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Original Research Article

PRESERVING BONE OR APPLYING FORCE? A COMPARATIVE STUDY OF PERIOTOME AND CONVENTIONAL EXTRACTION

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ABSTRACT

Background: An ideal tooth extraction aims at painless removal of the tooth with minimal trauma to surrounding tissues, allowing uneventful healing and preservation of alveolar bone. Atraumatic extraction techniques have gained importance in modern dentistry due to their role in preserving bone and soft tissue for future implant-supported rehabilitation. The aim is to evaluate and compare the efficiency of periotome-assisted tooth extraction with conventional forceps extraction.

Materials and Methods: This comparative study included 60 patients requiring extraction of single-rooted teeth. Patients were randomly allocated into two groups: Group A (conventional forceps extraction) and Group B (periotome-assisted extraction). Parameters assessed included time taken for extraction, grade of gingival laceration, postoperative healing using the Landry Healing Index, and immediate complications. Statistical analysis was performed using SPSS version 20.0.

Results: The periotome group demonstrated significantly fewer gingival lacerations ($p = 0.036$) and a trend toward improved healing outcomes ($p = 0.068$ at $\alpha = 0.10$). However, the time taken for extraction was significantly longer in the periotome group ($p = 0.039$). Immediate complications were fewer in the periotome group.

Conclusion: Periotome-assisted extraction is an effective atraumatic technique that preserves hard and soft tissue architecture, though it requires a longer operative time.

Keywords: atraumatic extraction, periotome gingival laceration.

INTRODUCTION

An ideal tooth extraction is defined as the painless removal of the entire tooth or root with minimal trauma to the surrounding hard and soft tissues, allowing uneventful healing and preventing postoperative functional or prosthetic complications.[1] primary objective of modern exodontia extends beyond simple tooth removal and focuses on the preservation of alveolar bone, gingival architecture, and adjacent anatomical structures. This shift in philosophy has become increasingly important with the widespread adoption of implant-supported and fixed prosthetic rehabilitation.[2-8]

Conventional extraction techniques using forceps and elevators rely largely on rotational, buccolingual, and tractional forces to disengage the tooth from its socket. While effective, these methods may generate excessive stress on the alveolar bone and surrounding soft tissues, leading to complications such as buccal plate fracture, gingival laceration, socket deformation, and delayed healing.[3] Loss of alveolar bone volume following traumatic extraction can compromise esthetics, reduce implant success rates, and necessitate additional augmentation procedures, thereby increasing treatment time, cost, and patient morbidity.[4,9-15]

To address these limitations, atraumatic extraction techniques have been developed with the goal of

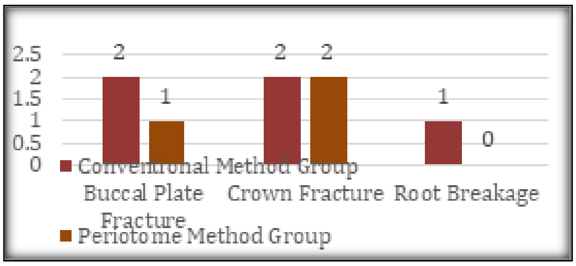
minimizing tissue injury while maintaining socket integrity. Among these, the periotome has gained considerable attention as a minimally invasive instrument specifically designed to sever periodontal ligament (PDL) fibers prior to tooth removal.[5] Periotome is a thin, sharp, blade-like instrument that is gently introduced into the periodontal space along the root surface. It functions on the principle of controlled wedging and progressive severance of PDL fibers, thereby reducing resistance to extraction and decreasing the need for excessive force.[6,16-22]
By facilitating gradual tooth luxation, periotomes help preserve the alveolar socket walls and surrounding gingival tissues, reducing the incidence of root fracture and alveolar bone damage.[7] These advantages are particularly significant in cases planned for immediate or delayed implant placement, where preservation of socket morphology is critical for achieving optimal functional and esthetic outcomes.[8] Additionally, atraumatic extraction using periotomes has been associated with reduced postoperative pain, minimal soft tissue trauma, and improved healing when compared with conventional extraction methods.[9,23-30]
Despite these proposed benefits, the routine use of periotomes remains limited, partly due to increased technique sensitivity, longer extraction time, and lack of widespread clinical training.[10] Moreover, existing literature presents variable outcomes, and further controlled clinical studies are required to substantiate the superiority of periotomes over conventional extraction techniques.[11,31-40] Therefore, a systematic clinical comparison of periotome-assisted extraction and conventional forceps extraction is essential to evaluate their effectiveness in terms of operative efficiency, soft-tissue trauma, and immediate postoperative outcomes.[41-44]
Aim and Objectives: The aim of this study was to evaluate the efficiency of periotome-assisted atraumatic extraction in comparison with conventional extraction techniques. The objectives were to compare time taken for extraction, assess soft tissue injury, evaluate postoperative healing, and record immediate complications.

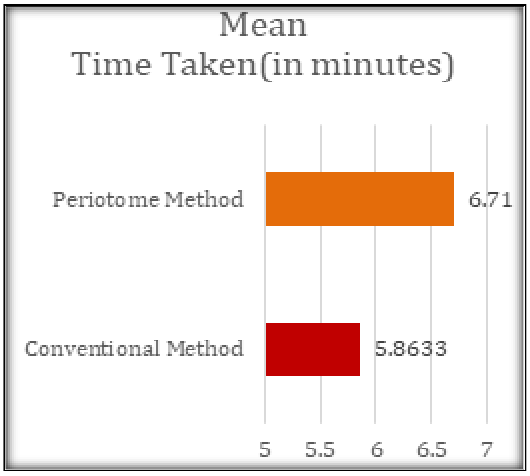
MATERIALS AND METHODS

This study was conducted in the Department of Oral and Maxillofacial Surgery, KMCT Dental College and Hospital Calicut, Kerala over a period of 18 months. A total of 60 patients requiring extraction of single-rooted teeth were included.
Patients were randomly divided into two groups of 30 each. Group A underwent non-surgical extraction using conventional forceps, while Group B underwent non-surgical extraction using a periotome. All procedures were performed by the same operator to eliminate operator bias.
Parameters assessed included time taken for extraction (measured from administration of local anesthesia to completion of extraction), grade of gingival laceration, postoperative healing using the Landry Healing Index, and immediate complications such as buccal plate fracture, crown fracture, and root breakage.
Statistical analysis was performed using SPSS version 20.0. Quantitative variables were expressed as mean and standard deviation, and qualitative variables as percentages. Shapiro–Wilk test was used to assess normality. Independent sample t-test, Mann–Whitney U test, and Chi-square test were applied as appropriate. A p-value < 0.05 was considered statistically significant.

RESULTS

The conventional extraction group comprised 15 males (50%) and 15 females (50%), whereas the periotome group included 10 males (33.3%) and 20 females (66.7%). The mean healing index score was higher in the periotome group (4.17 ± 0.74) compared with the conventional group (3.67 ± 1.06); however, this difference was not statistically significant at the 5% level (p = 0.068), though significance was observed at the 10% level. The mean duration of extraction was significantly longer in the periotome group (6.71 ± 1.52 minutes) than in the conventional group (5.86 ± 1.41 minutes) (p = 0.039). A statistically significant association was identified between the extraction technique and the severity of gingival laceration (p = 0.036), with fewer severe lacerations observed in the periotome group. Immediate intraoperative complications, including buccal cortical plate fracture and root fracture, were more frequently recorded in the conventional extraction group.





DISCUSSION

Atraumatic extraction techniques have increasingly been advocated because of their potential to preserve alveolar bone and surrounding soft tissues, both of which are essential for uneventful healing and predictable implant rehabilitation. In the present study, clinical outcomes of periotome-assisted extraction were compared with those of conventional forceps extraction in single-rooted teeth, with particular emphasis on soft-tissue injury, duration of the procedure, immediate intraoperative complications, and postoperative healing.[45-51]

The frequency of gingival laceration was significantly lower in the periotome group (p = 0.036), demonstrating a clear relationship between the extraction method and preservation of soft tissues. This observation is consistent with previous reports indicating that periotomes facilitate circumferential severance of periodontal ligament fibers, thereby limiting uncontrolled force transmission to adjacent soft tissues (Misch et al., 2008; Becker et al).[52] Preservation of gingival architecture is particularly critical in the aesthetic zone and in clinical scenarios involving immediate implant placement.

The duration of the extraction procedure was significantly greater in the periotome group (p = 0.039), in agreement with earlier studies describing atraumatic extraction methods as inherently more time-consuming due to their precise and controlled technique (Salama & Salama, 1993).[56] Although conventional extraction required less operative time, the reduced duration may be associated with increased tissue trauma. The marginally longer procedure time observed with periotome-assisted extraction may therefore be justified by the superior clinical outcomes achieved.

Postoperative healing, evaluated using the Healing Index described by Landry et al,[51] was more favourable in the periotome group, with statistical significance observed at an alpha level of 10% (p = 0.068). These findings suggest that minimizing surgical trauma positively influences early wound healing, corroborating previous evidence that atraumatic extraction techniques enhance socket healing and help maintain gingival contours (Landry et al., 1988; Bartee, 2001).[51]

Immediate intraoperative complications were more frequently encountered in the conventional extraction group, with a higher incidence of buccal cortical plate fractures and root fractures. In contrast, the periotome group demonstrated fewer hard-tissue complications and no instances of root fracture. This supports the premise that controlled severance of periodontal ligament fibers reduces the need for excessive extraction forces, thereby protecting the alveolar housing (Jebin et al., 2014; Muska et al., 2013).[55]

Furthermore, periotome-assisted extraction proved particularly advantageous in teeth with compromised coronal structure or a history of endodontic treatment, where conventional forceps application may be technically challenging. The ability to perform extractions without flap elevation or bone exposure contributes to preservation of socket morphology, rendering the periotome especially useful in orthodontic extractions and implant-driven treatment planning (Jebin et al., 2014).[56]

Within the limitations of the present study, periotome-assisted extraction demonstrated improved soft-tissue preservation, fewer immediate complications, and enhanced postoperative healing, albeit at the cost of a modest increase in operative time. These findings further support the use of atraumatic extraction techniques as a preferred approach in contemporary clinical practice, particularly in cases where optimal tissue preservation is essential.

CONCLUSION

Periotome-assisted extraction represents a predictable and effective atraumatic technique that offers superior preservation of both soft and hard tissues compared with conventional forceps extraction. The controlled severance of periodontal ligament fibers achieved with periotome use minimizes surgical trauma, reduces immediate intraoperative complications, and contributes to improved postoperative soft-tissue healing and maintenance of alveolar architecture. Although this technique is associated with a modest increase in operative time, the clinical benefits—particularly in implant-oriented and esthetically sensitive cases—appear to outweigh this limitation.

Notwithstanding these favorable outcomes, the present findings should be interpreted within the constraints of the study design and sample size. Future research should focus on large-scale, multicenter randomized controlled trials to enhance the external validity of these results. Inclusion of multirooted teeth, assessment of long-term alveolar bone dimensional changes, and evaluation of patient-reported outcomes such as postoperative pain and satisfaction would provide a more comprehensive understanding of the clinical utility of periotome-assisted extraction. Additionally, comparative studies integrating radiographic and histological assessments may further elucidate the biological advantages of atraumatic extraction techniques and support evidence-based clinical decision-making.

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