

DENTAL TECHNIQUE

Fabrication of a customized tray for preventing fracture of isolated abutment teeth in definitive casts



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Isolated abutment teeth with advanced bone resorption on definitive casts for a partial removable dental prosthesis can fracture when the cast is removed from the impression or during subsequent laboratory procedures. Sometimes the abutment tooth can be reattached to the definitive cast within the physiological limits of healthy tooth movement.¹ However, the accuracy of the cast is inferior. In addition, if the custom tray is border molded, then the impression cannot be repoured; the ideal option after fracture is to make a new impression and cast.

To decrease the risk of fracture in definitive casts of teeth with extensive bone loss, soft wax can be placed.² However, in the case of an isolated tooth, it is difficult to correctly position soft wax around it. Alternatively, the isolated abutment tooth can be reinforced with a dowel pin before pouring the dental stone,³ but this technique is complicated and may not prevent fracture, in which case a new definitive impression will be required.⁴

The present report describes a fabrication technique for a custom tray that can prevent the fracture of an abutment tooth in the definitive cast during impression removal.

TECHNIQUE

1. Mark the locations of the tooth stops on the diagnostic cast with black ink.

ABSTRACT

Isolated abutment teeth with advanced bone resorption on definitive casts for a partial removable dental prosthesis can fracture when the definitive cast is removed from the impression or during subsequent laboratory procedures. This report describes a technique that avoids fracture of the definitive cast during its fabrication. A separating line is formed on the custom tray, which enables removal of the definitive cast without fracturing the isolated tooth. In addition, if the cervical line is sharp and appears compromised, then the impression can be trimmed at the clinical cervical line to enlarge the abutment diameter and increase its resistance to fracture without altering the shape of critical areas. (*J Prosthet Dent* 2015;114:182-184)

2. Place sufficient baseplate wax (Paraffin Wax; GC Corp) on the diagnostic cast as a spacer to allow elasticity of the impression material.
3. Perforate the wax with a sharp hand instrument at the marked tooth stop locations (*Fig. 1*).
4. Place wax sprue former (Ready Casting Wax; GC Corp) onto the diagnostic cast at the planned separating line (*Fig. 2*).
5. Mix the custom tray material (Tray Resin II; Shofu Inc), and place a small amount of the resin at the tooth stop locations.
6. Place the residual resin onto the diagnostic cast and fabricate the handle. The darker sprue former will be visible through the tray (*Fig. 3*).
7. Remove the polymerized resin tray from the cast.
8. Complete the border molding (Peri Compound; GC Corp) of the custom tray and make the definitive impression (Examixfine Regular Type; GC Corp).
9. After the definitive impression, if the cervical area is sharp and appears compromised, then trim the impression obliquely at the clinical cervical line to create a 1- to 2-mm bevel (*Fig. 4*). Avoid trimming any area associated with the clasp design.

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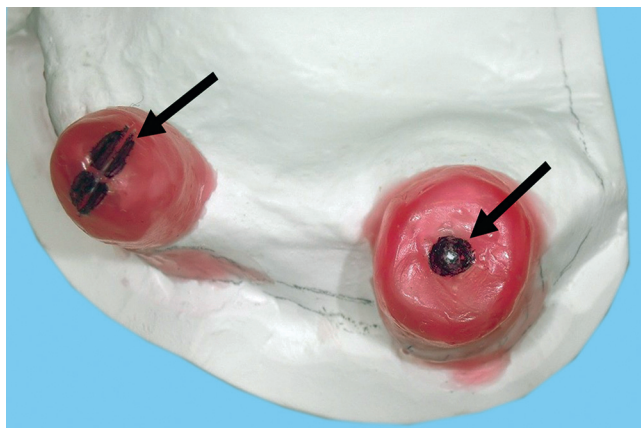


Figure 1. After placing pink baseplate wax at abutment teeth, wax is cut at marked tooth stop locations (arrows).



Figure 2. Sprue former is placed onto cast at separating line.



Figure 3. Tray resin is mixed and poured onto cast, and resin handle is fabricated. Sprue former is clearly visible through resin.

10. Pour Type IV dental stone (New Fujirock; GC Corp) into the impression.
11. Section the custom tray with a round bur (Jet Carbide bur no.7; Shofu Inc) at the separating line and separate the impression from the cast (Fig. 5).

DISCUSSION

The illustrated technique should prevent fracture of an isolated abutment tooth on a definitive cast according to several mechanisms. The impression material can be visibly confirmed through the separating line. This line acts as a guide allowing the clinician to separate the custom tray without damaging the cast. Separating the custom tray also allows deformation of the impression material, which decreases the tensile stress on the abutment of the definitive cast during separation of the impression.

If the cervical area is sharp and appears compromised, then the narrowest portion can be trimmed, which may help increase strength and enlarge the abutment

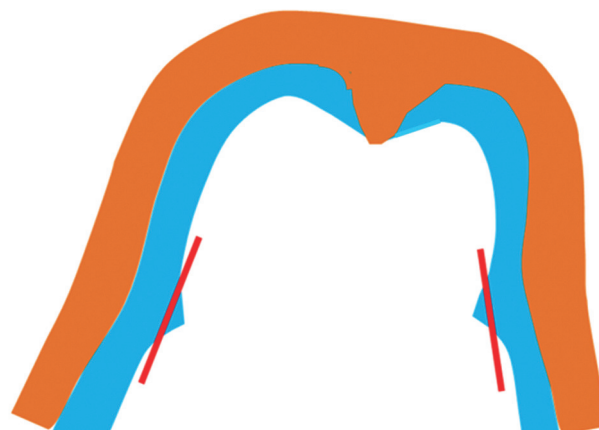


Figure 4. Separation of impression and cast. Resin (brown) and impression (blue) are carefully separated from underlying cast (white), and a 1- to 2-mm bevel is cut at clinical cervical line (red line) of impression.

diameter at the base. The practical abutment length was shortened by obliquely trimming the lever arm used to generate forces on the stone cast during impression separation. Finally, the removal of sharp angles at the tooth-base junction decreased concentrated stress at the isolated tooth.

Among the disadvantages of the technique, the sprue former that was placed on the diagnostic cast is difficult to press against the custom tray material in its dough stage. In addition, if the patient still has several incisors, because of the strong tensile stress generated during impression removal, there is a risk of damaging the customized tray at the cutting line immediately below the custom tray handle during removal; therefore, it attention should be paid to the design of the tray.

SUMMARY

This tray design provides a separating line that serves as a mark for sectioning the customized tray and enables removal of the definitive cast without fracturing an

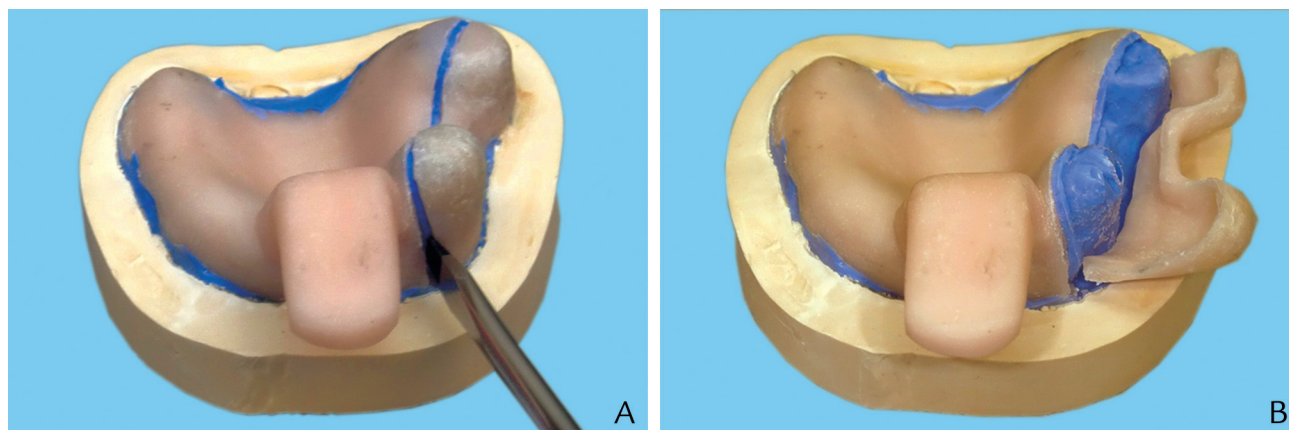


Figure 5. Definitive cast after tray removal. Impression is poured with dental stone to generate definitive cast. A, Once set, resin tray is sectioned at separating line. B, Section removed from underlying impression.

isolated tooth. In addition, if the cervical area is sharp and appears compromised, then the impression can be trimmed at the clinical cervical line to enlarge the abutment diameter and increase its resistance to fracture without altering the shape of critical areas.

REFERENCES

1. Hanson JG, Ettinger RL, Peterson LC, Rittman B, Scandrett FR. Effect on dimensional accuracy when reattaching fractured lone standing teeth of a cast. *J Prosthet Dent* 1982;47:488-92.
2. Sherman JR. Preimpression preparation for positive recovery of master casts. *J Prosthet Dent* 1985;54:19-20.
3. Sato Y, Tsuga K. Post-impression preparation to prevent fracture to isolated abutments with extensive bone loss in master casts. *J Prosthodont* 1998;7: 198-9.
4. Sato Y, Takaki N, Tsuga K, Hosokawa R. Effect of abutment tooth reinforcement techniques on the fracture resistance of removable partial denture master casts. *J Prosthodont* 2001;10:22-5.

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