

Suturing Instrument, Materials and Techniques

Suturing Instrument and Materials:

These including the needle holder, the tissue holding forceps, the suture materials itself and the suture cutting scissors.

a) The Needle Holder: As its name implies, it's used to hold the needle during suturing. The needle holder usually has short and blunt beaks and a locking handle (Fragiskos, 2007). The inner part of the short beaks of the needle holder has grooving and crosshatched allow more control over the needle during suturing. This makes the tip characteristically different from the artery forceps, in which the tip has parallel grooves and the beaks usually narrower and longer than the beaks of the needle holder (Fig.1) (Hupp *et al.*, 2014).

b) The Surgical Tissue Forceps: They are used for firmly grasp the tissue as the needle is passed. The most commonly used one is the Adson Forceps. This forceps is small and narrow, having beaks with/without wedge projections on one side and a receptor on the other side. The two sides fit into each other when the forceps is closed allowing firm grasp of the tissue. For more posterior parts of the mouth the long standard surgical forceps can be used (Fig.2) (Fragiskos, 2007). In other cases, large amount of tissue is needed to be removed (e.g. biopsy) a tissue forceps with locking handle is needed to grasp the tissue. In this situation Allis tissue forceps can be used (Fig.3) (Hupp



Figure 1 Left, Needle holder. Right the surface of the needle holder is cross-hatched ensuring firm grip of the needle, while surface of the haemostat have parallel grooves that do not allow a firm grip of the needle (Hupp *et al.*, 2014)

et al., 2014). The Allis forceps and the towel clip can be used for grasping the anterior tongue during biopsy taking.



Figure 1 Surgical forceps. a, Standard. b, Adson tissue forceps (Fragiskos, 2007)

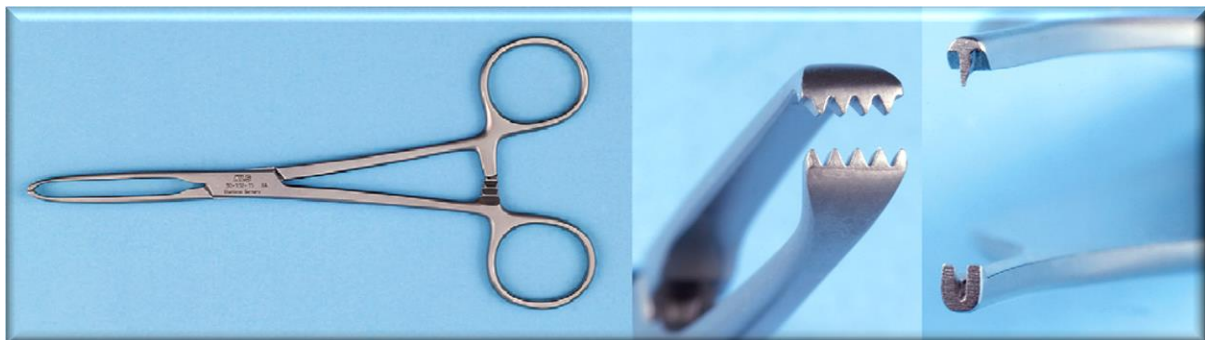


Figure 3 Left, the Allis tissue forceps. Right, Differences between beaks of Allis and Adson tissue forceps which reflect differences in their uses (Hupp *et al.*, 2014).

c) The Suture Cutting Scissors: They have variety of shapes. However, they all have in common a sharp tip to allow there insertion beneath the suture to cut it without causing much discomfort (Fig.4) (Mitra, 2009).



Figure 2 Suture Cutting Scissors

d) The Suture Material: It can be generally classified into two basic categories Resorbable and Non-resorbable sutures. The non-resorbable suture remains in the tissue and doesn't go by itself. It needs to be cut and

removed after healing takes place in about 7 days. Examples of these are silk, nylon, prolene and surgical steel. The silk is the most commonly used for oral surgical procedures.

On the other hand, resorbable sutures tend to resorb after certain time, according to the material of the suture. These can be either natural material (e.g. catgut or collagen) or synthetic material (e.g. Vicryl, PDS and Dexon). Catgut can be either plain catgut (resorbs in about 3-5 days) or Chromic catgut which is treated with chromic acid (resorb in about 7-10 days) (Hupp *et al.*, 2014). These sutures are used in areas with little tension, children, handicapped patients and any other patient who cannot return for suture removal (Fragiskos, 2007).



Figure 3 Non-resorbable sutures (Fragiskos, 2007)

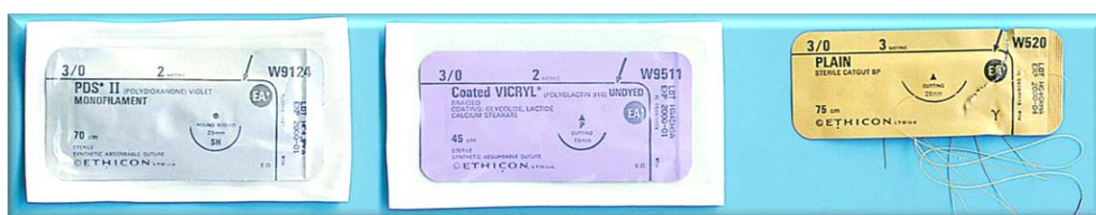


Figure 6 Resorbable sutures (PDS, Vicryl and Catgut) (Fragiskos, 2007)

Suture material can be also classified into polyfilament or braided suture (e.g. Silk, Vicryl) or monofilament (e.g. Nylon and Catgut) (Fig.7). Each type have its own advantages and disadvantages (Table.1)(Borle, 2014).

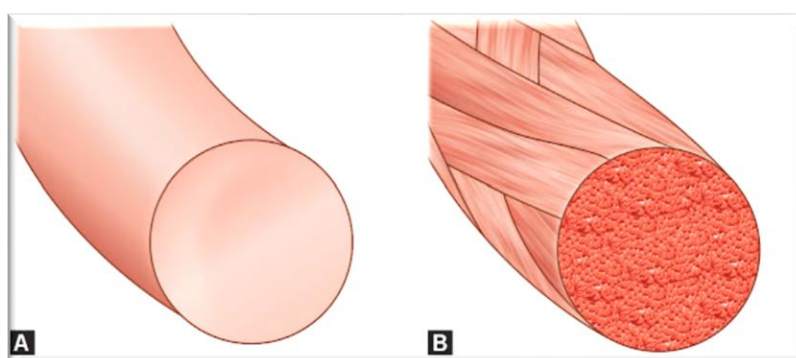


Figure 4 Magnified view of suture material. a, monofilament. b, polyfilament (Borle, 2014)

Table 1 Differences between monofilament and polyfilament suture

	Monofilament	Polyfilament
Knot Security	Less strength of knot (i.e. Tends to open), since the suture have smooth surface	Better knot strength
Infection	Smooth surface does not support bacterial growth	The multifilament can harbour bacteria forming a nidus of infection
Passage within tissue	Smooth surface allow easy passage	Less easy to pass within the tissues giving some tissue drag.
Traumatization from the suture ends	Ends are usually stiff causing trauma	The ends are usually smooth

Size of the suture: the size of the suture is assigned by a baseline average size termed as “0”. When the diameter of the suture decreases more “0” are added (e.g. 000 is same as 3-0 and 5-0 is smaller than 3-0). Whereas the diameter increase, less “0” are given (e.g. 2-0 is much larger than 6-0) (Borle, 2014).

Needles: These are usually made of stainless steel and can be classified either by their cross-section or by their size. The cross-section can be either round or oval (known as atraumatic needles) being the most commonly used for thin mucosa or it can be triangular in shape having three cutting edges on their surfaces. The latter can be either termed as cutting, having one cutting edge of the three on the inner surface, or reverse cutting, having two cutting edges of the three on the inner surface. When the needles are classified by their sizes, they are compared to a circle: one-quarter, three-eighths, half a circle or three-quarters of a circle (Fig.8) (Fragiskos, 2007).

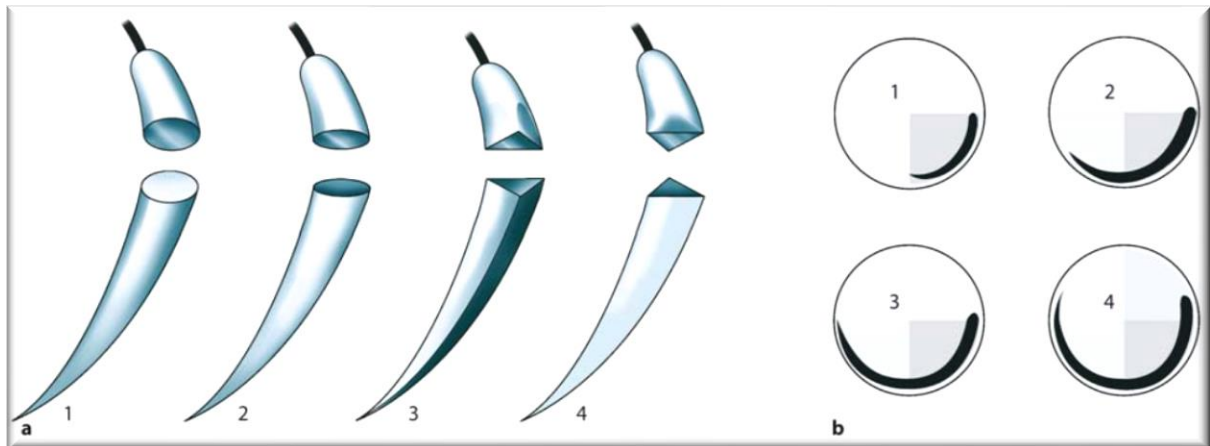


Figure 5 a, Cross-section of needles. (1) Round tapered, (2) Oval tapered, (3) Triangular with one cutting edge on the inner surface, (4) Triangular with two cutting edges on the inner surface.
b, Sizes of needles compared to a circle. (1) One-quarter. (2) Three-eighths. (3) Half a circle. (4) Three-quarters (Fragiskos, 2007).

Note: The college pliers are angled forceps that are used for picking up small objects in the mouth like loose fragments of tooth, amalgam, or other foreign material and for placing or removing gauze packs and cannot be used for soft tissue grasping (Fig.9).

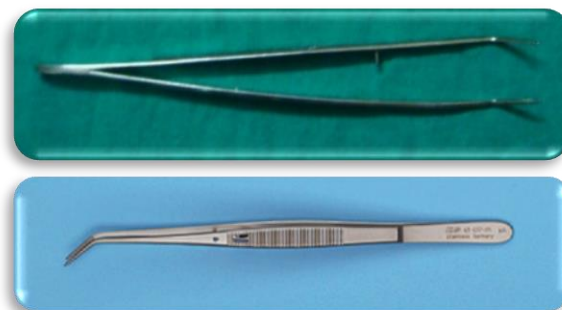


Figure 6 College tweezers

Suturing Techniques:

There are different techniques for suturing that can be used in oral surgical procedures, these are:

1. Interrupted suture.
2. Continuous suture.
3. Continuous interlocking suture.
4. Vertical mattress suture.
5. Horizontal mattress suture.
6. Figure of eight suture.

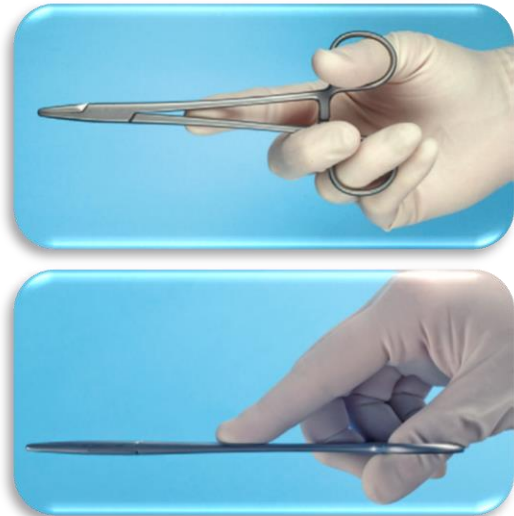


Figure 10 Correct handling of a needle holder.

Principle of suturing:

- The Needle should be grasped at about 2/3 of its length away from the tip (Fig. 11).
- The needle holder should be held by dominant hand thumb and ring fingers and having the index finger run along the instrument (Fig. 10).
- The tissue should be stabilized by tissue forceps during the needle passage.
- The tissue should be approximated passively, and the suture merely just keeps the area closed without tension.
- The needle should penetrate the tissue at right angle, taking full thickness of the flap. Acute angle results in superficial entrance (Fig.11).

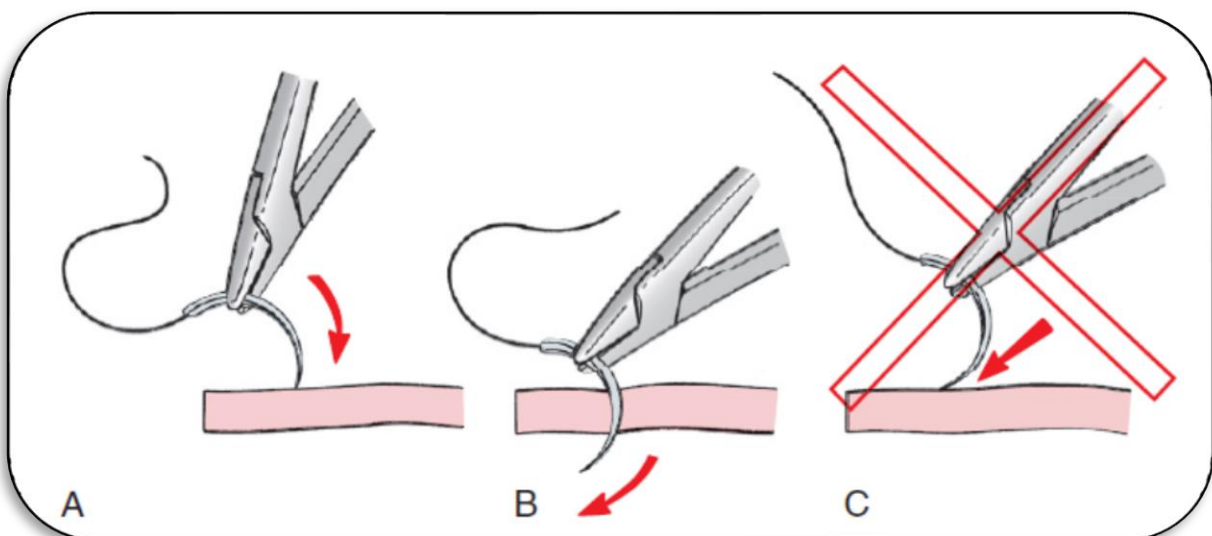


Figure 11 correct loading of needle and correct angulation for tissue passage.

- The needle should be 3mm away from the margin of incision, allowing sufficient bulk of tissue and minimizing the risk of tearing.
- Non-resorbable sutures are kept for about 7 days and then it best to be removed to minimize the risk of infection of the wound.

1. Interrupted Suture:

This the most common suturing techniques that almost used exclusively in most of the oral surgical procedures. The tightening of the suture is mostly done in oral surgery by instrument tie technique using needle holder. In this technique, the needle holder is placed horizontally and the suture is then wrapped twice in clockwise direction around the needle holder, the needle holder then grasps and pulls the free end of the suture through the loops creating what is known as “ The Surgeon Knot”. Then a safety knot is created by wrapping the suture once in counter clockwise direction around the needle holder. Sometimes the surgeon might prefer to add a third knot by wrapping the suture once in clockwise direction to add more security to the previously made knots (Hupp *et.al.*, 2014).

This technique has the advantage of better tissue security, in cast one suture being lost the other sutures will keep the area closed (Fragiskos, 2007) (Fig. 12).

2. Continuous Suture:

This type of suturing is mostly used for suturing long incisions. The suture is first in most distant area and a knot is made similar to interrupted suture, except only the free end of the suture is cut off and the other end of the suture with the needle is left. This end then continue to make more passage in continuous manner in the tissue. Finally, the last part of the suture left to form a loop which is used to tie the suture.

The advantage of this technique is that it is considered being faster in closing long incisions as it requires less number of knots. On the other hand, if the suture is cutted at any area the whole suture will be loose (Fig. 13).

3. Continuous Interlocking Suture:

This is a variation of continuous suture technique; in this technique the needle makes a passage beneath the loop of every bite before the suture is being tightened. This will form a suture similar to a chain with added security (Fig. 14).

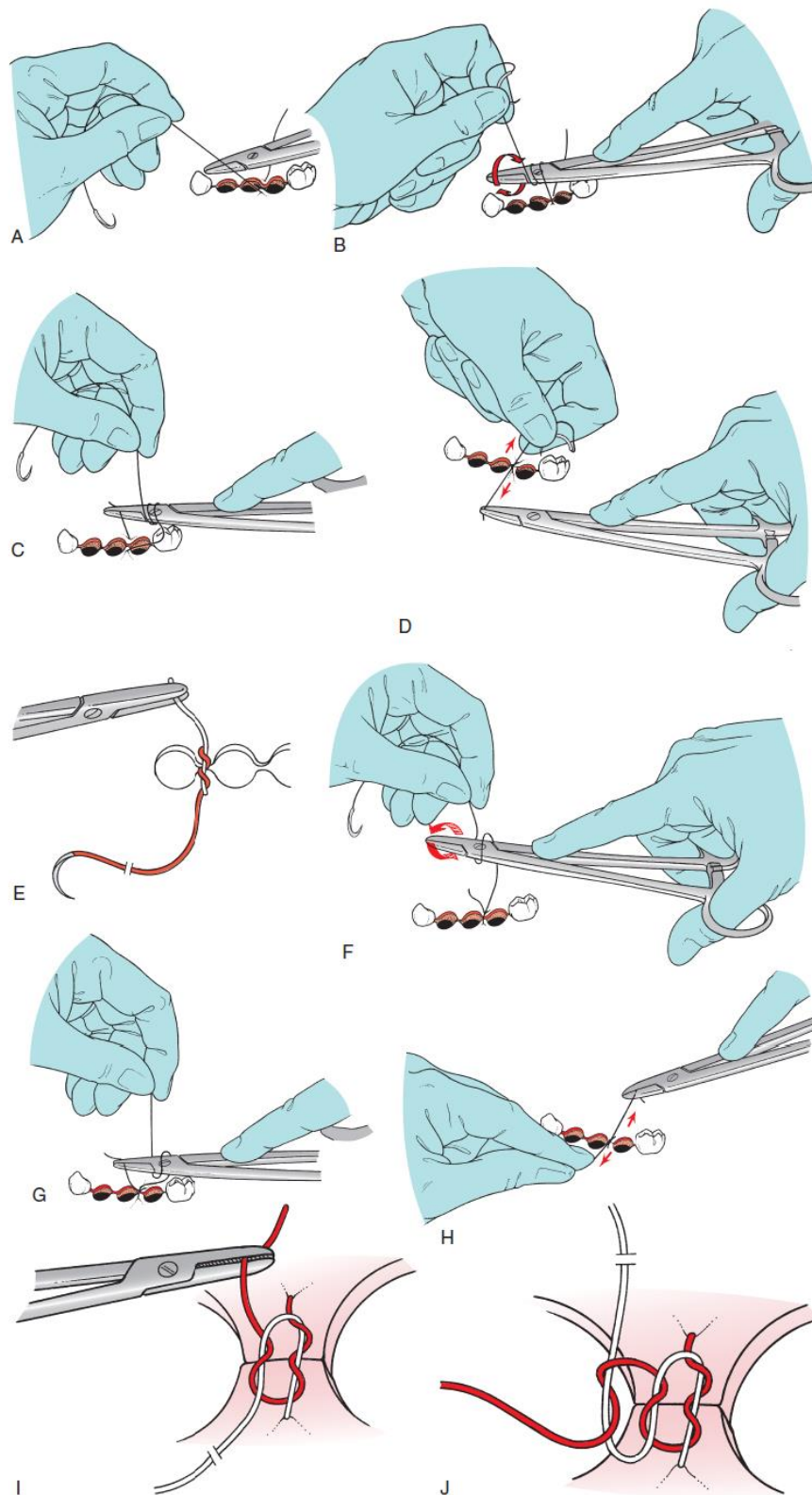


Figure 12 Technique for instrument tie for interrupted suture.

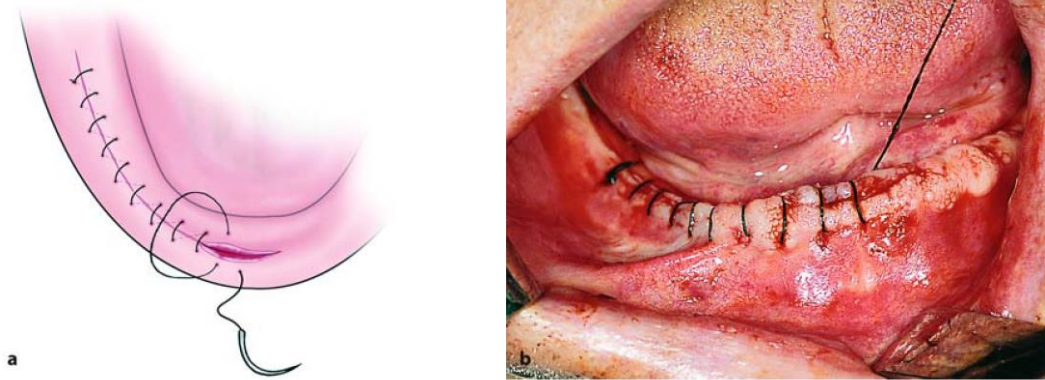


Figure 13 Continuous Suturing Technique.

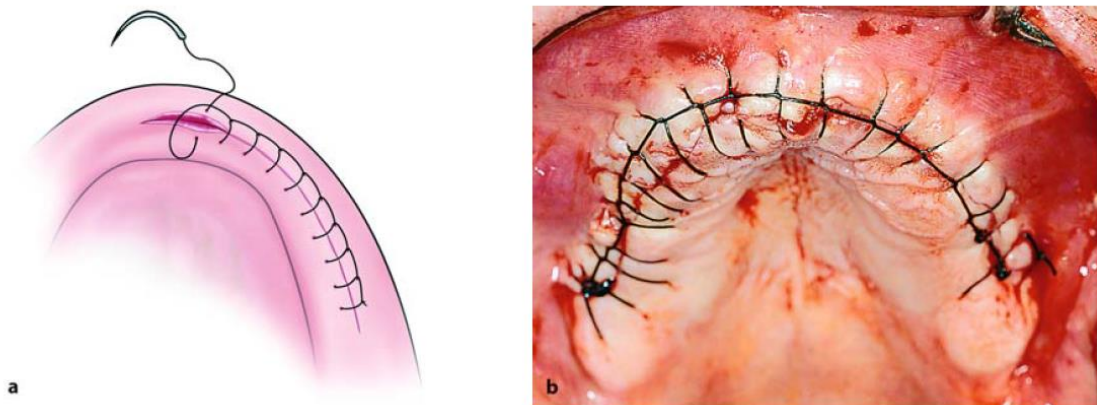


Figure 14 Continuous Interlocking Suturing Technique.

4. Horizontal Mattress Suture:

This type of suture is used when high strength is needed. The suture enters from the buccal side, loops around palatal side and exits from the buccal side, then a knot is made similar to interrupted suture to be placed on buccal side. This type of suture can be used to reposition interdental papilla and to approximate the soft tissue around extraction sockets (Fig. 15).

5. Vertical Mattress Suture:

This type of suture is used for closure of deep incisions. Its use is limited in oral surgical procedures (Fig. 16).

6. Figure of Eight Suture:

This type of suture helps to prevent dislodgment of clot or packing material from an extraction socket (e.g. an oxidized cellulose or collagen plug) (Fig. 17).

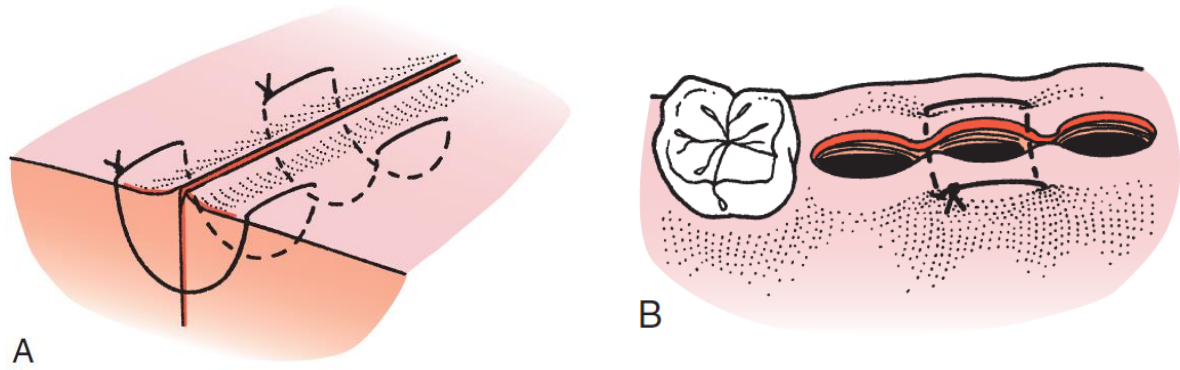


Figure 15 Horizontal Mattress Suture

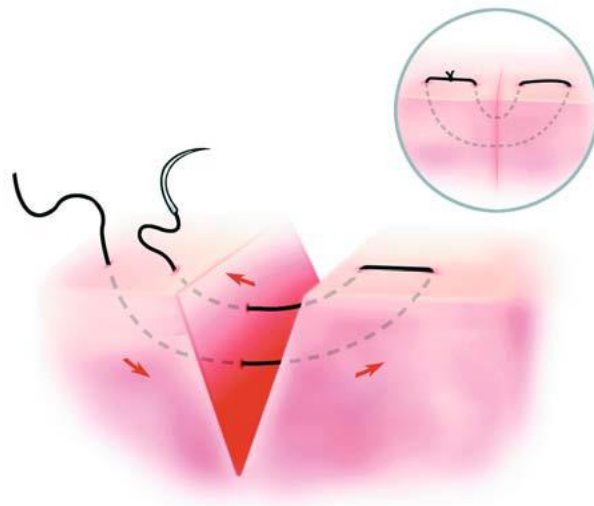


Figure 16 Vertical Mattress Suture

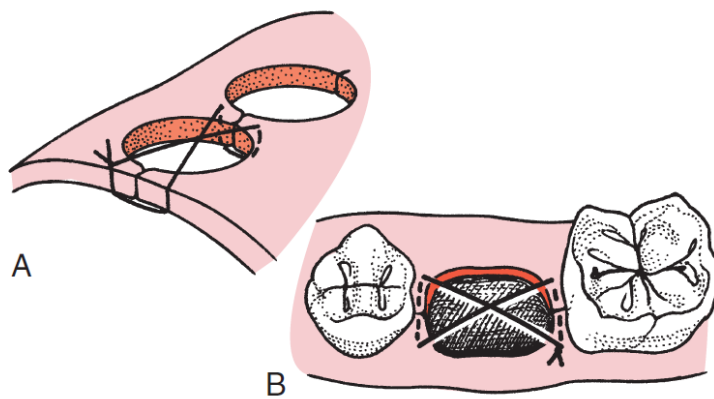


Figure 17 Figure of Eight Suture

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