

IMPRESSION TECHNIQUES IN DENTAL IMPLANTOLOGY

Sparsh Garg¹, Rajani. A Dable², Akash Gopi³, Siddarth Shukla⁴, Sakshi Saxena⁵

Post Graduate Student^{1,4,5}, Professor & Head², Senior Lecturer⁴

1-5 - Department of Prosthodontics and Crown & Bridge, Teerthanker Mahaveer Dental College and Research Centre, Moradabad

Abstract

The use of implants is an accepted and predictable clinical method to treat partially edentulous patients. The long term success of the implant prosthesis is highly dependable on the passive fit of the prosthesis and the accurate impression technique. Elastomeric impression materials are the material of choice for the impression. Polyvinyl siloxane and polyether are widely used. Different impression techniques require different armamentarium and have their own advantages and disadvantages. Two primary impression techniques comprises of the open tray technique and closed tray technique. Although, the technique should be selected according to the individual case. However impression technique selected should depend on the skill of the clinician. Finally accurate impression procedure to produce passively fitting implant prosthesis will ensure long term success of implant restoration.

Key words: Implant prosthesis, Passive fit, Accurate impression, Open-tray and closed tray techniques.

Introduction

The use of implants is an accepted and predictable clinical method to treat partially edentulous patients. The long term success of implants depends on its osseointegration and the inactive fit of the prosthesis. Osseointegration is a multifactorial, depending on precision of surgical and restorative techniques, soft tissue management, along with the general and oral health of the patient.^{1,2} As implants are in direct contact to the bone they lack the inborn mobility of the periodontal ligament hence they cannot lodge distortion or misfit at the implant–abutment interface.³ Long term clinical success of implant supported prosthesis is depended on passive fit. The misfit of the prosthesis may lead to complications such as screw loosening, screw fracture, occlusal discrepancies, increased plaque accumulation, resulting in loss of osseointegration and implant fracture.⁴

A high standard of fit is required because of the unique implant/bone relationship and is considered critical to the long-term success of prosthesis. The use of a dimensionally accurate impression material is the most critical factor, for achieving the passive frame work fit.⁵ Therefore; impression making and reciprocating three-dimensional (3D) position of implant to the working model should be precise.

Impression materials

A primary concern when dealing with the impression restorations is accurate transfer of the relationship of the implant and /or any remaining dentition to the master cast. Several impression modalities are available in implant prosthodontics. The implant analog or the abutments analog may be transferred to the master cast. An impression may be made of the prepared implant abutments and these are reproduced in the master cast each of these options require careful consideration in the choice of the impression material and the technique used.⁶

An elastomeric impression material is the material of choice for the impression. Most widely used and shown to be the most appropriate are polyether and polyvinyl siloxane impression materials as they are resilient

enough to spring out of the undercuts and stiff enough to allow for accurate seating of the components in to the impression.^{7,8}

Components

The long term success, function and aesthetics of an implant restoration are dependent on the proper treatment planning and through knowledge of components and instrumentation.⁹ The components consist of drivers, healing abutments, lab analogues and impression copings (Figure 1). Drivers are designed to take different types of components of implant to the mouth for easier placement and removal. The driver head can be of different design, it can be square, hexagonal and abutment driver and contra-angle torque driver.¹⁰ Healing abutments are also available in different heights and diameters which are selected based on clinical situations. Laboratory analogue are used in the fabrication of the master cast to replicate the retentive portion of the implant body or abutment. Impression copings are used to register the position of the dental implant or dental implant abutment relative to adjacent structures after the maturation of soft tissue.¹¹ These copings have the same flare as the healing abutments and should fully support the soft tissue around the head of the implant.⁵ There are different types of copings available for the different impression technique. In transfer type the coping is fixed on the implant when set impression is removed. In pick up type the coping gets integrated in the impression and it is removed from the mouth with the set impression.¹²

Abutments are components that alternate for missing coronal structure that will attach directly to the head of the implant and extend through the gingiva into the oral cavity. Abutment selection depends on many clinical factors and soft tissue maturation after second stage surgery.¹³

Additional considerations include the height of the lip line the occlusal scheme and position of the tooth in the arch. The abutment types are standard abutment, angulated abutments UCLA abutment (preparable abutments), provisional abutments, titanium abutments, ceramic abutments, prefabricated conical abutments and custom machined abutment.^{14, 15}

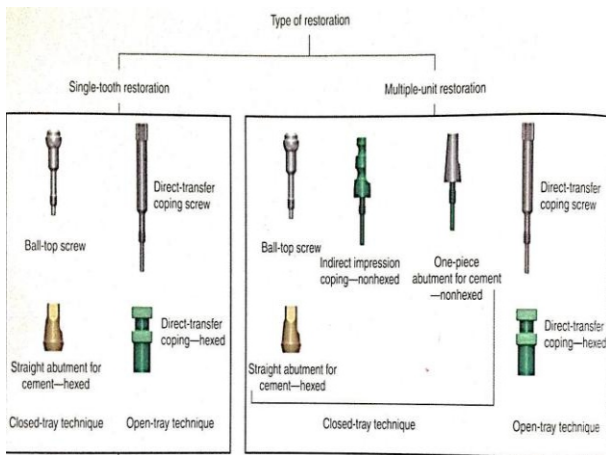


Figure 1: Components used in Impression procedure

Impression techniques

Several impression techniques have been advocated to achieve a definitive cast that will ensure the passive fit of prosthesis on osseointegrated implants (Figure 2).

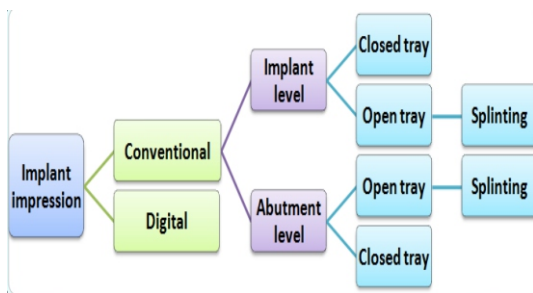


Figure 2: Different Techniques for Implant Technique

There are two primary techniques: The indirect (closed tray) technique and the direct (open tray) technique.¹⁸ The indirect technique may be less difficult clinically; however, it has been shown to have greater instability in transferring the implant position.¹⁹ In the direct technique, the impression coping lies within the impression. This reduces the effect of implant angulation, the deformation of the impression material upon recovery from mouth, and removes the concern for replacing the coping back into its respective space in the impression.²⁰ The direct technique may be carried out by using splinted or nonsplinted implant impression copings. Acrylic resin, pattern resin, plaster, composite can be chosen for splinting of impression copings.²¹

Closed-tray technique

In this impression technique, the transfer coping does not remain locked with the impression. This may be a two-piece coping (to capture the implant hexagon position), which uses a ball screw for retention, or it can also be a system using a cap impression that snaps on the implant abutment.²³ The cap remains attached to the impression and provides a secure orientation mechanism for the abutment, which is removed separately and reinserted in the cap/impression complex as shown in (Figure 3)

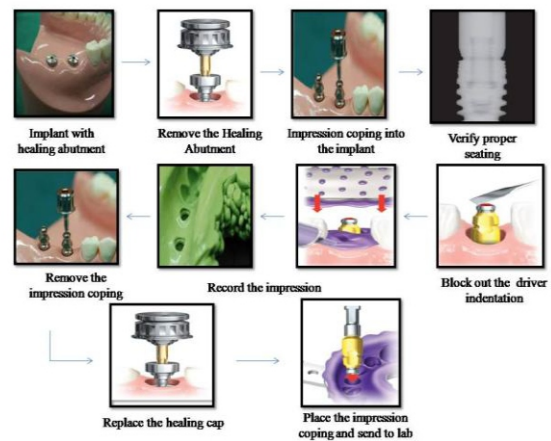


Figure 3: Step wise procedure for the closed tray impression technique

Advantages

1. Easier to perform.
2. Suitable for short inter arch distance.
3. Visual fastening of the analog to the coping is more accurate.
4. Special tray is not required.

Disadvantages

1. Replacing the coping back into its respective space.
2. Inaccuracies with recovery and subsequent deformation of impression material may be encountered with non-parallel implants.

Open tray technique When the impression transfer coping is designed with undercuts that lock into the impression, an open tray should be used to allow access to the fixation screw.²⁴ Once the impression has set it is unscrewed to liberate the impression-transfer coping complex as shown in (Figure 4)

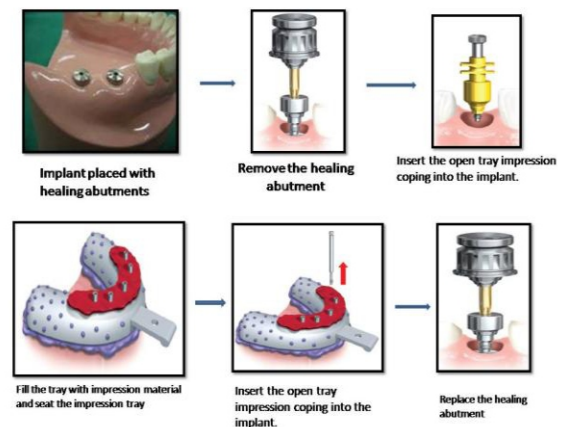


Figure 4: Step wise procedure for the open tray impression

Advantages of Open Tray technique

1. Reduces the effect of the implant angulations.
2. Reduces the deformation of the impression material.
3. Removes the concern for replacing the coping back into its respective space in the impression.

Disadvantage of Open Tray technique

1. The movement of impression copings inside the impression material during clinical and laboratory phases may cause inaccuracy in transferring the spatial position of implants from the oral cavity to the master cast.
2. Some rotational movement of the impression coping when securing the implant analog may occur.

Blind attachment of the implant analog to the impression coping may result in a misfit of components.

Conclusion

Impression is the most important step in the implant retained prosthesis as in any other prosthesis. The best and accurate impression will lead to the passive casting and accuracy in the prosthesis. Different techniques are available in the literature. No one technique is suitable for all the cases. Hence the technique should be selected according to the individual case. Impression material is also important.²⁵ However the type of the impression technique selected should depends on the skill of the clinician. Finally accurate impression procedure to produce passively fitting implant prosthesis will ensure long term success of implant restoration.²⁶

References

1. Sahin S, Cehreli MC. The significance of passive framework fit in implant prosthodontics: current status. *Implant Dentistry* 2001;10:85–92.
2. Yilam SK, Ozan O, Ozcelik TB, Yagiz A Digital evaluation of the accuracy of impression techniques and materials in angulated implants. *Journal of Dentistry* 42 (2014) 1553-1559
3. Papsyridakos P, Chen CJ, Galluci GO, et al Accuracy of Implant impressions for partially and completely edentulous patients. A systematic Review. *Int J of oral and maxilla facial implants* 2014;29:836-845.
4. Michael S.Block , John N kent , luis R. Guerra *Implants in Dentistry* W.B.Saunders Company Pg128.
5. Stuart. H. Jacobs And Brian C. O'Conenell Quintessence Publishing. *Dental Implant Restoration Principles and Procedures*.
6. Schaefer O, Schmidt M, Goebel R, Kuepper H. Qualitative and quantitative three-dimensional accuracy of a single tooth captured by elastomeric impression materials: an in vitro study. *Journal of Prosthetic Dentistry* 2012;108: 165–72.
7. Chee W, Jivraj S. Impression techniques for implant dentistry *British Dental Journal* Volume 201 No. 7 Oct 7 2006.
8. Del Acqua MM, Chavez AM, Amarat AL, Compagnoni MM, Mollo FA. Comparison of impression techniques and materials for an implant-supported prosthesis. *Int J Oral Maxillofac Implants* 2010 Jul-Aug;25(4):771-776.
9. Liou AD, Nicholls JI, Yuodelis RA, Brudvik JS. Accuracy of replacing three tapered transfer impression copings in two elastomeric impression materials. *Int J Prosthodont* 1993 Jul-Aug;6(4):377-383.
10. Wee A G. Comparison of impression materials for direct multi - implant impressions. *J Prosthet Dent* 2000; 83: 323–331.
11. Fernandez, M.A.; Paez de Mendoza, C.Y.; Platt, J.A.; Levon, J.A.; Hovijitra, S.T.; Nimmo, A. A comparative study of the accuracy between plastic and metal impression transfer copings for implant restorations. *J. Prosthodontics* 2013, 22, 367–376.
12. Rashidan, N.; Alikhasi, M.; Samadzadeh, S.; Beyabanaki, E.; Kharazifard, M.J. Accuracy of implant impressions with different impression coping types and shapes. *Clin. Implant Dent. Relat. Res.* 2012,14, 218–225.
13. Small, P.N.; Tarnow, D.P. Gingival recession around implants: A 1-year longitudinal prospective study. *Int. J.Oral Maxillofac. Implants.* 2000, 15, 527–532.
14. Grunder, U. Stability of the mucosal topography around single-tooth implants and adjacent teeth: 1-year results. *Int. J. Periodontics Restor. Dent.* 2000, 20, 11–17.
15. Kutkut, A.; Abu-Hammad, O.; Mitchell, R. Esthetic considerations for reconstructing implant emergence profile using titanium and zirconia custom implant abutments: Fifty case series report. *J. Oral Implantol.* 2013, 41, 554–561.
16. Schneider, A.L.; Kurtzman, G.M. Simplifying single-stage solid abutments: Techniques for impressioning and temporization. *Dent. Today.* 2004, 23, 114–117.
17. Charters, R.T. Restoration of a modified solid abutment of the ITI dental implant system: One of the most unique systems in implant dentistry. *J. Dent. Technol.* 2001, 18, 10–12.
18. Lee, H.; So, J.S.; Hochstedler, J.L.; Ercoli, C. The accuracy of implant impressions: A systematic review. *J. Prosthet. Dent.* 2008, 100, 285–291.
19. Azer, S.S. A simplified technique for creating a customized gingival emergence profile for implant-supported crowns. *J. Prosthodontics* 2010, 19, 497–501.
20. Lewis, M.B.; Klineberg, I. Prosthodontic considerations designed to optimize outcomes for single-tooth implants. A review of the literature. *Aust. Dent. J.* 2011, 56, 181–192.
21. Bertolini, M.D.; Kempen, J.; Lourenço, E.J.; Tellez Dde, M. The use of CAD/CAM technology to

- fabricate a custom ceramic implant abutment: A clinical report. *J. Prosthet. Dent.* 2014, 111, 362–366.
22. Wu, T.; Liao, W.; Dai, N.; Tang, C. Design of a custom angled abutment for dental implants using computer-aided design and nonlinear finite element analysis. *J. Biomech.* 2010, 43, 1941–1946.
 23. Bennani, V.; Schwass, D.; Chandler, N. Gingival retraction techniques for implants versus teeth: Current status. *J. Am. Dent. Assoc.* 2008, 139, 1354–1363.
 24. Arioli-Filho, J.N.; Compagnoni, M.A.; Mollo Fde, A., Jr. Accuracy of impression and pouring techniques for an implant-supported prosthesis. *Int. J. Oral Maxillofac. Implants* 2008, 23, 226–236.
 25. McArdle, B.F.; Clarizio, L.F. An alternative method for restoring single-tooth implants. *J. Am. Dent. Assoc.* 2001, 132, 1269–1273.
 26. Millennium Research Group. Annual Industry Report US Markets for Dental Implants: Executive Summary. *Impl. Dent.* 2003, 12, 108–111.

Corresponding Author

Dr. Sparsh Garg
Post Graduate Student
Department of Prosthodontics and Crown & Bridge
TMDCRC, Moradabad
Email-gargs007@yahoo.com

How to cite this article: Garg S, Dable R.A, Gopi A, Shukla S, Saxena S. Impression techniques in dental implantology. *TMU J Dent* 2017;4(4):139-142.