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CODED HEALING ABUTMENTS IN IMPLANT DENTISTRY: A REVIEW

Dental Science

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KEYWORDS

Accurate impressions for a final cast, which will be used to build the prosthesis, are one of the most important processes in the long-term success of implant restorations. [1] Implant depth, angulation, and location all have an impact on impression accuracy, which in turn affects how well implant-supported prostheses fit. [2,3] Implant mismatch can result in biological and mechanical issues, including failure, since implants are functionally ankylosed, which makes the implant-bone contact weak. [4,5]

Accurate definitive castings have been produced using various impression methods and materials, guaranteeing a suitable prosthesis. It is unknown, therefore, how accurate traditional imprint methods are and how tray type affects impression accuracy. [5–8]

Intraoral scanners (IOS) can now create digital imprints, but they are not yet able to scan implants at the fixture level beneath the peri-implant mucosa. Making an imprint of the implant directly on the healing abutments would simplify the process, shorten treatment times, and preserve the soft tissue seal. To enable scanning techniques, a "photogrammetric coping" [9] or digitally coded [10–12] must be developed. To achieve this, a digitally coded healing abutment that includes all the information required for the implant restorative platform, hex position, and healing abutment collar height has been introduced. Pilot studies have shown that this is adequate for transferring all the information required for the implant platform and position to the working cast. [10–12]

By scanning a stone cast (made by a silicone impression of the Encode abutments), a robot that employs a bur to remove the stone duplicates of the healing abutment and places an implant analogue of the appropriate diameter in the appropriate location within the working cast can obtain the digitalized information of implant diameter and position. As a result, installing the digitally coded healing abutment may only need one step in the future when digital impressions and intraoral scanning technologies are used. [9]

By employing an indirect digital process that involves laboratory scanning of the stone cast following a definitive imprint, advancements in computer-aided design and computer-aided manufacturing (CAD-CAM) have made it possible to fabricate precise implant-supported restorations. [13,14]

Coded healing abutments (CHAs) are essentially a three-in-one device for digital implant impressions, combining a healing abutment, scan body, and impression coping into a single digitally coded healing abutment. [15]

According to the manufacturers, the CHA may be used in two ways. A direct digital intraoral scan may be obtained, namely by scanning over the coded healing abutment without removing it. An intraoral elastomeric impression of the CHA is obtained instead, and a final cast is made.

Intraoral scan bodies (ISBs) have been manufactured from a variety of materials and sold in a range of sizes and forms in recent years. [16] Certain scanned bodies require specialized scanners, while others may be utilized with a variety of scanners, and their data may be processed using various CAD-CAM systems. [16]

The accuracy of measuring the scan bodies' dimensions about various surface geometries and dimensions is not well documented in the literature. [17, 18] Furthermore, the majority of the studies have investigated scan bodies of a single size, even though digital scans and traditional impressions have been compared, the correctness of restorations created from both, and the precision and accuracy of intraoral scanners have all been assessed. [19,20,21]

There are several inherent limits to the scannable healing abutment concept. On the one hand, the abutments must be glossy and smooth to promote clean and healthy peri-implant tissues throughout the healing process. On the other hand, they should ideally be low enough to be worn beneath a temporary detachable prosthesis. However, to accurately scan the implant's insertion angle, they must be the exact opposite for scanning, meaning they must be as high as feasible. Additionally, they ought to be everything but smooth and glossy; ideally, they should be multi angular, with rough edges and a highly contoured surface.

In certain cases, one of the potential advantages of the encoded abutment was lost when it became necessary to remove the abutments and replace them with a higher kind just for scanning. Since this is an essential component of the workflow of the specific scanner that was employed, it was determined that powdering the abutment surface before scanning was unavoidable. However, it turned out to be a very technique-sensitive step that required expertise and training.

The inaccuracy of fit might be caused by several procedural factors. The first is the component of the implant, particularly in multi-unit restorations with customized and angled abutments. Either the data collection or the data processing might be the source of inaccuracy in a digital workflow. When there is not enough topographic information available, the scanner software has trouble merging the several pictures, which is an inevitable part of this kind of therapy. Intraoral scanners are known to have trouble with accuracy in edentulous regions.

Additionally, the scan abutments' rounded, glossy surfaces provide the scanner software little direction. It is believed that the inaccuracy in marginal adaptation stems from the data collecting stage, as the other steps of the process are sufficiently accurate. More investigation into creating new intraoral scanner generations should be conducted on this. [22–26]

CONCLUSION

For implant-supported prostheses to be passive, impression accuracy is crucial, particularly when several implant units have different angulations. In circumstances involving many implant units, it is advised to employ CHA with IOS rather than elastomeric impressions of CHA. When employing CHAs for multiple unit situations, it is important to carefully evaluate the visibility of the CHA, especially in cases with angulated implants. When adopting digital impression techniques, clinicians should also be aware of elements that might impair an IOS system's accuracy. When employed with IOS, the accuracy of CHAs and ISBs is comparable. Recent years have seen a rise in the usage of ISBs and CHAs with IOS, and it's critical to acknowledge how digital implant prosthodontics is developing.

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