

## Technical note

# A technique of acrylic nail fixation in multilayered silicone finger prostheses

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### Abstract

A technique for the secure fixation of acrylic nails in multilayered silicone finger prostheses is described. The secure fixation of the nail to the prosthesis is achieved by a method of "sandwiching" portions of the nail between the silicone layers of the prosthesis akin to the overlapping of the nail by the anatomical nail fold and nail wall. In addition the use of a cyanoacrylate adhesive ensures strong surface to surface bonding.

### Introduction

The nail represents an important aesthetic feature of the hand. Its reproduction is thus an important aspect in producing a finger prosthesis for cosmetic restoration in the mutilated hand. Although silicone finger prostheses with acrylic nails are available commercially, technical information as to how the nail is securely attached to the prosthesis is not available in the literature. This is only to be expected since prosthetics for cosmetic restoration in the hand is more an enterprising endeavour than an academic exercise.

Attachment of acrylic nails on silicone prostheses is not a simple task. That silicone rubber has extremely good stain resistance is attributed to its highly inert property (Lynch, 1978; Polmanteer, 1987). This quality of silicone rubber also makes its bonding to most materials by the commonly used adhesives, a difficult challenge. Advances in material

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sciences have now made available new adhesives which can be used to bond acrylic to silicone surfaces. However, a secure fixation must involve more than mere surface-to-surface adhesion between acrylic resin and silicone rubber.

This paper describes a technique for a secure fixation of acrylic nails in multilayered silicone prostheses by a method of "sandwiching" portions of the nail between layers of the silicone rubber in addition to surface-to-surface adhesion between acrylic resin and silicone rubber.

### Method

#### *Moulding, outer layer of the prosthesis*

The outer layer of the prosthesis is moulded to the required thickness in translucent layers of tinted silicone rubber from a negative mould of a finger model (Leow *et al.*, 1996; Pereira *et al.*, 1996). Upon complete cure of the silicone layers, the partially completed prosthesis, with a "nail impression" replicated from the finger model, is removed from the negative mould and turned inside-out for touch-up colouration.

#### *Nail fixation proper*

After touch-up colouration at the "finger joints", the nail and the palmar aspect to match the pattern of pigmentation of the normal hand, the prosthesis is reverted to its original state and pulled over the finger model, which serves as a working base for the fixation procedure (Fig. 1a). A slit, into which a portion of the nail is to be inserted, is made along the crease of the "nail impression" of the prosthesis, excluding the distal edge (Fig. 1b). An acrylic nail of appropriate convexity is selected and trimmed to the shape of the "nail impression", in which

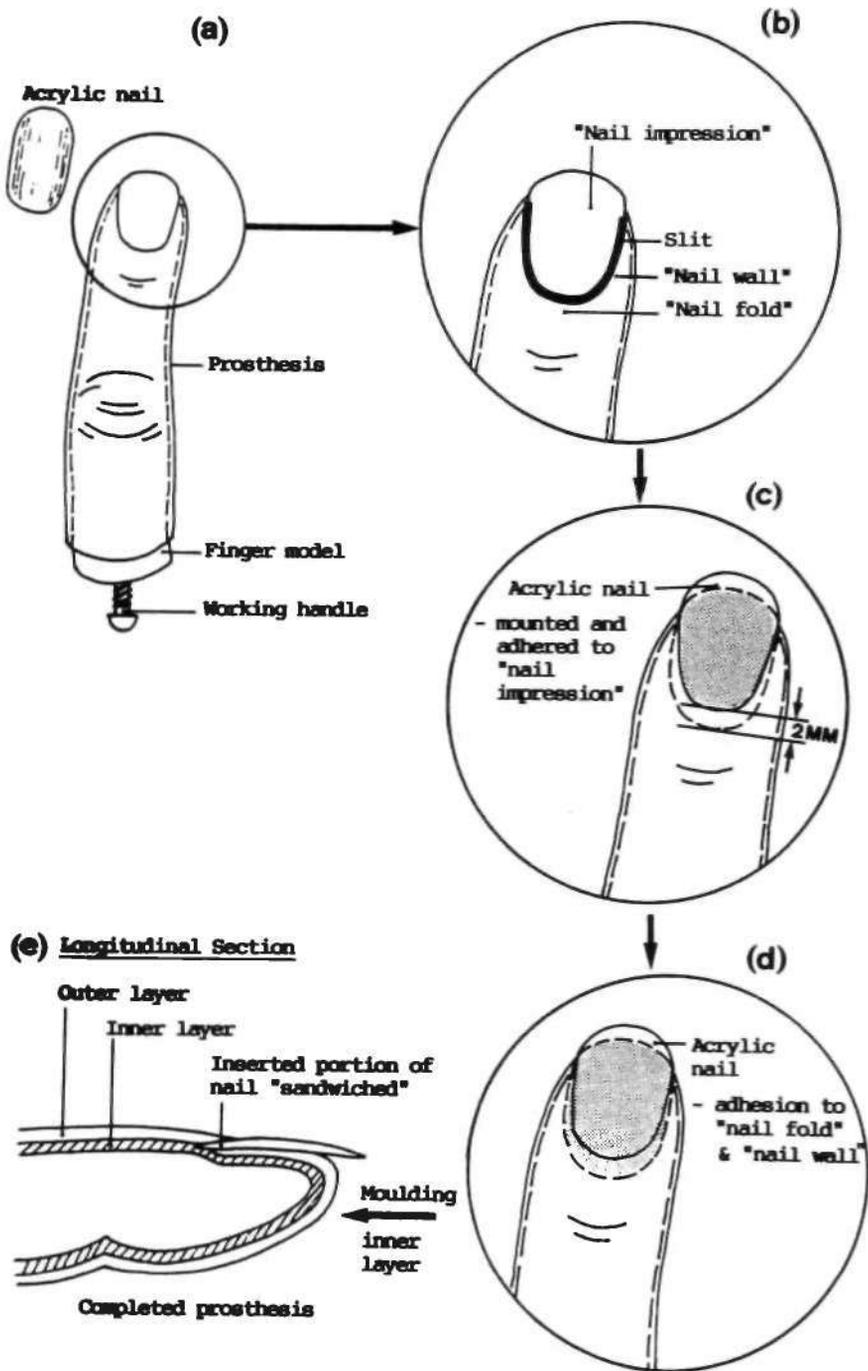


Fig. 1. Schematic illustrations of the acrylic nail fixation procedure in a multilayered silicone finger prosthesis (a) the partially completed prosthesis over the finger model, (b) a slit for nail insertion is made, separating the "nail impression" from the "nail fold" and "nail wall", (c) the acrylic is inserted, mounted and adhered to the "nail impression" (shaded area denotes adhesion) using the adhesive, (d) the acrylic nail adhered to the "nail fold" and "nail wall", (e) a longitudinal section of the completed prosthesis showing the inserted portion of the nail "sandwiched" between the silicone layers.

the acrylic nail is to be mounted and adhered. A trial mounting of the nail to establish its size and position for permanent fixation is first carried out before the actual fixation. The acrylic nail should be larger than the "nail impression" by 2mm proximally (edge-to-edge), reducing on the lateral borders to a matching size distally (Fig. 1c). The excess nail is that portion which inserts into the slit (hereafter referred to as the inserted portion of the nail).

After the size and position of the acrylic nail for permanent fixation has been established, the acrylic nail is unmounted and the "nail impression" surface is cleaned and treated with a polyolefin primer (Loctite 770, Loctite Corporation, Connecticut, USA). A cyanoacrylate adhesive (Loctite 401, Loctite Corporation, Connecticut, USA) is applied on the undersurface of the nail for bonding with the silicone surface. The "nail fold" and "nail wall" on the proximal and each collateral side of the slit is slightly lifted to allow insertion and mounting of the nail to the desired position following which it is pressed firmly against the finger model to achieve a stronger bonding to the "nail impression" (Fig. 1c). Following curing of the adhesive (45 seconds), adhesion of the inserted portion of the acrylic nail to the "nail fold", i.e., the overlying silicone layer, is effected using the same adhesive (Fig. 1d).

#### *Moulding, inner layer of the prosthesis*

Following completion of the nail fixation procedure, the prosthesis is withdrawn from the finger model for the final stage of moulding the inner layer. The inner layer of the prosthesis is moulded in opaque layers of silicone rubber pigmented such that when laminated into the outer layer, the resultant colour of the prosthesis matches the patient's skin colour. The inserted portion of the acrylic nail is thus "sandwiched" between the silicone layers and becomes securely fixed in the prosthesis (Fig. 1e).

## **Discussion**

This technique allows a secure fixation of acrylic nails on silicone prostheses. Attempts at detaching the nail thus attached invariably resulted in the tearing of the silicone prosthesis without nail detachment. The secure attachment of the nail to the prosthesis is achieved in the technique through a method of "sandwiching" of the inserted portion of the nail between the silicone layers of the prosthesis in addition to a strong surface-to-surface bonding between acrylic resin and silicone rubber by the adhesive. The "sandwiching" method is akin to the overlapping of the nail by the anatomical nail fold and nail wall. The primer was used in conjunction with the adhesive to augment bonding of the acrylic nail to the silicone prosthesis. Further stability of the nail is obtained when the hollow prosthesis is packed with a firm filler material at the distal end for fitting. The packing, which substitutes the lost segment of the finger, reduces compression and shearing forces during the use of the prosthesis.

To achieve a life-like appearance, a custom-made highly translucent nail is used which allows the underlying pinkish touch-up colouration of the nail simulating the anatomical nail bed to show through.

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