A Systematic Approach to Definitive Planning and Designing Single and Multiple Unit Implant Abutments

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Keywords
Implant dentistry; implant-supported abutment; abutment selection; prosthesis; restoration.

Abstract
With an increase in the availability of implant restorative components, the selection of an appropriate implant abutment for a given clinical situation has become more challenging. This article describes a systematic protocol to help the practitioner more thoughtfully select abutments for single and multiple unit fixed implant prostheses. The article examines the evaluation, planning, design, and fabrication processes for the definitive restoration. It includes an assessment of a variety of factors, namely restorative space, soft and hard tissues, the location of the implant platform, the type of platform connection, platform switching indications, tissue collar heights, emergence profile, implant angulation, and finally the design and esthetic options for the final implant abutment.

The dental implant has become a cornerstone in the current practice of restorative dentistry. The predictability of implant-supported restorations as a treatment modality has been sustained by a considerable amount of research. The continued development of implant surfaces, surgical protocols, and prosthetic components have enhanced the planning, placement, and restoration of missing dentitions.1 An abutment is a component between the implant and the restoration, usually retained to the implant by a screw. The abutment provides retention, support, stability, and an optimal position for the definitive restoration.

Implant dentistry may be technically considered a prosthodontic procedure with a surgical component and, as such, it should be restoratively derived. The protocol for abutment selection should therefore begin with an understanding of the factors controlling prosthetic outcomes. The prosthetic selection process can be divided into planning phases. Related criteria and decision-making processes have been suggested.2,3 Additional factors also requiring consideration include: (1) the proposed need for retrievability, (2) the passivity of fit of the prosthesis, (3) the occlusal scheme to be established, (4) predicting and planning for failure, and (5) the cost limitations and expectations of the patient.3,4

As part of the initial diagnostic assessment, the clinician should: (1) establish well-extended and articulated diagnostic casts. (2) Perform a diagnostic wax-up of the intended definitive restoration, reflecting its 3D size and exact location. (3) Begin to consider a protocol for rehabilitation, in the order outlined in Table 1 and described in detail below.

Restorative space evaluation
Examine the distance from the crest of the alveolar ridge or the implant platform to the proposed occlusal plane in the posterior region and the incisal edge in the anterior region.5
Restorative space has been classified by the American College of Prosthodontists as follows: Class 1: 15 mm or greater; Class 2: 12 to 14 mm; Class 3: 9 to 11 mm; Class 4: Less than 9 mm.6 An excessive crown height space is considered to be a distance greater than 15 mm.7 These distances outline the restorative boundary of the definitive prosthesis and provide the clinician with the ability to decide between a screw- or cement-retained, fixed or removable prosthesis. The ideal space for a fixed prosthesis is suggested to be between 8 and 12 mm.7

The choice of fixed restoration is dependent on the preference of the clinician, and equal success has been accomplished when...
using either cemented or screw-retained prosthetics. The tissue may respond more favorably to a screw- vs. a cement-retained restoration, due to potential extrusion of the luting media on cementation.\textsuperscript{5} Screw-retained restorations have disadvantages, including a higher cost of fabrication, and difficulty in optimally positioning the access opening in the design of the occlusion. As a result, some clinicians may prefer to use traditional crown and bridge protocols and use cemented restorations for prosthetic convenience.

A cementable restoration requires 8 to 10 mm of clearance from the implant platform to the opposing dentition. Clinicians should note that variations in the location of these restorations when considering anterior or posterior regions of the mouth may pose their own set of restorative space requirements. The dimensions requiring consideration for the abutment design should incorporate the 3-mm occlusogingival distance necessary for creating the ideal emergence profile, 2 mm for the ideal porcelain thickness, and 3 to 5 mm for the abutment to generate the retention, stability, and support needed for the definitive prosthesis. If 8 to 10 mm is not readily available, the dentist may choose to eliminate the abutment altogether, and retain the prosthesis directly into the body of the implant as a screw-retained restoration. Alternatively, if only the minimum of 3 mm for the construction of the abutment is available, the clinician may choose to modify the cementation method of the definitive restoration.

If between 3 and 4 mm of restorative space exists between the implant platform and the proposed occlusal plane, screw retention is most often chosen to accommodate the restorative space deficiencies. If 5 to 7 mm of restorative space exists, screw retention may be used. Additionally a cement-retained restoration (abutment-supported) may also be chosen if the implant has not been placed in its ideal location, to accommodate awkward screw access openings. Finally, if more than 8 mm of restorative space exists, the choice of either a cement- or screw-retained (abutment-supported) prosthesis may be possible.\textsuperscript{7} The clinician should plan and consider the required restorative space prior to implant surgery and not consider it as an afterthought following implant placement.

Interocclusal distances exceeding 15 mm may be a concern when considering fixed restorations, as ideal tooth proportions can be challenging to accomplish and can often be avoided and corrected if an examination of the soft and hard tissue is accomplished concurrently with an assessment of restorative space.\textsuperscript{7} Available intraoral restorative space may be estimated using a vacuum-formed shell of the diagnostic wax-up and a periodontal probe.

**Soft and hard tissue evaluation**

An assessment of the supporting tissues is critical in implant treatment planning. In most instances, the proposed implant site presents itself with deficiencies due to trauma, tooth loss, or periodontal disease. This loss in architecture translates to both hard and soft tissue deficiencies. The position of the definitive restoration therefore has to be assessed in relation to these existing deficiencies. This is accomplished both clinically and radiographically.

Vertical, horizontal, and combined ridge defects should be examined and classified relative to the planned restorative position,\textsuperscript{9} in addition to the quality and quantity of bone (Fig 1). These sites may require corrective grafting procedures or implant site development to have the implant platform placed in an ideal position for the definitive restoration. Careful planning will allow the implant restoration to have a good esthetic result and enable the definitive prosthesis to be placed in conformity with the body of the implant, thereby preventing any angulation and offset load issues.\textsuperscript{10}

**Implant platform location and evaluation**

Incorrect implant placement can lead to both esthetic and prosthetic complications. Positional complications may result from

### Table 1 Assessment criteria for abutment design

<table>
<thead>
<tr>
<th>Criteria</th>
<th>Implication for abutment selection</th>
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<tbody>
<tr>
<td>Determine restorative space available</td>
<td>Abutment height must not exceed the space available for the restoration</td>
</tr>
<tr>
<td>Evaluate the soft and hard tissue for possible grafting requirements</td>
<td>Placement of a bone graft may be required to correct vertical and horizontal defects prior to placement in order to achieve a more proportional and esthetic final abutment restoration</td>
</tr>
<tr>
<td>Determine implant platform location</td>
<td>Abutment margins should be supragingival in nonesthetic zones and slightly subgingival in the esthetic zone. Locate depth of soft tissue when deciding on the collar design (bone level, tissue level) with or without a transmucosal abutment</td>
</tr>
<tr>
<td>Choose engaging/nonengaging connection</td>
<td>Decide on the type of connection based on the type of restoration (single-unit, multi-unit)</td>
</tr>
<tr>
<td>Determine choice to platform switch</td>
<td>Decide on platform width based on adjacent teeth/implants and available or grafted bone thickness</td>
</tr>
<tr>
<td>Determine existing tissue collar height</td>
<td>Bone sound the tissue to determine tissue thickness</td>
</tr>
<tr>
<td>Plan to customize emergence profile</td>
<td>Depending on the soft-tissue profile at the restorative stage, prefabricated or customized abutments can be made</td>
</tr>
<tr>
<td>Plan to correct implant angulation</td>
<td>If unavoidable, the abutment must counter an implant angulation to allow the restoration to emerge in the correct position relative to adjacent teeth</td>
</tr>
<tr>
<td>Plan for esthetic abutment</td>
<td>Ceramic/zirconia abutment may improve the esthetics</td>
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an incorrect placement of the implant platform in mesiodistal, apicocoronal, or buccolingual directions. Positional requirements should be addressed at the soft and hard tissue evaluation phase, and if changes cannot be made by grafting, a custom abutment may be incorporated.

Mesiodistal positional errors should not exceed 3 mm from the intended prosthetic position, to prevent unreasonable esthetic and functional challenges. Figure 2 illustrates a less than ideal placement in this direction. In these instances, it is often difficult to obtain a fixture level impression of both implants at the same time, as the impression copings have no space to be placed next to each other. In such instances, departures from recommended impression protocols may present restorative complications. It might even become necessary to leave one of the implants unrestored if an anatomical, cleansable, and esthetic result cannot be obtained.

Apico-coronal positional errors should not lead to exposure of the metal collar and implant platform. Figure 3 illustrates an incorrect apico-coronal position that had to be corrected prosthetically. In such situations, crown height becomes excessive, producing an esthetically unesthetic result. In most instances, a gingival porcelain collar is often required, and a customized abutment will need to be constructed. The definitive prosthesis can then be cemented into place or tapped into the custom abutment if screw retention is preferred. As previously mentioned, an assessment of grafting requirements should be considered in advance so as to avoid the need for such prosthetic corrections.

Buccolingual positional errors should not result in a ridge lap design in the definitive prosthesis, as this invariably makes oral hygiene almost impossible for the patient. Placement should also not be directed buccally, as recession of facial tissue will often ensue. Figure 4 illustrates an incorrect buccolingual placement that had to be corrected prosthetically. In this instance, the access hole for the restoration emerges from the buccal surface of the first molar, as an intervening abutment could not be used, a result of a desire to keep the prosthesis retrievable. In this instance, a ridge lap design was unavoidable.

Internal engaging/nonengaging connection evaluation

The term “engaging” is an antirotational component that prevents the turning of the abutment at the implant interface, thereby preserving the integrity of the preload on the abutment screw interface. The type of prosthetic connection is established (Fig 5) in conjunction with the type of implant platform to be used, whether it be at the bone level or the tissue level. Interfaces are divided into internal and external connections. Both connections have been successfully used in the past; however, authors have suggested that under high occlusal loads the external connection abutments have been subject to greater micromovement, causing abutment joint instability associated with screw loosening.

A resulting new preference of design has evolved favoring the internal connection; however, with the variation in manufacturers and the multitude of designs available, differences in performance between varieties of internal connections have been described. These variations will require consideration during the selection process. Authors have outlined some factors for choosing a particular connection that may influence the success of the definitive prosthesis.

These factors help the clinician control the design of the implant/abutment interface to establish stability and longevity in the implant prosthesis. Substantial evidence suggests that eliminating misfit in the prosthesis and engaging the antirotational features while applying adequate preload on the abutment screw significantly reduces mechanical complications and screw loosening.

Selection of compatible components between manufacturers should always be considered with care and caution.

The depth of penetration of the abutment within the fixture of the implant should be known. In the past, screw loosening and difficulty with seating restorations were attributed to the short lateral wall heights of external indexed implant systems, which on average had 0.8 mm index heights. The newer more commonly used internal engaging connection systems have wall heights for lateral wall engagement on average of 2.4 mm, which provides a biomechanical advantage.

The intimacy of fit between the walls of the abutment and the internal surface of the implant fixture has become important, as these internally indexed abutments may be a challenge to seat accurately, especially when using multiple abutments. To
overcome this problem, nonengaging implant connections are being used.

In a recent study of cantilevered prostheses, the presence and position of engaging components was shown to have a significant effect on the amount of axial force and the number of cycles it took to see prosthesis failure resulting in screw fracture and separation. The authors concluded that using an engaging abutment in a screw-retained fixed cantilevered fixed dental prosthesis (FDP) provided a mechanical advantage.

The dimensions of the abutment screw should also be noted, as well as the type of thread design and the type of driver interface present (whether it is square, hexed, or unigrip), as these will influence individual torquing protocols. Screw preload and torque protocols vary for the specific implant and the manufacturer.

Three types of connection methods are available to the clinician to connect and retain the abutment to the implant platform. One method involves a screw in addition to the antirotational interference fit (Ankylos, Straumann, Basel, Switzerland). The other involves a tapered conical interference fit or Morse Taper (Bi-taper interface (Astra, Nobel Biocare, Zurich, Switzerland). The last mode of connection involves a tapered-fit connections are used, abutment loosening seems to be less of a concern.

**Platform switch evaluation**

The implant platform is the area or the interface at which the implant and the abutment come together. Platform diameters can vary and can range from 3 to 6 mm depending on the implant system used. All platforms are divided into groups: narrow (3 mm), regular (4 mm), and wide (5–6 mm). The width of the implant platform chosen is often indicated by the width of the tooth being restored.

The size of the edentulous space will also dictate the potential width of the proposed implant platform. Authors have shown that a minimum space of 1.5 mm is required mesiodistally between an implant and a tooth to maintain both the soft tissue and the architecture of the bone. When placing an implant adjacent to another implant, a greater distance has been recommended, with a minimum space of 3 mm.

The term “platform switching” is a concept first described in 1991 when Implant Innovations introduced its wide diameter implants, but they failed to develop an abutment to restore their implants. They therefore recommended using smaller standard diameter abutments and healing abutments as a substitute for their restorative protocol. They noticed that when these “platform-switched” components were used, there was a smaller change in crestal bone height around the implants than when restored in the conventional fashion. Since this discovery, implant manufacturers have tried to establish their own systems of platform switched implants.

Platform switching is a treatment philosophy, and a recent systematic review concluded that platform switching appears to be a promising tool in the preservation of peri-implant bone, but more research is needed to validate its application. Several confounding variables will need to be standardized in existing studies to reach a definitive conclusion.

### Tissue collar height evaluation

A measurement of the soft tissue sulcular depth from the surface of the implant platform to the free gingival margin should be reflected in the design of the abutment. This depth can be determined 6 to 8 weeks following stage 2 surgery. Assessment of gingival tissue thickness should begin prior to surgical placement. The need to determine if a restoration will connect straight to the implant or if an intermediary transmucosal abutment is preferred will depend on the amount of tissue present and the availability of an adaptable manufactured abutment collar height.

Abutment collar heights can affect the design of the final abutment restoration. Abutment marginal placement should ideally follow the anatomy of the gingival margin as it rises and falls past the interdental col areas. Abutment margins on the buccal and mesial should be placed at or 1 mm below the gingival margin based on the site and location of the restoration. Palatal and distal abutment margins may be placed at the gingival crest or 0.5 mm below the crest based on operator preference, as nonesthetic sites. This helps account for and controls any gingival recession changes that may occur over time. If a cemented restoration is chosen, cement clean-up is easier to accomplish if abutment margins are placed within 1 mm of the gingival crest. Studies have shown that margins placed more below the gingiva can pose a problem to cement removal. A recent study has indicated that 80% of peri-implant disease is a result of the bacterial colonization of the extruded cement. An exactly detailed custom abutment may be fabricated using gold, titanium nitride, or zirconia to ideally locate and esthetically enhance the restorative margin.

An implant may have a shallow tissue crevice and still be in a position that is apical in relation to the adjacent teeth. This happens in situations where vertical resorption has occurred prior to implant placement and the implants are placed into these sites without the correct site development protocols, causing an uneven gingival topography (Fig 6). If this restoration is within the esthetic zone it may produce an esthetic compromise in soft tissue and gingival architecture. The site may require removal of the implant and grafting to correct the hard and soft tissue deficiency. If this is not possible, pink porcelain can be used to mask the defect (Figs 3 and 6).

When soft tissue depth ranges from 1 to 3 mm, stock prefabricated abutments may generally be used. Tissue depths greater than 4 mm or presenting unusual gingival contours may, however, benefit from customized cast or milled computer-aided design/computer-aided manufacture (CAD/CAM) abutments.

CAD/CAM abutment designs now allow control of marginal placement based on operator- and patient-specific needs. These margins are designed from a scan of the implant site, either directly in the patient’s oral cavity or from an impression of the master cast, and the abutments can then be virtually designed and fabricated. Abutment margins may be placed by a variety of methods; some systems use subgingival depths by measuring.
the soft tissue from the gingival crest to the proposed abutment margin at the implant platform. Alternatively, the margin may be designed as close to the implant/abutment interface as possible or by using the neighboring teeth as a guide to its final placement.

**Emergence profile evaluation**

The emergence of an implant restoration is dependent on implant location in three-dimensional space and the width of the implant platform. Anatomically, teeth are ovoid in cross
**Figure 5** Platform connection, inter-implant, and inter-tooth distance.

**Figure 6** Gingival porcelain.

**Figure 7** Emergency profile customization.

**Figure 8** Ideal implant location to access hole.
section at the level of the cementoenamel junction (CEJ). Alternatively, implants have circular platforms, and this poses difficulties for the dentist in creating a natural tooth profile as it emerges from the soft tissue. Ideally, the placement of the implant platform should be established 3 mm below the CEJ of the adjacent teeth to provide the distance required to establish the correct emergence of the restoration out of its socket. If this can be established with relative ease, then a prefabricated abutment may be used to construct the definitive prostheses. If soft tissue depths exceed 3 mm, then customization may become necessary to follow the existing gingival topography. The need for customized abutment may also be beneficial in more challenging situations, especially where anterior restorations are being planned in patients with excessive gingival displays and esthetic challenges.

Keratinized tissues can be customized by a variety of methods, some of which are illustrated in Figure 7. The emergence profile may be modified either by a direct or an indirect technique prior to definitive abutment selection. Direct techniques involve customization intraorally, while the indirect technique involves customization within the laboratory setting. When using the indirect technique, authors have contoured the emergence profile on the master cast by shaping the gingival profile in stone or sculpting a gingival substitute after the implant level impression has been made. The disadvantage of using this method is that the technician has no indication of the biotype of the tissue or its tolerance to the contours of the final restoration. If the emergence profile is overcontoured, the tension created may result in trauma to the soft tissue, causing soft tissue recession and hard tissue resorption. In addition, if the tissue is undercontoured, tissue collapse can occur, leaving an unacceptable esthetic result. Figures 5 and 7 illustrate how the emergence profile can be sculpted by a direct technique.

Implant manufacturers have developed CAD/CAM patient-specific abutments, to optimize function, esthetics, and simplicity. Zirconia abutments are being used and possess favorable esthetic qualities and are available in a variety of shades. These abutments are being virtually designed to correspond to the specific emergence profile.

**Implant angulation evaluation**

Improper alignment of implants compromises both esthetics and function due to the unfavorable positioning of the screw access opening. Ideal access openings should be centrally placed (Fig 8). As mentioned previously, offset angulation problems should be avoided, and the restorative site must be assessed in mesiodistal, buccolingual, and apicocoronal directions. Figures 2 to 4 illustrate some of the problems associated with an incorrect placement as well as the prosthetic corrections required to compensate for faulty surgical placements. One of the major prosthetic problems in correcting such nonoptimal implant placements is screw loosening, which frequently ranges from 2% to 45%.

Prosthetic preangled abutments are available to correct such problems and are available in a variety of angulations that can range from 15° to 35° depending on the implant manufacturer chosen. The dentist may prefer to fabricate a custom abutment to produce a more ideal abutment design, thereby providing more control in the position of the definitive restoration. Angulations less than 15° are slight and may usually be corrected by modification of straight standard prefabricated abutments. Angulations between 15° and 20° may require the use of angle correcting prefabricated abutments, while an angulation discrepancy greater than 20° will usually require a custom abutment.

Studies have suggested that angulated abutments result in increased strain and stress along the implant and bone interface. It was shown that when 15° and 25° angulated abutments are used compared with straight abutments, compressive strain increased fourfold with strain gauge measurements, whereas photoelastic methods showed an 11% increase in fringe order at the implant/bone interface. It is now accepted that angulated abutments result in increased stress on the implant and the adjacent bone, but these stresses are within physiological limits. In addition, the use of angulated abutments has not decreased the survival rate of implants or prostheses in comparison with those of straight abutments, nor has this increase resulted in an increase in bone loss.

Implant angulation issues require additional restorative distances from the implant’s prosthetic platform to the free gingival margin. The dentist requires this distance to transition from the small-diameter, circular shape of the implant platform to the final shape of the tooth being restored. Larger distances can often be beneficial in creating a transition from the implant platform to the free gingival margin in situations where implants were incorrectly placed. Custom abutments are often preferred in these situations.

**Implant abutment—esthetics and function**

An ideal abutment should be durable and able to undergo functional loads without a risk of deformation and fracture. Within the anterior region, the abutment should ideally be tooth colored and allow soft tissue coloration. In sites of thin gingival biotypes, the implant abutment can often show through at the cervical extent of the tissue surface, producing an unesthetic result. In such instances, three options are available in abutment design. The operator may choose to use a zirconium abutment, a titanium nitride coated abutment, or a titanium abutment with pink gingival porcelain to mask the color show through the gingiva. Titanium abutments are the standard, but there is now a growing trend for titanium-reinforced zirconia abutments and zirconium or alumina abutments, which are often the choice if restorations are planned within the anterior esthetic zone to produce more satisfactory results; however, all-ceramic abutments are brittle and susceptible to fracture in thin sections, and careful examination and design of the prosthetic abutment is required. An alternative to the all-ceramic abutment is the traditional porcelain fused to metal gold cast-to-abutment. In situations of lost gingival profile, gingival contours can be recreated in the definitive restoration (Fig 6). The
1. PERFORM TRIAL TOOTH WAX-UP

2. DETERMINE RESTORATIVE SPACE AVAILABLE
   8-10 MM: CEMENT-RETAINED
   5-7 MM: CEMENT- OR SCREW-RETAINED
   < 4 MM: SCREW-RETAINED

3. EVALUATE SOFT AND HARD TISSUE
   SOFT TISSUE GRAFT REQUIRED
   HARD TISSUE GRAFT REQUIRED
   COMBINATION GRAFT REQUIRED
   BONE LEVEL IMPLANT REQUIRED
   SOFT TISSUE GRAFT NOT REQUIRED
   HARD TISSUE GRAFT NOT REQUIRED
   COMBINATION GRAFT NOT REQUIRED
   TISSUE LEVEL IMPLANT REQUIRED

4. DETERMINE IMPLANT PLATFORM LOCATION
   MESIODISTAL POSITION
   BUCCOLINGUAL POSITION
   APICORONAL POSITION

5. DETERMINE NEED FOR IMPLANT ENGAGING/ NON-ENGAGING CONNECTION
   EXTERNAL CONNECTION
   INTERNAL CONNECTION

6. DETERMINE NEED TO PLATFORM SWITCH
   NARROW PLATFORM- INCISOR, CANINE
   REGULAR PLATFORM- PREMOLAR
   WIDE PLATFORM- MOLAR

7. DETERMINE EXISTING TISSUE COLLAR HEIGHT
   1-4 MM: PREFABRICATED ABUTMENT
   >4 MM: CUSTOMIZED ABUTMENT

8. PLAN TO CUSTOMIZE EMERGENCE PROFILE
   3 MM: PREFABRICATED ABUTMENT
   >4 MM: CUSTOMIZED ABUTMENT

9. PLAN TO CORRECT ANY IMPLANT ANGULATION
   <15°: (STANDARD PREFABRICATED ABUTMENT)
   15°-20°: (ANGLE CORRECT PREFABRICATED ABUTMENT)
   >20°: CUSTOMIZE CAST OR CAD/CAM ABUTMENT

10. CONSIDER INDIVIDUAL ABUTMENT REQUIREMENTS
    ANTERIOR RESTORATION (Zr)
    POSTERIOR RESTORATION (Ti-reinforced Zr, Ti, Ti Nitride, Alloys)

**Figure 9** Flow chart (single and multiple units).

Uses of CAD/CAM abutments have their benefits, namely increased accuracy or precision of fit, durability, and simplicity of construction. With the advent of computer-generated technology in the 1980s, many manufacturers have now incorporated CAD/CAM technology into the production of their implant abutments. Traditional prosthodontic techniques used the lost-wax technique and relied on the processes of impression materials, gypsum products, waxing crowns, investing, and casting with alloys at high temperatures. The accuracy of this process is limited by the expansion and contraction of the materials at each stage. CAD/CAM production involves the steps of scanning, CAD modeling, and CAM production.

All implant manufacturers offer ceramic abutments that are available in either a prefabricated or a customizable form. The current materials of preference are densely sintered high purity alumina (Al₂O₃) and yttria-stablized tetragonal zirconia polycrystal ceramics. Zirconia has been shown to possess superior properties due to the stabilizing effect of yttria that allows the zirconia to be processed in a metastable tetragonal crystalline structure at room temperature. This tetragonal phase that is stable at room temperature allows transformation into the monoclinic form under stress, preventing crack propagation, a process called transformation toughening.

Alumina abutments are composed of 99.5% pure alumina ceramic. This abutment provides a more esthetic abutment...
when compared to the more whitish zirconia. Alumina abutments are also easier to prepare but are not as resistant to fracture as their zirconia counterparts. A study showed the masticatory loading after fixation of various zirconia, alumina, and titanium abutments and their restoration and adhesive cements of metal crowns. The median fracture loads for the zirconia, alumina, and titanium abutments were 294 N, 239 N, and 324 N, respectively. The authors concluded that titanium-reinforced zirconia abutments were comparable to metal abutments and can therefore be used as an alternative in the anterior region.

When considering the definitive restoration, studies have shown that the highest fracture resistance value was found with a titanium and alumina crown combination, whereas the smallest fracture resistance was found with an alumina abutment and a zirconia crown. They concluded that all abutment and crown combinations have the potential to withstand occlusal loads in the anterior region. For the posterior region, the routine use of zirconia abutments still must be validated. Zirconia abutments benefit from the process of customization, as this will ensure maximal bulk in the final prostheses to aid with durability. More recently, clinicians are using titanium nitride abutments, which are gold colored and have quite impressive esthetics through ceramic restorations as they impart a warm natural hue through the crown and gingiva.

Conclusion

Abutment selection is an important step in the process of creating the ideal restorative prosthesis. This article presents some of the factors and protocols needed for consideration in making this definitive restoration possible. Figure 9 presents a flow chart summarizing these factors. The treatment, however, remains the same and will invariably involve correct treatment planning, decision making, and finally sequencing of treatment to ensure a successful end result.

References