

CASE REPORT

A Chair-side Technique to verify the Parallelism of Fixed Partial Denture Abutments

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ABSTRACT

This report describes a chair-side technique to verify the parallelism of fixed partial denture abutments; this technique facilitates assessment of extraoral preparation and the detection of undercuts prior to making a definitive impression. This technique utilizes casts fabricated from polyvinyl siloxane impression material and a class II laser module attached to a dental surveyor.

Keywords: Abutments parallelism, Dental surveyor, Laser, Path of insertion.

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INTRODUCTION

The path of insertion is an imaginary line along which the restoration will be placed onto or removed from the preparation. It is determined mentally by the dentist before the preparation is begun, and all features of the preparation are cut to coincide with that line.¹

Achieving a common path of insertion during the preparation of fixed partial denture (FPD) abutments is essential in order to enable complete and passive seating of the fixed dental prosthesis.² Failure to achieve a common path of placement and the presence of undercuts in the preparations will force the dental technician to make a choice: (1) ask the clinician to repeat the preparation and impression steps or (2) leave the margins open to compensate for bypassing the undercuts.³ These open margins may lead to microleakage, which can cause many significant biological effects on the restored tooth, including the recurrence of caries, pulpal pathology, hypersensitivity, discoloration, and marginal

breakdown.⁴ Moreover, FPD with unparallelled abutments will necessitate excessive seating force that often results in fractures in the veneering ceramic.³ In order to avoid these side effects, clinicians tend to overtaper the preparation. This excessive reduction of the prepared abutments can compromise restoration retention and resistance and jeopardize the biological health of the dentin-pulp complex in vital abutment teeth.¹

The dental literature presents two primary techniques for verifying the parallelism of abutments and detecting the presence of undercuts. First, an intraoral direct visual survey of the abutment preparations can be conducted using a mouth mirror held at an angle above one of the prepared abutments. This mirror can be maneuvered with the same angle above the rest of the preparations while the image is viewed with one eye to detect any obscure preparation margins and the presence of any undercuts.¹ This technique is the most commonly used technique, but it unfortunately may be inaccurate and reliable; clinicians tend to overtaper the preparation when using this technique.⁵ Second, some clinicians use an extraoral indirect technique that consists of making an impression, pouring the impression with dental stone, and surveying the stone cast on a dental surveyor.⁶ The indirect method is more accurate than the direct visual survey, but it necessitates extra laboratory steps and may require additional visits before making a definitive impression, particularly if the laboratory is far away from the clinic. Therefore, some authors have developed intraoral devices to examine the parallelism of abutment teeth.⁷⁻⁹ However, these intraoral devices can be bulky and uncomfortable for patients.

Recently, Lee and So¹⁰ used a modified laser pointer attached to a dental surveyor to detect the undercut extraorally by surveying the intaglio surface of an irreversible hydrocolloid impression. Unfortunately, a major shortcoming of this technique is that it renders it impossible to visualize the preparation in detail and survey the impression, which is a negative reproduction, unlike surveying cast.

A simple and accurate chair-side method to verify the parallelism of FPD abutments prior to making a definitive impression will permit the fabrication of fixed dental prostheses that are completely and passively seated with no detrimental influence on their retention and resistance.

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Furthermore, the biological health of the dentin–pulp complex of the vital abutment teeth will be maintained, and the need for costly preparation/impression or prosthetic remakes will be reduced.

This report describes a chair-side technique to verify the parallelism of FPD abutments. This technique facilitates a simple and accurate extraoral preparation assessment and way to detect preparation undercuts prior to making the definitive impression. This technique utilizes casts fabricated from polyvinyl siloxane (PVS) impression material and a class II (<1 mW) laser module attached to a dental surveyor.

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Step 1: After the teeth are prepared (Fig. 1), an impression using an irreversible hydrocolloid (Cavex CA37 normal set; Cavex Holland BV Haarlem, the Netherlands) is made.

Step 2: Disinfect the impression and then make small vent holes using a periodontal probe through the intaglio occlusal surface of irreversible hydrocolloid impression (Fig. 2). Pour the impression using the PVS impression material as follows: Dispense the wash light-consistency

PVS impression material (Express™ vinyl polysiloxane (VPS) Impression Material light Body; 3M ESPE, St Paul, Minnesota, USA) from an automixing gun (Garant Dispenser; 3M ESPE) by placing the delivery tip so that it touches the intaglio occluso-axial line angle of the preparation and expelling the material slowly (Fig. 3). At the same time, the assistant should be hand mix the putty-consistency PVS impression material (Express™ STD VPS Impression Material Putty; 3M ESPE).

Step 3: When two-thirds coverage of the axial wall height and the residual ridge area is achieved, fill the rest of the impression with the putty material. Adjust the shape of the material using vinyl-gloved fingers to enable easy placement, then press the putty over the wash material until the impression overflows. Next, place a glass slab on the PVS impression material to attain a flat base surface.

Step 4: Wait until the material undergoes polymerization.

Step 5: Remove the PVS cast from the irreversible hydrocolloid impression and inspect it to ensure that all of the necessary details have been captured (Fig. 4).

Step 6: Place the laser module (Quarton Laser Module VLM-650-29 LPT; Quarton, New Taipei City, Taiwan) on



Fig. 1: Typodont teeth after preparation (occlusal view)



Fig. 2: Irreversible hydrocolloid impression with vent holes

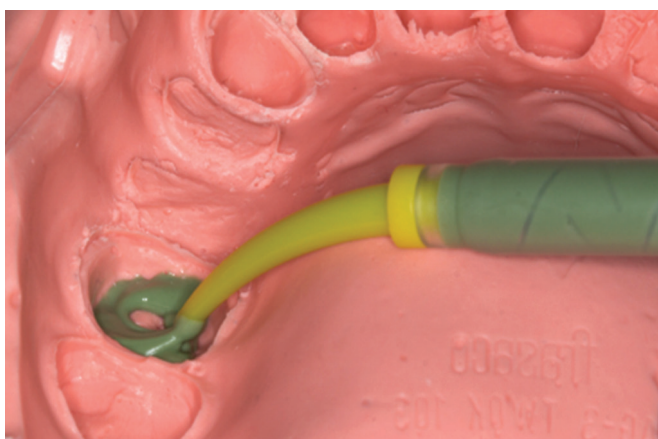


Fig. 3: Injection of light-consistency polyvinyl siloxane into the intaglio surface of the impression



Fig. 4: Polyvinyl siloxane cast

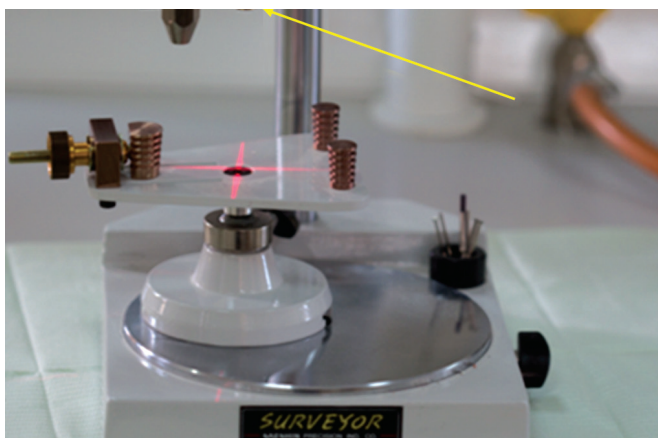


Fig. 5: Laser module (yellow arrow) fixed on the dental surveyor



Fig. 6: Noncontinuous laser line on one of the axial walls (yellow arrow) indicating the presence of an undercut



Fig. 7: Continuous laser line on all axial walls of the prepared abutments, which indicates that there is no undercut

the vertical arm of a surveyor (Surveyor; Saeshin Precision Ind. Co. Taegu, South Korean) in a parallel orientation and fix it in place (Fig. 5).

Step 7: Place the PVS cast on the surveyor table and turn on the laser module. Then, orient the cast to ensure that the placement path is parallel to the orientation of the laser.

Step 8: Examine the axial walls of the preparation. Ensure that the laser line runs continuously from the occlusal surface to the finish line (margins) for all of the prepared abutments. If a noncontinuous line is found (Fig. 6), which indicates the presence of an undercut, remove the undercut area by preparing the corresponding area of the abutment tooth in the patient's mouth.

Step 9: Repeat the previous steps until a continuous laser line is present in all of the prepared abutments (Fig. 7), which indicates parallel abutments with no undercuts. Proceed with making a definitive impression.

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