Periotome as an Aid to Atraumatic Extraction: A Comparative Double Blind Randomized Controlled Trial

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Received: 5 September 2014 / Accepted: 19 October 2014 / Published online: 8 November 2014
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Abstract

Aim The aim of this study was to evaluate the efficacy of periotomes in single rooted nonsurgical tooth extractions. **Materials and methods** A double blind, randomized controlled clinical trial of 100 patients requiring nonsurgical single rooted tooth extractions was performed. The subjects were randomized into the experimental group (underwent extractions with periotome and conventional extraction forceps) or into the control group (subjects underwent extractions using periosteal elevator and conventional extraction forceps). Pain was assessed using visual analogue scale all throughout 7 days postoperatively. Gingival laceration, duration of surgery, number and frequency of analgesics consumed and complications (if present) were also noted. **Results** On inter-group comparison, all the parameters were statistically significant in control group ($p < 0.05$).

Electronic supplementary material The online version of this article (doi:10.1007/s12663-014-0723-8) contains supplementary material, which is available to authorized users.

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Also on pre and post-operative inter-group comparison, statistically significant pain reduction was noted in experimental group (52.8 %) whereas pain increased in control group (65 %).

Conclusion The results of this study suggest that use of periotome may be helpful in reducing post extraction discomfort.

Keywords Atraumatic · Extraction · Periotome · Complications · Gingival Laceration

Introduction

The specialty of maxillofacial surgery has made tremendous strides in the past few decades encompassing such diverse fields as craniofacial surgery, microvascular reconstruction, etc. But the most commonly performed procedure by maxillofacial surgeons in many countries continues to be exodontia, comprising non-surgical routine tooth extractions as well as impacted tooth removal.

Improvements in local anaesthetics as well as its delivery armamentarium have resulted in painless extractions but the fear of post extraction pain deters many patients from undergoing this procedure [1–6]. Soft tissue trauma is one of the reasons for post extraction pain and various techniques have been tried to reduce this component's contribution. 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.

There are not many studies or case reports regarding the usage of periotome in exodontia, so we decided to conduct a prospective, double blind, randomized controlled trial to

compare the efficacy of periostome in nonsurgical single rooted tooth extractions.

Materials and Methods

A randomized, double blind, controlled clinical trial was performed in 100 patients. All patients underwent the nonsurgical extractions of single rooted teeth between October, 2012 and March, 2013.

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. Inclusion criteria included patients above 14 years of age requiring nonsurgical removal of either maxillary or mandibular single rooted tooth. Exclusion criteria consisted of refusal of informed consent, patients who were taking drugs which interfere with pain response, allergy to ibuprofen, pregnancy and history of intake of analgesics up to 10 days prior to extraction. Random allocation of groups was done using computer-generated randomization process to two groups. The patients did not receive any financial compensation for participating in the study. Tooth extractions were carried out aseptically under local anaesthesia (2 % lignocaine with 1:2,00,000 adrenaline) and post extraction instructions were given to each patient. In the control group, after clinical assessment of tooth to be extracted periosteal elevator was used for reflecting the gingiva to expose the cemento-enamel junction and the extraction was carried out using conventional forceps (Fig. 1).

In the test group, after clinical assessment of tooth to be extracted Amron periostome with blade attachments was held in modified pen grasp and inserted at 20 degrees to the long axis of tooth into the gingival sulcus (Figs. 2, 3). It was used to sever the cervical gingival attachment fibres first and then proceed several millimetres into periodontal ligament space and inclined first mesially and then distally tangential to root surface. Once the access was obtained,

the instrument was gradually advanced into the PDL space repeating the same motion until two-thirds of the distance towards the apex of root was reached. Then tooth was extracted using extraction forceps exerting rotational force in a coronal direction [7–10] (Fig. 4).

Fig. 2 Operating angulation

Fig. 3 Angulation of periostome to the tooth to be extracted

Fig. 1 Postextraction gingival laceration by conventional method

Fig. 4 Post extraction socket using periostome

Ibuprofen 400 mg was given immediately after completion of extraction and 1 Tab SOS later as analgesic [11, 12]. No other postoperative medication was prescribed. Patients were also instructed not to seek any medical help elsewhere for postoperative problems, if any, but to report to our department. They were followed-up for a minimum period of 1 week for evaluation of wound.

During the preoperative phase, pain was assessed using visual analogue scale before the administration of LA [13, 14]. During the intraoperative phase, duration of procedure was calculated from the onset of local anaesthesia till the completion of tooth extraction. Immediate post-op, complications, if any, were recorded. Gingival lacerations were graded using the following scale:

	Grade 1	Grade 2	Grade 3	Grade 4
Length	0–5 mm	5–10 mm	>1 cm	Torn Gingiva
Depth	Abrasion	Partial	Complete depth	

Postoperatively, patients were instructed to measure the intensity of postoperative pain throughout the period of 7 days (3rd h, 6th h, 24th h, 7th day) on visual analogue scale [13, 14]. They also had to record the number and frequency of analgesics consumed and any other complications. The following variables were also gathered: age, sex, tooth, mobility grade and operator. All the patients and investigator were blinded to avoid bias.

Data on 100 subjects (49 males and 51 females) was entered in Microsoft Excel and subjected to statistical analysis using SPSS version-11 statistical package. The critical level of significance was set at $p < 0.05$. Demographic data was analysed using *Chi square* tests. Student's *t* tests were used for independent samples and Karl Pearson correlation was used to calculate the scientific data and the association between the various variables. To compare the two groups regarding different parameters, repeated measures ANOVA tests were used.

Results

One hundred patients were enrolled, 4 (2 each in control and test group) were lost because they did not attend follow-up visits. The results were based on the analysis of 96 participants with 48 patients in each group.

Table 1 and Graph 1 shows the duration of procedure in control group which is significantly greater than test group ($p < 0.001$). Analgesic consumption was also more in the control group. Pain reduction in test group was significantly greater than control group on inter-group

Table 1 Distribution of mean and SD between test and control group (*t* test for two independent groups)

Group	N	Mean $\pm$ SD	Std. error mean	<i>p</i> value
Duration of operation				
Control group	50	12.8116 $\pm$ 7.393823	1.045644	0.000
Test group	50	5.78010 $\pm$ 4.043751	0.571873	
Frequency of analgesic consumed				
Control group	48	12.50 $\pm$ 5.120	0.739	0.000
Test group	48	4.44 $\pm$ 3.135	0.452	
No. of analgesics consumed				
Control group	48	2.21 $\pm$ 0.617	0.089	0.000
Test group	47	1.40 $\pm$ 0.577	0.084	
Pain reduction				
Control group	48	-0.7083 $\pm$ 2.20694	0.31854	0.002
Test group	48	0.8854 $\pm$ 2.65426	0.38311	
Gingival laceration grade				
Control group	50	1.2000 $\pm$ 0.90351	0.12778	0.000
Test group	50	0.2000 $\pm$ 0.63888	0.09035	

Table 2 Pain reduction in control and test group

	Mean $\pm$ SD	Std. error mean	<i>p</i> value
Test group			
Preoperative pain	1.63 $\pm$ 2.506	0.358	0.025
Postoperative pain	0.765 $\pm$ 0.6778	0.0968	
Control group			
Preoperative pain	1.08 $\pm$ 2.019	0.291	0.031
Postoperative pain	1.792 $\pm$ 1.0408	0.1502	

comparison ($p < 0.05$). Gingival lacerations were also more in the control group— $p < 0.05$.

Table 2 and Graph 2 shows the intra-group variance in test and control groups in reference to pain. There is a significant reduction in pain in test group ($p < 0.05$) whereas in control group there is a significant increase in postoperative pain as compared to preoperative pain ($p < 0.05$).

It was also found that there was significant difference of complication rate in test and control groups ($p < 0.05$). Complications like mild pain on 7th day etc. were

significantly more in control group than test group ($p < 0.05$) (Graph 3).

No association of different parameters with the grade of mobility of tooth was observed.

Discussion

Traditional extraction methods have a history of not only producing postoperative pain but also damaging the hard and soft tissues surrounding the tooth [15]. Conventional extraction techniques either elevate the tooth by leveraging against the interproximal bone resulting in damage to the interproximal bone or use of forceps to luxate the tooth from its socket which often results in reshaping of the socket or alveolus [10]. This leads to difficulty in maintaining the socket integrity due to hard tissue damage and thus making future prosthetic replacement difficult.

Also Bortoluzzi et al., Sjögren et al., and Al Khateeb, have conducted studies on postoperative pain in exodontia and observed it as the most common complication [1–3].

Many other complications are also prevalent in exodontia cases due to the conventional methods. Adeyemo et al. [16] have mentioned about presence of alveolitis in 11 % sockets and mild pain in 12 % cases. Bortoluzzi et al. [17] in their study observed an incidence of 0.6 % (2 cases each) for both alveolar infection and dry socket. Schropp et al. [18] in their study on bone healing of extracted socket mentioned about the major chances of bone loss at extraction site 1 year after tooth extraction. In another study by Adeyemo et al. [19], they discussed about 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. 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 [20].

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 non-surgical routine tooth extraction deteriorates with conventional method of extraction as in control group of our study [21]. Marco Cicciù et al. [22] 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. At the same time it is believed that an excessive force which exceeds expansion of socket results in fracture of alveolus specially in elderly patients in whom bone is dense and sclerotic.

To avoid the above mentioned problems and following a more technique sensitive approach, we need to proceed with “atraumatic extraction technique”. Atraumatic extraction preserves bone, gingival architecture and allows for option of future or immediate implant placement. There are a variety of tools available for a minimally invasive technique of tooth extraction such as Easy X-Trac system [4, 23], physics forceps [9, 24] and periotomes.

In our study, we have used periotome as a means of atraumatic extraction. This instrument helped in removing firm tooth and retained roots without damaging the surrounding thin alveolar plates of bone and minimally lacerating the soft tissue as well. This may aid in providing a completely supportive environment for both immediate and delayed implant placement. Thus, the above concept supports the biomechanical rationale for atraumatic extraction.

Also periotome seemed to be helpful in maintaining the soft and hard tissue architecture specially in extracting endodontically treated teeth and crown fracture cases. It aids in removing the tooth without damaging the osseous housing [10]. Similar findings were noticed in our study with the maximum number of buccal cortical plate fractures and apical third root fractures occurring in control group as compared to the test group. Periotome provided the opportunity to remove such teeth without reflection of flap and thus avoiding the need of mucoperiosteal flap and exposure of bone. This may be helpful in leaving the shape of extracted socket undisturbed and alveolus intact. In the test group where periotome was used, duration of surgery, frequency and number of analgesics consumed, pain reduction and gingival laceration favoured the use of this instrument for extraction.

Even with some of the drawbacks of our study (since it is a new study we could not compare it with any other study and also because the extractions were not performed by a single operator), we are of the opinion that use of periotome in single-rooted tooth extractions gives a superior result compared to extractions carried out using the traditional periosteal elevator.

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