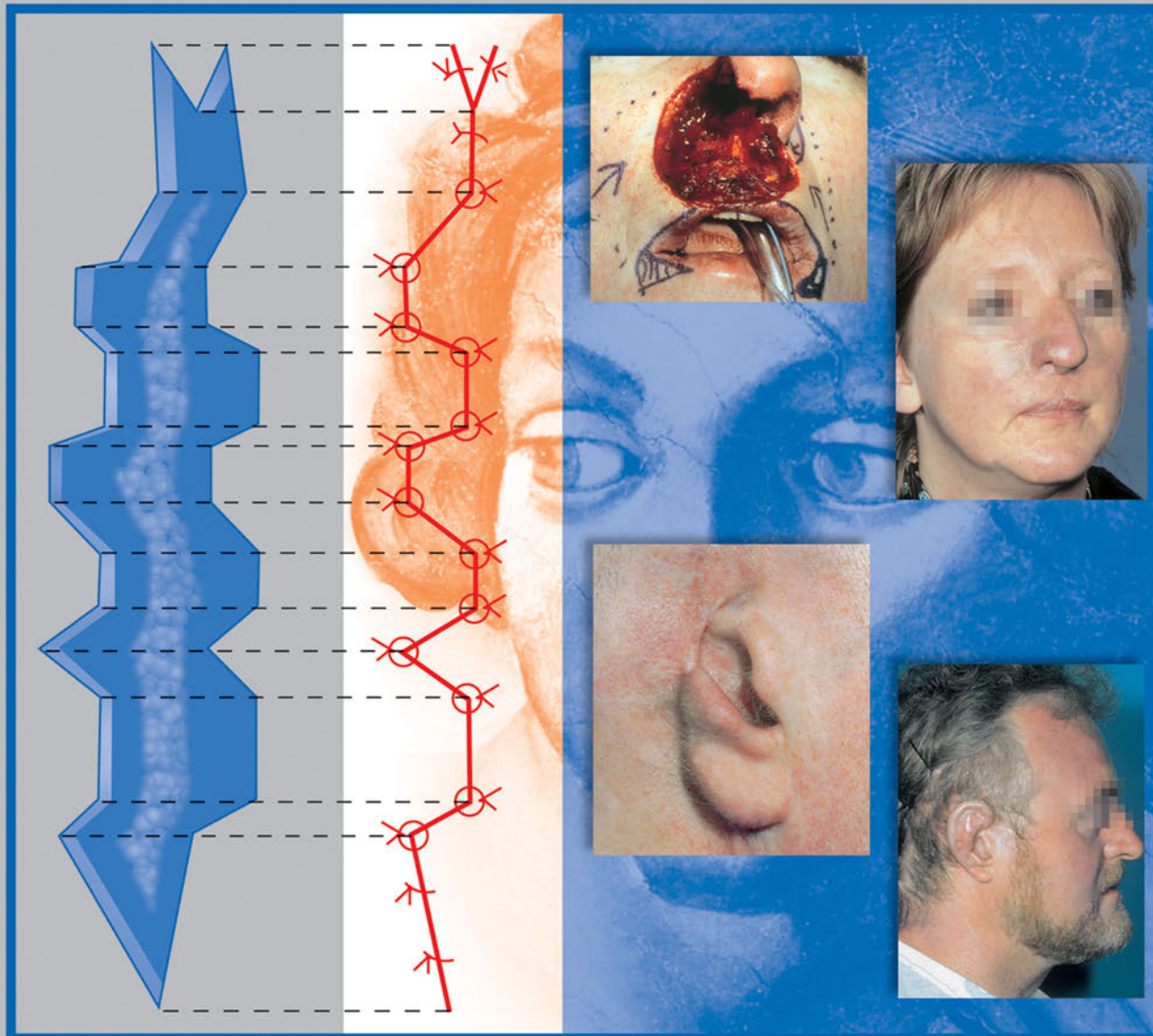


Reconstructive Facial Plastic Surgery

A Problem-Solving Manual

Hilko Weerda

2nd Revised and Expanded Edition



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Foreword to the 2nd Edition

The eagerly awaited second edition of Professor Hilko Weerda's beautifully concise, and influential guide to reconstructive facial plastic surgery combines a clarity of vision that results from years of analytical thought, with exemplary text. Almost 1,400 illustrations portray the approach and surgical planning for a myriad of surgical defects. While students of facial plastic surgery will find his instructions clearly described in a stepwise manner, more senior colleagues will also benefit from his insight into more complex problems. While there are numerous books on similar topics, those that can in any way rival this text in its scope and wisdom are few and far between. In my capacity as President of the European Academy of Facial Plastic Surgery, I would urge all surgeons interested in this field to have this book close at hand, on their work desks, and in the operating room's library, where it can act as a timely reminder of the best techniques available and a valuable teaching aid.

From a practical point of view, the surgeon is initially guided through the most important principles of facial reconstructive surgery, before being introduced to specialized sections that deal systematically with each of the major subunits of the face. Professor Weerda's pioneering work in auricular reconstruction is also clearly reflected in the appropriate sections in the book.

The specialty of facial plastic surgery has been growing exponentially over the past few years. This remarkable book will certainly act as a major leading light for our trainees and mentors. I would like to congratulate Professor Weerda and his team for this impressive achievement. It has already found permanent residence on my desk.

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Foreword to the First Edition

Balancing the twin needs of functional and aesthetic facial defect reconstruction has challenged surgeons over the centuries to develop practical and utilitarian repair solutions. Professor Hilko Weerda, in typical meticulous fashion, presents in this text atlas a virtual encyclopaedia of reconstructive options for the thoughtful repair of a wide-ranging group of facial, head, and neck defects. The multiple options and alternatives available for defect repair and reconstruction presented in this volume have met the test of time world-wide.

Reconstruction in the head and neck region requires a dedication to meticulous planning. Facial plastic and reconstructive surgery is, in its finest sense, a craft best developed over time and seasoned with experience. The thought process required in the planning of facial repair probably supercedes the technical skill involved in the surgical event itself. Techniques highly useful and indicated in one region of the face may not serve well for adjacent regions. Skin thickness, skin mobility, the presence of hair-bearing structures, and the junctions of facial landmarks must all be considered when the *most appropriate surgical option* is chosen. A tissue price is paid (by the patient) whenever regional tissues are advanced, rotated, transposed, or interposed to

reconstruct defects—scarring, distortion, and asymmetries of the donor as well as the recipient site are everpresent possibilities. The surgeon's critical responsibility is to diminish the amount of that price to be paid by employing the correct reconstructive option. Given our present state of knowledge, the majority of challenging facial repairs should produce a *functionally useful* and *aesthetically admirable* outcome. As the brilliant reconstructive surgeon Gary Burget states: “the eye does not perceive cover, lining or support. It sees a pattern of graduated light and shadow ... color, texture and most importantly contour create the visual image ...”.

Professor Weerda has succeeded admirably in authoring a comprehensive compendium designed to aid the reconstructive surgeon in assessing the various options and alternatives for facial repair.

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Preface to the 2nd Edition

Particularly in this age of mass media, the face plays a pivotal role in human self-identification. Malformations, defects, and bony or soft-tissue changes caused by trauma or neoplasms can drastically alter the patient's appearance, frequently impacting on his or her feeling of self-worth. Drawing on our experience in the operating room and our many years of planning and conducting courses in plastic and reconstructive surgery, we have created an easy-to-use, step-by-step surgical textbook for the face and neck, based on informative illustrations and concise text. Sequences of drawings provide both the novice and the experienced facial surgeon with simple, reproducible solutions to many of the most commonly encountered problems and questions in facial plastic surgery.

In the 2nd expanded edition we were able to add color photographs, partly taken from slides, to show

the situation before and after reconstruction. Along with the most commonly practiced reconstructive procedures, a number of other proposed technical solutions are presented, largely without commentary.

I express thanks to my colleagues Stephan Remmert, Konrad Sommer, Ralf Siegert, and Joachim Quetz for their excellent contributions. I thank Dr. S. Storz, Tuttlingen, for letting me use the illustrations of the basic instrument set and Mrs. Schumacher for providing most of the drawings that consistently conformed to the author's wishes. I also thank Mr. Konnry, Ms. Hengst, Ms. Hollins, and Ms. Kuhn-Giovannini of Thieme Publishers for their outstanding work in the production of this book.

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I Anatomy, Principles of Facial Surgery, and Coverage of Defects

1 Anatomy of the Skin and Skin Flaps

The Skin

(Fig. 1.1)

The skin is composed of epithelial layers (epidermis) and the dermis. Below the skin are the subcutaneous tissue, fascia, and muscle (Fig. 1.1).

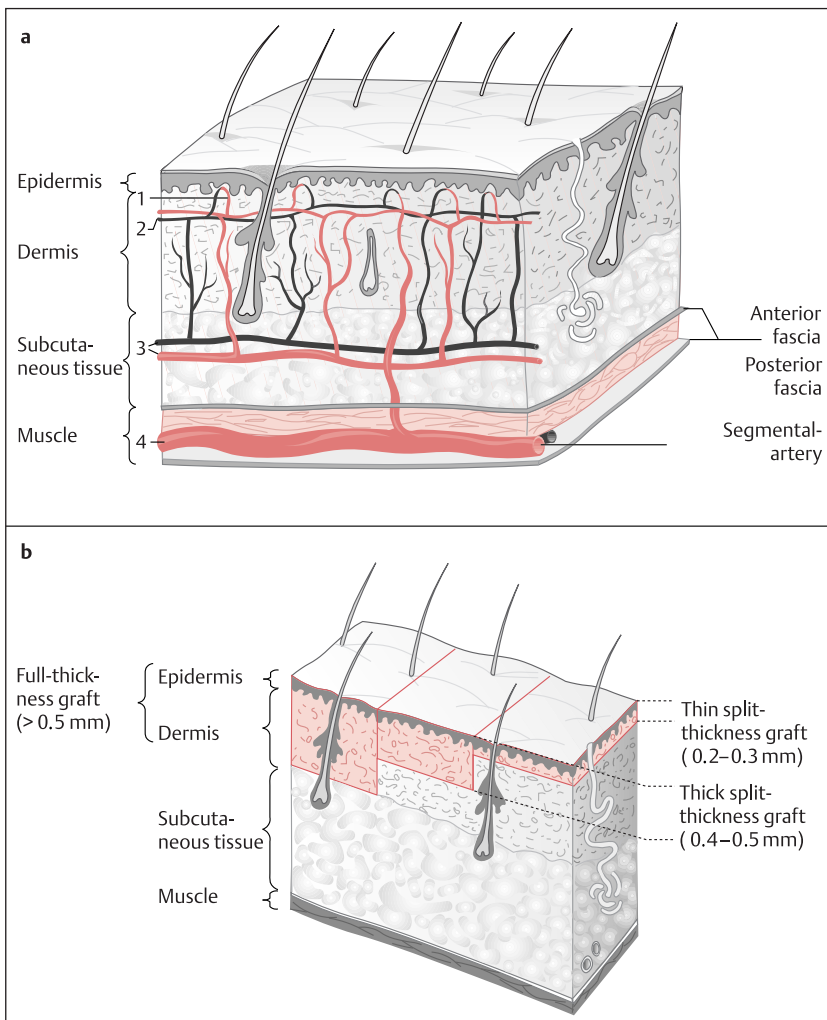


Fig. 1.1a, b

a Structure of the skin:

1. Subapillary vascular plexus
2. Dermal vascular plexus
3. Subdermal vascular plexus
4. Segmental vascular plexus.

b Composition of free skin grafts.

Types of Skin Flaps

Random Pattern Flaps

(Fig. 1.2)

Random pattern flaps derive their blood supply from the dermal and subdermal plexus (Fig. 1.2). The **ratio of flap length to flap width in the face is approximately 2:1**.

Axial Pattern Flaps

(Fig. 1.3)

An axial pattern flap is designed to be supplied by a specific arterial vessel. For example, a forehead flap can be mobilized on the frontal branch of the superficial temporal artery, and the median forehead flap can be based on the supratrochlear artery (see Fig. 5.15). A **3:1 or 4:1 length-to-width ratio** can be achieved with these flaps.

Island Flaps

(Fig. 1.4)

In an island flap, the skin is transposed into the defect on a pedicle composed of only the nutrient vessels (Fig. 1.4; see also Fig. 5.9; Fig. 10.5a).

Myocutaneous Island Flaps

(Fig. 1.5; see also Fig. 12.1)

The myocutaneous island flap is an axial pattern flap that generally includes skin, subcutaneous fat, muscle fascia, and muscle tissue. Familiar examples are the myocutaneous pectoralis major island flap and the myocutaneous latissimus dorsi island flap (see Fig. 12.2).

Neurovascular Island Flaps

With some flaps, sensory or motor nerves can be mobilized in addition to nutrient vessels. For example, authors have transferred neurovascular island flaps from around the mouth for use in lip reconstruction (Karapandzic 1974; Weerda 1983a, b; Remmert et al. 1994; see Figs. 6.19, 6.28, 12.3).

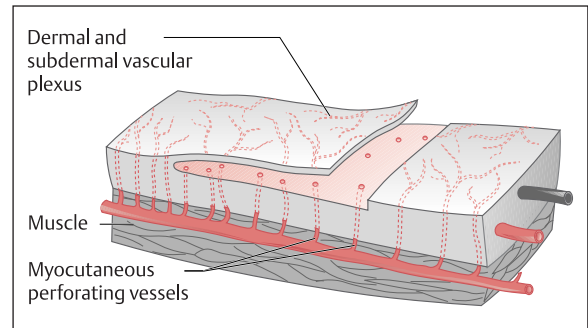


Fig. 1.2 Random pattern skin flap for facial use has an approximately 2:1 ratio of length to width. A special type is the subcutaneous pedicle flap (Barron et al. 1965; Lejour 1972; see Figs. 5.44 and 5.45).

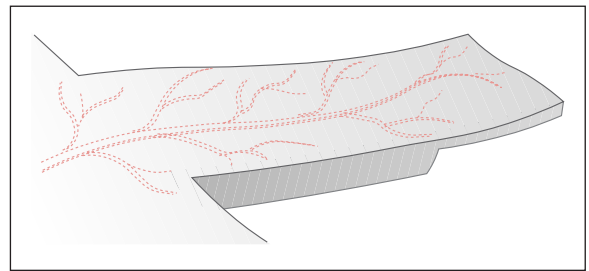


Fig. 1.3 The axial pattern flap is based on a specific artery. Examples are the forehead flap, Esser's cheek rotation, and the median forehead flap (see Figs. 5.51b, 6.17, 8.1).

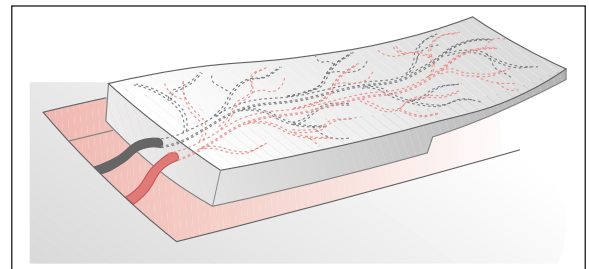


Fig. 1.4 Island flap. A variant of this flap is the neurovascular island flap, which includes a nerve supply (Karapandzic 1974; Weerda 1980c; Weerda and Siegert 1991; see Fig. 6.19).

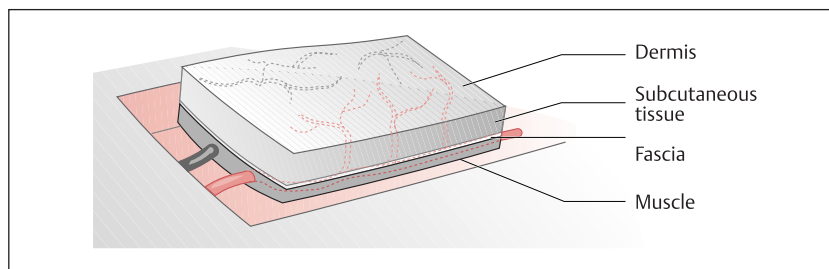


Fig. 1.5 Axial-pattern myocutaneous island flap (see Figs. 12.1 and 12.2).

2 Basic Principles of Facial Surgery

Suture Materials and Techniques

We use atraumatic cutting needles for the skin, and we generally use round needles for the mucosa. Our suture material of choice for the face is 6-0 or 7-0 monofilament on a very fine needle. Occasionally, we use 5-0 monofilament for areas that are not visible (Prolene, PDS, P 1 and P 6 5-0 needle with P 3 or PS 3 needle).

Our subcutaneous sutures are composed of absorbable or fast-dissolving braided or monofilament material (Vicryl or PDS, P 1, P 3 needle Ethicon, Nordestedt, Germany).

A suture or suture line must remain in place only until the wound has healed to an adequate tensile strength. Leaving sutures in for too long results in ugly scarring of the needle tracks.

Sutures are removed as early as possible. Sutures in the eyelid area or near the border of the lip should be removed on the fifth postoperative day, and sutures in other facial areas on day five or six. If sutures have been placed under tension, we remove them on day seven or eight. Sutures in the posterior auricular surface are removed on day eight.

The simple interrupted suture (Fig. 2.1) is most commonly used. Each surgical knot should be tied with at least two, or preferably three, throws tied in opposite directions.

We generally use continuous sutures (Fig. 2.2) for the lid area, for long traumatic wounds, and behind the ear in auricular reconstructions. After every three or four stitches, we usually tie an intermediate knot to obtain a secure coaptation.

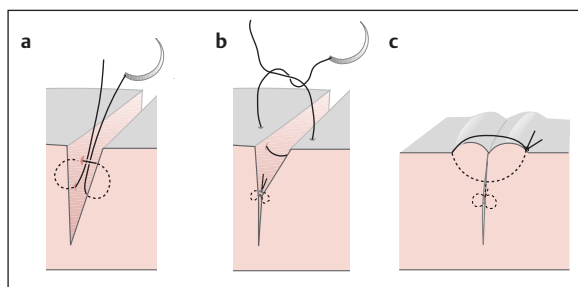


Fig. 2.1a–c Simple interrupted suture.

- Subcutaneous approximating suture of absorbable material, with a buried knot.
- The entrance and exit points are placed symmetrically.
- The suture is tightened, slightly pursing the wound margins, and is tied on one side.

The tightened suture should raise the wound edges slightly, so that the scar will be at skin level following scar contraction. With deep wounds, a subcutaneous approximating suture is placed initially with a buried knot (Fig. 2.1a, b).

In areas where two skin incisions meet at an angle, we generally use a Donati or Allgöwer type of vertical mattress suture to coapt the wound edges (Fig. 2.3).

Wounds under tension are additionally reinforced with mattress sutures tied over ointment-impregnated gauze or silicone button (Fig. 2.4). These sutures are removed in 7 to 10 days.

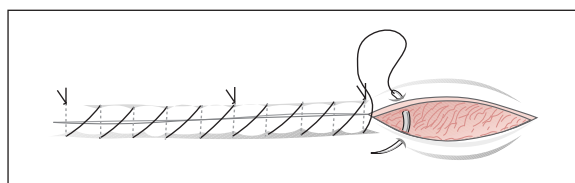


Fig. 2.2 Over-and-over continuous suture, intermediate knot after four stitches.

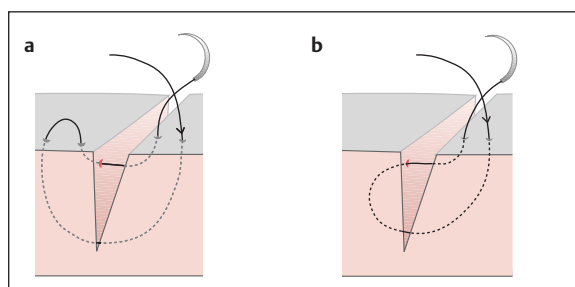


Fig. 2.3a, b

- Vertical mattress suture (Donati type).
- Vertical mattress suture (Allgöwer type).

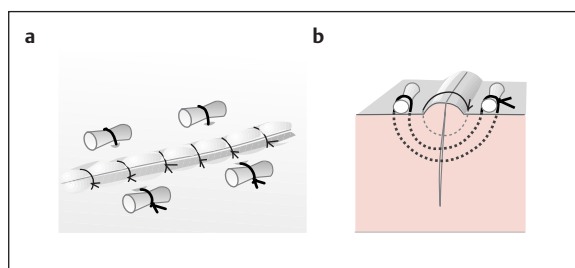


Fig. 2.4a, b

- Mattress sutures can be used to reinforce a suture line that is under tension. The monofilament threads are tied over bolsters consisting of swabs, silicone tubing, etc.
- Schematic view in cross-section.

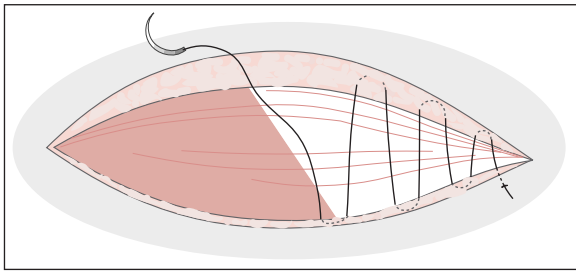


Fig. 2.5 Continuous intracutaneous suture.

The continuous intracutaneous suture can yield a more favorable cosmetic result in many surgical procedures (Fig. 2.5). We use 4-0 or 5-0 monofilament material for this type of suture.

Adhesive strips can be added to the sutures, to further relieve tension on the wound edges and ensure a cosmetically acceptable scar.

The Gillies corner suture is used in angled suture lines and for the dispersion of scars (Fig. 2.6a). The needle is passed subcutaneously through the wound angle and brought out on the opposite side (Fig. 2.6b).

Basic Instrument Set for Reconstructive Facial Plastic Surgery

(Weerda 2006; Weerda and Siegert 2012)
(Fig. 2.7)

We generally use a 2× to 2.5× binocular loupe when operating and suturing. A high-quality instrument set (Fig. 2.7a, d, e) is needed that includes no. 11, no. 15, and no. 19 knife blades ① and one small and one slightly larger needle holder for atraumatic needles ②. The set should include fine surgical forceps (e.g., Adson forceps), dissecting forceps ③, fine, angled bipolar forceps for vascular electrocautery, two or three fine hemostatic clamps, mucosal clamps, and assorted sharp-pointed scissors and dissecting scissors ④. Fine, single-prong and double-prong hooks ⑤ are useful for holding and manipulating flaps. The Weerda hook forceps (Fig. 2.7b) is a good alternative, but care must be taken not to crush the flap margins with the forceps. Important accessories are a millimeter rule, a caliper (Fig. 2.7a, ⑥), and sterile color markers or methylene-blue marking pencils. Suture materials consists of 5-0, 6-0, and 7-0 monofilament, along with 4-0 and 5-0 absorbable braided and monofilament sutures. For cutting the auricular cartilage and other cartilaginous structures, we use assorted carving tools available from KARL STORZ—ENDOSKOPE, Tuttlingen, Germany (Fig. 2.7a, ⑦ and 2.7f; see also Figs. 11.1 and 11.3).

We also use various lengths of adhesive tape for dressings, and emollient ointments that often contain petroleum jelly. We routinely use suction drains

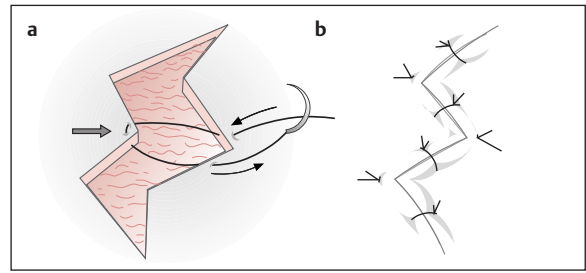


Fig. 2.6a, b Gillies corner suture.

and mini-suction drains to aspirate wound secretions and help contour the skin to the wound bed.

The Binocular Loupe

(Fig. 2.7c)

We have become accustomed to using a binocular loupe (2.0 to 2.5× magnification), both when performing operations and when placing sutures.

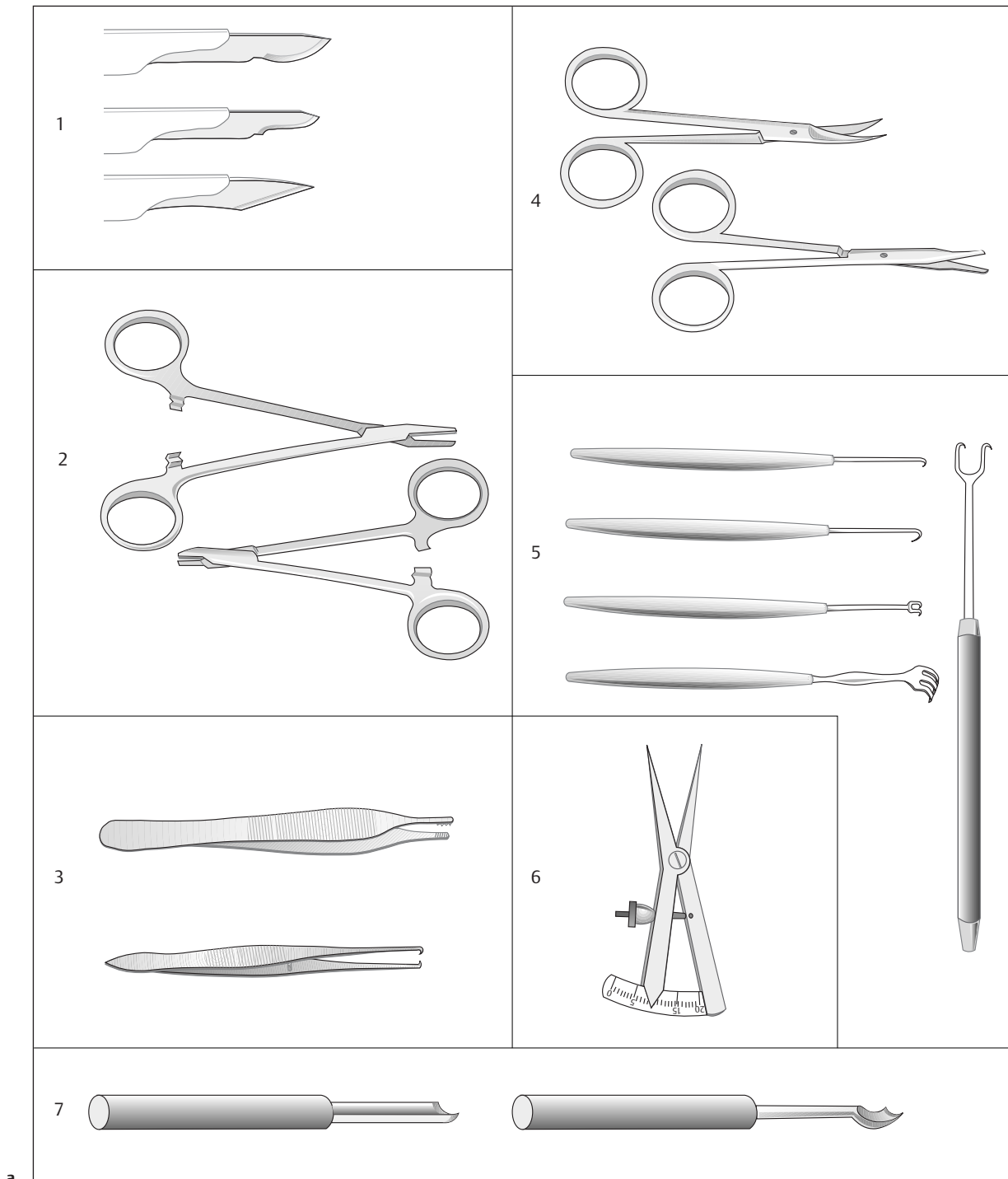
Here we will describe only the basic instrument set. The tray setups that we recommend for reconstructive facial plastic surgery are illustrated on p. 8.

The high-quality basic instrument set consists of the following items (Fig. 2.7d): ① scalpels with no. 11, no. 15, and no. 19 blades; ② needle holders—one small and one slightly larger, for atraumatic needles; ③ fine tissue forceps (e.g., Adson forceps); ④ fine, angled bipolar forceps for vascular electrocautery; ⑤ two or three small hemostatic clamps; ⑥ mucosa clamps; ⑦ assorted pointed scissors; and ⑧ dissecting scissors.

We additionally use ⑨ fine, single- and double-prong hooks for holding and manipulating the flaps. A good alternative is the Weerda hook forceps ⑩ (Fig. 2.7e). Ordinary forceps should not be used, as they are liable to crush the flap margins. Other important accessories are a millimeter rule ⑪ and a caliper ⑫ (Fig. 2.7f) and sterile skin markers or methylene blue marking pencils. We use an assortment of craft knives for carving and sculpturing cartilaginous frameworks (e.g., for an auricular reconstruction; see Fig. 2.7a ⑦ and g).

Additional instruments:

- Dermatome
- Mucotome
- Assorted needle holders
- Special clamp (or needle holder) for twisting the suture ends
- Wire cutters
- A Luniatschek gauze packer for burying wire sutures



a

b

Fig. 2.7a–g**a** Instruments for facial surgery (see text; from KARL STORZ–ENDOSKOPE, Tuttlingen, Germany).**b** Weerd hook forceps (KARL STORZ–ENDOSKOPE, Tuttlingen, Germany) see Fig. 2.7e.

(Continued on next page) ▶



Fig. 2.7a–g (Continued)

c Binocular loupe (from Weerda 2007, K. Storz Endo-Press).
 d Basic instrument set for reconstructive facial plastic surgery (from Weerda 2007).

e–g Basic instrument set for reconstructive facial plastic surgery (from Weerda 2007). A summary of instruments will be found in the appendix; see text, p. 6.
 With kind premission of Karl Storz-Endoskope, Tuttlingen, Germany (Weerda 2006, Weerda and Siebert 2012).

Wound Management, Repair of Small Defects, and Scar Revision

Surgical procedures of up to 2.5 hours can be conducted under local anesthesia. More extensive operations and scar revisions call for general anesthesia. Care should be taken that the tape-secured endotracheal tube does not distort the face. The face should not be taped over during operations in the facial nerve area. We use a transparent film drape for this purpose (to allow facial nerve monitoring).

Relaxed Skin Tension Lines, Vascular Supply (Fig. 2.8i), and “Esthetic Units” (Fig. 2.20)

The facial surgeon must be familiar with the location and distribution of the relaxed skin tension lines (RSTLs) in the face, the facial “esthetic units” (see Fig. 2.20a–d), and the vascular supply of the face (Fig. 2.8i). Besides the RSTLs, attention should also be given to **wrinkle lines** in the aging face.

Incisions or small excisions and sutures placed in the RSTLs will heal with fine, unobtrusive scars. Incisions and excisions made at right angles to these lines will often lead to broad, unsightly scars. Thus, the plastic surgeon should always try to place the cuts used for incisions, excisions, and scar revisions in these lines, to achieve good cosmetic results.

The term “esthetic units” (see Fig. 2.20a–d) refers to circumscribed facial regions that should each be reconstructed as a separate unit whenever possible. The radical excision of tumors takes precedence over esthetic units, however. We shall return to this reconstructive concept in the sections that deal with specific facial regions.

Wound Management and Scar Revision

It is a general rule in facial plastic surgery to sacrifice as little skin as possible. Small wounds that extend obliquely into the tissue should be straightened whenever the surrounding tissue can be mobilized and the wound edges coapted without tension. A subcutaneous suture with a buried knot should always be placed to allow tension-free approximation of the wound margins (see Fig. 2.1). Because the subcutaneous tissue, epidermis, and dermis take different lengths of time to achieve adequate wound strength, early removal of the skin sutures from a wound without subcutaneous sutures would result in a broad, unsightly scar.

Management of Wounds with Traumatic Tattooing

If a wound contains embedded grit and dirt, it should first be scrubbed with a sterile toothbrush or hand brush and antiseptic soap, until all dirt residues have been removed. It can be extremely tedious to remove these particles after the wound has healed.

Scar Revision by W-Plasty and the Broken-Line Technique of Webster (1969)

(Fig. 2.8a–j)

If time permits in trauma cases, the wound should be dispersed with a **W-plasty**, broken-line excision, or Z-plasty that conforms to the RSTLs. If this is not possible, scar revision should be postponed for at least 6 months to 1 year. Long scars are very conspicuous, especially when they cross RSTLs at right angles. Scar revision therefore has two goals:

- Dispersing a long scar into smaller individual scars
- Positioning the smaller scars in RSTLs.

Revision techniques involve excising the scar and dispersing the wound line into multiple segments. The **W-plasty** consists of segments 4 to 5 mm long arranged in a zigzag pattern (Fig. 2.8a2, c, e–j). The new scars run in alternating directions and are barely perceptible after the wound has healed. In the **broken-line technique**, the segments are placed in an irregular pattern (Fig. 2.8a3, c). In both the W-plasty and broken-line techniques, the margins of the excision are fashioned so that they will fit together precisely like a lock and key. Generally, this is done with a no. 11 blade that is held perpendicular to the skin surface when the cuts are made. The wound edges are then undermined with a no. 15 blade or pointed scissors (Webster 1969; Borges 1973; Haas 1991). Fine scars can also be managed by dermabrasion (see Chapter 17). The suture material of choice is 6-0 or 7-0 monofilament, and subcutaneous sutures should be placed whenever possible. Corners and triangles are secured with Gillies corner sutures (Fig. 2.6).

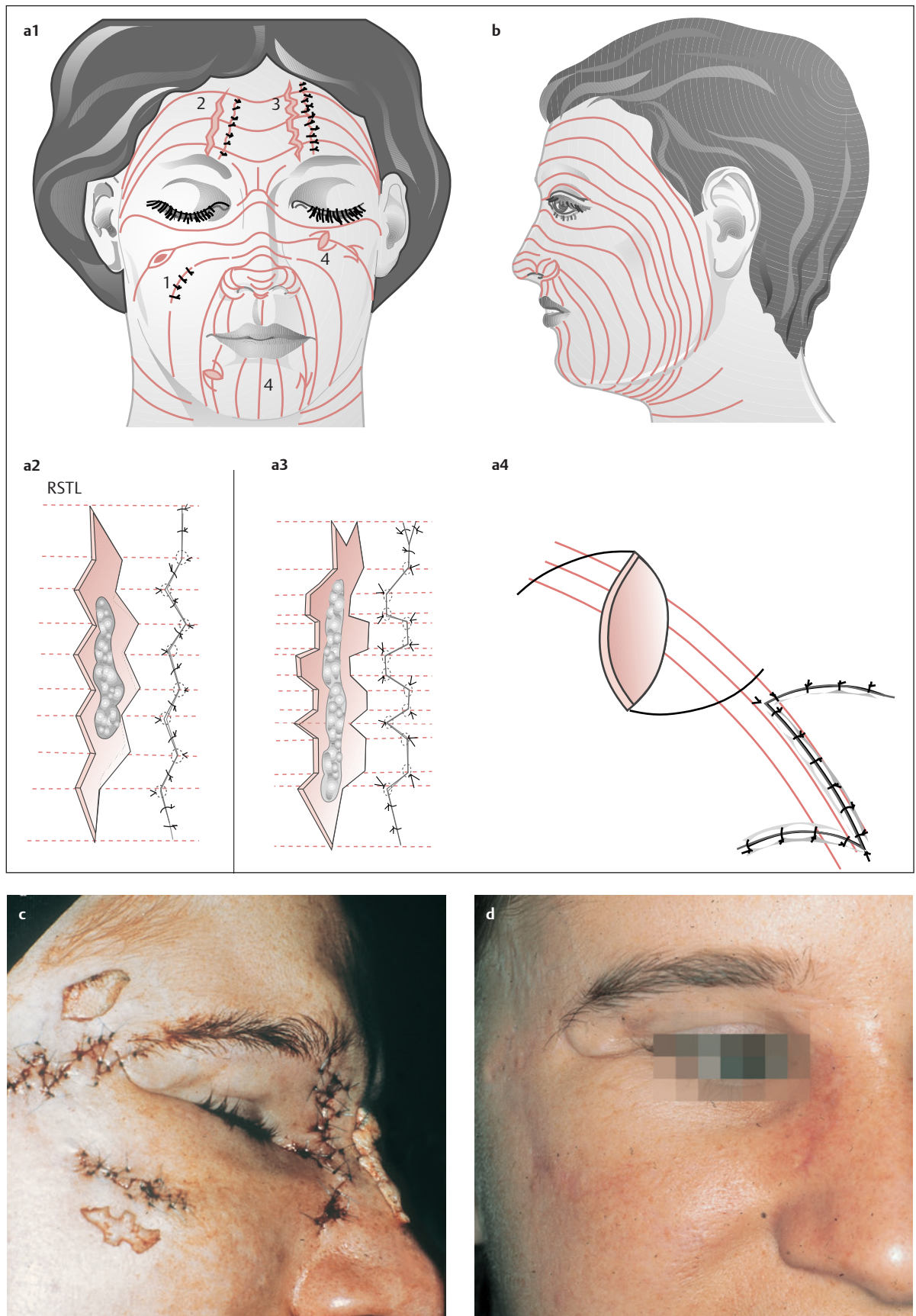


Fig. 2.8a–j Relaxed skin tension lines (RSTL) and scar revision (see p. 11) in the face.