Redesign of a fixture mount to be used as an impression coping and a provisional abutment as well

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Abstract

Purpose: An integrated fixture mount/impression coping/temporary abutment can provide many advantages for immediate loading of dental implants, such as simpler procedure, less chair time, cost reduction, and comfort for the patients. Materials and Methods: A newly designed dental implant fixture mount (DIFMA) can be used as an impression coping for taking an immediate impression. An immediate load provisional prosthesis can then be fabricated shortly after implant placement to immediately load the implants. This fixture mount can also serve as a temporary abutment for immediate chair-side fabrication of provisional prosthesis. Two clinical cases are presented. Results: A clinical case utilizing the fixture mount abutment (DIFMA)/implant assembly is presented. The precision of fitting between the impression copings and implants is secured with this system. The chair time for taking an immediate impression is greatly reduced. Less cost for the restoration is provided and patient comfort is delivered. Conclusions: More patient satisfaction can be conferred by employing the fixture mount in the process of immediate impression taking and as an immediate provisional abutment.

Keywords: Fixture mount, impression coping, implant, immediate load, provisional abutment

Introduction

Immediate endosseous implantation into fresh extraction sockets was not well accepted until 15 years of research and clinical practice were published. Schwartz-Arad and Chaushu stated in their review article that today, the dilemma is no longer when, but which protocol to follow for immediate placement of dental implants. Another significant exploration in the history of implant dentistry is the attempt to immediately load dental implants and the success of all-on-4 technique by Paulo Malo has been widely employed today for proven patient satisfaction and function.

However, several problems exist for immediate loading the dental implants. In order to immediately load the implants, fabrication of an immediate temporary prosthesis is necessary. Therefore, impression copings need to be attached onto implants shortly after implant placement in order to take the impressions. Clinicians often encounter difficulties in taking immediate impressions right after implant placement. Factors such as bleeding during surgery and the difficulty to seat the coping completely with soft tissue and/or bone interference can significantly reduce the accuracy of impression taking. Extra chair time for taking radiographs to confirm the complete seating of impression copings is also required, which may further exhausts the patient and cause more discomfort.

Therefore, there is a need to modify the implant fixture mount design so it can be used as an impression coping and also a temporary abutment. This modification provides several advantages. A modified preassembled fixture mount/impression coping/temporary abutment, which has been readily attached to the implant before packaging or before implant placement, therefore, can greatly reduce the chair time and guarantee the precision of the interface. In addition, there is no need to purchase a separate impression coping or a temporary abutment and the cost of restorations can be reduced, which also benefits the patients.

The first report of using an implant fixture mount as an impression coping was described by McCarthy and Morgan in 1995. The unmodified fixture mount was used as a transfer coping or prepared on a lathe to mimic the elastomeric impression coping, after shortening and slotting the retention screw. With further modification, the fixture mount could also be used as a temporary abutment for provisional prosthesis. Papazian and Morgano employed a disposable implant mount for use as positional index for an immediate provisional restoration, temporary implant abutment, verification jig,
and implant-supported record base.\textsuperscript{46} Ganddini \textit{et al.} later listed seven uses for an implant carrier/fixture mount: as (1) a surgical guide, (2) a positional index at stage I surgery, (3) an impression coping for the open or closed tray technique, (4) a verification device to verify the position of multiple implants after the definitive cast is fabricated, (5) a provisional abutment, (6) an aid for an implant-supported record base and (7) an occlusal registration stop.\textsuperscript{53}

The implant/fixture mount abutment system specifically designed for the purpose of immediate implant placement and immediate impression taking was proposed by Hung and Kim in 2009. The new design employs several modern concepts in order not only to enhance the primary stability but also to provide multiple applications of an implant fixture mount. With the new designed fixture mount/impression coping/temporary abutment, the clinician can take an immediate final impression right after implant placement. A cast can then be immediately poured for wax-up and a screw-retained/cement retained provisional prosthesis is fabricated and delivered within the same day or in couple of days. Alternatively, an acrylic shell can be fabricated before the surgery and a provisional prosthesis fabricated and placed on the modified temporary abutment at chair side right after implant placement.

This case report describes a clinical case utilizing the newly designed fixture mount abutment as well as discusses the advantages and disadvantages of this system.

\textbf{Materials and Methods}

The implant system described in this report is a new implant/fixture mount abutment assembly (AIDI Biomedical), which is designed to facilitate immediate implant loading by: (1) supporting immediate impression taking, especially with multiple implants, (2) providing precise fitting between the impression coping and the implant with the coping preassembled with the implant or attached to the implant before implant placement and (3) providing a provisional abutment (three-in-one design).

Description of the modified fixture mount/impression coping/temporary abutment assembly (three-in-one design)

- Dental implant fixture mount abutment (DIFMA, AIDI Biomedical): The DIFMA comprises [Figure 1] (1) a male connector for endomaxim connection to the implant, (2) a temporary abutment portion at the bottom with two flat facets, (3) a 2-mm coronal extension/metal collar delineated from the abutment portion by a circumferential groove, (4) and an internal hex (pentagonal, square, or triangular) slot which receives an implant driver.
- Abutment screw: Connects the DIFMA to the implant [Figure 2].
- Ball impression screw [Figure 3]: Is used to attach the DIFMA to the implant, also provides additional retentive features for the DIFMA to serve as an impression coping.
- The retentive features on the assembly to serve as an impression coping come from the two flat facets, the circumferential groove between the abutment portion and the 2-mm extension, a circumferential notch formed at the junction of the ball impression screw and the DIFMA, and a circumferential groove on the head of the ball impression screw [Figure 4].
- Implant-DIFMA package [Figure 5]: The IDI implant is prepackaged as an implant-DIFMA assembly. The implant-DIFMA is carried and placed into the osteotomy site with a hex implant driver. The hex implant driver bears an O-ring on its head, which is inserted into the hex slot of DIFMA.

\textbf{Clinical procedure}

The newly developed dental implant fixture mount abutment can be used as an impression coping when coupled with a ball impression screw, which is designed for closed tray technique. The lower portion of the DIFMA can also serve as a temporary abutment after the upper portion of the DIFMA is removed by a lab disk.

Figure 6 illustrates the implant placement procedure. The intended implant sites or a fresh extraction socket is prepared with twist drills [Figure 6]. Implant-DIFMA is carried with a hex implant driver attached to the fixture mount [Figure 6] and inserted into the prepared alveolar bone or extraction socket. It is recommended to torque the implant to 45-70 Ncm to ensure good primary stability. After insertion of the implant, the abutment screw is replaced with the ball impression screw and the immediate impression is taken using closed tray technique [Figure 7]. The DIFMA and ball impression screw are then removed from the implant, attached to an implant analog, and inserted into the impression before a cast is poured.

If a cement-retained immediate provisional prosthesis is planned, the top 2-mm portion of the DIFMA, delineated from the bottom abutment portion with a circumferential groove, can be removed by a lab disk. The remaining abutment portion of the DIFMA provides a finishing margin ready for chair-side fabrication of a provisional prosthesis with an acrylic shell.

\textbf{Case presentation}

\textbf{Case I}

A male patient, age 56, was admitted with bouncing pain at #13 and pupitis of #17 due to a recurrent decay [Figures 8 and 9]. Clinical findings revealed fractures at #13 with poor prognosis. #17 was an abutment for fixed partial denture from #17 to #20. After consultation and treatment option given, patient elected to have #13 and #17 to be extracted and three implants were immediately placed at #s 13, 17 and 18 positions (4.3x10.5 mm, 5.0x8.8 mm, 4.3x10.5 mm, respectively) (AIDI Biomdedicals). The final torque for implant #13 was 70 Ncm, for #17 was 70 Ncm, and for #18 was 70 Ncm. Immediately after implant placement, final impressions were taken using the implant fixture mounts as...
impression copings [Figures 10 and 11]. Healing abutments were placed. A single screw-retained restoration for #13 was delivered 1 week later and a splinted screw-retained restoration for #17 and #18 was fabricated and delivered in 3 weeks [Figures 12-14]. One-week postdelivery check revealed good stability of all three dental implants and restorations.

**Case II**

A 66-year-old male patient presented with a missing tooth of #31 with healed socket. Two pieces of 3.5×10.5 mm implants (IDI Biomedical) were placed. The final torque for both implants exceeded 50 Ncm. Ball screws were used to secure the fixture mount abutment [Figure 15] and a PVS impression was made immediately after implant placement [Figure 16]. A definitive restoration was delivered about 3 week later [Figure 17]. The postdelivery check revealed good stability and patient was very satisfied with the result.

**Discussion**

The development of immediate load of dental implants is derived from the need of early satisfactory aesthetics and
function for the patients, which cannot be delivered by the use of removable dentures or with no restorations during the healing period of postimplantation. The predictable success of immediate load of all-on-4 prosthesis has been demonstrated by Paulo Malo. Observation on immediately loaded implant revealed faster increase of implant stability and less marginal bone loss (Ostman et al.) Studies compared early or immediately loaded implants and traditional submerged implants placed in complete edentulous mandible and maxilla, partially edentulous mandible and maxilla, and as single implants have shown comparative or better results with immediately loaded implants. For complete edentulous mandible and maxilla, when implants were rigidly splinted together to afford an early/immediately loaded fixed or
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removable provisional restoration (Chow et al.,[7] Aalam et al.,[8] Testori et al.,[9] Bergkvist et al.[10] Ibanez et al.[11] Degidi et al.[12]), implant success rates were found to be comparable to those of implants placed submerged (85.7-100%). Implants loaded early or immediately in partial edentulous mandible and maxilla also showed encouraging results with implant survival rate ranging from 90% to 100% with 1-4 years of follow-up (Machtei et al.,[13] Roccuzzo et al.[14]).
In order to immediately load dental implants, an immediate impression is required to fabricate a provisional prosthesis shortly after implant placement. Traditionally, impression copings need to be inserted onto implants at the time of placement surgery before taking the immediate impression. Problems exist when access to the implant shoulder is obscured by bloody surgical field or obstructed by collapsed gingiva or alveolar bone on top of the implant. In addition, the complete seating of each impression coping on top of the implant needs to be confirmed by radiograph before impression taking. All of these cost clinician extra chair time and more discomfort for the patient. Therefore, a proposed modification of an implant fixture mount, which is attached to the implant before placement, to be used as an impression coping and even a temporary abutment is appealing.

Early attempts of modification of an implant fixture mount provided the convenience and function of a completely seated impression coping, however, did present some problems or disadvantages. The unmodified fixture mount reported by McCarthy and Morgan did not provide sufficient retentive features as an impression coping[1]. On the other hand, the modified version of the same fixture mount had to be prepared on a lathe and the retention screw needed to be shortened and slotted, in which the fixture mount had to be removed from the implant and therefore did not provide the advantage of an readily seated impression coping. The first unmodified fixture mount which was suitable to be used as an impression coping was reported by Ganddini and Schejtman et al.[2]. However, this particular fixture mount could not be used as a temporary abutment.

In contrast, the DIFMA is specifically designed for immediate impression taking. DIFMA, when unmodified and with the exchange of an abutment screw with a ball screw while leaving the fixture mount still seating on the implant, provides sufficient retentive features as an impression coping. This seemingly simple concept provides a predictable fit between the impression coping and the implant, excluding the troubles of finding the implant in a bloody surgical field, taking verification radiographs, as well as the need of using a scalpel or a chisel to remove collapsed gingival tissue or alveolar bone onto the implant shoulder. Furthermore, with a very simple modification by separating the top 2-mm collar from the bottom portion with a lab disk, the DIFMA can be used as a provisional abutment with a readily incorporated finishing margin and eliminates the need to purchase a separate provisional abutment. Therefore, DIFMA provides several advantages over a regular fixture mount and an impression coping, which include less office visits, simpler procedure, less chair time, convenience and comfort, and cost reduction.

Conclusions

The three-in-one design of DIFMA is a novel concept of reducing the cost of implant restoration as well as providing support for immediate loading of dental implants. In conclusion, with a specially designed fixture mount, more patient satisfaction can be delivered by employing the fixture mount in the process of immediate impression taking and/or as an immediate provisional abutment.

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