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Infrazygomatic Crest Screws In Orthodontics

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Abstract:
Usage of TADs have revolutionized orthodontic treatment modalities. Borderline surgical cases have been converted to non- surgical treatment. Infra zygomatic crest implants have overcome the disadvantages of inter radicular implants and have extended the boundaries of non- surgical orthodontic treatment. In this article, we have reviewed the IZC implants, their applications and complications.
Keywords: anchorage, extra radicular, Infra zygomatic crest

INTRODUCTION:
The Infra Zygomatic Crest is a common site for insertion of temporary anchorage devices (TADs). Intraorally infra zygomatic crest is a crest of bone emanating from the buccal plate of the alveolar process, lateral to the roots of the first and second maxillary molars.Clinically, it is a palpable bony ridge running along the curvature between the alveolar and zygomatic processes of the maxilla. In younger subjects, it is between the maxillary second premolar and first molar, whereas it is above the maxillary first molar in adults.
Few authors[1,2]placed it in the anatomical ridge of the IZC, and Villegas[3]used a 25mm long screw to engage the superior aspects of the IZC, approximating the zygoma.

Anatomical Considerations:
IZC TADs are placed in the attached gingiva to avoid soft tissue irritation. The size of the IZC is selected by considering the anatomy of the IZC site. The average thickness of the attached gingiva in the maxillary first molar is about 1.0mm,[4]and the cortical bone thickness is about 1.1-1.3mm. [5] Primary stability depends on the mechanical retention between the screw thread and the cortical bone. Under most clinical conditions, an 8mm screw is adequate to engage the cortical plate and secure primary stability.The IZ crest has 2 cortical plates—the buccal cortical plate and the sinus floor. Hence, with bicortical fixation, a better primary stability of the miniscrew can be achieved.

Placement:
Liou[6] suggested orienting screws about 55-70 degrees inferior to the horizontal plane to achieve maximal buccal bone engagement.One common problem encountered with IZC placement is injury to the mesiobuccal root of the maxillary first molar.It is recommended to insert miniscrews in higher rather than lower positions, so that the interseptal bone is thicker and there is less chance of root injury.
Initially, it is inserted inter-dentally between the 1st and the 2nd molar and 2 mm above the muco-gingival junction in the alveolar mucosa. The self-drilling screw is directed at 90° to the occlusal plane at this point. After the initial notch in the bone is created after couple of turns to the driver, the bone screw driver direction is changed by 55°–70° toward the tooth, downward, which aid in bypassing the roots of the teeth and directing the screw to the infra-zygomatic area of the maxilla. The bone screw is screwed in till only the head of the screw is visible outside the alveolar mucosa.Immediate loading is possible and a force of up to 300–350 g can be taken up by a single bone screw.[7]

Material And Size:
The density index of infra zygomatic crest is more than 1250 HU. Hence the choice of material is pure stainless steel because of its high fracture resistance than titanium alloys.
They are available in two sizes commonly – 12 and 14 mm in length and 2 mm in diameter. When the soft tissue in the buccal vestibule is thick a 14 mm screw is used. These have 7 mm of head and collar area and 7 mm of cutting spiral. Orthodontic bone screws of 12 mm length are preferred in cases of thin soft tissue at the vestibule. The length of cutting spiral, head, and collar dimensions may vary according to the choice of manufacturer.

Applications:
They can be used for molar uprighting, segmental, and full arch distalization, intrusion of single tooth to full arch, protraction and retraction of dentition and for any other anchorage needs.However, they can not be placed between teeth due to their large diameter.
Lin[8] proposed a new method for the maxillary dentition distalization with miniscrews implanted in the infrazygomatic (IZ) crest using a sliding mechanism, which was comparatively easier. With the use of IZC implants, Class II malocclusion can be corrected effectively by distalizing the maxillary dentition without producing adverse reciprocal movement in the nonextraction patients.
Sugawara et al[9] reported that the average value of the first molar crown distalization was 3.6 mm using titanium anchor plates for maxillary dentition distalization. The distal value using miniscrews was less than the value using plates. The miniscrews have lower costs and more simple surgical placement and removal procedure. Therefore, the miniscrews implanted in the IZ crest are an efficient anchorage for maxillary dentition distalization. With distalization of the maxillary dentition with the IZC implants, molar often extrudes along with it and causes subsequent clockwise mandibular rotation in orthodontic mechanics. However, the clockwise rotation of the mandible could be prevented by intrusive force provided to the maxillary molars through the miniscrew.
The retraction force in the entire maxillary arch generates intrusive force in the molars and extrusive force in the incisors, caused by clockwise rotation around the center of resistance of the entire maxilla, which is located between the premolars.The force line of action passes below the

maxillary Cr and, consequently, causes this rotation. At the same time, incisor extrusion takes place, which may be unfavorable for patients with deep bite. By changing the height of hooks in the anterior area, the retraction biomechanics is altered.

IZCs were otherwise used for retraction of the anterior segment following extraction of premolars because, with inter radicular implants, they blocked blocked the path of distalizing tooth movement. During en masse teeth retraction, a clockwise moment is created in the maxilla and a counterclockwise one, in the mandible. These moments of resultant force promote uncontrolled inclination movement in the posterior teeth since the direction of force passes away from the center of resistance of the maxilla and mandible. In addition to this, vertical forces are also generated over incisors and molars. With this mechanics, incisors present extrusion, increasing overbite, while molars respond with an intrusive force that tends to open the bite in posterior area.[10] By changing the installation heights of the TADs, the force system can be altered. Similarly, using different heights of hooks in the anterior region can also change the direct and amount of force.

Complications:

Apart from minor bleeding on insertion, gingival overgrowth on the screw and and early loosening of the screw are common complications. Breakage of tip of the screw is seldom seen if pure stainless steel good quality screws are used. To avoid problems related to gingival overgrowth – oral hygiene maintenance is of utmost importance. The incidence of gingival overgrowth is far less with screws having larger heads. In case of early loosening of the screw– re-placement of the screw is advisable in a different site.

Failure rate of IZC is 7% [10]. The reason for failure was poor bone quality, immediate loading, low sinus floor, movable mucosa. Chang et al.[10] in his study could not find any significant difference in the failure rate between movable mucosa and attached gingiva if the platform of the screw was at least 5mm away from the soft tissue surface. However, it meant using a longer screw. Similarly,several studies have reported that the perforation of the maxillary sinus membrane during miniplate and dental implant placement is not significant in causing postsurgical complications.[11,12]

CONCLUSION:

The results from an orthodontic point of view look promising and relapse is not expected if the patient is past their growth phase. However, as this is a new modality of treatment, a longterm followup will help to determine the success achieved.

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