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"Comparative Evaluation between Physics Forceps and Conventional Extraction Forceps in Orthodontic Extraction of Maxillary Premolars: A Prospective, Interventional, Single Blind, Randomized Split Mouth Study"

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Abstract:*Tooth extraction procedure, although known as a minimal traumatic procedure, some sort of trauma is subjected to underlying soft and hard tissues, resulting in immediate destruction and loss of alveolar bone. Conventional extraction forceps are designed on the principle of simple machine incorporating two first-class levers, connected with a hinge. The physics forceps are the newly invented forceps. The design of physics forceps which implements a first class lever, creep, and type of force that provides a mechanical advantage, which makes it more efficient.*

AIM: The aim of the present study to evaluate the efficacy between the conventional extraction forceps and physics forceps in orthodontic extraction of maxillary premolars.

Patients & Methods:*A total of 50 healthy patients with indicated for extraction of bilateral maxillary premolar for orthodontic reasons; split mouth design (control side, test side) in a randomized manner; were included in the present study.*

Results:*Ease of technique, buccal cortical plate fracture, fracture of tooth or root, gingival laceration, soft tissue healing was not significant. The extraction time and bleeding associated with extraction socket were significant. Post operative days 1-4 are not significant and on day 5-7 the pain on VAS score is 0.*

Conclusion:*The results of present study suggest that, extraction using any forceps can produce predictable results and it totally depends on surgeon's expertise in a particular technique.*

I. INTRODUCTION

Extraction of tooth although, ideally a minimally traumatic procedure eventually leads to certain degree of trauma to the investing tissue like gingiva, the alveolar bone, subsequently leading to complex cascade of biochemical and histological events which further leads to physiologic alterations to alveolar bone and soft tissue architecture. Over the last decade there has been an increased concern for atraumatic tooth extractions in order to preserve alveolar bone for subsequent rehabilitationwith implant supported prosthesis.[1]

The extraction of the teeth for orthodontic purposes needs least trauma to the investing structure, especially the alveolar bone because, the healthy bone is required subsequently to move the teeth in the desired position with application of orthodontic forces. Loss of alveolar bone during extraction could lead to poor bone quality and quantity thereby making the job of orthodontist difficult. Conventional extraction forceps are designed on the principle of simple machine incorporating two first-class levers, connected with a hinge.[1] The Physics forceps implement a first-class lever, creep, and type of force that provides a mechanical advantage, making it more efficient.[2]Considering the fact that the physics forceps are less traumatic a null hypothesis was made that "the extraction of the premolars for the orthodontic reasons using a physics forceps is more advantageous than using the conventional forceps". The present study was thus designed and implemented to evaluate the efficacy of the physics forceps and to assess whether the use of physics forceps offers added advantage over the conventional forceps during the extractions of the premolars for orthodontic considerations in terms of lesser trauma, lesser chances of alveolar bone or tooth fracture and better quality of bone healing succeeding the extraction.[2]

II. MATERIAL & METHODS

A prospective, interventional, randomized split mouth study was designed and implemented in the Outpatient Department of Oral & Maxillofacial Surgery, SharadPawar Dental College Sawangi (Meghe) Wardha, between Aug. 2014 and July 2016. Fifty consecutive patients requiring bilateral extraction of maxillary first premolars for orthodontic considerations wereincluded in the present study between the ages of 14-25 years, after obtaining clearance from the Institutional Ethics committee.A detailed written, informed consent was obtained from all the patients who were willing to participate in the present study before recruiting them, "according to Helsinki declaration".

Split mouth design was implemented and each patient was subjected to extraction of maxillary 1st premolar using conventional extraction forceps (control side) at one side and physics forceps at contralateral side (test side) in a randomized manner. Under all aseptic precautions and standard patient preparation, the extraction of maxillary first premolar was done under local anesthesia with 2%lidocaine hydrochloride with adrenaline. The extraction of premolar on the contralateral side was undertaken after the gap of 3-4 days maintaining the standard conditions as in place for the previous extraction on the opposite side.

Operative complications such as incomplete removal or fracture of the tooth, fracture of cortical plates, gingival laceration and bleeding was assessed intraoperatively and recorded. Bleeding was evaluated using a 3 point VAS (0 representing minimal bleeding and 3 indicating continuous low bleeding) A simple yes/no format were used for the assessment of fracture of tooth, cortical plates and gingival laceration. Pain score was noted for both post extraction sites by using 10 point visual analogue scale where 0 representing absence of pain and 10 indicating the most severe pain; upto7 of the postoperative day.The patients were educated about the pain scale and were ask follow-up visit on seventh post-operative day and pain score were tabulated.

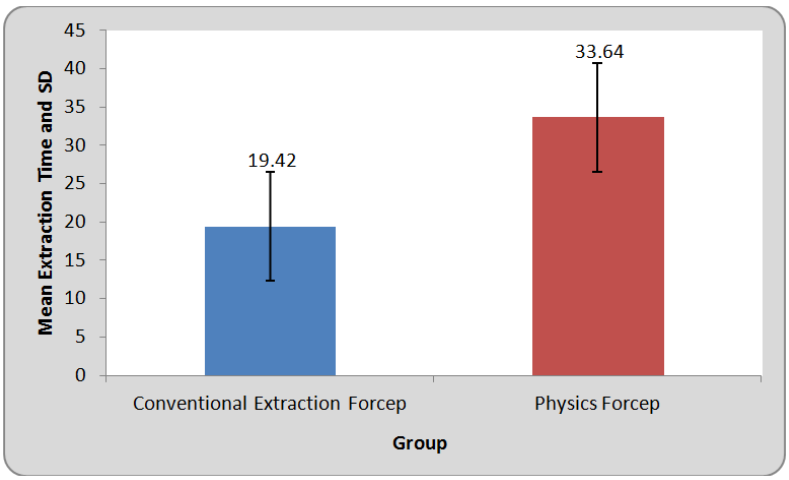
All the patients were prescribed paracetamol 650 mg SOS up to three days, post operatively. All the Patients were advised warm saline rinses twice daily. No prophylactic antibiotics were prescribed to the patients.Healing of the extraction sockets were evaluated on 7th, 14th and 21st postoperative days using a 5 point VAS scale (0 representing normally pink, non-edematous and 5 representing dry socket).

III. RESULTS

The results of the postoperative parameters were explained below with the use of tables. The statistical tests used for the analysis of the result were; Chisquare Test and Student's unpaired t test.

	Conventional Extraction Forcep	Physics Forcep	χ2-value	p-value
Ease of Technique				
Easy	46(92%)	46(92%)	2.66	0.26 NS,p>0.05
Moderately Difficult	4(8%)	2(2%)		
Difficult	0(0%)	2(2%)		
Buccal Cortical Plate Fracture				
Yes	1(2%)	2(4%)	0.34	0.55 NS,p>0.05
No	49(98%)	48(96%)		
Fracture of tooth or root				
Yes	0(0%)	2(4%)	2.02	0.15 NS,p>0.05
No	50(100%)	48(96%)		
Gingival Laceration				
Yes	1(2%)	3(6%)	1.04	0.30 NS,p>0.05
No	49(98%)	47(94%)		
Bleeding				
Minimal Bleeding	11(22%)	34(68%)	24.82	0.0001 S,p<0.05
Oozing	28(56%)	11(22%)		
Accidental Low Bleeding	10(20%)	2(4%)		
Continuous Low Bleeding	1(2%)	2(4%)		

Table 2: Comparison of Ease of Technique, Buccal Cortical Plate Fracture, Fracture of tooth or root, Gingival Laceration and bleeding in two group



Graph 3: Comparison of Extraction Time in two group

Day	Soft Tissue Healing	Conventional	Physics Forcep	χ2-value	p-value

		Extraction Forcep			
Day 7	Normally pink, not edematous	31(62%)	29(58%)	3.09	0.21 NS,p>0.05
	Pink red, slightly edematous	19(38%)	18(36%)		
	Red edematous	0(0%)	3(6%)		
	Red edematous, bleed easily when touched	0(0%)	0(0%)		
	Frank pus discharge	0(0%)	0(0%)		
	Dry socket	0(0%)	0(0%)		
95% CI		0.24-0.51	0.30-0.65		
Day 14	Normally pink, not edematous	50(100%)	50(100%)	-	-
	Pink red, slightly edematous	0(0%)	0(0%)		
	Red edematous	0(0%)	0(0%)		
	Red edematous, bleed easily when touched	0(0%)	0(0%)		
	Frank pus discharge	0(0%)	0(0%)		
	Dry socket	0(0%)	0(0%)		
95% CI		0.00-0.00	0.00-0.00		
Day 21	Normally pink, not edematous	50(100%)	50(100%)	-	-
	Pink red, slightly edematous	0(0%)	0(0%)		
	Red edematous	0(0%)	0(0%)		
	Red edematous, bleed easily when touched	0(0%)	0(0%)		
	Frank pus discharge	0(0%)	0(0%)		
	Dry socket	0(0%)	0(0%)		
95% CI		0.00-0.00	0.00-0.00		

Table 4: Comparison of soft tissue healing in two groups

	Day 1		Day 2		Day 3		Day 4		Day 5		Day 6		Day 7	
Pain on VAS Score	Conventional Extraction Forcep	Physics Forcep	Conventional Extraction Forcep	Physics Forcep	Conventional Extraction Forcep	Physics Forcep	Conventional Extraction Forcep	Physics Forcep	Conventional Extraction Forcep	Physics Forcep	Conventional Extraction Forcep	Physics Forcep	Conventional Extraction Forcep	Physics Forcep
0	5(10%)	5(10%)	17(34%)	16(32%)	28(56%)	27(54%)	50(100%)	47(94%)	50(100%)	50(100%)	50(100%)	50(100%)	50(100%)	50(100%)
1	15(20%)	15(30%)	18(36%)	17(34%)	13(26%)	12(24%)	0(0%)	3(6%)	0(0%)	0(0%)	0(0%)	0(0%)	0(0%)	0(0%)
2	27(54%)	24(48%)	14(28%)	16(32%)	9(18%)	11(22%)	0(0%)	0(0%)	0(0%)	0(0%)	0(0%)	0(0%)	0(0%)	0(0%)
3	3(6%)	3(6%)	1(2%)	1(2%)	0(0%)	0(0%)	0(0%)	0(0%)	0(0%)	0(0%)	0(0%)	0(0%)	0(0%)	0(0%)
4	0(0%)	3(6%)	0(0%)	0(0%)	0(0%)	0(0%)	0(0%)	0(0%)	0(0%)	0(0%)	0(0%)	0(0%)	0(0%)	0(0%)
5	0(0%)	0(0%)	0(0%)	0(0%)	0(0%)	0(0%)	0(0%)	0(0%)	0(0%)	0(0%)	0(0%)	0(0%)	0(0%)	0(0%)
6	0(0%)	0(0%)	0(0%)	0(0%)	0(0%)	0(0%)	0(0%)	0(0%)	0(0%)	0(0%)	0(0%)	0(0%)	0(0%)	0(0%)
7	0(0%)	0(0%)	0(0%)	0(0%)	0(0%)	0(0%)	0(0%)	0(0%)	0(0%)	0(0%)	0(0%)	0(0%)	0(0%)	0(0%)
8	0(0%)	0(0%)	0(0%)	0(0%)	0(0%)	0(0%)	0(0%)	0(0%)	0(0%)	0(0%)	0(0%)	0(0%)	0(0%)	0(0%)
9	0(0%)	0(0%)	0(0%)	0(0%)	0(0%)	0(0%)	0(0%)	0(0%)	0(0%)	0(0%)	0(0%)	0(0%)	0(0%)	0(0%)
10	0(0%)	0(0%)	0(0%)	0(0%)	0(0%)	0(0%)	0(0%)	0(0%)	0(0%)	0(0%)	0(0%)	0(0%)	0(0%)	0(0%)
χ2-value	3.17		0.19		0.25		3.09		-		-		-	-
p-value	0.52,NS,p>0.05		0.97,NS,p>0.05		0.87,NS,p>0.05		0.07,NS,p>0.05		-		-		-	-

Table 5: Comparison of operative pain on VAS in two group

IV. DISCUSSION

For the better evaluation between conventional extraction forceps and physics forceps, the teeth extracted for orthodontic indications are selected in the present study;premolar extraction was chosen as methodology to have parity in sample for better evaluation of the objectives.

The teeth are extracted for the orthodontic indications to create space for orthodontic movement of the teeth to correct the crowding, the quality and quantity of the bone is very important. In the event of damage to the investing structures like the alveolar bone both by way of fracture of the alveolar bone or while surgical removal of the fractured root fragment, the form and quality of the bone gets compromised and the subsequent orthodontic treatment becomes challenging. It may not produce the desired clinical results and thus, the extractions are required to be essentially performed with utmost care and minimum trauma and complications. It is therefore popularly said that "the tooth belongs to the surgeon and bone belongs to the patient" thereby meaning that the bone must be conserved during the extraction.[1]

With this aim the present study was carried out to compare the outcomes of the extraction using the conventional extraction forceps and the physics forceps to find out whether the physics forceps offer any added advantage in terms of the ease of extraction, trauma to the investing tissue and minimizing complications associated thereof.

Use of appropriate and specialized instruments facilitates the procedure and makes it more predictable. The ease of technique essentially entails facilitation of extraction. In the present study, on comparison of conventional extraction forceps with physics forceps, pertaining to ease of technique, the results were found to be insignificant (*p=0.26*).

The result of the present study suggests both the techniques are equally effective in terms of ease of technique. The possibility of ambiguity in results cannot be ruled out considering it to be a newly introduced armamentarium in exodontias and a learning curve. It demands a considerable amount of time to master the technique in view of its significantly different technique from what is used for conventional extraction forceps.

Time taken to extract a tooth can be considered as a time period from engaging a tooth by forceps to completely removing it out of socket. In present study, mean time taken for extraction by conventional forceps(19.42 sec) was found to be significantly lesser as compared to physics forceps (33.64 sec).While S. Hariharan et al, in their study did not find significant difference in time taken for extraction with mean extraction time using physics forceps being 29.4 sec and conventional forceps 43.5 sec.[3]

The cortical plates hold the tooth medially and laterally. In the maxilla there is only one plate called as buccal/labial cortical plate laterally and medially there is palatal bone which is thicker as compared to lateral plate. It is desirable that both the cortical plates should be intact for healthy tooth movement in teeth extracted for orthodontic purposes. The buccal cortical plate being comparatively weaker usually fractures due to inadvertent forces applied by operator or by application of excessive forces.In present study, buccal cortical plate fracture was observed in a single case with use of conventional forceps while no fracture was observed with the use of physics forceps. Statistically insignificant differences were observed between the two techniques (*p=0.15*)

The results of present study are in agreement with studies by Mohammad el Kenawy and Wael Mohammad who observed buccal cortical plate fracture in 3 patients using physics forceps and in 7 patients using conventional extraction forceps out of 100 patients, respectively.[4]SoumenMandal also found that the buccal cortical plate fractures in 12 patients with using the conventional extraction forceps and no buccal plate fracture with use of physics forceps group.[5]

Conversely, Harsh Patel et al found no buccal cortical plate fracture using conventional extraction forceps while he observed two cases of buccal cortical plate fractures with the use of physics forceps in a sample size of 10 subjects.[6]

Usually the root fractures occurs in extraction of maxillary first premolars, because the bifurcation of root at its apical 1/3rd. Morphologically, the maxillary first premolar has thin and slender root which could occasionally be dilacerated and unfavorable in form. Hence, under these circumstances root fractures more commonly occurs due to root anomalies.

In present study we found that 3 cases of root fractures in which 2 cases of root fractured occurred with the use of physics forceps and 1 with application of conventional forceps. The fractured root fragments were removed using bur window technique. Out of three, two cases had slender roots and one case had dilacerations which are more likely to fracture in normal circumstances.The results of the present study are contrary to the experience of Harsh Patel who found that apical root fracture in 2 patients with use of conventional extraction forceps and none with the use of physics forceps.[6] Mohammad Kenawy et al also observed root fractures, 14 patients in physics forceps group and 27 patients in conventional extraction forceps.[4] However, above cited studies failed to mention the probable reasons for root fractures.

For the effective tooth extraction, gingiva mucoperiosteum should be separated from the tooth and the bone structure. Less commonly it occurs in association with fracture of buccal cortical plate or root fractures due to injudicious and inappropriate application of forces to deliver the tooth. Also sometimes extraction with the use of conventional extraction forceps lacerates the gingiva or crushing of the gingiva due to improper handling or improper forceps technique. To avoid the gingival laceration careful retraction is needed.

Design of physics forceps is such that forces are applied on buccal gingiva through bumper, which can contribute to crushing injury. However, no such findings were observed in the present study and results were found to be non-significant (*p=0.305*), suggesting appropriate design of bumper which dissipates the forces over larger surface area. Conversely, Saumenmandel found more gingival laceration with the application of conventional forceps.[5]Bleeding is always associated after trauma. After tooth extraction the bleeding is usually occurs due to trauma to the investing tissues. During dental extractions, barring systemic causes, bleeding usually occurs following shearing of PDL ligaments, microfractures of cortical plates, antral perforations, presence of granulation tissue and rarely from apical / nutrient foramen.

The parameter of bleeding with the application of the above mentioned forceps were not considered for evaluation in earlier studies. However, in the present study we considered this parameter as we believe that, this finding is a direct indicator of soft tissue and hard tissue trauma caused during extraction. In the present study, bleeding following extraction was assessed by VAS. The mean VAS score for bleeding with the use of conventional extraction forceps was more as compared with use of the physics forceps and was found to be

significant statistically (p=0.0001). In the present study, minimal bleeding was found more with the use of physics forceps than with conventional extraction forceps.

Healing of soft tissue wound is an orchestrated event. Healing is influenced by number of local and systemic factors. In present study there are no statistically significant differences in soft tissue healing in both the groups on 7th, 14th and 21stpost operative day. There are no studies which considered this factor, this is first attempt to establish results of this parameter in both groups. Present study suggests there is no difference in soft tissue healing in either technique as orthodontic extraction itself is atraumatic procedure.

Pain is purely a subjective symptom. It can vary from person to person and in same person at different times. In the present study, postoperative pain measured on VAS scale was recorded from day 0 to day 7. On evaluation pain was observed in conventional till day 3 and in physics forceps group till day 4 after which pain was subsided in both the groups. Mean VAS score on 1st post op day using conventional forceps and physics forceps were 1.56 and 1.68 respectively. Mean VAS score on 3rd post op day using conventional forceps and physics forceps were 0.62 and 0.68 respectively. However, the difference in pain score using either forceps were not statistically significant (*p= 0.52,0.87*)

Results of present study are in agreement with study by Harsh Patel who also observed no statistically difference in pain in both the groups.**Error! Bookmark not defined.** However results are contrary to study by SatishMadathanapalli et al and S. Hariharan.[7,8]

SatishMadathanapalli et al noted statistically significant difference on 3rd day while there was no difference seen on the 5th and 7thpost-operative day.[8]Hariharan et al observed stasically less pain on 1stpost-operative day in application of physics forceps (SD = 0.6) compared to conventional group (SD = 0.9).[7]

V. CONCLUSION

The result obtained showed that, statistically significant differences with ease of technique, buccal cortical plate fracture, fracture of the tooth or root, gingival laceration, soft tissue healing and post-operative pain between the two groups. Statistically significant findings were observed in time taken for extraction and bleeding associated with it. Root fracture, buccal cortical plate fracture, time required and ease of extraction are technique sensitive and can be attributed to learning curve with use of physics forceps. Gingival laceration can be avoided by careful retraction immaterial of forceps used. Bleeding with physics forceps was less owing to less soft and hard tissue trauma during extraction. According to literature, physics forceps have certain advantages over conventional method of extraction in multi rooted, decayed tooth. In present study, there are no such obvious results found to indicate consideration of physics forceps over conventional forceps for orthodontic extraction in routine practice.

So the present study suggests that, extraction using any forceps can produce predictable results and it totally depends on surgeon's expertise in a particular technique.

1 Borle et al, Textbook of Oral & Maxillofacial Surgery, 1st ed., New Delhi, Jaypee Brothers, 2014.

2 Misch Carl E., Atraumatic Extractions: A Biomechanical Rationale, dentistry today, 2014.

3 SamyukthaHariharan, Vinod Narayanan, Chen LoongSoh, Split-mouth comparison of Physics forceps and extraction forceps in orthodontic extraction of upper premolars, 2014, BJOMS, e137–e140.

4 M.H.El-Kenawy, W.M.S. Ahmed, comparison between physics and conventional forceps in simple dental extraction,2015, JOMS

5 Dr.SoumenMandal, Dr. Sunil Kr. Gupta, Dr. Ankur Mittal, Dr. RiteshGarg, Collate On the Ability of Physics Forceps V/S Conventional Forceps in Multirooted Mandibular Tooth Extractions, 2015, Volume 14, Issue 3 Ver. I , PP 63-66.

6 Patel harsh et al, Comparative Evaluation of Efficacy of Physics Forceps versus Conventional Forceps in Orthodontic Extractions: A Prospective Randomized Split Mouth Study, J ClinDiagn Res. 2016 Jul; 10(7): ZC41–ZC45

7 SamyukthaHariharan, Vinod Narayanan, Chen LoongSoh, Split-mouth comparison of Physics forceps and extraction forceps in orthodontic extraction of upper premolars, 2014, BJOMS, e137–e140

8 Madathanapalli S., Surana S., Thakur D., Ramnani P., Kapse S., Physics forceps vs conventional forceps in extraction of maxillary first molar.International Journal of Oral Care and Research, January-March 2016;4(1):29-32