

## A Sword in Orthodontist's Arsenal-Temporary Anchorage Devices

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Temporary Anchorage Devices have recently been nothing but a savior in Orthodontic practices. Who knew a tiny titanium, or a stainless-steel screw would change the horizons of treatment and expand the envelope of discrepancy in Orthodontics. Introduced by Gainsforth and Higley (1945), it was first used to distalise a maxillary canine in a dog. The concept of osseointegration and titanium implants for prosthesis was introduced by Per Ingvar Branemark. Creekmore and Eklund (1983) reported the first therapeutic use of TADs for anterior nasal spine intrusion. Recent research explores palatal on plants, mid-palatal screws, and miniplate implants for orthodontic applications [1].

Mini-implants also called mini-screws or TADs in orthodontics. Orthodontic mini-implants are miniature versions of prosthetic dental implants. The size of orthodontic mini-implants varies from 1.5mm to 2mm in diameter and from 6mm to 10mm in length. The surfaces of orthodontic mini-implants are more processed compared to prosthetic dental implants. The reason is that orthodontic mini-implants do not depend on osseointegration with bone but rather on mechanical retention for retention [2].

The components of the TAD include the head, neck, and screw part. TADs are classified based on various sizes, head types, screw types, and biocompatibility. These factors are paramount in their selection and placement in orthodontic treatment. The Cope JB classification (2005) further categorizes TADs into biologic, ankylosed teeth, dilacerated, and biocompatible types [3].

The various applications of TADs include Anterior Intrusion and extrusion, Posterior Intrusion and Extrusion, Occlusal Cant Correction, Maxillary Orthopedic Expansion, Asymmetric Transverse Control, Distalisation, Protraction and retraction. Recently, there has been an advent of a hybrid approach in the treatment of clear aligners where TADs play an integral role in performing complex tooth movements.

Temporary anchorage devices have developed into important orthodontic adjuncts for expanding the scope of biomechanical therapy and enhancing clinical outcomes [4]. They have dramatically altered orthodontic treatment planning. It may not be an exaggeration to state that such devices have resulted in a complete paradigm shift within the field of modern orthodontics. They have become an important tool in treating complex cases where conventional orthodontic treatment has proven difficult.

A crucial step in the success of TADs is the placement of the screw without causing damage to the root or surrounding structures. Atraumatic placement of TAD requires knowledge of surrounding structures and various diagnostic aids such as imaging to make an errorless placement. Recently, various adjuncts and methods have been developed to simplify TAD placement.

Various studies have been conducted to determine the success of mini-implants and it ranged from 35% to 95% in the literature [5]. Nevertheless, it depends on a lot of factors such as the quality of bone, trabecular pattern, proximity to surrounding structures, age, and gender of the patient.

In the future, we can expect the TADs to be custom-made for each patient with reduced complications, insertion time, fewer post-operative complications, and improved material sciences. The contemporary applications of TADs have significantly expanded the scope of orthodontic treatment, offering solutions to complex cases. The future of TADs holds exciting opportunities for enhanced device design, advanced techniques, and interdisciplinary collaboration with scientific acumen ultimately shaping the landscape of orthodontics and patient care.

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