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Piezosurgery in Bilateral split sagittal ramus Osteotomy: A Case Report

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Abstract
This case report aims to depict the use of piezosurgery in orthognathic surgeries, especially that of BSSRO reduction. In this case a piezoelectric device was used instead of the conventional saw blade technique for the mandibular split in an Angle's class III malocclusion. The Peizosurgery device proved to be just as effective in achieving the mandibular split.

Introduction
Bilateral split sagittal ramus Osteotomy is the most commonly used technique in mandibular orthognathic procedures. [1,2] Every procedure has potential complications, which include unfavorable fracture of the mandible, neurovascular bundle damage and bleeding when it comes to BSSRO. Mandibular osteotomy can be performed by a vertical cut in the bone on the inside of the ramus, or via a modified osteotomy could be opted for by drilling between the incisura along the anterior border of the mandibular ramus. Sagittal splitting is performed along the inside of the outer cortical bone along the body of the ramus. Final split of the mandible is achieved by using a separator.
A piezoelectric device is an ultrasonic device used for bone cutting with bone selectivity which causes a decrease in the potential damage to soft tissues. The heat generated by a piezoelectric device is considerably lesser than the heat generated by burs and saw blades which eventually end up causing damage to the adjacent soft tissue structures [3]. With the increasing advantages of a piezoelectric device and the advancement in the recourses, the aim became to establish an ideal BSSRO split using a piezoelectric device.
Case Report

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A 37-year-Old Female patient presented herself at our OPD with a chief complaint of advanced mandible. On Lateral cephalogram tracing, it was established that there was indeed a mandibular prognathism noted. A 6mm set back was calculated. A reverse jet of 4mm was established on measuring clinically as well. Considering a 2mm overjet, the clinical set back using a splint was also kept at a 6mm setback. BSSRO split of the mandible and repositioning with a setback was planned for after evaluating clinical pre operative pictures (Figure 1) and lateral cephalogram planning. Standard protocol for local anesthesia and vasoconstriction and incision was followed (Figure 2). A piezoelectric device is used for the sagittal osteotomy bilaterally Figure 3).

The piezoelectric device was loaded with 0.9% NS that is used as irrigation with conventional saw handpieces as well for heat dissipation(Figure 11). An angular cutting edge was used for the Ramal portion where as a straight cutting-edge component was used for the inferior border of the mandible for better access(Figure 12). Final split of the mandible was achieved with the application of the Smith Spreader (Figure 4).

The time taken (38 minutes 58 seconds) and blood loss noted (170ml) were recorded. Mandibular segment was set back with the help of occlusal splints and the excess mandibular bone was removed to prevent bony overlap (Figure 5). The fractured segment is repositioned and plated into the predicted position (Figure 6) and closure was done with 3-0 Vicryl (Figure 7).

Figure 1: Pre operative facial profile

Figure 2: Incision Marking

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Figure 3: Osteotomy with Piezoelectric device

Figure 4: Osteotomy completed

Figure 5: Predicted occlusion obtained by Locking with splint; excess bone marked

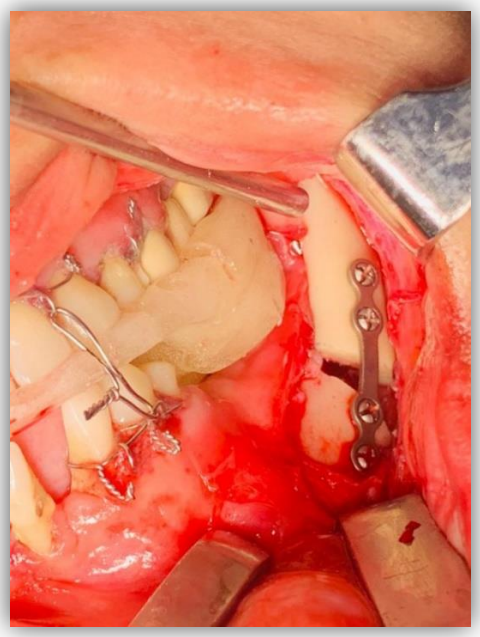

Figure 6: Excess bone removed and fixation done with miniplates and screws

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Figure 7: Suturing done with 3-0 Vicryl

Figure 8: Post operative facial profile (1 month)

Figure 9: Post Operative Lateral Cephalogram

Figure 10: Post Operative OPG (1 month)

ISSN: 0975-3583, 0976-2833 VOL12, ISSUE03, 2021

Figure 11: Piezoelectric device

Figure 12: Piezoelectric attachments

Pressure dressing was kept over the initial 48 hours for the decrease in swelling and patient was kept on a tapering dosage of corticosteroids for inflammation. Post operative signs and symptoms for any sort of nerve paresthesia was recorded till the patient was admitted and on 1 week, 1 month and 3 month follow up.

Edema was negligible after POD 6 and no signs of parasthesia was observed. The predicted set back was achieved and a more natural facial profile was provided and recorded on regular follow (Figure 8) up which was confirmed with post operative radiographs (Figure 9,10)

Discussion

The initial splitting of the mandibular bone that is involving the cortical and cancellous bone is done on the lateral cortex below the height of the mandibular canal to avoid injury to the Inferior alveolar nerve. This conventionally was achieved with the use of chisel and mallets, but with the advancement of technology, a piezoelectric device provides micro vibrations that permit selective cutting of the bone without much of damage to soft tissue structures resulting also in a relatively bloodless field [4]. This becomes the main basis of reduced rates of parasthesia, as suggested by Brockmeyer et al, noted in piezoelectric driven devices for BSSRO surgeries resulting in a lesser recovery time noted in these patients post operatively [5].

Orthognathic surgery of the mandible has always been rated difficult and chances of damage to the IAN is considered high [6,7]. Nerve damage can be caused by direct nerve injury, Oedema or even compression of the nerve on fixation. By using piezoelectric devices, the ultrasonic vibrations are known to cut only bone, and stop once in contact in with any non-mineralized tissue thus causing minimal damage by direct nerve injury [8].

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We also noted a decrease in the post operative swellings as suggested by Pagotto et al, who stated that one week after the surgery, the swelling was still present in only 16.6% of the patients as compared to 66.6% using conventional methods.[9]

The noted draw back of piezoelectric devices are the learning curve associated with it. The cutting direction of the piezo blade only unidirectional where the handpiece must move in the direction of the operator. It is also noted that excessive pressure applied on the tip of the piezoelectric device leads to decreased cutting precision due to hampering of the vibrations by the cutting edge. [10,11]

Pain is a part of any surgery that the patient undergoes and is something that most Surgeons anticipate and administer analgesics accordingly. With the use of Piezoelectric, it is noted that most patients have noted lesser pain and require lesser administration of analgesics. [12,13]

With every bourn, there is always a bane though, Piezoelectric devices are not readily available for use in developing countries such as ours and in the places that they are available, it is often an expensive solution and have a learning curve. Having said that, the future of orthognathic surgery lies in tantum with piezoelectric devices due to their innumerable advantages and there is an undeniable piezosurgery revolution in the near future.

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