

RESTORATION OF DIVERGENT FREE-STANDING IMPLANTS IN THE MAXILLA

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KEY WORDS

Locator
Stud attachment
Divergent
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Overdenture

Divergent implants in the maxilla can make restoration with removable prosthetics difficult when the implants will not be splinted with a superstructure. Attachments to be used with individual implants require that the implants be within 10° of divergence. This article will address a new angled male designed to fit the locator attachment (female component) that can accommodate up to a 40° divergence.

INTRODUCTION

The maxilla presents challenges to implant placement because of the anatomical shape of the bone. Often the crest sits laterally to the base, necessitating that implant placement be tipped buccally. This is more common in the anterior aspect than in the posterior of some patients because of the flare of the premaxilla. Osseous grafting can provide bone to widen the ridge, but this may not allow vertical implant placement and retention of bony contours. To place the implant vertically would require the apex to be moved laterally while maintaining the platform position. This places the apical half of the implant body outside the contours of the bone. An alternative solution would be to maintain the apical in its position and rotate the platform palatally. This would orient the platform too far palatally to be restorable. Therefore, divergent implants may be placed and restoration with a removable prosthesis may be the treatment desired by the patient.¹⁻³

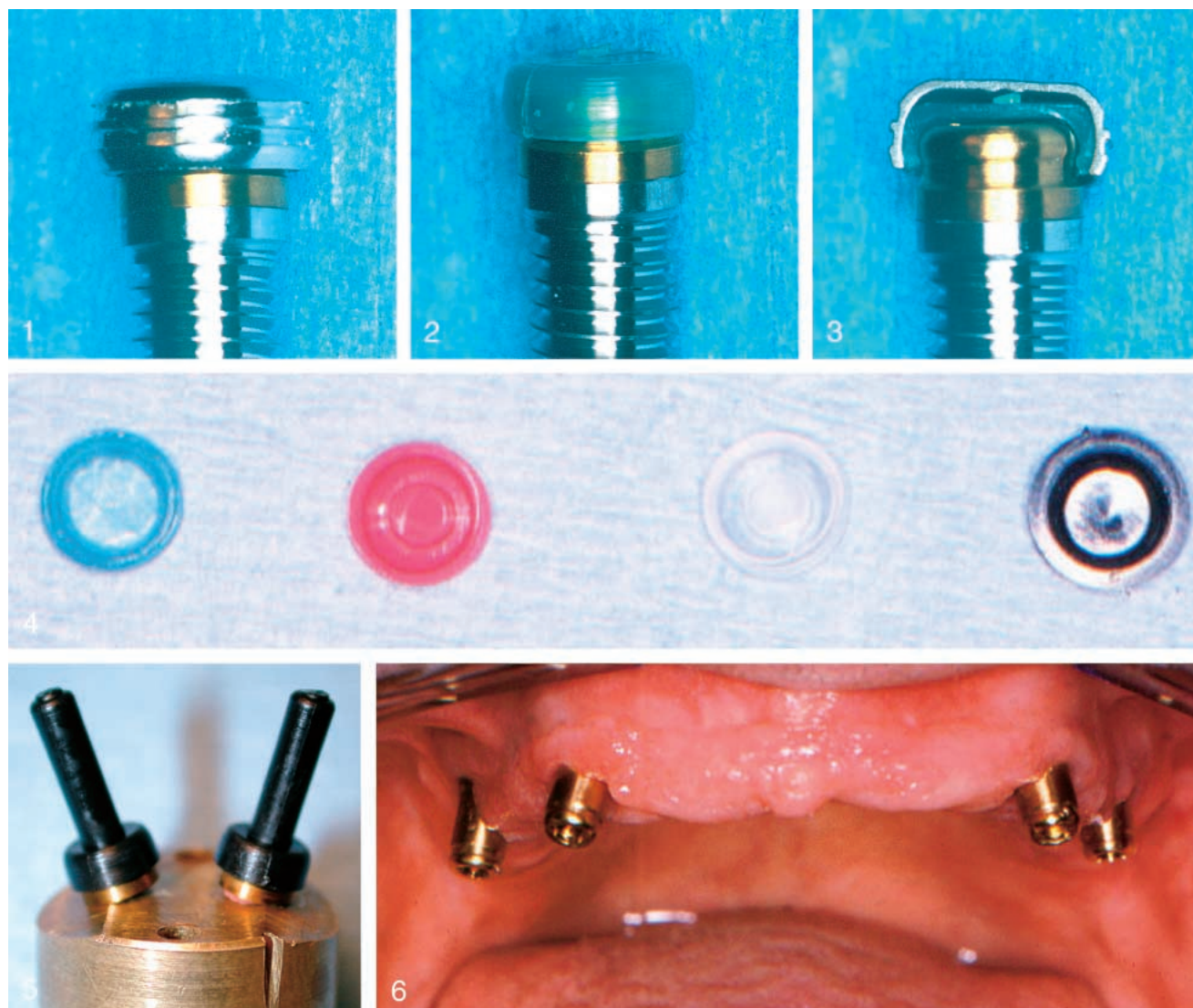
Angulation problems are not as

critical when fixed prosthetics or a superstructure bar is to be used. The attachments can be paralleled in the superstructure bar and a straight path of engagement designed. Attachments placed on nonsplinted individual implants in the past have been restricted to divergences of less than 10° from the long axis of the implant.⁴ Angled abutment heads have been developed by various attachment companies to allow the portion of the attachment within the denture to engage the abutment portion and accommodate greater degrees of divergence. Requiring that the abutment heads be aligned intraorally to develop a straight-line path of insertion and minimize the divergence can be difficult. The Locator attachment (Zest Corp, Escondido, Calif) addresses this problem differently.⁵⁻⁸ The angulation correction is in the male component that lies within the removable prosthesis, and a straight implant abutment is utilized (Figures 1-4).

The standard Locator male (white nylon liner) will permit up to 10° of divergence for a single implant and 20° between implants. The extended-range

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FIGURES 1–6. FIGURE 1. The extended-range male Locator within the metal housing placed on the female component that is affixed to an implant. Note the minimal height above the implant platform. FIGURE 2. The extended-range male Locator upon the female component (without the metal housing) affixed to an implant. FIGURE 3. A cut-away of the attachment demonstrating how the extended-range male engages the female component of the Locator. Space between the plastic component and the metal housing provide resiliency. FIGURE 4. The parts associated with the male Locator component (from left to right; green extended-range male, pink male [4 pounds retention], white male [6 pounds retention], and the metal housing). FIGURE 5. A test model demonstrating the degree of divergence that can be accommodated between 2 Locator attachments. Parallel posts have been placed on the female Locator component to aid in visualization. FIGURE 6. A facial view of the patient's maxillary arch with female Locator components affixed to the implants. Divergence of the implants can be observed.

Locator male (green nylon liner) by contrast can accommodate up to 40° of divergence between implants, as shown on a test model (Figure 5). Both male types allow free-floating movement between the nylon retention liner and its metal housing, creating a resilient attachment connection. Retention with the green male provides 6 pounds of release force when connected to a Locator abutment at 0° and reduces up

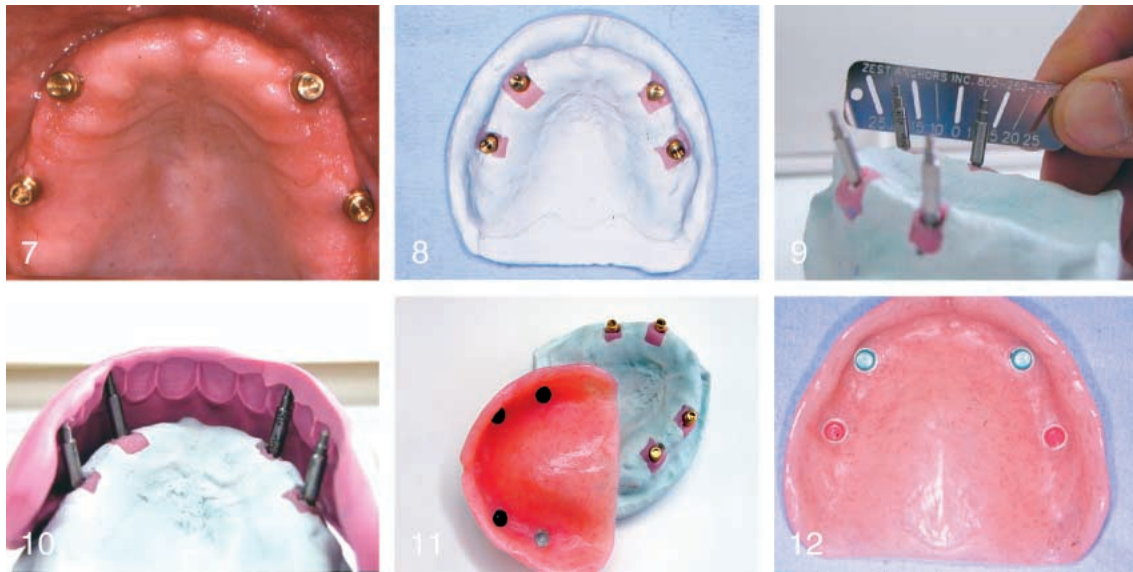
to 4 pounds of force when the angulation of the abutment approaches 20°.

CASE PRESENTATION

A 55-year-old white man presented with implants that had been previously placed bilaterally in the canine and first molar positions (Figures 6 and 7). Evaluation of the implants revealed that they had been placed divergent in relation to each other because of an-

gulation of the maxillary crest. The patient had been wearing a full denture and requested that the implants be activated to improve retention of a complete maxillary denture.

An open tray impression was taken to allow tray removal after setting of the impression material. Analogs were placed on the implants and sent to the lab. A soft-tissue model was fabricated (Figure 8). Long guide pins were



FIGURES 7–12. FIGURE 7. An occlusal view of the maxillary arch with female Locator components affixed to the implants. FIGURE 8. Soft tissue master cast with female Locator analogs placed. FIGURE 9. Guide pins placed within the female Locator analogs to evaluate the divergence. FIGURE 10. The soft tissue model showing the guide pins and buccal polyvinyl stent of the position of the teeth from the wax try-in. FIGURE 11. The tissue surface of the finished denture showing the Locator metal housing with black processing males. The Locator at the lower left has had the processing male removed. FIGURE 12. Final overdenture with anterior green locators and posterior pink (3 pounds) locators.

placed on each implant analog to determine the divergence (Figures 9 and 10).

The Locator extended-range male were selected because of its greater acceptance of divergence between individual implants compared with other commonly used attachments available. The buccal inclination of the implants also influenced the thickness of the teeth and acrylic allowable to maintain an aesthetic result. The Locator's lower height of 3.17 mm (minimum) allowed an increase in the overlaying acrylic.

The female component of the Locator was placed on each implant and a torque wrench was applied. The wax rim returned with 2 Locator attachments placed in the record base was tried and denture records were taken. This permitted establishment of the vertical dimension and occlusion without movement of the wax rim.

The laboratory returned the selected teeth set in wax on the stabilized record base. Occlusion, aesthetics, and phonetics were verified and the denture was returned for processing. Prior to processing, the Locator males were removed from the record base and

placed on the analogs on the master cast to begin final processing. The denture was processed and returned with the Locator males within the acrylic (Figure 11).⁹

The denture was inserted and adjustments were made for pressure areas and occlusion. The black processing males were removed from the metal housing using the hooked end of the Locator instrument and were replaced with angled anterior green male locators (Figure 12). The patient was dismissed and scheduled for a follow-up appointment several days later to evaluate the comfort of the prosthesis.

CONCLUSION

Divergent free-standing implants often pose prosthetic problems. These can be circumvented with bar superstructures, which can align the attachments and create a 0° divergence. Patient finances and desires may prevent utilization of bar superstructures and free-standing implants may be the only option for restoration of the patient's maxilla. The Locator extended-range male attachment can be used, accommodating greater divergence than other

“stud-type” attachments available. The free-floating male and self-aligning guide planes provide ease of insertion with a high degree of retention.

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