SECOND EDITION

Practical Periodontal Plastic Surgery

Edited by Serge Dibart

WILEY Blackwell

PRACTICAL PERIODONTAL PLASTIC SURGERY

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PRACTICAL PERIODONTAL PLASTIC SURGERY

Foreword

Rarely does a scholarly work bridge the gap between academic underpinnings and utility for the practitioner. *Practical Periodontal Plastic Surgery* fulfills that role and is arguably the most useful book available on the subject today. Like all scholarly works, the content is not static and it requires updating. This second edition fills the gaps created by new discoveries and advances in the field since the publication of the first edition.

The essence of any practical guide to surgical procedures is the understanding of the biology, anatomy, and technical complexities of the procedures described. Omitting any of these elements limits the utility of the work. This book is indeed "practical" in every sense of the word. It is complete as well as directly useful. The clearly written chapters by the most expert educators and practitioners in the field provide an easily understood and valuable guide to experienced practitioners and students alike.

The discipline of periodontal plastic surgery has expanded exponentially in the past few years, making this second edition both timely and necessary. Life-long learning by the dental surgeon is the essence of successful, quality patient care. This book provides an excellent tool to manage the continued education needed for successful patient care by periodontists and others in our profession with an interest in the specialty. Our field is changing fast and everyone must keep abreast of innovations and changes to be successful caregivers in the 21st century.

In the spirit of scientific discovery and the development and implementation of those discoveries, this textbook, with new and expanded chapters, provides the scope and utility necessary for fostering expanded practical learning.

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Chapter 1 Definition and Objectives of Periodontal Plastic Surgery

Serge Dibart, Mamdouh Karima, and Drew Czernick

Periodontal plastic surgery procedures are performed to prevent or correct anatomical, developmental, traumatic, or plaque disease-induced defects of the gingiva, alveolar mucosa, and bone (American Academy of Periodontology 1996).

THERAPEUTIC SUCCESS

This is the establishment of a pleasing appearance and form for all periodontal plastic procedures. Treatment of mucogingival deformities requires gingival augmentation procedures that address both a functional and esthetic component for the patient (American Academy of Periodontology 2015).

INDICATIONS

Gingival Augmentation

This is used to stop marginal tissue recession resulting from periodontal inflammation, toothbrush abrasion, or naturally occurring or orthodontically induced alveolar bone dehiscences. It facilitates plaque control around teeth or dental implants (Schrott et al. 2009; Lin et al. 2013) or in conjunction with the placement of fixed partial dentures (Nevins 1986; Jemt et al. 1994).

Root Coverage

The migration of the gingival margin below the cemento-enamel junction with exposure of the root surface is called *gingival recession*, which can affect all teeth surfaces, although it is most commonly found at the buccal surfaces (Murtomma et al. 1987). Gingival recession has been associated with toothbrushing trauma, periodontal disease, tooth malposition, alveolar bone dehiscence, high muscle attachment, frenum pull, and iatrogenic dentistry (Wennstrom 1996). Gingival recessions can be classified in four categories based on the expected success rate for root coverage (Miller 1985):

- Class I: A recession not extending beyond the mucogingival line; normal interdental bone. Complete root coverage is expected.
- Class II: A recession extending beyond the mucogingival line; normal interdental bone. Complete root coverage is expected.
- Class III: A recession to or beyond the mucogingival line. There is a loss of interdental bone, with level coronal to gingival recession. Partial root coverage is expected.
- Class IV: A recession extending beyond the mucogingival line. There is a loss of interdental bone apical to the level of tissue recession. No root coverage is expected.

Root-coverage procedures are aimed at improving aesthetics, reducing root sensitivity, and managing root caries and abrasions.

Augmentation of the Edentulous Ridge

This is a correction of ridge deformities following tooth loss (facial trauma) or developmental defects (Allen et al. 1985; Hawkins et al. 1991). It is used in preparation for the placement of a fixed partial denture or implant-supported prosthesis when aesthetics and function could be otherwise compromised. Ridge deformities can be grouped into three classes (Seibert 1993):

- Class I: A horizontal loss of tissue with normal, vertical ridge height
- Class II: Vertical loss of ridge height with normal, horizontal ridge width
- Class III: Combination of horizontal and vertical tissue loss

Aberrant Frenulum

Frenectomy or frenotomy can be used to remove or apically reposition aberrant frenulum in order to close diastemas in conjunction with orthodontic therapy. It is used in treating gingival tissue recession aggravated by a frenum pull (Edwards 1977).

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Prevention of Ridge Collapse Associated with Tooth Extraction (Socket Preservation)

The maintenance of socket space with a bone graft after extraction will help reduce the chances of alveolar ridge resorption and facilitate future implant placement.

Crown Lengthening

This is used when there is not enough dental tissue available (Yeh & Andreana 2004; Sharma et al. 2012) or to improve aesthetics (Bragger et al. 1992; Garber & Salama 1996; Sonick 1997).

Exposure of Nonerupted Teeth

The procedure is aimed at uncovering the clinical crown of a tooth that is impacted and enable its correct positioning on the arch through orthodontic movement.

Loss of Interdental Papilla

No technique can predictably restore a lost interdental papilla (Blatz et al. 1999; Kaushik et al. 2014). The best way to restore a papilla is not to lose it in the first place.

FACTORS THAT AFFECT THE OUTCOME OF PERIODONTAL PLASTIC PROCEDURES

Teeth Irregularity

Abnormal tooth alignment is a major cause of gingival deformities that require corrective surgery and is a significant factor in determining the outcomes of treatment. The location of the gingival margin, the width of the attached gingiva, and the alveolar bone height and thickness are all affected by tooth alignment.

On teeth that are tilted or rotated labially, the labial bony plate is thinner and located farther apically than on the adjacent teeth. The gingiva is receded, subsequently exposing the root. On the lingual surface of such teeth, the gingiva is bulbous and the bone margins are closer to the cemento-enamel junction (Bowers 1963; Andlin-Soboki & Bodin 1993). The level of gingival attachment on root surfaces and the width of the attached gingiva following mucogingival surgery are affected as much, or more, by tooth alignments as by variations in treatment procedures.

Orthodontic correction is indicated when performing mucogingival surgery on malpositioned teeth in an attempt to widen the attached gingiva or to restore the gingiva over denuded roots. If orthodontic treatment is not feasible, the prominent tooth should be ground to within the borders of the alveolar bone, avoiding pulp injury.

Roots covered with thin bony plates present a hazard in mucogingival surgery. Even the simplest type of flap (partial thickness) creates the risk of bone resorption on the periosteal surface (Hangorsky & Bissada 1980). Resorption in amounts that generally are not significant may cause loss of bone height when the bony plate is thin or tapered at the crest.

Mental Nerve

The mental nerve emerges from the mental foramen, most commonly apical to the first and second mandibular premolars, and usually divides into three branches. One branch turns forward and downward to the skin of the chin. The other two branches travel forward and upward to supply the skin and mucous membrane of the lower lip and the mucosa of the labial alveolar surface.

Trauma to the mental nerve can produce uncomfortable paresthesia of the lower lip, from which recovery is slow. Familiarity with the location and appearance of the mental nerve reduces the likelihood of injuring it.

Muscle Attachments

Tension from high muscle attachments interferes with mucogingival surgery by causing postoperative reduction in vestibular depth and width of the attached gingiva.

Mucogingival Junction

Ordinarily, the mucogingival line in the incisor and canine area is located approximately 3 mm apically to the crest of the alveolar bone on the radicular surfaces and 5 mm interdentally (Strahan 1963). In periodontal disease and on malpositioned, disease-free teeth, the bone margin is located farther apically and may extend beyond the mucogingival line.

The distance between the mucogingival line and the cemento-enamel junction before and after periodontal surgery is not necessarily constant. After inflammation is eliminated, there is a tendency for the tissue to contract and draw the mucogingival line in the direction of the crown (Donnenfeld & Glickman 1966).

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Chapter 2 Surgical Armamentarium, Sutures, Anesthesia, and Postoperative Management

Serge Dibart

ARMAMENTARIUM

This includes the basic surgical kit:

- Mouth mirror
- Periodontal probe (UNC 15; Hu-Friedy, Chicago, IL, USA)
- College pliers (DP2; Hu-Friedy)
- Scalpel handle no. 5 (Hu-Friedy) with blade no. 15 or 15C
- Tissue pliers (TPKN; Hu-Friedy)
- Periosteal elevator 24G (Hu-Friedy)
- Prichard periosteal elevator (PR-3; Hu-Friedy)
- Gracey curette 11/12 or Younger-Good universal curette (Hu-Friedy)
- Rhodes back-action periodontal chisel (Hu-Friedy)
- Castroviejo needle holder (Hu-Friedy)
- Goldman-Fox curved scissors (Hu-Friedy)
- A 5-0 silk suture with P-3 needle
- A 5-0 chromic gut suture with C-3 needle
- Periodontal dressing

For basic microsurgical procedures, add the following to the kit:

- Magnifying loupes ×4 (or higher) wide field or surgical microscope
- Surgical headlight (optional)
- Miniblade scalpel handle with miniblades (round tip and spoon blade angle of 2.5 mm)
- Micro Castroviejo needle holder
- Castroviejo curved microsurgical scissors
- Microsurgical tissue pliers
- A 6-0 chromic gut suture with C-1 needle
- A 7-0 coated vicryl suture 3/8 with 6.6-mm needle

SUTURES

Use the smallest and least reactive suture material compatible with the surgical problem (Halstead 1913).

Types

Two major categories of suture materials exist—resorbable and nonresorbable. These sutures are best used with tapercut needles, which have a sharp point and pass atraumatically through the mucogingival tissue, making them ideal for periodontal plastic surgery use.

Nonresorbable Sutures

Silk (Braided)

A silk suture is easy to use, and its smooth handling ensures knot security. A disadvantage, however, is that it will absorb plaque and may infect the wound if kept longer than 1 week.

Polyester (Nylon Monofilament, Polytetrafluoroethylene)

The polyester suture can be kept in the mouth longer, for 2–3 weeks, with little risk of infection. A disadvantage is that it is likely to untie if extreme care is not exerted when tying the knot. This is a result of the materials' characteristics.

Resorbable Sutures

Gut

A gut suture has mild tensile strength and is resorbed by the body's enzymes in approximately 5–7 days. A disadvantage is that its knot-handling properties are inferior to those of silk sutures. Gut sutures may untie, so care must be taken not to cut the ends too short. Gut sutures may also irritate the tissues.

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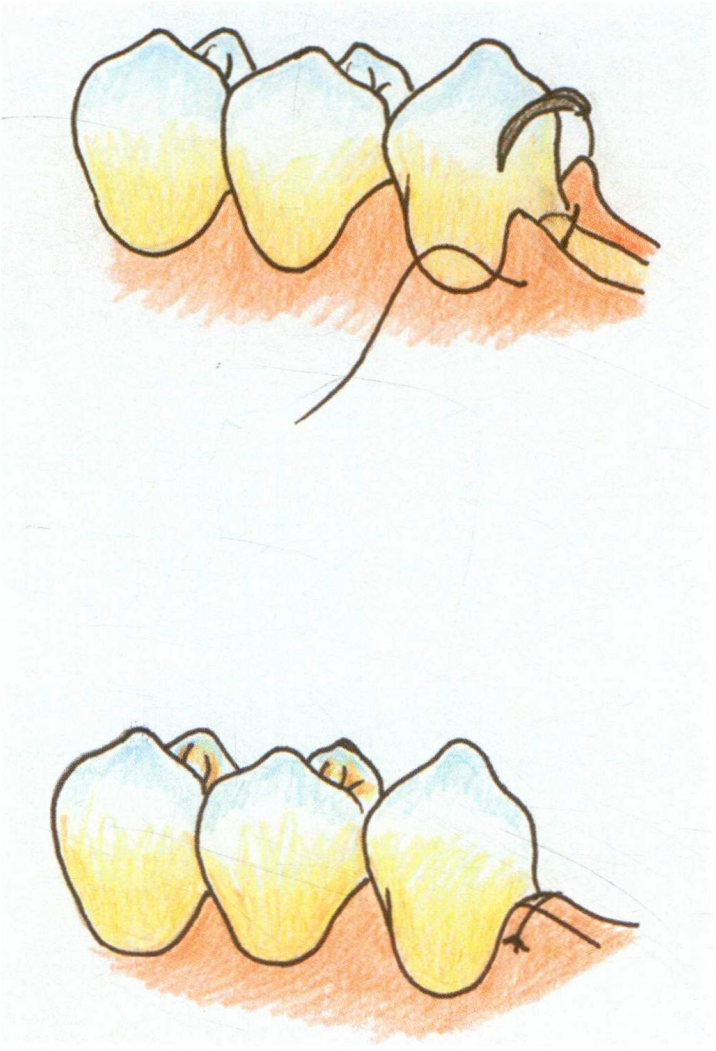

Figure 2.1 Single interrupted suture.

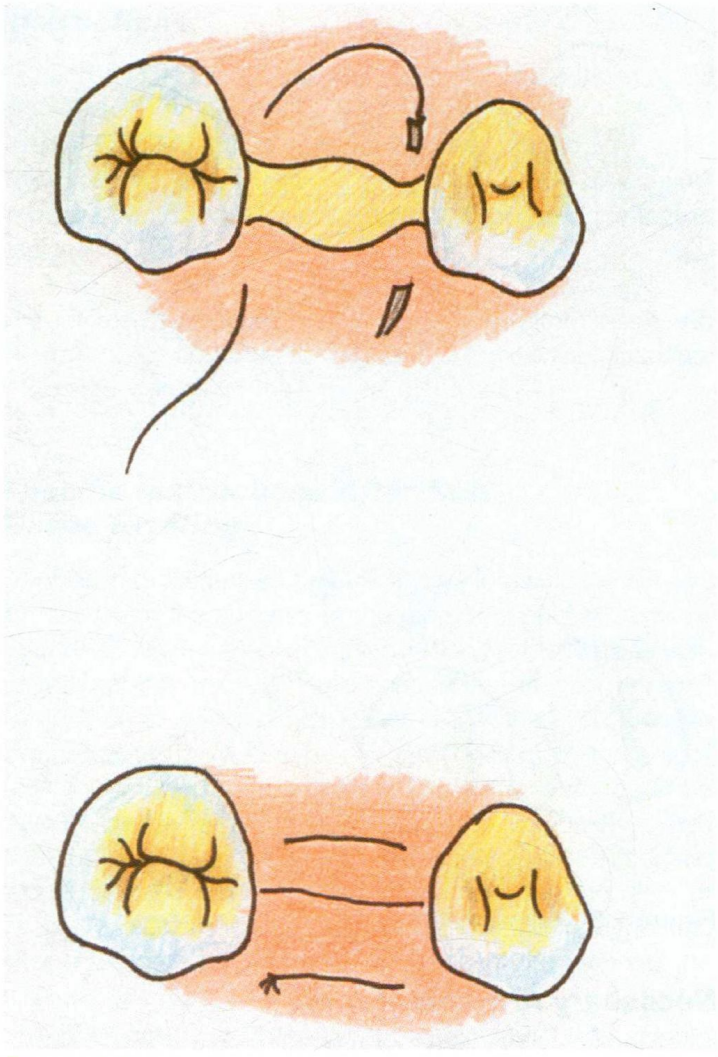

Figure 2.2 Horizontal mattress sutures.

Chromic Gut

A chromic gut suture has moderate tensile strength and is resorbed in 7–10 days. This suture is more practical than the gut suture.

Polyglycolic Acid (Synthetic)

The polyglycolic acid suture has good tensile strength, resorbs slowly (within 3–4 weeks intraorally), and is broken down through slow hydrolysis.

Sizes

Suture sizes vary from 1-0 to 10-0, with 10-0 being the thinnest. The most common size used for periodontal plastic macrosurgery is 5-0, and the most common sizes used for periodontal microsurgery are 6-0, 7-0, and 8-0.

Cyanoacrylates (Butyl and Isobutyl Forms)

Cyanoacrylate sutures have been used in wound closure since the mid-1960s. The cyanoacrylates can cement tissues together and dissolve in 4–7 days (McGraw & Caffesse 1978). These sutures should not be used alone to secure wound closure, but can be used as an adjunct to sutures.

Techniques

- Single interrupted suture (Fig. 2.1)
- Horizontal mattress suture (Fig. 2.2)
- Vertical mattress suture (Fig. 2.3)
- Crisscross suture (Fig. 2.4)
- Sling suture (Fig. 2.5)

ANESTHESIA

Most of the time, adequate and profound anesthesia for soft tissue resection and limited bone contouring may be secured through infiltration. Block anesthesia may reduce the number of needle punctures in nonanesthetized tissue, but infiltration will achieve tissue rigidity and hemostasis that are useful when proceeding with the incisions.

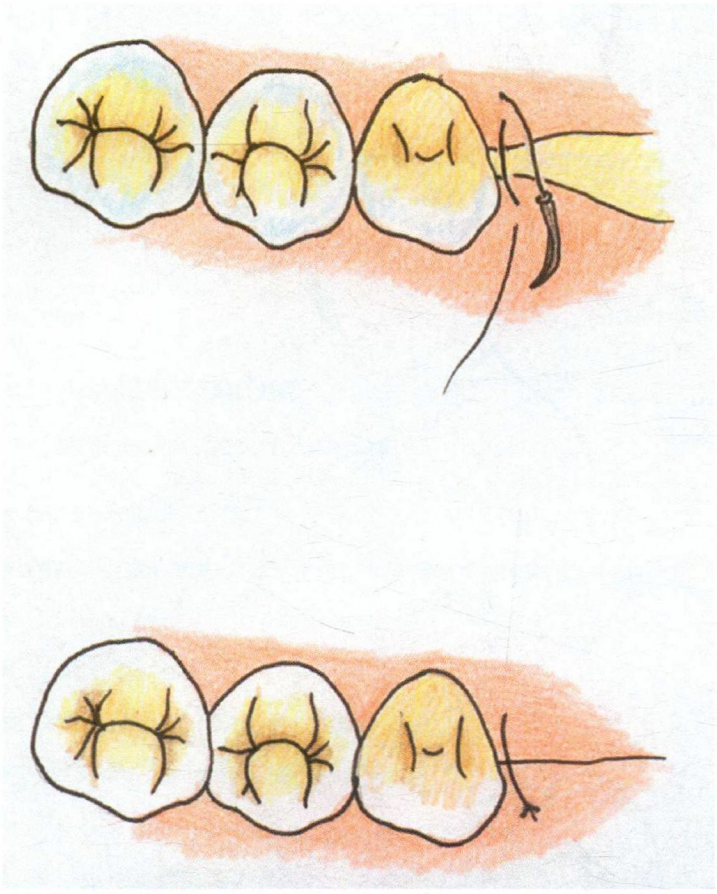

Figure 2.3 Vertical mattress suture.

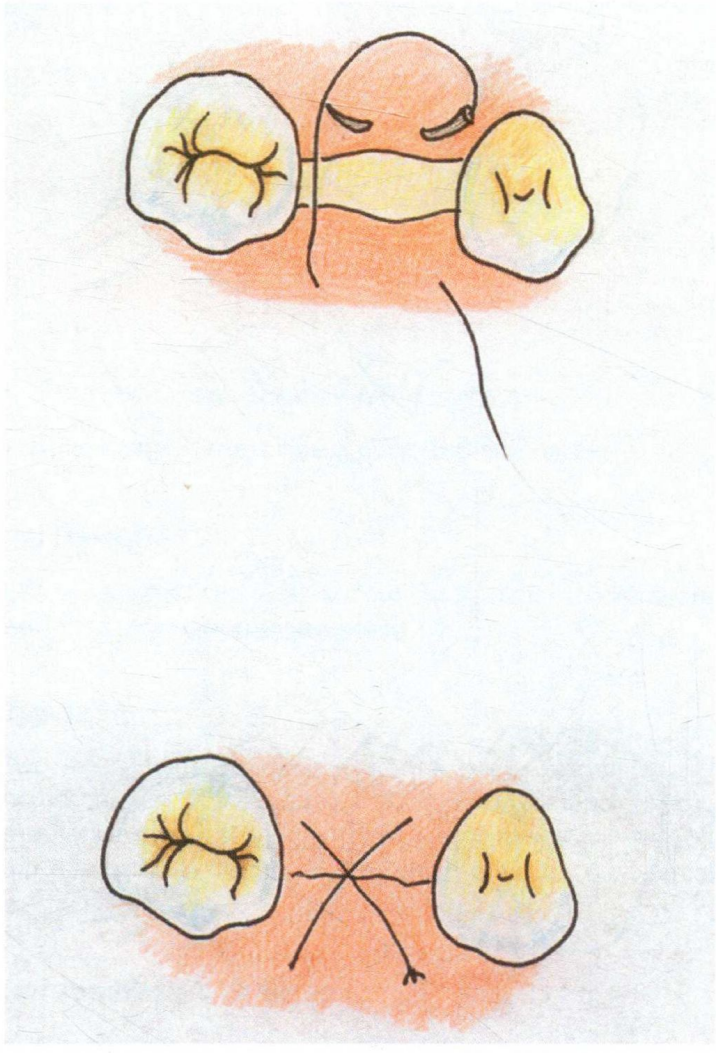

Figure 2.4 Crisscross suture.

Necessary Armamentarium

- 10 ml chlorhexidine gluconate 0.12
- Topical anesthetic and application tip
- Anesthetic aspirating syringe
- 30-gauge needle
- Lidocaine hydrochloride (HCl) with 1/100,000 epinephrine
- Lidocaine HCl with 1/50,000 epinephrine (to control hemorrhaging only)

Technique

After the patient rinses for 1 min with 10 ml of chlorhexidine gluconate, dry the areas to be anesthetized with a gauze. Using a Q-tip, apply the topical anesthetic on the oral tissues for 3 min for superficial anesthesia. Then anesthetize locally using one or two carpules of lidocaine HCl with 1/100,000 epinephrine in infiltration. Distraction techniques, such as gently pressing the tissues at some distance of the intended puncture site, may help further diminish the perception of puncture pain.

The first step is to administer the injection to the vestibular fold and then inject small amounts of anesthetic into the interdental papillae of the surgical site (buccal and palatal/lingual). You will observe blanching of the papilla being anesthetized, the marginal gingiva, and the adjacent papilla. This will help provide a painless anesthesia as you move along the area to be anesthetized.

Diffuse the anesthetic by gently massaging the soft tissues of the vestibular fold with your finger. This will reduce the swelling occasioned by the anesthetic solution. At this time, you will be able to see your anatomical landmarks again. Massaging the tissue will also promote their rapid anesthesia.

A few drops of lidocaine HCl with 1/50,000 epinephrine can be used to control bleeding by infiltrating the tissues around the surgical site.

POSTOPERATIVE INSTRUCTIONS, MEDICATIONS, AND REGIMEN

After the procedure, the patient is given a mild analgesic while still in the office (i.e., ibuprofen 600 mg) as well as an ice pack.

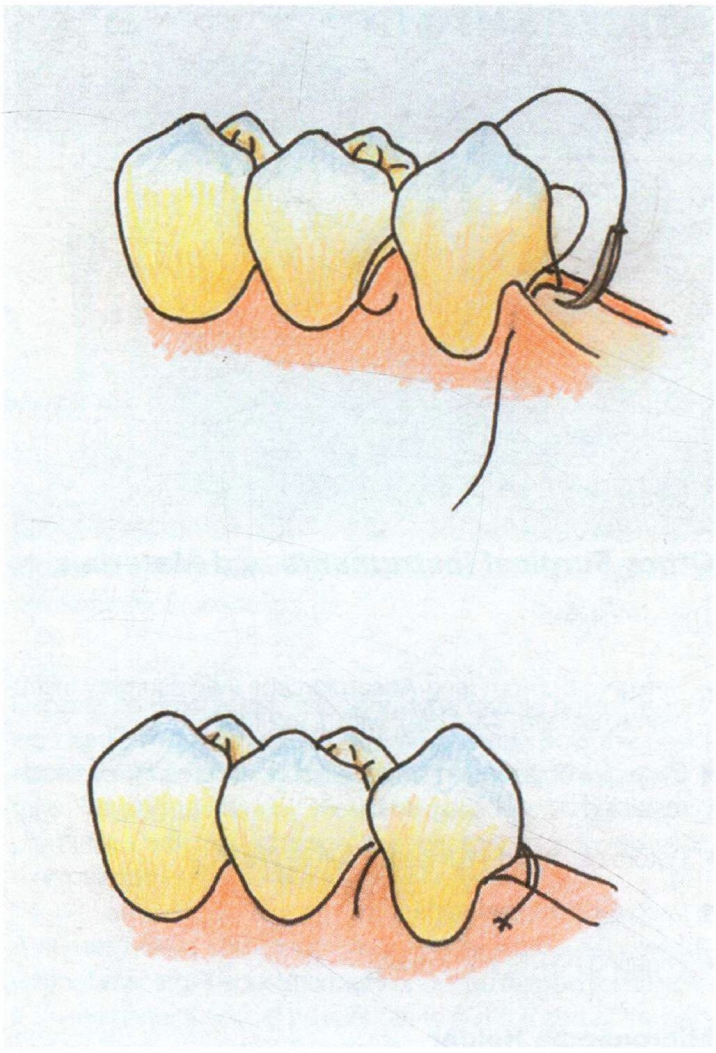

Figure 2.5 Sling suture.

Prescription

1. Ibuprofen 600 mg (Motrin) or acetaminophen 300 mg and codeine phosphate 30 mg (Tylenol no. 3) 3–4 times a day as needed for pain.
2. Chlorhexidine gluconate 0.12% to be used after week 1. Rinse twice a day for 7 days.

Instructions

Instruct the patient to keep the ice on the face for the next 2 h, 20 min on and 20 min off. Also instruct the patient to keep a soft diet and to avoid alcoholic beverages and hot or spicy food for the next 48 h. The patient should also refrain from rinsing, physical exercise, and taking drugs containing aspirin.

The sutures, if nonresorbable, will be removed after 1 week, and the patient will be asked to rinse with chlorhexidine gluconate 1.2% for 1 week after the removal of the sutures.

Specific Instructions After Soft Tissue Grafting

Emphasize to the patient that the 4 days following the surgery are critical for the success of the graft. It should be remembered that, when transplanted, a diffusion system will maintain both the graft's epithelium and connective tissue for approximately 3 days until circulation is restored (Foman 1960); therefore, complete immobility of the graft is a must for a successful outcome of the procedure. After suture removal, the patient should not brush the grafted area for 2 weeks. Two weeks after surgery a Q-tip, dipped in chlorhexidine gluconate, should be used in lieu of a toothbrush to clean the teeth of the grafted site. The patient should continue this for 2 months. After a 2-month period, gentle brushing of the area can be initiated.

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Chapter 3 Introduction to Microsurgery and Training

Ming Fang Su and Yu-Chuan Pan

INTRODUCTION

In 1960, J.H. Jacobson and E.L. Suarez first introduced microsurgical technique when they anastomosed small vessels under an operative microscope. In 1963, Chen Zong-Wei, the authoritative figure in microsurgery in China, reported the world's first successful replantation of an amputated forearm (Chen et al. 1963a & b). Thereafter, with the development and refinement of microsurgical technique and its clinical application, much progress has been made in reconstructive surgery throughout the world.

TRAINING IN MICROSURGERY

Generally speaking, microsurgery techniques are comparatively difficult to learn. Learning microsurgical skills requires practice that involves a period of hardship and endurance. Before the clinical application in patients, it is paramount that one trains in the laboratory and on animal models to gain familiarity with techniques.

Since viewing objects under the microscope or surgical loupes is different from viewing objects with the naked eye, a surgeon's hand–eye coordination must be precisely adjusted according to various degrees of magnification. The hands must be trained for delicate manipulation. This is one of the challenges in microsurgery. The higher the magnification is, the more accurate the maneuvering that is required.

BASIC MICROINSTRUMENTATION

Few items are required for training in microsurgery (Fig. 3.1).

Microsurgery Basic Set

The five pieces are:

- One curved, 14-m-long microneedle holder
- Two straight, 15-cm-long micro-strong forceps, with a 0.3-mm tip and round handle with platform
- One straight, 14-cm-long forceps, with a 0.2-mm tip and round handle with platform
- One straight, 14-cm-long scissors

Other Surgical Instruments and Materials

These include:

- Straight, 12.5-cm-long Adson forceps (Microsurgery Instruments, Bellaire, TX, USA), with 1 × 2 teeth
- Curved, 12.5-cm-long Iris scissors (Microsurgery Instruments)
- Suture card with 16 lines for suture practice
- Vascular double clamps
- Irrigating needle and spring

Microneedle Holder

The needle holder is used to grasp the needle, pull it through the tissues, and tie knots. The needle should be held between its middle and lower thirds at its distal tip. If the needle is held too close to the top, the anastomosis between the two ends of the vessel cannot be completed with a single stitch. If it is held too close to the bottom, maintaining steady control is difficult, and the direction of the tip can be changed easily. The needle can be bent or broken if too much force is used.

The needle holder is mainly manipulated by the thumb, index, and middle fingers, similar to how a pencil is held between the fingers. With this pencil-holding posture, the hand is maintained in a functional or neutral position.

The appropriate needle-holder length depends on the nature of the operation. The most commonly used are 14 cm and 18 cm. The tips can be straight or gently curved, but the latter are most often used. The choice of the tip is determined by the nature of the suture. Usually a delicate tip (0.3 mm) is used for 8-0 and 10-0 sutures. The needle holder with a 1-mm tip is used for 5-0 and 6-0 sutures.

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Figure 3.1 Basic setup for microsurgical training, including a chicken's foot (see text).

Dentists commonly use a locking-type needle holder. A locking needle holder is useful because one can hold the needle securely, which is most important during needle insertion. To minimize jogging, the lock should be closed slowly but released promptly. Dedicated practice is necessary to develop skillful manipulation of the needle holder.

A needle holder should ensure that a needle is held steadily without slipping. It should be light and require the minimal force from the hand. It should be a length to suit the size of the hand and be manipulated easily. A titanium needle holder is the best choice.

Microforceps

These are important instruments in microsurgery, especially for delicate manipulation and detailed movement. They are used to handle minute tissues without damaging them and to hold fine sutures while tying knots. Microforceps can make those maneuvers that cannot be performed by hand. For example, the forceps can be inserted into the lumen of a cut vessel end to open the vascular lumen for needle insertion. The forceps used for vessel anastomosis are very fine and called *dilators*.

A standard pair of forceps should be able to pick up a 100 nylon suture on a glass board without slipping. The tips of the forceps should be smooth and strong. The forceps should not damage the tissue, and no break to the suture should occur during suturing.

Microdissection

Microforceps are used for dissection, especially for blood vessels and nerves. A common mistake occurs when the tips of the forceps adhere to the vessel wall, and the vessel breaks, which leads to massive bleeding. Therefore, when using the forceps for dissection, the artery and the vein should not be touched with the tips, which should be kept closed. The sides of the tips are used for dissection of tissues and blood vessels, similar to how fingers are used during blunt dissection in general surgery.

To prevent unnecessary bleeding, it is important to remember to use the *sides* of the tips for dissection so that the tips do not face and break the vessels. Delicate dissection can be performed after one is familiar with the use of microforceps. Even 0.3- to 0.5-mm blood vessels or nerves can be handled after repeated practice.

There are different types of microforceps for different operations. The most commonly used microforceps are 15 cm long, with round handles and 0.2- to 0.3-mm tips. The rounded handle enables the direction, degree, and position of the instrument to be changed by merely rolling the fingers, which facilitates knotting and dissection. The tips for microforceps can be straight or curved. Some have teeth to strengthen the opposing force of the tips, and some also have platforms. When operating on deeper structures, like the posterior part of the oral cavity, 18-cm-long forceps are used for dissection and for tying knots.

Jeweler forceps are strong and cheap, with a variety of tips available. They can be straight or curved at different degrees, such as 45° or 90°. They are usually 11–12 cm long and suitable only for superficial operations. Their handles are flat, which makes rotating and changing the direction of the instrument less efficient.

While stitching with a needle holder and forceps, the needle sometimes isn't in the microscopic field of view. Two different methods are adopted to find the missing needle. The first is to place the needle within the operating field under the microscope after every stitch. This is not only the easiest method but also the most time efficient. In the other method, the forceps are used to grasp one end of the thread, which slides through the tips of the forceps. The needle holder can catch the thread while the needle is seen. This should be done under the microscope to reduce operating time.

Microscissors

These are used for the dissection of tissues, blood vessels, and nerves. Different sizes of scissors are used for cutting sutures or tissue, removing adventitial tissue of vessels or nerves, and trimming vessels or nerves during repair.

The most commonly used microscissors are 14 cm and 18 cm long. To manage the delicate part of the adventitial tissues, 9-cm microscissors are preferable.

The tips of the scissor blades can be straight or gently curved. Straight scissors cut sutures and trim the adventitia of vessels or nerve endings. Curved scissors dissect vessels and nerves. The tips of the scissors should be sharp and cut with ease. During dissection of tissues and vessels, apart from using the tips to cut, the sides of the scissors can be used for dissection with the tips closed, similar to dissection with forceps. If done properly, this is a safe and fast way to use the tips of the scissors for dissection.

Surgical Loupes

Since the mid-1960s, surgical loupes have been widely applied in microsurgery. In addition to the conventional role in pedicle dissection and flap elevation, they are also used in digital replantation, free jejunal transfer, and animal experimentation (Peters et al. 1971; McManammy 1983; Jurkiewicz 1984; Lee 1985; Shenaq et al. 1995).

Because of the exponential growth of the development of surgical loupes, those with a magnification of 2.5- to 4-fold and 5.5- to 8-fold are available.

The advantages of surgical loupes are that they are small, easy to carry, efficient, and cost-effective. If operating on a blood vessel of 1-mm diameter or larger with surgical loupes, the result will be the same as when working under a microscope. The most commonly used magnifications are 3.5- to 6.5-fold. A disadvantage of loupes is the limited magnifying power.

There are generally two types of surgical loupes:

Galilean Loupes

These, which are economical and simple to use, consist of two to three lenses and are easy to operate, light, and inexpensive. Their disadvantages are limited magnification (2.5- or 3.5-fold) and a blurry peripheral border of the visual field.

Prism Loupes (or Wide-Field Loupes)

Each of the prism loupes, which are high quality and precise, consists of seven lenses. The magnification can reach from 3.5-fold to 10-fold, and the visual field is much clearer and sharper than with other loupes.

Properties of Ideal Surgical Loupes

These include:

- Light weight: No pressure is felt on the nose bridge while wearing these loupes
- Advanced optic lenses: These have a clearer image, wider field of view, sharper picture, and a greater depth of visual field
- Vertical and interpupillary adjustment: This enables the operation to be performed with a comfortable posture
- Magnification (range, 2.5- to 8-fold) and working distances (range, 14–22 inches)
- Mounting choice: Spectacle frames and headband
- Low cost

The usual magnification of loupes for a general dentist is 2.5- to 3.5-fold. However, the magnification for a periodontist is 3.5- to 4.5-fold. Operation on delicate tissues requires loupes with a magnification of 5.5- to 6.5-fold.

Practice

It is an important step in practice to choose a pair of surgical loupes of appropriate magnification and comfortable working distance.

Proper Wear

While wearing surgical loupes, along with adjusting interpupillary and vertical distances, the band of the surgical loupes must be fixed with appropriate tightness. If the band is too tight, too much force will be exerted on the nose bridge and the head, which is uncomfortable. Pain over the nose and head, and even swelling of the soft tissue, can occur after prolonged operations if the band is too tight.

Once the band length has been appropriately adjusted, the loupes should be moved up and down 1 cm over the nose. Properly fitted loupes exert no pressure on the nose.

Adjusting the interpupillary and vertical distances for head-mounted bend loupes is necessary. The closer the lenses are to the eyes, the larger is the field of view. A comfortable size of bend is also mandatory.

Focus

Focus is the primary aim for using surgical loupes properly. If the loupes are in focus, a clear operating view is obtained, facilitating the procedure. The focus is achieved by moving the head forward and backward until the head position can be maintained.

To obtain the proper focus, repeated exercises in head and neck positioning are needed. A simple way of doing this is to use a pair of surgical loupes to read newspapers or books. After practicing this 20–30 times every day for 3–5 days, it is easier to use loupes during microsurgery. To keep the loupes in focus during reading, the muscles of the head and the neck must be trained to maintain the head position. Once this is achieved, surgical loupes can be efficiently used during operations.