Implant Abutment Materials and Selection Criteria

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INTRODUCTION

With the advent of implant dentistry, dentists have the opportunity to restore dentitions in a more conservative approach without the need of preparing natural teeth. Implants have been well studied regarding their surface characteristics, and several implant brands are in the market, however, it is also crucial to have a selection criteria for the type of restoration materials that can be placed into those implants. We will discuss the biological, mechanical and esthetic characteristics to select the appropriate abutment material.

ABUTMENT MATERIAL ALTERNATIVES

- Titanium
- All Zirconia (one-piece)
- Zirconia with Ti-base (two-piece)
- Noble metals (Gold alloy)
- Metals (Chrome/Cobalt)
- Aluminum oxide

BIOLOGICAL CONSIDERATIONS

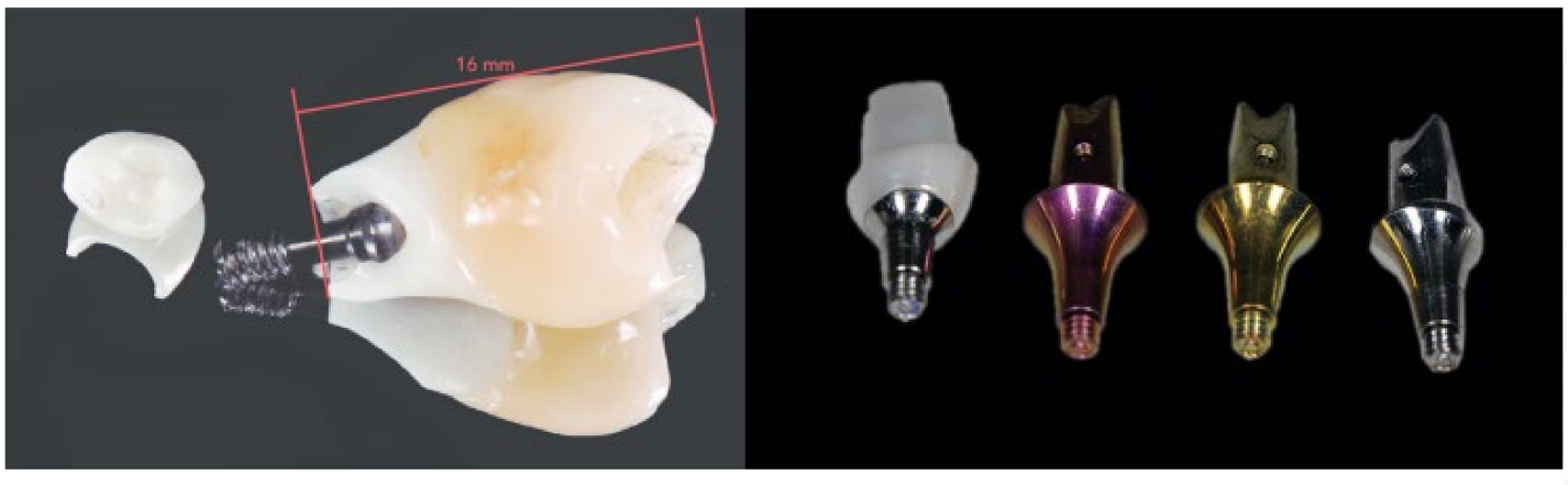
Recent histological and immunohistochemical studies (1, 2) suggest that Titanium and Zirconia abutments are more tissue friendly compared to Gold cast abutments. Gold alloy presents a lower biocompatibility and less cellular adhesion (3, 4). Chrome/Cobalt abutments show a higher risk of allergy (5), therefore Cr/Co abutments present more limitations on their use. Regarding the marginal bone level, a systematic review (6) showed that different abutment materials (Zr, Gold, Alumina) had no significant impact on bone loss compared to Ti abutments.

MECHANICAL CONSIDERATIONS

Titanium abutments have had a long history of use and research, and have proven to be a successful abutment material over time. However, a systematic review concluded that Ti and Zr abutments showed similar fracture strength after cyclic loading (7). Moreover, *in vitro* studies on narrower implants demonstrated that Zr abutments with Ti-base presented similar results to Ti abutments and better results than all Zr abutments (8), which presented the added risk of fracture at the abutment/implant connection if used as one-piece Zirconia abutment (9). Another study (10) concluded that to prevent fracture risk, Ti abutments should be preferred if the angulation is greater than 20 degrees. Gold alloy presents good strength as a metal, but lacks other characteristics.

ESTHETIC CONSIDERATIONS

Abutment color influences the shine-through effect. Zirconia and Aluminum oxide are the most esthetic abutment materials regarding their light properties. In fact, a recent clinical study (11) tested four different abutment color materials: Zirconia, gold-hue anodized Titanium, pink-hue anodized Titanium and unanodized Titanium. The closest color match with the natural gingiva was the Zirconia abutment. Pink and gold had differences statistically significant compared with unanodized Titanium, but scored less than Zirconia. However, it is claimed in the literature that a gingival thickness of 2mm will hide any shine-through effect on any material (12).



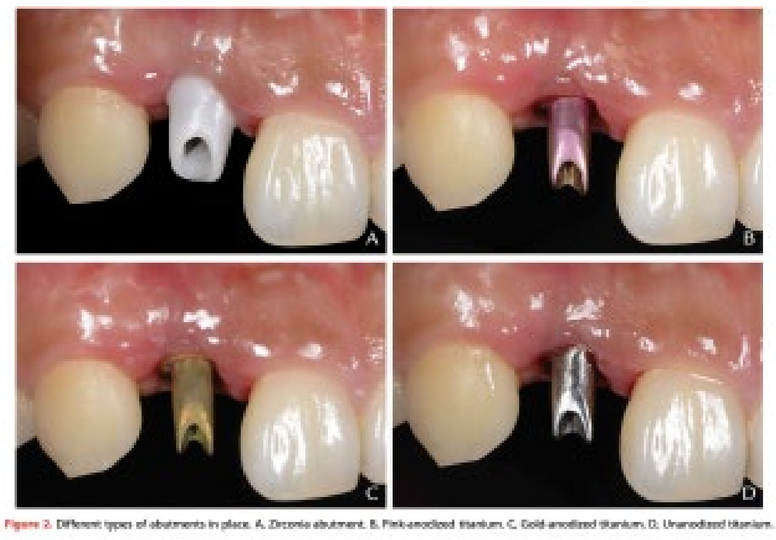


Figure 2. Different types of abutments in place. A. Zirconia abutment. B. Pink-anodized titanium. C. Gold-anodized titanium. D. Unanodized titanium.

CONCLUSION

Titanium abutments have the longest record of clinical and research data supporting their use. However, for anterior implant restorations, Zirconia abutments with a Ti-base have a better esthetic performance. Therefore, we can safely say that Ti abutments work well in every case, especially when the implant angulation is not optimal, and even in esthetic areas where we can change their color by anodization, but Zr abutments with Ti-base will give a better esthetic result in anterior cases.

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