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### Comparative evaluation between physics forceps and conventional extraction forceps in extraction of maxillary molars

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#### Abstract

Atraumatic dental extraction preserves bone, gingival architecture, and allows for the option of future or immediate dental implant placement. A number of tools and techniques have been proposed for minimally invasive tooth removal such as physics forceps.

**Methodology:** Subjects were divided into two groups including Conventional & Physical forceps for extracting of maxillary molars. Parameters like fracture of the bone, Cortical plate, gingival laceration, healing, bleeding & Pain were assessed.

**Results:** All the parameters showed difference between physical group than conventional forceps.

**Conclusion:** The biomechanical design of physics forceps decreases the incidence of root fracture, and maintains the buccal bone plate, which is essential for the proper healing of an immediately placed dental implant.

**Keywords:** Dental extraction, physics forceps, conventional forceps

#### Introduction

Over the last decade there has been an increased interest in atraumatic tooth extraction in order to maintain bone for implant insertion<sup>[1]</sup>. Recently, a revolutionary new concept and tooling in exodontia the Physics forceps is developed which primarily uses the biomechanical advantages of a first-class lever, creep, and stress distribution without the squeezing, grasping, twisting and pulling forces<sup>[2]</sup>.

In recent years there has been an increased emphasis on the atraumatic removal of teeth. The physics forceps are the latest innovation in dental extraction technology & they provide an efficient means for atraumatic dental extractions<sup>[2]</sup>. In the process of a simple extraction, surgeons must exercise a great deal of fineness and a certain degree of controlled force to deliver a simple tooth extraction<sup>[3]</sup>.

Loss of alveolar bone during extraction could lead to poor bone quality and quantity<sup>[1]</sup>. Traditional extraction techniques use a combination of severing the periodontal attachment, luxation with an elevator, and removal with forceps. If the elevator fails to cause noticeable separation of the tooth from the socket, the forceps accomplish the work through intermittent apical and lateral forces. If the tooth is already weakened from endodontic treatment or decay, or if the roots are long and/or dilacerated, then traditional extraction forceps often cause fracture of the tooth, surrounding bone, or both. This can lead to a more involved surgical approach, accompanied by corresponding undesirable postoperative sequelae<sup>[4]</sup>. Biomechanical aspects of force have been applied to tooth extraction for centuries. However, the mechanical advantages available to extract the teeth were primarily applied to hold the crown of the tooth, rather than help extract it<sup>[5]</sup>.

Conventional extraction forceps are designed on the principle of simple machine incorporating two first-class levers, connected with a hinge<sup>[1, 3]</sup>. The Physics forceps implement a first-class lever, creep, and type of force that provides a mechanical advantage, making it more efficient<sup>[6, 3]</sup>. Considering the fact that the physics forceps are less traumatic a hypothesis was made that "the extraction of the molars using a physics forceps is more advantageous than using the conventional forceps". Hence, 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

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offers added advantage over the conventional forceps during the extractions of the molars in terms of lesser trauma, lesser chances of alveolar bone or tooth fracture and better quality of bone healing succeeding the extraction.

### Objectives

1. To compare the efficacy of physics forceps over conventional forceps in terms of Trauma, Pain, Bone or Tooth fracture & bone healing after extraction.

### Methodology

Hundred adult patients seeking simple dental extraction were selected from the Outpatient Clinic in the Oral and Maxillofacial Surgery Department, according to the following inclusion and exclusion criteria's

#### Inclusion Criteria

- Patients with teeth having 3 mm or more of intact tooth structure above the gingival margin with at least the minimum of 2 intact surfaces.
- Subjects of both the gender

#### Exclusion criteria

Exclusion Criteria for Both Conventional and Physics Forceps Groups

- Patients with teeth having abnormal root morphology (as dilacerated, severely curved, bulbous roots, etc.) as depicted by preoperative periapical X-ray examination.
- Patients with uncontrolled systemic disease, that compromise dental extraction.
- Patients requiring extraction of wisdom teeth.
- Refused to sign the informed consent
- Existing moderate-severe infections
- Root stump
- Surgical extraction
- Periodontally weak- grade II- III mobile

Informed consent was taken from every participant "according to Helsinki declaration". The study protocol was approved by the Institutional Ethics Committee. The selected patients were randomly allocated into two groups:

Group I (physics forceps group): included 50 patients, in this group extraction was done using physics forceps.

Group II (conventional forceps group): included 50 patients, in this group extraction was done using conventional forceps. Extraction was carried out under aseptic condition using local anaesthesia, 2% lignocaine with adrenaline and postoperative instructions were given to each subjects. Subjects were followed for a period of 5days for 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 7<sup>th</sup> day using a 5 point VAS scale (0 representing normally pink, non-edematous and 5 representing dry socket).

### Result

Table 1 depicts all the parameters like fracture of tooth, fracture of buccal cortical plate, Gingival laceration, Bleeding & Healing for physical forceps is much better than conventional forceps though there was no significant difference between the two except in bleeding & healing where the difference was significantly noticed.

Table 2 shows the VAS score for pain among conventional & physical forceps among different time intervals. The difference between the conventional & physical forceps in 1<sup>st</sup> & 2<sup>nd</sup> day was observed significant & physical forceps showed the significant reduction in pain. But there was no statistical difference between the two on 3<sup>rd</sup>, 4<sup>th</sup> & 5<sup>th</sup> day.

**Table 1:** Comparison of clinical parameters between Conventional and Physics Forceps

Parameter	Evaluation	Forceps		Significance
		Physical	Conventional	
Fracture of tooth	Yes	2 (4.0%)	4 (8.0%)	$\chi^2 = 0.709$ p = 0.678 NS
	No	48 (96.0%)	46 (92.0%)	
Buccal Cortical Plate Fracture	Yes	3 (6.0%)	5 (10.0%)	$\chi^2 = 0.543$ p = 0.715 NS
	No	47 (94.0%)	45 (90.0%)	
Gingival laceration	Yes	3 (6.0%)	6 (12.0%)	$\chi^2 = 1.099$ p = 0.487 NS
	No	47 (94.0%)	44 (88.0%)	
Bleeding	Minimal	21 (42.0%)	39 (78.0%)	$\chi^2 = 14.929$ p = 0.001 S
	Moderate	26 (52.0%)	8 (16.0%)	
	Continuous low bleeding	3 (6.0%)	3 (6.0%)	
Healing	Normally pink, not edematous	35 (70.0%)	48.0 (96%)	$\chi^2 = 12.036$ p = 0.002 S
	Pink red, slightly edematous	14.0 (28.0%)	2 (4.0%)	
	Red edematous	1 (2.0%)	0.0 (0%)	

NS – Non Significant, S - Significant

**Table 2:** Comparison of mean VAS score between Conventional and Physics Forceps for 5 postoperative days

	Forceps	Mean	Std. Deviation	Significance
DAY 1	Physical	1.78	0.93	t = 5.12
	Conventional	2.76	0.98	p<0.001 HS
DAY 2	Physical	1.20	1.01	t = 4.476
	Conventional	2.16	1.13	p<0.001 HS
DAY 3	Physical	0.66	0.84	t = 0.893
	Conventional	0.82	0.94	p = 0.374 NS
DAY 4	Physical	0.14	0.35	t = 0.610
	Conventional	0.10	0.30	p = 0.543 NS
DAY 5	Physical	0.04	0.19	t = 0.000
	Conventional	0.040	0.19	p = 1.000 NS

HS – Highly Significant, NS – Non Significant

## Discussion

Physics forceps are the most innovative oral surgery instruments in recent years, completely changing the physics behind dental extractions; hence it is named as physics forceps. They were developed by Dr. Richard Golden in 2004 and have been modified with the help of several doctors. This study aimed to compare between physics and conventional forceps regarding fracture of the crown, roots, and alveolar bone plates [7].

The main advantage of physics forceps over conventional forceps is related to their unique design that can deliver a powerful mechanical advantage by employing an efficient first-class lever. The extraction technique differs from any other extraction technique in that the buccal portion of the forceps is not a beak, but rather a plastic covered bumper which is placed apically in the vestibule, creating a more efficient class I lever system [7].

By combining the biomechanical advantages of a first class lever with the biochemical reaction, extraction of the teeth became easier with physics forceps than conventional type with less incidence of crown and root fracture. When the periodontal ligament was traumatized with forceps or elevators, hyaluronidase was released. Once this chemical breakdown of the periodontal ligament by hyaluronic acid was sufficient, the tooth was released from its attachment to the alveolus and could be removed. This explains why the physics forceps with its steady trauma to the periodontal ligament quantitatively creates a greater release of hyaluronidase than traditional forceps or elevator extractions because the trauma from those techniques was intermittent.

This is what makes the physics forceps more efficient, and causes less crown and root fracture [7]. These results were similar to present study & in agreement with the study of Choi *et al* [8]. who used physics forceps to extract teeth for intentional replantation (IR) and they concluded that, physics forceps could be considered as a reliable extraction method for safe and successful IR; it is expected to contribute greatly to save natural teeth.

In addition, the beak of the physics forceps is designed to apply control pressure parallel to the long axis of the root, and the bumper acts as a simple fulcrum or pivot point, so there were no squeezing forces applied to the beak of the physics forceps; because of that the tooth does not split, crush or fracture. Traditional forceps grasp, squeeze, twist, and exert crushing forces on the crown leading to increase in the incidence of crown fracture in conventional forceps group. These results were concomitant with the study of Misch and Perez [7].

The physics forceps applies a constant and steady pressure with the wrist only, as this technique requires a minimal

amount of strength and a maximum amount of patience, that helping to decrease the incidence of buccal bone fracture. This may be the reason for the present study results which was in agreement with the result of Kosinski<sup>9</sup> who stated that the buccal movement applied by physics forceps was slow and generally insufficient to fracture the buccal bone plate.

Pain was also less in physical forceps in comparison with conventional at all-time intervals which was similar to the other studies by Feck A [12], Kosinski T [13], Sathish M [2] & Soumen M *et al* [5].

But this was in contrast with Sonune A M *et al* [3] where there was no difference in VAS score was observed in both the groups.

## Conclusion

Physics forceps are innovative extraction instruments & by using them, it is possible to perform difficult extractions, with predictable results, and without need to reflect a flap. Using physics forceps decreases the incidence of crown, root, and buccal bone plate fractures, in comparison to the conventional forceps. Hence, the physics forceps is clinically valuable in atraumatic tooth removal and in preserving the buccal bone plate, which is mainly critical for implant dentistry.

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