Use of Reciprocating Saw for Alveolar Ridge Reduction in the Anterior Mandible for Immediate Load Implant-Supported Hybrid Dentures

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Purpose: Alveolar ridge reduction, which is needed to create sufficient room for abutments, metal framework, and acrylic teeth, and a flat bone platform using commonly used burs is a time-consuming procedure and may cause discomfort to the patient. The aim of this study was to describe an alternative technique to fabricate a mandibular hybrid denture in 4 days without making any final impression and to describe the use of a reciprocating saw for alveolar ridge reduction.

Patients and Methods: Ten patients aged 45 to 75 years were considered for this study. Each patient received 5 implants for the reconstruction of the edentulous mandible after alveolar ridge reduction using a reciprocating saw or burs after the extraction of infected teeth. These implants were placed in the anterior region of the edentulous mandible and restored with final mandibular hybrid prosthesis in 4 days using the Ohio State University acrylic frame requiring no final impression procedure.

Results: No implants were lost, no technical complications were observed, and only minor marginal bone loss was noted after a year. The overall alveolar ridge reduction using a reciprocating saw after extraction of teeth took fewer than 2 minutes in the 5 patients, whereas a similar reduction took 34 ± 12 minutes (20 to 50) with commonly used burs (round, fissure, or acrylic) in the other 5 patients.

Conclusion: This study indicates that use of a reciprocating saw is a rapid and efficient method for alveolar ridge reduction in the anterior mandible, and the Ohio State University acrylic frame may be an alternative method to restore any edentulous mandible with an immediate-load mandibular hybrid denture.

The consistently high success rates of the original treatment concept and continuous improvements in implant materials, designs, and surface treatment techniques have led dental practitioners to decrease total treatment time, with modified surgical, prostodontic, and dental laboratory protocols. Early or immediate loading protocol has recently become popular in implant dentistry, especially in the anterior mandible, where bone quality is high.

For patients with an immediate load implant-supported hybrid denture, proper (flat and even) alveolar ridge reduction to create sufficient room for abutments, metal framework, and acrylic material and teeth is one of the most time-consuming procedures during surgery, especially for patients with infected teeth to be extracted in the anterior mandible and/or minimum alveolar bone resorption. It takes a long time to use a bur (ie, round, fissure, acrylic) in this process. Moreover, because the bur is highly likely to touch soft tissue around the bottom, greater caution must be used. In addition, the bur itself becomes worn, blunt, and as a result, inefficient. Furthermore, it is more difficult to cut the alveolar ridge evenly for a flat bony base using a bur, which makes implant leveling and fabrication of the metal framework more complicated. A long alveolar reduction procedure also causes some pain and discomfort as the effect of local anesthesia dissolves over time, and administration of an additional amount of local anesthesia is
generally needed to complete surgical procedures including extraction of teeth, implant placement, and suturing of soft tissue.

The reciprocating saw has been used by plastic and oral and maxillofacial surgeons for mandibular angle reduction, mandibular sagittal osteotomy, a lateral bone window for sinus-lifting procedures, and distraction osteogenesis. A reciprocating saw is a type of saw in which the cutting action is achieved through a push-and-pull (back-and-forth) reciprocating motion of the blade. The reciprocating saw cuts the bone in a very short time and provides a clean flat surface for implant placement. No bony particles spread around, and no bony smear layer occurs on the soft tissue. In this study, the harvested piece of bone was ground and mixed with a bone grafting material and then used for a simultaneous sinus-lifting procedure.

This report describes the use of a reciprocating saw for alveolar ridge reduction in the anterior mandible immediately after the extraction of infected teeth to create a flat platform of the bone for the implants supporting an immediate-load implant-supported hybrid denture.

Patients and Methods

Ten consecutive patients with edentulous mandibles or mandibles with infected teeth (Fig 1) were treated with an immediate-load mandibular hybrid denture using the Ohio State University acrylic frame developed in the Implant Clinic, Department of Restorative and Prosthetic Dentistry, Ohio State University, in 2007 and 2008. Fifty implants (40 TSV implants, 3.7 × 15 mm or 3.7 × 13 mm, Zimmer Dental, Carlsbad, CA; 10 Replace implants, 4.3 × 15 mm or 4.3 × 13 mm, Nobel Biocare, Yorba Linda, CA) were placed in the anterior mandibles, and each patient received 5 implants according to the surgical and prosthetic protocols described below. Inclusion criteria for selection included having a completely edentulous mandible or mandible with infected teeth, sufficient bone volume to receive standard implants (≥13 mm long and 3.7 mm in diameter), and opposing edentulous maxilla. Exclusion criteria included systemic disease (uncontrolled diabetes, blood disorders, or mucosal pathology), history of chemotherapy or radiation therapy, and inadequate residual bone for implant placement (≥13 mm long and 3.7 mm in diameter). The patients’ common chief complaints considered were poor retention and frequent sore spots with their mandibular complete dentures or having infected teeth.

Surgical Procedures

All patients provided written informed consent before implant placement. The mental foramen were located after flap elevation. The alveolar ridge was marked and reduced vertically to obtain 15 mm of interocclusal distance using a reciprocating saw (reciprocating saw and Osteopower 2i, OsteoMed, Addison, TX) in 5 patients (Figs 2A,B) or commonly used burs (round, fissure, or acrylic) in the other 5 patients, which is needed to create sufficient room for the abutments, metal framework, and acrylic teeth, and a flat bone platform was established. Implants were placed using a torque controller (Fig 3). The final
insertion torque values recorded during implant placement in this study were 40, 45, and 50 N-cm. The standard abutments (TAC3, Zimmer Dental; or multiunit, Nobel Biocare) were tightened on top of the implants using a manual torque wrench (30 N-cm) and the mucosa was sutured. The harvested piece of bone was then ground and mixed with a bone grafting material and used for a simultaneous sinus-lifting procedure in the 5 patients. Because the alveolar bone was harvested in 1 piece, no bone tissue was lost for grafting purposes. It is very difficult to save all bone tissue for sinus lifting because the burs result in small bone particles in the surgical area and a smear layer on the soft tissue. This smear layer also needs to be cleaned before suturing, which requires extra time.

PROSTHETIC PROCEDURES

Day 1
The patients were sent to the implant clinic for restorative procedures immediately after implant placement. Autopolymerizing acrylic resin (Dura Lay; Reliance Dental Manufacturing Co, Worth, IL) was used to connect the waxing sleeves to the Ohio State University frame (Fig 4). The waxing sleeves and Ohio State University frame were removed from the implants as a single unit after the acrylic resin was set. The cast was poured, and the resin pattern was cast into metal.

Day 2
After the passive fit of the metal framework was confirmed, wax occlusion rims were attached to the metal frame and maxillary base plate, and final maxillomandibular jaw relation was recorded. After tooth arrangement was accomplished, esthetics, phonetics, and occlusion were checked.

Day 3
The laboratory processed the acrylic for final delivery of both dentures.

Day 4
A final immediate-load mandibular hybrid denture and a maxillary complete denture were adjusted and delivered (Figs 5, 6). A soft diet was recommended to the patient, and normal surgical and denture follow-up appointments were made.

The patients were recalled 2 weeks, 3 months, 6 months, and 12 months after implant placement. Implant success was based on the following criteria proposed by Albrektsson and Zarb: absence of mobility, painful symptoms, periapical radiolucencies, and less than 1 mm of marginal bone resorption after a 1-year period.

Results
The overall alveolar ridge reduction using a reciprocating saw after the extraction of infected teeth
took fewer than 2 minutes in the 5 patients, whereas a similar reduction took 34 ± 12 minutes (20 to 50) with conventional burs (round, fissure, or acrylic) in the other 5 patients. The same level of the implants was easily achieved with the reciprocating saw compared with the burs.

No implants were lost. All implants were stable and did not show more than 1 mm of bone loss after a year, which was determined by panoramic radiographs using magnification (×10). Marginal bone changes were measured in a computer using image analysis software with the implant–abutment junction as a reference. Thus, all implants were considered successful.

Discussion

The reciprocating saw was used for mandibular angle reduction by Jin and Kim.5 They used a reciprocating saw to pass through the outer cortex on the occlusal plane in the mandibular angle, then inferiorly and caudally, adhering to the cortex. At the level of the first molar, the saw moved toward the outside. When parts that were not reached by the saw were cut with a chisel, the L-shaped outer cortex was separated. This process took approximately 5 minutes. They stated that this procedure would take a great deal of time with a bur, and it is more difficult to cut the surface evenly using a bur. Laster et al9 performed distraction osteogenesis for correction of horizontal alveolar width deficiency for 9 patients using an alveolar crest-widening device. Under local anesthesia, a blind crestal osteotomy was carried out with minimal periosteal reflection. Bone cuts were made through the trough and through the anterior and posterior vertical incisions without stripping the mucoperiosteum using a sagittal microsaw, reciprocating scalpel saw, or piezoelectric ultrasonic bone cutter without any complications in a short time. Distraction osteogenesis occurred in all 9 patients and increased alveolar width from 4 to 6 mm. They noted that 20 of 21 implants were successfully osteointegrated, and they observed no marginal bone resorption after a year.

In conclusion, the results of this study show that the use of a reciprocating saw may be a rapid and efficient method for the alveolar ridge reduction in the anterior mandible compared with the commonly used burs, and an immediate-load implant-supported hybrid denture may be a viable option to restore the edentulous mandible. It should be kept in mind that the reciprocating saw needs to be used by experienced surgeons.

References

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