A Clinical Report on the Use of Closed-Tray, Hex-Lock-Friction-Fit Implant Impression Copings

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The precision of an impression determines the subsequent accuracy and fit of the final restoration. Therefore, the ultimate search is for the most accurate impression material and the most efficient and least time consuming technique. One of the major debates in implant dentistry has focused on the advantages of the pick-up versus the transfer impression technique. The pick-up technique is widely accepted as the more accurate. However, the conventional transfer technique is simpler and less time consuming. The Hex-Lock-Friction-Fit impression coping (AB Dental Devices) combines the advantages of the transfer impression technique and the pick-up impression technique. In this article we will review the relevant literature, discuss the advantages of this unique implant impression technique, and present some related clinical cases.

Key Words: implants, impression, transfer coping

INTRODUCTION

Biomedical engineering in the field of dental implants has undergone a drastic improvement in the past decade. As a result of advanced modern technologies, dental implants now have an exceptionally high success rate and can be said to last indefinitely.[1] Advances include the development of the friction-fit abutment, which completely eliminates any micromovement of the abutment.[2] There are now even one-piece implants that eliminate the implant-abutment interface and the need for a healing abutment altogether.[3] However, despite all of these advances, the success of any dental implant restoration still relies on a primary step of the treatment process: the impression. A dental impression is a negative imprint of an oral structure used to produce a positive replica of the structure for use as a permanent record or to produce a dental restoration or prosthesis.[4]

Traditionally, dentists have had to choose between 2 accepted techniques for implant impression taking: the pick-up open-tray technique or the transfer closed-tray technique. In choosing one over the other they have had to accept the weaknesses along with the strengths of the chosen technique.

Practitioners continue to seek a technique that produces the most accurate results but is also efficient and easy to use. Impression accuracy has been tested by changing the impression material, by splinting or not splinting the impression copings, and by using transfer-type versus pick-up type impression copings.[5] A transfer-type impression technique involves a closed tray and impression copings that are connected to the implants. When the impression is removed from the mouth, the copings remain intraorally. They are then removed and connected to the implant analogs; the coping-analog assembly is then placed in the impression.[6,7] A pick-up impression technique traditionally uses an open tray. Before removing the impression, the copings are unscrewed from the implants and removed, together with the impression from the

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DOI: 10.1563/AAID-JOI-D-11-00056

mouth. The implant analogs are then attached to the copings while they are embedded in the impression tray.[6,7]

The pick-up impression technique is believed to be more accurate because the impression copings are maintained within the impression when removed from the mouth, thus eliminating the potential for error when manually placed in the impression.[5–11] However, in certain situations it is not possible to use the open-tray technique, for example, in posterior segments with limited intermaxillary space or when there is limited mouth opening (ie, progressive systemic sclerosis and microstomia). This technique is also beneficial in patients with exaggerated gag reflexes, when the impression has to be removed as soon as possible.[7] There are other known advantages to using the transfer technique, even when not necessitated by the aforementioned factors.[12,13] It is less time consuming because no modifications are required to the impression tray, and the copings do not need to be unscrewed from the implants.

Over the past 20 years most of the literature on implant impression techniques has focused on comparing these 2 methods, in addition to debating splinting versus nonsplinting of the impression copings and using polyether versus vinylpolysiloxane impression material.[5] Most authors conclude that the direct technique is more accurate than the transfer technique.[5–11] Carr,[7] Barrett et al,[9] and Assif et al[10]were among the first to demonstrate this in the 1990s, while more recently Del'Acqua et al[11] and Lee et al[12] confirmed these findings. Among the early investigators, Humphries et al[13] and Burawi et al[14] found that the transfer technique was more accurate, whereas in another of his publications Carr[15] found that there was no significant difference between the 2 techniques. Contributing to the ongoing controversy, Herbst et al[16] and Wenz and Hertrampf,[17] as recently as 2000 and 2008, respectively, found no significant difference between the 2 techniques. In 2007, Cabral and Guedes[18] introduced the added step of sectioning the acrylic splints used to connect the impression copings and re-welding them after setting. This was to account for the distortion caused by acrylic resin shrinkage earlier described by Inturregui et al[19] and Phillips et al[20] in the early 1990s. The significance of this shrinkage was confirmed by Mojon et al,[21] who showed that 80% of resin shrinkage occurs in the first 17 minutes and ends only after 24 hours. Overall, the systematic review by Lee et al[6] of the relevant literature from 1980 to 2008 concluded that, "For situations in which there were 3 or fewer implants, most studies showed no difference between the pick-up and transfer techniques, whereas for 4 or more implants, more studies showed higher accuracy with the pick-up technique."

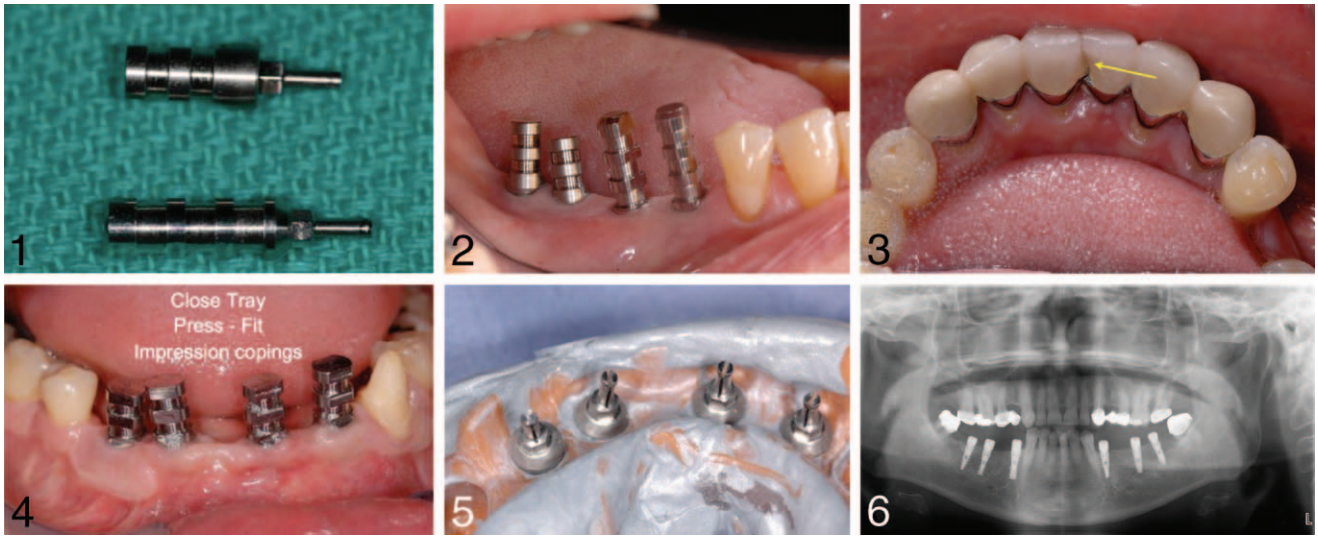
The objective of this article is to introduce an impression technique that uses a particular coping that combines the technical benefits of the pick-up technique with the convenience and efficiency of the closed-tray technique: the Hex-Lock-Friction-Fit impression coping (AB Dental Devices, Nir Galim, Israel) (Figures 1 and 2).

Case Series

Patient 1

A 46-year-old white woman presented with nonsignificant medical findings; she had no allergies and was taking oral contraceptives. She presented with a solder joint fracture on porcelain fused to metal (PFM) fixed partial denture (FPD), teeth number 43-42-X-31-32-33 (Figure 3), secondary caries on tooth 43, generalized advanced periodontitis, and periapical radiolucency on tooth 43. Treatment options were discussed with the patient, and a final treatment plan was agreed on. The FPD on teeth 43, 31, 32, and 33 was initially removed, and teeth 44, 43, 42, 31, and 32 were extracted. An immediate acrylic lower removable partial denture (RPD) was inserted and adjusted. 10 weeks later, 4 nonsubmerged endosseous implants were placed in sites 32, 41, 43, and 44 (AB Dental Devices). Because excellent primary stability was achieved, a single-stage protocol was followed, and healing abutments were attached. A provisional crown was placed on tooth number 33. A postoperative prescription of amoxicillin 500 mg, ibuprofen 400 mg, and 0.12% chlorhexidine mouth rinse was prescribed.

One-week follow-up showed good healing and evidence of good oral hygiene. Ten weeks later a final polyvinylsiloxane, heavy and light body (Affinis Precious, Coltene/Whaledent, Cuyahoga Falls, Ohio) impression for the implant-retained PFM FPD was taken using closed-tray Hex-Lock-Friction-Fit impression copings (Figures 4 and 5). The final



Figures 1–6. Figure 1. Hex-Lock-Friction-Fit impression copings demonstrating the wide and standard platforms at different lengths (AB Dental Devices). **Figure 2.** Intraoral view of the 2 lengths of Hex-Lock-Friction-Fit impression copings (AB Dental Devices). **Figure 3.** Occlusal view of pretreatment porcelain fused to metal fixed partial denture. Note the solder joint fracture between teeth 31 and 41. **Figure 4.** Short-length Hex-Lock-Friction-Fit impression copings in place. **Figure 5.** Short-length Hex-Lock-Friction-Fit impression copings in place. **Figure 6.** Panoramic radiograph after placement of the 6 endosseous implants.

restoration consisted of a cement-retained PFM FPD 32-X-41-X-43-44 and a single PFM crown on 33.

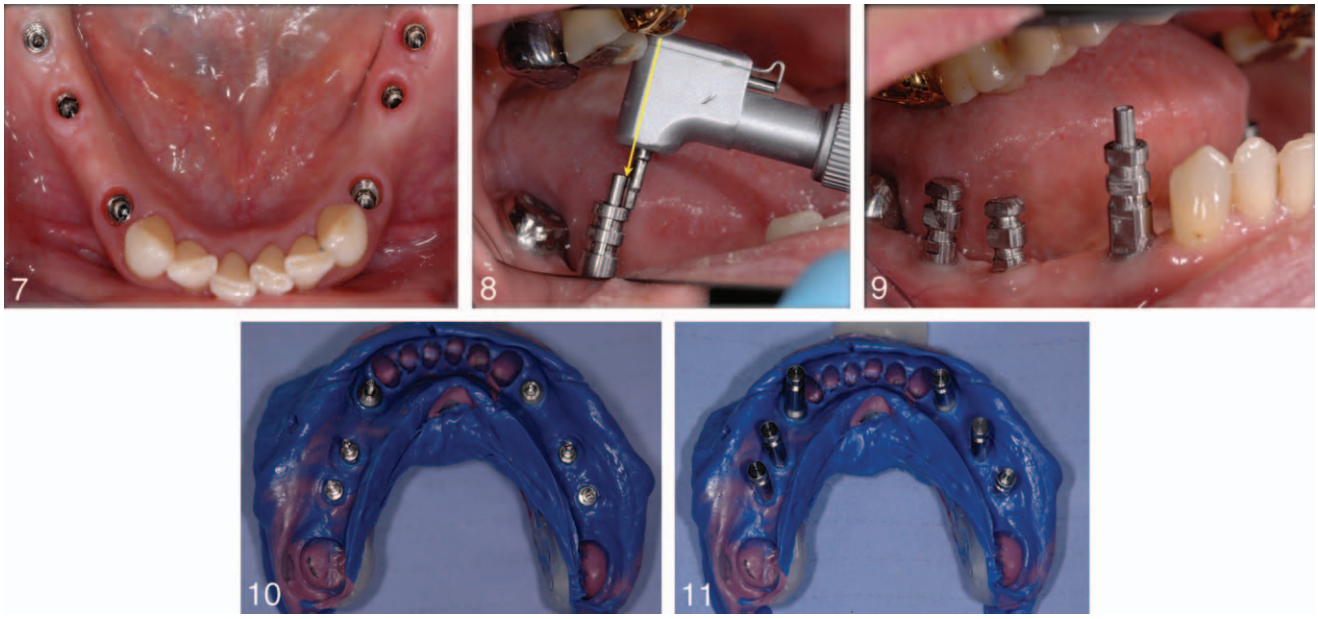
Patient 2

A 56-year-old white woman presented with nonsignificant medical findings except for low thyroid levels, for which she was taking levothyroxin. Her dental assessment revealed partial edentulsim and failing bilateral mandibular PFM FPD on teeth 34-X-X-X-38 and 44-45-X-X-48. After discussing treatment options with the patient, a treatment plan was agreed on. The PFM FPDs were sectioned mesial to 38 and 48, and teeth 44, 45, and 34 were extracted due to recurrent caries. An immediate provisional RPD was inserted and modified as needed. Ten weeks following the extractions, the patient was sent for a cone beam computerized tomography scan. About 3 weeks later, 6 nonsubmerged endosseous implants (AB Dental Devices) were placed following the single-stage protocol, replacing roots 34, 36, and 37 and roots 44, 46, and 47 (Figure 6). A postoperative prescription of amoxicillin 500 mg, ibuprofen 400 mg, and 0.12% chlorhexidine rinse was provided. At the 2-week follow-up, the RPD was relined again; the follow-up showed good healing and evidence of good oral hygiene. Ten weeks later, the final impression was taken using a combination of closed-tray Hex-Lock-Friction-Fit impression copings (AB Dental Devices) and conventional open-tray impression transfers. Polyether heavy-body (Impregum) and light-body (Permadyne) impression materials were used (3M-ESPE-Pentamix, Seefeld, Germany) (Figures 7 through 11). The final restoration consisted of a combination of screw- and cement-retained PFM FPD 34-X-36-37 and 44-X-46-47. Because of patient parafunctional muscle activity, a night guard was prescribed and inserted.

Discussion

The Hex-Lock-Friction-Fit impression coping is designed with a tightly fitting interface that is stable enough to remain in the implant while an impression is taken but is not so secured as to be removed with the impression after the impression material has set. This allows for the use of the closed-tray technique without the need to modify the tray or screw in the copings.

The pick-up technique has been found to be the more accurate and reliable approach, but it is also more time consuming and has limitations with reduced interocclusal space. It has also been noted



Figures 7–11. Figure 7. Intraoral view showing the healing after 10 weeks. Patient is ready for impression. **Figure 8.** Demonstration of the limitation of using a conventional pick-up impression coping in the posterior segment in this case. **Figure 9.** Right-side view of q conventional pick-up impression coping and 2 short-length Hex-Lock-Friction-Fit impression copings. **Figure 10.** Closed-tray pick-up impression of the Hex-Lock-Friction-Fit impression copings. **Figure 11.** Closed-tray pick-up impression showing the attachment of the implant analogues in place.

that the transfer technique is simpler, is more efficient, and can be used in situations of reduced interocclusal space. There has been little research into the new impression technique using the Hex-Lock-Friction-Fit impression coping described here. This article introduces the clinician to this impression technique, which combines the benefits of the 2 traditional techniques.

Summary

Given this new opportunity presented by the Hex-Lock-Friction-Fit impression coping to combine the simplicity and ease of the transfer technique with the greater accuracy of the pick-up technique, the clinician can now avoid the controversy and obtain simple, efficient, and consistently reliable implant impression results.

Future research should be focused on the indications for this new technique. The authors believe that in the case of multiple implants, where there is more than 15° between implants, these transfer copings cannot be used predictably. Also to be explored is whether splinting will make a clinically significant difference with respect to this new technique.

Abbreviations

FPD: fixed partial denture
PFM: porcelain fused to metal

Acknowledgment

The authors would like to thank AB Dental devices for their support.

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