

“Evaluation of Conventional Corticotomy With Novel Piezosurgery In Orthodontic Treatment - Study Protocol For A Comparative Study”

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Abstract: *Background: Addressing the needs of young adults undergoing orthodontic for faster treatment with unrealistic requirements has become challenge in modern era to orthodontists. So, to meet the treatment needs of the patients a combined multidisciplinary approach of orthodontists and oral surgeon is required. Various techniques are emerging in accelerated orthodontics field. Piezosurgery being a novel minimally invasive technique has shown to be a emerging trend with good results with the piezocision technique. Objectives: We aim to evaluate and compare the conventional corticotomy with piezo-guided corticotomy in accelerated osteogenic orthodontic treatment. Methods: This randomized comparative study has sample size of 24 subjects equally divided in two groups, i.e. conventional corticotomy group done with bur and piezo-guided corticotomy group. The time required for the surgical procedure, rate and amount of tooth movement and total treatment time required for completion of space closure was measured. Along with this, secondary parameters like gingival recession, periodontal pocket formation and dehiscence/ fenestration formation were also assessed. Results: Piezosurgery being minimally invasive requires more time for surgical procedure, however, it more efficiently moved tooth with reduced total treatment time when compared to conventional corticotomy. The piezosurgical group resulted in faster rate as well as amount of tooth movement than bur group. Although there was no statistically significant difference evident in complications associated with accelerated orthodontics tooth movement. Conclusion: A novel, minimally invasive approach for surgical orthodontics with better patient acceptance is equally effective in accelerating orthodontic tooth movement and definitely widen the scope of surgically accelerated orthodontic treatment with prognostically satisfactory clinical outcomes.*

Keywords: *Corticotomy, Piezocision, RAP, PAOO*

INTRODUCTION:

Orthodontics along with Oral & Maxillofacial surgery are interdependent specialties since decades. Orthodontists rely on the Oral surgeon in several ways to ameliorate orthodontic

treatment outcomes. The main distress of teenagers today before wearing braces is how soon the orthodontic treatment will complete? Prolonged orthodontic treatment pose numerous possible complications like caries, periodontal diseases and root resorption. This leads to a longer treatment time. Thus by accelerating the orthodontic treatment, duration is shortened, possible complications aborted and maximum support and stability desired by orthodontist is achieved in lesser time.

Selective alveolar corticotomy-facilitated orthodontics accelerates tooth movement and broaden the aspects of treatment plan, reduced necessity for extraction of tooth with proper support and stability. **Corticotomy** is a surgical procedure which involves making cut over cortical bone that can be perforated or mechanically altered. **Kole** first introduced modern-day corticotomy-facilitated orthodontics.[1] He used the term ‘bony block movement’ for tooth /dental arch to describe his theory of movement after corticotomy and achieved rapid tooth movement after corticotomy. This eliminated hindrance of cortical bone in tooth movement by circumscribing corticotomy cuts. Recently a minimally invasive technique was introduced by **Dibart** as an alternative to conventional corticotomy optimized by piezoelectric devices thus initiating regional acceleratory phenomenon (RAP) and consequent acceleration of Orthodontic Tooth Movement (OTM) through Peizocision.[2]

Piezocision has shown promising results in animal & invitro studies with varying size and design of corticotomy cuts. Rapid treatment with a minimally invasive surgery is desirable. Unfortunately there are few studies demonstrating comparison of conventional corticotomy and piezocision. From these perspectives, we conduct a study to determine the competence of piezo-guided corticotomy with conventional corticotomy in orthodontic tooth movement.

Objectives:

The study is being carried out to determine the time required to perform both the surgical procedures, the difference in rate and total amount of tooth movement and associated complications like gingival recession, fenestration/dehiscence and periodontal pocket.

Trial Design:

A randomized, comparative split-mouth study design reviewed by Institutional Ethical Committee with a sample of 24 subjects will be recruited for study after obtaining a written informed consent.

METHODOLOGY:

The protocol of this study has been reviewed by Institutional Ethical Review Board of DMIMS (DU) (**Ref. No. DMIMS (DU)/IEC/2018-19/7504**). The present study will be performed in Oral & Maxillofacial surgery OPD in association with Department of Orthodontics, SPDC; Wardha (M) between October 2018 till May 2020. Subjects will be divided in two groups, where 24 patients divided equally in study and control group.

Inclusions:

- 1) Subjects between age of 14 to 25 years.

- 2) Healthy subjects requiring comprehensive orthodontic treatment.
- 3) Subjects willing to participate in the prescribed study, and are providing informed consent.
- 4) Subjects without any other systemic diseases affecting bone resorption.
- 5) Subjects with healthy periodontium.

Exclusions:

- 1) Subjects with previous orthodontic treatment.
- 2) Subjects with systemic diseases such as HTN, DM, blood dyscrasias and immunocompromised status.
- 3) Subjects having alveolar bone loss and periodontal disease.
- 4) Subjects who are not-willing to be a part of study.

EXPECTED RESULTS:

The study is aimed to determine which surgical modality is better in accelerating the tooth movement with reduced time period for total orthodontic treatment with minimal periodontal complications encountered throughout the course. Piezosurgery is equivalently efficient in accelerating tooth movement with minimal injury to soft tissue providing a key-hole surgical approach to attain RAP effect.

DISCUSSION:

Dr. Wilcko brothers considered the theory of localized demineralization-remineralisation process to be primarily responsible for acceleration in tooth movement. Micro-alterations within the periodontal ligament affects this process secondarily.[3] Then the **RAP** (Regional acceleratory phenomenon) was suggested by **Frost in 1982** [4] and rapid orthodontics propelled based on this phenomenon where an physical alteration over bone in the form of injury results in biomolecular dynamic activation of all the processes involved in healing, including inflammation, perfusion, metabolism, modeling, cell turnover, remodeling and micro-damage repair. This period of acceleratory effect of corticotomy has limited bone activation for certain period. The RAP effect points at initial 1-2 months post-corticotomy, later slowing down its effect near 4-6 months. Here first vertical slit-like gingival, interproximal microincisions are made of 5mm length through which ultrasound piezosurgical-tip inserts makes incisions over the cortical alveolar bone. The advantage of piezo-guided corticotomy is it avoids soft tissue injury and a small button hole sized incision would be enough to access the corticotomy site.

The ultrasound piezosurgical knife improves bone healing with minimal osteonecrosis and periodontal damage, thereby preserving root integrity due to precise and selective bone cutting action in comparison to motor-driven burs.[5] Also the piezoelectric knife has effect and works only on mineralized tissues such as bone with no damage to soft tissue and nearby neurovascular bundle.[5] The literature shows scarcity of such randomized human trials evaluating two surgical modalities in accelerating orthodontic tooth movement. Few related articles about Piezo surgery were reported by Pakhare et al [6] , Patil et al [7] and Vincze, et al[8] **Sundrani et al reported a case on** surgical orthodontic correction of class ii malocclusion

with vertical maxillary excess and gummy smile[9]. Thote et al reported about en-masse retraction of six maxillary anterior teeth in labial orthodontics [10].

CONCLUSION:

Clinicians and patients often encounter prolonged orthodontic treatment with increased risk of numerous complications. Thereby innovative interventions have evolved in the face of tissue engineering of periodontal tissue and this study will open gates to assess the efficacy of the various surgical modalities that will help attain better patient and doctor satisfaction.

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