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Case Report

Complication of Trans-Palatal Arch (TPA) appliance placement: A case of palatal mucosa embedment

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Abstract

The Trans-Palatal Arch (TPA) is a fixed orthodontic appliance commonly used to reinforce posterior anchorage during orthodontic treatment. Despite its functional benefits, the TPA can lead to soft tissue irritation and mucosal lesions, including persistent discomfort and grooves on the tongue or palate due to its close proximity to the palatal tissues. In rare instances, the appliance may become embedded in the palatal mucosa.

This case report describes the embedment of a TPA in the palatal soft tissue of a 35-year-old female patient and describes a successful management approach. The embedded appliance was surgically removed by the Department of Periodontics using a diode laser *(BioLase soft tissue laser).* Postoperative healing was uneventful, with complete resolution observed within one month. A new TPA was fabricated with a 2.5 mm clearance from the palatal mucosa. Upon reinsertion, the modified appliance fit appropriately without further tissue involvement or adverse reactions.

The etiology of the TPA embedment was attributed to a fabrication error resulting in inadequate palatal clearance, added by vertical forces exerted by the dorsum of the tongue. This case highlights the importance of incorporating sufficient palatal clearance in TPA design and considering tongue posture during appliance fabrication to prevent similar complications.

Keywords: Trans-palatal arch (TPA), Palatal mucosa, Orthodontic appliance complications, Tongue Position, Laser surgery..

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1. Introduction

Trans-Palatal Arch (TPA) is a fixed orthodontic appliance commonly employed to reinforce posterior anchorage by connecting the palatal aspects of contralateral maxillary molars, following the contour of the palate. It is also referred to as the *trans-palatal bar, palatal bar, or palatal arch bar.*[1] (**Figure 1**)

The TPA has become an integral component of contemporary orthodontic practice due to its versatility. It is utilized for maintaining arch width, correcting molar rotations, reinforcing anchorage, facilitating molar expansion and distalization, as well as enabling molar intrusion.[2] Its adaptability allows for the modification or *stabilization of maxillary molar positions in all three spatial planes.*

Traditionally, the TPA is fabricated from heavy-gauge stainless steel wire that is 0.9 mm (0.036").[3] The original design consists of a *straight palatal bar connecting the left and right buccal segments*, commonly termed a trans-palatal bar.[4]

While transient mucosal changes associated with orthodontic appliances are frequently observed, persistent or long-term lesions are comparatively rare.[6]

This case report presents a rare instance of a Trans-Palatal Arch (TPA) appliance becoming embedded within the palatal mucosa. The embedded TPA was successfully removed using *soft tissue laser technology*. Recent advancements in *laser-assisted dentistry* have introduced minimally invasive alternatives to conventional surgical techniques.[7] The use of lasers offers several clinical

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advantages, including a bloodless surgical field, minimal collateral tissue damage, and reduced postoperative swelling and discomfort.[8]

2. Case Report

A 35-year-old female patient undergoing orthodontic treatment for Angle's Class I bimaxillary protrusion presented with a chief complaint of spacing and proclination of maxillary and mandibular anterior teeth. The treatment plan involved the extraction of all four first premolars, followed by space closure. To reinforce maximum maxillary anchorage, a modified Trans-palatal arch (TPA) incorporating a Nance button was cemented onto the molars. This appliance was designed and placed to enhance three-dimensional stabilization of the molars by minimizing their unwanted movement, maintaining the transverse dimension of the maxillary arch, and preventing buccal segment collapse.[5,9](**Figure 1**).

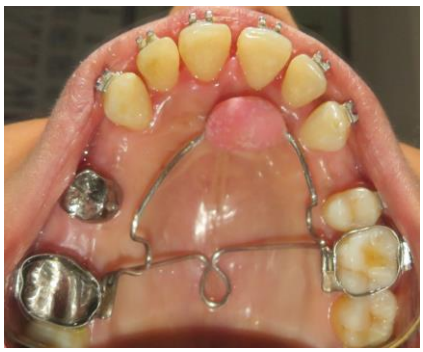

Figure 1: Pre-embedment intraoral photograph of a modified Trans-Palatal Arch (TPA) appliance.

Within five months of treatment, the patient began experiencing discomfort associated with the Trans-Palatal Arch (TPA) appliance penetrating the palatal mucosa. Notably, during this period, the patient had missed three consecutive follow-up appointments. Upon her subsequent visit, intraoral clinical examination revealed partial embedding of the "U-shaped loop" of the TPA into the palatal tissue.

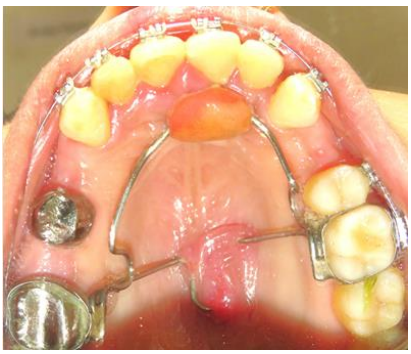

Figure 2: Post-embedment intraoral photograph of a modified trans-palatal arch appliance.

This was accompanied by:

1. Partial epithelialization of the mucosa over the loop
2. Localized inflammation and redness surrounding the affected area of mucosal tissues.
3. Swelling and overgrowth of palatal tissue around the mid-palatal loop of the TPA. (**Figure 2**)

These findings indicated a need for timely intervention and prompt further treatment plan to address the complications associated with the TPA embedment.

The embedded TPA was surgically removed by the Department of Periodontics using a soft tissue diode laser.

Before initiating the treatment, the patient received a thorough explanation of the laser procedure. The necessary preparatory steps were taken such as:

1. Blood investigations were done.
2. All safety guidelines were taken into consideration.
3. Informed consent was obtained from the patient.

2.1. Surgical interventional procedure

2.1.1. Clinical management and laser-assisted removal of embedded trans-palatal arch

1. Local anaesthesia was administered via palatal infiltration until tissue blanching was observed. A soft tissue diode laser (*BioLase Diode Laser with E4 surgical tips*) was then employed to perform precise incisions on either side of the embedded U-shaped loop of the Trans-Palatal Arch (TPA) (**Figure 3**). The laser settings were as follows:
   - Wavelength: 980nm
   - Output energy: 1.0-1.5W
2. A 400-micron diameter disposable straight E4 tip was used in continuous mode. Gentle sweeping motions were applied to avoid direct contact with the TPA wire and loop, thereby minimizing the risk of thermal damage to the appliance.
3. High-speed suction was utilized throughout the procedure to maintain a clear surgical field, reduce laser plume, and eliminate the odour of cauterized tissue.
4. To further protect surrounding tissues and minimize the risk of thermal injury, moistened gauze was intermittently applied to adjacent areas when the laser was not in use.
5. The embedded TPA was successfully excised and removed from the palatal mucosa without complications (**Figure 4**, **Figure 5**). *Postoperative analgesics* were prescribed to manage discomfort and *oral hygiene maintenance instructions* were given (table.1). The patient was recalled for follow-up the following day, and initial healing was satisfactory. At the one-week review, mild erythema and localized inflammation were noted (**Figure 6**).

6. However, complete mucosal healing was achieved by one month postoperatively, with no signs of residual inflammation or tissue damage (**Figure 7**).

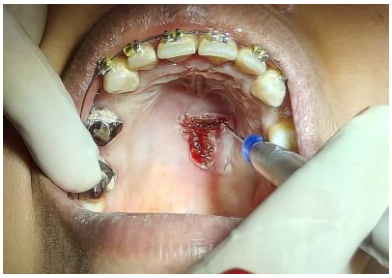

Figure 3: Removal of embedded trans-palatal arch appliance using a soft tissue diode laser.

Table 1: Management protocol for embedded TPA

Component	Recommendation
Oral Hygiene	- Soft toothbrush - Warm saline rinses (3–4× daily) - Avoid irritant (Spicy, Hard, Acidic) foods
Antiseptic Rinse	Chlorhexidine gluconate 0.12%, rinse twice daily for 1–2 weeks
Analgesics	- Paracetamol 500 mg TID - or Ibuprofen 400 mg TID (if inflammation present)
Topical Medication	Triamcinolone acetonide 0.1% oral paste, applied 2–3× daily to ulcerated tissue
Antibiotics (if infection present)	Amoxicillin 500 mg TID × 5 days (Clindamycin 300 mg TID if penicillin-allergic)
Orthodontic Intervention	Immediate removal or adjustment of the TPA
Follow-up	Re-evaluate healing in 7–10 days

2.1.2. Further treatment and appliance modification

Following removal of the embedded appliance, two primary treatment options were considered:

1. Fabrication of a new Trans-Palatal Arch appliance, or
2. Utilization of a modified TPA design to prevent recurrence.

In this case, a new TPA was fabricated, correcting the original design error by ensuring a 2.5 mm clearance between the arch and the palatal mucosa (**Figure 8**, **Figure 9**). This modification was aimed at preventing further embedment and accommodating tongue posture during function. The revised appliance was well-tolerated by the patient, with no adverse tissue response upon reinsertion (**Figure 10**).

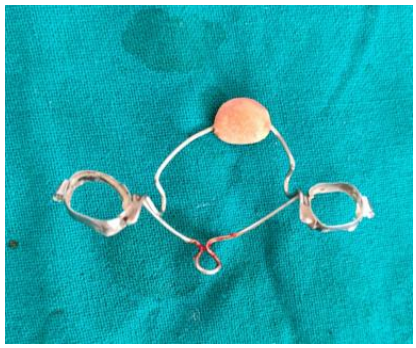

Figure 4: The removed TPA appliance.

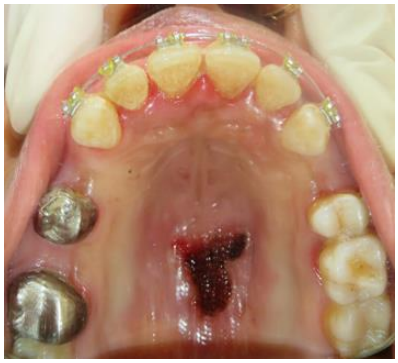

Figure 5: Immediate Postoperative: After (TPA) appliance was carefully removed using a laser.

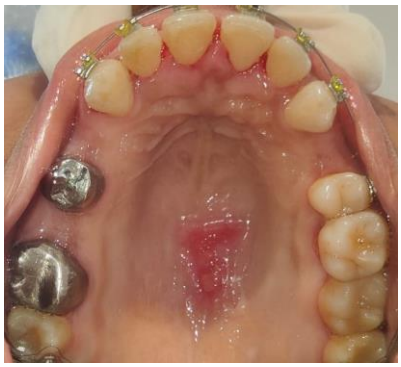

Figure 6: One week postoperative: Partial healing was observed, accompanied by slight inflammation.

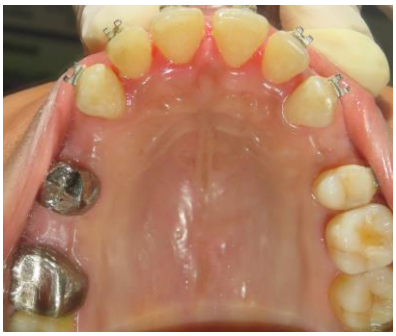

Figure 7: One month postoperative: Complete healing was observed, with no any signs of inflammation.

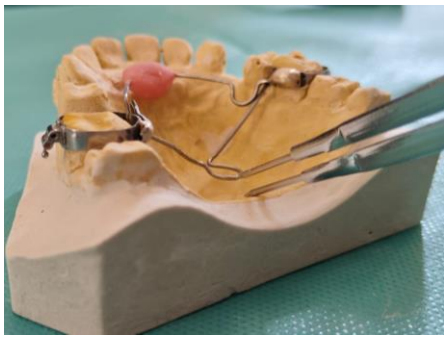

Figure 8: A newly fabricated modified trans palatal arch appliance with 2.5mm of palatal clearance.

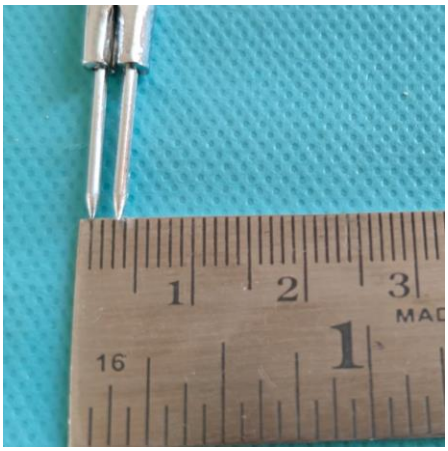

Figure 9: Clearance confirmed on metal scale for accuracy.

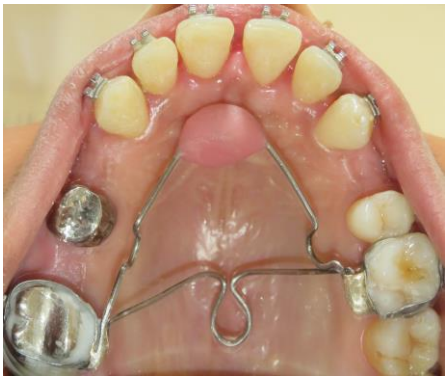

Figure 10: A newly fabricated modified trans palatal arch appliance, accurately positioned intraorally with appropriate clearance.

3. Discussion

Orthodontic treatment is inherently complex, often requiring the use of various auxiliary appliances to address diverse clinical needs[1]. One such appliance is the Trans-Palatal Arch (TPA), a fixed orthodontic device that plays a pivotal role in multiple treatment protocols due to its versatility and effectiveness.[2]

The primary function of the TPA is to stabilize and maintain the transverse dimension of the maxillary arch, thereby preventing buccal segment collapse and ensuring proper arch development[3]. This stabilization is especially critical during space closure following premolar extractions, where anchorage preservation is essential[5]. In addition to maintaining arch width, the TPA is frequently used for the correction or prevention of posterior crossbites and to reinforce anchorage during complex tooth movements (**Figure 1**).

The TPA can also be integrated with other orthodontic appliances to enhance treatment outcomes, particularly in cases involving impacted teeth or in the stabilization of dental movements[4]. For instance, it may serve as a valuable anchorage adjunct in the orthodontic management of impacted canines or contribute to arch stability in Class III malocclusion correction protocols.[9]

Despite its many benefits, the use of a TPA is not without complications. Orthodontic patients are at risk of iatrogenic soft tissue trauma, and the TPA may induce irritation or even embedment into the palatal mucosa. This adverse effect may present clinically as discomfort, inflammation, or ulceration, particularly if the appliance is poorly adapted (**Figure 2**).[6] Several etiological factors have been implicated, including fabrication errors that result in inadequate clearance from the palatal tissue, vertical forces from tongue pressure, or unintended molar intrusion that displaces the appliance closer to the palate.[12]

To mitigate soft tissue irritation caused by TPAs, various preventive and therapeutic strategies have been proposed. The application of orthodontic wax over the wire can reduce mechanical irritation, while chlorhexidine mouth rinses may help prevent secondary infections.[5] Importantly, patients should be counselled regarding the possibility of mucosal irritation, and the appliance should be removed or adjusted once it has fulfilled its intended purpose.[13]

In severe or persistent cases of palatal embedment, surgical intervention may be warranted to remove the appliance and facilitate healing.[11] The treating clinician holds a key role in reinforcing oral hygiene measures and identifying soft tissue changes during routine visits. Regular evaluation enables early detection of gingival inflammation, mucosal trauma, or appliance-related irritation, allowing timely intervention and modification of treatment to maintain optimal oral health.

To address the limitations of conventional TPA designs, various modifications have been proposed. Kumar et al. introduced U-shaped loops and arch wire sleeves to maintain a safe distance between the appliance and the palatal mucosa, thereby reducing irritation.[9] Gupta et al. (2013) further modified the TPA by incorporating a 1-inch arch wire sleeve with an internal diameter of 0.31 inches over a 0.9 mm stainless steel wire during the fabrication of the U-loop. This innovation successfully minimized tongue and palatal irritation by preventing direct contact between the wire and soft tissue.[10]

In instances where irritation persists despite preventive measures, diode laser-assisted soft tissue procedures have emerged as an effective intervention. The use of diode lasers offers several advantages, including a relatively bloodless surgical field, reduced postoperative swelling, minimal scarring, and enhanced patient comfort.[7,8]

In summary, the design, fabrication, and periodic evaluation of the trans palatal arch are critical to minimizing the risk of soft tissue trauma. Modified TPAs with added features such as loops or sleeves may significantly enhance patient comfort and reduce complications.[14] A well-constructed and properly monitored TPA appliance contributes to a favourable orthodontic outcome while ensuring patient safety and satisfaction.

4. Conclusion

The Trans-Palatal Arch (TPA) appliance serves as a valuable adjunct in orthodontic treatment, offering significant versatility in anchorage control and arch stabilization. However, if not appropriately designed, adjusted, or monitored, it may lead to soft tissue irritation and mucosal lesions. Careful appliance design, precise fabrication, and regular clinical monitoring are essential to minimize the risk of tissue embedment and associated complications. Such preventive measures contribute to improved patient comfort and enhance the overall success of orthodontic treatment.[11]

5. Conflict of Interest

None.

6. Source of Funding

None.

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