

Comparison of the efficiency of arm force versus arm force plus wrist movement in closed method extractions an observational study

ABSTRACT

Background: Atraumatic dental extraction preserves not only the bone, but also maintains the gingival architecture, hence allows immediate or late dental implant placement. The incidence of fracture of roots and buccal cortical plates increases when wrong force is used. Currently, there is insufficient literature evidence with regard to the appropriate method for application of arm and wrist force at the time of dental extraction.

Aim: Therefore, the aim of the present study was to compare the efficiency of arm force only versus arm force plus wrist movement during closed extractions.

Materials and Methods: The patients who underwent extractions of right upper molars ($n=50$) in the Oral and Maxillofacial Surgery Department were selected for the study after obtaining Informed Consent. The patients with grossly decayed broken teeth and mobile teeth were excluded. The procedure was carried out by interns and was observed by three maxillofacial surgeons of more than 5 years of experience independently.

Results: It was observed that 30% of the trainees used arm only force during dental extraction and were unaware about it. The time taken for tooth removal in the group which used arm and wrist force was significantly lesser ($P < 0.001$). It was also observed that the breakage of tooth and alveolar bone fracture was more common with the group who used only arm force.

Conclusion: From the results of the present study, it can be concluded that during exodontia procedures, the principle of using arm and wrist facilitates safe and easy removal of tooth with less time.

Keywords: Arm force, dental extraction, ergonomics, extraction, wrist force

INTRODUCTION

Teeth extraction is one of the most common oral surgical procedures practiced since the early days of dentistry. It was the only procedure performed by dentists in the previous centuries and various instruments used for extraction have evolved over time. In the 14th century, Guy de Chauliac invented dental pelican, which was in use till the late 18th century.^[1] The dental pelican was replaced by the dental key which, in turn, was replaced by tooth extraction forceps only in the 20th century.^[1] Conventional tooth extraction forceps, a metallic instrument with two beaks to grasp the crown of tooth, with a hinge in center and handle was widely used.

Tooth extraction with associated loss of surrounding alveolar bone and soft tissues could be attributed to improper

technique. In recent years, there has been an increased emphasis on the atraumatic removal of teeth. Atraumatic

PRASHANTH SUNDARAM, SARAVANAN KANDASAMY¹, REENA RACHEL JOHN¹, K. C. KEERTHANA SRI

Vinayaka Mission's Sankarachariyar Dental College, Vinayaka Missions Research Foundation, Deemed to be University, ¹Department of Oral Maxillofacial Surgery, Vinayaka Missions Sankarachariyar Dental College, Salem, Tamil Nadu, India


Address for correspondence: Dr. Saravanan Kandasamy, Department of Oral and Maxillofacial Surgery, Vinayaka Missions Sankarachariyar Dental College and Hospital, Ariyanoor, Salem - 636 308, Tamil Nadu, India.
E-mail: saranmds.dr@gmail.com

Received: 06 October 2020, **Revised:** 02 February 2021, **Accepted:** 27 February 2021, **Published:** 15 July 2021

This is an open access journal, and articles are distributed under the terms of the Creative Commons Attribution-NonCommercial-ShareAlike 4.0 License, which allows others to remix, tweak, and build upon the work non-commercially, as long as appropriate credit is given and the new creations are licensed under the identical terms.

For reprints contact: WKHLRPMedknow_reprints@wolterskluwer.com

How to cite this article: Sundaram P, Kandasamy S, John RR, Sri KC. 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;12:250-4.

Access this article online	
Website: www.njms.in	Quick Response Code 
DOI: 10.4103/njms.NJMS_212_20	

dental extraction preserves bone and maintains gingival architecture, thereby ensuring the option of replacement with implant supported prosthesis.^[2] The instrument selection and the technique used for extraction significantly affects the amount of para dental tissue loss. Marginal alveolar bone protection was influential in achieving optimal functional, esthetic and orthodontic treatment results.^[3]

Tooth extraction is a surgical act and several complications might arise directly related to the operator's actions. Fracture of the alveolar bone is the most frequent complication during tooth extraction which is related to either too much force being transferred onto the tooth through the instrument or wrong placement of forceps. In addition, incorrect hand movements can increase the possibility of tooth apex fracture. In most cases, the incidence of crown root fractures alone or along with buccal cortical plates increased when the wrong force was given.^[4] Currently, there is no sufficient literature evidence with regard to the appropriate method for the application of arm and wrist force at the time of dental extraction. Hence, the present study was planned to compare the efficiency of arm force only versus arm force plus wrist movement during closed method extractions.

MATERIALS AND METHODS

The present Prospective study was approved by the institutional ethical committee (VMSDC/IEC/App No:186). The participants of the study comprised of 50 healthy controls ($n = 50$) between the age group of 22–55 years from 2017 to 2019 reported to the department of oral and maxillofacial Surgery. After obtaining informed consent, the patients who presented with upper right first molar with sound alveolar bone on all surfaces and with minimum of 2 intact surfaces, were taken up for the study. The patient who presented with abnormal root morphology (as dilacerated, severely curved, bulbous roots, etc.) as depicted by preoperative periapical X-ray examination, history of uncontrolled systemic disease, impacted teeth, localized periodontitis, and root stumps were excluded from the study.

Each patient underwent standard presurgical preparation including detailed case history, blood tests wherever indicated and radiographic examination (OPG or IOPAR of tooth to be extracted). Extractions were done following aseptic surgical protocols.

Methods

Local anesthesia containing 1:80,000 lignocaine hydrochloride and adrenaline was used. Mucoperiosteal flap reflection was done using the periosteal elevator. Elevators were not used for luxation of tooth to be extracted. Tooth specific forceps were used for extraction of specific molars as per British forceps system. The beaks of forceps were placed at the cemento-enamel junction of particular tooth and extraction was performed. All the cases were performed by intern trainees who were blinded to the study protocol and the procedure was assessed by three maxillofacial surgeons independently. The specific movement given by the operator for each case was noted by the observers. The operator was unaware of being observed by the assessors from a 5 ft distance. The time taken for extraction was considered from the point of application of the beaks on the tooth to the delivery of tooth out of socket, measured using stop watch and recorded in seconds. Compression of socket was done following the extractions and post extraction instructions were given to all the patients. The extracted tooth was clinically examined for root fracture, adherence of buccal plate to the root and recorded.

The following parameters were assessed by the observers:

- Use of arm force or arm plus wrist force for extraction
- Time taken for extraction (from the point of application of the forceps on the tooth to the delivery of tooth out of the socket)
- Intraoperative evaluation - evaluation for root fracture, bone plate fracture, and adherence of buccal plate to the root.

The assessment of extraction was based on the following criteria given by Choi *et al.*^[5] [Table 1].

Table 1: The assessment of extraction was based on the following criteria given by Choi *et al.*^[5]

Scores	Interpretation	Significance
Score 5	Complete success	Extraction without crown and root fracture
Score 4	Limited success with root tip fracture	Extraction involving root tip fracture
Score 3	Limited success with root fracture	Extraction involving root one or more root fracture or crown fracture
Score 2	Limited success with osteotomy	Fracture-free extraction and partial osteotomy in case divergent roots and thick cortical bone was present
Score 1	Failure	Failure to extract

Table 2: Comparison between observers difference

	3 observers, n (%)	2 observers, n (%)	Total	χ^2	P
Arm force only	10 (66.67)	5 (33.33)	15	0.302	0.582
Arm force plus wrist movement	26 (74.29)	9 (25.71)	35		
Total	36 (72.00)	14 (28.00)	50		

RESULTS

Among the extractions performed in the study on fifty patients, 15 operators used arm force to extract the teeth and 35 operators used arm plus wrist force as shown in Table 2 and Figure 1. The average time taken for extraction was 10.25 min and 4.93 min using arm force and arm force plus wrist movement, respectively [Figures 2 and 3]. It was observed that 85.71% showed complete success of extractions on using arm plus wrist movement while 13.33% had successful extractions on using arm force [Tables 3 and 4] showing statistically significance.

DISCUSSION

Atraumatic tooth extraction is a technique that is used to remove a tooth completely which dramatically reduces or

eliminates the trauma to the tissues preserving the remaining bone around the tooth. The advantages of the atraumatic tooth removal are as follows:

- Preservation of the tissue and bone around the teeth
- Improvement of the potential of the body to regenerate bone and “fill-in” the socket
- Reduction in the risk of infection
- Reduction or elimination of the discomfort after the extraction
- Preservation of the natural contour of the gums
- Enhancement of the esthetics of the final restoration.^[6]

Various instruments and techniques have been developed to aid atraumatic tooth extraction. Techniques such as powered

Table 3: Comparison of time taken for extraction

Group	n	Mean	SD	SE	T	P
Time (min)						
Arm force only	15.00	10.25	4.87	1.26	3.94	0.001**
Arm force plus wrist movement	35.00	4.93	4.15	0.70		

**Clinically significant. SD: Standard deviation, SE: Standard error

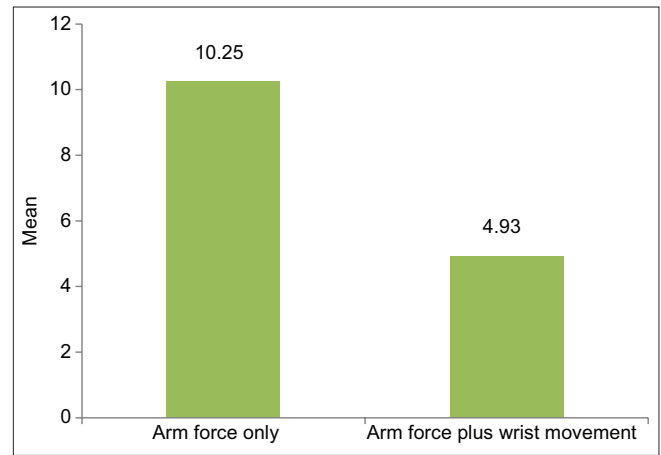


Figure 2: Comparison of time taken for extraction

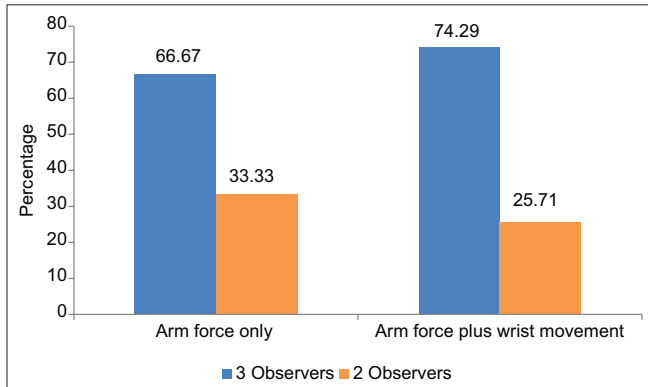


Figure 1: Comparison between observers difference

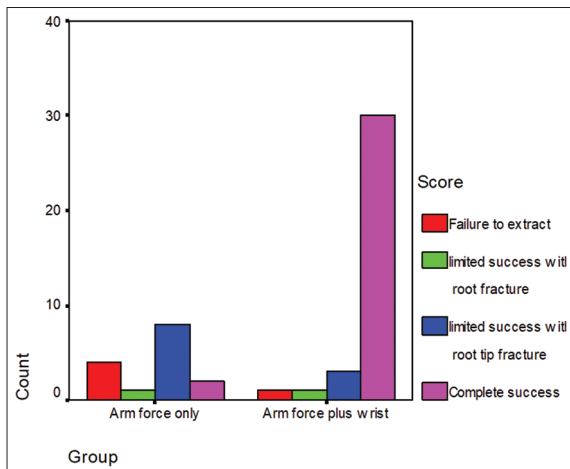


Figure 3: Comparison of extraction score

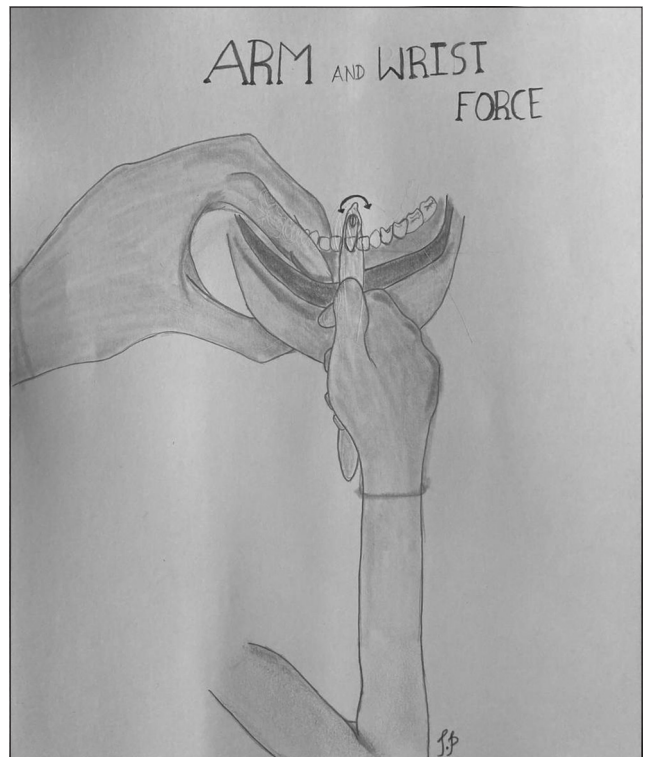
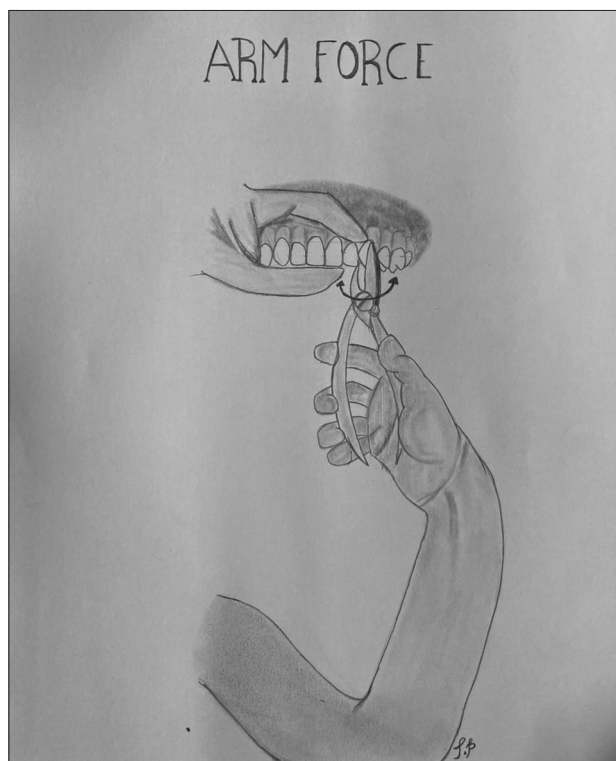


Figure 4: Use of Arm and wrist force

Table 4: Comparison of extraction score

Group	Score				Total	χ^2	P
	Failure to extract, n (%)	Limited success with root fracture, n (%)	Limited success with root tip fracture, n (%)	Complete success, n (%)			
Arm force only	4 (26.67)	1 (6.67)	8 (53.33)	2 (13.33)	15	24.49	0.001**
Arm force plus wrist movement	1 (2.86)	1 (2.86)	3 (8.57)	30 (85.71)	35		
Total	5 (10.00)	2 (4.00)	11 (22.00)	32 (64.00)	50		

**Statistically significant

**Figure 5: Use of Arm force**

periotomes,^[7] piezosurgery,^[8] lasers,^[9] physics forceps,^[7,9,10] orthodontic extrusion of the third molar,^[5] and the Benex vertical extraction system^[11] are among the few tested and tried methods. Among the above-mentioned techniques, the force that is applied by the operator that plays an important role for atraumatic dental extraction.

Dental forceps belongs to first-class lever, connected by a hinge. The forces applied to the handle are on the long side of the lever while, the beaks on the tooth are the short side of the lever, and the hinge acts as a fulcrum. Hence, the force on the handles is magnified to allow the forceps to grasp the tooth with great force. The handle of the forceps allows the operator to grasp the tooth.

The authors preferred to study the right maxillary 1st molars because they were considered to be the most difficult to extract due to their variable crown bulk and multiple roots with variable anatomy.

Misch and Perez developed the physics forceps for dental implant placement immediately after extraction to minimize damage to the root and especially, the marginal periodontal tissue. The bumper of the forceps acts as a fulcrum and prevents fracture of the buccal alveolar bone. In addition, by using the principle of Type 1 lever, force can be loaded vertically, facilitating safe extraction. The beak contacts only the lingual side, minimizing damage to the gingiva and alveolar bone, and significantly lowering the possibility of crown or root fracture.^[10]

Kosinski *et al.* stated that the physics forceps applied constant and steady pressure with the wrist only, as this technique required a minimal amount of strength and a maximum amount of patience, thereby helping to decrease the incidence of buccal bone fractures.^[12]

Also in the present study, there was reduced incidence of crown or root fracture on using arm plus wrist movements. The average time period was significantly increased in using only arm force when compared with combined force of arm and wrist. Further, it was observed that using conventional forceps with arm plus wrist force showed clinically and statistically significant results than while using arm force only. For upper teeth extractions, the arm and wrist should be 0–15° upward with the wrist moving 0–45° along the horizontal line axis facilitating easy removal [Figure 4]. For lower teeth extractions, wrist should be in flexion position along the horizontal axis about 0–45° with the arm and the wrist move between the perpendicular (90°) and straight (180°) [Figure 5].

CONCLUSION

In the present study, the combined use of arm and wrist force had better outcomes when compared to the use of arm force alone for a successful extraction with minimal complications. The limitation of the study was that only maxillary molars were involved for extraction on a small sample. Further research on all other teeth extractions on a large sample is needed to substantiate the results of the present study. The authors also suggest to impart the importance of the above-mentioned technique in the teaching program for the undergraduate and postgraduate students.

Financial support and sponsorship

Nil.

Conflicts of interest

There are no conflicts of interest.

REFERENCES

1. Atkinson HF. Some early dental extraction instruments including the pelican, bird or axe? *Aust Dent J* 2002;47:2.
2. Caplanis N, Lozada JL, Kan JY. Extraction defect assessment, classification, and management. *J Calif Dent Assoc* 2005;33:853-63.
3. 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:ZC41-5.
4. Cicciù M, Bramanti E, Signorino F, Cicciù A, Sortino F. Experimental study on strength evaluation applied for teeth extraction: An *in vivo* study. *Open Dent J* 2013;7:20-6.
5. Choi YH, Bae JH, Kim YK. Atraumatic safe extraction for intentional replantation. *J Korean Acad Cons Dent* 2011;36:211-8.
6. Patil SS, Rakhewar PS, Doiphode SS. Strategic extraction: An unexampled epitome altering our profession. *J Dent Implants* 2012;2:121-6.
7. Weiss A, Stern A, Dym H. Technological advances in extraction techniques and outpatient oral surgery. *Dent Clin North Am* 2011;55:501-13.
8. Stübinger S, Kuttenger J, Filippi A, Sader R, Zeilhofer HF. Intraoral piezosurgery: Preliminary results of a new technique. *J Oral Maxillofac Surg* 2005;63:1283-7.
9. Stubinger S1, von Rechenberg VB, Zeilhofer HF, Sader R, Landes C. Er: YAG laserosteotomy for removal of impacted teeth: Clinical comparison of two techniques. *Lasers Surg Med* 2007;39:583-8.
10. Misch CE, Perez HM. Atraumatic extractions: A biomechanical rationale. *Dent Today* 2008;27:98, 100-1.
11. Muska E, Walter C, Knight A, Taneja P, Bulsara Y, Hahn M, *et al.* Atraumatic vertical tooth extraction: A proof of principle clinical study of a novel system. *Oral Surg Oral Med Oral Pathol Oral Radiol* 2013;116:e303-10.
12. Kosinski T. Use of innovative physics forceps for extractions in preparation for dental implants. *Implant News Views* 2012;14:1-2.