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Efficacy of Physics Forceps versus Conventional Dental Extraction Forceps and Their Impact on Oral Health: A Randomized Clinical Comparative Study

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ABSTRACT

Ideal tooth extraction is the painless removal of the entire tooth or tooth roots with little or no harm to the surrounding tissues, resulting in a wound that heals without complications and no postoperative or prosthetic concerns. If the crown or root of tooth fractures, it can be stressful, complicating and prolonging the extraction procedure. Dental extraction techniques and instruments are modified to reduce extraction complications caused by conventional dental forceps and preserve healthy bone for implant and denture placements. Physics forceps have an advantage over traditional forceps and all other extraction techniques because of the design, which allows them to deliver a massive mechanical force by utilizing an efficient first-class lever. The purpose of this study was to determine the feasibility of physics forceps during the extraction of teeth in comparison with a conventional dental extraction and their impact on gingival and intraoral bone health. 51 adult patients seeking dental extraction of permanent teeth in the college of dentistry, Dar Al Uloom University, meeting the study criteria were enrolled for the study. Written informed consent was obtained from the participating patients.

Physics Forceps were proven to be atraumatic compared to conventional dental forceps. These results are similar to those previously reported by a number of authors.

Key words: Dental extraction, physics forceps, Conventional forceps, Visual analog scale (VAS -scale), Wound healing index (Landry et al), Atraumatic extraction

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INTRODUCTION

Ideal tooth extraction may be defined as the painless removal of the whole tooth or tooth roots with minimal trauma to the surrounding tissues so that the wound heals uneventfully with no postoperative and prosthetic problems [1-3]. The extraction of a tooth is a challenging task for the operator sometimes. It can be stressful if the crown of the tooth or root fractures, further complicating the procedure of extraction. Atraumatic extractions are important, and dentists use many modified techniques and instruments to improve extraction and postoperative wound healing, prevent dry sockets, excessive bleeding, buccal cortical plate fracture, and gingival lacerations and maintain healthy bone for an implant and denture placement [2,4,5].

In order to be done efficiently and with the least amount of trauma, tooth extraction must be done with regulated force and stability [4,6]. Physics forceps have the advantage over conventional forceps and all other extraction techniques because of their unique design, which allows them to deliver a tremendous mechanical force by utilizing an efficient first-class lever [5,7]. Unlike traditional forceps, the buccal portion of the beak in physics forceps is covered with a plastic bumper that is inserted apically in the vestibule and works by rotation of the wrist rather than a squeezing movement (Figure 1) [8,9].

The tooth and alveolus are not shattered because the bumper's impact on the gingiva and bone is distributed across a larger surface area and is compressive [10-12].

Class 2 levers with hinges are used in traditional dental forceps. Forces are applied to the lever's long side, i.e.

the handles, with the beaks acting as the load arm, the hinge acting as the fulcrum, and the tooth to be extracted acting as the load. As a result, the force given to the handle is multiplied in order for the forceps to grab the tooth, but there is no mechanical advantage in extracting the tooth. Before attempting extraction with the Physics forceps, there is no need to elevate a mucoperiosteal flap or employ an elevator. This is a significant benefit, especially in circumstances where atraumatic extraction is required [2,13].

According to Soumen Mandal, et al. mechanics forceps is an instrument that utilizes a first-class lever mechanism to remove a tooth atraumatically from its socket. There are two handles, one of which is attached to a bumper that functions during extraction as the fulcrum [14].

It is added to the buccolabial side, ideally at the junction with mucogingival. The other beak is placed in the gingival sulcus, at a lower level than the bumper, to the palatolingual part of the tooth (Figures 1 and Figure 2). This "beak and bumper" arrangement allows for removal without excessive force which uses the biomechanical advantages of a first-class lever, creep, and stress distribution without trying to squeeze, grasp, twist, and pull force. Physics forceps Prevent the need to lay flaps and remove the roots of the bone [2,14,15]. On application of physics forceps, hyaluronidase chemically breaks down the periodontal ligament until the tooth is released from its attachment to the alveolus and can be easily removed. The more hyaluronidase released per unit of time, the more efficient the release of the tooth, and the fewer traumas to the alveolar bone. This explains why the Physics Forceps (Golden-Misch), with its steady, unrelenting pressure on the periodontal ligament prevents periodontal, gingival, and intraoral bone health [15].

MATERIALS AND METHODS

Dar Al Uloom University, College of Dentistry's Scientific Dental Research Ethical Committee gave its approval for the study with the IRB approval number COD/IRB/2019/3. Patients strictly meeting the inclusion criteria were selected for the extraction of teeth. Patients were screened for medical and dental problems and any relevant findings were recorded. None of the participants had uncontrolled systemic disease. Every participant signed a full written, informed consent approving their participation in the study. A total of 51 adult patients for dental extraction were randomly recruited from the College of Dentistry, Dar al-Uloom University. At random, 51 patients were allocated into two groups. Group 1 consisted of 25 patients who underwent extraction of teeth using conventional forceps. Study group 2 included 26 patients, who underwent extraction with physics forceps. The study was conducted between 2nd September 2020 to 2022 January. Permanent anterior and posterior teeth with sound tooth structure of at least 3mm above the gingival margin and two or more unflawed surfaces, indicated for extraction under local anesthesia were included. Patients were selected based on the following inclusion and exclusion criteria in both the conventional and physics forceps group.

Criteria for acceptance

Age range: 15 to 60 years old

Permanent anterior and posterior teeth with at least 3mm of sound tooth structure above the gingival margin and two or more unflawed surfaces that are suitable for extraction under local anesthesia.

Healthy individuals and not on any antibiotics or pain-altering medications.

Criteria for exclusion

Patients with uncontrolled systemic disease.

A patient who has a known allergy to a local anesthetic.

Patients who are mentally ill.

Patients who are uncooperative and unwilling to cooperate

Patients who refuse to give informed consent.

Patients who require partial or complete impacted tooth extraction.

Surgical removal.

Materials

Instruments for diagnosis.

Metal syringe with 27 G needle (short or long), a local anesthetic cartridge (2% mepivacaine with epinephrine.

A periosteal elevator.

Conventional dental extraction forceps.

Physics Forceps.

Gauze, no. 6.

The extraction was performed under local anesthesia with 2 % Mepivacaine hydrochloride and adrenaline, with all aseptic precautions and routine patient preparation, and each subject was given postoperative instructions. The visual analog pain scale was used during and after the extraction, on the seventh postoperative day, using a 10-point visual analog scale, with 0 signifying no pain,1,2-mild pain, 3,4-moderate pain, 5,6-severe pain, 7,8-more severe pain,9 and 10 denoting the worst pain. Extraction socket wound healing was assessed using a 5-point healing index (Landry et al) (1 representing very poor, 2-poor, 3-good, 4-very good socket healing, and 5 representing excellent socket wound healing).

Intraoperative problems (if any): Incomplete removal or fracture of the tooth root or crown, fracture of cortical plates, gingival laceration, hemorrhage, oroantral communication, tissue injury, and tooth displacement into the maxillary sinus were also assessed and recorded. After the third day, the subjects were monitored on phone for surgical problems such as dry socket, infection, and

bleeding. All the patients were prescribed paracetamol, 500 mg, once a day for up to three days after surgery. Antibiotics were not administered to the patients as a prophylactic step nor postoperatively.

Physics forceps were employed for extraction as follows:

The mucogingival attachment was not detached from the tooth unlike in the conventional dental forceps.

The forceps beak was placed into the lingual or palatal sulcus on the cement enamel junction of the clinical crown, with the handles wide open. The bumper was placed buccal gingiva perpendicular to the tooth at roughly the height of the mucogingival junction (the buccal/labial beak of the physics forceps is capped with plastic or rubber to prevent injury to the buccal soft tissues).

A steady and gentle rotational force was applied in the direction of the bumper without squeezing the handles or rotating the arm until the tooth becomes loose.

Once the tooth has been luxated, it can be delivered using conventional extraction forceps (Figures 1 and 2).

Figure 1: Physics forceps.

Figure 2: Physics forceps applied intraorally.

RESULTS

Categorical and quantitative variables were expressed as frequency (percentage) and mean ± SD respectively. An independent t-test was used to compare quantitative parameters between categories. The Chi-square test and Fisher's exact test were used to find an association between categorical variables. Mann-Whitney U-test was used to compare ordinal parameters between groups. For all statistical interpretations, $p<0.05$ was considered the threshold for statistical significance. Statistical analysis was performed by using a statistical software package SPSS, version 20.0.

A total of 51 patients were included for analysis. The majority of the participants (50%) were between 40-50 years of age who underwent extraction with physics forceps and (40%) were under the 30-years age group, who underwent extraction of teeth with conventional forceps. A periosteal elevator was used to reflect the gingival tissues before applying conventional dental forceps in all the group patients (100%) whereas it was used only in 34.6% of group 2 patients with physics forceps.

52% of group 1 (conventional forceps extraction) showed trauma to the gingiva compared to the 19.2% in group 2 (physics forceps extraction) with significant differences ($P< 0.05$) as shown in Table 1. Pain during extraction was severe in 56% of the conventional forceps group as against 11.5% in the physics forceps group with a statistical difference of $p<0.01$ (Table 1).

Pain during extraction was severe in 56% of the conventional forceps group as against 11.5% in the physics forceps group with a statistical difference of $p<0.01$ (Table 2 and Figure 3).

72% of group 1 patients with conventional forceps had bleeding during extraction procedure as compared to 26.9% in group 2 with physics forceps with a statistically significant p-value of 0.001 (Table 3).

92.0% of conventional forceps extraction patients had post-operative bleeding as compared to 28.5% of the physics forceps group with a significant difference ($p<0.001$) (Table 4).

Post operatively, 28% exhibited mild pain, 40% exhibited moderate pain, 12% had severe pain in the patients who underwent extraction with conventional dental forceps while 53.8% had mild pain, ,46.2% patients had moderate pain and none (0%) with severe post-operative pain in group with physics forceps with no significant differences (0.967) (Table 5).

No statistically significant results were found for cortical bone fracture with 8% evident with the use of conventional forceps and 3.8% reported in the physics forceps group (Table 6).

No statistically significant difference was found in relation to the root fracture between the groups (P-0.523) with 15.4% root fractures in the conventional

Table 1: Comparison of the trauma to the gingival tissue based on group.

Traumatic level to the gingival tissue	Conventional forceps		Physics forceps		χ^2	p
	Count	Percent	Count	Percent		
No	12	48	21	80.8	5.99*	0.014
Yes	13	52	5	19.2		
*: Significant at 0.05 level						

Table 2: Comparison of pain during procedure (Vas-Score) based on group.

Pain during Procedure (Vas-Score)	Conventional forceps		Physics forceps		Z#	p
	Count	Percent	Count	Percent		
No pain	1	4	0	0	4.33	p<0.01
Mild pain	1	4	17	65.4		
Moderate pain	7	28	6	23.1		
Severe pain	14	56	3	11.5		
Worst pain	2	8	0	0		
Mean ± SD	5 ± 2.2		2.7 ± 1.2			
#: Mann-Whitney U Test						

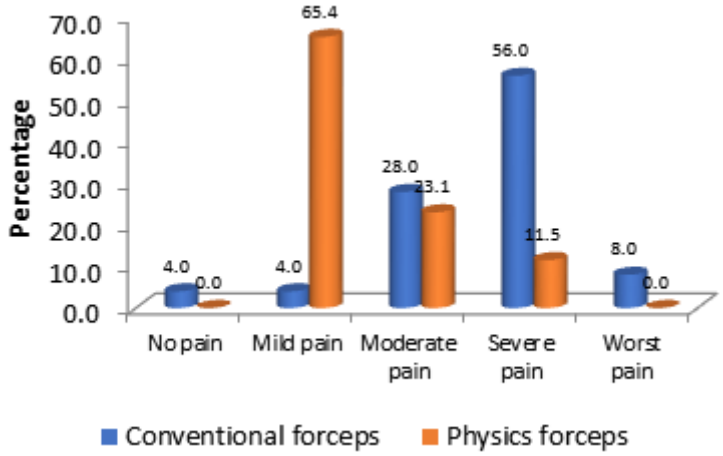

Figure 3: Comparison of pain during procedure (Vas-Score) based on group.

Table 3: Comparison of bleeding during the procedure based on group.

Bleeding during procedure	Conventional forceps		Physics forceps		χ2	p
	Count	Percent	Count	Percent		
No	7	28	19	73.1	10.36**	0.001
Yes	18	72	7	26.9		
**: Significant at 0.01 level						

Table 4: Comparison of immediate Post-operative bleeding based on group.

Immediate Post-operative bleeding	Conventional forceps		Physics forceps		p#
	Count	Percent	Count	Percent	
No	2	8	16	61.5	<0.001
Yes	23	92	10	38.5	
#: Fisher's Exact Test					

Table 5: Comparison of pain immediately after extraction (Vas-score) based on group.

Pain immediately after Extraction (Vas-score)	Conventional forceps		Physics forceps		Z#	p
	Count	Percent	Count	Percent		
No pain	5	20	0	0	0.04	0.967
Mild pain	7	28	14	53.8		
Moderate pain	10	40	12	46.2		
Severe pain	3	12	0	0		
Mean ± SD	2.4 ± 1.8		2.7 ± 1			
# Mann-Whitney U Test						

forceps group and 12% root fractures seen in the physics forceps group (Table 7).

8% of group 1 (conventional forceps) showed extraction failure as against 100% successful ex-traction in group 2 (physics forceps) with no significant difference (0.235) (Figure 4).

There was no significant difference (p-0.465) for pressure sensation with 23% of patients in the physics forceps group reporting mild pain with forceps pressure against 4% of the conventional for-ceps group (Figure 5).

There was no statistically significant difference (p-0.515) in the dry socket cases postoperatively when compared with both the groups with 7.7% of the conventional forceps group reporting dry socket and, group 2 with physics forceps showing 4% (Table 8).

There was no significant difference in postoperative infection in the groups (P-0.490) with 4% of conventional dental extraction forceps showing 4% infection while no infection was reported in troup 2 using physics forceps (Table 9).

There was no postoperative prolonged bleeding in the physics forceps groups while 4% of the con-ventional extraction forceps group reported prolonged bleeding (arrested by gel foam and hemostal solution) with no significant difference (P- 0.490) (Table 10).

1-week follow-up results for socket wound healing showed 11.5% poor wound healing, 26.9% very good wound healing, and 61.5% excellent wound healing in the physics forceps group, while 12% very poor wound healing 12% poor wound healing, 8% good wound healing, 12% very good wound healing and 56% excellent wound healing in conventional forceps group with no significant differ-ence (0.470) (Table 11).

However, 1-week post-op pain showed Significant results at a p-0.05 level with 15.4 % -mild pain and 3.8% -moderate pain in the physics forceps group compared to mild or moderate pain in the conventional forceps group (Table 12).

Table 6: Comparison of buccal cortical plate fracture-2 based on group.

Buccal Cortical plate fracture-2	Conventional forceps		Physics forceps		p#
	Count	Percent	Count	Percent	
No	23	92	25	96.2	0.485
Yes	2	8	1	3.8	
#: Fisher's Exact Test					

Table 7: Comparison of root fracture based on group.

Root fracture	Conventional forceps		Physics forceps		p#
	Count	Percent	Count	Percent	
No	22	88	22	84.6	0.523
Yes	3	15.4	4	12	
#: Fisher's Exact Test					

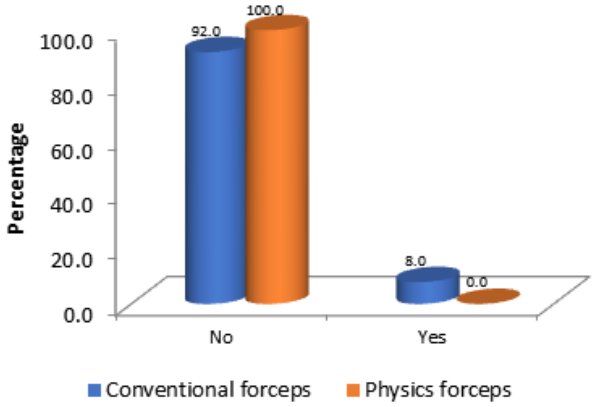

Figure 4: Comparison of extraction failure based on group.

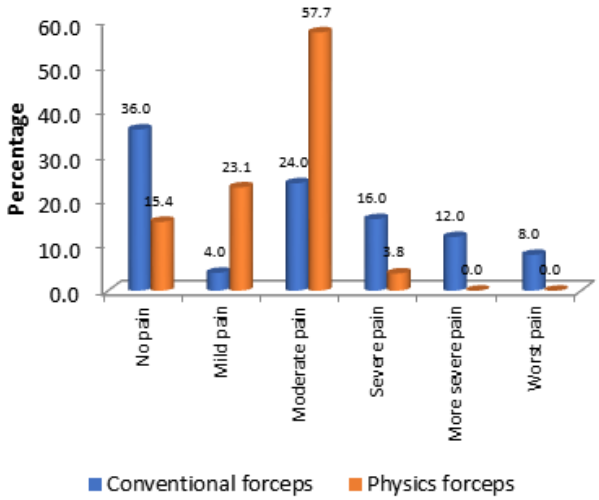

Figure 5: Comparison of pressure sensation based on group.

Table 8: Comparison of dry socket based on group.

Dry socket	Conventional forceps		Physics forceps		p#
	Count	Percent	Count	Percent	
No	24	96	24	92.3	0.515
Yes	1	7.7	2	4	
#: Fisher's Exact Test					

Table 9: Comparison of postoperative infection based on group.

Postoperative infection	Conventional forceps		Physics forceps		p#
	Count	Percent	Count	Percent	
No	24	96	26	100	0.49
Yes	1	4	0	0	
#: Fisher's Exact Test					

Table 10: Comparison of postoperative bleeding based on group.

Postoperative bleeding	Conventional forceps		Physics forceps		p#
	Count	Percent	Count	Percent	
No	24	96	26	100	0.49
Yes	1	4	0	0	
#: Fisher's Exact Test					

Table 11: Comparison of 1-week follow-up, socket healing score (1-5) based on group.

1-week follow-up, socket healing score (1-5)	Conventional forceps		Physics forceps		Z#	p
	Count	Percent	Count	Percent		
Very poor	3	12	3	11.5	0.72	0.47
Poor	3	12	0	0		
Good	2	8	0	0		
Very good	3	12	7	26.9		
Excellent	14	56	16	61.5		
Mean ± SD	3.9 ± 1.5		4.3 ± 1.3			
# Mann-Whitney U Test						

Table 12: Comparison of 1-week follow-up, Pain (vas-Score) based on group.

1-week follow-up, Pain (vas-Score)	Conventional forceps		Physics forceps		Z#	p
	Count	Percent	Count	Percent		
No pain	25	100	21	80.8	2.28*	0.022
Mild pain	0	0	4	15.4		
Moderate pain	0	0	1	3.8		
Mean ± SD	0 ± 0		0.3 ± 0.7			
# Mann-Whitney U Test						
*: Significant at 0.05 level						

Table 13: Comparison of crown fracture based on group.

Crown fracture	Conventional forceps		Physics forceps		p#
	Count	Percent	Count	Percent	
No	23	92	22	84.6	0.353
Yes	2	8	4	15.4	
#: Fisher's Exact Test					

Table 14: Comparison of tooth displacement into the maxillary sinus based on group.

Tooth displacement into the maxillary sinus	Conventional forceps		Physics forceps		p#
	Count	Percent	Count	Percent	
No	25	100	26	100	-
Yes	0	0	0	0	
#: Fisher's Exact Test					

Table 15: Comparison of oroantral communication based on group.

Oroantral Communication	Conventional forceps		Physics forceps		p#
	Count	Percent	Count	Percent	
No	25	100	26	100	-
Yes	0	0	0	0	
#: Fisher's Exact Test					

Similar to the previous finding, the tooth-crown fracture was 15.4% in the physics forceps group while the conventional forceps group reported 8% of tooth fractures with no statistical difference of (p-0.353) (Table 13).

No cases were reported with tooth or root displacement into the maxillary sinus or oroantral Com-munication (Tables 14 and 15).

DISCUSSION

The reported results of comparative efficacy studies between conventional and physics forceps showed

variations. Physics forceps, however, excel the conventional forceps in terms of overall efficacy. In the current study, 1 week follow-up results for socket wound healing showed 61.5% excellent wound healing in the physics forceps group, while 56% excellent wound healing in the conventional forceps group with no significant difference (0.470) (Table 12) (wound healing index Landry et al) [16].

Ramakrishna Shenoi et al, in their study done in group A, 32 patients underwent extraction of maxillary molars using conventional Extraction forceps. In group B, 31 patients underwent extraction of maxillary molars using physics forceps and reported erythema, swelling, pus discharge, and pain were considered signs of infection if present. Post-operative infection was found in 2 patients in group A and there was no delayed healing in either patient, or the results were not significant. 4 cases of fractured alveolar bone were reported, 3 cases were reported in group A and 1 case was reported in group B and the results were statistically insignificant [17].

Choi et al. found high success rates in their study of physics. In both the cases of extraction, they found no swelling nor Buccal cortical fracture was not seen, which was consistent with previous studies on the 3rd postoperative day [2,4,12,18,19].

Cortical bone fracture

The cortical plates retain the tooth laterally and medially. Within the maxilla, there is only one plate called a buccal/labial cortical plate laterally and medially there is the palatal bone that is thicker than the lateral plate. For healthy tooth mobility in teeth removed for orthodontic purposes, it is important that all the cortical plates are intact. The buccal cortical layer is comparatively weaker and typically breaks due to inadvertent forces applied by the user or by excessive force application. According to the study by Dr. Sulphi Abdul Basheer, it was observed that 3 out of 50 patients with buccal cortical plate fracture were present while using physics forceps whereas 47 patients reported no buccal cortical plate fracture. For conventional forceps 5 out of 50 patients, buccal cortical plate fracture was present however 44 subjects stated no buccal cortical plate fracture [20].

The physics forceps must apply consistent and continuous pressure on the wrist since this procedure requires minimum strength and maximum patience, which tends to minimize the occurrence of buccal bone fracture. Kosinski's observation that the buccal movement applied by physics forceps was slow and usually inadequate to break the buccal bone plate. Using physics forceps, in contrast with traditional forceps, the frequency of crown, root, and buccal plate fractures are decreased [21]. However, in our study, the cortical bone fracture was reported in 8% evident with the use of conventional forceps and 3.8% reported in the physics forceps group no statistically significant results were found (Table 6). Mandal et al, in their comparative study, reported that there was no cortical plate fracture when physics forceps were used, compared to 12 cases of cortical plate fracture out of 25 subjects with conventional forceps extraction [4]. The findings (cortical plate fracture) of our research are in agreement with reports by Mohammad el Kenawy and Wael Mohammad who found a buccal fracture of the cortical layer in 3 patients using physics forceps and in 7 patients using traditional extraction forceps out of 100 patients [22]. Soumen Mandal, et al. also found that the buccal cortical plate fractures in 12 patients using the conventional extraction forceps and no buccal plate fractures with the use of the physics forceps group [14]. Patel et al found no buccal cortical plate fracture using conventional extraction forceps while observing two cases of buccal cortical plate fractures in a sample size of 10 subjects using physics forceps similar to our study. In yet another study, including fifty consecutive patients requiring bilateral extraction of maxillary first premolars for orthodontic considerations between the ages of 14-25 years, a fracture of the buccal cortical plate was observed in a single case using conventional forceps, while no fracture was observed using physics forceps. No statistically important variations between the two techniques were found [19].

Time taken for extraction

Few studies reported that the time consumed by the physics forceps was less compared to the conventional dental extraction forceps [5,7,9,10]. Hariharan, et al. on contrary, reported that there was no significant difference in extraction time while either of the forceps was used [8]. According to Lingaraj, et al. the comparison of two groups (physics forceps & convention forceps for 12 premolar extraction each) with the time required (sec) by the Mann-Whitney u test presented an average time of 131.75 sec with physics forceps with a standard deviation of 18.83 sec whereas, with conventional forceps, the average time was 295.17 sec with a standard deviation of 42.31 sec. Therefore physics Forceps involve less time for extraction than conventional forceps with a significant difference of (p=0.0001). The force applied by the bumper to the gingiva & the buccal cortical plate is over a larger surface area and is a compressive force, thereby bracing the buccal bone, allowing further expansion of the lingual plate and protecting the facial plate against fracturing. Thus in physics forceps, the expansion of the socket is less than in conventional forceps for extraction. He concluded that the use of physics forceps on the alveolar bone is more efficient, faster, & less traumatic. This study reflects the meantime taken for extraction of multirooted tooth with physics forceps and traditional forceps which comes to be 2.33 minutes with physics forceps with a standard deviation of 1.588 minutes while with traditional forceps meantime came to be 3.94 minutes with a standard deviation of 2.145 minutes was noted [23].

Raising mucoperiosteal flap

Consistent with our study, Dym and Weiss suggested that there is no need to lift a mucoperiosteal flap or use an

elevator before attempting extraction with the physics Forceps. Thereby there is less time needed as there is no gingival retraction necessary which takes around 40-60 sec and avoids gingival laceration [24].

Overall, studies have shown less amount of subjects reported lacerations with the use of physics forceps. Previously it was observed that less gingival laceration using physics forceps relative to conventional forceps and it was concluded that physics forceps would be less traumatic for extractions [5,6,25-27].

Pain and bleeding

In our study, intra op and post-op bleeding was more in group 1 (conventional dental forceps compared to group 2, physics forceps (Tables 3 and 4). However, 1st-week post-op pain showed Significant results at a p-0.05 level with 15.4 % -mild pain and 3.8% -moderate pain in the physics forceps group compared to no-mild or moderate pain in the conventional forceps group (Table 13).

Dry socket

Our study showed no statistically significant difference (p-0.515) in the dry socket cases postoperatively with 7.7% of the conventional forceps group reporting dry socket and, group 2 with physics forceps showing 4% (Table 9). The actual cause of the dry socket has yet to be determined. Several local and systemic elements, however, are known to play a role and have been shown in published studies. Birn hypothesized that extraction-related trauma, as well as aggressive curettage, could harm alveolar bone cells, resulting in inflammation of the alveolar osseous medulla and the release of cell mediators into the alveolus, where they cause fibrinolytic activity, thereby increasing the risk of the dry socket [28]. In addition, the most common problem found in these investigations was the dry socket. Researchers looked into the link between the reason for the extraction and the occurrence of dry sockets. When the extraction was considered therapeutic (presence of infection and cavities), they discovered a 21.9 percent incidence of dry socket, compared to 7.1 percent for preventative extractions without any symptoms [29-32].

Root fracture and extraction failure

In our study, conventional forceps showed 8% extraction failure owing to grossly decayed teeth or crown fracture surgical removal of teeth was done) against 100% success with physics forceps (Table 8). 15% of root fractures were noted with the use of conventional forces in comparison with 12% of root fractures with the physics forceps use, with no significant statistical differences (Table 7). A similar finding was reported by Sonune Avinash, et al. in which two cases of root fractures were reported with physics forceps, and one with standard forceps. The bur window approach was used to retrieve fragments of the damaged root. Two of the three cases had thin roots, and one had dilacerations, which are more likely to break in normal environmental conditions; however, for successful tooth extraction, gingival mucoperiosteum should be separated from both the tooth and bone structure. Less is most likely due to inappropriate and excessive use of pressures to extract the tooth, as well as displacement of the buccal cortical layer and root fractures [33]. Extraction using conventional extraction forceps also sometimes lacerates or crushes the gingiva due to improper handling or inaccurate forceps technique. Careful retraction is needed to avoid gingival laceration [19,34].

Limitation of the study

Although the results in the current study are consistent with the various published research, some limitations are acknowledged. The sample size is small and more experienced clinicians could better evaluate the efficacy of the conventional and physics forceps. Hence there is scope for further research with more sample size and experienced dentists.

CONCLUSIONS

Within the limitation of this study, it can be concluded that physics forceps are efficient compared to conventional dental forceps. The dental curriculum and clinics should include more exposure to newer instruments and their concepts, and continuous education courses in this field should be implemented.

AUTHOR CONTRIBUTIONS

Conceptualization, Leena AlAmri, and Nafeesa Tabassum; Formal analysis, Nafeesa Tabassum and Suhael Ahmed; Investigation, Nafeesa Tabassum; Methodology, Leena AlAmri, Nafeesa Tabassum, shamoukh shahrani, Nisren Ansary, Sahar Alharbi, and Hajar Albahkaly; Project administration, Nafeesa Tabassum and Suhael Ahmed; Resources, shamoukh shahrani, Sahar Alharbi, and Hajar Albahkaly; Software, Sahar Alharbi, and Hajar Albahkaly; Supervision, Nafeesa Tabassum and Suhael Ahmed; Writing – original draft, Leena AlAmri, Nafeesa Tabassum, Nisren Ansary and Hajar Albahkaly; Writing – review & editing, Nafeesa Tabassum and Suhael Ahmed.

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INSTITUTIONAL REVIEW BOARD STATEMENT

The study was approved by the Institutional Review Board of Dar Al Uloom University.

INFORMED CONSENT STATEMENT

Informed consent was obtained from all subjects involved in the study.

DATA AVAILABILITY STATEMENT

The data presented in this study are available upon request.

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CONFLICTS OF INTEREST

The authors declare no conflict of interest.

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