Esthetics in Implant Dentistry—A Case Report Using the Astra Tech Zir Abutment in a Maxillary Anterior Single Tooth Reconstruction

a report by
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Private practice

The introduction of zirconium and aluminum oxide abutments has been a major advance for the world of esthetic implant dentistry.[1] When an implant is placed into dental alveolar bone, the abutment serves as the connector from the implant through the gingival mucosa to the crown restoration, directly affecting the esthetic appearance of the tooth and gingival structures. In past years, only metal abutments have been available, limiting the esthetic result of many anterior restorations due to their grayish hue.

The Zir abutment by Astra Tech is made of yttria zirconium, a strong and highly biocompatible material that has optimum optical characteristics over the traditional metal equivalent. Zirconium is rare in nature, but can be synthesized with a small percentage of metal oxide as stabilizer, commonly yttrium. This allows for stable cubic crystal formation of a dense, hard, durable substance that looks like naturally occurring diamond.[2] Zirconium is commonly manufactured for use in orthopedics and now dental healthcare. Yttria-stabilized zirconium abutments are able to withstand the maximum incisor load cited in the literature (90–370N) and double the load an aluminum oxide abutment resisted prior to fracture, in an *in vitro* test.[3]

The prefabricated precision-milled zirconium abutments are available for all Astra Tech implant sizes, including the 3.5mm, 4.0mm, 4.5mm, and 5.0mm. The Conical Seal Design™ Astra Tech implants provide a stable and tight connection with the abutment, while the hexagonal internal interface allows for indexing rotational position between the two components.[4]

Zirconium and aluminum oxide abutments interact well with the periodontium and surrounding oral tissues. With their highly polishable surface, there is no inflammatory response, resulting in a predictable, stable and healthy peri-implant mucosa.[5] In a human *in vivo* model, titanium was tested in comparison to rectified zirconia stabilized with yttrium for bacterial colonization, and it was found that the total number of bacteria and presence of potential putative pathogens was lower on the zirconia materials than on the polished titanium surfaces.[6] Glauser et al. found that experimental zirconia abutments provided stability for implant-supported single tooth reconstructions in anterior and premolar regions for up to four years and the soft tissue reactions were directly comparable with neighboring teeth.[7]

In the esthetic areas of the mouth, the shade of the implant abutment with its optical appearance and reflective characteristics enhances the light transmission properties of the gingiva at the cervical emergence of the restoration. This is particularly important when the gingival is thin and translucent. The abutments also resemble natural tooth structure for an esthetic emergence profile characteristic. Comparatively, metal abutments often produce a grayish gingival appearance

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Figure 1: Valen I

Figure 2: Template Design 0007

Figure 3: Immediate Temp Placed

Figure 4: Final Smile

with reduced luminosity that is especially visible in cases of a high smile line.

Case Presentation

A 19-year-old female presented with a history of endodontic failure of her maxillary right central incisor, subsequent to fracture from athletic injury and endodontic treatment (see *Figure 1*). There was a draining infection (fistulation) in the cervical attached gingival. The tooth was extracted using the closed extraction technique. Socket preservation was performed with platelet-rich plasma and an allogenic particulate bone graft. A removal partial denture with ovate pontic was positioned. The surgical area was allowed to heal for two months, with tissue contact acrylic reline of the pontic area every week.

An Astra Tech 4.5 OsseoSpeed implant was surgically placed using a surgical template guide (see *Figure 2*), and an impression was made with an implant-level impression coping joined to an occlusal acrylic registration jig made from the diagnostic cast. A healing abutment was temporarily positioned and a subepithelial free connective tissue graft to the underlying buccal mucosa was placed. An implant analog was attached to the impression coping on the registration, and the altered cast was poured. A Zir abutment was placed onto the cast and prepared, using diamond and stone rotary instrumentation. An indirect provisional was fabricated on this model. The abutment and temporary crown were positioned intraorally with light cementation and light occlusion including no lateral or protrusive contact (see *Figure 3*).

After a three-month healing period, final impressions were made at the implant level. A second Zir abutment was milled in the dental laboratory, and a ceramic crown custom fabricated (Procera). The definitive ceramic abutment and crown were delivered (see *Figure 4*).

Conclusions

As dental implants continue to define the standard of care for tooth replacement, a transition can be found in the patients' expectations for treatment outcomes. Once seen mainly as a solution for restoring function, patients now also expect optimal esthetic results. The replacement of a single anterior tooth can be one of the greatest surgical, restorative, and esthetic challenges in dentistry. Today by utilizing an implant system designed with a biomechanical approach that includes biocompatible components such as zirconium, these challenges can be successfully met. ■

Credits and Special Appreciation

Dr Robert Schaedel, Oral Surgery, Southern Maine Oral and Maxillofacial Surgery, South Portland, Maine. Paul Chen, Prestige Dental Ceramics, Chestnut Hill, Massachusetts.

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