



A RADIOGRAPH POSITIONING TECHNIQUE TO EVALUATE PROSTHETIC MISFIT AND BONE LOSS AROUND IMPLANTS

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A radiograph positioning device was developed to fit with commercially available film holders and implant systems. The device is indexed to the dental implant body and the adjacent dentition by using an implant placement driver and polyvinyl siloxane occlusal registration material. By fitting the device to a conventional film holder, accurate orthogonal radiographs can monitor changes in bone architecture and prosthetic misfit. (J Prosthet Dent 2014;111:163-165)

Based on the classic review article by Albrektsson et al,¹ the long-term success of dental implants is evaluated radiographically by the absence of pathology and an unusual pace of bone loss around the implants. When looking at the long-term success of an implant restoration, obtaining a passive fit between the abutment and implant body is also believed to be critical for biologic and biomechanical reasons.²⁻⁶ Several methods have been adopted for such diagnostic purposes,^{3,7-9} including intraoral radiographs which provide a convenient way to evaluate the health of the surrounding alveolar bone and the status of the implant body-abutment junction. To monitor such changes consistently, however, it is essential to standardize and produce orthogonal radiographs of the implants.⁹⁻¹²

Clinicians have independently sought to modify different generic film positioners to attach to the implant body and abutment to observe changes in crestal bone level accurately, but the implant prostheses had to be removed for

orthogonal radiographs to be made.⁹⁻¹¹ Payne et al¹² improved upon the film holder design by Cox and Pharoah⁹ and connected impression copings to implant bodies, but the procedure still required local anesthesia and the removal of the overdenture bar and attachments.

By combining the advantages of occlusal registration material and implant body level film positioning devices, the researchers developed a device called the Precision Implant X-ray Relator and Locator (PIXRL).¹³ When properly fabricated, the PIXRL registration jig allows for consistent orthogonal radiographs to be made at the prosthetic abutment level without having to repeatedly access the implant bodies. This article describes the technique for fabricating the PIXRL registration jig on single-unit implants.

TECHNIQUE

1. Obtain access to the implant body either intraorally or with an implant definitive cast. Position the

appropriate implant placement driver on the implant body (Fig. 1).

2. Apply tray adhesive on the underside of the PIXRL and apply polyvinyl siloxane registration material (Fig. 2).

3. Connect the PIXRL jig to the shank of the implant placement driver through the hole in the center and orient the assembly to make an occlusal registration of the adjacent teeth (Fig. 3).

4. Remove the implant placement driver and any excess registration material; maintain only sufficient registration material on the occlusal surfaces against the adjacent teeth.

5. Replace the implant restoration or healing abutment on the implant body.

6. Attach the radiographic film holder to the PIXRL device.

7. Do not alter the orientation of the radiographic film or digital sensor once the occlusal registration is positioned properly against the adjacent teeth (Fig. 4).

8. Adopt the conventional parallel-cone technique when making the radiographs (Fig. 5).

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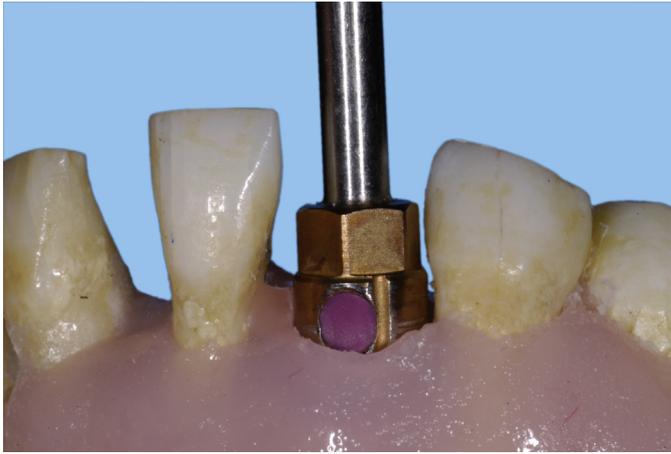
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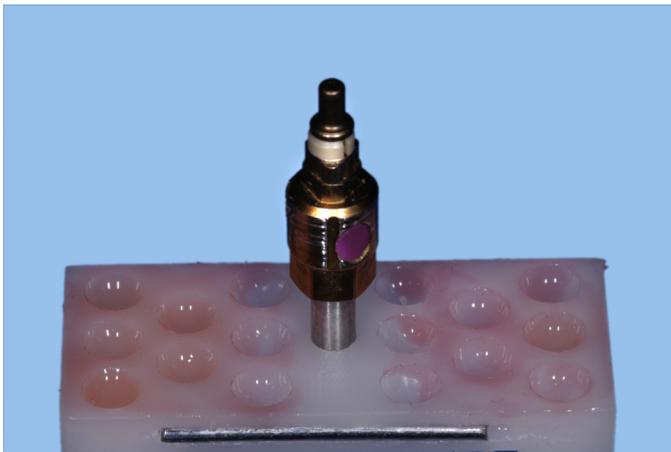
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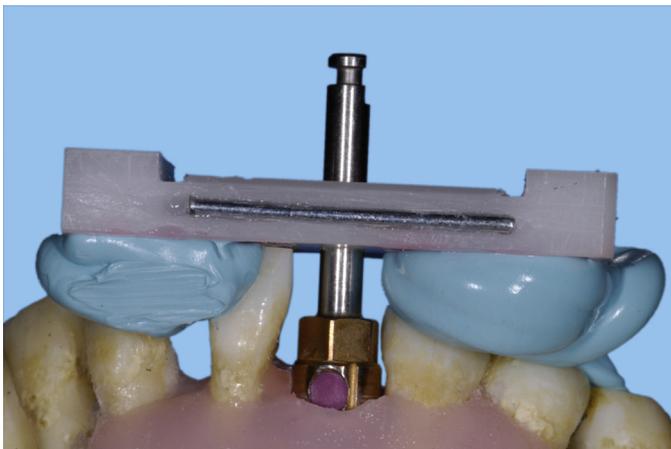




1 Access to implant body may be obtained intraorally or from implant definitive cast; implant placement driver is attached to implant body.



2 Connect Precision Implant X-ray Relator and Locator jig to shank of implant placement driver; adhesive is applied on undersurface of jig.



3 Orient Precision Implant X-ray Relator and Locator jig assembly to implant placement driver and make occlusal registration record against adjacent teeth.

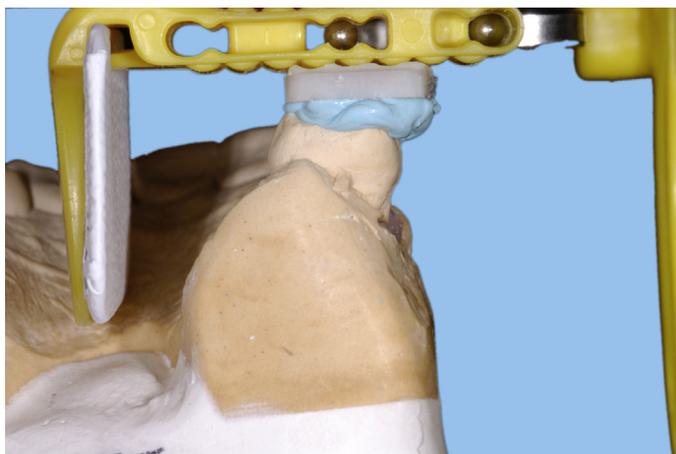
DISCUSSION

The technique and the use of the PIXRL device allow for orthogonal radiographs to be made for an implant without having to remove the implant prosthesis. Adopting such a paralleling device in making clinical radiographs will allow clinicians to monitor accurately and consistently the changes in bone architecture or prosthetic misfit around an implant. The technique described is appropriate for single-unit implant restorations with both mesial and distal adjacent teeth intact. Anatomic limitations (such as missing teeth, the palatal vault contour, shallow lingual sulcus, the presence of tori, or unfavorable mandibular arch form) and patient factors (prominent gag reflex or psychological issues) may restrict the use of the PIXRL. The application of the device in splinted multiunit or terminal implant restorations is the topic of a future publication.

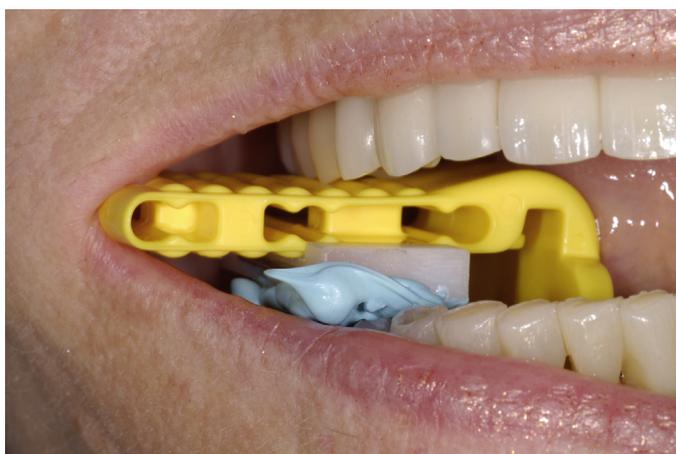
In regard to the choice of occlusal registration materials, addition-reaction polyvinyl siloxane was selected because of its accuracy, versatility, and ease of use. The radiopacity of the material allows for confirmation of the seating of the index to the adjacent reference dentition.¹⁴ It also is capable of producing dimensional accuracy because of the low polymerization shrinkage.¹⁵ With proper storage temperature (18°C to 24°C), results of studies have shown that polyvinyl siloxane as an impression material does not undergo further chemical reaction after setting^{15,16}; unfortunately, whether long-term distortion occurs and with what clinical significance is unknown. For long-term stability, other materials may also be considered; ideally, the choice should be based on ease of use, cost, and dimensional stability both intraorally and in storage.

SUMMARY

The PIXRL jig is indexed to the implant body and the adjacent dentition with an implant placement driver and a polyvinyl siloxane occlusal registration material. By connecting the



4 Attach radiographic film holder to Precision Implant X-ray Relator and Locator jig; use occlusal registration record to maintain orientation of film holder and radiographic film.



5 Adopt conventional parallel-cone technique to make radiographs intraorally with device (film holder paralleling arm was attached for actual clinical use and was only removed here for better visualization of Precision Implant X-ray Relator and Locator jig assembly).

PIXRL jig to a conventional film holder, accurate orthogonal radiographs can be made consistently to monitor changes in bone architecture and prosthetic misfit predictably.

REFERENCES

1. Albrektsson T, Zarb G, Worthington P, Eriksson AR. The long-term efficacy of currently used dental implants: a review and proposed criteria of success. *Int J Oral Maxillofac Implants* 1986;1:11-25.
2. Brånemark PI. Osseointegration and its experimental background. *J Prosthet Dent* 1983;50:399-410.
3. Jemt T. Failures and complications in 391 consecutively inserted fixed prostheses supported by Braenemark implant in the edentulous jaw: a study of treatment from the time of prostheses placement to the first annual check up. *Int J Oral Maxillofac Implants* 1991;6:270-6.
4. Ormaechea MB, Millstein P, Hirayama H. Tube angulation effect on radiographic analysis of the implant-abutment interface. *Int J Oral Maxillofac Implants* 1999;14:77-85.
5. Papavassiliou H, Kourtis S, Katerelou J, Chronopoulos V. Radiographical evaluation of the gap at the implant-abutment interface. *J Esthet Restor Dent* 2010;22:235-51.
6. Farina AP, Spazzin AO, Pantoja JMCN, Consani RLXC, Mesquita MF. An in vitro comparison of joint stability of implant-supported fixed prosthetic suprastructures retained with different prosthetic screws and levels of fit under masticatory simulation conditions. *Int J Oral Maxillofac Implants* 2012;27:833-8.
7. Henry PJ. An alternate method for the production of accurate casts and occlusal records in the osseointegrated implant rehabilitation. *J Prosthet Dent* 1987;58:694-7.
8. Yanase RT, Binon PP, Jemt T, Gulbrandsen HJ, Parel S. Current issue form. How do you test a cast framework for a full arch fixed implant supported prosthesis? *Int J Oral Maxillofac Implants* 1994;9:471-4.
9. Cox JF, Pharoah M. An alternative holder for radiographic evaluation of tissue-integrated prostheses. *J Prosthet Dent* 1986;56:338-41.
10. Meijer HJA, Steen WHA, Bosman F. Standardized radiographs of the alveolar crest around implants in the mandible. *J Prosthet Dent* 1992;68:318-21.
11. Naffah N, Johann CJ. A modified periapical radiographic holder used for standardized implant assessment. *J Prosthet Dent* 2004;91:398.
12. Payne AGT, Solomons YF, Lownie JF. Standardization of radiographs for mandibular implant-supported overdentures: review and innovation. *Clin Oral Impl Res* 1999;10:207-319.
13. Duckworth JE, Judy PF, Goodson JM, Socransky SS. A method for the geometric and densitometric standardization of intraoral radiographs. *J Periodontol* 1982;54:435-40.
14. Fano V, Gennari PU, Ortalli I. Dimensional stability of silicone-based impression materials. *Dent Mater* 1992;8:105-9.
15. Chee WWL, Donovan TE. Polyvinyl siloxane impression materials: a review of properties and techniques. *J Prosthet Dent* 1992;68:728-32.
16. Mandikos MN. Polyvinyl siloxane impression materials: an update on clinical use. *Aust Dent J* 1998;43:428-34.

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