

Comparative Assessment of Surgical Outcome Using Reduction Gear Handpiece and Conventional Handpiece While Removal of Impacted Mandibular Third Molars: A Prospective Study

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Abstract

Background: To find out the operating time and to investigate post-operative sequelae following impacted mandibular third molar surgery after using reduction gear and conventional handpiece for the osteotomy.

Materials and Methods: The study was conducted on 15 bilaterally symmetrical mandibular impacted third molars patients; one side of tooth was removed with reduction gear handpiece and another side with conventional handpiece with an average interval time of 3-4 weeks. Measurement of facial swelling, maximal interincisal distance was made preoperatively and on the 1st, 3rd, 5th, 8th, and 15th post-operative days. Pain was evaluated from patients response to numerical rating scale and operating time was also recorded in both groups.

Results: Reduction gear treated group showed a significant reduction in pain, swelling and trismus as compared with the control group at all intervals. There was statistically significant reduction in operating time in reduction gear handpiece treated group when compared to conventional handpiece treated group.

Conclusion: Reduction gear handpiece is an effective therapeutic tool for reducing operating time, and post-operative sequelae following surgical removal of impacted third molars. Moreover, further clinical trials with larger sample size should be done to get more affirmative and conclusive results.

Key words: Conventional handpiece, Reduction gear handpiece, Third molar surgery

INTRODUCTION

The chronological age of eruption of third molars is between 18 and 24 years with wide variation in the eruption time. The eruption failure being very common makes the removal of impacted third molars one of the most frequent surgical procedures in the maxillofacial region. Third molars are present in 90% of the population with 33% having at

least one impacted third molar.¹ In most of the situations, it results in recurrent pericoronitis, caries to adjacent tooth, cyst, etc. Removal of mandibular third molars is the eighth most common surgical event recorded in British National Health Service.² It is the most common and challenging surgery performed by the oral and maxillofacial surgeons and they are considered as the masters of it.³⁻⁵

One of the most critical steps in disimpaction is cutting the bone or osteotomy, for which many techniques are used, and if they are used injudiciously, they can be dangerous. However, rotary cutting instruments are potentially injurious because they produce excessively high temperatures during cutting of the bone, which can produce marginal osteonecrosis and impair regeneration

Access this article online	
www.ijss-sn.com	
	Month of Submission : 08-2016 Month of Peer Review : 08-2016 Month of Acceptance : 09-2016 Month of Publishing : 10-2016

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and healing.⁶ Recently, after painstaking research and the application of advanced principles of physics, newer instruments have been introduced to reduce the difficulty and morbidity in third molar surgery. One such innovation is Reduction gear handpiece to make precise and safe osteotomies.

MATERIALS AND METHODS

The study was conducted on 30 randomly selected patients who required removal of impacted mandibular third molars, reporting to the Department of Oral and Maxillofacial Surgery, V. S. Dental College and Hospital, Bengaluru.

Patients with bilaterally impacted mandibular third molars who required removal, either for prophylactic reasons or because of pain, participated in this study and had given their consent.

RESULTS

In our study, patients reported lower values of pain on numerical rating scale in Reduction gear treated groups as compared to control group; Facial swelling showed a significant reduction in reduction gear treated groups on 1st and 3rd post-operative day as compared to controls. However, there was no significant difference between reduction gear handpiece treated groups and control group for this parameter on 3rd and 5th post-operative day. All values for facial swelling reached baseline in all the groups by the 8th post-operative day. Patients in the control group consistently had lower maximal interincisal opening on the 1st and 3rd post-operative day as compared with the reduction gear handpiece treated groups. However, there was no statically significant difference among the both groups; the interincisal mouth opening values reached baseline in both groups by the 8th post-operative day. The operating time was consistently lower in reduction gear handpiece treated group than conventional handpiece treated group; this parameter was statically significant (Figures 1-7).

DISCUSSION

The surgical removal of impacted teeth may range from relatively easy to extremely difficult depending on its location, depth, angulations, and the density of the bone. Regardless of the degree of difficulty, success depends primarily on correct preoperative planning, and on the careful execution that comes with extensive training and experience. One of the most critical steps in disimpaction is cutting the bone or osteotomy, for which many techniques

are used, and if they are used injudiciously they can be dangerous. However, rotary cutting instruments are



Figure 1: Pre-operative photographs - Profile pictures. (a) Frontal view. (b) Right lateral view. (c) Left lateral view

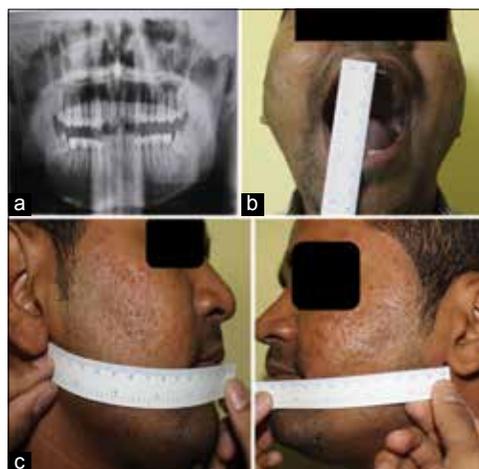


Figure 2: Pre operative photograph. (a) Orthopantomograph. (b) Mouth opening. (c) Swelling measurement

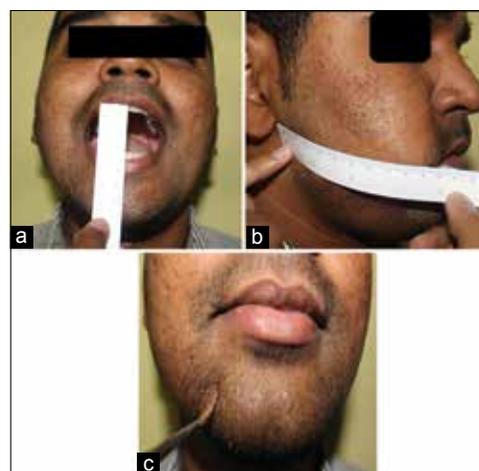


Figure 3: 1st Post-operative day after using conventional handpiece. (a) Mouth opening. (b and c) Swelling brush directional stroke test



Figure 4: 8th post-operative day using conventional handpiece. (a) Mouth opening. (b) Swelling

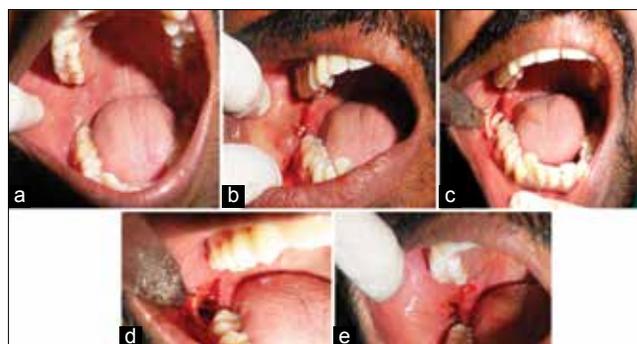


Figure 7: Surgical procedure of mandibular third molar. (a) Impacted tooth. (b) Ward's incision. (c) Mucoperiosteal reflection flap. (d) Gutting and elevation of tooth. (e) Closure with 3-0 mersilk

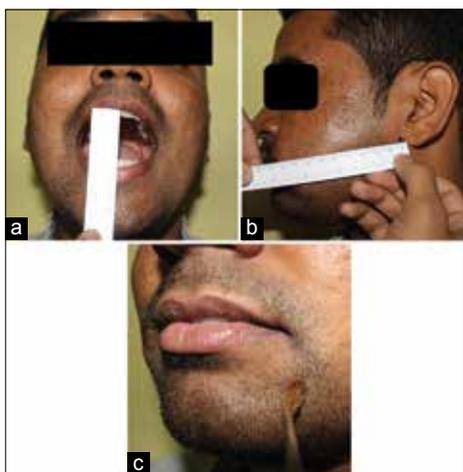


Figure 5: 1st Post-operative day after using reduction gear handpiece. (a) Mouth opening. (b) Swelling. (c) Brush directional stroke test



Figure 6: 8th Post-operative day after using reduction gear handpiece. (a) Mouth opening. (b) Swelling

potentially injurious because they produce excessively high temperatures during cutting of the bone, which can produce marginal osteonecrosis and impair regeneration and healing. Recently, after pains taking research and the application of advanced principles of physics, newer instruments have been introduced to reduce the difficulty and morbidity in third molar surgery.⁷

One such innovation is reduction gear handpiece to make precise and safe osteotomies. These handpieces are most

commonly used in implant surgeries and endodontics. Two important factors to understand reduction gear handpieces are speed and torque. Speed is expressed in revolutions per minute (rpm), whereas torque is expressed in watts and is an indication of the tool's cutting power. Torque is the ability to cut precisely and efficiently through a bone structure. Cutting efficiency is actually a balance between the speed and torque delivered to the bur. Reduction gear handpiece offers smooth, constant torque that does not vary as the bur meets resistance, the bur is connected through gears in the head of the handpiece to a central drive shaft that is physically turned by the motor. Reduction gear motors also offer accuracy by enabling the end user to set precise speeds for procedures, rather than the conventional "feathering" of the rheostat.⁸

In our study, we evaluated and compared five parameters, i.e., Mouth opening, pain, swelling, sensory disturbances with baseline values between two groups on 1st, 3rd, 5th, 8th, and 15th post-operative days and operating time, based on obtained result from statically analysis we can briefly conclude that there was consistently lower decrease in mouth opening in reduction handpiece group than conventional handpiece group on 1st, 3rd and 5th post-operative day, the mean of pain score (NRS), swelling were lower in reduction gear handpiece than conventional handpiece on 1st, 3rd and 5th post-operative days, facial swelling with a tape measure as two reference point from corner of mouth to just below the ear lobe, where most post-operative swelling is concentrated, however, all data were statistically insignificant. There was complete absence of sensory disturbances in both the groups.

The operating time was calculated to find out the efficacy of the operation, and statistical analysis showed that there was a significant difference between the two techniques. The mean duration of operation was longer in the conventional handpiece group than in the reduction gear handpiece group, The operating time was measured in minutes from placement

of incision to placement of last suture; there was consistently less operating time was required in reduction gear handpiece group than the conventional handpiece group; this parameter was statistically significant, so we can conclude that cutting efficiency of reduction gear handpiece was more and less of post-operative sequelae like swelling, pain, trismus were consistently less in reduction gear handpiece group when compared to conventional handpiece group.

Student's *t*-test (two-tailed, independent) has been used to find the significance of study parameters on continuous scale between two groups (Intergroup analysis) on metric parameters. We, therefore, conclude from our study that cutting efficiency, operating time and post-operative outcomes were favorable in reduction gear handpiece group than the conventional handpiece group.

CONCLUSION

The results obtained suggested that reduction gear handpiece was effective in reducing. Post-operative pain, swelling, and trismus following removal of mandibular third molars. However, both reduction gear and conventional handpiece showed no statically significant difference in managing postoperative outcome. Moreover, it was found

that reduction gear handpiece had less operating time, which was statically significant, further clinical trials with larger sample size should be done to get more affirmative and conclusive results.

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How to cite this article: Quadri A, Gopinath AL, Reyazulla MA, Rajkumar GC, Nanjappa M. Comparative Assessment of Surgical Outcome Using Reduction Gear Handpiece and Conventional Handpiece While Removal of Impacted Mandibular Third Molars: A Prospective Study. *Int J Sci Stud* 2016;4(7):120-123.

Source of Support: Nil, **Conflict of Interest:** None declared.