



ORIGINAL ARTICLE

Comparative evaluation of use of reciprocating saw and bur in Le fort I osteotomy for superior repositioning of maxilla: A cross-sectional study



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KEYWORDS

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Abstract *Background:* Traditionally bur has been used to carry out osteotomy. In a developing country like India, the cost of surgical treatment is the important factor in determining treatment plan. Although the use of bur is cost-effective and efficient, with the advent of newer technology, it is getting replaced with a saw.

Aim: To evaluate and compare the use of reciprocating saw and bur in Le Fort I Osteotomy for superior repositioning of the maxilla.

Materials and Methods: Patients referred from the Department of Orthodontics for the surgical correction of vertical maxillary excess (VME). They were divided into two groups. In group I, osteotomy was performed with Synthes Reciprocating Saw and in group II, bur was used. The parameters recorded in both the groups were time required for the completion of down-fracture, precision of the osteotomy cut (margins of the cut), and ease of superior repositioning. Data was collected from both the groups for comparison.

Results: A total of 14 patients with VME were included in the study. They were divided into two groups. Seven study participants were allotted to each group. In group I, Synthes Reciprocating Saw was used while in group II, a bur was used to carry out the osteotomy cut. In group I, the average time required to complete the down-fracture of the maxilla was 3.5–4 min while in group II it

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was more than 8 min. The margins of the osteotomy cut were smooth and regular and there was bone-to-bone contact during superior repositioning in Group I.

Conclusion: The combination of the use of a saw for inferior osteotomy and a bur for the superior cut would be more beneficial in the superior repositioning of the maxilla.

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1. Introduction

Le fort I Osteotomy is a versatile surgical procedure used for the correction of dentofacial deformities (Spinelli et al., 2014). It is indicated for maxillary advancement and superior repositioning of the maxilla. Traditionally burs /drills have been used to perform osteotomy (Bertossi et al., 2013; Landes et al., 2008; Manikandhan et al., 2011).

Various types of equipment are available to carry out osteotomy ranging from rotating instruments like burs, saws. The use of saw is found to reduce surgical time which results in better patient compliance and decreased cost of the surgery (Bertossi et al., 2013).

Recently, piezoelectric devices have been widely used for osteotomy (Datarkar et al., 2021). In a developing country like India, the cost of surgical treatment is the important factor in determining treatment plan. The use of bur is cost-effective and efficient.

Most of the institutions in India are still using bur for osteotomy. There are some disadvantages in using bur, for example the incidence of breakage of bur, necrosis of bone caused by increased heat produced during osteotomy, and injury to vital structures (Troedhan et al., 2017; Rashad et al., 2015). With the advent of the use of newer technology, the use of bur is getting replaced with a saw. This study aims to compare the use of a reciprocating saw and bur in Le fort I Osteotomy for superior repositioning of the maxilla.

2. Materials and Methods

2.1. Study design

A clinical study was carried out in the Department of Oral and Maxillofacial Surgery, at a Dr. D.Y Patil Dental College and Hospital Pune from January 2021 to June 2022. The study was approved by the Institutional Ethical Review Board Committee. Patients with a vertical maxillary excess (VME) who require orthognathic surgery were included in the study. The surgical procedure was explained to the study participants. Patients with an active growth phase, and not willing to participate were excluded from the study. Informed written valid consent was obtained from the patients.

The sample size calculated was 14. Patients were divided into two groups i.e. Group I and II. They were allocated to each group alternatively. Each group consisted of seven patients. In group I, osteotomy was performed with Synthes Reciprocating Saw at a speed of 60,000 revolutions per minute (RPM). In group II, osteotomy was performed with SS White Straight Fissure Bur No. 702 using a micromotor at 40,000 RPM.

2.2. Synthes Reciprocating saw

The equipment used in the study was Synthes Reciprocating Saw with an Electric Pen Drive. Electric Pen Drive is a very compact drive and has specific attachments for a wide range of applications. It is lightweight, provided with a handpiece and foot switch. It has a hand switch for the convenience of the operator. Saw blade is trapezoidal and its dimensions are 27 mm usable length, 6.4/2.9 mm height, and 0.6 mm width.

2.3. Surgical procedure

- The surgical procedure was carried out under general anesthesia with endotracheal intubation. A K wire or drill bit of 1.5 mm was inserted into the frontonasal suture and the distance between the upper incisal edge and the frontonasal suture was measured preoperatively. From clinical and cephalometric analysis, the amount of superior repositioning of the maxilla was calculated.
- The mucosal incision was taken from the right first molar to the left molar crossing the midline.

A mucoperiosteal flap was reflected to expose the maxilla. An osteotomy cut was marked 3–4 mm above the apices of the canine.

- The osteotomy cut was made with either bur or saw at the base of the pyriform rim 4–5 mm above the root apices of the teeth. The osteotomy cut extended from the lateral wall of the pyriform rim posteriorly across the canine fossa above the tuberosity towards the infratemporal surface of the maxilla. The lateral nasal wall was separated with the corresponding nasal osteotome. The nasal septum was detached with a nasal septal osteotome. A similar osteotomy cut was made on the opposite side with either a bur or saw (Fig. 1 and Fig. 2). A pterygoid chisel was used to perform Pterygoid-disjunction on both sides. The Smith's spreader was inserted into the osteotomy site and down-fracture of the maxilla was achieved. The complete mobilization of the maxilla was achieved with finger pressure. Superior repositioning of the maxilla was done by removing the posterior bony interferences with rongeur forcep and fixed with mini plates bilaterally.

2.4. Parameters assessed

1. Time – Time required from the start of the osteotomy cut till the completion of down-fracture was recorded in both the groups and it was then calculated in minutes.

2. Precision of osteotomy cut (margins of the cut) – It was evaluated by a single operating surgeon experienced in orthognathic surgery. Margins of the osteotomy were described as smooth and regular or ragged.
3. Ease of superior repositioning – It was evaluated by a single operating surgeon during surgery. During superior repositioning of the maxilla, there should be a bone-to-bone contact without any gaps. Any difficulty or obstacle in the repositioning of the maxilla was noted.

3. Results

A total of 14 patients were included in the study. Participants were enrolled in each group alternatively. Each group consisted of seven participants. In group I, the age of the patient ranged from 22 to 29 years and the mean age was 25 years (Table 1). In group II, the age of the patient ranged from 25 to 32 years and the mean age was 28.28 years. In group I, out of seven patients three were male and four were female. In group II, out of seven patients two were male and five were female (Table 1).

In group I, time required for the down-fracture of the maxilla was less than 5 min as compared to group II (Table 2).

The margins of the osteotomy cut were fine, regular, and smooth in group I (Fig. 1), while the margins of osteotomy were irregular and ragged in all patients from group II (Fig. 2).

Superior repositioning of the maxilla was found to be easy and bone-to-bone contact was achieved after superior repositioning of the maxilla in Group I compared to Group II (Fig. 3).

4. Discussion

In our study, use of a reciprocating saw was found to be beneficial compared to bur in Le fort I Osteotomy for superior repositioning of the maxilla.

Synthes Reciprocating Saw was used to carry out the osteotomy. In developing countries like India, bur is still being used to carry out osteotomy. There are very few studies available in the literature which compare the use of bur and saw in

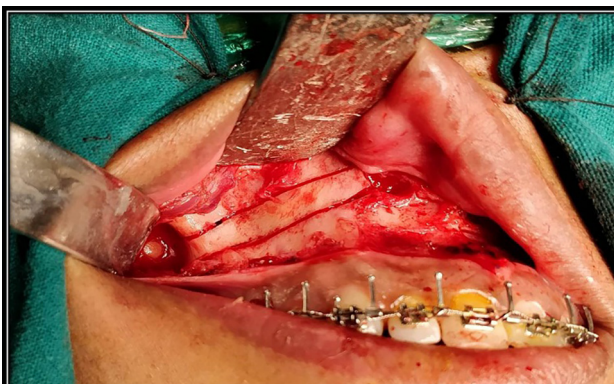


Fig. 1 Showing right osteotomy cut performed with Synthes Saw, margins of the osteotomy were fine and regular compared to bur.

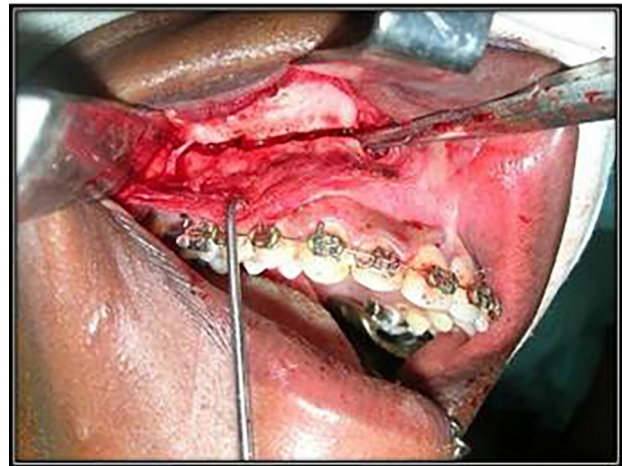


Fig. 2 Osteotomy cut performed with bur.

orthognathic surgery (Bertossi et al., 2013; Datarkar et al., 2021; Rashad et al., 2015).

There were various complications reported in the literature when bur was used for osteotomy (Jedrzejewski et al, 2015; Kim and Park, 2007). The common complications were necrosis of the bone and breakage of the bur.

The breakage of bur during osteotomy and its effect have been reported in the literature. The reuse of bur and repeated sterilization cycles were the reasons for the breakage of the bur (Manikandhan et al., 2011). They proposed a protocol for the removal of broken bur during orthognathic surgery. It is always recommended to use a new bur.

Heat is generated when bur is used. If irrigation is not directed towards bone cutting, necrosis of bone may occur and it may delay postoperative wound healing and recovery time.

In our study, the time required to perform osteotomy with a saw was less compared to bur.

A comparative clinical study was carried out with the use of bur and saw for bilateral sagittal split osteotomy of the mandible (Datarkar et al., 2021). They found that the ease of handling of the bur was good compared to saw. The duration required for completion of osteotomy using bur was less compared to saw. The findings of this study were in contrast to our study. It may be because of the use of different makes of the saw. They used Stryker Saw for osteotomy. They carried out osteotomy in the mandible.

In our study, Synthes Reciprocating Saw was used and it took less than 5 min to carry out down-fracture of the maxilla compared to bur (Table 2). The osteotomy cut performed with

Table 1 Clinical Demographic of Patients.

	Group 1	Group 2
No of patients	7	7
Age in Years	22–29 yrs	25–32 yrs
male	4	5
Female	3	2
Diagnosis	Vertical Maxillary excess	Vertical Maxillary excess
Total number of patients	14	

Table 2 Time required from the osteotomy cut to the down-fracture of the maxilla.

	Group 1	Group 2
Case 1	4	9.5
Case 2	5	8.5
Case 3	4	8.5
Case 4	3.5	9
Case 5	4	8
Case 6	5	9.5
Case 7	4	8
Mean	4.12	8.71

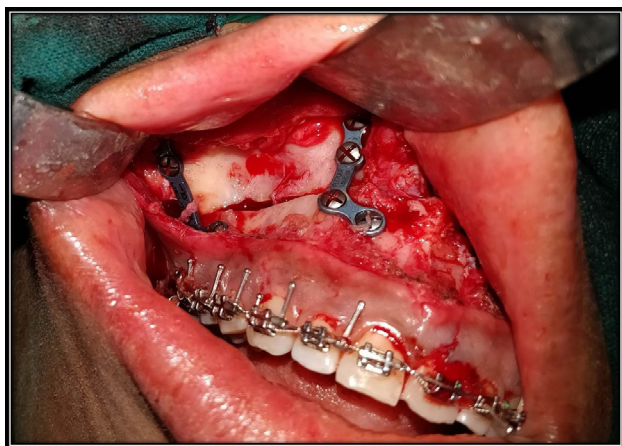


Fig. 3 Superior repositioning of the maxilla was easier and bone to bone contact was achieved after fixation.

the saw was fine and smooth, and was faster (Fig. 1). There was a better bone-to-bone contact (Fig. 3). There was no loss of bone and hence, there was decreased bone reaction and less postoperative edema. There is a learning curve associated with the use of saw. The operator needs to adjust the initial speed while performing the osteotomy cut. Synthes Electric Pen Drive was found to be very easy to use as it is lightweight and provided with a hand and foot switch. With the hand switch, it is easier for the surgeon to stop or start the motor while being used. It has specific attachments for a wide range of applications and it has an ergonomic handpiece with a powerful motor. The blade is Trapezoidal and its dimensions are 27 mm usable length, 6.4/2.9 mm height-, and 0.6-mm width, which permit to carry out a very fine osteotomy cut without removing much of the bone.

5. Conclusion

From our study, we conclude that the use of a reciprocating saw is found to be more advantageous in maxillary osteotomy procedures. For traditional Le fort I Osteotomy for advancement, the use of a saw would be a better option while a combination of both i.e. use of a saw for inferior osteotomy and bur for the superior cut would be more beneficial in the superior repositioning of the maxilla.

Ethical approval

This study was performed in line with the principles of the Declaration of Helsinki. An approval was granted by the Institutional Ethics Committee.

7. Authors' contributions

All authors have accepted responsibility for the entire content of this manuscript and approved its submission.

CRedit authorship contribution statement

Shilpa S. Bawane: Methodology, Writing – original draft, Data curation, Formal analysis, Investigation, Supervision. **Pushkar P. Wankar:** Conceptualization, Data curation, Supervision, Writing – review & editing. **Prathamesh V. Bhujbal:** Investigation, Visualization.

Declaration of Competing Interest

The authors declare that they have no known competing financial interests related to the study and study was not supported by any company or agency or financial institution.

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