

Use of Flexible Periotomes and Conventional Periotomes in Atraumatic Extractions: A Comparative Study

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Abstract

The aim of this study was to compare the efficiency of flexible periotomes versus non-flexible conventional periotomes in atraumatic dental extractions of similar teeth. The study also aimed to evaluate the wound healing, duration of the procedure, and level of gingival laceration associated with the use of these two instruments. The study was a randomized controlled clinical trial involving 26 patients requiring nonsurgical tooth extractions bilaterally. The subjects were randomized into two groups: the study group, where flexible periotomes were used to break the periodontal ligament, and the control group, where conventional periotomes were used. A total of 52 extractions were performed, either for orthodontic or implant placement purposes. After the extractions, the researchers evaluated the level of gingival laceration, duration of the procedure, and wound healing on postoperative days 1 and 7. Any complications that arose were also noted. The study group (flexible periotome) and control group (conventional periotome) were compared, and the results showed that the flexible periotomes required a shorter duration of time (around 4 minutes) compared to conventional periotomes (7 minutes). Additionally, gingival lacerations were found to be less severe in the study group. In conclusion, the use of flexible periotomes was found to be more efficient in atraumatic dental extractions compared to conventional periotomes. This study highlights the importance of using newer technology to perform atraumatic extractions, particularly in the era of implantology where there is an increased demand for such procedures.

Keywords

Randomized Clinical Trial, Periotome, Flexible Periotome, Atraumatic Extraction

1. Introduction

Methods for extracting teeth have remained remarkably static over the decades, with trauma to the surrounding tissues continuing to be a common occurrence. [1] [2] While conventional dental extraction techniques encourage minimal trauma, the use of elevators and forceps in tooth extraction can often result in fracture or alteration of the dentoalveolar socket. This trauma usually could result in some type of post-extraction ridge defect. These defects may hamper treatment with dental implants and could even result in food traps when traditional fixed partial dentures using pontics are used. These problems could be avoided with “atraumatic” extraction techniques. A method to reduce trauma to the adjacent bone during tooth extraction and maintain the dentoalveolar unit is via the use of the periotome. [3] With the advent of implantology, atraumatic extraction has come into vogue again, and proponents of periotome have claimed that it not only reduces soft tissue injury but also aids in salvaging the bony integrity of the socket as well. [4]

Periotomes are instruments used in extraction. They work on the mechanisms of “wedging” and “severing” to facilitate tooth removal. Periotomes are made of very thin metallic blades that are wedged down the periodontal ligament (PDL). This is done in a circumferential fashion repeatedly in addition to the minimally invasive luxation, the periotome blade severe sharpey’s fibers. Due to the repeated wedging, the majority of sharpey’s fibers get separated from the root surface, and rotational movements allow for the extraction of the tooth with minimal lateral pressure. This can reduce the potential trauma to adjacent bone and gingival structures. Disadvantages of the periotome include provider fatigue, adding a significant amount of time to the extraction procedure, and, eventually, they wear away due to usage. [3]

The benefits of using this technology include preservation of the adjacent papillae and underlying host bone, along with dramatically improved patient experiences. Traditional periotome has thinner blades that are prone to fracture as well as higher time duration for extraction. These disadvantages have been compensated by the use of flexible periotomes with more wear resistance thinner blades which allows for better access with the advantage of shape memory. This provides better access to periodontal space to break the periodontal ligaments. All these may promote better healing of the socket with fewer traumas being induced.

There are not many studies or case reports regarding the usage of flexible periotome in exodontia and their efficiency versus regular periotomes, so we decided to conduct a prospective, randomized, controlled trial to compare the efficacy of per extraction.

2. Aims

To compare the efficiency of flexible periotome versus non-flexible conventional periotome in atraumatic dental extraction of similar teeth.

- To compare the wound healing following the use of flexible periostome and non-flexible conventional periostome.
- To compare the duration of the procedure of flexible periostome and non-flexible conventional periostome for extraction of a tooth.
- To compare the level of gingival laceration in the use of flexible periostome and non-flexible conventional periostome.

Settings

- Convenience sampling method was used.
- Even-Odd method was used for randomization.

Design

- Randomized controlled trial.

Methods

Inclusion criteria:

- Patients who require extraction of bilateral similar sound teeth for orthodontic treatment or implant placement.
- Age: 17 - 45 years

Exclusion criteria:

- Patients who gave an allergic history.
- Patients who are pregnant.
- Patients suffering from any systemic disease.
- Periodontally and/or endodontically compromised teeth.

3. Methodology

The study was approved by the Research and Ethics Committee of the institution. Before enrolment, the objectives, implications, and possible complications of this clinical trial were explained to all the patients and informed consent was obtained.

Protocol no: YEC2/987.

The study was conducted on patients who have teeth that are indicated for bilateral extraction of similar teeth on the same jaw and were divided into two groups. The control group was in which conventional periostome (GDC P1), and the study group was in which flexible periostome (GDC PTF1) (**Figure 1**). The study was approved by the Research and Ethics Committee of the institution. Before enrolment, the objectives, implications and possible complications of this clinical trial were explained to all the patients and informed consent was obtained.

In the control group, after clinical assessment of the tooth to be extracted, conventional periostome (GDC P1) was to be held with a modified pen grasp. It is inserted into the long axis of the tooth at 20 degrees into the gingival sulcus (**Figure 2**). It was used to detach the cervical gingival fibers, reaching into periodontal ligament space, first mesially and then distally to the root surface. Once the access is obtained, the instrument is gradually moved forward into the PDL space, repeating the same motion until two-thirds of the distance toward the apex of the root is reached. Then the tooth was extracted using extraction forceps.



Figure 1. GDC—flexible periotome (PTF1) and GDC—conventional periotome (PT1).



Figure 2. Conventional periotome being used to detach the periodontal ligament wrt 24.

In the test group, after clinical assessment of the tooth to be extracted, flexible periotome (GDC PTF1) was held with a modified pen grasp and inserted at 20 degrees to the long axis of the tooth into the gingival sulcus (**Figure 3**). It was used to sever the cervical gingival attachment fibers first and then proceed several millimeters into periodontal ligament space and inclined first mesially and then distally tangential to the root surface. Once the access was obtained, the instrument would be gradually moved forward into the PDL space, repeating the same motion until two-thirds of the distance toward the apex of the root was reached. Then tooth would be extracted using extraction forceps.

During the intraoperative phase, the duration of the procedure was noted from the beginning of the procedure till the completion of tooth extraction. Immediate post-op complications, if any, were recorded.



Figure 3. Flexible periosteal being used to detach the periodontal ligament attachment.

Gingival lacerations would be graded using the following scale [1].

	Grade 1	Grade 2	Grade 3	Grade 5
Length	0 - 5 mm	5 - 10 mm	1 cm	Torn gingiva
Depth	Abrasion	Partial	Complete depth	

Landry's healing index was used to assess early wound healing [5].

Healing index	Criteria
Very poor 1	Tissue color: more than 50% of gingival red Response to palpation: bleeding Granulation tissue: present Incision margin: not epithelialized, with loss of epithelium beyond margins Suppurations present
Poor 2	Tissue color: more than 50% of gingival red Response to palpation: bleeding Granulation tissue: present Incision margin: not epithelialized with connective tissue exposed
Good 3	Tissue color: more than 50% of gingival red Response to palpation: no bleeding Granulation tissue: none Incision margin: no connective tissue exposed
Very good 4	Tissue color: more than 25% of gingival red Response to palpation: no bleeding Granulation tissue: none Incision margin: no connective tissue exposed
Excellent 5	Tissue color: all gingivae pink Response to palpation: no bleeding Granulation tissue: none Incision margin: no connective tissue exposed

Statistical analysis

Descriptive statistics

- Two independent sample t-test will be used to compare the average time duration, gingival laceration, and healing of socket in both groups.

Ethical and humane considerations

- The study was ethically conducted in accordance with the declaration of Helsinki.

4. Results

A total of 26 patients were considered for the study that needed similar bilateral extractions. The duration of extractions was found to be lesser in the usage of flexible Periotome, where the mean average was 4.43 minutes, whereas, with conventional periotome, the mean average was 7.2 minutes. The p-value was <0.001 showing significance (**Table 1**).

The gingival laceration was calculated in the study and control group using Wilcoxon signed rank test, and the p-value of the test is 0.011. The scores of the two groups differ significantly (**Table 2**), where the study group showed less amount of gingival lacerations.

Total healing was calculated in both the groups immediately and on the seventh day, where the study group showed superior results in the healing based on the laundry healing index, where excellent healing was achieved in all but two cases in the study group. In contrast, only 17 cases achieved excellent healing in the control group. On post-op day 7, all patients in both groups showed excellent healing.

5. Discussion

Conventional tooth extraction methods can cause damage to the surrounding bone and reshaping of the socket. Leveraging the interproximal bone results in damage to the interproximal bone. Even the use of forceps to luxate the tooth from its socket can often result in modifying the socket or alveolus. Atraumatic extraction is a better option for preserving bone and gingival architecture and

Table 1. Comparison between duration of surgery in both groups.

	N	Median	IQR	Statistic	P Value
Study Group	25	3.50		12.0	<0.0001
Control Group	25	7.23			

Comparison of duration of procedure in study and control group using Wilcoxon Signed rank test.

Table 2. Comparison between gingival lacerations in the study group and control group.

	N	Mean	Median	SD	IQR
Study Group	25	4.92	5	0.277	0.00
Control Group	25	4.64	5	0.490	1.00

The P value of the test is 0.011, the scores of two groups differ significantly.

allowing for future or immediate implant placement. Various minimally invasive tooth extraction tools are available, including Easy X-Trac system physics forceps and periostomes.

Pj Thomson's study spoke about the disadvantage of a regular periostome, where the duration of the procedure is higher, as well as operator fatigue. Another disadvantage is the fracture of the instrument due to high pressure and more trauma to soft tissue, as stated by Sneha D. Sharma. In this study, the maximum number of gingival lacerations occurred in the control group [1] [2].

The flexible periostomes, due to their wider size and serrated edges, helps break the periodontal ligament. Its flexibility allows greater access to the periodontal ligament space without traumatizing the adjacent bone. This could be helpful in leaving the extracted socket undisturbed and the alveolus intact. In the test group where flexible periostome was used, the duration of surgery was found to be lesser

Other methods are available that support atraumatic extractions but are not available easily and require a learning curve. [3]

Many other complications are also prevalent in exodontia cases due to conventional methods. Bortoluzzi *et al.* [6] in their study observed an incidence of 0.6% (2 cases each) for both alveolar infection and dry socket. Schropp *et al.* [7], in their study on bone healing of extracted sockets, mentioned the major chances of bone loss at the extraction site one year after tooth extraction.

In another study by Adeyemo *et al.* [8], they discussed the various pre-operative complications such as accidental crown, root, or alveolar bone fractures, which often lead to healing complications and even increased time of extraction due to such complications leading to disturbance in healing. Adeyemo *et al.* [8] have mentioned the presence of alveolitis in 11% of sockets and mild pain in 12% of cases. Venkateshwar *et al.* found tooth fracture, trismus, fracture of cortical plates, and dry socket to be the most common complications, while wound dehiscence and postoperative pain were the rare complications, and luxation of adjacent teeth, fracture of maxillary tuberosity and displacement to adjacent spaces among the rarest complications encountered during tooth extraction [9]

Similar outcomes to the above studies were observed in our study in the control group, where postoperative pain, buccal cortical plate fracture, bleeding till 2nd day, dry socket, apical third root fracture, and erythematous margins were observed. Even the oral health-related quality of life following nonsurgical routine tooth extraction deteriorates with the conventional method of extraction, as in the control group of our study [10]. The greater the amount of trauma to the surrounding bone, the greater the incidence of the dry socket.

Marco cicciù *et al.*, in their study, have mentioned that extraction of teeth was not affected by the amount of strength applied or the quality of bone surrounding the tooth but is more technique sensitive. With the advent of periostomes in 2013, atraumatic extractions for immediate implant placement have now become a common occurrence [11].

The use of flexible periostomes is to overcome these demerits and help in better

operator handling and wound healing. Their usage may help provide a supportive environment for immediate and delayed implant placement. The limitations involved the lack of use of radiographic assessment in assessing the level of bone healing, and no long-term follow-up was done for the patients.

6. Conclusion

On the basis of the study, we are of the opinion that the use of flexible periosteal in tooth extractions gives a superior result compared to extractions carried out using the traditional periosteal. Due to the lesser time they require to carry out the extractions, more fracture resistance and better wound healing.

Conflicts of Interest

The authors declare no conflicts of interest regarding the publication of this paper.

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