For many years, Anchorage has been always an integral part of treatment mechanics in Orthodontics & Dentofacial Orthopaedics. Various extraoral and intraoral devices have been attempted in the scientific literature to prevent anchorage loss, but until the advent of TADS, no practical solutions were found. The 20th century witnessed the emergence of different skeletal anchorage devices, such as prosthetic implants, palatal implants, micro-implants, mini-plate screws, and onplants.

Because they are small, simple to insert and can be removed easily, can be loaded right away, and can offer absolute anchorage for many forms of orthodontic treatment mechanics with little to no patient compliance, orthodontic implants, also known as temporary anchoring devices (TADs), have grown in popularity in late 1900.

Teeth are subjected to stresses and moments as the orthodontic treatment progresses. All of these forces result in opposing reciprocal forces. For the therapy to be successful and to prevent unintended tooth movements, these pressures must be directed. The anchorage protocols are now in place. Orthodontics is very concerned with anchor management techniques or modalities. The primary objective of orthodontic treatment is to reposition teeth in the desired direction while enhancing the patient's aesthetic appearance.[(1)]

Planning the anchorage requirements and assessing the needs for their execution can be a time-consuming and labor-intensive process. Orthodontic professionals have suggested several strategies to overcome the challenges associated with anchorage, such as utilizing extraoral anchorage, employing opposing anchors, and increasing the number of teeth in anchorage units."

The extraoral anchorage is a little difficult to use and can hurt the patient and require patient compliance which affects the patients' willingness to use it. The term 'absolute anchorage'

refers to the stability of the anchorage unit, which is a challenge in conventional orthodontic mechanics. "Absolute or infinite anchorage is a term used to describe the absence of movement in the anchorage unit caused by the reaction forces that are applied to move teeth. This kind of anchorage can only be achieved by utilizing ankylosed teeth or dental implants as anchors, which rely on the bone to restrict movement. With the emergence of mini-implants, it has become feasible to achieve absolute anchorage of the skeleton. Mini-implants provide maximum anchorage while minimizing adverse side effects."[(2)]

"Mini implants are presently utilized in orthodontics as temporary anchorage devices (TADs), which are temporarily fixed to the bone to enhance anchorage. The objective is either to support the reactive unit's teeth or to eliminate the need for the reactive unit entirely.".[(3)]"TADs can be attached to the bone either biochemically or mechanically. In terms of implants, limitless anchorage is defined as exhibiting no movement (zero anchorage loss) due to reactive pressures. The introduction of skeletal anchorage systems and TADs into orthodontic treatment has made it possible to achieve limitless anchorage."

The osseo-integrated implant (endosteal) was the first one to be used for the purpose of orthodontic anchorage. Although they have a limited scope for use in orthodontics, they did a good job of supplying the orthodontic anchorage. In essence, they were used to fill edentulous areas that weren't present in typical orthodontic cases.[(4)]

One of the downsides of endosteal implants was the lengthy waiting period required for implant integration, which typically took around 3 to 4 months before loading could take place.Even the implant's size and the installation process had issues. The size is substantial, and the placement's surgical technique is challenging.[(5)]

These issues and complications were resolved by non-osseointegrated micro implants utilized in orthodontics. In addition, they were mechanically stabilized cortical implants. Micro screws are ones that are less than 2mm wide while mini screws are those that are 2mm wide or wider. The first small screw system was made by Oleus, LomesMondeal, and HDC Italy.

Additionally, Dentos Inc. in Degu, Korea, produced the original miniscrew or microimplant anchorage known as the Abso Anchor. A screw with various lead shapes is an added benefit. Depending on the mechanism, these head types enable the screw to be employed in a variety of applications.

"Conventional dental implants have some limitations, including:

- They can only be placed in edentulous or retromolar areas.
- The direction of force application is limited since a dental implant is situated on the alveolar ridge, and it is too large for horizontal orthodontic traction.
- The surgery required for dental implants is complex, and patients may experience discomfort during the initial healing period. Oral hygiene can also be challenging for patients with dental implants."

Advantages of the mini implant[6],[7]:

• Mini-implants for orthodontic anchorage can be placed in any area of alveolar bone, including apical bone, since they are small enough.

• The surgical procedure is simple and can be performed by an orthodontist or general dentist. It is a minor surgery, and the healing process is rapid.

• The mini implant can be easily removed after orthodontic traction."

- "Conventional dental implants are typically 3.5-5.5mm in diameter and 11-21mm long, while mini implants are only 1.2mm in diameter and 6mm long, making them much more suitable for orthodontic purposes. The screw is small enough to be inserted between the mesial and distal roots of a molar, allowing for molar intrusion."

- Shorter or even no waiting period (for miniscrews), it is suggested that a waiting period for bone healing and osseointegration before loading is unnecessary because the primary stability (mechanical retention) of the miniscrews is sufficient to sustain a regular orthodontic loading.

- No need for laboratory work

- Easier removal after treatment

- Low cost.

Anatomic considerations in placement of the implants[7]:

- "The thickness and density of the cortical bone, which are crucial for retaining the mini-screw, can vary among patients and implant sites. Sites with thick, dense cortical bone are considered the most stable for mini-screw implants. In the mandible, the retromolar area and the buccal side of the posterior region are suitable sites that meet these criteria. In the maxilla, the midpalatal suture area is considered the most favorable site for implantation due to the thin soft tissue and dense bone."[8].

- "Whenever possible, mini-screws should be implanted in the zone of attached gingiva above the mucogingival junction. This area is less likely to have soft tissue impingement, reducing the likelihood that the soft tissue will cover the screw or that the screw will become dislodged, and making it easier for the patient to maintain good oral hygiene."

•Before placing the implant, it is important to determine the number, position, and parallelism of the proximal roots. Panoramic and periapical radiographs can be utilized for this purpose."

"When placing the mini-screw in the mandible, it is important to avoid the mandibular canal and the mental foramen. Similarly, in the maxilla, the incisive canal and the greater palatine nerve and artery should be considered, although they are generally far from the implant site and rarely pose a problem."

The **implant procedure** is as follows:

- Open a mucoperiosteal flap and denude the alveolar bone
- Drill into the cortical bone with a 2mm round bur, using water cooling, to make a pit about 1.5mm in diameter [FIGURE 1]

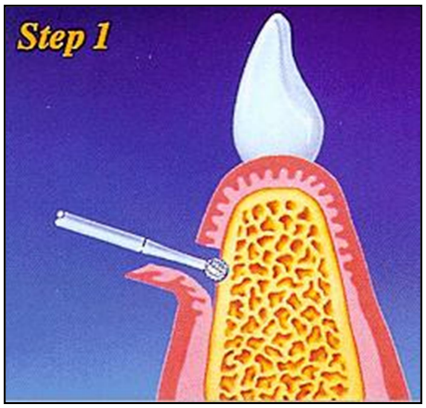

Figure 1: Drill Into The Cortical Bone

- Drill into the bone with a 1mm pilot drill, still using water cooling, as far as the length of the mini-implant [Figure 2]

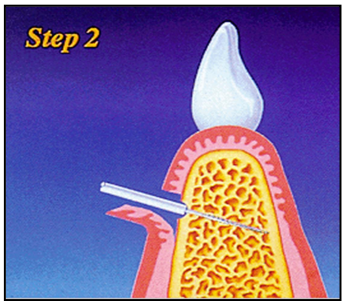

Figure 2: Drill Into The Bone With1mm Pilot Drill

- Insert the implant with the accompanying miniature screwdriver [Figure 3]

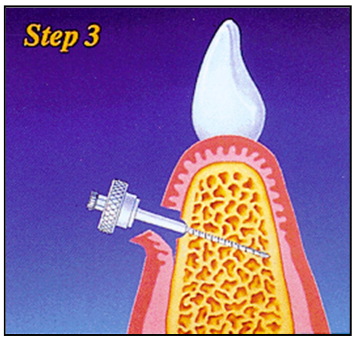

Figure 3: Implant Insertion With Screwdriver

•Cover the implant with the flap, and suture the wound. Document the position of the implant with a periapical x-ray.

•After healing and osseointegration, remove the gingival tissue covering the mini-implant.

•Using a mucosal punch, remove the soft tissue surrounding the head of the mini-implant.

•Attach a two-hole titanium bone plate to the head of the mini-implant to act as a hook.

Tie a ligature wire or elastic chain between this hook and the bracket on the tooth or

teeth to be intruded—in this case, the mandibular central incisors.

•RyuzoKanomi introduced the Mini-implant in 1997. The implant is a modified surgical miniscrew of 1.2mm diameter and 6-7mm length, which can be placed interdentally. This procedure is carried out under local anaesthesia.

Complications that may arise after implantation of mini-screws include

- Inflammation of the soft tissue surrounding the screw, which is the most common cause of mini-screw failure.
- When the mini-screws are implanted below the mucogingival junction on movable mucosa, applying elastic force can be challenging due to the soft tissue covering the screw head. Care must be taken during the operation to avoid damaging adjacent roots, nerves, and blood vessels.[9].
- Occasional miniscrew fracture can occur, but this can be prevented by using screws with a diameter of 2mm or more.

Effect of Orthodontic forces on Mini-implants:

- J.W. Liou, Betty C.J.Pai et al[10]. conducted a clinical cephalometric study in order to evaluate the behaviour of miniscrews under orthodontic loading.
- Sixteen adult patients were included in this study, where miniscrews (diameter-2mm, length-17mm) were used for maxillary anchorage. The miniscrews were inserted directly on the maxillary zygomatic buttress to facilitate en masse anterior retraction. After two weeks of miniscrew insertion,

nickel-titanium closed-coil springs were placed for retraction with a force of approximately 400 grams. Cephalometric radiographs were taken immediately before force application (T1) and 9months later (T2). The cephalometric tracings at T1 and T2 were superimposed for the overall best fit on the structures of the maxilla, cranial base, and cranial vault to determine any movement of the mini screws. The mini screws were also evaluated clinically for their mobility (0: no movement, 1: <0.5mm, 2:0.5-1mm, 3:>1.0mm). the mobility of all mini screws was 0 at T1 and T2.

  - On average, the mini screws showed a significant forward tipping of 0.4mm at the screw head.

- However, in 7 out of the 16 patients, the miniscrews were extruded and tipped forward by a range of -1.0 to 1.5mm.
- Miniscrews are a stable anchorage but do not remain absolutely stationary Miniscrews provide stable anchorage but are not completely stationary during orthodontic loading. Unlike endosseous implants, miniscrews do not provide absolute anchorage. The movement of miniscrews could be due to various factors, such as fixture size, magnitude of orthodontic force, depth of miniscrew insertion, bone quality and quantity at the implant site, and waiting period. Among these factors, the waiting period may play a determining role in the displacement of miniscrews.[11].

Microfracture or microcrack of the peri-implant microcallus and strong bone remodeling and resorption on the tension and compression side may occur, which can ultimately result in the displacement of the miniscrew.

It has been suggested that a waiting period is not necessary for miniscrews because of their primary stability (mechanical retention) is sufficient to sustain normal orthodontic loading and this would not compromise the clinical stability of the miniscrews.

Liou and Pai[12] suggested that the miniscrews used in the study were not fully osseointegrated and instead had a layer of fibrous tissue between them and the surrounding bone. This allowed the miniscrew to be extruded and tipped in the direction of the orthodontic force, similar to a tooth and its periodontal ligament. The fibrous tissue compressed, and the threads of the miniscrew mechanically locked into the surrounding bone. This hypothesis can explain why some miniscrews were displaced but still appeared clinically stable. However, there was no histological evidence to support this hypothesis.

•The average forward tipping of the screw head by 0.4mm may not have a significant clinical impact on the displacement. Miniscrews are commonly utilized as temporary fixtures for orthodontic treatment and are removed after completion. It is not essential for the miniscrews to remain completely stationary during orthodontic loading, as long as the desired treatment outcomes are achieved.[13].

• However, the displacement of miniscrews could potentially cause harm to adjacent vital organs such as dental roots, nerves, and blood vessels, making it a serious concern. Therefore, miniscrews should be placed in a site that is not adjacent to any vital organ. A suitable implant site for miniscrews could be a non-tooth bearing area that has no foramen or pathway for any major nerves and blood vessels. In cases where miniscrews are placed in a tooth-bearing area, a clearance of 2mm between the miniscrew and dental root is recommended for safety purposes.

CLINICAL APPLICATION IN ORTHODONTICS

Intrusion of Anterior Teeth

A case study on the use of avitallium implant for anchorage when invading the upper anterior teeth was reported by Creekmore in 1983. Immediately below the front nasal spine,

The vitallium screw was placed. The researchers implemented a 10-day unloading period before attaching an elastic thread between the screw's head and the archwire. Over the course of one year, the results showed 6 mm intrusion and 25 degrees of lingual torque. [Figure 4]

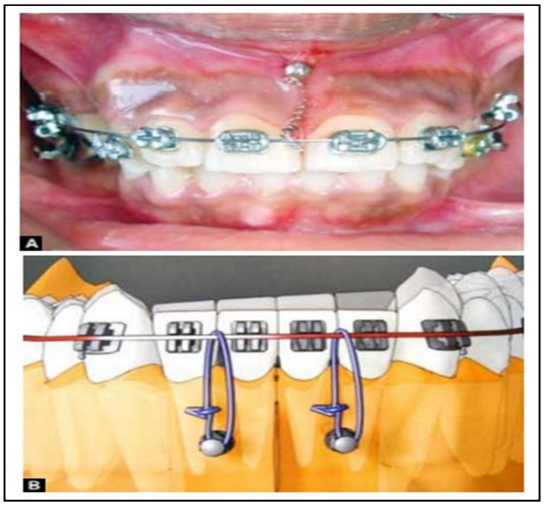

Figure4: Implants Used For (A) Maxillary Anteriors

(B) Mandibular Anteriors

Extrusion of posterior teeth or intrusion of anterior teeth are two nonsurgical approaches for treating deep bites. When extrusion of posterior teeth is not desired, it is necessary to intrusion of anterior teeth in patients with excessive incisal display and to rectify deep bite in adult patients.

Temporary anchorage devices (TADs) can be used to facilitate the intrusion of anterior teeth, particularly in cases where there is a deep bite or excessive overbite. The use of TADs for

intrusion can provide absolute anchorage, allowing the orthodontist to move the teeth in a controlled and predictable manner without any reciprocal movement of other teeth or structures in the mouth.To intrude anterior teeth using TADs, the orthodontist will first place

the TADs into the bone between the roots of the teeth that need to be intruded. The TADs serve as an anchor point for a spring or elastic band that is attached to the teeth being intruded.

The orthodontist will then apply a continuous and controlled force to the teeth over a period of several weeks or months. The force will cause the teeth to move gradually, allowing the bone to remodel around the roots of the teeth and enabling the teeth to be intruded.

One advantage of using TADs for anterior intrusion is that it can be done without the need for other orthodontic appliances, such as headgear or braces. This can reduce treatment time and improve patient comfort. Additionally, using TADs for anterior intrusion can help to avoid unwanted side effects, such as tipping or rotation of adjacent teeth.

In summary, TADs can be an effective tool for facilitating the intrusion of anterior teeth in cases where there is a deep bite or excessive overbite. By providing absolute anchorage, TADs allow orthodontists to achieve precise and predictable tooth movements with minimal discomfort to the patient.

Gummy smile

Temporary Anchorage Devices (TADs) are widely used to treat a gummy smile, and they have been found to be a popular and successful method. However, one of the main drawbacks

of this approach is the possible extrusion of posterior teeth, which can lead to an increase in lower anterior facial height, especially when combined with a continuous archwire.[14]

The "gummy" smile is characterised by a full smile that exposes 2mm or more of the maxillary gingiva. Gummy smiles can arise from different causes, including overgrowth of the maxilla in the vertical direction, a short upper lip, overactive levator muscles, passive eruption of the upper front teeth, and gingival hyperplasia. Treatment options to correct a gummy smile can vary depending on the underlying cause. Some options include headgear therapy, crown lengthening procedures, surgical techniques like Lefort 1 osteotomy with superior impaction, botulinum toxin injections, skeletal anchorage system-assisted intrusion, and various loop mechanics.

Utilizing a standard continuous arch wire for treating a gummy smile with TADs can lead to unintended extrusion of posterior teeth. However, using a TAD-assisted segmented arch wire for maxillary anterior intrusion and retraction is a great way to treat a gummy smile successfully while preventing posterior extrusion. [figure 5-7]

Figure 5 Intraoral Pictures Of Dental Implants

Figure 6: Pre- Treatment Photographs

Figure 7: Post Treatment Photographs

Retraction of anterior teeth[15]

TADs (temporary anchoring devices) are a common orthodontic treatment method for retraction of anterior teeth, which is used to address dental malocclusions such crowding or tooth protrusion. The TADs are tiny, temporary screws inserted into the jawbone to act as anchors for the stresses of orthodontic treatment.

The TADs are positioned carefully in the jawbone during retraction and joined to the teeth with orthodontic wires or elastic bands. The anterior teeth can be moved back into place using the TADs as a solid anchor. By doing so, the orthodontist can get the best outcomes possible without needing to rely on the patient's cooperation or heavy external appliances like headgear.

The appearance and functionality of a patient's teeth can be greatly enhanced by retraction of anterior teeth with TADs, which is a minimally invasive and successful treatment approach.

With the use of TADs, orthodontists can move teeth with more control and accuracy, completing treatments more quickly and with better results.

One of the significant challenges in cases of tooth extraction is the loss of anchorage in the posterior region, which can impact the curve of Spee and cause a deep bite. To address this issue, mini screws can be used as a reliable skeletal anchor for anterior retraction, whether en masse or segmental retraction is being performed. (Figure 8)[16]

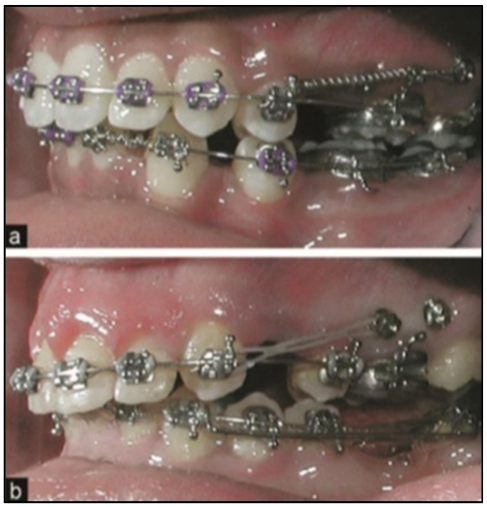

Figure 8: Closure Of Extraction Spaces With Implants

Correction of a canted occlusal plane

An orthodontic treatment method called "correction of a canted occlusal plane" includes levelling out an unbalanced or slanted occlusal plane. The incisal margins of the upper front teeth and the occlusal surfaces of the back teeth form a theoretical plane known as the occlusal plane.

When the occlusal plane is uneven, slanted, or sloping, it is said to have a canted occlusal plane, which results in an unbalanced bite and an asymmetrical appearance of the teeth and

face. This can be brought on by a number of things, including skeletal irregularities, dental wear, missing teeth, and jaw asymmetry.

Depending on how severe the issue is, orthodontic treatment for a canted occlusal plane may combine techniques including braces, TADs, and jaw surgery. TADs offer secure anchorage for more accurate tooth movement while braces can be utilised to move teeth into the proper position. Jaw surgery could be necessary in some situations to fix skeletal irregularities and enhance face symmetry.

Canted occlusal plane correction is crucial for the function and health of the jaw and teeth as well as for aesthetic reasons. The distribution of forces when chewing is improved by a balanced occlusal plane, which lowers the incidence of tooth wear, gum disease, and temporomandibular joint disorders (TMD).

It was difficult to cure a canted occlusal plane with traditional orthodontics. In addition, micro implants provide skeletal anchoring to allow teeth on the canted side to erupt (Fig 9)

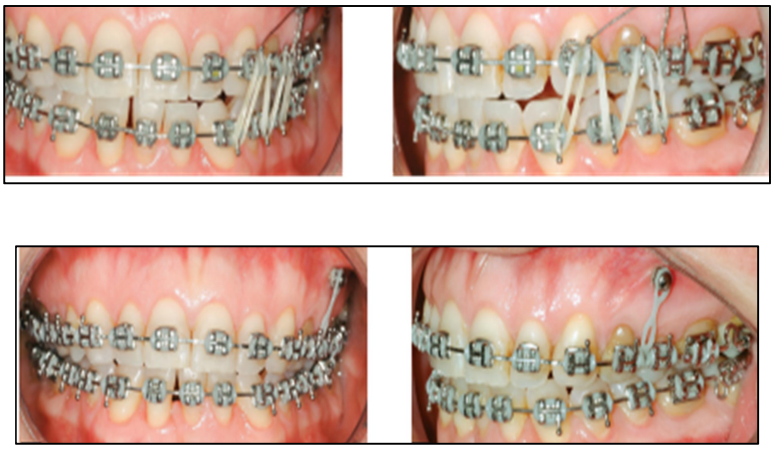

Figure 9: Correction Of Canted Occlusion With Tads

Correction of dental midline

The ideal alignment of the dental midline with the face midline is when it splits the upper and lower teeth into left and right halves.

When the dental midline is out of alignment with the facial midline, it results in an asymmetrical grin and face, which is known as a dental midline discrepancy. This may be brought on by a number of things, including tooth loss, dental crowding, or skeletal irregularities.

Temporary anchorage devices (TADs) can be utilized to provide stable anchorage for accurate tooth movement to correct a dental midline discrepancy. To direct the teeth into the proper position, TADs are inserted in the jawbone strategically and joined to orthodontic wires or elastic bands. Teeth can move more predictably and precisely thanks to the stable anchor provided by TADs.

TADs can be used to address dental midline abnormalities, and they provide a number of benefits, such as shorter treatment times, increased precision, and better control over tooth movement. The use of TADs also lessens the requirement for other orthodontic devices, like as headgear or elastics, which can be uncomfortable or bothersome for the patient.

Intermaxillary elastics are typically used to repair dental midlines when patient cooperation is crucial. The bite of elastics can intensify as a result of vertical force, which is one of its main drawbacks. Miniscrews could therefore be a practical substitute. The head of a screw can be positioned either buccally or lingually, and the line of force is directed more occlusally with an enhanced horizontal vector at the crown borders (Fig 10)

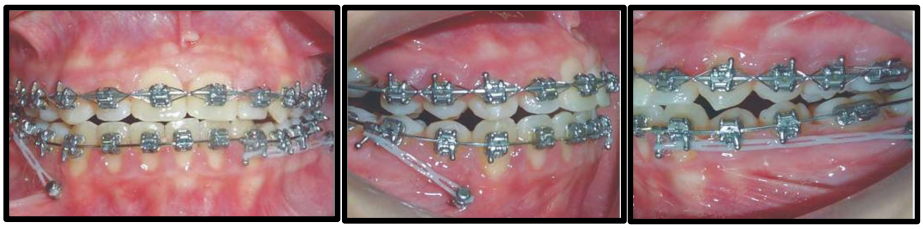

Figure 10: Correction Of Midline With Tads

Molar Mesialization

The orthodontic treatment method known as molar mesialization with TADs (temporary anchoring devices) includes advancing the molars towards the front of the mouth. When there is not enough room for further teeth to erupt or when the molars have moved backward, resulting in a malocclusion, molar mesialization may be required.

TADs are tiny, temporary screws that are inserted into the jawbone to give orthodontic pressures a secure anchor. TADs are carefully positioned in the jawbone during molar mesialization and attached to the molars with orthodontic wires or elastic bands. The TADs serve as an anchor, enabling the molars to migrate forward in a precise and regulated manner.

Molars have occasionally shifted mesially to close extraction spaces. The difficult process of mesialization of the molar can also result in problems including anterior anchoring loss and molar tipping. Following the initial phase, insertion of a mini screw can help engage a full-sized archwire and prevent mesial crown tipping of the molars during space closure in extraction cases.By positioning the mini screw at the midpoint of the space, the force vectors are closer to the center of resistance of the molar. This provides a stable skeletal anchorage for anterior retraction, which can prevent posterior anchorage loss and minimize changes to the curve of Spee and overbite. (Fig 11) [16]

Faster treatment timeframes and better control of tooth movement are two benefits of molar mesialization with TADs. Additionally, it does away with the need for additional orthodontic devices like elastics or headgear, which can be uncomfortable or bothersome for the patient.

To find out if molar mesialization with TADs is the best solution for your particular orthodontic needs, it is crucial to speak with a knowledgeable orthodontist. Because every case is different, the ideal treatment strategy for getting the best results requires a thorough review. A safe and efficient treatment option that can dramatically enhance the functionality and appearance of your smile is molar mesialization using TADs.

Figure 11: Molar Mesialization

Molar distalization[8]

When there is crowding, a malocclusion, or a need to provide more room for other teeth, molar distalization may be indicated.

TADs are tiny, temporary screws that are inserted into the jawbone to give orthodontic pressures a secure anchor. TADs are positioned carefully in the jawbone during molar distalization and attached to the molars with orthodontic wires or elastic bands. The TADs serve as an anchor, enabling the molars' precise and controlled migration backward.

For the treatment of molar distalization, there are numerous fixed and removable prostheses available, although numerous investigations of distalization reveal anterior anchoring loss. The TAD system is thought to be the best option for molar distalization. Palate is the best location for placing. If the tiny implant is less than 2mm, the palatal anchorage will not be stable enough (Figure 12)

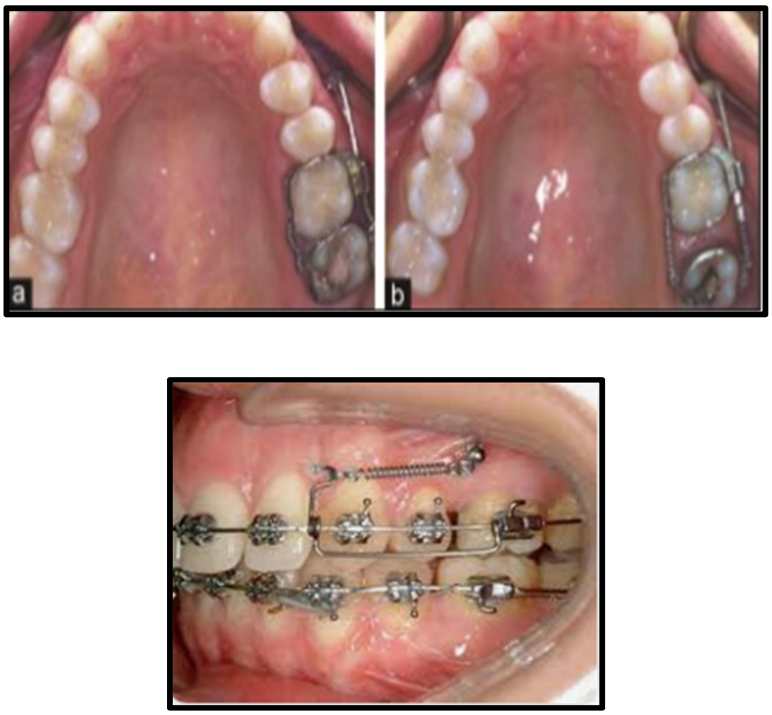

Figure12: Molar Distalization

The use of TADs for molar distalization has a number of benefits, including quicker treatment timeframes and better control over tooth movement. Additionally, it does away

with the need for additional orthodontic devices like elastics or headgear, which can be uncomfortable or bothersome for the patient.

Intermaxillary anchorage

Elastics or anterior repositioning devices are used to do Class II correction (i.e. Jasper Jumper, Bite Fixer, etc.). These types of mechanics have a lot of negative side effects, including opening of the bite and excessive anterior movement (proclination and protrusion) of the lower incisors, to mention a couple (Fig 13)

Figure 13: Implants Are Used For Intermaxillary Fixation

Molar Intrusion[17]

It is quite challenging to accurately put the microscrews between the first and second molar roots without affecting the teeth's roots during implantation or intrusive motions. Furthermore, in cases when there is not enough room for the screw placement, the intrusion force may need to be relatively strong and multiple screws may be required. For the aforementioned reasons, it is advised to only employ miniscrews in instances of straightforward molar intrusion of one or two teeth (Fig 14).

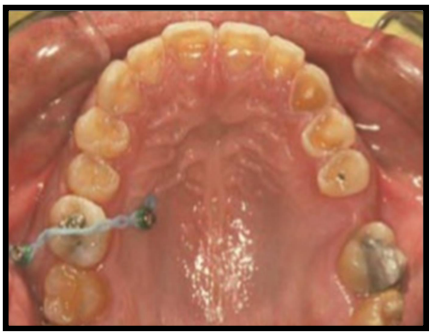

Figure 14: Implants Are Used For Molar

When prosthodontic treatment of a missing molar has been delayed, the traditional treatment has been to reduce the crown length of the tooth opposite the extruded tooth or to adjust the path of intrusion. Intrusion by subapical osteotomy or extraction of extruded molar are more aggressive alternatives.

The orthodontic treatment should aim to intrude or upright the extruded or tilted teeth to restore the original occlusal plane and minimize any further damage to the teeth.

Intrusion of teeth using conventional orthodontic methods often results in extrusion of the anchorage tooth due to the law of action and reaction. Despite efforts, efficient molar intrusion is difficult to achieve. Moreover, extrusion of adjacent teeth may lead to clockwise rotation of the mandible, causing anterior open bite or retrusion of the chin. Therefore, alternative methods such as TADs may be considered for efficient and effective molar intrusion.

Mini-screws can be used to obtain absolute anchorage in order to obtain tooth movement. Their simple design makes them comfortable to the patient; side effects, such as extrusion of adjacent teeth are minimized, so that results are more reliable; and the implantation technique is relatively simple as is controlling the direction and amount of force.

Young-Chel Park et al[18]utilized miniscrews to achieve intrusion of extruded molars. They implanted two mini-screws mesiodistally to the tooth to be intruded on the palatal side. On the buccal side, an L-type mini-plate was implanted at the zygomatic crest[19], with one end exposed through the buccal vestibule.Lingual buttons were attached to the tooth, and an intrusion force was applied using elastic thread or power chain. The retention of the intruded molar was accomplished with restorations in the opposite arch.

If there isn't enough space to carry out molar intrusions, an open-coil spring can be used after passively bracketing the premolars and second molars. Once adequate space is obtained, the teeth to be intruded can be intruded using power chains.

The amount of force to be used to cause intrusion: For molar intrusion, Umemori et al recommended an initial force of 500g. Kalra et al suggested 90gms per tooth for molar intrusion in growing children. Melson and Fiorelli used 50gms buccolingually to intrude maxillary molars in adult patients.

Young-Chel Park et al. have used mini-screws in order to cause intrusion of the extruded molars and concluded that by simply implanting mini-screws and controlling the direction and amount of force can obtain successful molar intrusion.

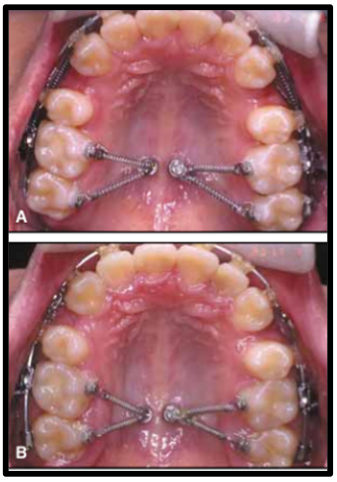

Figure 14: Implants Used For Molar Intrusion

Considering the number and the surface area of posterior tooth roots, it is reasonable to apply intrusion forces 2 to 3 times greater than those applied on anterior teeth

Upper Third Molar Alignment

Mini screws can also be useful in situations where traditional orthodontic mechanics cannot be used, such as when there are multiple missing teeth. For example, an upper third molar can be straightened using a fixed sectional wire and a palatal mini screw as skeletal support to prevent excessive protrusion of the molar. (Figure 15)

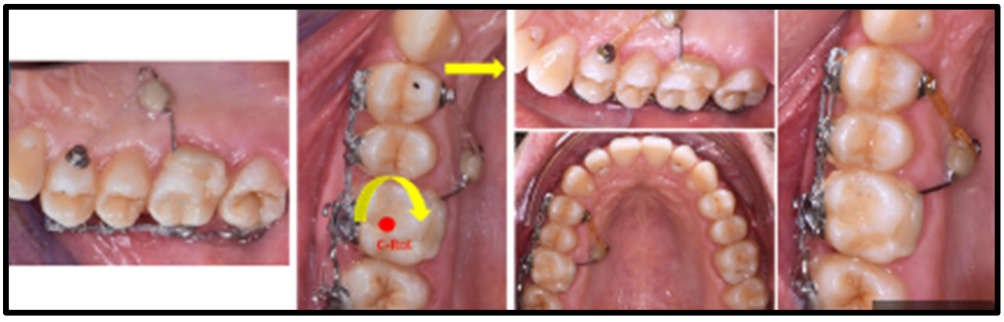

Figure 15: Upper 3rd Molar Alignment

Extrusion of Impacted Canine

To prevent anchorage loss and canting of the occlusal plane during the alignment of an impacted canine, various treatment approaches have been proposed. A few authors have suggested attaching auxiliary components to the primary archwire, like Kilroy springs. Archwires with superelastic overlays have been suggested by others. In order to bring an impacted canine into occlusion and prevent anchorage loss and canting of the occlusal plane, several treatment options have been proposed. One method is to use miniscrews to apply strong forces without relying on other teeth for support. Depending on whether the impacted canine is palatally or lingually positioned, the miniscrew can be positioned to provide the optimal force vector, and can even be adjusted as the canine is extruded.[20] (Fig 16a and b)

Figure 16 A: Extrusion Of Impacted Canine

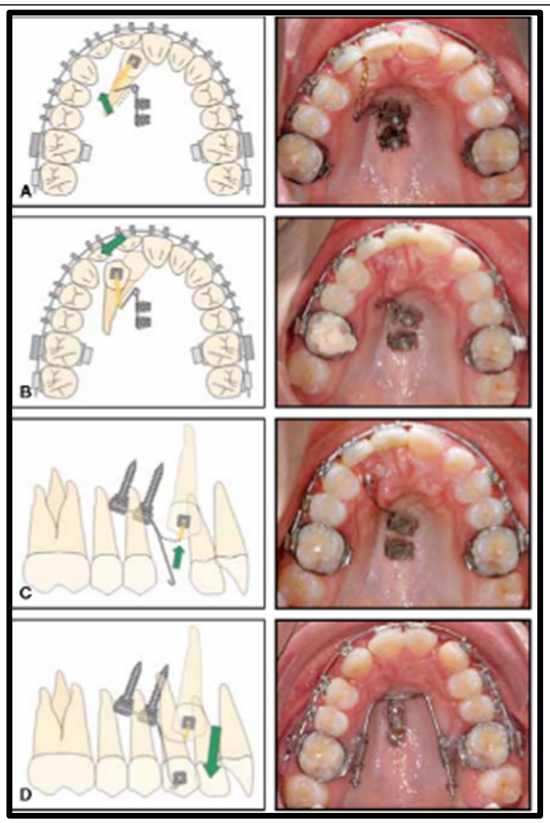

Figure 16 B: Extrusion Of Impacted Canine

Correction of Molar Crossbites (Fig 17)

Through-the-bite elastics are necessary for scissors bite correction with traditional orthodontic mechanics; nevertheless, if these elastics are utilized, undesired posterior tooth extrusion may result. But during buccalcrossbite treatment, the same type of uprighting and intrusion is seen when micro-implants are employed.[21]

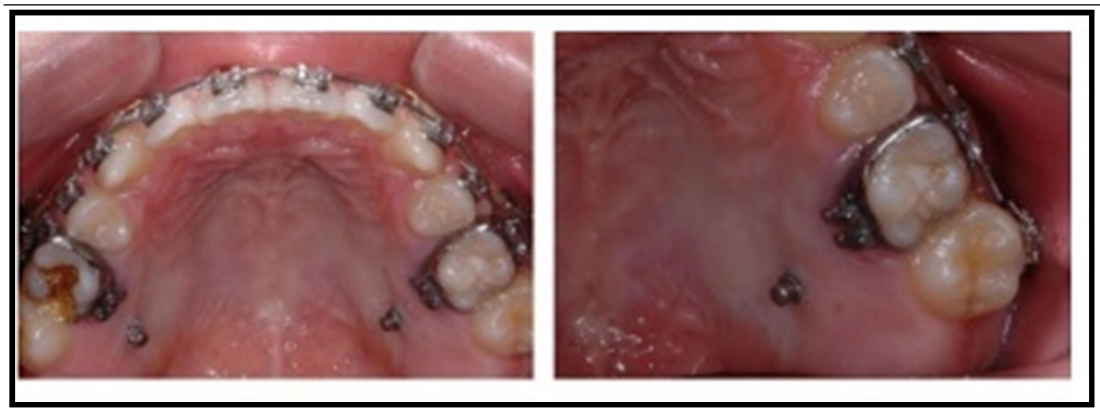

Figure 17: Tads In Palatal Slope Area As Direct Anchorage For Scissor Bite Correction

MARPE –miniscrew assisted rapid palatal expansion[22]

The application of orthopaedic forces or a surgical intervention is required for the treatment of the constricted maxillary arch in order to achieve expansion. Individuals who have little to no growth left may be reluctant to have surgery, which led to efforts to address these deficits without undergoing surgery, which served as the inspiration for the creation of MARPE. The MARPE appliance, developed by Dr. Won Moon et al.,[23] is a creative modification of the RME appliance and a breakthrough in the treatment of transverse malocclusion. Since its creation, this has demonstrated to be a practical and effective nonsurgical choice for young people.

A maxillary skeletal expander (MSE) with four miniscrews parallel to the midpalatal suture was created by Mac Ginnis et al[24]based on Lee's experiments. The device had two posterior screws with a length of 9mm, two anterior screws with a diameter of 1.5 to 1.8 mm and a length that could be adjusted depending on the anatomical thickness of the patient's palate. [Fig 18 a and b]

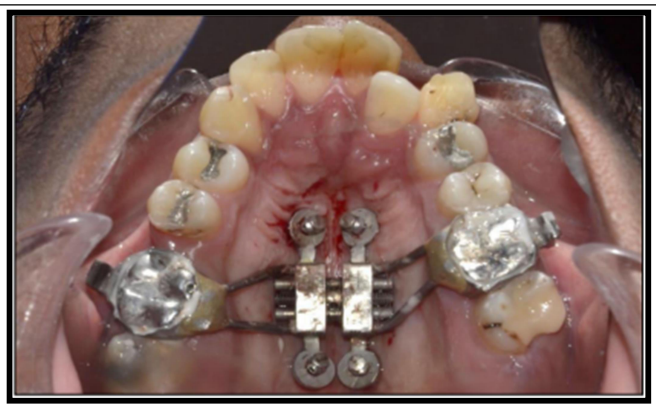

Figure 18 a: MARPE-Miniscrew Assisted Rapid Maxillary Expansion

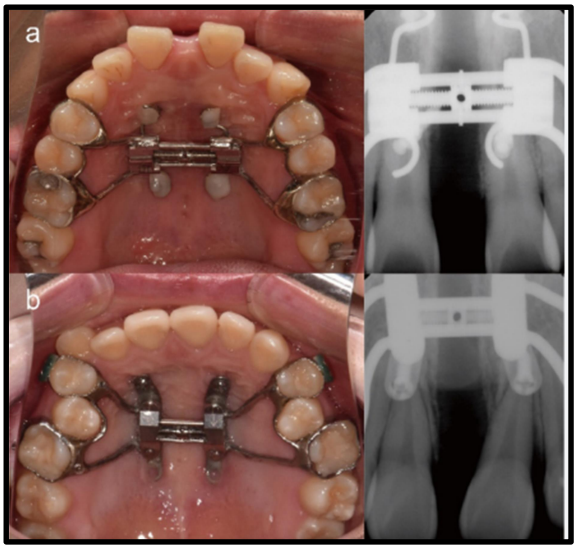

Figure 18 b: MARPE-Miniscrew Assisted Rapid Maxillary Expansion

REFERENCES

1. Salehi P, Torkan S, Roeinpeikar SMM, Salehi P, Torkan S, Roeinpeikar SMM. The Use of Mini-Implants (Temporary Anchorage Devices) in Resolving Orthodontic Problems

2. Samuels RH, Jones ML. Orthodontic facebow injuries and safety equipment. Eur J Orthod. 1994 Oct;16(5):385–94.

3. Uzuner F, Işık aslan B. Miniscrew Applications in Orthodontics. In 2015.

4. Herman R, Cope J. Temporary anchorage devices in orthodontics; Mini implants. Semin Orthod 2005,11;32-9

5. Bhutani R, Mehan P. The Role of Implants in Orthodontics. International Journal of Oral Implantology & Clinical Research. 2012 Apr;3(1):36–8.

6. Baumgaertel S, Razavi MR, Hans MG. Mini-implant anchorage for the orthodontic practitioner. Am J Orthod Dentofacial Orthop. 2008 Apr;133(4):621–7.

7. Insertion torque and orthodontic mini-implants: A systematic review of the artificial bone literature - Reint Meursinge Reynders, Laura Ronchi, Luisa Ladu, Faridi Van Etten-Jamaludin, Shandra Bipat, 2013 . [2023 May 1].

8. Massey CC, Kontogiorgos E, Taylor R, Opperman L, Dechow P, Buschang PH. Effect of force on alveolar bone surrounding miniscrew implants: a 3-dimensional microcomputed tomography study. Am J Orthod Dentofacial Orthop. 2012 Jul;142(1):32–44.

9. Hembree M, Buschang PH, Carrillo R, Spears R, Rossouw PE. Effects of intentional damage of the roots and surrounding structures with miniscrew implants. Am J Orthod Dentofacial Orthop. 2009 Mar;135(3):280.e1-9; discussion 280-281.

10. Chen Y, Kyung HM, Zhao WT, Yu WJ. Critical factors for the success of orthodontic mini-implants: a systematic review. Am J Orthod Dentofacial Orthop. 2009 Mar;135(3):284–91.

11. Lombardo L, Gracco A, Zampini F, Stefanoni F, Mollica F. Optimal palatal configuration for miniscrew applications. Angle Orthod. 2010 Jan;80(1):145–52.

12. Baumgaertel S. Predrilling of the implant site: Is it necessary for orthodontic mini-implants? Am J Orthod Dentofacial Orthop. 2010 Jun;137(6):825–9.

13. Liu TC, Chang CH, Wong TY, Liu JK. Finite element analysis of miniscrew implants used for orthodontic anchorage. Am J Orthod Dentofacial Orthop. 2012 Apr;141(4):468–76.

14. A H, Navedha, P SA, T N, Rijash M. Segmental intrusion and retraction with tads for the correction of gummy smile -A case report. International Journal of Oral Health Dentistry. 2020 Jul 15;6(2):150–5.

15. Nayak UK, Malviya N. Role of Mini-implants in Orthodontics. International Journal of Oral Implantology & Clinical Research. 2011 Dec;2(3):126–34.

16. Rastogi N, Kumar D, Bansal A. The role of implants in orthodontics. Journal of Dental Implants. 2011 Jul 1;1(2):86.

17. Sherwood KH, Burch JG, Thompson WJ. Closing anterior open bites by intruding molars with titanium miniplate anchorage. Am J Orthod Dentofacial Orthop. 2002 Dec;122(6):593–600.

18. Moon CH, Park HK, Nam JS, Im JS, Baek SH. Relationship between vertical skeletal pattern and success rate of orthodontic mini-implants. Am J Orthod Dentofacial Orthop. 2010 Jul;138(1):51–7.

19. Chae JM, Paeng JY. Orthodontic treatment of an ankylosed maxillary central incisor through single-tooth osteotomy by using interdental space regained from microimplant anchorage. Am J Orthod Dentofacial Orthop. 2012 Feb;141(2):e39-51.

20. SA M. TADs assist forced eruption of upper labially impacted canine - Case report. Clinical and Medical Reports. 2018 Jan 1;1.

21. Lee K, Lim S, Lee G, Park JH. Scissor Bite Correction with TADs. In: Park JH, editor. Temporary Anchorage Devices in Clinical Orthodontics [Internet]. 1st ed. Wiley; 2020 [cited 2023 Mar 11]. p. 259–70

22. Kumar N, Desai A, Nambiar S, Shetty S. Miniscrew Assisted Rapid Palatal Expansion (Marpe) – ExpandingHorizons To Achieve An Optimum In Transverse Dimension: A Review. Clinical Medicine. 2021;08(02).

23. Carlson C, Sung J, McComb RW, Machado AW, Moon W. Microimplant-assisted rapid palatal expansion appliance to orthopedically correct transverse maxillary deficiency in an adult. Am J Orthod Dentofacial Orthop. 2016 May;149(5):716–28.

24. MacGinnis M, Chu H, Youssef G, Wu KW, Machado AW, Moon W. The effects of micro-implant assisted rapid palatal expansion (MARPE) on the nasomaxillary complex—a finite element method (FEM) analysis. Prog Orthod. 2014 Aug 29;15(1):52.