# Alveolar Width Distraction Osteogenesis for Early Implant Placement

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Distraction osteogenesis for correction of horizontal alveolar width deficiency was performed for 9 patients by using an alveolar crest widening device. Four prototypes were used during the course of the study until a final protocol was achieved. Under local anesthesia, a blind crestal osteotomy was carried out with minimal periosteal reflection. The horizontal distraction device was placed percutaneously. Distraction proceeded from the seventh postoperative day at a rate of 0.4 mm/day for 14 to 18 days. Seven to 10 days later, dental implants were placed. Distraction osteogenesis occurred in all 9 patients and increased alveolar width from 4 to 6 mm. Twenty implants successfully osteointegrated of 21 placed. Marginal bone resorption was not observed after 12 months' follow-up. The advantages of horizontal distraction over block grafting include simultaneous expansion of soft tissue, high degree of dimensional stability, abbreviated overall treatment time, and no graft requirement.

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The indications for alveolar ridge augmentation are acquired or congenital alveolar defects. Acquired alveolar bone loss may be caused by post-extraction defects, traumatic avulsion, periodontal disease, and/or prolonged denture wear with subsequent disuse atrophy. In most of these cases the most significant loss is in the horizontal dimension. Traumatic tooth avulsion with loss of the buccal bone plate is a typical example of a situation leading to a horizontal defect.[1]

Modalities to augment horizontal bone defects include autogenous onlay bone graft,[2,3] guided bone regeneration,[4,5] alloplastic augmentation,[4,5] and alveolar split grafting.[1] Each of these modalities has its advantages and disadvantages. Use of an autogenous bone graft has donor site morbidity[6] and graft resorption is expected.[7] While guided bone regeneration has been extensively documented,[4,5] it is often difficult to provide optimal space for the regeneration of the desired bone volume and is therefore better suited for limited defects. Alloplastic materials[4,5] used in quantity are not reliable for implant osseointegration.

Alveolar widening by distraction osteogenesis (DO) is an alternative method for reconstructing alveolar atrophy[8-11] that is similar to alveolar split grafting but without the graft. The combination of vertical DO and osseointegration has produced a stable esthetic reconstruction of the alveolar bone and attached mucosa,[12] but the use of distraction to gain alveolar width, first reported by Aparicio and Jensen,[13] has not been fully established clinically.[14]

Block et al[15,16] confirmed isotropic augmentation by DO for alveolar bone in animal studies. But, clinical studies[17,18] have only established efficacy of alveolar distraction in the vertical dimension because there are few reports on the use of DO to gain width for dental implants.[13,14,19-22] The purpose of this clinical study was to establish, in a consecutive series of horizontal alveolar distractions using the Laster Crest Widener (Surgetek Inc, Brussels, Belgium), that dental implant restoration could be consistently accomplished to an optimized alveolar width morphology.

## Materials and Methods

During the development of alveolar width distraction, 4 prototype devices were used on 9 patients aged 18 to 52-years-old who presented with moderately deficient alveolar bone in the horizontal dimension.

The Laster Crest Widener consists of 4 sharp arms, 2 on each side connected with guide pins and an activating distraction screw. By rotating the activating

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**FIGURE 1.** A crestal mucoperiosteal incision is made along the desired area for widening, followed by vertical mucoperiosteal incisions anteriorly and posteriorly.

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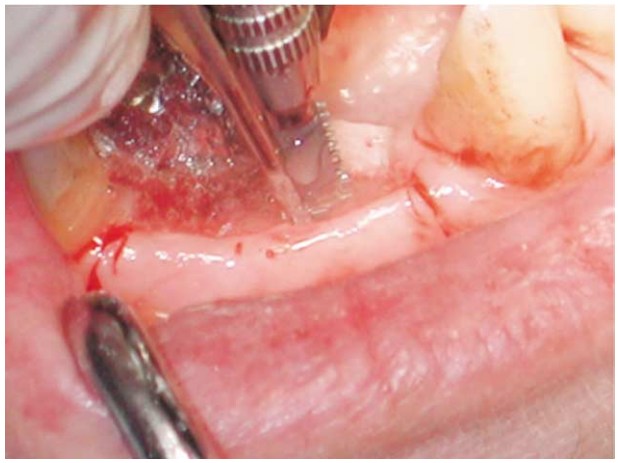

**FIGURE 2.** Bone cuts are made through the trough, and the anterior and posterior vertical incisions *without stripping the mucoperiostium* using a sagittal micro saw, a reciprocating scalpel saw, or piezoelectric bone cutter.

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screw, the pair of arms move apart, thus engaging each side of the osteotomy site to spread it apart.

### SURGICAL TECHNIQUE

Under local anesthesia, a crestal mucoperiosteal incision is made followed by buccal vertical mucoperiosteal incisions placed anterior and posterior to the distraction zone (Fig 1). The crest itself is minimally exposed, otherwise there is no flap reflection. A round burr is used to make a small trough along the crest. Bone cuts are made through the trough, and through the anterior and posterior vertical incisions *without stripping mucoperiostium* using a sagittal micro saw, reciprocating scalpel saw, or piezoelectric ultrasonic bone cutter (Fig 2). An osteotome is introduced crestally and the buccal plate is "green-stick" fractured bucally (Fig 3). The distractor is tapped into place and the wound is approximated with sutures. A provisional prosthesis is then placed (Figs 4, 5). Distraction begins 1 week later by turning the activating screw 2 and 1/2 turns per day (0.4 mm). This is done by the patient at home (Fig 6). After a 7- to 10-day retention period for early bone "consolidation," the distraction device is removed and 1 week later implants are inserted percutaneously. In 1 case (no. 3) the periostium was stripped buccally to make a stop cut in the vestibule before out-fracturing the segment (Fig 7). Pressure or mastication on the distraction site by a temporary denture is avoided during distraction, consolidation, and osseointegration. The exposure of dental implants is performed 3 to 4 months after insertion, and prosthetic rehabilitation completed thereafter (Fig 8). Panoramic and periapical x-rays are taken following distraction, after implant placement, and at 1-year intervals.

## Results

Nine patients underwent horizontal expansion of the alveolar process by DO followed by dental implant placement. The distraction was evident clinically and radiographically. Alveolae increased in width between 4 and 6 mm (Table 1). The attached mucosa at the top of the alveolar crest increased simultaneous to increased bone mass.

No infections resulted from treatment. Of 23 threaded implants placed, 22 implants osseointegrated. The post-distraction follow-up period was from 6 to 24 months. No significant marginal bone resorption was observed after implant placement, except in case no. 3, where reflection of a mucoperios-

**FIGURE 3.** An osteotome is introduced and the buccal plate is "green-stick" fractured bucally.

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