Original Article

OPEN ACCESS

Physics Forceps versus Conventional Forceps in Dental Extractions – A Split Mouth Comparison

Sana Riaz[1], Khalid Mahmood Siddiqi[2]

[1]FCPS Resident (Oral and Maxillofacial Surgery), [2]HOD Oral & Maxillofacial Surgery, Islamabad Medical and Dental College, Main Murree Road, Bharakahu, Islamabad

Author`s Contribution

[1]Substantial contributions to the conception or design of the work; or the acquisition, [1,2]Drafting the work or revising it critically for important intellectual content

Funding Source: None

Conflict of Interest: None

Received: Jan 30, 2025
Revised: April 13, 2025
Accepted: April 24, 2025

Address of Correspondent
Dr Sana Riaz
FCPS Resident (Oral and Maxillofacial Surgery),
Islamabad Medical and Dental College, Main Murree Road,
Bharakahu, Islamabad
SanaR.12@iideas.edu.pk

ABSTRACT

Objective: To compare the outcomes of physics forceps with traditional forceps during dental extractions for orthodontic treatment.

Methodology: This Randomized control trial / Split mouth study was conducted at the Oral and Maxillofacial Surgery Department, Islamabad Dental Hospital, Bharakahu from June 2023 to November 2024. The participants were recruited from the OPD who met inclusion criteria, after taking informed written consents. Group A, the experimental group, had teeth extracted utilizing physics forceps, whereas Group B, the control group, had teeth extracted using standard methods. Both groups were compared by using the Chi-Square Test for qualitative variables. An Independent sample T-test was used for the comparison of operating time in both groups.

Results: The study involved 70 extractions from 35 participants, with tooth numbers 14 and 24 extracted from each, representing 50% of the sample for each tooth. Both groups were statistically comparable at baseline (p-value > 0.05). The mean extraction time in Group A was 108.51±93.30 seconds, while Group B's was 127.29±117.09 seconds. Alveolar fractures occurred in 1 case (2.9%) in Group A and 8 cases (22.9%) in Group B. Tooth fractures were 4 cases (11.4%) in Group A and 3 cases (8.6%) in Group B. Soft tissue injuries were 4 cases (11.4%) in Group A and 10 cases (28.6%) in Group B.

Conclusion: The study found similar operational times between the groups. However, Group A had fewer alveolar fractures and soft tissue injuries. Both groups had similar tooth fracture rates, but Group A had lower complications and better comfort.

Keywords: Alveolar Bone, Dental Fractures, Forceps, Orthodontics, Physics Forceps, Soft Tissue Injuries, Tooth Extraction.

Cite this article as: Riaz S, Siddiqi KM. Physics Forceps versus Conventional Forceps in Dental Extractions – A Split Mouth Comparison. Ann Pak Inst Med Sci. 2025; 21(3):509-514. doi. 10.48036/apims.v21i3.1454.

Introduction

Exodontia, or tooth extraction, is a common dental procedure involving the painless removal of a tooth or dental root from its alveolar bone socket, minimizing stress on surrounding tissues. This method facilitates normal bone recovery and prevents post-operative prosthetic complications, making it essential in various dental settings. Exodontia is typically required for conditions such as non-restorable teeth, periodontal diseases, dental trauma, impacted teeth, and orthodontic therapy.[1,2]

Traditional extraction techniques using elevators and forceps can result in trauma by separating periodontal ligament attachments and expanding the alveolus. The extraction process often leads to complications, including broken roots, inflammation, post-operative pain, and tissue loss.[3] Conventional dental forceps apply multiple forces i.e. apical, buccal, lingual/palatal, rotational, and tractional, which can contribute to patient discomfort and additional trauma.[4]

In recent years, the focus has shifted toward atraumatic extraction techniques that prioritize the protection of marginal alveolar bone, crucial for achieving optimal functional, cosmetic, and orthodontic outcomes.[5] Various

innovative procedures have been developed to enhance extraction efficiency and predictability, including lasers, endoscopically aided root splitting, piezo surgery, and the use of physics forceps.[6]

Dr. Golden and Misch developed physics forceps in 2004 as an advanced extraction tool aimed at reducing trauma. Using a class 1 lever and biomechanical principles, these forceps cause creep in the bone and periodontal ligament, releasing hyaluronic acid to assist in severing the ligament.[7,8] Hassan et al. reported that physics forceps help maintain the integrity of the gingiva and surrounding periodontium.[7] Raghu et al. found that this technique results in minimal tooth fractures and soft tissue injuries, making physics forceps a valuable addition to a general dentist's armamentarium, despite their higher cost.[7] Patel et al. concluded that physics forceps are more efficient in reducing operating time and preventing marginal bone and soft tissue loss during orthodontic premolar extractions.[8] Mutashar et al. observed shorter extraction times with physics forceps compared to conventional ones, although the difference was not statistically significant. They noted lower rates of root and buccal cortical plate fractures in the physics group, along with higher pain scores on the third postoperative day ($p = 0.038$) and an 85% patient satisfaction rate. Post-extraction socket healing was comparable in 75% of cases.[9] Punchal et al. found physics forceps significantly superior in terms of procedure duration.[10]

Given these mixed findings, further trial was imperative to confirm these results and provide a definitive conclusion that will guide clinicians in choosing the best extraction technique for future practice in terms of mean operational time, alveolar fracture, tooth fracture, and soft tissue injury.

Methodology

This Randomized control trial / Split mouth study was conducted at the Oral and Maxillofacial Surgery Department, Islamabad Dental Hospital, Bharakahu for 1.5 years after approval of the synopsis from June 2023 to November 2024. The sample size of 35 patients was calculated by using the WHO calculator and statistics from the previous study.[7]

Inclusion criteria were all patients requiring bilateral maxillary orthodontic extractions irrespective of age and gender and patents with engageable teeth with/without crown. However, participants were excluded from the study if they had conditions affecting bone density or quality, such as osteoporosis or rheumatoid arthritis, or were on anti-resorptive medications. Individuals with uncontrolled systemic diseases, including diabetes mellitus and chronic kidney disease, were also excluded. Additionally, patients undergoing or planning to undergo radiotherapy or chemotherapy, those with endodontically treated teeth, partial or total ankylosis, teeth with more than grade I mobility, those requiring trans-alveolar extractions, and individuals with a restricted mouth opening of 20mm or less were not eligible for inclusion.

After obtaining from the Institutional Review Board (IRB) of the Dental Section, Islamabad Medical & Dental College vide letter No. IMDC/DS/IRB/220 dated 30-11-2022, and research evaluation unit of College of Physicians & Surgeons Pakistan (CPSP) vide letter No. CPSP/REU/DSG/-2021-135-3700 dated 25-06-2023, participants were recruited as per inclusion and exclusion criteria from the OPD of the Islamabad Dental Hospital. The purpose, procedure, risks, and benefits of the study were explained to all the participants & were acknowledged as written informed consent.

Pre-operative assessment including detailed dental history and radiographs was obtained. Bilateral similar teeth were extracted, each tooth representing one group. Group A was the Physics forceps group while teeth extracted with the conventional method were placed under Group B. Tossing a coin for the first extraction followed by an alternate was used in every patient to decide whether to extract a tooth with a certain forceps system (physics or conventional).

All extractions were done by the primary researcher and pre-assessed for the use of conventional and physics forceps for dental extractions by senior faculty members of the department. After proper surgical preparation and draping, 2% lidocaine with adrenaline was injected into both teeth to achieve optimum anesthesia. After confirming the effectiveness of anesthesia, separation of the attached gingival soft tissue was done using a periosteal elevator Molt #09, where needed. The operating time for each group was recorded by a colleague with the help of a stopwatch after confirmation of effective anesthesia till the delivery of the tooth.

Extractions with physics forceps (Group A) were done by placing the beaks on the lingual/palatal aspect of the tooth at or below the cementoenamel junction, and the bumper was placed on the buccal alveolar ridge at the mucogingival junction, and then a constant controlled traction force was given till the tooth displaces out of the socket. It was then delivered using either tweezer or root

forceps. For Group B, extractions were carried out conventionally.

The second extraction was carried out within 3 days of the 1st one. Following the extraction, the tooth was inspected for any fracture. Manual palpation along the socket externally and running a dental explorer on the lingual aspect of the buccal plate from inside the socket in all directions (from apical to occlusal & from mesial to distal) was done to check for bone discontinuity. The gingival tears were assessed by inspection. All the data collected was recorded in the Proforma.

After data collection, statistical analysis was done with the help of SPSS version 23. Descriptive statistics in terms of mean and standard deviation were measured for quantitative variables like age & operating time. Frequency and percentage were used for the qualitative variables like alveolar fracture, crown fracture, and soft tissue injury. Both groups were compared by using the Chi-Square Test for qualitative variables. An Independent sample T-test was used for the comparison of operating time in both groups. Effect modifiers like age, gender, and demographic data were stratified by using the post-stratified Chi-Square Test & Independent T-test. A p-value of ≤ 0.05 was considered significant at a 95 % confidence interval.

Results

The study included a total of 70 extractions where a total of 35 participants had a mean age of 27.69±10.85 years. Among these participants, 19 individuals (54.3%) were 25 years old or younger, while 16 participants (45.7%) were older than 25 years. In terms of gender distribution, there were 7 males (20.0%) and 28 females (80.0%). The extractions were performed on two specific teeth: tooth number 14 and tooth number 24, with each tooth being extracted from 35 participants, representing 50% of the sample for each tooth. Both the groups were statistically comparable with each other at baseline with a p-value >0.05. Mean age (p=1.000), age groups (p=1.000), gender (p=1.000), and tooth number (p-value=0.232). Table I

The mean operational time for Group A was 108.51±93.30 seconds, and for Group B, it was 127.29±117.09 seconds. The difference in mean times was not statistically significant (p = 0.461). Group A had 1 alveolar fracture (2.9%), while Group B had 8 (22.9%), a statistically significant difference (p = 0.028). For tooth fractures, Group A had 4 cases (11.4%) and Group B had 3 (8.6%), with no significant difference (p = 1.000). Soft tissue injuries were reported in 4 cases (11.4%) in Group A and 10 cases (28.6%) in Group B, showing a trend towards higher incidence in Group B (p = 0.073), but not statistically significant. Table II

The mean operational time was stratified by age, gender, and tooth number. In most subgroups, Group A performed better, except for the age >25 years subgroup, where

Table I: Demographic Characteristics of Study Groups. (n=70)

Characteristics	Total	Group A (n=35)	Group B (n=35)	P-value
Age (years)	27.69±10.85	27.69±10.9	27.69±10.9	1.000
• ≤ 25 years	19 (54.3%)	19 (54.3%)	19 (54.3%)	1.000
• >25 years	16 (45.7%)	16 (45.7%)	16 (45.7%)	
Gender				
• Male	7 (20.0%)	7 (20.0%)	7 (20.0%)	1.000
• Female	28 (80.0%)	28 (80.0%)	28 (80.0%)	
Tooth No.				
• No. 14	35 (50.0%)	20 (57.1%)	15 (42.9%)	0.232
• No. 24	35 (50.0%)	15 (42.9%)	20 (57.1%)	

Table II: Comparison of Various Outcome Measures between the Study Groups. (n=70)

Parameter	Group A (n=35)	Group B (n=35)	P-value (*Chi-square test*)
Mean Operational Time (sec)	108.51±93.30	127.29±117.09	0.461
Alveolar Fracture			
• Yes	1 (2.9%)	8 (22.9%)	0.028
• No	34 (97.1%)	27 (77.1%)	
Tooth Fracture			
• Yes	4 (11.4%)	3 (8.6%)	1.000
• No	31 (88.6%)	32 (91.4%)	
Soft Tissue Injury			
• Yes	4 (11.4%)	10 (28.6%)	0.073
• No	31 (88.6%)	25 (71.4%)	

doi. 10.48036/apims.v21i3.1454

Table III: Comparison of Mean Operational Time (Sec) between the Study Groups across Various Subgroups.

Subgroups	Group A	Group B	P-value *(Independent sample t-test)*
Age (years)			
• ≤ 25 years	98.42±90.72	138.26±134.83	0.292
• >25 years	120.50±97.84	114.25±94.47	0.855
Gender			
• Male	126.00±102.87	218.29±114.41	0.139
• Female	104.14±92.25	104.54±108.03	0.988
Tooth No.			
• No. 14	90.00±88.13	122.55±119.66	0.381
• No. 24	122.40±96.85	133.60±117.42	0.759

Group A had a higher mean operational time than Group B. However, no subgroup analysis achieved statistical significance. Table III

In Group A, physics forceps were initially used in 25.7% of cases, while conventional forceps were used in 74.3% (Figure 1). Despite this, 71.4% of participants preferred physics forceps over conventional forceps (28.6%) as their instrument of choice (Figure 2). Table IV demonstrates that Group A was selected for less pressure and pain during extractions, whereas Group B was preferred for comparatively less pain and quicker extractions in a few patients. Statistical significance shows that each patient group has distinct preferences.

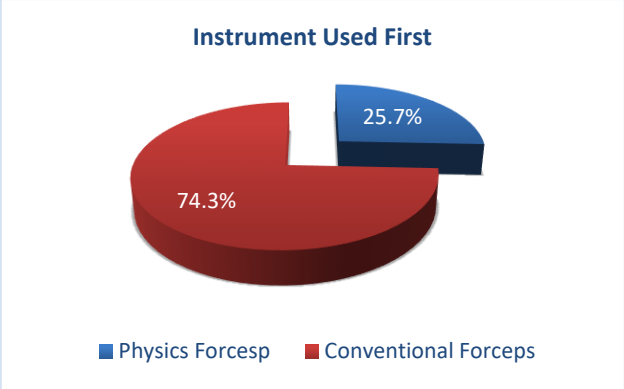

Figure 1 Showing 1st Instrument Used.

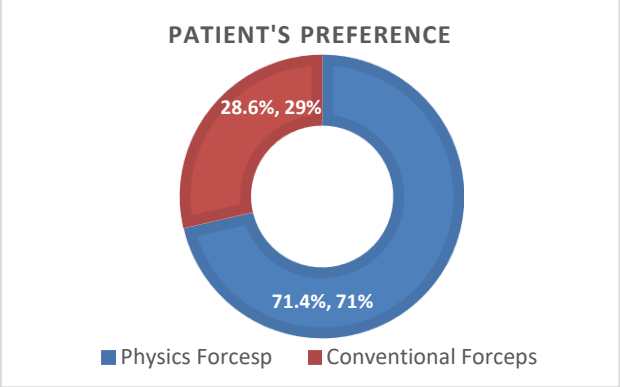

Figure 2. Showing Patient's Preference Regarding Instrument.

Table IV: Miscellaneous Information Regarding Patient's Preference,

Subgroups	Reason for Preference: Group A (physics forceps)	Reason for Preference: Group B (conventional forceps)	P-value (*Chi-square test*)
Less Pain	0 (0.0%)	2 (10.0%)	
Less Pain/Quick	4 (8.0%)	0 (0.0%)	
Less Pressure	18 (36.0%)	2 (10.0%)	
Less Pressure/Less Pain	9 (18.0%)	2 (10.0%)	
Less Pressure/Less Pain/Quick	8 (16.0%)	0 (0.0%)	0.000
Less Pressure/Quick	7 (14.0%)	0 (0.0%)	
Past Experience	2 (4.0%)	6 (30.0%)	
Quick	2 (4.0%)	8 (40.0%)	

Discussion

Dental extractions commonly use conventional forceps, which are familiar and easy but have higher complication rates, such as alveolar fractures. In contrast, physics forceps, a newer method, aim to reduce trauma and improve patient comfort.[11,12] However, the literature shows mixed results regarding their efficacy and safety, with conflicting findings on operational time and complications.[13-15] This study aims to clarify the differences between physics and conventional forceps using a split-mouth comparison, ultimately guiding best practices in dental extractions.

The mean age of the patients in this study was 27.69±10.85 years which is higher than the previously reported mean age in a similar study by Benazeer et al. in Pakistan at 22.85±0.35 years.[16] In terms of gender distribution, there were 7 males (20.0%) and 28 females (80.0%) with a male-to-female ratio of 0.25:1. This male dominancy in the study sample was also reported by Benazeer et al. as 68.7%.[16]

The mean operational time for extractions in Group A was 108.51±93.30 seconds, whereas Group B had a mean operational time of 127.29±117.09 seconds. The difference in mean operational times between the two groups was not statistically significant, with a p-value of 0.461. Likewise, Mutashar et al. reported less operational time in group A than in group B but the difference was not significant (42.85±12.44 vs. 51.50±20.73 seconds; p-value=0.118).[9] However, some studies reported mean operational time significantly less in group A than in group B. Benazeer et al.[16] reported a mean operational time of 1.05±0.21 vs. 1.23±0.42 min; p-value=0.028, Ranjeet [17] reported it 34.78±8.6 vs. 53.86±24.98 seconds; p-value<0.001 and Panchal et al.[10] reported as 52.96 vs. 76.59 seconds; p-value=0.001.

In this study, in terms of alveolar fractures, Group A experienced only 1 case (2.9%), while Group B had 8 cases (22.9%). This difference was statistically significant, with a p-value of 0.028, indicating a higher incidence of alveolar fractures in Group B. Our findings are in line with the results reported by Sambyal et al. as 12.0% vs. 25.0%; p-value=0.025, respectively between group A and group B.[18]

Regarding tooth fractures, Group A had 4 cases (11.4%) compared to 3 cases (8.6%) in Group B in this study. The difference between the two groups was not statistically significant, with a p-value of 1.000. Our findings are per the results of Basheer et al. who reported the frequency of tooth fracture between the groups as 4% vs. 8%; p-value=0.678.[19]

For soft tissue injuries, Group A reported 4 cases (11.4%), while Group B had 10 cases (28.6%) in this study. Although the p-value of 0.073 suggests a trend towards greater incidence in Group B, it does not reach statistical significance. Similar findings were previously reported by Benazeer et al. where the frequency of soft tissue injury between groups A and B was 1.56% vs. 21.87%; p-value=0.001.[16]

The mean operational time between the groups was stratified for subgroups of age, gender, and tooth number, wherein the majority of the subgroups, group A maintained its supremacy except in a subgroup of age >25 years where mean operational time was higher in group A than group B. However, in the overall subgroup analysis, statistical significance could not be achieved on any occasion which may probably be associated with a small sample size in each subgroup, as well.

Out of 35 subjects, 25 participants (71.4%) preferred Physics Forceps, compared to 10 participants (28.6%) who preferred Conventional Forceps. Group A was preferred for less pressure and pain during extractions, while Group B was favored for less pain and quicker extractions in a few patients. Statistical significance indicates distinct patient preferences for each group.

An additional finding was buccal mucosa ulceration at the physics forceps padding site, caused by traction or crushing during beak closure. The ulceration, which took 2 to 3 weeks to heal, caused pain and patient distrust. Gauze placement under the bumper offered no relief. Kapila et al. noted ulceration on the third postoperative day in two cases within the physics forceps group, attributed to excessive pressure exerted by the bumper on the buccal surface. The ulcers were healed, as noted on the sixth postoperative day.[15]

Limitations and recommendations: This study's strengths include a clear focus on specific tooth extractions and the comparison of physics versus conventional forceps, providing valuable insights into patient outcomes and preferences. However, limitations such as a small sample size may affect the generalizability of the results. Future research should aim for larger, more diverse populations to validate these findings and explore additional factors influencing extraction outcomes, such as technique variations and long-term patient comfort.

Conclusion

The study concluded that while the mean operational time was similar between the groups using physics and conventional forceps, the physics forceps group had significantly fewer alveolar fractures and reported fewer soft tissue injuries. The lower complication rates and better patient comfort made physics forceps the preferred choice for extractions. Despite the lack of significant differences in operational time, the findings suggest that physics forceps offer superior outcomes in terms of safety and patient experience.

References

1. Singh AK, Khanal N, Acharya N, Rokaya D, Hasan MR, Saito T. Are physics forceps less traumatic than conventional forceps for tooth extraction? A systematic review and meta-analysis of randomized controlled trials. Dentist J. 2022;10(2):21–35. https://doi.org/10.3390/dj10020021
2. Ahmed N, Lal A, Shakeel M, Cyrus D, Zehra FT, Ayub A. Prevalence of types, frequency and risk factors for complications after exodontia. Pak J Med Dent. 2021;10(1):44–9.
3. Shetty P, John N. Assessment of extraction technique using physics forceps and the conventional method: a comparative study. Indian J Forensic Med Toxicol. 2020;14(4):226–72.

4. McKenzie WS. Principles of exodontia. Oral Maxillofac Surg Clin North Am. 2020;32(4):511–7. https://doi.org/10.1016/j.coms.2020.06.001
5. Sundaram P, Kandasamy S, John RR, Sri KK. Comparison of the efficiency of arm force versus arm force plus wrist movement in closed method extractions: an observational study. Natl J Maxillofac Surg. 2021;12(2):250–4. https://doi.org/10.4103/njms.NJMS_212_20
6. Niyas M, Nazar N. Atraumatic extractions: a revolution in exodontia—a review. Int J Clin Dent. 2019;12(3):189–99.
7. Hasan AM. The efficiency of physics forceps in comparison to the conventional dental extraction forceps: a randomized clinical trial. J Baghdad Coll Dent. 2019;31(2):52–9. https://doi.org/10.26477/jbcd.v31i2.2624
8. Patel HS, Managutti AM, Menat S, Agarwal A, Shah D, Patel J. Comparative evaluation of efficacy of physics forceps versus conventional forceps in orthodontic extractions: a prospective randomized split-mouth study. J Clin Diagn Res. 2016;10(7):ZC41–5. https://doi.org/10.7860/JCDR/2016/17724.8160
9. Mutashar HA, Abdulrazaq SS. Evaluation and comparison of physics forceps and conventional forceps in bilateral dental extraction: a randomized, split-mouth, clinical study. Cureus. 2023;15(4):e38206. https://doi.org/10.7759/cureus.38206
10. Panchal KV, Shah NS, Panchal B. Comparative evaluation of efficacy of physics forceps versus conventional forceps in therapeutic extractions of premolars: a prospective clinical study. Int J Res Med Sci. 2020;8(9):3322–6. https://doi.org/10.18203/2320-6012.ijrms20203686
11. Raghu K, Selvakumar S, Muthukumar R, Thangavelu A, Sathyanarayanan R, Mani M, et al. Beak and bumper-physics forceps: evaluation of new technique in extraction. Indian J Dent Res. 2020;31(1):4–13. https://doi.org/10.4103/ijdr.IJDR_433_18
12. Sonune AM, Borle R, Jadhav A. Comparative evaluation between physics forceps and conventional extraction forceps in orthodontic extraction of maxillary premolars: a prospective, interventional, single-blind, randomized split-mouth study. Int J Pharm Sci Invent. 2017;6(3):4–8.
13. Ebenezer V, Balakrishnan Ramalingam DS. Importance of physics forceps in dental extraction—a review. NVEO J. 2021;8(5):638–40.
14. Elicherla SR, Bandi S, Nunna M, Saikiran KV, Sahithi V, Nuvvula S. Comparative evaluation of efficacy of physics forceps versus conventional forceps in pediatric dental extractions: a prospective randomized study. J Dent Anesth Pain Med. 2021;21(6):547–56. https://doi.org/10.17245/jdapm.2021.21.6.547
15. Kapila S, Kaur T, Bhullar RS, Sandhu A, Dhawan A, Kaur A. Use of physics forceps in atraumatic orthodontic extractions of bilateral premolars: a randomized control clinical study. J Maxillofac Oral Surg. 2020;19(3):347–54. https://doi.org/10.1007/s12663-020-01347-6
16. Benazeer, Irshad F, Khan UQ, Memon ZA, Punjabi SK, Zaidi SA. Use of physics forceps versus conventional forceps in extraction of mandibular first molar: physics forcep versus conventional forcep. Pak J Health Sci. 2023;4(5):123–8. https://doi.org/10.54393/pjhs.v4i05.710
17. Ranjeet GB. Comparative study on the efficacy of physics forceps versus conventional forceps in dental extractions [dissertation]. Bangalore (India): Rajiv Gandhi University of Health Sciences; 2016.
18. Sambyal SS, Saxena V, Gopalkrishnan V, Rangarajan H, Kumar AN. Comparison of physics forceps to conventional forceps in simple dental extraction. Int J Otorhinolaryngol Head Neck Surg. 2023;9(10):789–94. https://doi.org/10.18203/issn.2454-5929.ijohns20232827
19. Basheer SA. Comparative evaluation between physics forceps and conventional extraction forceps in extraction of maxillary molars. Int J Appl Dent Sci. 2017;3(4):152–4.