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# COMPARING THE EFFICACY OF PHYSICS FORCEPS AND CONVENTIONAL FORCEPS IN MANDIBULAR FIRST MOLAR EXTRACTIONS: INSIGHTS FROM CLINICAL EXPERIENCE

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**Abstract**

**Objectives**. Atraumatic tooth extraction aims to preserve the alveolar bone and surrounding structures. Several tools have been designed for atraumatic extraction of teeth like physics forceps which have been found to be very effective. The objective of this study was to assess the efficacy of physics forceps and compare the clinical outcomes to the conventional forceps.

**Methods:** In this comparative study 100 patients requiring simple dental extractions of first mandibular molar were divided into two groups each group having 50 patients. Extractions in one group were done using Conventional forces and in other group using Physics forceps.

Parameters like fracture of crown and root, cortical plate fracture, soft tissue injuries, duration of surgery, post operative pain, patient satisfaction, and post-extraction socket healing evaluated.

**Results:** The mean surgical time taken using physics forceps was shorter than conventional forceps but without statistical significance. Root and buccal cortical plate fractures were lower in the physics forceps group. Higher patient satisfaction was found in the physics forceps group (82%). Post extraction socket healing was equal in 75% of the cases. Soft tissue injuries less in patients with physics forceps group and no significant difference between two groups regarding analgesic intake for pain control.

**Conclusion:** Physics forceps are a valuable alternative to traditional forceps for atraumatic tooth extraction due to less surgical time taken and better satisfaction rate

**Key words**: Tooth extraction, conventional forceps, physics forceps, oral surgery, patient satisfaction.

## INTRODUCTION

Tooth extraction is among the most frequently performed surgical interventions in dentistry. Over the years, various tools, including physics forceps, powertomes, proximators, periotomes, and the Benex extractor, have been developed to streamline the procedure [1,2].

The growing popularity of dental implants in the past decade has led to an increased focus on atraumatic tooth extraction methods aimed at preserving alveolar bone integrity. Introduced in 2004 by Dr. Richard Golden, physics forceps facilitate the minimally traumatic removal of severely carious teeth while minimizing complications. **[image-1]**. These forceps utilize the principle of a first-class lever to distribute stress evenly over the tooth's surface, avoiding conventional techniques such as squeezing, pulling, grabbing, or rotating [3,4]. This innovative biomechanical design reduces the risk of root fractures and preserves the buccal bone plate, which is critical for successful healing and immediate dental implant placement [5].

The present study explored the use of physics forceps compared with conventional forceps, focusing on parameters such as patient comfort and satisfaction, surgical time, surgical site healing, the occurrence of soft tissue injury, tooth and buccal cortical plate fractures, postoperative pain levels, and analgesic requirements.

**Image 1- Physics forceps**

**Materials and Methods**

This prospective, randomized clinical study was conducted with 100 patients who visited the Department of Oral and Maxillofacial Surgery at the College of Dentistry, Saudi Arabia, between March 2024 and December 2024 for tooth extractions and met the inclusion criteria and after ethical approval. A written informed consent was secured from all participants. Inclusion criteria comprised patients aged 20 to 40 years with carious, non-restorable mandibular first molars possessing two roots. Patients were excluded if they had severe periodontitis (Grade II or III mobility), endodontically treated teeth, fused roots, cystic pathology, were pregnant, or had psychological conditions.

The patients were randomly assigned to two groups, each consisting of 50 individuals: Group A (treated with physics forceps) and Group B (treated with conventional forceps). A preoperative panoramic radiograph was recommended. Local anesthesia was administered using 2% mepivacaine HCl with 1:100,000 epinephrine. When using physics forceps, the beak was placed on the lingual side of the tooth at or slightly below the cementoenamel junction, while the bumper was positioned on the buccal aspect of the alveolus at the mucogingival junction. Tooth extraction was facilitated by applying a steady and constant rotational force directed towards the bumper. Patients received standard postoperative care instructions, and analgesics, specifically paracetamol 500 mg, were prescribed for use as required. The duration of the extraction procedure was recorded in seconds using a stopwatch, starting from the moment the tooth was grasped with the forceps until it was removed from the socket. Tooth fractures were determined using the following format: one root fracture = 1, two root fractures = 2, and crown fracture = 3. Patient satisfaction with the procedure was evaluated on a 1−5 scale, where 1 indicated ‘not satisfied’, 2 ‘slightly satisfied’, 3 ‘neutral’, 4 ‘satisfied’, and 5 ‘very satisfied’.

Socket healing was examined using the Landry, Turnbull, and Howley healing index, as modified by Pippi et al. [6]. Each socket was assigned a cumulative score of up to 7, based on the following parameters: (1) tissue color—either pink, indicating healthy healing, or red, suggestive of an inflammatory response; (2) presence or absence of granulation tissue; (3) presence or absence of suppuration; (4) presence or absence of swelling; (5) extent of epithelialization, classified as partial or complete; (6) presence or absence of tenderness on palpation; and (7) presence or absence of bleeding on palpation. Assessing these criteria allowed the healing status to be categorized as better, worse, or equivalent when compared to other sites. Additionally, patients were provided with a visual analogue scale (VAS) chart to assess intraoperative pain on a scale from 0 to 10, where 0 indicated no pain and 10 denoted continuous pain.

Data were analysed using Statistical Package for Social Sciences, version 22.0. An independent samples t test was conducted to compare pain levels and surgical durations between groups, whereas categorical outcome variables were examined using the chi-square test. A p value of $<0.05$ was considered statistically significant.

## RESULTS

### Demographics

The study included 100 patients, comprising 43 females and 57 males. Group I (treated using physics forceps) included 23 females and 27 males (mean age: 28.59 ± 10.23 years). Group II (treated using conventional forceps) consisted of 20 females and 30 males (mean age: 29.25 ± 11.08 years). The age difference between the groups was not statistically significant ($p = 0.692$).

### Crown and root fracture

In Group I, crown fractures were reported in 2 patients (4%), and root fractures occurred in 5 patients (10%). In Group II, crown fractures were observed in 3 patients (6%), while root fractures were noted in 9 patients (18%). Although differences in crown and root fractures between the groups were not statistically significant ($p = 0.051$ and 0.515, respectively), Group I showed a clinically notable reduction in crown fractures **(Table 1)**.

| **Variable** | Physics forceps | Conventional forceps | **P-value** |
|---|---|---|---|
| Crown Fracture | 2 | 5 | P=0.057 |
| Root Fracture | 3 | 9 | P=0.515 |
| **TABLE 1: Crown and Root Fracture** | | | |

### Cortical plate fracture

In Group I, buccal cortical plate fractures were observed in 3 patients (6%), compared to 6 patients (12%) in Group II. This difference was both statistically and clinically significant ($p = 0.032$).

### Soft tissue injury like gingival laceration/tearing

Gingival lacerations were observed in 4 patients (8%) in Group I and 7 patients (14%) in Group II, with the difference not reaching statistical significance (p = 0.347) **(Table 2)**.

**Need for sutures**

Post-extraction suturing was required in 5 patients (10%) in Group I compared with 12 patients (24%) in Group II, a difference that was both statistically (p = 0.007) and clinically significant **(Table 2)**.

| **Variable** | Physics Forceps | Conventional Forceps | **P-value** |
|---|---|---|---|
| Soft tissue injury | 4 | 7 | P=0.347 |
| Need of suturing | 5 | 12 | P=0.007 |

**TABLE II: Soft tissue injury and need for Suturing**

**Distribution of degree of patient satisfaction**

The highest patient satisfaction rate was observed in Group I at 78% compared with 67% in Group II. However, the difference between the groups was not statistically significant (p = 0.216) (**Table 3)**.

| **Variable** | Physics Forceps | Conventional Forceps | **P-value** | **Fisher t test** |
|---|---|---|---|---|
| 1 | 1 | 3 | p = 0.216 | 5.014 |
| 2 | 4 | 8 | | |
| 3 | 6 | 5 | | |
| 4 | 5 | 5 | | |
| 5 | 34 | 29 | | |

**TABLE III: Distribution of patient's satisfaction among groups.**
1: not satisfied; 2: slightly satisfied; 3: neutral; 4: satisfied; 5: very satisfied

**Duration of extraction procedure**

The duration of the extraction procedure, after the administration of anaesthesia, ranged from 6 to 13 minutes in Group I, with a mean duration of 7.47 ± 1.14 minutes. The duration in Group II ranged from 8 to 17 minutes, with a mean of 9.57 ± 1.59 minutes. This difference was both statistically (p < 0.001) and clinically significant.

**Postoperative pain assessment (VAS scores)**

Pain levels were determined using the VAS provided to patients upon discharge from the clinic. Patients were instructed to rate their postoperative pain on a scale of 0 to 10, where 0 indicated no pain and 10 denoted severe, continuous pain. Follow-up appointments were scheduled three days postoperatively to examine the extraction socket and collect the completed VAS scores.

The recorded pain scores were 1.21 ± 1.64 and 1.56 ± 1.33 for Groups I and II, respectively, with a mean difference of 0.35. This difference was nonsignificant (p = 0.077).

**Post extraction socket healing**

On the seventh postoperative day, clinical examinations revealed satisfactory healing in 43 patients (86%) from Group I and 40 patients (80%) from Group II. The difference was neither clinically nor statistically significant (p = 0.124).

**Postoperative analgesics**

The mean number of analgesics used was 1.62 ± 1.02 and 1.76 ± 0.48 tablets in Groups I and Group II, respectively, with a mean difference of 0.14 tablets, which was not statistically significant (p = 0.63). Additionally, 8 patients in Group I and 11 patients in Group II required no postoperative analgesics, with this difference also being statistically insignificant.

## Discussion

Various techniques for atraumatic tooth extractions have been developed over time, including periotomes, piezo surgery, lasers, orthodontic extrusion, and the Benex method. Among these, physics forceps stand out as a modern instrument that applies biomechanical principles, specifically those of a first-class lever, to improve the efficiency of atraumatic extractions. Their advantage over conventional forceps lies in their distinctive design, which offers considerable mechanical leverage [7].

In this study, physics forceps use during extractions resulted in a lower incidence rate of crown and root fractures (2%) than did conventional forceps use (6%). These findings align with those reported by Benazeer et al. who indicated crown and root fracture rates of 3.5% and 9% with physics and conventional forceps, respectively [8]. Similarly, Choi et al. evaluated the extraction of premolars and molars for intentional replantation using physics forceps, achieving a 97% success rate without crown or root fractures, with only 3% of cases showing root tip fractures [9].

This study found that buccal cortical plate fractures occurred less frequently when using physics forceps (6%) compared with conventional forceps (10%). This difference is likely due to the steady and controlled pressure exerted by physics forceps, facilitated solely by wrist movements, which reduces the likelihood of buccal bone fractures. These results align with those reported by El-Kenaw and Ahmed who observed buccal cortical plate fractures in 3% of patients treated with physics forceps and 7% of those treated with conventional forceps [10].

Improper handling of elevators during tissue separation and incorrect positioning of forceps beaks on gingival tissues can result in soft tissue injuries. Physics forceps are designed to minimise such damage to both soft and hard tissues as their beaks engage subgingivally on the lingual aspect, whereas the bumper supports the soft tissues on the buccal side. In this study, soft tissue injuries, such as tearing, were observed in 6% (3 out of 50) of cases in the physics forceps group compared with 12% (6 out of 50) of cases in the conventional forceps group. These results are consistent with those of Mandal et al. who reported soft tissue tearing in 4% (2 out of 25) patients in the physics forceps group, with no instances of laceration, compared with 24% (6 out of 25) patients in the conventional forceps group [11]. Likewise, Sonune et al. found no significant differences in gingival laceration between the two types of forceps, concluding that careful retraction during extractions can effectively prevent gingival lacerations regardless of the forceps used [12].

The findings of this study, which demonstrated fewer soft tissue tears with physics forceps than with conventional forceps, align with the results reported by Basheer et al. and Patel et al. These differences were statistically significant [13, 14], suggesting that the use of physics forceps improve patient outcomes and reduce discomfort during extractions.

The need for suturing was lower in the physics forceps group (10%) than in the conventional forceps group (24%), likely due to the decreased frequency of soft tissue injuries in the former. These findings are consistent with those reported by Benazeer et al. [8]. Furthermore, the duration of the extraction procedure was significantly shorter with physics forceps than with conventional forceps ($p < 0.001$). A comparative study by Mandal et al. also reported similar findings, with a mean extraction time of 1.868 minutes with physics forceps versus 2.584 minutes with conventional forceps [11]. These results further corroborate the observations made by Benazeer et al., supporting the outcomes of this study [8].
Postoperative pain from hard tissue injuries may result from cortical bone plate fractures during instrumentation or soft tissue trauma. Following the principles of exodontia infection control and providing detailed postoperative care instructions can help alleviate this pain. Postoperative pain is a common but undesirable effect of surgical procedures and has a multifactorial origin. It is caused by the release of inflammatory mediators from injured tissues and is influenced by the patient's physiological pain threshold and anxiety levels [15].

In this study, there was minimal difference in postoperative pain between the two groups. However, Hariharan et al. reported significantly lower pain levels in the physics forceps group on the first postoperative day compared with the conventional forceps group [12]. Similarly, Madathanapalli et al. observed a significant reduction in pain on the third postoperative day in the physics forceps group, although no differences were noted on the fifth and seventh days [13]. By contrast, Kapila et al. documented a slightly higher mean pain score on the first postoperative day for the physics forceps group ($3.04 \pm 1.47$) than for the conventional forceps group ($2.89 \pm 1.21$) [16]. In the present study, no significant difference was noted between the two groups in postoperative analgesic intake ($p = 0.63$), consistent with the findings of Benazeer et al. [8].
The healing of extraction sockets is affected by numerous local and systemic factors, and various methodologies have been proposed for evaluating wound healing in oral soft tissues. This study used the healing index introduced by Landry, Turnbull, and Howley (1988) to assess the degree of clinical healing after surgery. On the seventh postoperative day, no significant difference in socket healing was noted between the two groups, consistent with findings of Kapila et al. [20], Hariharan et al. [10], and Ramakrishna et al. [10,17,18].
Patient satisfaction, a vital indicator of treatment quality, was higher in the physics forceps group. This increased satisfaction may be due to the shorter procedure time, which likely reduced anxiety, and the greater comfort resulting from the lower pressure and force applied during the extraction process. These findings align with previous studies that reported higher levels of patient satisfaction and comfort among patients who underwent extractions with physics forceps [19,20,21].

**Limitations**

This study was limited by its relatively small sample size and its exclusive focus on the extraction of a single tooth type, namely the mandibular first molar. Future studies should consider a larger sample size and include both anterior and posterior teeth to achieve more comprehensive results.

## CONCLUSION

Physics forceps provide notable advantages over conventional forceps by minimizing trauma during tooth extractions. They reduce surgical time, lower the risk of root and cortical plate fractures, and are associated with improved patient satisfaction. Thus, physics forceps represent a viable alternative for atraumatic tooth extractions, particularly in cases where the preservation of the bone, such as for implant placement, is essential.

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