eruption path because of its functional position with respect to the occlusal plane. When a tooth in a typical eruptive position stops erupting without a physical barrier it is primary retention. A genetic disruption in eruption or an inability of the dental follicle to resorb naturally could be the cause. Primary retention, or failure to erupt, is likely when a tooth with a typical radiographic orientation for eruption is at least two years behind schedule^{2,10,11}.

Secondary retention, which is typically identified from infra-occlusion because of acquired ankylosis, is the termination of passive eruption after a tooth has emerged^{12,13}.

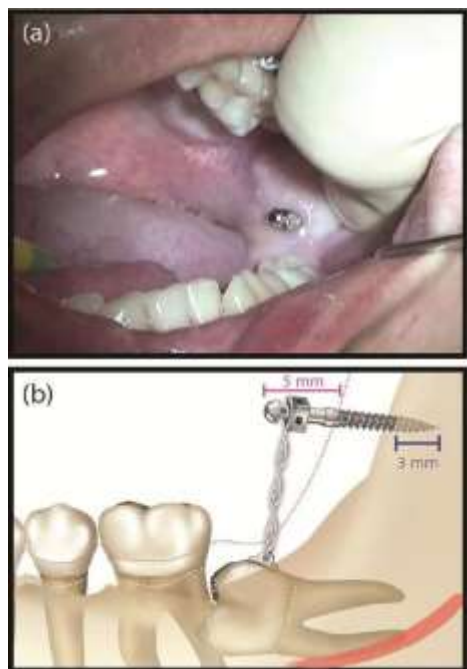
Different choices for treatment are available based on the etiologic factors identified by the differential diagnosis¹⁴. Provide adequate space in the arch before removing any obstructions, such as odontogenic tumors, cysts, or an extra tooth, if the impaction is caused by a physical barrier obstructing the eruption path. It could be necessary to expose the tooth, bond an attachment, and use orthodontic traction if the intended eruption course does not follow the long axis of the impaction^{15,16}.

Primary retention is the default diagnosis in the absence of any discernible responsible causes¹⁷. The standard course of therapy involves bonding an orthodontic attachment to the tooth, luxating the impaction to break any ankylosis that may be present, applying traction along the desired path of tooth movement, and, if necessary, orthodontically creating a desired path for eruption where ramal implants come into play.

RAMUS AS A TAD SITE

Mandibular molars that are completely impacted or mesially tipped (mesio-angular) must be recovered using an effective yet simple procedure. After reviewing six distinct techniques for recovering highly impacted molars, Lin1 came to the conclusion that surgical

Figure 5- A- Ramal implant placed intraorally. B- Traction force on impacted molar²



exposure and uprighting with traction via ramus was the most dependable and effective strategy. A thorough analysis of the anterior ramus' anatomy served as the basis for choosing the anatomical location and screw design. About 5-8 mm above the occlusal plane, halfway between the ascending ramus's exterior and internal oblique ridges, is the ideal location for a direct line of traction free from occlusal obstruction^{2,18}.

CONCLUSION

1. Direct traction from a 2 x 14 mm SS bone screw placed in the mandibular anterior ramus can straighten and align a horizontally impacted mandibular tooth.
2. The process is quick, effective, and reliable.
3. To facilitate oral hygiene and manage soft tissue irritation, it is essential to keep a minimum of 5 mm of space between the soft tissue and the screw head.
4. Compared to buccal shelf bone screws (7.2%) and I-R miniscrews in the maxilla (12%) or mandible (19), the failure rate of E-A ramus screws (5%) is marginally lower.
5. In actuality, the ramus screw anchorage method was 100% effective in restoring mandibular molars that were horizontally impacted and in good periodontal health².

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