

Research Article

Improved Suturing Model for Surgical Simulation

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Abstract: Background: The purpose of the present article is to develop a simple and cost effective suturing model that simulates the oral tissues and enhance the skills of medical trainees. **Materials and Method:** A simplified suturing model is constructed for the preclinical training purpose. The model requires four easily available materials; which include a macintosh sheet, synthetic sponge, poly vinyl siloxane impression material in putty consistency and maxillary and mandibular acrylic teeth. **Result:** The model thus, developed by the above mentioned technique simulate the surgical field up to the maximum possible extent, hence enabling the students to practice various suturing techniques at different tissue planes. **Conclusion:** Easy availability and cost effectiveness as well as resemblance of this model with the elasticity and texture of the keratinized mucosa helps the medical students to perform a live procedure in a more skilled way.

Keywords: Preclinical suturing, Polyvinylsiloxane, Acrylic teeth.

INTRODUCTION

Development of intellectual faculties considering ability, technical competence, and issue comprehension are the goals of teaching and learning in any health profession education. The progression towards competence has been described in stages from beginner (the unconscious incompetent) to novice (the conscious incompetent) to the consciously competent individual (Hauser, A.M., & Bowen, D.M. 2009).

Oral surgery has been identified as one of the areas in which predoctoral dental students and Trainees feel stressed and technically insecure (Macluskey, M. *et al.*, 2004). Pre-clinical laboratory training programmes in medical and dental fields appear to be a successful approach to achieve confidence, competence, and proficiency on surgical procedures before trainees

perform surgery on patients. Also, they facilitate avoidance of ethical concerns about teaching and learning basic surgical techniques on live human patients (Dantas, A. K. *et al.*, 2010).

In medical field, the most common method of wound closure uses sutures. The primary objectives of suturing are to stabilize and to secure tissues in their desired locations. Surgical specialties, both medical and dental, have many unique methods and materials for wound closure. Of the medical surgical specialties, plastic surgery techniques and materials are probably the most useful for application in periodontics. The field of plastic surgery shares some common goals with that of periodontal surgery, such as emphasis on aesthetics, flap rotation and grafting techniques (Moore, L.R., & Hill, M. 2000).

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Despite the presence of an ocean of theoretical knowledge and visual aids available regarding suturing techniques, dental students still lack the practical knowledge to perform suturing with confidence in

patient's mouth, leaving them insecure and in lack of the required competence (Uppal, N., & Saldanha, S. 2012).

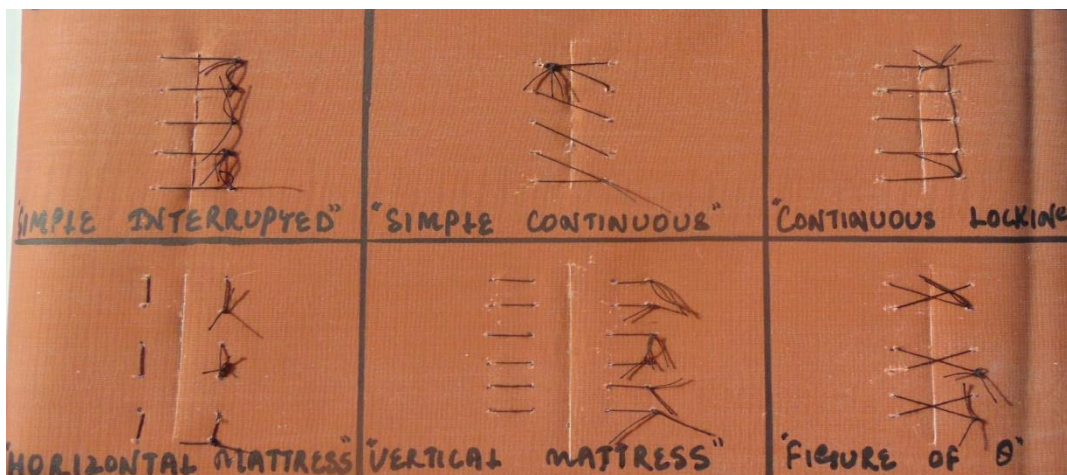


Figure1. Earlier used Preclinical suturing model

Previous methods of suturing involved use of synthetic sponge over a wooden framework covered with a piece of macintosh sheet. The incisions were then made on it and the suturing was performed accordingly [Figure 1]. However, this method was not that accurate as it used only synthetic sponge that lacks the consistency required to simulate oral mucosa. Moreover, the aforementioned method did not incorporate artificial teeth, so the trainees were not able

to appreciate the nature of incisions and sutures accurately.

Thus, there was a need for methodologies that included arrangement of teeth over the suturing pad, so that the suturing exercise could be performed in a precise manner. Hence, the present study focuses on construction of a simple and cost effective suturing model thoroughly simulating the oral cavity and thereby, enhancing the skills of medical trainees.

PREPARATION OF SUTURING PAD

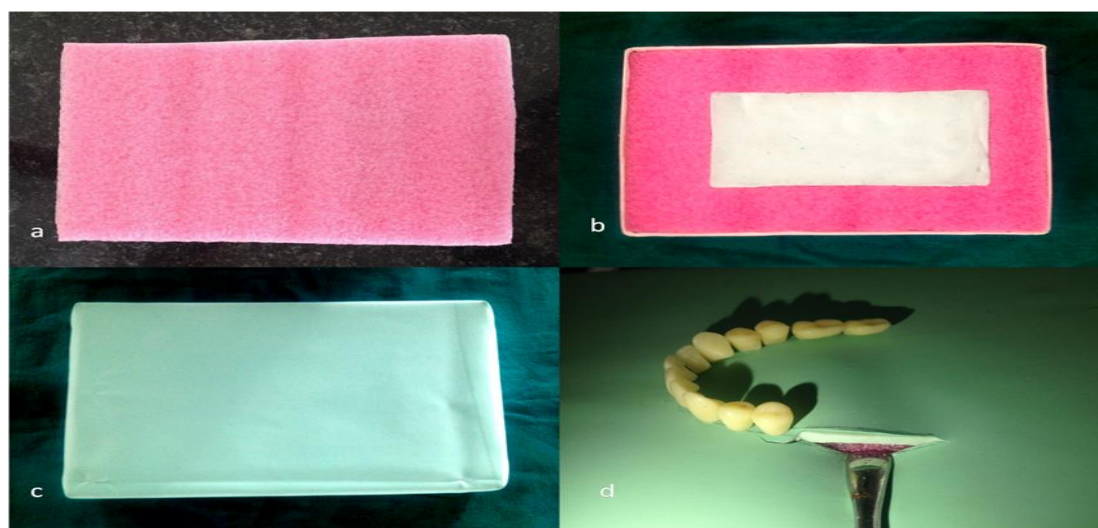


Figure2. Steps involved in construction of New Preclinical suturing model

- Foam
- Poly vinyl siloxane impression material in the central portion of foam
- Impression material embedded in foam, covered with macintosh sheet
- Cross section showing layers of foam, putty, macintosh sheet

The present exercise was carried out in Department of Periodontics, Himachal Institute of Dental Sciences, Paonta Sahib. A 17 cm x 23 cm sized, synthetic sponge of 5-6 mm thickness was taken and a 5mm thick layer of poly vinyl siloxane impression material in putty consistency was applied over its central portion. It was then covered with a macintosh sheet. On the prepared model, maxillary and mandibular acrylic teeth were arranged in an arch form, simulating their arrangement in the oral cavity (Figure 2).

SUTURING TECHNIQUE

The suturing exercise was performed using the following steps:

- Incision: Incisions were made around the arranged teeth using the Bard Parker handle and a no.15 blade at a uniform distance from the teeth, maintaining adequate interdental papilla.
- Suturing technique: A half circle needle was used for suturing along with nylon 3-0 suturing material. The needle was held with a needle holder from the junction of anterior two-third and posterior one-third. It was then penetrated through the macintosh sheet at 90° angle for the purpose of placing required sutures. Caution was exercised as to pass the needle along its curvature and the knots being tied away from the incision line.

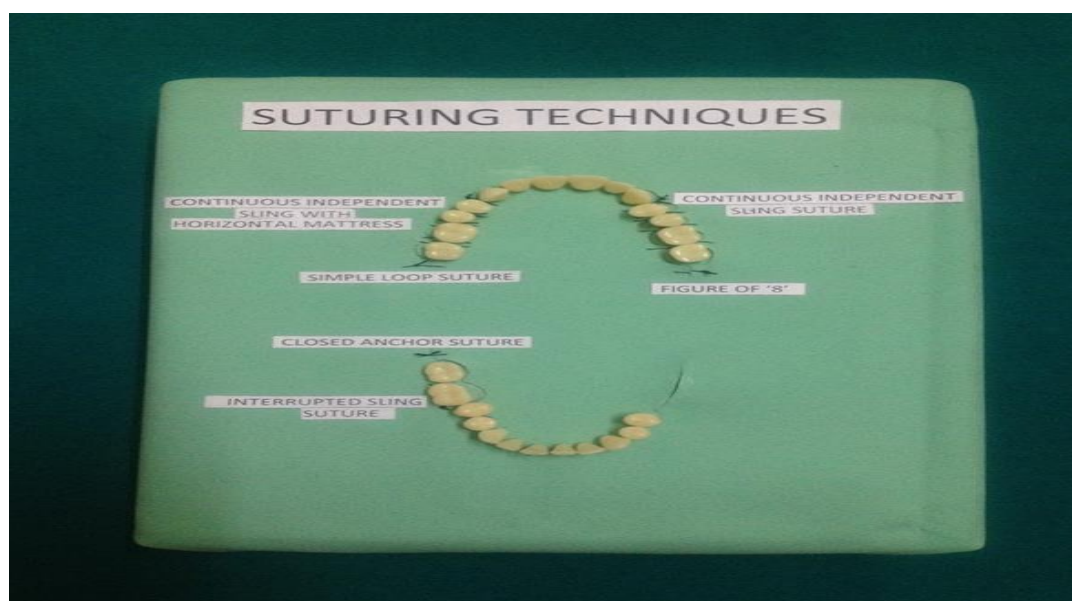


Figure3. Final model showing suturing techniques

Following the above said protocol, the suturing techniques practiced were as follows (Figure 3):

- Simple loop suture
- Interrupted figure of eight suture
- Continuous independent sling suture
- Continuous independent sling suture with horizontal mattress
- Closed anchored suture
- Independent sling suture.

DISCUSSION

Periodontal surgery is an ever evolving specialty that requires meticulous training and expertise. Attaining surgical proficiency is not possible without the knowledge and experience of suturing techniques. Thus, pre-clinical suturing models form an important component of the periodontal training protocol.

Various designs of preclinical suturing models have been followed in the medical field these include suturing on foam, animal skin, waste meat, self-made and commercially available suturing models (Uppal, N.,

& Saldanha, S. 2012; Whitehead, F.I., & Newman, A. 1973). These methods carry certain disadvantages. Foam, though easily available and has an infinite life, its consistency does not replicate the texture of normal mucosa of the oral cavity. The methods involving use of animal skin and waste meat are not ideal means of pre-clinical training as they are difficult to store and have chances of microbial contamination. Adequate simulation of the oral cavity could not be attained in the earlier models due to the lack of arrangement of teeth. To overcome all these drawbacks we have focused on the construction of a simple and cost effective suturing model that replicates the oral cavity and hence, has the ability to enhance the skills of medical trainees.

Keeping in mind the above facts, the present study focussed on the use of synthetic sponge, elastomeric impression material (addition silicone), macintosh sheet and acrylic teeth set. The foam sponge resembles the deeper connective tissue and the putty impression material further provides a firm, flexible base to the suturing model. Use of elastomeric impression materials (addition silicone) in putty consistency is recommended because of their rubbery

nature and good tear strength thus, simulating the elasticity and texture of keratinized mucosa. It offers acceptable resistance to the passage of a suture needle, and prevents suture material from cutting through the incision margins while placing the knot.

The idea of using this model is beneficial as the armamentarium required is easily available. The process of the overall construction of the model is not that time consuming as the material sets within 5 minutes (Kumaresan, R *et al.*, 2014). Training with this technique provides an improved dexterity to the trainees with less needle stick injuries and excellent tactile sensation as it simulates the living tissues.

CONCLUSION

Practice of the suturing techniques clearly forms an important aspect of the periodontal surgical training and construction of a suturing model that is easy to fabricate and simulates the oral tissues will indeed be beneficial for the same.

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