IOSR Journal of Dental and Medical Sciences (IOSR-JDMS)
e-ISSN: 2279-0853, p-ISSN: 2279-0861.Volume 20, Issue 1 Ser.8 (January. 2021), PP 01-09
www.iosrjournals.org

Physics Forceps Versus Conventional Forceps For Tooth Extraction: A Comparative Study

Dr. Mandar Madhukar Patole[1], Dr. Chidambar Y.S.[2]
[1](Department Of Oral And Maxillofacial Surgery, Acpm dental college and hospital, Maharashtra, India)
[2](Department Of Oral And Maxillofacial Surgery, Acpm dental college and hospital, Maharashtra, India)

Abstract:
Background: *Atraumatic extraction preserves bone, gingival architecture, and allows for the option of future or immediate dental implant placement.Physics forceps were designed by Dr. Richard Golden in 2004; it enables to predictably remove even the most grossly broken down teeth with little or no trauma to the surgical site. The biomechanical design of this instrument 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.Post-extraction complications are few, but could be further minimised by proper handling of patients, reducing the number of extractions and by emphasising the need of early reporting of patients with post-extraction complications.The development of Physics Forceps® by Golden|Misch in an attempt to change the face of dental extraction.The purpose of this study which we conducted at our institute was to evaluate the efficacy of physics forcep over conventional forceps in simple dental extraction.*
Materials and Methods: *Group I: Extraction in 100 patients using the conventional forcep extraction technique will be considered as control group for the study.Group II: Extraction in 100 patients using the physics forcep extraction technique.The time required during extraction of tooth with physics forceps and conventional extraction technique will also be compared.The time taken is considered from the time of application of the forcep on the tooth to be extracted till the tooth is delivered out of the socket.Post operative pain will be assessed on 2^{nd}, 5^{th}, 7^{th} and 15^{th} day using verbal pain intensity scale (VPIS) (Fig.No.6) and post operative wound healing will be assessed on 5^{th},7^{th} and 15^{th}day between both the forceps techniques.*
Results: *There was statistically very highly significant ($p < 0.001$) difference of mean extraction time of patients more in conventional forceps group than physics forceps group. There was statistically significant ($p < 0.05$) difference of complete wound healing more in physics forceps group than conventional forceps group on 15th postoperativeday.*
Conclusion: *Physics forceps is clinically valuable in atraumatic tooth removal and in preserving the buccal bone plate which is important for implant dentistry.Hence in our study we conclude that the physics forceps to be more efficient than conventional forceps in dental extractions.*
Key Word*: Physics forceps; Conventional Forceps; Tooth Extraction; Pain; Time; Postoperative Wound Healing.*

Date of Submission: 01-01-2021 Date of Acceptance: 13-01-2021

I. Introduction

‘‘Atraumatic’’ dental extraction techniques have gained prominence and may ultimately become the standard technique for teeth removal. Atraumatic extraction preserves bone, gingival architecture, and allows for the option of future or immediate dental implant placement[123].Physics forceps were designed by Dr. Richard Golden in 2004; it enables to predictably remove even the most grossly broken down teeth with little or no trauma to the surgical site. The biomechanical design of this instrument 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.[4] Post-extraction complications are few, but could be further minimised by proper handling of patients, reducing the number of extractions and by emphasising the need of early reporting of patients with post-extraction complications.[5] The development of Physics Forceps® by Golden|Misch in an attempt to change the face of dental extraction. The Physics Forceps implements a first-class lever, creep, and the type of force that provides a mechanical advantage that makes it more efficient.[6] The purpose of this study which we conducted at our institute was to evaluate the efficacy of physics forceps over conventional forceps in simple dental extraction.

II. Material And Methods

This prospective comparative study was carried out on patients of Department of 200 patients referred for extraction reporting to department of Oral and Maxillofacial Surgery, at our institute at JMF's A.C.P.M. Dental College and Hospital, Maharashtra, India were selected for the study with their informed consent.

Study Design: The present study is a comparative clinical study.

Study Location: This was a tertiary care teaching hospital based study done in department of Oral and Maxillofacial Surgery, at our institute at JMF's A.C.P.M. Dental College and Hospital, Dhule, Maharashtra, India

Study Duration: June 2016 to June 2019.

Sample size: 200 patients.

Sample size calculation: Two hundred patients are categorised into two groups

1.**Group I:** Extraction in 100 patients using the conventional forcep extraction technique will be considered as control group for the study.

2.**Group II:** Extraction in 100 patients using the physics forcep extraction technique.

The time required during extraction of tooth with physics forceps and conventional extraction technique will also be compared.The time taken is considered from the time of application of the forcep on the tooth to be extracted till the tooth is delivered out of the socket.Post operative pain will be assessed on 2^{nd}, 5^{th}, 7^{th} and 15^{th} day using verbal pain intensity scale (VPIS) and post operative wound healing will be assessed on 5^{th},7^{th} and 15^{th} day between both the forceps techniques.

Subjects & selection method: Essential Advanced Series Physics Forceps Set Includes Three (3) Physics Forceps Instruments (Fig No.1)

•The Physics Forcep EZ2 is use to extract posterior teeth on maxillary 2nd quadrant and mandibular 4th quadrant

•The Universal physics forcep LU is use to extract maxillary and mandibular anterior teeth.

•The Physics forcep EZ1 is use to extract posterior teeth on maxillary 1st quadrant and mandibular 3rd quadrant.

BUMPER GUARDS - Bumper Guards Green colour is bulbous, convex bumper guard for universal anterior physics forcep LU. The bumper guard is perpendicular to the long axis of the handle of the instrument.

Bumper Guards Yellow colour is thin and flat bumper guard for posterior essential advance series physics forceps EZ1, EZ2. The bumper guard is parallel to the long axis of the handle of the instrument.

Standard conventional extraction forceps (European Pattern) set which is appropriate for the tooth indicated for extractions were utilized for the study. Conventional group of the standard armamentarium meant for extraction were utilized for the study.

Fig. No.1 - Group 2 Physics Forceps :Essential Advanced Physics forcep EZ2 (left),Universal Anterior Physics forcep LU (in center),Essential Advanced Physics forcep EZ1 (right)

Inclusion criteria:

•Firm tooth which are indicated for extraction.

•Grossly decayed tooth.

•Tooth that are indicated for open extraction.

Exclusion criteria:

•Ankylosed tooth.

•Third Molar.

•Deciduous Teeth.

•Periapical pathology.
•Patients who have periodontally compromised tooth.
•Dilacerated teeth, fusion, concrescence, hypercementosis.
•Impacted teeth.

Procedure methodology: This study entailed the use of physics forceps in dental extractions and comparing its efficacy with the conventional forceps.The Physics Forceps (Golden Dental Solutions, formerly known as Golden Misch) invented by Dr. Richard Golden is an innovative design that provides a simple mechanical advantage by employing first-class lever mechanics. This device that has two handles, one of which is connected to a bumper that functions as the fulcrum or pivot point. During extraction, it is applied to the bucco-labial aspect, usually at the mucogingival

Figure No.2: Biomechanics of physics forceps

junction. The other beak is applied to the palatolingual aspect of the tooth within the gingival sulcus, at a lower level than the bumper ;and is designed to apply controlled pressure parallel to the long axis of the root. Utilizing the patented "beak and bumper" technique, one can simply and predictably extract virtually any tooth in any condition, while preserving the buccal bone and socket. While traditional instruments grasp, squeeze and twist, the Physics Forceps employs a no squeezing pressure. Instead, the handles (once in position) are rotated as one unit for a few degrees, and then the action is stopped for approximately 1 minute. The torque force generated on the tooth, periodontal ligament, and bone is related to the length of the handle to the bumper (8 cm), divided by the distance from the bumper to the forceps beak (1 cm). As a result, a force on the handle connected to the bumper will increase the force on the tooth, periodontal ligament, and bone by 8 times. No force is required to be placed on the beak, which is only on the lingual aspect of the tooth root. (Fig No.2)

Statistical analysis: The data was analysed using SPSS 16 IBM statistical software. The categorial variables were presented in frequency and percentage (%) distribution. Comparison between groups was done by using pearson chi square test and comparison between continous variables was done using unpaired t test. The level of significance was 0.05% ($p < 0.05$).When each group was evaluated the following results were obtained.

III. Result

Comparison of age group in between Conventional and Physics forcep group: In Conventional forceps group, 20% patients were within 16 to 20 years age group, 45% were 21 to 40 years old and 31% were within 41 to 80 years old while 4% were above 80 years. Within Physics forceps group, 23% patients were within 16 to 20 years age group, 51% were 21 to 40 years old and 20% were within 41 to 80 years old while 6% were above 80 years. There was statistically no significant ($p > 0.05$) difference of age groups within the conventional and physics forceps group.

Comparison of Sex in between Conventional and Physics forcep group: In Conventional forceps group, 56% were female and 44% were male patients. Within Physics forceps group, 50% were female and 50% were male patients. There was statistically no significant ($p > 0.05$) difference of sex of patients within the conventional and physics forceps group.

Comparison of Upper tooth extraction in between Conventional and Physics forcep group: In Conventional forceps group there was extraction of upper tooth in 50% patients and 50% in physics forcep group. There was statistically no significant ($p > 0.05$) difference of number of patients having upper tooth extraction in between conventional and physics forceps group.

Comparison of Lower tooth extraction in between Conventional and Physics forcep group: In Conventional forceps group there was extraction of lower tooth in 50% patient and 50% patients in physics forcep group. There was statistically no significant ($p > 0.05$) difference of number of patients having lower tooth extraction in between conventional and physics forceps group.

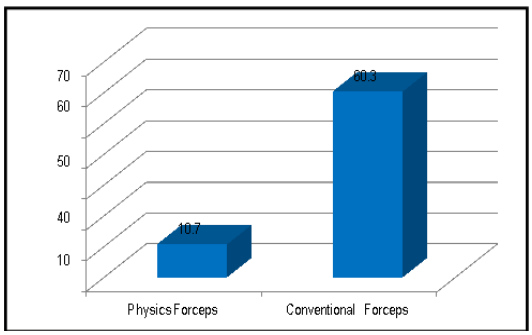
Comparison of anterior tooth extraction in between Conventional and Physics forcep group: In Conventional forceps group there was extraction of anterior tooth in 54% patient of conventional forcep group and 68% of physics forcep group. There was statistically significant ($p < 0.05$) difference of number of patients having anterior tooth extraction in between conventional and physics forceps group.

Comparison of posterior tooth extraction in between Conventional and Physics forcep group: In Conventional forceps group there was extraction of posterior tooth in 46% patient of conventional forcep group and 32% in physics forcep group. There was statistically significant ($p < 0.05$) difference of number of patients having posterior tooth extraction in between conventional and physics forceps group.

Comparison of mean age in between Conventional and Physics forcep group: Mean age of patients in Physics forcep group was 34.0±18.6 years while those in conventional forcep group was 35.9±15.9 years. There was statistically no significant ($p > 0.05$) difference of mean age of patients in between two groups.

Table 1: Comparison of mean extraction time in between Conventional and Physics forcep group (Refer Table Number 1,Graph Number 1)

Extraction Time(seconds)	Physics Forceps	Conventional Forceps
Mean ± S.D	10.7±13.6	60.3±68.0
t	-7.147	
p value	<0.001	



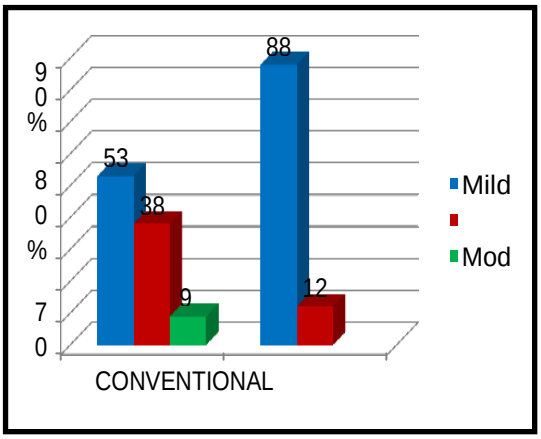
Mean Extraction Time of patients in Physics forcep group was 10.7±13.6 seconds while those in conventional forceps group was 60.3±68.0 seconds. There was statistically very highly significant ($p < 0.001$) difference of mean extraction time of patients more in conventional forceps group than physics forceps group.

Comparison of Verbal pain intensity scale on 2nd postoperative day in between Conventional and Physics forcep group.(Refer Table Number 2, Graph Number 2)

Table 2: Comparison of Verbal pain intensity scale on 2nd postoperative day in between Conventional and Physics forcep group.

VPIS DAY 2	CONVENTIONAL FORCEPS	PHYSICS FORCEPS	Total
Mild	53	88	141
	53.0%	88.0%	70.5%
Moderate	38	12	50
	38.0%	12.0%	25.0%
Severe	9		9
	9.0%		4.5%
Total	100	100	200
	100.0%	100.0%	100.0%

Chi-Square Tests : Value=31.208, p<0.001



Verbal pain intensity scale (VPIS) on 2nd postoperative day in Conventional forceps group was mild pain in 46% patient, moderate in 38% while 9% had severe pain. In Physics forceps group VPIS on 2nd postoperative day was of mild intensity in 88%, moderate intensity in 12% patients. There was statistically very highly significant ($p < 0.001$) difference of more patients in conventional forceps group having severe pain than physics forceps group on 2nd postoperative day.

Comparison of Verbal pain intensity scale on 5th postoperative day in between Conventional and Physics forcep group.Verbal pain intensity scale (VPIS) on 5th postoperative day in Conventional forceps group was mild in 38% patient, moderate in 9% while 53% had no pain. In Physics forceps group VPIS on 5th postoperative day was of mild intensity in 12%, none had moderate intensity while 88% patients had no pain. There was statistically very highly significant ($p < 0.001$) difference of more patients in conventional forceps group having higher pain than physics forceps group on 5th postoperative day.

Comparison of Verbal pain intensity scale on 7th postoperative day in between Conventional and Physics forcep group.Verbal pain intensity scale (VPIS) on 7th postoperative day in Conventional forceps group was mild in 9% patient, and 91% had no pain. In Physics forceps group VPIS at 7th postoperative day was of mild intensity in 1%, none had moderate intensity while 99% patients had no pain. There was statistically highly significant ($p < 0.01$) difference of more patients in conventional forceps group having higher pain than physics forceps group on 7th postoperative day.

Comparison of Verbal pain intensity scale on 15th postoperative day in between Conventional and Physics forceps group.None of the patients in Conventional forceps group or physics forcep group had pain according to verbal pain intensity scale (VPIS) on 15th postoperative day.

Comparison of Wound healing status on 5th postoperative day in between Conventional and Physics forcep group. In Conventional forceps group, wound was healed in 2% while in 98% patients wound was not healed on 5th postoperative day. Within Physics forceps group, 5% patients had healed wound and in 95% patients wound was not healed on 5th postoperative day. There was statistically no significant ($p > 0.05$) difference of wound healing in between conventional and physics forceps group.

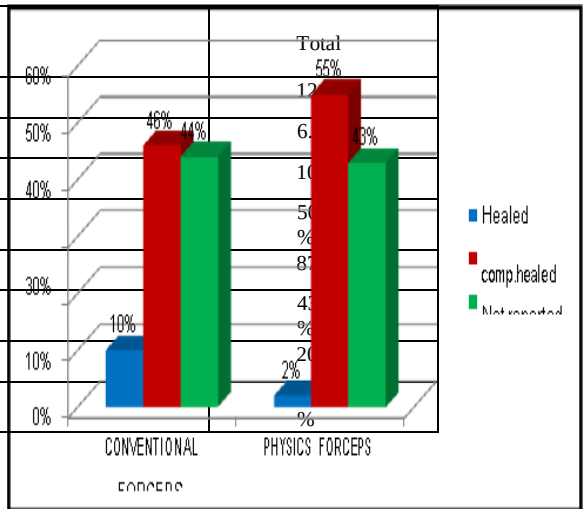
Comparison of Wound healing status on 7th postoperative day in between Conventional and Physics forcep group.In Conventional forceps group, wound was healed in 89%, 2% had completely healed wound while in 9% patients wound was not healed on 7th postoperative day. Within Physics forceps group, 92% patients had healed wound, 6% had completely healed wound and in 2% patients wound was not healed on 7th postoperative day. There was statistically significant ($p < 0.05$) difference of wound healing more in physics forceps group than conventional forceps group on 7th postoperative day.

Comparison of Wound healing status on 15th postoperative day in between Conventional and Physics forcep group.(Refer Table Number 3, Graph Number 3)

Table 3: Comparison of Wound healing status on 15th postoperative day in between Conventional and Physics forcep group.

WOUND HEALING DAY 15	CONVENTIONAL FORCEPS	PHYSICS FORCEPS
Healed	10	2
	10.0%	2.0%
Completely .healed	46	55
	46.0%	55.0%
Not reported	44	43
	44.0%	43.0%
Total	100	100
	100.0%	100.0%

Chi-Square Tests : Value=6.147, p=0.046



In Conventional forceps group, wound was healed in 10%, 46% had completely healed wound while in 44% patients had not reported on 15th postoperative day. Within Physics forceps group, 2% patients had healed wound,55% had completely healed wound and in 43% patients had not reported on 15th postoperative day. There was statistically significant ($p < 0.05$) difference of complete wound healing more in physics forceps group than conventional forceps group on 15th postoperative day.

Comparison of condition of tooth in between Conventional and Physics forcep group. Extracted Tooth was grossly destructed in 49% patients in Conventional forceps group while 51% had sound tooth. In physics forceps group, tooth condition was grossly destructed in 46% while 54% were sound tooth. There was statistically no significant ($p > 0.05$) difference of condition of extracted tooth in between conventional and physics forceps groups.

Comparison of Buccal cortical plate fracture in between Conventional and Physics forcep group. Buccal cortical plate fracture was noted in 3% patients in conventional forceps group while in physics forceps group only one patient had buccal cortical plate fracture. There was statistically no significant ($p > 0.05$) difference of buccal cortical plate fracture in between conventional and physics forceps groups.

Comparison of dry socket presence in between Conventional and Physics forcep group. In conventional forceps group, 4% patients had dry socket while in physics forceps group only 1% patient had dry socket. There was statistically no significant ($p > 0.05$) difference of dry socket development in between conventional and physics forceps groups

IV. Discussion

Conventional forceps have been the mainstay of exodontia since long time, however there is a risk of mutilation in the existing pattern of forceps.The after effects of extraction with routine forceps may vary from paltry of gingival trauma to extensive damage to interdental or alveolar bone crest.[7] This may lead to dry socket, delayed healing, post-operative pain and infection. All this may result in post-operative inconvenience and may also cause future prosthetic rehabilitation difficult.[8]

To overcome these drawbacks various techniques have been evolved over the period of time such as Physics forceps is one such instrument that has shown promising results in terms of less trauma, greater speed of extraction and more convenience. The advantage of physics forceps lies in its biomechanics with 1st class lever mechanism which allows stress distribution without any wrenching or compressive force.[6,9]

Physics forceps are the most innovative oral surgery instruments in recent years, completely changing the physics behind the 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.[10]

Our study aimed to compare between physics and conventional forceps techniques regarding the time taken for extraction, pain assessment in verbal pain intensity scale and wound healing assessment in visual analogue scale.The main advantage of physics forceps over conventional forceps is related to their unique design that candeliver 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.

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.[11]

The Physics forceps, which works on the mechanism of a first-class lever, is used by rotation of the wrist rather than a squeezing movement. The handles are rotated as a single unit for a few degrees, and then stopped for almost a minute.7 The length of the forceps handle to the bumper is 8 cm and the torque force that is generated on the tooth, periodontal ligament, and bone is related to this, divided by the distance from the bumper to the beak of the forceps (1 cm). The force that is applied on the handle attached to the bumper will therefore increase the force on the tooth, periodontal ligament, and bone by about 8 times. The force applied by the bumper on to the gingiva and bone is over a larger surface area and is a compressive force, so the tooth and alveolus do not fracture. Once the tooth is subluxated, it can be delivered with the help of conventional forceps or a rongeur.[1,12]

Time:- In the current study, the operating time was calculated from the point of application of the beaks on the tooth to the delivery of tooth out from the socket. Mean Extraction Time of patients in Physics forcep group was 10.7±13.6 seconds while those in conventional forceps group was 60.3±68.0 seconds.The mean duration of extraction procedure was longer with the Conventional forceps than with the physics forceps. T.Lally et al[38] compared the extraction time for both the forceps and found that the Conventional forceps had a mean extraction time of 188.55 secs and Physics forceps a mean time of 120.45 secs. In another study done by Samyuktha et al [30], the mean operating time using the Conventional extraction forceps was 43.5(49.5) secs

and with Physics forceps was 29.4(27.3) secs. This shows that the operating time was more with the use of Conventional forceps which is consistent with the literature.

The reason for the lesser time required in physics forceps extraction can be attributed to the biomechanical advantages of a first-class lever with a controlled force eliminating the need for the another force (clinician's arm) unlike the Conventional forceps. In our study there was statistically very highly significant ($p < 0.001$) difference of mean extraction time of patients which was more in conventional forceps group than the physics forceps group.In our study the newest version which we are using, the essential advanced series of physics forceps group has given us far less extraction time as compared to standard series of physics forceps group done in other studies.

Pain:- Pain sensation depends on each individual's subjective pain threshold, and to optimize this evaluation, the Verbal pain intensity scale (Fig No.6) was chosen, which is straightforward to apply. In our study the Verbal pain intensity scale (VPIS) on 2nd postoperative day in the conventional forceps group was mild intensity in 46% patient, moderate intensity in 38% and severe intensity in 9% .In Physics forceps group VPIS on 2nd postoperative day was of mild intensity in 88%, moderate intensity in 12% patients and severe intensity in 0%. There was statistically very highly significant ($p < 0.001$) difference with more patients in conventional forceps group having severe pain than physics forceps group on 2nd postoperative day.Verbal pain intensity scale (VPIS) on 5th postoperative day in conventional forceps group was mild in 38% patient, moderate in 9% while 53% had no pain. In Physics forceps group VPIS on 5th postoperative day was of mild intensity in 12%, none had moderate intensity while 88% patients had no pain.Verbal pain intensity scale (VPIS) on 7th postoperative day in conventional forceps group was mild in 9% patient, and 91% had no pain. In Physics forceps group VPIS on 7th postoperative day was of mild intensity in 1%, none had moderate intensity while 99% patients had no pain. None of the patients in conventional forceps group or physics forcep group had pain according to verbal pain intensity scale (VPIS) on 15th postoperative day.

According to Dym and Weiss[1] there is no need to raise a mucoperiosteal flap or use an elevator before attempting extraction with the Physics forceps. This is a major advantage, particularly in cases that require atraumatic extraction. The design of the Physics forceps allows the tooth to be delivered atraumatically, unlike the conventional forceps. This might reduce trauma at the surgical site and therefore pain, particularly in the early post operative period. The constant unrelenting pressure to the PDL by the physics forceps is substantially more efficient at releasing the tooth compared to the intermittent and alternating forces of conventional extraction forceps. Since the Physics forceps was a less traumatic experience for the patient, it also had the potential to reduce post-operative pain and discomfort.

Wound Healing:- We evaluated post-operative healing of extraction socket on 5th ,7th and 15th day. Healing was assessed to be unhealed /healed /completely healed depending upon the completeness of soft tissue coverage. Unhealed healing was observed in all the patients with the use of both the conventional and physics forceps on 5th post-operative day. In Conventional forceps group, wound was healed in 89%, 2% had completely healed wound while in 9% patients wound was not healed on 7th postoperative day. Within Physics forceps group, 92% patients had healed wound , 6% had completely healed wound and in 2% patients wound was not healed on 7th postoperative day. In Conventional forceps group, wound was healed in 10%, 46% had completely healed wound while in 44% patients had not reported on the 15th postoperative day. Within Physics forceps group, 2% patients had healed wound , 55% had completely healed wound and 43% patients had not reported on the 15^{th} postoperative day. None of the subjects reported delayed wound healing with the use of physics forceps and therefore sufficient alveolar bone volume and favorable architecture of the alveolar ridge, which is essential to obtain ideal functional and esthetic prosthetic reconstruction following implant therapy, can be achieved by the use of Physics forceps during extraction.

Clinical evaluation of both the forceps was done to compare its efficacy during extraction. An observing assistant assessed for the intraoperative complications such as buccal cortical bone plate fracture or any adherence of buccal plate to the root. In our patients buccal cortical plate fracture was noted in 3% patients in conventional forceps group while in physics forceps group only one patient had buccal cortical plate fracture. Long S et al[13] compared both the forceps and found the incidence of fractures of the bony plate was 22% in the Physics forceps group compared with 25% in the Conventional forceps group.

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[11], who concluded that the handles of conventional forceps allow the operator to grasp the tooth but do not assist in the mechanical advantage to remove it. This is similar to attempting to pull a bottle cap off a bottle using a pair of pliers versus using the advantages of a lever to remove the cap, as with standard bottle cap opener. The extraction of a tooth using physics forceps is similar to the removal of a nail from wood using a

hammer versus a pair of pliers. The handle of the hammer is a lever, and the beak of the hammer's claw fit under the head of a nail. The hammer's head acts as a fulcrum. A rotational force applied to the hammer's handle is magnified by the length of the hammer's handle, which elevates the nail out of the wood.

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 help to decrease the incidence of buccal bone plate fracture. In addition the bumper applies a compressive force at the buccal bone as it was positioned on the buccal alveolar ridge, resulting in holding and supporting the bone in its place. This result was in agreement with the result of Kosinski8 who stated that the buccal movement applied by physics forceps was slow and generally insufficient to fracture the buccal bone plate.Our results were in agreement with the study of Choi et al. [14] 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.

Post-operative Satisfaction:- The post-operative patient satisfaction was assessed for the physics forceps and conventional forceps by patient response. Overall, the patients who got tooth extracted with physics forceps were more satisfied than the conventional forceps. The reason for patient's comfort is due to less pressure and force exerted by the physics forceps during the procedure. Owing to this reason, majority of the patients were willing to undergo similar procedure in future. Perkins NJ et al[15] stated that the Physics forceps has a definite learning curve because the method of delivering the tooth from the alveolus is so different.No patient developed postoperative infection or delayed healing, which is in agreement with studies that reported only minimal complication after uncomplicated extractions[16] .Difficulty faced during the study was in getting adjusted with the technique of handling the physics forceps; and to adapt the bumper on the labial/buccal mucogingival junction while balancing the beaks on the lingual surface of the tooth. A conscious effort has to be made to retain our hands to not to squeeze the instrument and to not pull with our arm. Unlike the conventional forceps, the Physics forceps is new, having recently been introduced onto the market. Fewer dental professionals are therefore familiar with its design and use. However, once the operator is familiar with the movement of the wrist and direction of application of force, the process of extraction is simple.

Limitations of this study include the need for increased operational skill and a learning curve associated with the Physics forceps. The cost of physics forceps limits its clinical application. The fact that density of the bone increases with age and thus directly affects factors like creep and expansion of alveolar bone may have an impact on the final outcome; as a wider range of age group was taken up for this study. Within these limitations of the study, when the overall outcome was compared in the two forceps groups, we found significantly less pain, and more comfort after tooth extraction using the physics forceps and the final outcome suggests that physics forceps is a relatively favorable and valuable alternative for atraumatic extraction of teeth over the conventional forceps.

V. Conclusion

Over the last decade, there has been an increased interest in atraumatic tooth extraction in order to preserve bone for implant placement. The physics forceps can be used as a helpful aid in atraumatic extractions as it not only reduces patient's postoperative discomfort but also maintains the socket integrity by not disturbing the soft tissue and hard tissue architecture and thus making future prosthetic replacement easier.

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. Other advantages of utilizing the Physics Forceps includes: Predictable and efficient extractions in minimal time, preserving the buccal bone and cortical plate, preventing the need for flaps and removing bone to access roots, virtually eliminating root tip fractures, assisting with efficient full mouth reconstructive extractions, supporting immediate implant placement.

The reason for the lesser time required in physics forceps extraction can be attributed to the biomechanical advantages of a first-class lever with a controlled force eliminating the need for the third force (clinician's arm) unlike the Conventional forceps.With Physics forceps the success rate of extraction is more compared to that of conventional forceps. Fracture of root was also observed to be more with conventional forceps than with physics forceps.The wound healing is less uneventful in physics forceps as compared to conventional forceps.

Physics forceps is clinically valuable in atraumatic tooth removal and in preserving the buccal bone plate which is important for implant dentistryHence in our study we conclude that the physics forceps to be more efficient than conventional forceps in dental extractions.

References

[1]. Dym H, Weiss A. Exodontia: tips and techniques for better outcomes. Dental Clinics. 2012 Jan 1;56(1):245-66.
[2]. Kosinski T. Use of innovative physics forceps for extractions in preparation for dental implants. Implant News Views. 2012 Mar;14(2):1-9.
[3]. Nazarian A. An efficient approach to full-mouth extractions. Dentistry today. 2011 Aug;30(8):94.
[4]. Misch CE, Perez HM. Atraumatic extractions: a biomechanical rationale. Dentistry today. 2008 Aug;27(8):98-100.
[5]. Simon E, Matee M. Post- extraction complications seen at a referral dental clinic in Dar Es Salaam, Tanzania. International dental journal. 2001 Aug;51(4):273-6.
[6]. Golden R, inventor. Dental plier design with offsetting jaw and pad elements for assisting in removing upper and lower teeth utilizing the dental plier design. United States patent US 6,910,890. 2005 Jun 28.
[7]. Al-Khateeb TH, Alnahar A. Pain experience after simple tooth extraction.Journal of oral and maxillofacial surgery. 2008 May 1;66(5):911-7.
[8]. Venkateshwar GP, Padhye MN, Khosla AR, Kakkar ST. Complications of exodontia: a retrospective study. Indian journal of dental research. 2011 Sep 1;22(5):633
[9]. Hariharan S, Narayanan V, Soh CL. Split-mouth comparison of Physics forceps and extraction forceps in orthodontic extraction of upper premolars. British Journal of Oral and Maxillofacial Surgery. 2014 Dec 1;52(10):e137- 40.
[10]. El-Kenawy MH, Ahmed WM. Comparison between physics and conventional forceps in simple dental extraction. Journal of maxillofacial and oral surgery. 2015 Dec 1;14(4):949-55.
[11]. Misch CE, Perez HM. Atraumatic extractions: a biomechanical rationale.Dentistry today. 2008 Aug;27(8):98-100.
[12]. Golden R, inventor. Dental plier design with offsetting jaw and pad elements for assisting in removing upper and lower teeth utilizing the dental plier design. United States patent US 6,910,890. 2005 Jun 28.
[13]. Tally T, Long S, O'regan M. A comparison of the conventional forceps to physics forceps.The Preliminary program for IADR General Session 2010 July;14-17.
[14]. Choi YH, Bae JH. Clinical evaluation of a new extraction method for intentional replantation. Journal of Korean Academy of Conservative Dentistry. 2011 May 1;36(3):211-8.
[15]. Perkins NJ, Perez HM, Misch CE, Golden R. P35 The physics forceps–a breakthrough in dental extraction technology. British Journal of Oral and Maxillofacial Surgery. 2010 May 1;48:S34.
[16]. Al-Khateeb TH, Alnahar A. Pain experience after simple tooth extraction.Journal of oral and maxillofacial surgery. 2008 May 1;66(5):911-7.

Dr. Mandar Madhukar Patole, et. al. "Physics Forceps Versus Conventional Forceps For Tooth Extraction: A Comparative Study." *IOSR Journal of Dental and Medical Sciences (IOSR-JDMS)*, 20(01), 2021, pp. 01-09.