

Case Report

Sectional Impression Trays with An Interlocking Handle Using Implant Impression Components to Fabricate Interim Dentures for A Patient with Scleroderma-induced Microstomia

Watcharapong Aroonsang¹, Surasak Yowcharoensuk²

¹Department of Prosthodontics, Faculty of Dentistry, Chiang Mai University, Chiang Mai, Thailand

²Dental World Clinic Chiang Mai, 180/1 Raj Chiang Saen Road, Haiya, Muang, Chiang Mai, Thailand

Abstract

Recording impressions in patients with microstomia is usually difficult for both the patients and clinicians. It is impossible to use a conventional impression procedure for patients with a limited mouth opening. So, modification of the clinical and laboratory procedures is necessary. This case report describes the construction of maxillary and mandibular sectional impression trays with an interlocking handle, using implant impression components, for a patient with microstomia induced by scleroderma.

Keyword: Microstomia, Scleroderma, Sectional tray

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Correspondence to:

Watcharapong Aroonsang, Department of Prosthodontics, Faculty of Dentistry, Chiang Mai University, Chiang Mai, 50200 Thailand. Tel: 053-944438 Email: watcharapong.a@cmu.ac.th, awatcharapong@gmail.com

Introduction

Scleroderma is an autoimmune disease that affects connective tissues and blood vessels.¹ This condition leads to fibrosis, thickened skin and mucosa, and sometimes problems with internal organs and joints. Facial skin becomes hard and tight, resulting in a mask-like appearance and a reduced mouth opening. Patients may present finger and toe deformities (Raynaud phenomenon). This condition is challenging in dental treatment due to an abnormally small oral orifice (microstomia) and increased tongue rigidity.

Without a surgical operation to enlarge the oral aperture, it is difficult to provide prosthetic treatment for patients with microstomia caused by scleroderma. Prosthodontic management has been described in the literature.²⁻⁵ The insertion of a full-arch stock impression tray may not be possible due to a limited mouth opening. Treatment modifications include flexible impression trays,⁶ flexible stock trays⁷ and sectional impression trays.^{3,4,8} Some patients may complain of an inability to place and

remove the prostheses. Several designs of sectional collapsed dentures have also been suggested.^{5,9,10}

This clinical report describes a technique to fabricate maxillary and mandibular sectional impression trays with an interlocking handle connected by an implant impression post and an implant analog, collectively known as implant impression components, for a partially edentulous patient with microstomia induced by scleroderma.

Clinical Report

A 60-year-old, partially edentulous man with microstomia induced by scleroderma was seeking prosthodontic treatment to replace missing teeth, which were 11, 12, 21, 22, 45, 46 and 47 at a private dental clinic in Chiang Mai, Thailand. He presented tight and mask-like facial skin along with hand deformities. Oral examination revealed a limited mouth opening which measured to

be about 18 mm between the lower border of the upper lip and the incisal edge of the mandibular central incisor (Fig. 1). He also presented limited tongue movement. His oral hygiene was poor and extensive caries were found on some of the remaining teeth. Treatment options were discussed, which were removable prostheses and implant therapy. The patient did not agree to any surgical treatments to enlarge the oral orifice, nor to implant therapy.

The treatment goals were to maintain good oral hygiene, control dental caries, and replace the missing teeth by means of removable prostheses. The sequence of treatment included extraction of non-restorable teeth, periodontal treatment, restorative treatment and caries control, interim acrylic partial dentures and definitive removable partial dentures.

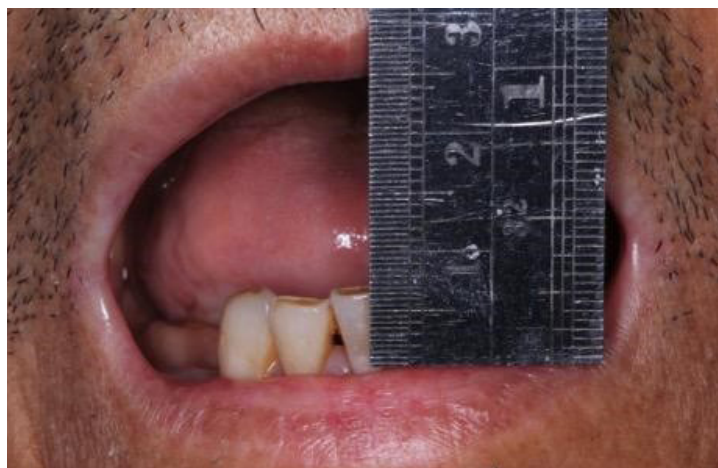


Figure 1 Extra-oral view of patient with a limited mouth opening of 18 mm

Preliminary impression and fabrication of study models

After periodontal and restorative treatments were rendered, the patient returned two weeks following the extraction. The maxillary and mandibular interim acrylic partial dentures were fabricated to transition the patient through the healing phase and for esthetic purposes. A full-arch stock tray could not be inserted due to the limited oral orifice. So, four sectional, stock, perforated trays were used to make the preliminary impression on each side of both dental arches according to the technique

described by Dikbas and colleagues⁴ and Suzuki and colleagues.¹¹ Four half-arch one-step impressions were made using putty and light-bodied polyvinylsiloxane (PVS) impression material (Silagum, DMG, Hamburg, Germany). One side of the impression was poured with Type III dental stone (Kromotipo 3, Lascod, Florence, Italy), and a half-arch cast was fabricated. Then, the impression of the other side was trimmed to remove the excess material and positioned on the cast (Fig. 2A). To ensure complete seating of the impression on the cast, care was taken that only the teeth

came in contact with the impression (Fig. 2B). The second half of the cast was poured with dental stone while the

assembly was held with finger pressure until the stone was set. Finally, a one-piece preliminary cast was fabricated (Fig. 3).

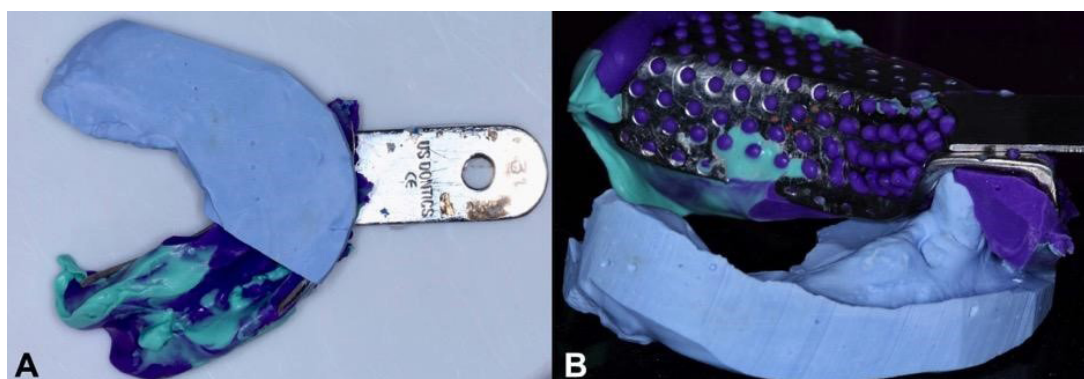


Figure 2 A) A half-arch cast was positioned in the impression of the other side of the jaw B) Only the teeth came in contact with the impression to ensure complete seating.

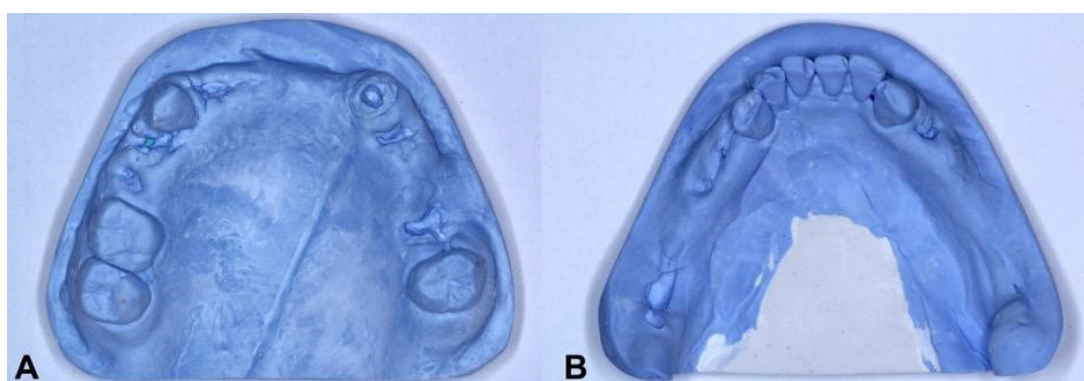


Figure 3 The completed maxillary and mandibular preliminary casts.

The preliminary casts were carefully examined. The design of the interim acrylic partial dentures included rest seats on the maxillary molars; teeth 16, 17 and 27, whereas 33 and 43 were planned to receive wrought-wire clasps. The endodontically treated tooth 23 was planned to have a short metal coping to support the maxillary prosthesis. Occlusal rest seats were prepared, using a 014 round diamond bur, on the mesial marginal ridge of the upper right first molar, and distal marginal ridges of both upper second molars.

Sectional impression trays with an interlocking handle

The remaining teeth on the preliminary casts were covered with two layers of pink baseplate wax as a spacer. Palate was used as a tissue stop for a maxillary tray. Mandibular tray stoppers were placed on incisal edges of teeth 33 and 43. The custom impression trays

were fabricated with autopolymerizing acrylic resin (Instant Tray Mix Acrylic Resin, Lang, Wheeling, IL, USA) on the preliminary casts. The trays were then sectioned along the midline using a cutting disc. The tray handle was also sectioned (Fig. 4), and the implant impression coping and lab analog (Biohorizon, Birmingham, AL, USA) were attached to the handle using pattern resin (Pattern Resin LS, GC, Tokyo, Japan) (Fig. 5). The impression coping was attached to one side of the sectioned tray, and the implant analog was attached to the other side, so the sectional tray could be precisely re-assembled. To stabilise the trays with an accurate fit, the 5 mm x 5 mm key-ways were prepared on one side of the tray in the palatal area of the maxillary tray and the lingual area of the mandibular tray. Then keys made of pattern resin were added on the other side to provide additional support (Fig. 6).

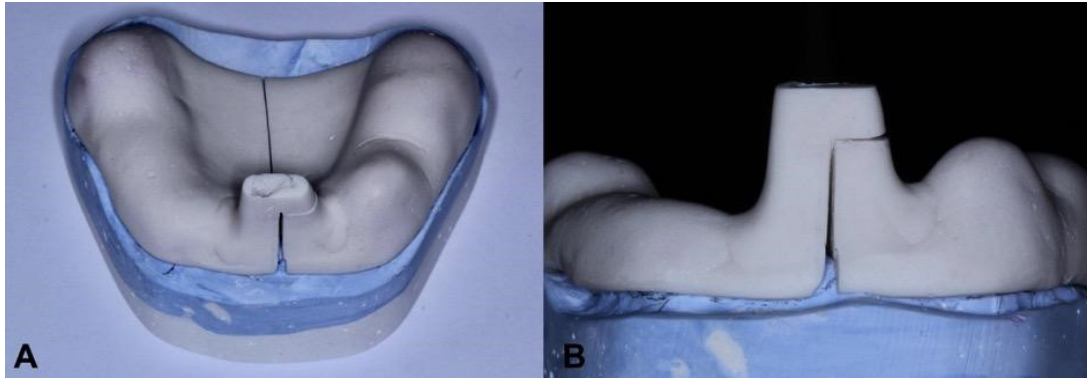


Figure 4 The custom-made tray on the upper preliminary cast after sectioning the tray at the base (A) and at the handle (B)



Figure 5 The implant impression components were attached to the handle using pattern resin. The impression coping was attached to one side of the sectioned tray, and the implant analog was attached to the other side.

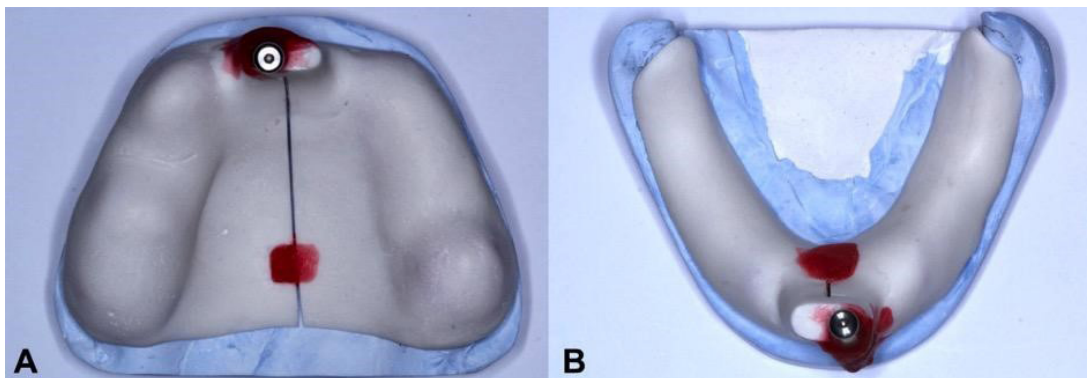


Figure 6 The completed maxillary and mandibular sectional custom trays. Note the 5 mm x 5 mm key-ways on the palatal area of the upper tray and the lingual side of the lower tray.

Impression procedure

The sectional custom trays were reassembled intra-orally and tried as shown in Figure 7. The assembled trays were removed from the patient's mouth with some difficulty. Border molding could not be performed due to difficulties in insertion and removal. Light-bodied and medium-bodied PVS impression materials (Silagum, DMG, Hamburg, Germany) were used to record a definitive

impression. While the light-bodied material was injected over abutment teeth, the impression trays were filled with the medium-bodied impression material, and inserted in two pieces. Then these two pieces were accurately reassembled by hand-tightening the implant impression coping and lab analog. Care was taken to load the trays with only enough medium-bodied material to control the excess of the impression materials. The assembled tray was posi-

tioned, seated, and held in place without border molding due to skin stiffness and tongue rigidity. After the impression material was completely set, the tray was removed in one

piece (Fig. 8) with some difficulty by gently rotating the tray out of the mouth. The master casts were fabricated using Type IV dental stone (Kromotypo4, Lascod, Florence, Italy).



Figure 7 The sectional custom tray was tried in

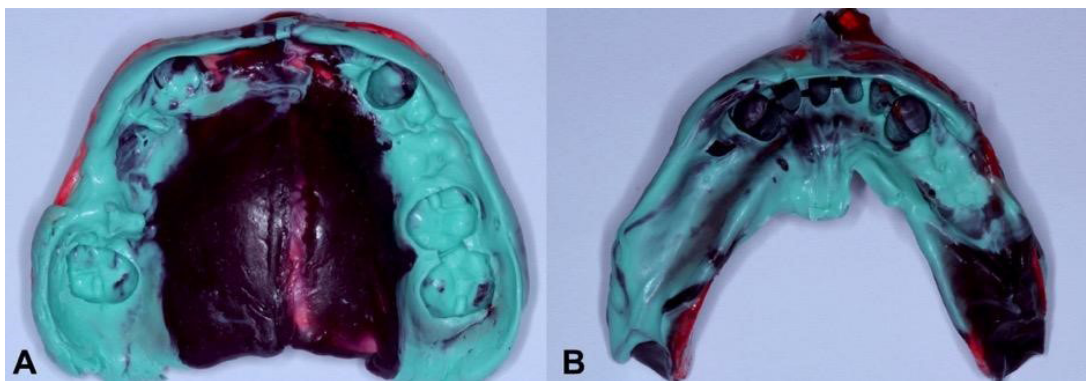


Figure 8 The maxillary and mandibular impressions

Denture fabrication and placement

The acrylic partial dentures were fabricated using a conventional technique. The dentures were processed using heat-polymerised acrylic resin. During the denture delivery appointment, the patient was able to properly insert and remove both the maxillary and the mandibular dentures with practice in front of a mirror. Instructions for cleaning were provided.

The patient was seen again one week post-placement. The patient reported pain and discomfort underneath the mandibular denture on chewing. Pressure indicator paste was used to identify the pressure spot areas. They were properly adjusted. Occlusion was checked. The patient was recalled every month for

two months to monitor the changes of alveolar ridge following the tooth extraction, and the interim partial dentures were intra-orally relined as needed (Fig. 9).



Figure 9 Intra-oral frontal view after insertion of maxillary and mandibular prostheses

Discussion

Patients with microstomia pose some difficulties to the clinician. However, conservative treatment can be performed using modifications of the laboratory and clinical procedures. The most common technique for such patients is the use of sectional impressions, instead of regular full-arch one-piece impressions. The sectional impressions are then recorded in two parts and repositioned extra-orally. The key to this technique is the joining mechanism between the parts of the sectional trays to facilitate relocation. Several designs of connecting mechanisms have been widely described in the literature, such as interlocking handles,¹² pins,⁵ Lego blocks,¹³ locking levers¹⁴ and orthodontic expansion screws.¹⁵

This article describes the use of sectional impression trays with an implant impression coping and an implant analog to facilitate tray assembly. The sterilized and reused metal implant impression components are financially affordable for this technique, and are generally available in dental clinics. The trays can be accurately assembled due to the precise fit between the implant impression coping and impression analog. However, this technique has some disadvantages in terms of additional tray fabrication time and longer chair time, which are considered as common drawbacks for any other technique in the fabrication of sectional impression trays.

Besides the accurate relocation of the locking mechanism, one requirement of the sectional tray is the ease of intra-oral assembly. The sectional trays presented in this article have the locking mechanism located in the tray handle. The advantage of this design is that the tray is easy to assemble and disassemble using an implant screwdriver, since the tray handle is located in the anterior part of the mouth (Fig. 7). A similar sectional tray design has been described by Fernandes and colleagues¹² with the interlocking mechanism located in the tray handle. Wax patterns of the interlocking mechanism were fabricated, cast in base metal alloy and attached to the handle of the

sectional trays. In the case described here, it was possible to remove the assembled impression trays from the mouth in one piece. So, the likelihood of errors in re-assembling the trays extra-orally was minimized.

Four sectional, stock, perforated trays were used to make a preliminary impression for each quadrant. The study cast was fabricated by means of reseating the first half of the cast on the second half of the preliminary impression. While the preliminary impression was made on one side of the arch, an attempt was made to capture as many oral structures beyond the midline as possible, to aid in orienting the first half of the cast in the second half of the impression. A similar technique has been described by Dhanasomboon and Kiatsirijoj.⁷ Their technique would be more accurate than other methods, such as recording the preliminary impression using putty silicone impression material with finger pressure.¹⁰

Summary

Patients with microstomia pose a challenge to clinicians in prosthetic rehabilitation, especially while recording impressions. However, these patients can be managed conservatively by clinical and laboratory procedure modifications. This case report describes a method for fabrication of sectional impression trays with interlocking handles using implant impression components for a patient with microstomia induced by scleroderma. This tray fabrication technique is simple, inexpensive and applicable for patients with microstomia.

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