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NEW AVENUES IN DENTAL IMPLANT ABUTMENTS – AN OVERVIEW

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ABSTRACT:

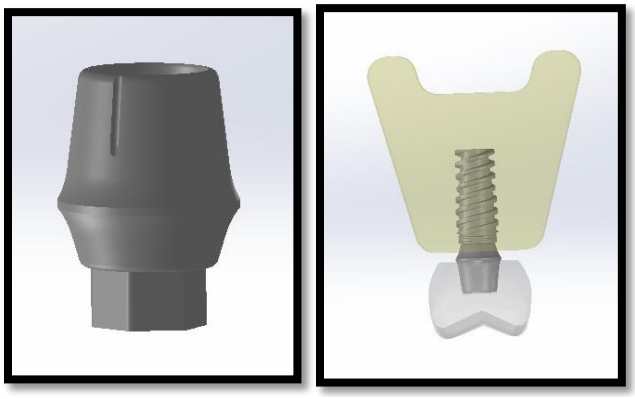
Dental implants are the gold standard for prosthetic rehabilitation. Recent advances in all aspects of implant therapy, from planning through surgery and post rehabilitation has made it a predictable and affordable treatment option for patients. Abutments are connecting elements joining the implant module to the prosthesis. A thorough knowhow about the different types, its uses and newer systems is essential for successful therapeutic outcome.

KEYWORDS:

IMPLANT ABUTMENTS, CUSTOM ABUTMENTS, CAD CAM ABUTMENTS, SCAN BODIES.

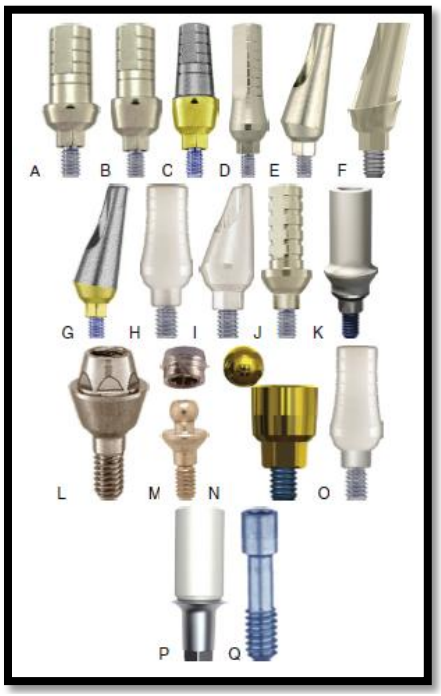
INTRODUCTION

Implant Abutment is that portion of a dental implant that serves to support and/or retain prosthesis. (Definitive Abutment). Abutments are usually separate from the implant, but in some cases they may form as a part of the implant itself. Also, not all implant restorations require abutments. In such cases, the crown is fabricated to be attached directly to the implant platform. The abutment provides the retention, support, stability and optimal position for the final restoration.[1][6]



Different kinds of abutments and connection screw.

(A) Straight abutment with short gingival collar. (B) Straight abutment with long gingival collar for deep seated implants. (C) Straight abutment with long gold-hued gingival collar to avoid see-through of the black metal collar through thin marginal soft tissues. (D) Long straight abutment for long crown height. (E) Angled abutment to correct angulation problem of the implant prosthesis. (F) Anatomical (aesthetic collar) abutment for maxillary anterior implant. (G) Angled abutment with gold-hued aesthetic collar. (H and I) Plastic (cast able) abutments (straight and angled) for screwreta in ed prosthesis. (J) Temporary abutment to immediately temporize the implant. (K) Zirconium abutment for the metal free zirconium prosthesis. (L) TCT abutment for abutment level, screw-retained, fixed prosthesis or bar-retained dentures. (M) Ball abutment for ball retained over denture (metal cap – above). (N) Angled ball abutment for over denture to correct angulation problem. (O) Non-engaging abutment. (P) UCLA abutment. (Q) Connection screw *(Courtesy: Alpha-Bio implant system, Israel)*.[1]



They may be classified

1. According to manufacturing process.

Prefabricated abutments and Custom made abutments

Prefabricated or stock abutments are manufactured in a range of sizes and shapes and are usually delivered by manufacturing companies along with the implants.

Custom made abutments are fabricated at the dental laboratory after an impression of the top of the implant is made with the adjacent teeth and gingiva. The size, shape and material depend on the clinical application. [1][7]

2. According to connection interface.

Engaging and Non-engaging abutments:

Engaging abutments have the triangular/hex/ octave connection and so can be fixed to implants only at a few particular oriental positions. It is the ant rotational feature and should be used in most prosthetic situations.

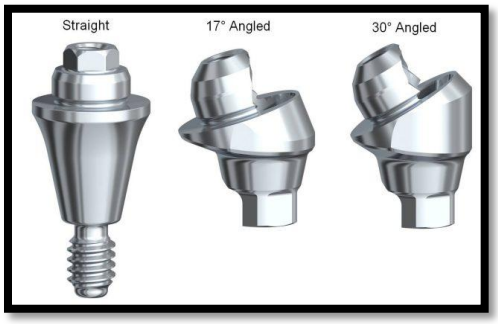
Non-engaging abutments do not have any triangular/hex/octave connection and so can be fixed to the implant at any orientation. These abutments can be used in cases of a joint prosthesis fixed over multiple implants[1][6]

3. According to Material.

Titanium abutments, Zirconium abutments, BioHPP Polymer based Abutments [7]

Permanent abutments are used for the final restoration and will remain in place definitively. The dentist has a choice during the final fabrication to use either a standard prefabricated, custom cast able or computer generated abutment. The choice is dictated by the individual clinical situation, clinical experience level and patient preference.

Stock abutments are pre-machined abutments that can be modified by the dentist chair side using air/micro motor hand piece or by the laboratory technician using a milling tool. Implant companies manufacture stock abutments to try to cut down the preparation time by the dentist. This has included abutments which are shaped more to the natural contours of the crown and are term aesthetic abutments. In addition, these abutments also come in a variety of angulations to deal with implant positional problems. Standard stock abutments vary according to the manufacturer and they come as fixed and removable abutment restorations each having their own indications. Fixed abutments include Snappy abutments, Multi-unit abutments, Esthetic abutments, Procera abutments, Gold adapt abutments and single tooth abutments. Removable abutments are Locator, ERA, Mini ERA, Ball attachments, ZAGetc. [2]



Customized abutments, are more commonly used in situations where stock abutments cannot be used to correct extreme angulation problems or to deal with corrective abutment designs to accommodate proper coping and crown designs. These abutments are waxed by the technician to the required contours and custom fit into the restorative space. They tend to be quite labour intensive and costly. They utilize UCLA, gold adapt, or cast to abutments for the casting process. [7]

The UCLA abutment was introduced in 1987. It consists of a "gold cylinder" (that engages with the implant) and a plastic sleeve (that can be waxed and cast out of a high noble alloy and subsequently baked with ceramic). It is valuable in overcoming problems of limited interocclusal distance, interproximal distance, implant angulation, and soft tissue response. Another major advantage with the UCLA abutment is that of improved esthetics. [4]

Engaging vs Non Engaging Abutments

In implant retained fixed partial dentures which involve multiple implants it's not always possible to achieve

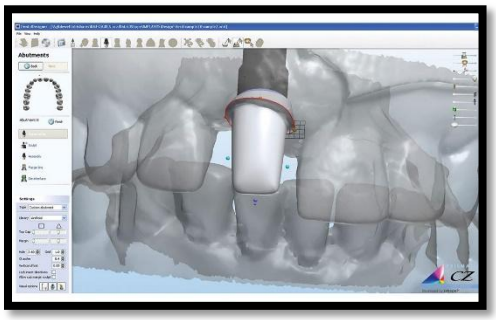
perfect parallelism in order to insert all engaging abutments in one go. The internal hex causes the abutments to have a single path of insertion and hence affects proper fit. Non engaging abutments lack this internal hex so that they have multiple path of insertion and engage the implant fixture only when the abutments are completely seated thus providing more flexibility than Engaging abutments. These are of more value in case of Full mouth prosthesis and Fixed partial dentures spanning either side of the dental arch. [2]

Titanium Bases and TMA Cementing Cone

A titanium base is used for the restorative supply of an implant. For this purpose, a superstructure is glued onto the titanium base, which can be individually adjusted in line with aesthetic and functional requirements. Depending on the superstructure design, the product glued to the titanium base can be used as the abutment or directly bolted crown. An Abutment Screw is also used for the definitive attachment to the implant. The Ti Base product consists of two individual components: Titanium base and Abutment Screw.

Computer Generated Abutments

CAD/CAM technology was incorporated in to the production of implant abutments and frameworks in the 1980s. These abutments are fundamentally changing present restorative protocols. Traditional techniques relied on the accuracy of the processes of impression materials, gypsum products, waxing crowns, investing and casting with alloys at high temperatures. These are weak links in the work flow for in accuracies to develop. CAD/CAM has introduced methods of fabricating the final impression with digital methods of impression making and scanning and then milling out prefabricated metal alloys to producea restoration that is more precise than the traditional casting methods. When considering CAD/CAM implant abutments there are several systems available on the market currently, but they all seem to stem from the following protocol: [6]



a. Scannable Abutments (Scan bodies)

b. Prepable Scanned Abutments

c. Virtual Assisted Design

d. Robotic Analog Design

Implant manufacturers have developed unique proprietary systems. Some of the common systems are outlined below:

1) Nobel Procera® (Nobel Biocare USA, LLC, Yorba Linda, CA)provides abutments in titanium, zirconia or alumina. Fixture level impressions are made and a master cast is

produced. This cast can then produce the abutment in two modes. The cast can be scanned and the abutment can be designed in an entirely 3D fashion by computer software. Another method would allow a pre prepared base cylinder to be placed on the cast and then waxed. This wax-upis then transferred to the scanner. This information for both systems is then sent to the Nobel Bio care facility for CAM and sent back as either a metal or ceramic coping.

2) Bella Tek® Endocde® (BIOMED3i, Palm Beach Gardens, FL)is a robotic analog design. This system uses an impression of the healing abutment to design and fabricate the final abutment. These healing abutments come in a two-piece system which has notches on its occlusal surface which act as codes that the computer can scan and translate into implant abutment designs. The scanner can extract information about the position of the hex, the diameter of the implant platform, the collar height and then exact 3D placement of the implant. This then allows CAD/CAM fabrication.[12]

3) Straumann® CARES® (Straumann, USA, Andover, MA) makes two-types of abutments: zirconium dioxide and titanium. In this system an implant level impression is made and then duplicate model of the master cast is fabricated. This is called the scan model and is made of a type of plaster that is scanable. A scan body is also attached to the implant analog prior to the scan to delineate implant position. The custom abutment is then designed CA Don screen to the contours needed and transmitted to the Straumann center. Etkon is another system that uses the same principles of waxingup onto a plastic cylinder which isthen removed and scanned.[10]

4) Atlantis™ FLO (Feature Locating Object), (DENTPSLY, International, York, PA is used as a digital transfer coping, ensuring that the position and orientation of the implant is accurately represented in the Atlantis VAD (Virtual Abutment Design) software. This system can be used with any of the available implant systems and be gins with a fixture level impression and then the diagnostic cast and the master cast are scanned. The abutment is then designed on the software Atlantis VAD (Virtual Abutment Design) and then milled. The abutments can be fabricated in titanium or gold shaded titanium or zirconium.[11] The gold-shaded abutments aid in covering up the silver color of the titanium and providea more esthetic value to the patient. Guidelines for the design are incorporated into the prescription ,including:

a. Implant information: Tooth number, implant brand and platform diameter

b. Abutment material: Titanium, gold shaded it anium, zirconia etc

c. Margin design: Chamfer, Shoulder

d. Retentive Surface: Yesor No

e. Healing Abutment diameter

f. Margin Position: Free gingival margin (FGM) to abutment or implant platform to abutment

g. Emergence profile options: Full anatomic, Contour soft tissue, Support tissue or no tissue displacement

4) Adin Scan Bodies

Scan Body and its Retaining Screw are products which are used for the digital acquisition of an implant position instead of an impression post to transmit the implant position and connection orientation to a 3D model, a Scan Body is required in the digital process, which can be optically acquired in an effective way along with the mouth situation. For this purpose, a titanium scan body product is mounted on an implant or laboratory analog with a Retaining Screw. [8]

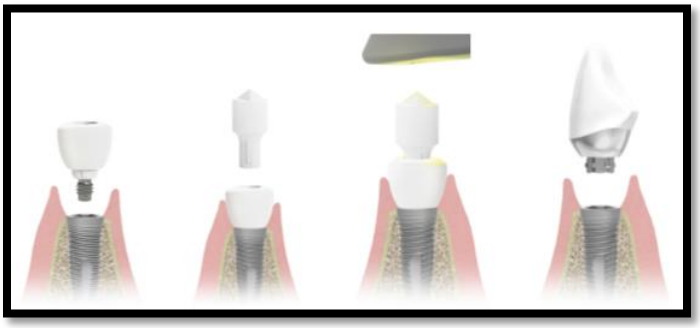
The Scan Body is used to detect the exact position of the implant or TMA-MU in the mouth or in the stone model to transfer it in the correct position of a 3D model.

5) Scan Peg (Neoss® Esthetic Healing Abutments)

- Easier handling – a faster, improved procedure
  - Minimized component exchange
  - Streamlined intra-oral scanning
  - Less chair time, fewer treatment steps
- Undisturbed healing and more patient-friendly
  - Biological seal is maintained, tissue level is preserved
  - Less invasive for increased patient comfort
- Anatomically-shaped to create excellent esthetics
  - Shapes soft tissue during healing

PROCEDURE

Healing abutment placement: The Esthetic Healing Abutment is placed during first or second stage surgery and then left until the final abutment is placed.



ScanPeg placement and scanning: An accurate intra-oral scan is carried out at healing abutment level utilizing the ScanPeg. The ScanPeg comes co-packed with the Esthetic Healing Abutment and is easy to both attach and remove. The intra-oral digital impression can be taken whenever you choose, using your existing scanner.

Placement of the final restoration: Flexibility in when you take the digital impression allows design work to continue during the healing phase. The healing

abutment is not removed until the final restoration is placed, eliminating one complete surgical intervention.[9]

Conclusion

Understanding abutments and its application is just one step in the extensive process of creating the ideal dental implant prosthesis. The treatment, however remains the same and will invariably involve correct treatment planning, decision making and sequencing of treatment that will ensure a successful end result.

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