COMPARATIVE EVALUATION OF PHYSICS FORCEPS AND CONVENTIONAL FORCEPS IN ORTHODONTIC EXTRACTION OF MANDIBULAR PREMOLARS

Dr. Prashant Punde[1] , Dr. Mouneshkumar C.D[2]., Dr. Kumar Nilesh[3] ,Dr. Shrikant Patil[4]
Oral and Maxillofacial Surgery ofSchool of Dental Sciences, Karad. School of Dental Sciences, Krishna Institute Of Medical Sciences, "Deemed To Be University", Karad (Dist. Satara), Maharashtra, India415110

A Comparative Analysis of the Use of Conventional Forceps with the Physics Forceps for Orthodontic Extraction of Mandibular Premolars

Abstract

Surgeons must use a lot of skill and a little bit of controlled force during a basic extraction to remove a simple tooth3. Severing the periodontal attachment, luxation using an elevator, and removal with forceps are all common extraction methods.

The forceps complete the task with sporadic apical and lateral stresses if the elevator is unable to clearly separate the tooth from the socket. Traditional extraction forceps frequently shatter the tooth, surrounding bone, or both if the tooth is already weak from endodontic therapy, disease, or if the roots are lengthy and/or dilacerated.

This may result in a more complicated surgical procedure with concomitant unfavourable postoperative complications. Since ancient times, biomechanical characteristics of force have been used to remove teeth. However, rather of aiding in tooth extraction, the mechanical advantages available for tooth extraction were mostly used to retain the tooth's crown. (Misch C, Perez H., 2008).

Keywords: Extraction, forceps, endodontic, surgeon, tooth, socket, periodontal
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Introduction

The basic principle of extraction involves removal of tooth with minimal trauma to the investing soft and hard tissues, so that the wound heals uneventfully with minimal postoperative complications. Atraumatic tooth extraction is essential in orthodontic cases to minimize post-operative complications, facilitate early tooth movement and reduce treatment delay. Over the last decade there has been an increased interest in atraumatic tooth extraction in order to maintain bone for implant insertion.

The mechanics of extraction forceps were outlined by Aristotle (384–322 BC), who also discussed the benefits of two levers operating in opposition while sharing a single fulcrum

(Misch C, Perez H., 2008) Abulkasim (1050–1122 AD) was the first person to use a single lever functioning alone (i.e., an elevator), and he did so to extract a tooth from its socket (Dym H, Weiss A., 2008).

The "Physics forceps," a ground-breaking innovation in exodontia tools, were created in 2004 and principally utilise the biomechanical benefits of a first-class lever, creep, and stress distribution without the utilisation of squeezing, grabbing, twisting, or pulling forces (Golden R., 2011). It was developed by Dr. Golden Richard in 2004).

The Physics Forceps and this method have the following benefits:

a) Reliable and quick extractions, usually taking under four minutes.
b) Preserving the cortical plate and buccal bone
c) Avoiding the need to cut bone and lay flaps to reach roots
d) Almost completely eradicating root tip fractures
e) Providing effective whole mouth reconstructive extraction assistance.
f) Supporting the insertion of implants right away.
g) To make room in the dental arch, patients who need malocclusion treatment frequently need to have a few teeth extracted, typically the first and second maxillary or mandibular premolars. It is important that these extractions be as painless as possible.

In order to immediately put a dental implant after extraction, the tooth must be removed without complications or harm to the face plate of bone (Kosinski T., 2012). The extractions performed with the Physics Forceps take less time overall, go more quickly, and most importantly, cause the patient less physical and psychological anguish.

In this study, the effectiveness of conventional forceps and physics forceps for orthodontic extractions of mandibular premolars will be assessed and compared.

Review of Literature

Misch C and **Perez H** (2008) reported about biomechanical rational for atraumatic tooth extraction utilizing a new forceps design. They claimed that the invention of the physics forceps was based on biomechanical principles. The extraction tool has one handle that is attached to a "bumper" that serves as a fulcrum. The degree of bone deformation increases with increasing applied force. This procedure enables the tooth to emerge from the socket and causes the tooth socket to enlarge. The bumper's force, which is a compressive force given over a larger surface area to the gingiva and bone, braces the buccal bone, allowing the lingual plate to expand further and preventing fracture of the facial plate.

Meyer DM (2008), The use of the periotome and luxator in performing non-traumatic tooth extractions was mentioned in a research he did on care of the extraction socket site preservation prior to implant insertion. A little or no flap was raised around the tooth's neck during the intrasulcular incision, allowing access to the periotome, which is used to cut the periodontal ligament around the tooth's coronal surface. This improves the luxator's access point, which is then used to extend the periodontal ligament gap. This increases tooth mobility and makes atraumatic tooth extraction possible by allowing for more tooth motion..

Using a random sample of 200 patients, Al-Khateeb TS and Alnahar A (2008) conducted a study on the pain experienced following simple tooth extraction. Analgesics were used by 55.3% of patients on the evening after extraction, and 6.8% of patients maintained using them through the seventh day. The authors advised frequent analgesic usage in the first week following simple tooth extraction.

In their 2009 study of "7 instances in which atraumatic extractions were conducted with a powertome (automated power tome)," White J, Holtzclaw D, and Toscano N discovered that the majority of the extractions were finished in only a few minutes. By preventing

mucoperiosteal flap reflection, harm to nearby bone, and preservation of sensitive gingival papillae, they came to the conclusion that an automated powertome was an efficient tool for quick, non-traumatic dental extractions.

A research on "minimising trauma during tooth removal" was conducted by Al Harbi SH in 2010. a methodical sectioning strategy that mentions "least traumatising tooth extraction that minimises harm to the soft and hard tissue components of the removed tooth socket. Additionally, he noted that traditional methods frequently cause damage of one kind or another, ranging from minor gingival tissue laceration to total loss of the buccal bony plate and interdental bone crest, and came to the conclusion that, in order to avoid all these issues, an extraction technique using a systematic tooth sectioning approach helps in minimising soft and hard tissue loss in the extracted tooth socket.

The extractions employing the physics forceps are predictable in time commitment, speedier process, and most definitely less stressful physically and mentally to the patient, Fazio CR (2010) said in his essay "Physics Forceps - Deliver New Quantum Leap.

Physics Forceps feature a "beak and bumper" design that allow the operator to extract teeth with simply wrist movement, according to Scull P (2010). They function as a basic first-class lever. On the lingual side of the tooth or root, the beak applies one force. The "bumper," which is positioned on the alveolar ridge at the mucogingival junction, applies the second force. The Physics Forceps' handles are simply held while a light rotating force is provided by making a modest amount of wrist movement. This small amount of wrist movement is accomplished by simply rotating the wrist by around 3 to 4 degrees and holding this position for 30 to 40 seconds to administer the consistent, mild pressure.

The pressure during an extraction process triggers the release of the enzyme hyaluronidase, which catalyses the breakdown of hyaluronan, known as the "cement material" (extracellular matrix) of all human tissue, according to Melville AN (2011). By inducing the release of a greater amount of hyaluronidase in a shorter period of time, Physics Forceps are less traumatic to the alveolar bone than conventional forceps. Once this chemical breakdown of the periodontal ligament by hyaluronidase is sufficient, the tooth is released from its attachment to the alveolus and can be removed.

Exodontias: Tips & Technique by Dym and Weiss (2011) was described. They claimed that for better results, physics forceps employ first-rate lever mechanics to gently remove a tooth from its socket. One handle of the tools is attached to a bumper that serves as the extraction's fulcrum; the bumper is typically positioned on the facial aspect of the dental alveolus, usually at mucogingival junction. Most frequently, the lingual or palatal roots of the tooth and the gingival sulcus are where the extractor's beak is placed. With this approach, no prior elevator usage is necessary before trying the extraction, and no mucosal flap needs to be employed. This is in contrast to traditional forceps, which make just one point of contact with the tooth being removed.

The principle of biomechanics is the basis for the development of a different type of dental forceps called 'physics forceps, according to Patil SS, Rakhewar SP, and Diphode SS (2012), these are the dental extractors that use first class lever mechanics, it has a bumper on one beak, which is placed below the tooth, typically at or above the mucogingival junction, once in a position, it is used as one unit.

When it comes to exodontia instruments, Taylor J. (2012) explained why physics forceps are in a class by themselves. With the lever, there is no need for a squeezing action, only rotation against a very broad, padded bumper, which allows the tooth to just pop out easily without needing much strength from the dentist's hand. No damage is caused to the buccal gingiva, indicating minimal pressure on it, and this too is an improvement over the

traditional forceps. This procedure does not need lifting or laying a flap, and root tip fractures are also avoided.

In a paper titled Atraumatic Vertical Tooth Extraction: A Proof of Principle Clinical Study of a Novel Technique, Muska E, Walter C, Knight A, et al. (2013) assessed the usefulness and limits of a novel atraumatic extraction system called the Benex Extraction system. Following the recruitment of 72 individuals, 111 teeth were taken using forceps from teeth that were significantly deteriorated or had root fragments that were not appropriate for forceps extraction (Benex). They discovered that 92 out of 111 teeth were effectively removed (about 83%) The Benex Extractor System may be used successfully for non-traumatic tooth extraction because the success rate was higher in single-rooted teeth (89%) and lower in multirooted teeth (43%), with a risk ratio for failure of multirooted versus single-rooted teeth of 5.2 (95% confidence interval 2.5-10.7).

A research by Hariharan S, Vinod N, and Soh LC (2014) compared physics forceps with extraction forceps while removing upper premolar teeth for orthodontic treatment. They compared the outcome variables (operative complications, inflammatory complications, and operating time) and came to the conclusion that the physics forceps group had lower mean (SD) Visual Analogue Scores (VAS) for pain on the first postoperative day than the other group (1.04 (0.85)) (p=0.03), but that there were no other significantly different findings between the 2 groups in any other variable examined.

To compare the effectiveness of physics forceps with conventional forceps in terms of operating time, prevention of marginal bone loss and soft tissue loss, postoperative pain, and postoperative complications following bilateral premolar extractions for orthodontic purposes, Patel HS, Managutti AM, and Menat S (2016) conducted a study. Their study evaluated the results of the two groups' (n = 42 premolars) extractions utilising physics forceps and traditional forceps for orthodontic therapy. Clinical results were noted and compared in terms of time required, buccal soft tissue loss and buccal cortical plate loss based on an extraction defect categorization system, postoperative discomfort, and other extraction-related complications.

Material and Methods

After receiving proper clearance from the Institutional Ethical Committee, the current study was carried out in the Department of Oral and Maxillofacial Surgery, School of Dental Sciences, Krishna Institute of Medical Sciences Deemed University, Karad.

Total of 50 patients, males and females undergoing orthodontic treatment requiring extraction of mandibular premolars were included in the study with the following Inclusion and Exclusion criteria:

A. <u>Inclusion criteria</u>

1. Patients requiring bilateral extraction of mandibular premolars for orthodontictreatment purpose.
2. Patients available for assessment up to 7 days post operatively
3. Patient in age group between 12 to 30 years.
4. Patient willing to participate in study.

B. <u>Exclusion criteria</u>

1. Medically compromised patients
2. Premolars affected by Dental Caries
3. Periodontally compromised teeth
4. Teeth with abnormal root anatomy, hypercementosis, root dilacerations
5. Patients with Mal-aligned Premolars.
6. Patients unwilling to participate continuoulsy

<u>Methodology</u>

I. Application of Conventional forceps at control site included the following stages-

1) Separation of the gingival attachment from tooth on buccal and lingual side.
2) Placement of beaks of forceps on buccal and lingual surface of tooth as

apically aspossible.

3) Application of buccal, lingual, rotational force on the tooth.
4) Delivery of tooth from the socket.

II. Six processes are involved in applying physics forceps at the study site:

1) The gingival attachment on the tooth's lingual side has separated (e.g. using periotome)
2) Attaching the beak to a reliable lingual application site (root surface)
3) Placing a "bumper" at the mucogingival junction level on the buccal face of the alveolus (this act as fulcrum; braces and protects the buccal plate)
4) Applying gentle, constant pressure helps the tooth emerge from the socket and promotes periodontal creep.

All extractions were done by the same operator. After extraction, the socket was compressed manually and a gauze pack was placed for 45 minutes. Usual postoperative instructions were given. Analgesic medication was given. On appearance of complications like root fracture, antibiotics and anti-inflammatory drugs were given.

Parameters

The following parameters were compared at the study and control sites-

I. The duration of the extraction.
II. Evaluation of utility of instruments and success of extraction (consist of evaluation for root fracture, bone plate fracture and adherence of buccal cortical plate to the root).

To judge the success of extraction and utility of the instrument, the following criteria were followed.

a) Extraction without crown or root fracture was a complete success.
b) Partial root tip fracture extraction with limited success due to root tip fracture.
c) Extraction coupled with an alveolar bone fracture and limited success with osteotomy.
   It was considered positive if there is an obvious fracture evident clinically and also judged by Radiovisiograph taken immediate post operatively.
d) Failure to extract.

In case of failure to extract the tooth in study site, conventional forceps were used to extract the tooth.

In case of failure at the control site, surgical removal of fractured tooth was undertaken.

III. Intra-operative discomfort/pain to the patient during the procedure was evaluated using Visual Analogue Scale (VAS).
IV. Post-operative Pain was evaluated using VAS on the 1st, 3rd and 7th post-operative day.
V. Evaluation of socket healing: the following parameters were used to evaluatepost- operative healing.

a) Assessment for post-operative infection was carried on 1st, 3rd and 7th days after extraction
b) Assessment for dry socket was carried on 1st, 3rd and 7th days after extraction.

Fig.1: Physics Forceps with Bumper

Fig.2: Armamentarium for Orthodontic Extraction of Mandibular Premolars

Case 1

Fig.3: Preoperative Photograph of patient showing 34 & 44

Fig.4: Preoperative Orthopantamogram of patient showing 34 & 44

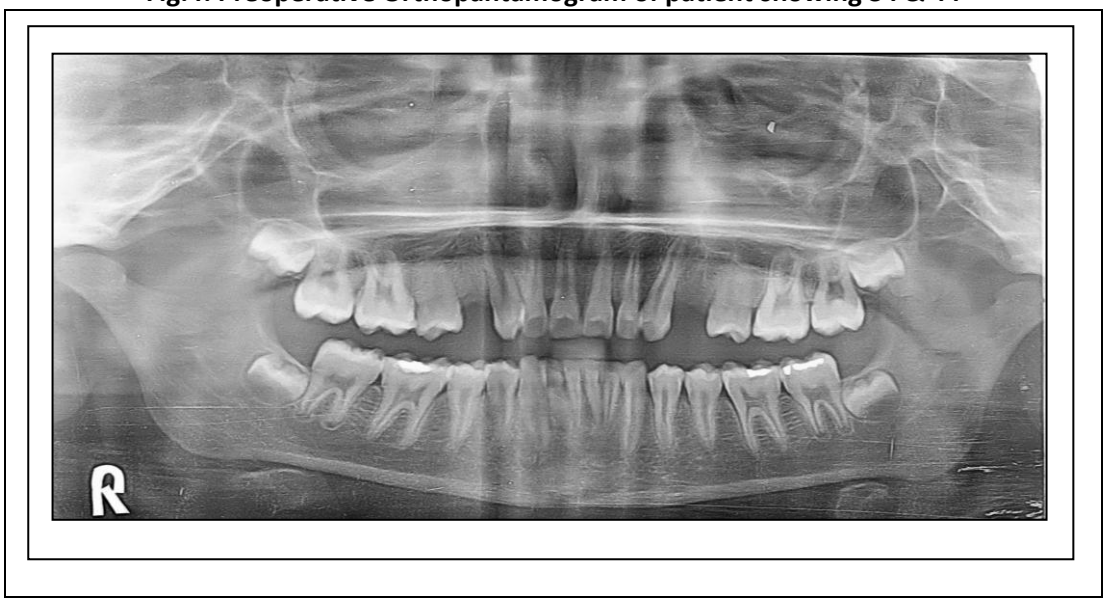


Fig.5: Preoperative Radiovisiograph of 34 & 44

Fig.6: Extraction of 44 with conventional forceps

Fig.7: Extraction of 34 with Physics Forceps

Fig.8: (a) Extraction of 34 with Wrist movement only and (b) Removal of tooth

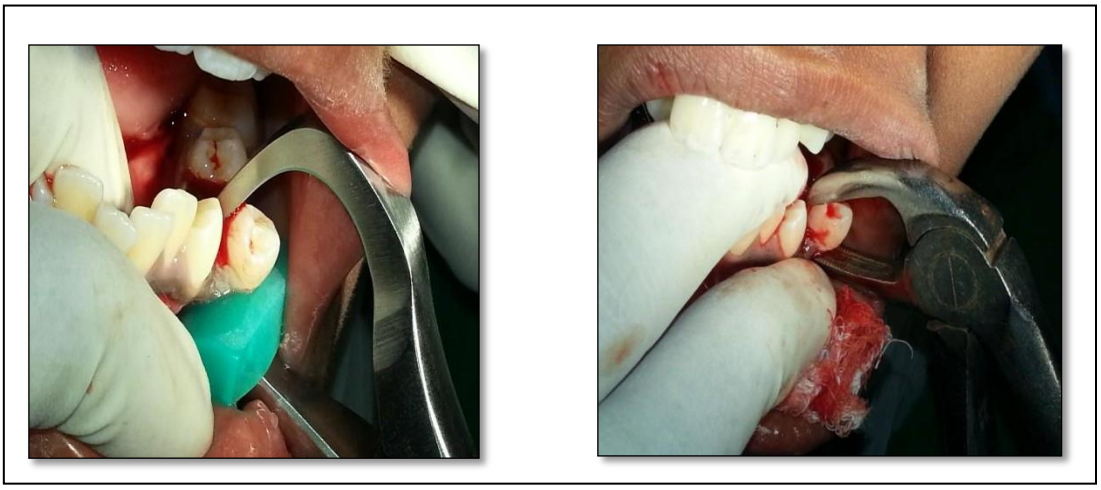
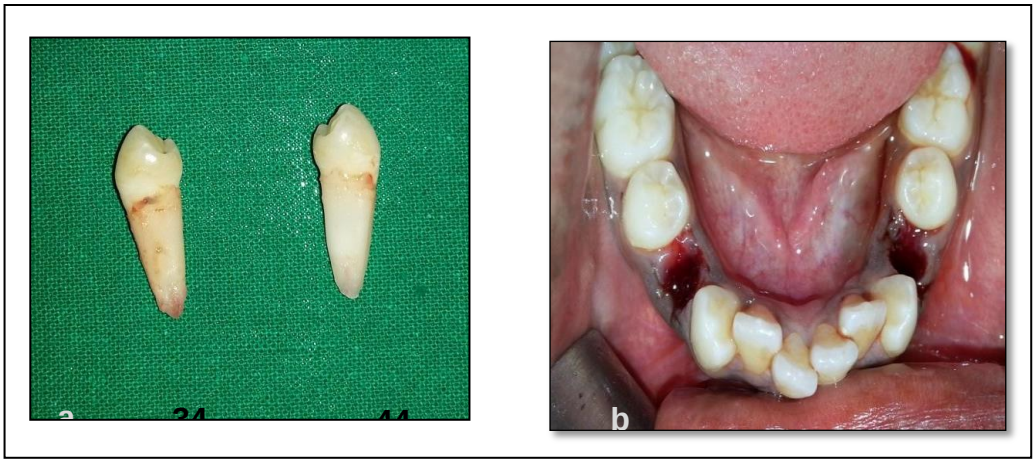


Fig.9: (a) Extracted tooth and (b) Extraction socket of 34, 44



Observation and Results

Total of sixty patients (both male and female) requiring orthodontic extraction of mandibular premolars were included in split mouth study.

a) Assessment of Total Time taken for extraction

Total time taken for extraction of mandibular premolars was calculated from application of forceps to the tooth till it gets extracted. Time was calculated in seconds.

For Physics Forceps minimum time required for extraction was 20 sec and maximum was 50 sec. Similarly, for conventional Forceps minimum time taken for extraction was 8 sec and maximum was 27 sec.

For Physics Forceps, mean ± standard deviation was 35.45 ± 6.166.Similarly, for Conventional Forceps mean ± standard deviation was 17.85 ± 4.898

Time taken for control site showed statistically significant as compared to study site **(p value- < 0.001) Independent t Test.**

b) Assessment of Intra operative Pain (VAS Scale)

(i) For Physics Forceps

A total of 60 patients, 21 patients (35%) showed no pain (0), 29 patients (48.3%) showed pain score (1), 9 patients (15.0%) showed pain score (2), and 1 patient (1.7%) showed pain score (7).

(ii) For Conventional Forceps

A total of 60 patients, 22 patients (36.7%) showed no pain (0), 16 patients (26.7%) showed pain score (1), 9 patients (15.0%) showed pain score (2), 11 patient (18.3%) showed pain score (3), 1 patient (1.7%) showed

pain score (4), 1 patient (1.7%)showed pain score (6).

Statistical analysis showed no significant difference of intra operative pain between study site and control site (p value- 0.155) by **Mann -Whitney U test and NON parametric Independent t test**

c) Assessment of Post operative Pain (VAS Scale)

(i) For Physics Forceps

Post operating Pain score among PF group at Day 1 and Day 3 when compared, statistical analysis showed no significant difference (p value-0.375) as per Wilcoxon Signed Ranks Test.

Post operating Pain score among PF group at Day 1 and Day 7 when compared, "statistical analysis showed significant difference (p value-0.005)" as per Wilcoxon Signed Ranks Test.

Post operating Pain score among PF group at Day 7 and Day 3 when compared, "statistical analysis showed significant difference (p value<0.001)" as per Wilcoxon Signed Ranks Test.

(ii) For Conventional Forceps

Comparing Post operating Pain (POP) score among CF group at Day 1 and Day 3 when compared, "statistical analysis showed significant difference (p value-0.000)" as per Wilcoxon Signed Ranks Test

Post operating Pain score among PF group at Day 1 and Day 7 when compared, "statistical analysis showed significant difference (p value< 0.001)" as per Wilcoxon Signed Ranks Test.

Post operating Pain score among PF group at Day 7 and Day 3 when compared, "statistical analysis showed significant difference (p value-0.017)" as per Wilcoxon Signed Ranks Test.

Therefore, on comparing Postoperative pain among study site and control site, POP in control site was greater than study site on Day 1, Day 3, and Day 7.

d) Assessment of Post operative Bleeding

(i) For Physics Forceps

Post operating Bleeding scores among PF group at different time interval Day 1 and Day 3 when compared, "statistical analysis showed no significant difference (p value- 1.000)". Wilcoxon Signed Ranks Test.

Post operating Bleeding scores among PF group at different time interval Day 1 and Day 7 when compared, "statistical analysis showed no significant difference (p value- 1.000)". Wilcoxon Signed Ranks Test.

Post operating Bleeding scores among PF group at different time interval Day 7 and Day 3 when compared, "statistical analysis showed significant difference (p value< 0.001)". Wilcoxon Signed Ranks Test.

(ii) For Conventional Forceps

Post operating Bleeding scores among CF group at different time interval Day 1 and Day 3 when compared, "statistical analysis showed no significant difference (p value- 1.000)". Wilcoxon Signed Ranks Test.

Post operating Bleeding scores among CF group at different time interval Day 1 and Day 7 when compared, "statistical analysis showed no significant difference (p value- 1.000)". Wilcoxon Signed Ranks Test.

Post operating Bleeding scores among CF group at different time interval Day 7 and Day3 when compared, "statistical analysis showed no significant difference (p value- 1.000)". Wilcoxon Signed Ranks Test.

Therefore, on comparing Postoperative bleeding among study site and control site, there was no POB in control site and study site on Day 1, Day 3, and Day 7.

e) Assessment for Dry socket

(i) For Physics Forceps

Dry socket scores among PF group at different time interval Day 1 and Day 3 when compared," statistical analysis showed no significant difference (p value-1.000)".

Wilcoxon Signed Ranks Test.

Dry socket scores among PF group at different time interval Day 1 and Day 7 when compared, "statistical analysis showed no significant difference (p value-1.000)".

Wilcoxon Signed Ranks Test.

Dry socket scores among PF group at different time interval Day 7 and Day 3 when compared, "statistical analysis showed significant difference (p value< 0.001)". Wilcoxon Signed Ranks Test.

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(ii) For Conventional Forceps

Dry socket scores among CF group at different time interval Day 1 and Day 3 when compared, "statistical analysis showed no significant difference (p value-1.000)".
Wilcoxon Signed Ranks Test.
Dry socket scores among CF group at different time interval Day 1 and Day 7 when compared, "statistical analysis showed no significant difference (p value-1.000)".
Wilcoxon Signed Ranks Test.
Dry socket scores among CF group at different time interval Day 7 and Day3 when compared, "statistical analysis showed no significant difference (p value-1.000)".
Wilcoxon Signed Ranks Test.
Therefore, Dry socket was not present in any of the patient at study as well as control site on Day 1, Day 3, and Day 7.

f) Assessment of Mucosal Inflammation

(i) For Physics Forceps

Mucosal Inflammation scores among PF group at different time interval Day 1 and Day3 when compared, "statistical analysis showed no significant difference (p value-1.000)".Wilcoxon Signed Ranks Test.
Mucosal Inflammation scores among PF group at different time interval Day 1 and Day7 when compared, "statistical analysis showed no significant difference (p value-1.000)".Wilcoxon Signed Ranks Test.
Mucosal Inflammation scores among PF group at different time interval Day 7 and Day3 when compared, "statistical analysis showed significant difference (p value< 0.001)". Wilcoxon Signed Ranks Test.

(ii) For Conventional Forceps

Mucosal Inflammation scores among CF group at different time interval Day 1 and Day3 when compared, "statistical analysis showed no significant difference (p value-1.000)".Wilcoxon Signed Ranks Test.
Mucosal Inflammation scores among CF group at different time interval Day 1 and Day7 when compared, "statistical analysis showed no significant difference (p value-0.046)".Wilcoxon Signed Ranks Test.
Mucosal Inflammation scores among CF group at different time interval Day 7 and Day3 when compared, "statistical analysis showed no significant difference (p value- 1.000)". Wilcoxon Signed Ranks Test
Mucosal Inflammation was not present in any of the patient at study On control site at different time interval Day 1 and Day 7 when compared, "statistical analysis showed significant difference (p value-0.046)". Wilcoxon Signed Ranks Test.
On comparing 4 parameters (post operative pain, Post operative bleeding, dry socket and Mucosal inflammation) among two groups (PF and CF) among 3 time intervals (Day 1 Day 3 and Day 7) by Mann Whitney U test only statistically significant parameter is postoperative pain. Therefore Postoperative pain on control site is more than study site on Day 1, Day 3 and Day 7.

Table 1: Comparing 4 parameters (post operative pain, Post operative bleeding, drysocket and Mucosal inflammation) among two groups (PF and CF) among3 time intervals (Day 1 Day 3 and Day 7) by Mann Whiteny U test

Test Statistics[a]					
DURATION		POP	POB	DRY SOCKET	MUCOSAL INFLAMMATION
	Mann-Whitney U	730.000	1800.000	1800.000	1740.000
DAY1	Wilcoxon W	2560.000	3630.000	3630.000	3570.000
	Z	-6.271	.000	.000	-1.420
	Asymp. Sig. (2-	.000	1.000	1.000	.156
	tailed) p value				
DAY3	Mann-Whitney U	1246.000	1800.000	1800.000	1680.000
	Wilcoxon W	3076.000	3630.000	3630.000	3510.000
	Z	-3.990	.000	.000	-2.026
	Asymp. Sig. (2- tailed) p value	.000	1.000	1.000	.043
DAY7	Mann-Whitney U	1469.000	1800.000	1800.000	1800.000
	Wilcoxon W	3299.000	3630.000	3630.000	3630.000
	Z	-3.224	.000	.000	.000
	Asymp. Sig. (2- tailed) p value	.001	1.000	1.000	1.000
a. Grouping Variable: GROUP					

Ranks					
DURATION		GROUP	N	MeanRank	Sum ofRanks
DAY1	POP	PF	60	42.67	2560.00
		CF	60	78.33	4700.00
		Total	120		
	POB	PF	60	60.50	3630.00
		CF	60	60.50	3630.00
		Total	120		
	DRY SOCKET	PF	60	60.50	3630.00
		CF	60	60.50	3630.00
		Total	120		
	MUCOSAL INFLAMMATION	PF	60	59.50	3570.00
		CF	60	61.50	3690.00
		Total	120		
	POP	PF	60	51.27	3076.00
		CF	60	69.73	4184.00
		Total	120		
	POB	PF	60	60.50	3630.00
		CF	60	60.50	3630.00

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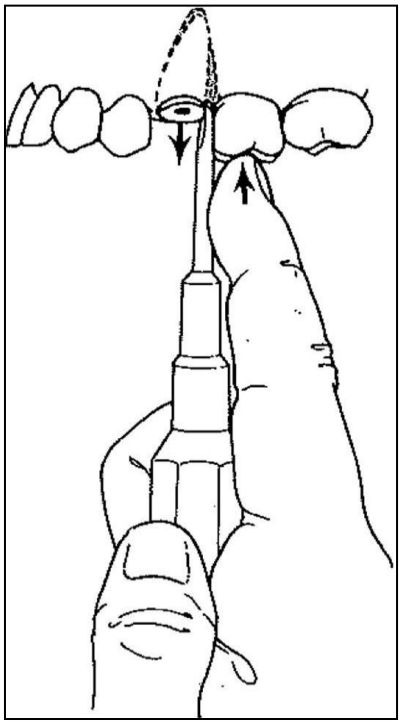
		Total	120		
	DRY SOCKET	PF	60	60.50	3630.00
		CF	60	60.50	3630.00
		Total	120		
DAY3	MUCOSAL INFLAMMATION	PF	60	58.50	3510.00
		CF	60	62.50	3750.00
		Total	120		
DAY7	POP	PF	60	54.98	3299.00
		CF	60	66.02	3961.00
		Total	120		
	POB	PF	60	60.50	3630.00
		CF	60	60.50	3630.00
		Total	120		
	DRY SOCKET	PF	60	60.50	3630.00
		CF	60	60.50	3630.00
		Total	120		
	MUCOSAL INFLAMMATION	PF	60	60.50	3630.00
		CF	60	60.50	3630.00
		Total	120		

Discussion

The classic techniques of extraction, which avoid harming the alveolar bone or supporting tissue, are utilised to gently loosen and remove the tooth. By becoming the first to use a single lever under the tooth to drive it out of its bed, Abulkasim invented the elevator. A conventional extraction method combines luxation with an elevator, forceps removal, and breaking the periodontal connection.

Fig.10: Use of Straight elevator for luxation of tooth.



If the tooth is already weak from endodontic therapy, decay, or if the roots are lengthy and/or dilacerated, traditional extraction forceps usually shatter the tooth, the

surrounding bone, or both. The forceps complete the task with sporadic apical and lateral stresses if the elevator is unable to clearly separate the tooth from the socket. This might lead to a more difficult surgical operation with associated detrimental postoperative consequences. Damage from conventional extraction methods can range from slight gingival tissue laceration to complete loss of the buccal cortical plate and interdental bone. (Al-Harbi SH. Minimizing., 2010).

Atraumatic extraction maintains bone and gingival architecture, gives the possibility of placing implants later or right away, and keeps the alveolus intact to reduce the need for ridge augmentation. It spares the patient from multiple plastic and reconstructive procedures to regain it.

When the labial plate is lost as a result of a draining apical infection or a vertical root fracture, atraumatic extractions are also required. This is especially true in the aesthetic zone, where stability of the soft tissue profile is even more important. For minimally invasive tooth extraction procedures, there are many modern equipment available, such as the simple x-trax system (Babbush CA., 2007), "#15 scalpel blades" (Patil SS, Rakhewar S.P, Diphode SS., 2012), "periotomes" (Jones S., 2012) and "physics forceps" (Misch C, Perez H., 2008).

The extractions performed with the Physics Forceps take less time overall, go more quickly, and most importantly, cause the patient less physical and psychological anguish (Al-Khateeb., 2008). It is not necessary to elevate a mucoperiosteal flap or utilise an elevator before attempting extraction with the Physics forceps, claim Dym and Weiss. This is a significant benefit, especially when atraumatic extraction is required (Dym H, Weiss A., 2012).

The development of the physics forceps was based on biomechanical principles, and the use of a first-class lever, creep, and the type of force provides the mechanical advantages required to increase the effectiveness of this dental extraction tool. In our study, we used physics forceps as a means of atraumatic extraction (Hariharan S, Vinod N, Soh LC., 2014).

Fig.11: Placement of bumper of physics forceps on mucogingical junction andapplication of beak on lingual aspect

Conclusion

A material can "creep," or alter shape over time while being subjected to a steady load. Creep can happen in the periodontal ligament and bone during tooth extraction. The bone undergoes three stages of form change over time under a constant stress of 60 Megapascals (Scull P., 2010). Most bone changes take place within the first minute; this motion helps the ligament gradually rupture and typically elevates the tooth by a few millimetres from the socket.

The degree of bone deformation increases with increasing applied force. When a rotating force is applied to the physics forceps on the tooth, the stress to the tooth and periodontal complex is a shear component of force,

allowing the tooth socket to expand and allowing the tooth to depart the socket. The bumper's compressive force, which is distributed over a larger surface area and braces the buccal bone, allows the lingual plate to expand more and prevents fracture of the facial plate. Perkins NJ et al. (2010) discussed a case of extraction employing physics forceps to preserve the buccal cortical plate in their presentation given at the British Association of Oral and Maxillofacial Surgeons (Perkins NJ, Perez MH, Misch EC, Golden R., 2010).

Overall success rate with physics forceps was 100% while that with conventional forceps was 98%.We considered patients requiring orthodontic extraction of single rooted tooth hence success rate was more in our study. Choi et al., in their study found 93% success rates with physics forceps for extraction of mandibular molars (Choi YH, Bae JH., 2011). During the study period we found some limitations with the use of physics forceps which mired in our study for example large size of “bumper” attached to one of its beak makes it challenging to extract the mandibular premolars. Secondly, the rubber bumper is to be changed after every extraction. Third, set of extraction forceps is quite expensive while associated with conventional forceps.

After evaluating physics forceps we found various parameters such as time taken for extraction, gingival laceration, cortical plate fracture, post-operative pain, to be in favor of “atraumatic extraction”. Although technique sensitive procedure, extraction with physics forceps is more acceptable for patients.

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