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Physics Forceps Versus Conventional Forceps in the Extraction of Posterior Teeth: A Comparative Study

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ABSTRACT

Background: The aim of the present study is to evaluate the efficacy of physics forceps in the extraction of posterior teeth compared with conventional forceps.

Materials and methods: A randomized controlled prospective study was conducted on 160 patients seeking nonsurgical removal of posterior teeth. One hundred extractions were allocated to each group, wherein group I extractions were performed using physics forceps, and in the group, II extraction was performed using conventional forceps.

Results: Incidence of crown fractures 18 in group I and 11 in group II, number of root fractures in group I were 4 cases, whereas 0 cases in group II, the alveolar bone fracture was noticed in 5 cases in group I and 4 cases in group II, soft injuries noticed in group I were 0 and in group II were 9 cases. The value of failure to remove the tooth in toto was 21%, and success was 79% in group I and values of failure was 10%, and success was 90% in group II. Mean operating time was 52.40 seconds in group I and 150.98 seconds in group II, the mean operator ease in group I was 8.23 and in group II was 7.43.

Conclusion: This study suggests that compared to conventional forceps, soft tissue injuries are minimal in extractions done by physics forceps. The physics forceps was found to be more efficient than conventional extraction forceps in atraumatic extraction of teeth by reducing operating time.

Keywords: Physics Forceps, Conventional Forceps, Extraction, Posterior teeth.

INTRODUCTION

Tooth extraction is one of the most common procedures in dentistry, and it is often the first surgical procedure performed by young dentists. History of tooth extraction dates back to the era of Aristotle (384 to 322 BC), where he described the mechanics of extraction forceps, including the advantages of "two levers acting in a contrary sense having a single fulcrum". During middle ages and throughout the 19th century, dentistry was not a profession per se, and often dental procedures were performed by barbers or general physicians.[1]

Teeth are extracted for a variety of reasons like, severe unrestorable caries, severe periodontal disease, orthodontic reasons, malposed teeth, preprosthetic extractions, impacted teeth, supernumerary teeth, teeth associated with pathologic lesions, preradiation therapy, teeth involved in jaw fractures, esthetics etc. An ideal tooth extraction may be defined as "the painless removal of the whole tooth or tooth roots with minimal trauma to the investing tissues, so the

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wound heals uneventfully with no postoperative prosthetic problems". [2]

In recent years tremendous improvement has been witnessed in dental implantology, thereby increasing the need for atraumatic tooth extraction in order to maintain a good quality of bone and soft tissues for implant placement. There have been many advances in different tools and extraction techniques to achieve atraumatic extraction. One of those advances was the introduction of Physics Forceps by Dr Richard Golden [2] in 2004. Physics forceps has two beaks one with a rubber bumper, placed on buccal gingiva and the other a sharp, flat beak which engages the lingual surface of the tooth at the level of cementoenamel junction. It works on a first-class lever principle and 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. The force applied on the handle attached to the bumper is a compressive force, which acts on the tooth, periodontal ligament and alveolar bone. The force applied by the bumper is spread over a larger surface area and hence minimizes fracture of the tooth and alveolus. Once the tooth is subluxated, it can be delivered with the help of conventional forceps or a rongeur.[3] It enables to predictably extract even the most grossly decayed or broken tooth 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.[2]

Fig. 1 Upper right physics forceps

Fig. 3 Upper anterior physics forceps

Fig. 2 Upper left physics forceps

Fig. 4 Lower universal physics forceps

There is a paucity of literature describing the use and efficiency of physics forceps, hence this study was designed to compare the efficacy of physics forceps with conventional forceps for the extraction of the maxillary and mandibular posterior teeth.

MATERIALS AND METHODS

A randomized controlled prospective study was conducted on patients seeking nonsurgical removal of posterior teeth. The study was designed and conducted in accordance with the ethical principles of the currently amended version of the Declaration of Helsinki, after approval by the Institutional Ethics Committee. Informed consent was taken from all the patients in a standard case proforma. Demographic data was collected. All procedures were performed in the Department of Oral and Maxillofacial Surgery, SVS Institute of Dental Sciences, Mahabubnagar, Telangana State, India.

Patients of both the genders, above the age of 14years, indicated for extraction of firm posterior teeth were included in the study. Patients with grade II and III mobile teeth, root stumps, moderate to severe infections associated with the tooth, trans alveolar extractions and those who refused to sign the informed consent were excluded from the study.

Patients were randomly allocated into two groups, Group I / Test Group and Group II / Control Group, where extractions were done using physics forceps and conventional forceps, respectively. The patients were evaluated clinically for soft tissue injuries, cortical bone fracture, crown and root fractures. Operator data regarding the operating time and ease of the operation was recorded. Data regarding the procedure and clinical parameters were recorded in a detailed case proforma.

Operative Procedure:

Under all aseptic conditions, lignocaine with adrenaline (1:80.000) was administered as local anaesthesia required for the tooth indicated to be extracted. In the case of conventional forceps, a standard extraction procedure with an elevation of the mucoperiosteal flap was used. However, the elevation of the mucoperiosteal flap is not required for extraction of the tooth by physics forceps and was not performed in Group I patients. The beak of physics forceps with a bumper was placed on buccal gingiva, and the other beak was engaged on the

lingual side of the tooth at the cementoenamel junction of the teeth to be extracted. The handles were rotated as a single unit for a few degrees and then stopped for almost a minute. This process was repeated till a 'popping sound' was heard, indicating subluxation of the tooth from the socket. Once the tooth was subluxated, it was delivered with conventional forceps.

All extractions were performed by five operators. The patient was evaluated clinically for soft tissue laceration, cortical bone fracture, crown and root fracture by the operator. Data regarding the procedure and clinical parameters were recorded in a detailed case proforma. Operator data regarding the operating time and ease of the extraction was noted after the injection of local anaesthetic from the beginning till the completion of extraction. The socket was compressed manually, and a gauze roll was placed, and the patient was asked to bite on it for 30 minutes.

The analysis was done using SPSS version 18. A p-value of <0.05 was considered statistically significant. Categorical variables are analyzed using Chi-square or Fishers Exact test. Continuous variables were analyzed using the Mann-Whitney U test.

RESULTS

A total of 160 patients, satisfying the selection criteria and indicated for extraction of a posterior tooth, were evaluated in this study. The mean age of patients included in the study was 32.48 years. No significant difference was seen with respect to the age between both groups. Incidence of crown fractures were 18 in group I and 11 in group II (p=0.211, NS). A number of root fractures in group I were 4, whereas 0 in group II (p=0.055, NS). The alveolar bone fracture was noticed in 5 cases in group I and 4 in group II (0.739 NS). Soft injuries noticed in group I were 0 and in group II were 9 (0.004, Sig). The values of failure to remove the tooth in toto were 21%, and success was 79% in group I and values of failure was 10%, and success was 90% in group II (0.032, Sig). Mean operating time was measured in both the groups, where the values were 52.40 in group I and 150.98 in group II (<0.001, Sig). The mean operator ease in group I was 8.23, and in group II was 7.43 (<0.001, Sig).

DISCUSSION

After extraction parameters measured were soft tissue and hard tissue injuries during extraction. Soft injuries included laceration of mucosa surrounding the tooth to be extracted. Hard tissue injuries include crown fracture, root fracture, buccal cortical plate, lingual/palatal cortical plate. Failure or success to remove the tooth in toto was also noted. In the present study, crown fractures noted was 17.2% in group I and 11% in group II. The difference between the groups was not statistically significant. (P= 0.211). In contrast to this study number of crown fractures in El Kenawy H M et al. [2] study were 13 cases in both test and control group in, 3 (4%) in group I (Physics Forceps), 10 (10%) in group II (Universal forceps). The difference between the groups was statistically significant (P = 0.04).

Soft tissue injuries occurred in this study were 0 in group I and 9% in group II in both the groups. The difference between the groups was statistically significant. (P= 0.004) i.e. soft tissue injuries were more in group II compared to group I. Similar soft tissue injuries were reported in a study conducted by Lingaraj J et al. [7] total number of cases with soft tissue laceration were 12 in all the cases, 1 case (8.33%) in physics forceps group, 11 cases (91.67%) in conventional forceps group. Thus physics forceps group shows that there is less gingival laceration with a significant difference of (P=0.0001)

Root fractures occurred in the present study in group I was 4.2% and in group II 0 %. The difference between the groups was not statistically significant. (P= 0.055). In contrast to this study El Kenawy, M H et al. [2] quoted the root fractures in their study which included 41 root fractures totally, were 14 (8.5%) in group I, 27 (16.6%) in group II. In a study performed by Hariharan S et al. [5] one patient had a fracture of the buccal root above the middle third when the universal extraction forceps was used, and this root was removed with root forceps. There was, therefore, no significant difference between the two groups, which is similar to the present study.

Buccal cortical plate fracture noticed in the present study was 5.5% in group I and 4% in group II. The difference between the groups was not statistically

significant. (P= 0.739). In contrast in Hariharan S et al. [5] study, there were no complaints of a fractured alveolus in their study among both the groups. Harsh S P et al. in their study reports that fracture of the buccal cortical plate which remained adhered to roots of extracted teeth was found in 2 teeth (4.76%) extracted using physics forceps. In El Kenawy M H et al.[2] study, there were 10 cases of bone plate fractures. 3 (3%) in group I, 7(7%) in group II, there was no significant difference between two groups (P = 0.19) which is similar to the present study.

Mean operating time was measured in both the groups, where the values were 52.40mins in group I and 150.98 mins ingroup II. the difference between both the groups was statistically significant (p= < 0.001). In a study by Hariharan S et al. [5] the operating time was shorter when the Physics forceps was used than for the universal extraction forceps, but the difference was not significant (p = 0.2) which is similar to present study. Lingaraj J et al. [7] in their study compared to the time required for extraction in two groups (physics forceps and conventional forceps) which comes to be meantime as 131.75 sec with physics forceps with a standard deviation of 18.83 sec whereas with conventional forceps meantime came to be 295.17 sec with a standard deviation of 42.31 sec. There was a significant difference for extraction in both the groups, where the time required for extraction in group I was less than group II (P = 0.0001) which is in accordance to present study.

In this study, another parameter included is operators ease in case of extraction using physics and conventional forceps. The operator's ease value was evaluated by rating from 1 to 10. Initially, it was difficult to perform an extraction with physics forceps as the operators were used to conventional forceps in the extraction of teeth, eventually ease of extraction improved after performing few extractions. There was a total of five operators, ease of extraction was taken from all the operators after the extraction is completed either using physics forceps or conventional forceps. The mean operator ease in group I was 8.23 and in group II was 7.43 for which p = < 0.0001. The mean operating ease scores were significantly higher in physics forceps when compared to universal forceps.

Another parameter which was included in the study was a failure to remove the tooth in toto using physics or conventional forceps where the values of failure were 21%, and success was 79% in group I and values of failure was 10% and 90% in group II. P-value was 0.032; thus, there were significant differences in success and failure rates in both groups. So a significantly higher number of success was seen with the use of universal forceps. In all the group's patients were recalled if they have any post-extraction complications like pain, swelling or any discomfort after extraction of teeth. No patient reported back with any of the complications.

CONCLUSION

Analysis of the efficacy of both forceps was done by comparing different parameters in both the groups which were soft tissue injuries, hard-tissue injuries, operator time and operators ease. Soft tissue injuries very minimal in extractions done by physics forceps when than in extractions done by conventional forceps. The physics forceps are more efficient than conventional extraction forceps in atraumatic extraction of teeth by reducing operating time. Apart from atraumatic extraction usage of physics forceps also provides ease for the operating surgeon. Physics forceps having many advantages also have limitations which include

1. There is more incidence of crown fractures in the usage of physics forceps.
2. Incidences of failure in the removal of the tooth in totto are also more when compared to conventional forceps.
3. The cost of a physics forceps is high when compared to conventional forceps; hence the usage of physics forceps in routine clinical practice is less viable.

Hence from the findings of our study, we advocate the usage of physics forceps would provide atraumatic extraction, which will provide uneventful postoperative healing. In spite of the higher cost of the instrument and a steep learning curve, it would be commonly employed in future to perform atraumatic extraction with minimal operating time.

CONFLICTS OF INTEREST

The authors declare they have no potential conflict of interests regarding this article.

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