

Case Report

A modified matrix impression technique

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Abstract

Clinicians have been looking for an ideal impression technique for decades, which demands to be painless, fast, and predictable. The matrix impression system, published in 1998, is a painless and predictable impression technique. However, the limitation of this impression technique is clinical time-consuming. Also, there is a potential problem with the delamination between impression materials. Therefore, PVS adhesive, which might negatively affect the impression outcome, is still in need.

This article introduces a modification based on the matrix impression system, including the clinical procedures, material selection, and rationale. The new technique attempts to preserve the advantages of the original technique, reduce the chair-side time, and avoid material delamination.

Key words: cordless, gingiva retraction, matrix impression, Polyvinyl Siloxane, painless

Introduction

TMaking an impression is a crucial procedure during the fabrication of dental prostheses. An ideal impression should be quick, painless, atraumatic, accurate, and with a highly predictable success rate¹.

However, even though there are many different impression techniques and impression materials available, people are still looking for better clinical performance in the impression procedure.

The most challenging task during impression for fixed prostheses is dealing with subgingival margins² along with multiple abutment teeth³.

Retracting gingiva with retraction cords is the fundamental technique. However, this technique is time-consuming and also uncomfortable for the patients.

Another difficulty of the retraction cord technique for multiple teeth impression would be the material working time being insufficient to make an adequate impression³.

Many impression techniques do not require a retraction cord, for example, Copper band^{4,5}, Matrix system^{6,7}, Retraction Paste¹, Magicfoam cord¹, and Centrix GingiTrac¹. Amount these techniques, Copper band, Matrix system, and Magicfoam

cord can maintain the retraction results without gingival collapse due to the retraction item itself being included in the impression material.

Matrix impression system, proposed by Livaditis in 1998^{6,7}, is a painless and highly predictable technique. This technique only requires occlusal registration material and impression material, which are both available in every clinic.

This technique uses the semirigid occlusal registration material for the first impression and then trim the first impression into the proper shape to serve as the matrix. The matrix functions as a small custom tray, fitting onto the prepared tooth margins. Then make the second impression with this matrix, high viscosity impression material, and a pick-up impression with stock tray and medium body impression material.

The advantages of this impression technique are^{1,6,7}:

1. An atraumatic and painless technique
2. Delivers impression material in the gingival sulcus accurately
3. Holds the sulcus open during the impression procedure.

The limitations of this impression technique are^{1,6,7}:

1. Increased chairside time.
2. Impression material delamination
3. The PVS adhesive might affect the quality of the impression on the margin areas.
4. Higher risk to fracture the die.

This article describes a modification of the original technique to make it more straightforward and timesaving. According to the author's clinical experience, this modified technique performed well clinically. Our pilot study reveals the amount of gingival displacement achieved by this technique is about 300 μm on average, affected by the location of the margin and the gingival biotype, also the chosen materials. Further study outcomes will be polished in the following articles.

Technique

1. Site preparation (Fig 1a)

After tooth preparation, place a lip retractor to hold the lip, clean the tooth surface, and dry it. It is unnecessary to over-dry the teeth.

2. Matrix forming (Fig 1b, 1c, 1d)

Load the bite registration material onto the impression, adapt the mixing tip and impression tip. Cut off 1 to 2mm of the impression tip to facilitate the injection. Discard some of the first-mixing material to ensure all the material is well-mixed. Position the impression tip into the margin and sulcus area, apply the bite registration material just as applying impression material. Ensure the material covers all the margin areas. Then apply the material to cover all the abutment teeth. There is no need to apply too much material onto the abutment teeth; except the margin area, it is acceptable to leave it not fully covered.

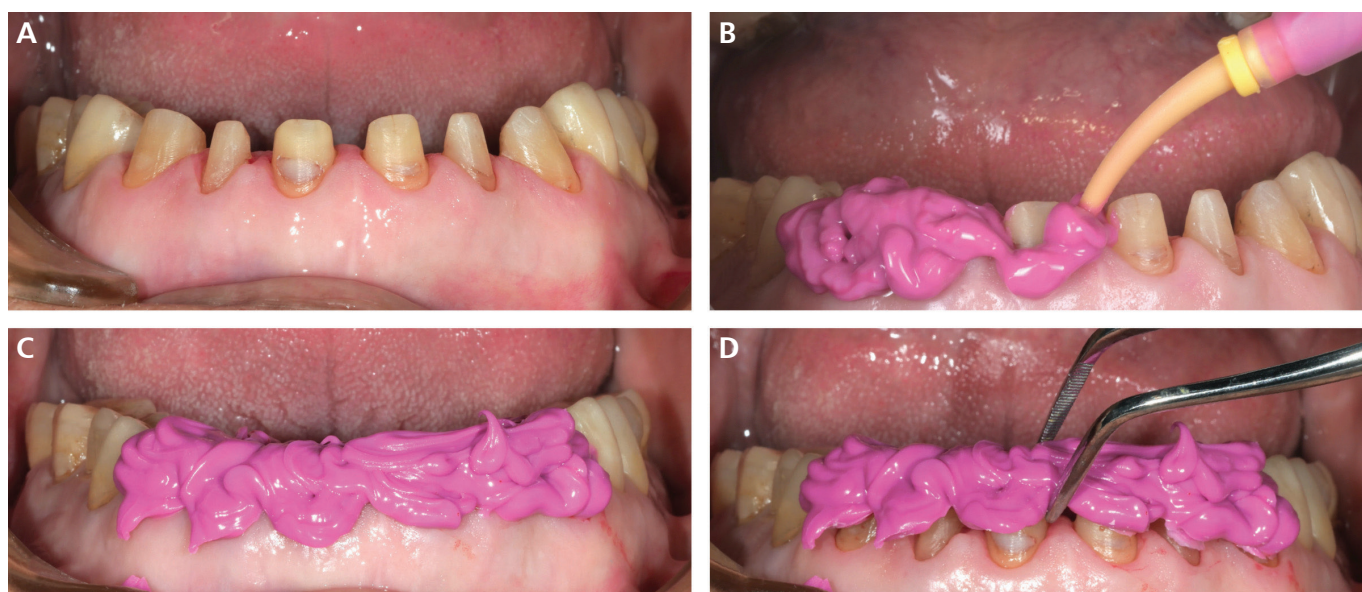


Figure 1. (a) Tooth surface after final preparation. Clean the tooth surface and ready for impression. (b)(c) Cut off 1 to 2mm of the impression tip to apply bite registration material to fill the margin area and cover the teeth. (d) Wait until the bite registration material setting, remove it carefully.

3, Matrix trimming (Fig 1d, Fig 2)

Wait until the bite registration material setting, remove it carefully. Start to trim the matrix in the dust collector. Diamond burs are the most suitable solution for trimming the hard bite registration material properly.

There are three important features of trimming.

1. The margin area: Trim off any material outside the gingival crest
2. Internal relief: Make space for further impression material, but left the most coronal portion as the stop, and left the margin area for support.
3. Perforation: This provides mechanical retention for the new impression material.

4. Try-in and cleaning the matrix (Fig 3)

Wash the matrix thoroughly. Try-in the matrix

and confirm this matrix can fit appropriately on the prepared teeth. The margin area of the matrix should be intact, and any defect can be easily relined with new bite registration material. After relining, redo the trimming in the relining area.

5, Loading impression material (Fig 5a, 5b, 5c)

Dry the matrix and the prepared teeth thoroughly, apply light body or medium body impression material onto teeth, and inside the matrix. Place the matrix onto the abutment teeth and ensure the matrix seating properly.

6. Pick-up impression (Fig 5d, Fig 6)

Use a stock tray containing medium or heavy body, perform a pick-up impression over the matrix impression system. Wait until the material becomes fully setting. Remove the impression tray carefully, check the integrity of the margin and the whole impression.

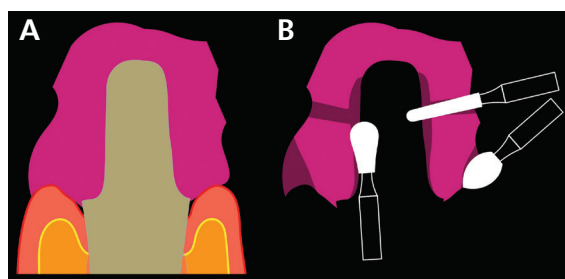


Figure 2. (a) The figure shows how dose the bite registration material adapts on the tooth and fills the gingival margin.
(b) There are three critical features while trimming the matrix.

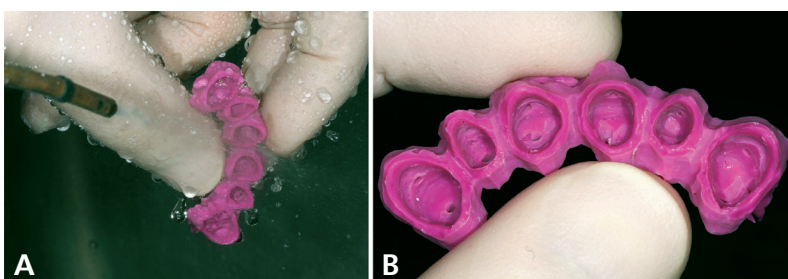


Figure 3. (a) After trimming the matrix, use the air-water spray to clean the dust off.
(b) This figure shows the appearance of the finished matrix.

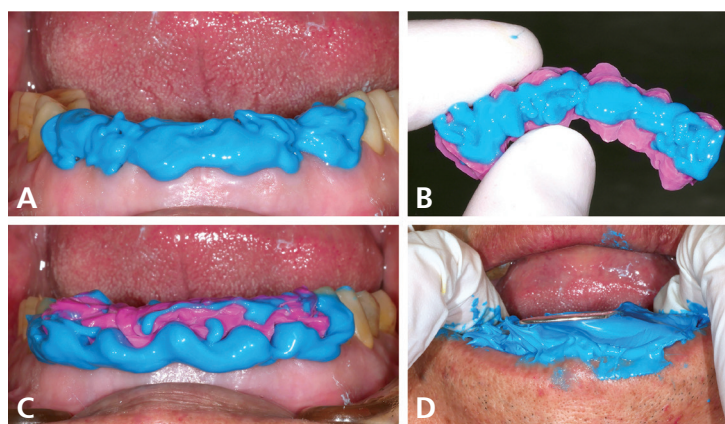


Figure 4. (a)(b) Apply light body or medium body impression material onto teeth and inside the matrix.
(c) Place the matrix onto the abutment teeth.
(d) Pick-up impression with stock tray and medium body PVS.

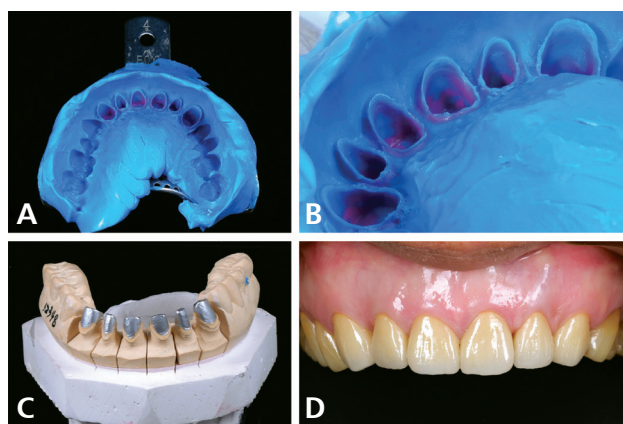


Figure 5. (a)(b) The final impression result and close-up view.
(c) The working cast and die.
(d) The final result of the anterior six crowns.

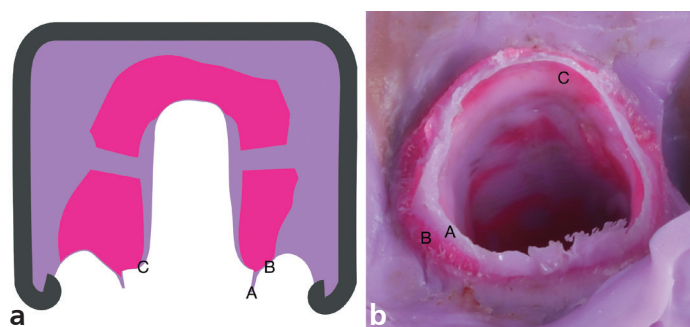


Figure 6. (a) Side-by-side comparison of drawing. (b) and actual impression image.

A. The PVS impression material “fin,” which records the subgingival morphology.

B. The outer marginal surface of the matrix.

C. The inner marginal surface of the matrix.

There is a thin layer of PVS light body coating on B and C surfaces. This thin PVS layer is smooth in the C area representing the prepared tooth surface. The PVS layer in the B area represents the surface of intrasulcular epithelium.

Discussion

Material selection:

This modified matrix impression chooses PVS rigid bite registration material to form the matrix; the hardness is about 90 Shore A.

A relatively rigid material can provide rigidity with less bulk of the material. The high viscosity of the bite registration material also works well in displacing the marginal gingiva. The author had tested heavy body, medium body, and light body to work with both perforated and non-perforated matrix design. Perforated matrix combined medium or light body work better. Light body group shows better detail and less chance of losing the subgingival information.

We select light body PVS as the final impression material to apply inside the matrix and around the prepared teeth. Considering the gingiva has been displaced by the matrix, the final impression material will focus on capturing details and filling the gingival sulcus well. At the same time, the material should be able to adhere to the matrix. (Fig 6) The characteristics of light body PVS is suitable for those requirements.

Saving the clinical time:

The modified matrix impression technique does not require a prefabricated tray to form the matrix. This bite registration material can be directly applied to the sulcus, margin, and abutment surfaces.

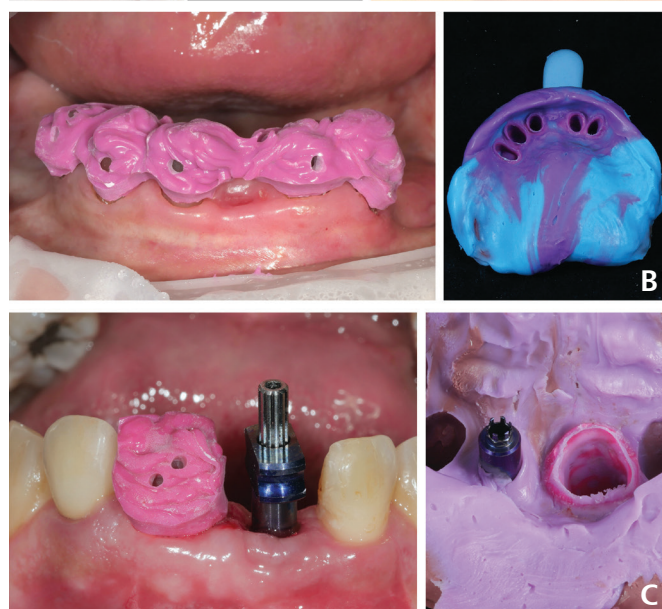
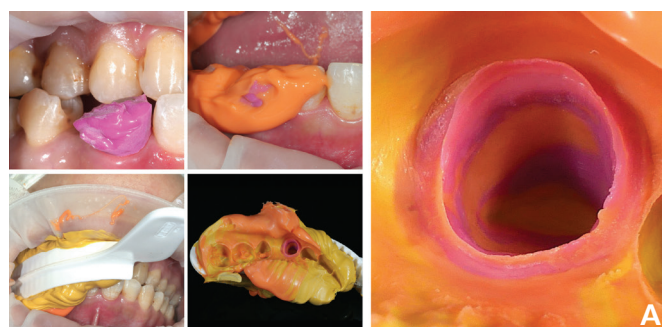


Figure 7. The modified matrix impression technique can be used in combination with different impression techniques.

(a) Combine with triple tray impression; the matrix should be made without occlusal interference.

(b) Combine with RPD soft tissue impression; a custom tray with border modeling been used together with the matrix.

(c) Combine with the open tray implant impression; the matrix should be made without interfering the impression coping.

Owing to its small amount of material, it does not require much effort and time to trim it properly. Coarse diamond burs are the most suitable tool to do the trimming, which provides accurate outcomes and causes no tearing of the material. The surfaces cut by coarse diamond burs give the roughness for the PVS light body to adhere to it. The rough surface combining with the perforated areas, provide sufficient retention to prevent material delamination. Thus, the original procedure of applying adhesive can be omitted.

Comparison and future application:

According to the original publication of the matrix impression technique, a semirigid polyether bite registration material works well and no need for adhesive. However, nowadays, PVS bite registration material has become the mainstream; materials with different hardness are available in the market. It becomes easy for each clinician to find the most suitable materials for himself to apply this modified matrix impression technique.

The original technique was to force the impression to flow into the gingival sulcus. On the other hand, the modified technique focuses on holding the cervical gingiva away from the tooth surface, creating a space for more flowable PVS to flow into it, but not aim to fill the whole gingival sulcus.

The new technique advocates trimming the matrix with coarse diamond burs. This approach will produce much tiny silicon dust and need to perform in a dust collector to protect human health. If the operator makes a vast and bulky matrix, low-speed carbide bur can be used to trim the bulk faster. However, while trimming the essential detail areas, coarse diamond burs work better.

This modified technique also has the potential to combine with the removable partial denture impression and the triple tray impression. (Fig 7)

Summary

This article introduces a modified matrix impression technique. This new technique inherits previous advantages, which is painless, economical, and highly predictable. Furthermore, it works faster and effectively prevents impression material delamination.

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