



Overview of Various Angled Abutments Commercially Available: A Review

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Abstract

The utilization of implant-supported crowns and bridges has become a well-established and preferred approach in treating completely and partially edentulous states. An ideal implant position is requisite for obtaining good esthetic results and correct emergence of screw access hole. Commonly, due to insufficient bone volume, implant will be placed in available bone which leads to unfavorably placed implants. Once placed, such implants are restored by giving a cement-retained prosthesis to avoid labial/buccal screw access holes which are esthetically displeasing. In such a scenario, a graftless solution would be using an angulated screw channel technology which tilts the prosthetic screw access hole emergence in a desirable direction that is more esthetic and acceptable. Angulated abutment system is unique and exclusive and are designed through computer-aided design and computer-aided manufacturing technologies. This system rectifies angulation issues with millimetric precision with full freedom of movement. This review article presents an overview of various types of angulated abutments commercially available. It highlights the features and angulation provision of various commercially available angulated abutments.

Keywords: Angulated Screw Channel; Computer-Aided Design and Computer-Aided Manufacturing; Dental Implants; Graftless; Screw Retained

Introduction

Edentulous state represents a compromise in the integrity of masticatory system, frequently accompanied by adverse function and cosmetic problems. It is also considered as a social psychological catastrophe by majority of people and its replacement by artificial substitutes, such as implants and dentures is vital to the continuance of normal life [1]. Implants have now become the best way to replace missing teeth. Implant dentistry has shown remarkable advancement in past few years and is predominantly being practiced due to its longevity and high clinical success rates. With this progress in the past few years, implant dentistry

has witnessed challenging issues concerning the materials and designs related to implants as well as implant abutments regarding achieving maximum clinical success rates [2]. The employment of implant-supported crowns and bridges has become a well-established and preferred approach in replacing missing teeth [3].

Employing implants is a technique sensitive procedure that involves placing of the implant in an ideal position which at a later stage of restoration comes out to be esthetic. For the final restoration to be esthetic, implant should be placed in such a way that the screw hole emergence results lingually. When this does not happen, a cement retained crown is given to cover the labially emerging

screw hole. However, screw-retained restorations are considered to be more favorable due to their ease of retrievability and to facilitate the treatment of any technical and biologic complications [4]. But for the use of screw retained restorations an ideal emergence of screw access hole, a favourable implant position is mandatory [5].

An unfavourably placed implant results due to an improper positioning or tilting of implants such as to avoid sensitive anatomical structures, or implants placed on best available bone width in the arch which make them out of line [6]. Therefore, it is said that the implant-supported prosthesis planning should start much time before the implant placement surgery or even the choice of the implant itself. This is the concept of reverse planning.

Previous research suggests to approach ideal implant positioning from a three-dimensional perspective [7,8]. It states that the most common error in implant placement is to angle it facially, which displaces the soft-tissue contours of the crown apically. A better solution for this scenario, where the grafting surgery can be avoided, would be using an angulated screw channel technology which tilts the prosthetic screw access hole emergence in a desirable direction that is more esthetic and acceptable and onto which a screw retained prosthesis can be given.

Angulated abutment system is unique and exclusive and can be used as a true alternative to grafting procedures and cement retained crowns. These are designed through computer-aided design and computer-aided manufacturing (CAD/CAM) technologies. They fix angulation issues with millimetric precision with the full freedom of movement. By employing this system any number of teeth can be replaced in almost any situation with a screw-retained restoration and by a graftless procedure.

Success rate of angulated abutments

A systematic review was conducted by Wei-Shao Lin and Steven E. Eckert which included 42 published articles. The study concluded that based upon the systematic review of the literature, an analysis of the descriptive data suggested no differences in clinical performance between implants that are placed in an axial position relative to the residual alveolar ridge when compared with implants that are intentionally tilted toward the distal aspect of edentulous jaws. In a study by Balshi, *et al.* the cumulative survival rates for angled abutments were 94.8% and 94.1% for the maxilla and mandible respectively. These are comparable to those of straight

abutments which were 91.3% in the maxilla and 97.4% in the mandible [9]. Sethi *et al.* reported a 5-year mean survival probability of 98.6% and a 10-year survival probability of 98.2% with a 95% confidence interval for angled abutments. In their observations, 3101 implants restored with angled abutments ranging from 0° to 45° were included. They reported that the magnitude of the angles did not significantly influence the survival rate [10]. A case report by Chandrasekhar, *et al.* presents a case where multiple unfavourably placed implants were managed by giving angled abutments and altering screw hole emergence. The study concluded that after a 3 year follow up, there were no technical or biological complications found due to the corrections of screw emergence [11].

Commercially available angulated abutments

Many manufacturers have responded to this problem and created angled abutments with various angles. These allow for a custom abutment to be fabricated and compensates for the off-angulation of the implant by allowing access to a unique screw head with a special multiangle driver. Few commercially available angulated abutments are as follows.

Dynamic abutment solutions®

One of its kind is dynamic abutment® solutions. This system is unique and exclusive and can be used as a true alternative to titanium angulated abutments or customized Ti abutments designed using computer-aided design and computer-aided manufacturing (CAD/CAM) technologies. The system rectifies angulation issues with millimetric precision up to 30° with full freedom of movement.

A dynamic abutment® solutions abutment is composed of a Ti base in a hemisphere, which allows free movement of a screwdriver with deviation from the axis up to 30° (Figure 1). The fixation screw is distinctive and allows tightening with a hexagonal 1.30-mm-faceted spherical screwdriver (Figure 2). This abutment is compatible with over 270 implant systems available on the market. CAD/CAM technology is used for designing and milling screw-retained crowns. This system includes the Dynamic TiBase®, the dynamic screw-screwdriver set, scanbodies, and digital libraries available for the main CAD software packages on the market: Exocad, 3Shape, Dentalwings, Imetric, and EGS. This screwdriver design has a hexalobular head with a contra-angle connection, which makes it easier to use with a dynamometer or manual ratchet as well as the corresponding adaptors or handles.



Figure 1: Dynamic abutment solutions screw driver.



Figure 2: Dynamic abutment Ti base®.

Osstem

In this, the system rectifies angulation issues with millimetric precision up to 23° (Figure 3).

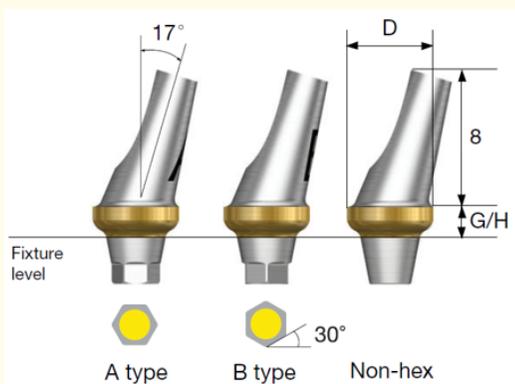


Figure 2: Dynamic abutment Ti base®.

The following features are present:

- Cement/combination-retained prosthesis
- Angle compensation up to 23° without the need for trimming
- Fixture level impression
- Uses a 1.2 hex driver
- Recommended tightening torque: 20 Ncm (mini), 30 Ncm (regular).

Bio horizons

The Precision Angled Driver and Screw can be used with the Hybrid Base abutment (hexed and non-hexed) to position the screw channel at an angle up to 15°. Digital library is available for 3Shape and Exocad design software.

The 17° and 30° Angled Multi-unit abutments (Figure 4) may be used to angle-correct divergent implants. Use for multiple-unit restorations including: screw retained restorations at the abutment level, cast alloy bars for overdentures and fixed/detachable (hybrid) restorations. It comes with a cover cap (PXMUCC) and abutment screw (PXMUAS). The final torque is 30 Ncm and is made up of Titanium alloy. It conveniently delivers abutment one-handed using an .050 hex or Unigrip™ driver or two-handed using an angled Multi-unit carrier (MUCA).

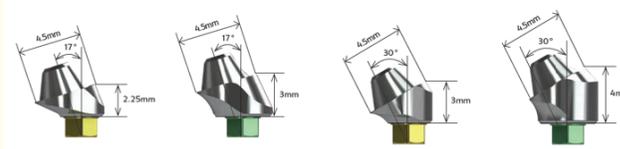


Figure 4: Bio horizons® angled abutments.

Straumann

The Straumann® Angled Solutions (AS) offer flexible treatment options for a wide variety of indications in the anterior and posterior zones and offers the choice of either a conventional or digital design. They allow to tilt the screw channel of restorations by up to 30°, so that the screw-exit is located in its ideal position for esthetic and functional results (Figure 5). For ease of use, the AS screwdriver maintains the same self-retaining feature of the standard Straumann® screwdrivers. The Straumann® conical screw connection and insertion torque of 35Ncm provides the restoration with strong retentive power.



Figure 5: Straumann® angled abutments.

Dio

DIO’s quality angled abutments are ideal for standard or customised prosthetic fabrication. They secure a tapered connection. These are aesthetically designed with a gold colouring and are available as Torx® or 30 degree Torx® options (Figure 6).



Figure 6: Dio® angled abutments.

Discussion

The position of the implants placed, determines the esthetics of implant-supported restorations [12]. Particularly, when the prosthetic choice is screw-retained crowns, the surgeon should bring to the attention, the inclination of the implant fixture accordingly while planning the surgical procedure. This issue is usually not encountered with posterior implants, as they are positioned more axially in relation to the alveolus and tooth. However, it is problematic with anterior teeth as the implants need to be inclined lingually to allow screw emergence through the cingulum area of the restoration [3]. The clinician needs to evaluate the angulation of the ridge before placing the implant.

Ideally, when multiple implants are placed they should be parallel to each other and to adjacent teeth and should be aligned vertically with axial forces. However, achieving this may not be possible when there are deficiencies in the ridge’s anatomy. To compensate for ridge topography that is less than ideal or unfavourable, the clinician can follow several scenarios to result in successful placement of implants. These scenarios include performing a grafting procedure, changing the intended location of an implant or insert an implant with an angled trajectory. The latter technique proves to be the best as it provides a variety of advantages like a facilitated placement of an implant with greater dimensions in width and height, avoiding any additional grafting or guided bone regeneration (GBR) procedures and allowing circumferential insertion of implants into bone [10].

Studies have concluded there were no statistical significant differences between axial and tilted groups regarding clinical implant and prosthesis outcomes, including survival rates, biological and mechanical complications, no excess bone loss, peri-implant marginal bone resorption, pocket depth, bleeding index and gingival index. Researchers have tried to analyze stress/strain distributions generated from angled abutments with different analytical techniques [4]. It is only know that stresses and strains increase as the abutment angulation increases but there is no general consensus about how much stresses/strains increase with regard to the unit increase in abutment angulation. Therefore, this method of using angled abutments is a best proven solution for off-angled implants.

Conclusion

A variety of angled abutments are available commercially with various angles facilitating tilting of implant trajectory. Clinician can choose amongst these wide range of products and select the one which best suits the case and provide a graftless solution as well as avoid the cons of cemented crowns and have the advantages of screw-retained abutments during placement of off-angled implants.

Bibliography

1. Kumar L. “Biomechanics and clinical implications of complete edentulous state”. *Journal of Clinical Gerontology* 5 (2014): 101-104.
2. Shadid R and Sadaqa N. “A comparison between screw-and cement-retained implant prostheses. A literature review”. *The Journal of Oral Implantology* 38 (2012): 298-307.

3. Assaf M and Gharbyeh AZA. "Screw-retained crown restorations of single implants: A step-by-step clinical guide". *European Journal of Dentistry* 8 (2014): 563-570.
4. Sailer I, et al. "Cemented and screw-retained implant reconstructions: A systematic review of the survival and complication rates". *Clinical Oral Implants Research* 23 (2012): 163-201.
5. Ahmad M., et al. "Replacement of missing anterior tooth using screw retained implant prosthesis in the esthetic zone: A case report with 3 years of follow up". *The Journal of the Indian Prosthodontic Society* 14 (2014): 297-300.
6. Ramasamy M., et al. "Implant surgical guides: From the past to the present". *Journal of Pharmacy and Bioallied Sciences* 5 (2013): S98-102.
7. Grunder U., et al. "Influence of the 3-D bone-to-implant relationship on esthetics". *International Journal of Periodontics and Restorative Dentistry* 25 (2005): 113-119.
8. Tarnow DP, et al. "The effect of inter-implant distance on the height of inter-implant bone crest". *Journal of Periodontology* 71 (2000): 546-549.
9. Balshi TJ, et al. "Three-year evaluation of Branemark implants connected to angulated abutments". *The International Journal of Oral and Maxillofacial Implants* 12 (1997): 52-58.
10. Sethi A., et al. "The use of angulated abutments in implant dentistry: five-year clinical results of an ongoing prospective study". *The International Journal of Oral and Maxillofacial Implants* 15 (2000): 801-810.
11. Nakka C., et al. "Graftless solution for multiple unfavorably placed implants using dynamic abutment® solutions: A case report with a 3-year follow-up". *The Journal of the Indian Prosthodontic Society* 20 (2020): 331-334.
12. Martin WC., et al. "The influence of restorative procedures on esthetic outcomes in implant dentistry: A systematic review". *The International Journal of Oral and Maxillofacial Implants* 29 (2014): 142-154.

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