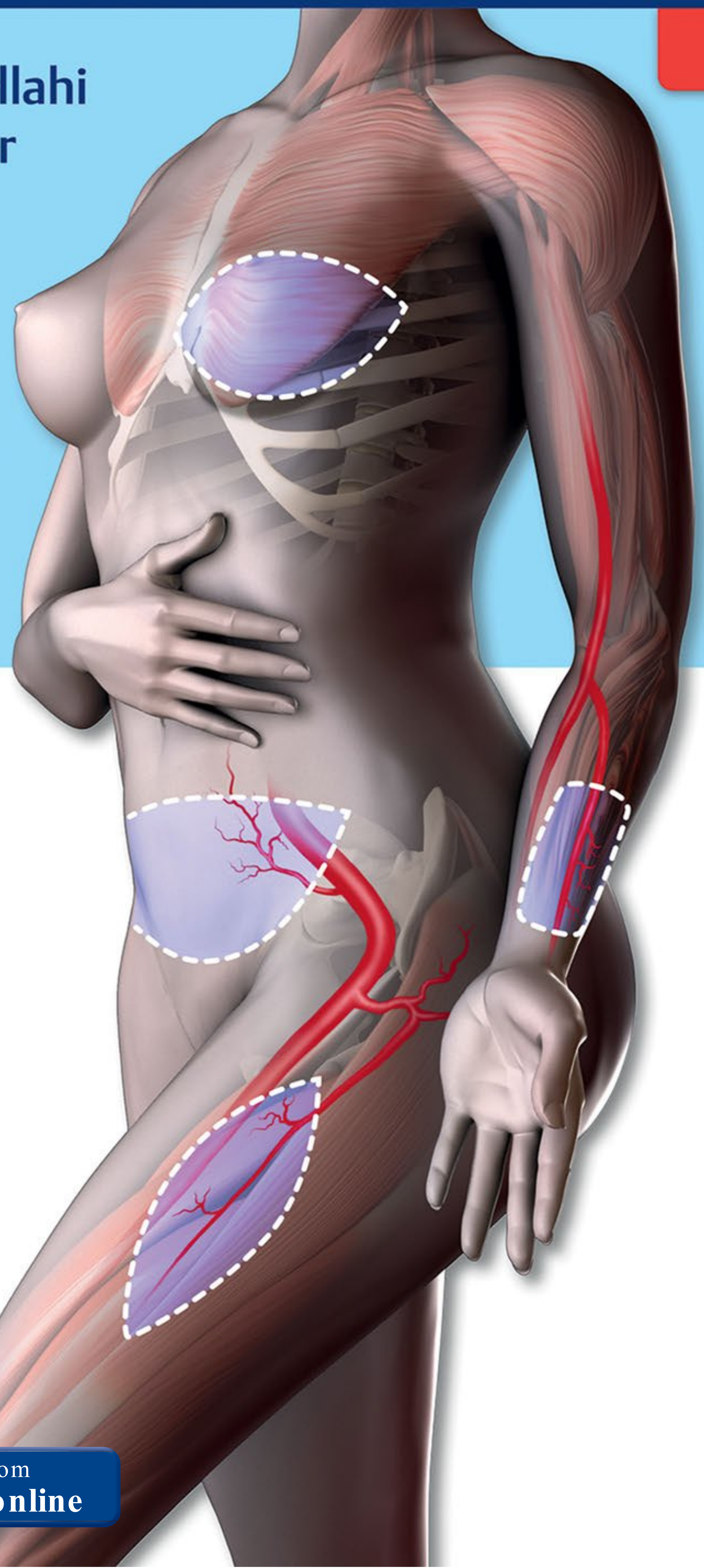
Flaps

Practical Reconstructive Surgery

plus videos

Kayvan Shokrollahi
Iain S. Whitaker
Foad Nahai



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Flaps

Practical Reconstructive Surgery

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Printer: Asia Pacific Offset

Library of Congress Cataloging-in-Publication Data

Names: Shokrollahi, Kayvan, editor. | Whitaker, Iain S., editor. | Nahai, Foad, 1943- editor.
Title: Flaps : practical reconstructive surgery / [edited by] Kayvan Shokrollahi, Iain S. Whitaker, Foad Nahai.
Other titles: Flaps (Shokrollahi)
Description: New York : Thieme, [2017] | Includes bibliographical references and index.
Identifiers: LCCN 2016035628| ISBN 9781604067156 | ISBN 9781604067163 (eISBN)
Subjects: | MESH: Surgical Flaps | Reconstructive Surgical Procedures—methods | Microsurgery—methods | Wound Healing
Classification: LCC RD119 | NLM WO 610 | DDC 617.9/52—dc23
LC record available at https://lccn.loc.gov/2016035628

Thieme Publishers New York
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1-800-782-3488, customerservice@thieme.com

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A-12, Second Floor, Sector-2, NOIDA-201301
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Thieme Publishers Rio de Janeiro, Thieme Publicações Ltda.
Edifício Rodolpho de Paoli, 25º andar
Av. Nilo Peçanha, 50 – Sala 2508
Rio de Janeiro 20020-906 Brasil
1 55 21 3172-2297 / 1 55 21 3172-1896

Printed in China by Asia Pacific Offset 5 4 3 2 1

ISBN 978-1-60406-715-6

Also available as an e-book:
eISBN 978-1-60406-716-3

Dedicated to the past masters of the art and science of plastic surgery upon whose shoulders we stand;
and also to those now learning, to whom we offer our own shoulders via this book,
so that you may one day stand yet taller and see still further than us.

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About the Editors

Professor Kayvan Shokrollahi is a Burns, Plastic, and Laser Surgeon and clinical lead for the regional burns centre at the Mersey Regional Burns and Plastic Surgery Unit in Liverpool, England. He is Editor-in-Chief of the international journal *Scars, Burns & Healing*, which remains the world's only peer-reviewed scar journal. He is Associate Editor of the journal *Annals of Plastic Surgery*, and Chairman of the noted charity *The Katie Piper Foundation*. He graduated from Bristol University with both a Bachelor of Science degree with first class honours in Cellular and Molecular Pathology and a degree in Medicine. He went on to graduate with both a Masters in Clinical Engineering and subsequently a Masters in Law with commendation, having developed a specific interest in consent for medical treatment and the ethics and law related to medicine. He was awarded the Hunterian Professorship of the Royal College of Surgeons in 2007, and has delivered numerous guest and keynote lectures around the world. Professor Shokrollahi has won various prizes, grants, and scholarships including from the British Association of Plastic, Reconstructive and Aesthetic Surgeons, Bristol University, the Pathological Society of Great Britain, and The Healing Foundation. He has a strong academic and research interest having published over seventy peer-reviewed articles in the scientific literature. He has written a number of textbooks including those currently in press such as the *Oxford Specialist Handbook: Burns* and *Multiple Choice Questions in Plastic Surgery*. He has written dozens of book chapters on a variety of reconstructive, aesthetic, scientific, and legal subjects relevant to his diverse interests and expertise. He is an authority in a number of clinical areas including scars and burns, laser treatment in the context of both skin oncology and scar management, as well as pediatric ear surgery and is current writing the textbook *Laser Management of Scars* (Springer).

Outside of clinical medicine, Professor Shokrollahi is an accomplished composer and pianist with his original music and performances having reached 153rd in the all-time top 500 Classic FM charts in Europe under the pseudonym *Shokolat*. His music is widely available including via digital and online platforms, in addition to CDs and sheet music. In addition, he is a regularly exhibiting artist and sculptor with art works available internationally through Saatchi Gallery Online.

Professor Iain S. Whitaker is the Professor of Plastic Surgery at the Welsh Centre for Burns and Plastic Surgery and Swansea University Medical School. He combines a clinical practice (both acute care and elective surgery) with the development of an active research program. He is the Director of the Reconstructive Surgery & Regenerative Medicine Research Unit (www.reconregen.com) and Deputy Editor of Europe's largest reconstructive surgery journal, the *Journal of Plastic, Reconstructive and Aesthetic Surgery* (JPRAS). After reading medicine at Cambridge University (Trinity Hall), Professor Whitaker completed a sub-internship in Plastic Surgery at Harvard Medical School, followed by plastic, reconstructive, and aesthetic surgery training in Yorkshire, Wales, Sweden, Australia, and France. During his training Professor Whitaker was awarded numerous prizes from the British Association of Plastic, Reconstructive and Aesthetic Surgeons (BAPRAS) and the Royal College of Surgeons. He completed prestigious fellowships in Melbourne, Australia (The Rowan Nicks Award, Royal Australasian College of Surgeons) and Paris (European Association of Plastic Surgeons Young Plastic Surgeon Scholarship).

Professor Whitaker has published over 150 articles, with a Hirsch Index of 30, edited several textbooks, and written in excess of 25 book chapters. He currently sits on the BAPRAS research council and in addition to his role at JPRAS is the Chief Specialty Editor for *Frontiers in Surgery*, Associate Editor of the *Annals of Plastic Surgery*, and is the regenerative medicine lead for BMC Medicine. In collaboration with leading scientists at Swansea University, Professor Whitaker developed a doctoral and postdoctoral career path for plastic surgeons in Wales, having drawn in millions of pounds of funding from a variety of sources including Welsh Assembly Government, the Medical Research Council, Royal College of Surgeons, the British Association of Plastic, Reconstructive and Aesthetic Surgeons, and the ABMU Health Board. His group's research focuses on stem cell biology in combination with platform technologies such as 3D printing to solve aesthetic and reconstructive problems safely and effectively.

In his spare time, now that his own playing days are over, he enjoys following rugby. Professor Whitaker dedicates this book to his wife and their greatest achievement, their daughter Lara.

Professor Foad Nahai is a graduate of Bristol University in England, and is the Maurice J. Jurkiewicz Chair in Plastic Surgery and Professor of Surgery at Emory University in Atlanta, Georgia. He is Editor-in-Chief of *Aesthetic Surgery Journal* and the current president of the American Association for the Accreditation of Ambulatory Surgical Facilities. He is past president of the International Society of Aesthetic Plastic Surgery, past president of the American Society for Aesthetic Plastic Surgery, former director American Board of Plastic Surgery, and past chairman of the Plastic Surgery Research Council. He has published over 210 peer reviewed articles, edited or co-edited 9 textbooks, and his writings have covered all aspects of reconstructive and aesthetic plastic surgery.

Professor Nahai is internationally recognized as an innovator in the field of plastic surgery where he has developed and refined many procedures. His contribution to reconstructive surgery is extensive, including the Mathes-Nahai classification of flaps and the original description of the Tensor Fascia Lata flap as well as numerous refinements and innovations in reconstructive surgery. The most recent book before this that he authored and edited, published in 2011, is the second edition of his three-volume text entitled *The Art of Aesthetic Surgery*, and he has used his knowledge and skills to contribute greatly to the advancement and safety of aesthetic surgery, the focus of the latter half of his career.

Professor Nahai has been invited to lecture and demonstrate plastic surgical procedures all over the world. In addition to numerous professional honours and awards, he is listed among the “Best Doctors in America,” and has been named by W Magazine as one of the top plastic surgeons in the world.

Menu of Accompanying Videos

These videos have been edited, narrated, and demonstrated by Iain R. Mackay of the Canniesburn Plastic Surgery Unit, Glasgow Royal Infirmary, and Department of Anatomy, Glasgow University, Glasgow, Scotland, United Kingdom. The Canniesburn Plastic Surgery Unit has pioneered flap surgery over the decades and continues to provide internationally renowned flap and microsurgery training courses.

The videos are best viewed at the presented size and not maximized to full screen.

Video 1: First Dorsal Metacarpal Artery Flap

Video 2: Becker Flap

Video 3: Deltopectoral Flap

Video 4: Distal Fasciocutaneous Flaps of Lower Limb

Video 5: Fibular Flap

Video 6: Gastrocnemius Flap

Video 7: Gracilis Flap

Video 8: Lateral Arm Flap

Video 9: Latissimus Dorsi Flap

Video 10: Pectoralis Minor Flap

Video 11: Pectoralis Major Flap

Video 12: Posterior Interosseous Flap

Video 13: Radial Forearm Flap

Video 14: Scapular Flap

Video 15: Temporal Artery Flap

Video 16: Trapezius Flap

Preface

Flaps are an essential tool in our reconstructive armamentarium, and a good working knowledge of flap surgery provides the backbone of surgical practice through which we restore form and function. This book and its accompanying videos bring together the cumulative experience of the leading pioneers and educators in reconstructive surgery from around the world to demonstrate and simplify flap surgery, focusing on the most useful and common flaps and the most advanced and cutting-edge methods. The aim is not to be a flap encyclopedia, but more helpfully to be a source of reference of reliable and workhorse flaps to reconstruct the majority of anatomical defects seen in the course of general and specialist reconstructive surgery. These are outlined in as safe and effective a way as possible and presented in a step-by-step format from planning to execution. We are excited that many series in this book demonstrate flap surgery in details heretofore never described.

Overview chapters for each major anatomical area provide a general approach to reconstruction with a choice of recommended flaps. Workhorse flaps are then presented in greater detail in the A-Z of flaps. Masterclasses are presented at the end of the book, and this important section is packed with state-of-the-art innovations, personal experiences, and challenging reconstructions and will maintain the freshness of each subsequent edition of the book as techniques evolve and further interesting material becomes available to our readers.

Our plan to regularly update the information presented herein is best underscored by Professor Foad Nahai's recollections: "My involvement with this book was cause for reflection. Reflection and reminiscence which took me back to the late 1970s when Stephen Mathes and I, as trainees, laid plans for the *Atlas of Muscle and Musculocutaneous Flaps*. We were encouraged in our efforts by our mentors Maurice Jurkiewicz, Luis Vasconez, John Bostwick, John McCraw, and P. G. Arnold, all of whom were pioneers in the development of muscle and musculocutaneous flaps. We have certainly come a long way since then. So much has changed; so many new flaps, with more sophistication in clinical applications. Flap descriptions and dissections are more detailed, accompanying artwork all in color with complex clinical examples of the flaps. In short, when I compare our initial efforts to describe the blood supply and arc of rotation of muscle flaps with this work I realize how fortunate I have been to be a part of and to have witnessed the evolution of our specialty."

We hope and expect that you will find this book and its accompanying videos useful to your practice.

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Join the flap community at:

www.thef apbook.com

Acknowledgments

We are grateful to the numerous international experts who have contributed to this book, many of whom were the first to describe or popularize the techniques herein. Especial thanks go to our publisher, Thieme, whose people have diligently shaped this book into its final form. We are particularly grateful to the access granted by Thieme to their considerable and world-class image library, and to the authors and illustrators of those books in which these illustrations first appeared, as well as to the beautiful new illustrations provided by artist Samantha Stutzman.

Thanks also to those editorial assistants that have facilitated the coordination of the manuscript, including Jamie Howie and Thomas Hayes, and to project manager Luke Whitmore.

Last but not least we thank our friends, families, and loved ones who have supported us through thick and thin.

Many thanks to artist Steve Atherton and the Department of Medical Illustration of Morriston Hospital for the masterful three-dimensional illustration shown on the front cover.

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Section I

Planning and Decision Making in Reconstructive Surgery

I

1 Basic Principles of Reconstructive Surgery and Flaps

Parneet Gill and Kayvan Shokrollahi

Principles of Wound Healing

Wound healing is a complex biological response, involving a defined, regulated sequential cascade, with coordinated cellular activity including phagocytosis, chemotaxis, mitogenesis, and extracellular matrix component synthesis. Three overlapping phases are traditionally described: inflammatory, proliferative, and remodeling (**Fig. 1.1**). It is important that these activities occur in an ordered manner for successful wound healing to take place.

Phases of Wound Healing

Inflammation

The primary sequence of events is initiated by injury to the tissue, causing hemorrhage with initial vasoconstriction and activation of the coagulation cascade. This is followed by release of inflammatory mediators, leukocytes, erythrocytes, and platelets. Platelets release vasoactive amines, including serotonin, and cytokines, including platelet-derived growth factor (PDGF), transforming growth factor-beta (TGF-b), and epidermal growth factor (EGF). Granulation tissue production commences. Hematoma and fibrin bind to the wound, attracting platelets and supporting fibroblast migration.

The coagulation and complement cascades enable the migration of leukocytes and monocytes within hours, closely followed by macrophages after 24 to 36 hours via the process of margination and diapedesis. Debris is phagocytosed and removed from the wound by the polymorphonuclear cells (PMNs). Epithelialization results in migration of epithelial cells across the wound, with the leading edge losing its basement membrane adhesion and flattening out.

By 48 to 72 hours macrophages are the predominant cell types, producing growth factors for the production of the extracellular membrane (ECM) by fibroblasts and angiogenesis following proliferation of smooth muscle and endothelial cells. Chemo-attractants for macrophages include immunoglobulin G (IgG) fragments; complement, collagen, and elastin breakdown products; and cytokines, such as PDGF, TGF-b, and leukotriene B_4. Lymphocytes are attracted by interleukin-1 (IL-1), IgG, and complement products and are the last cells to enter the wound during the inflammatory phase.

Proliferation

By day 7 the wound is predominated by fibroblasts, migrating through the ECM into the wound following stimulation by cytokines. Fibroblasts synthesize type I and type III collagen, to form the foundation of the wound ECM. New blood vessel formation occurs by the action of platelets releasing cytokines to attract macrophages and PMNs. The macrophages release angiogenic substances such as tumor necrosis factor-alpha (TNF-a), vascular endothelial growth factor (VEGF), and basic fibroblast growth factor (bFGF). These actions result in angiogenesis.

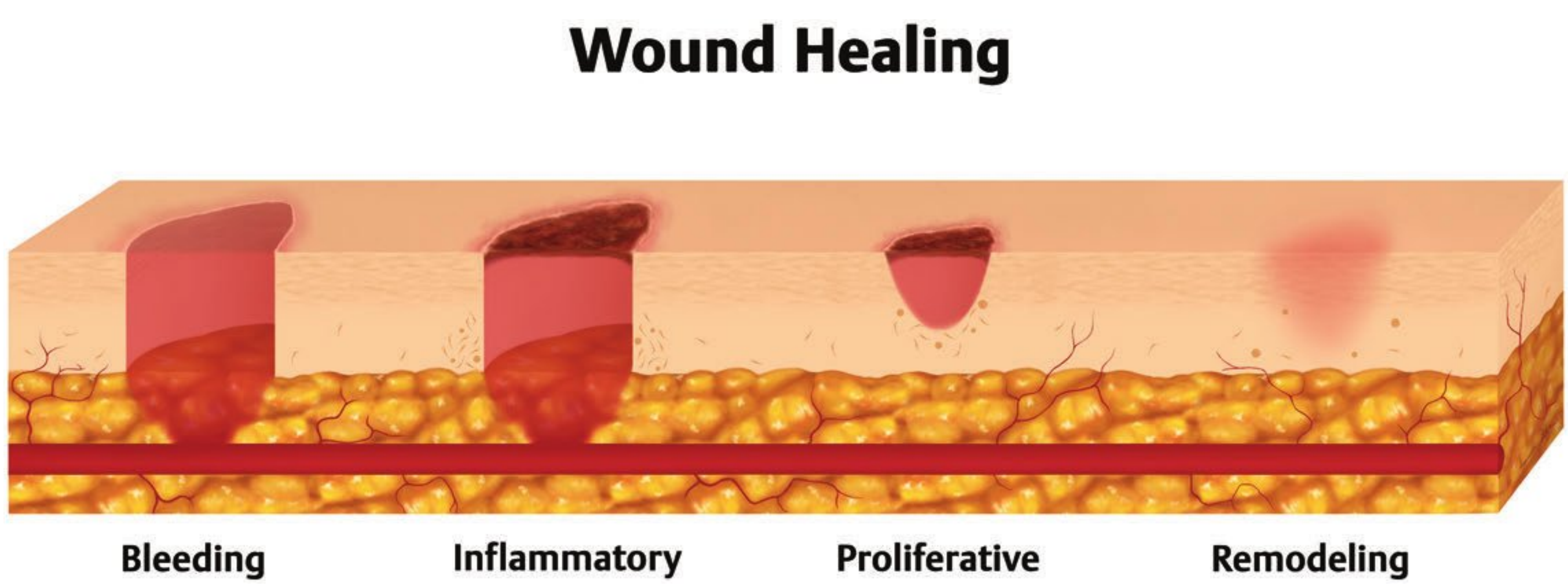


Fig. 1.1 Following the initial injury, the three phases of wound healing are shown: inflammatory, proliferative, and remodeling.

Remodeling

By day 21, a steady state of collagen synthesis and breakdown is reached following remodeling of the ECM. TGF-b promotes matrix accumulation by decreasing the activity of the matrix metalloproteinases (MMPs), which are produced by fibroblasts, macrophages, and granulocytes. Fibronectin acts as a scaffold for collagen deposition and is involved in wound contraction, cell interaction and migration, collagen matrix deposition, and resultant epithelialization. As the wound matures, type I collagen replaces type III and the amount of fibronectin reduces. Stromal ground substance consisting of proteoglycans and glycosaminoglycans (GAGs) is vital in creating a hydrated environment to enable cell mobility and binding. Remodeling occurs increasing tensile strength of the wound to 80% of normal between 3 and 8 weeks.

Factors that Affect Wound Healing

Local factors that affect wound healing include:

- Infection
- Handling of wound by surgeon
- Local tissue ischemia
- Wound oxygenation
- Radiation
- Denervation

General factors that affect wound healing include:

- Age
- Smoking
- Nutritional status
- Vitamin deficiency 1 zinc deficiency
- Temperature
- Inherited conditions, such as, pseudoxanthoma elasticum, Ehlers-Danlos
- Acquired conditions, such as, diabetes mellitus, autoimmune inflammatory conditions

Structure and Function of the Skin

The skin is composed of epidermis and dermis (**Fig. 1.2**). The five layers of the epidermis are the stratum corneum, stratum granulosum, stratum lucidum, stratum spinosum, and stratum basale. Epidermis is stratified squamous epithelium with mainly keratinocytes, but also Langerhans cells, Merkel cells, and melanocytes.

The dermis accounts for 95% of the thickness of the skin and is split into the superficial papillary dermis and the deeper reticular dermis, separated by the vascular plexus (**Fig. 1.2a**). The

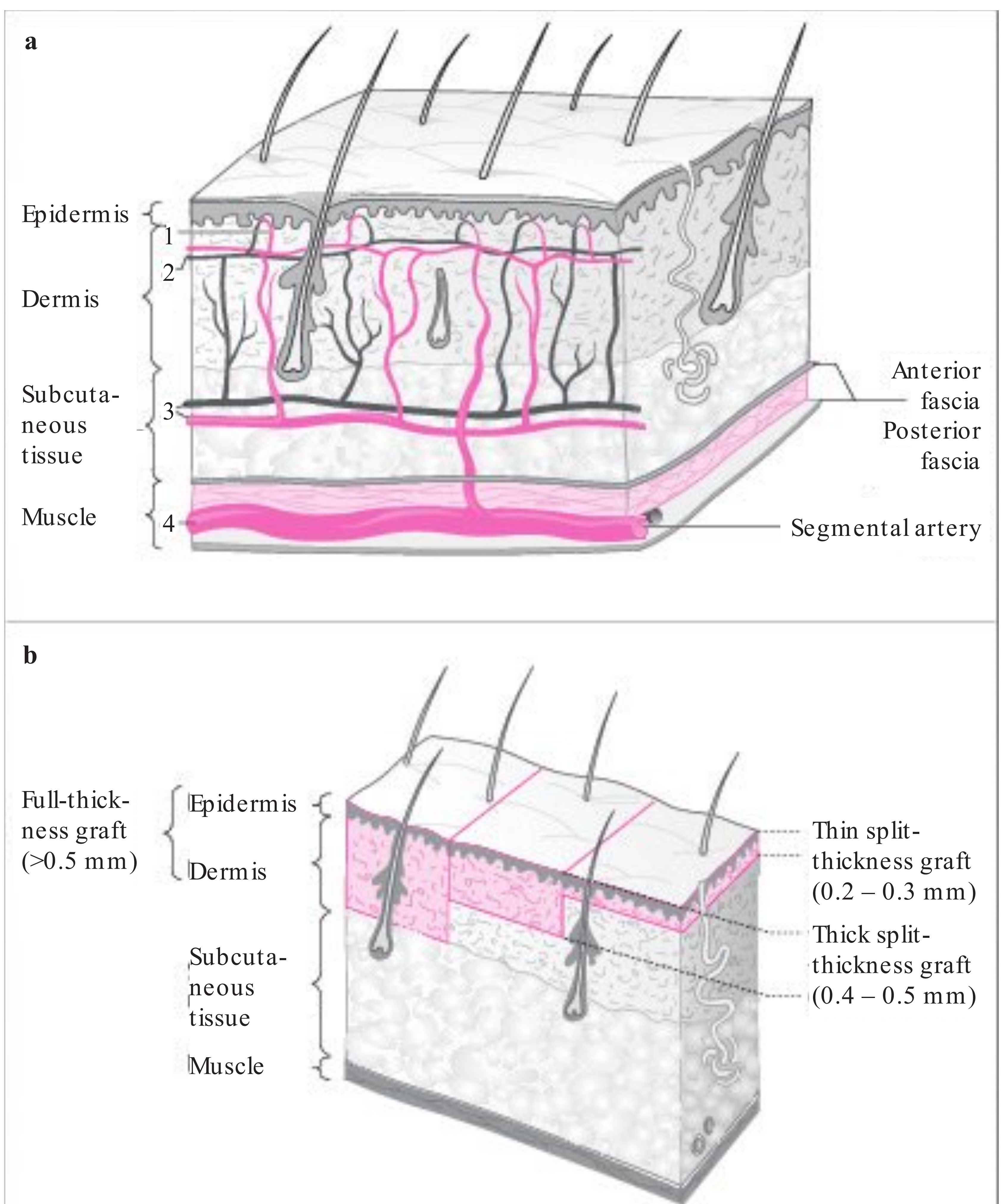


Fig. 1.2 **(a)** Structure of the skin. Skin consists of epidermis and dermis, leading into the layers of subcutaneous tissue and muscle. Within the layers are vascular plexi, shown as listed. (1) Subpapillary vascular plexus; (2) dermal vascular plexus; (3) subdermal vascular plexus; (4) segmental vascular plexus. **(b)** Composition of free skin grafts. Skin grafts can be classified as full thickness or split thickness.[1]

dermis consists of collagen, elastin fibers, ground substance, and the vascular plexus. The skin appendages including the hair follicles, eccrine glands, apocrine glands, and the sebaceous glands are found in the dermal layer (**Fig. 1.2a**).

For the blood supply to the skin, deep vessels arising from the aorta divide to form the main arterial supply to the head, neck, trunk, and limbs before feeding into the vascular plexus of the fascia, subcutaneous tissue, and skin. Fasciocutaneous and musculocutaneous perforators connect the deep vessels to the skin.

The vascular plexus is divided into six layers (**Fig. 1.2a**):

1. Subfascial plexus
2. Prefascial plexus
3. Subcutaneous plexus
4. Subdermal plexus
5. Dermal plexus
6. Subepidermal plexus

An angiosome is a composite block of tissue that is supplied by a named artery. Angiosomes were first described by Manchot in 1889 and later by Taylor and Palmer. The vessels that pass between the anatomical territories of the angiosomes are called choke vessels.

Reconstructive Techniques

Options

Reconstructive Ladder

This is a stepwise progression from the simplest options for reconstruction to those that are more complex:

- Secondary intention healing
- Primary closure
- Graft—split skin, full thickness skin, or composite
- Tissue expansion
- Local tissue transfer
- Distant tissue transfer
- Free tissue transfer
- Miscellaneous, such as, cell culture, vacuum-assisted closure (VAC)

Reconstructive Menu

The reconstructive menu is a more recent, sophisticated option, as the reconstructive ladder encourages the simplest option rather than the most optimal reconstruction. Any item can be chosen from the menu, allowing personal preference and the most suitable reconstruction to be used for each individual case.

The aims of reconstruction are both functional and cosmetic. Scars should be placed in lines of election (Langer lines) or parallel to them to enable settling of the scar into wrinkles over time (**Fig. 1.3a**). The nasolabial fold, glabellar wrinkle pattern, lateral canthal "crow's feet," and forehead wrinkles are preferable areas to place scars. The use of a natural junction line distracts the eye from the scar and can be used effectively, such as, the base of the alar, the vermilion border, and the lower eyelid below the line of the eyelashes (**Fig. 1.3b**).

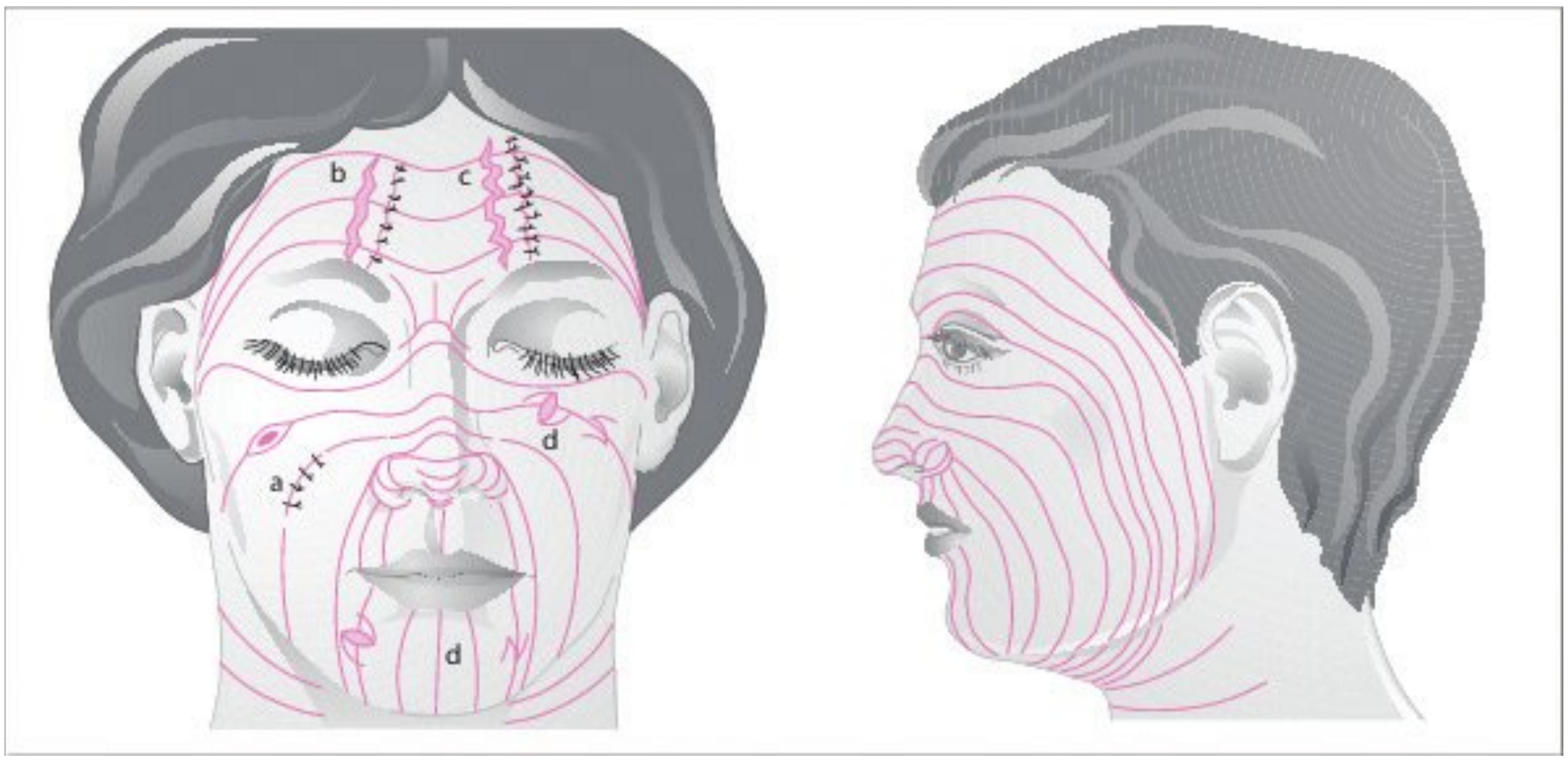
Facial Subunits

The face can be divided into six major aesthetic subunits: forehead, eyes/eyebrows, nose, cheek, lips, and chin (**Fig. 1.4**). These can be further divided into additional anatomical subunits (**Figs. 1.5, 1.6,** and **1.7**). These are important when considering reconstruction as defects affecting more than 50% of a subunit may produce a superior result if the whole subunit is replaced instead of the defect alone.

Direct Closure

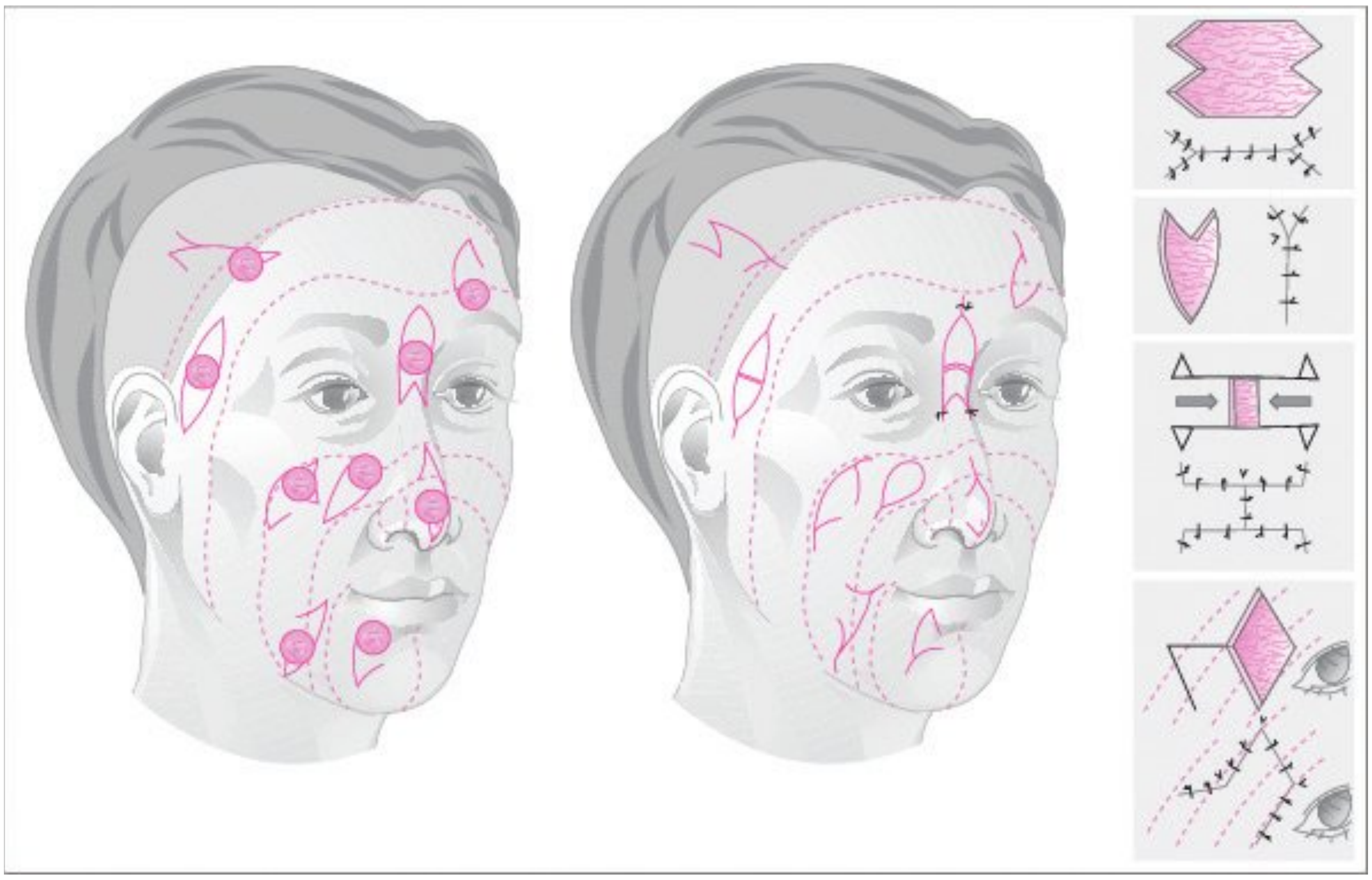
The aims of direct closure include:

- Place scar in Langer lines if possible (**Fig. 1.3**)
- Adequate debridement of traumatic wounds



a

Fig. 1.3 **(a)** Langer lines. Scars are placed in lines of election as shown. (continued)



b

Fig. 1.3 (continued) **(b)** Use of resting skin tension lines to plan reconstruction using direct closure and local flaps.[1]

- Atraumatic technique
- Minimize dead space
- Tension-free closure
- Opposition of skin edges without overlap (**Fig. 1.8**)
- Evert skin edges (**Fig. 1.8**)
- Use finest suture possible for tension
- Excise dog ears

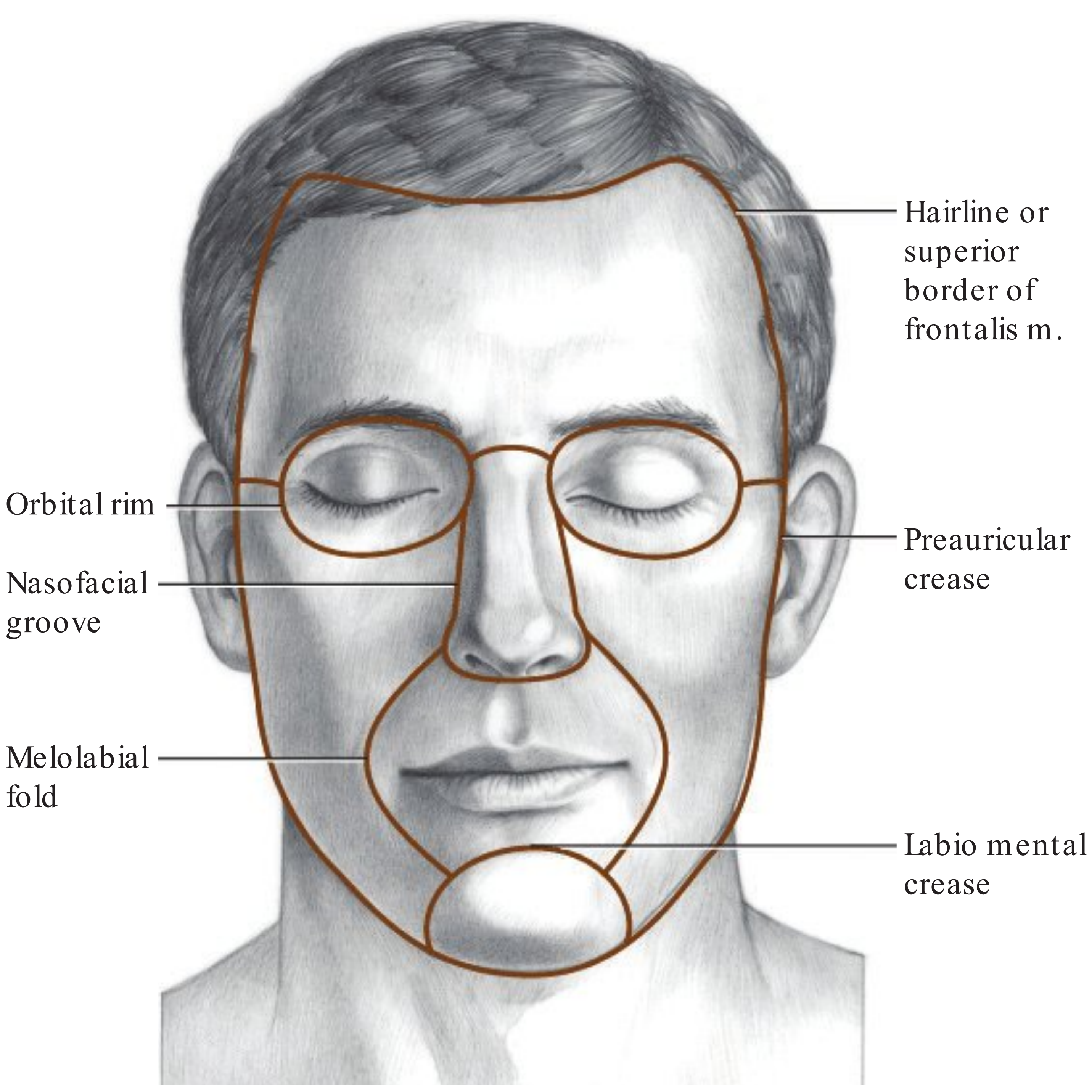


Fig. 1.4 The major subunits of the face.[2]

The methods of direct closure include:

- Simple interrupted (**Figs. 1.8** and **1.9**)
- Subcutaneous with buried knot (**Figs. 1.8** and **1.9**)
- Subcuticular (**Fig. 1.10**)
- Vertical mattress (**Figs. 1.11** and **1.12**)
- Horizontal mattress (**Fig. 1.13**)
- Continuous (**Fig. 1.14**)

The standard suture technique can be described as a deep buried subcutaneous suture or a simple interrupted skin suture (**Figs. 1.8** and **1.9**). The aim of the buried subcutaneous suture is to eliminate dead space at the base of the wound to reduce the risk of hematoma, seroma, or infections. The simple interrupted skin suture aims to evert the wound edges by ensuring an equal

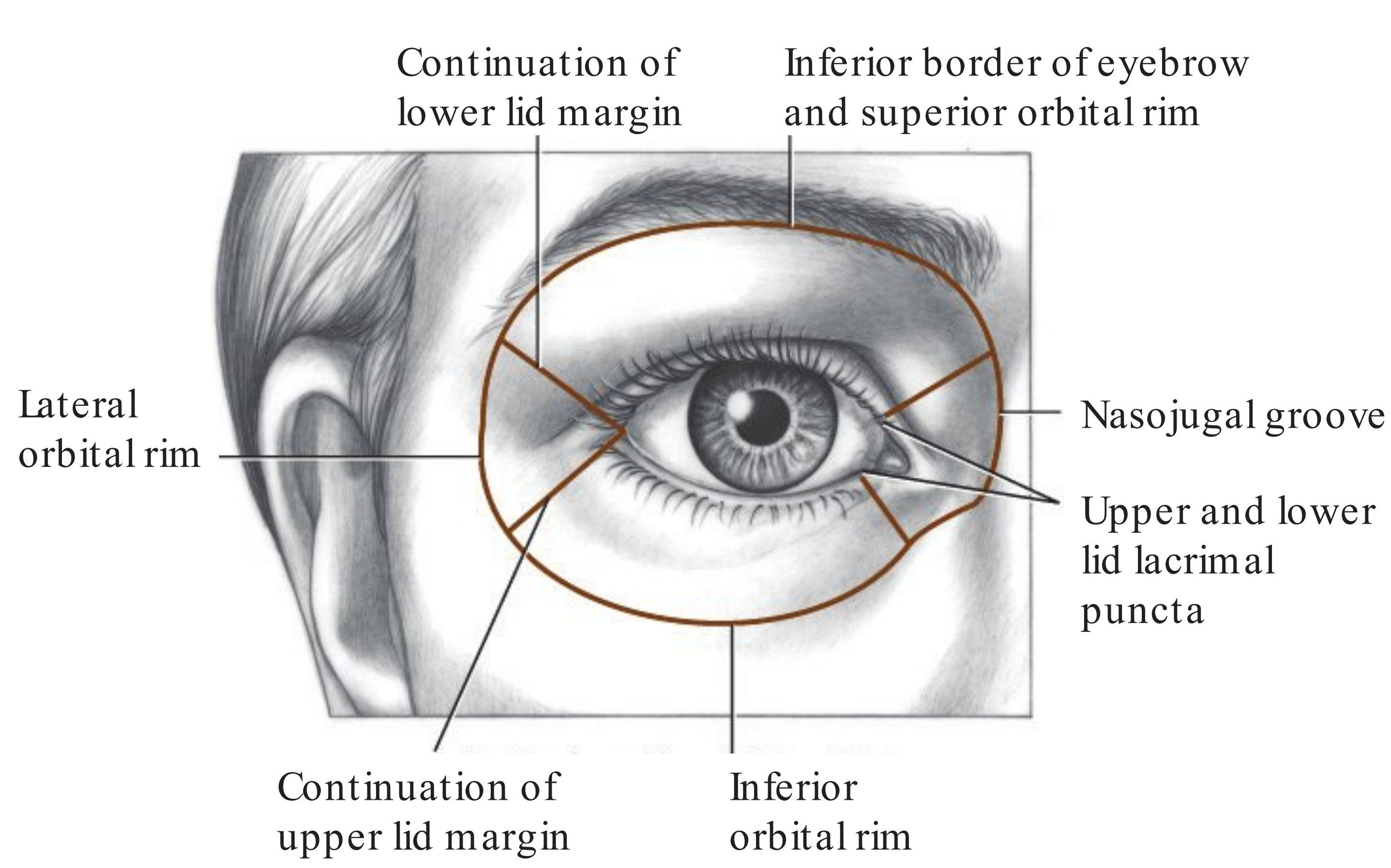


Fig. 1.5 Subunits of the eye.[2]

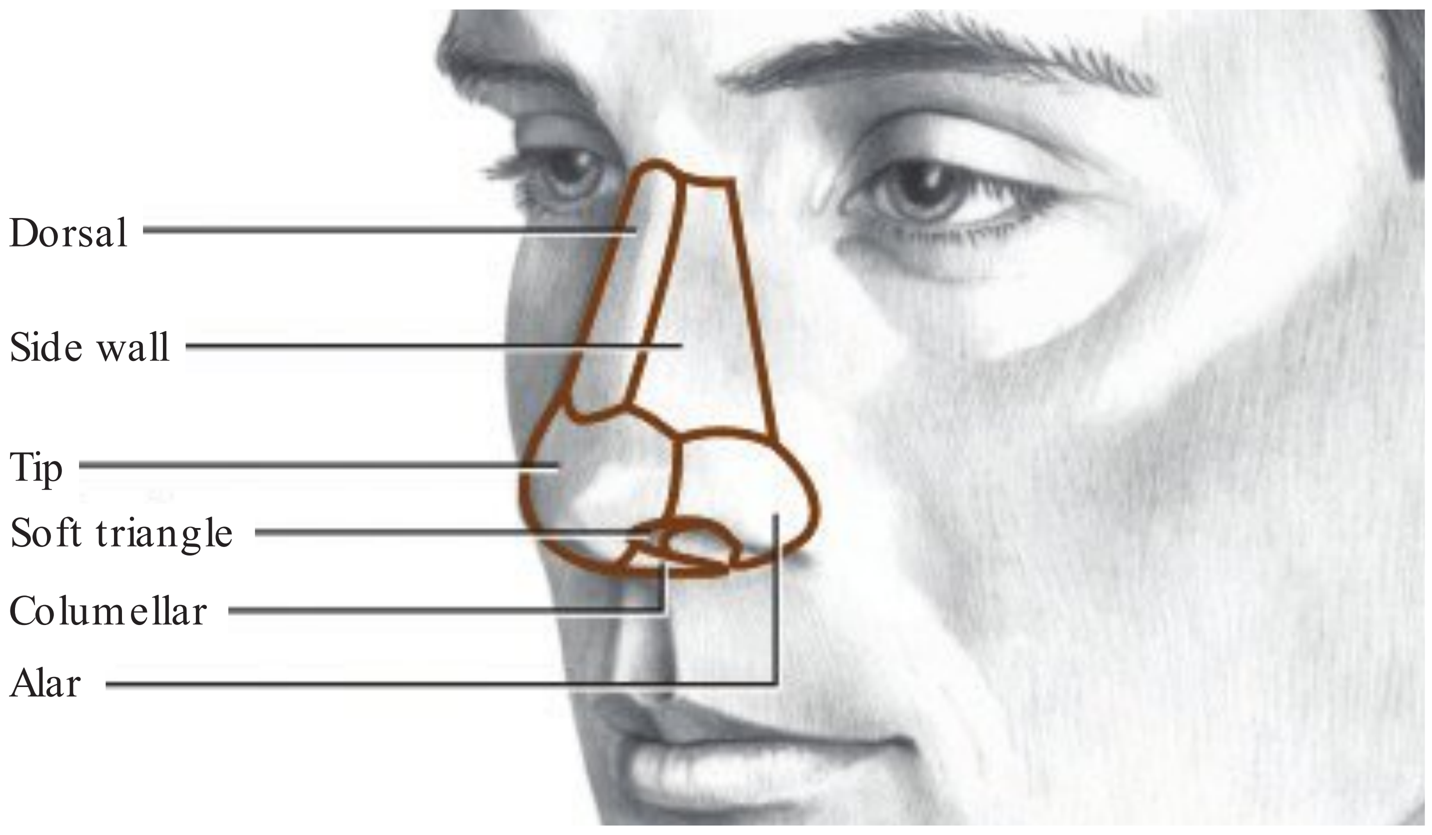


Fig. 1.6 Subunits of the nose.[2]

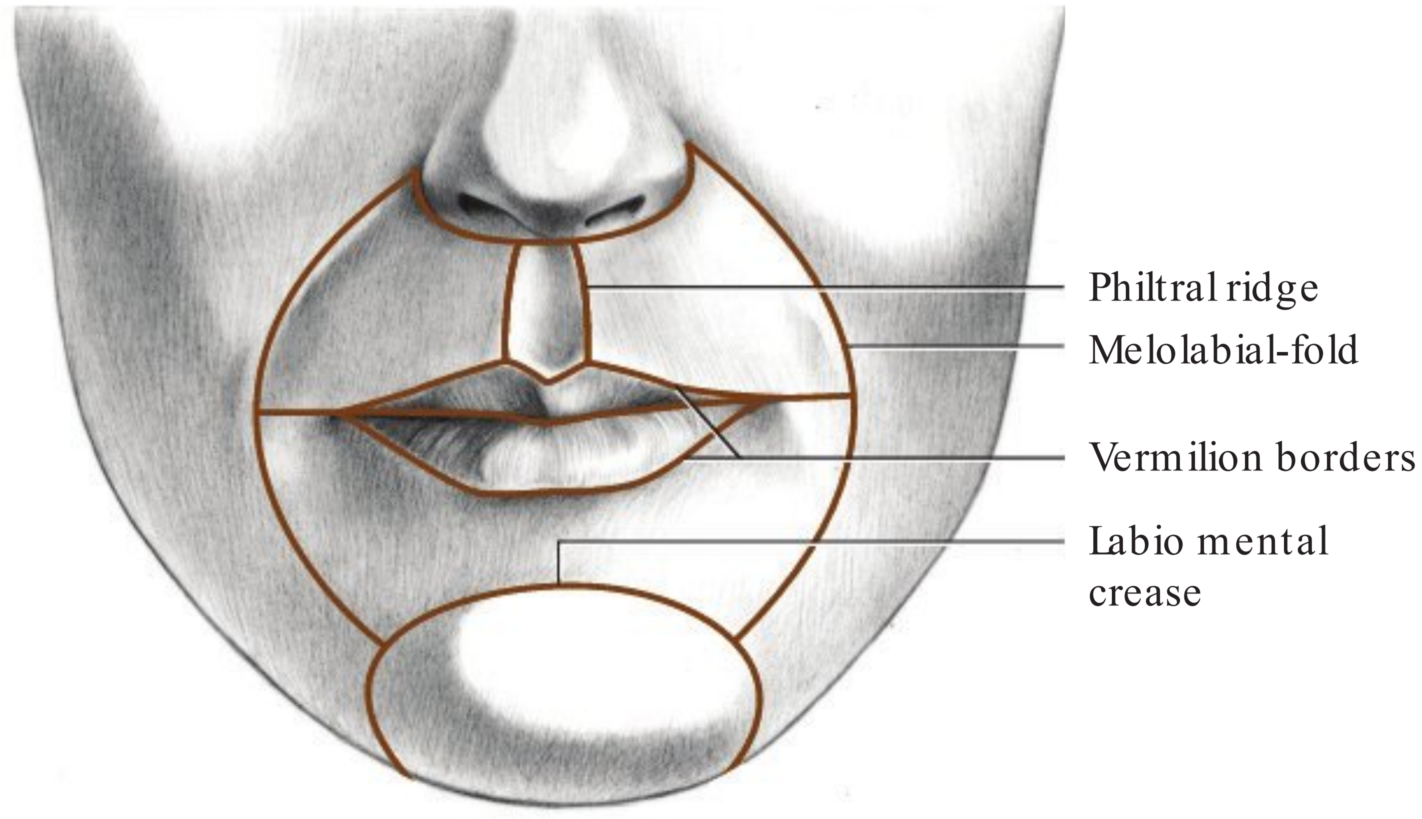


Fig. 1.7 Subunits of the lips and chin area.[2]

"bite" is taken at each wound edge with a simple loop knotted at one side of the wound (**Fig. 1.9c**). Inverted wound edges do not heal adequately.

A subcuticular suture is used to close a wound edge without leaving external tracking marks. It consists of a single running suture, which starts at one end of the wound, traversing the wound at the level of the dermis to the other end of the wound (**Fig. 1.10**). The subcuticular suture can be left free at either end and trimmed upon review or can be buried.

The vertical mattress suture is used to evert wound edges while reducing dead space. The distance from the wound edge must be equal in both the deeper and superficial "bite" to avoid a step deformity (**Fig. 1.11**). The half-buried vertical mattress suture can also be used to close a wound by passing deep from one wound edge into the other and exiting superficially by forming a loop, which is knotted on the side of entry (**Fig. 1.12**).

The horizontal mattress suture is used to evert wound edges by taking the tension and spreading it along the wound edge by taking horizontal "bites" (**Fig. 1.13**). It is ideal for closing fragile skin as well as areas under a large amount of tension; however, the blood supply to the tissue between the suture may become compromised if tied too tightly.

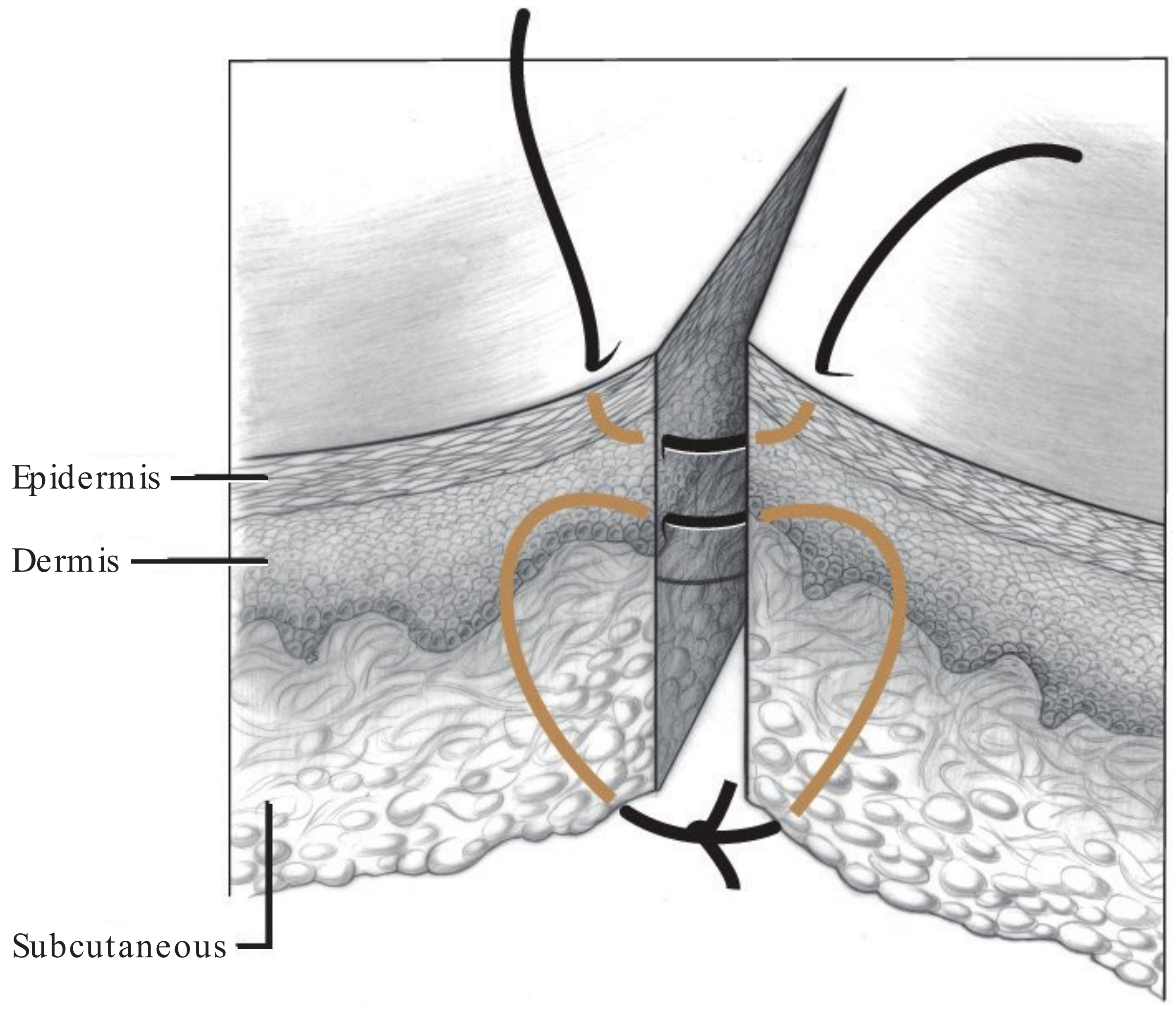


Fig. 1.8 Simple interrupted and buried deep dermal suture. This figure shows opposition of the wound edge with eversion.[2]

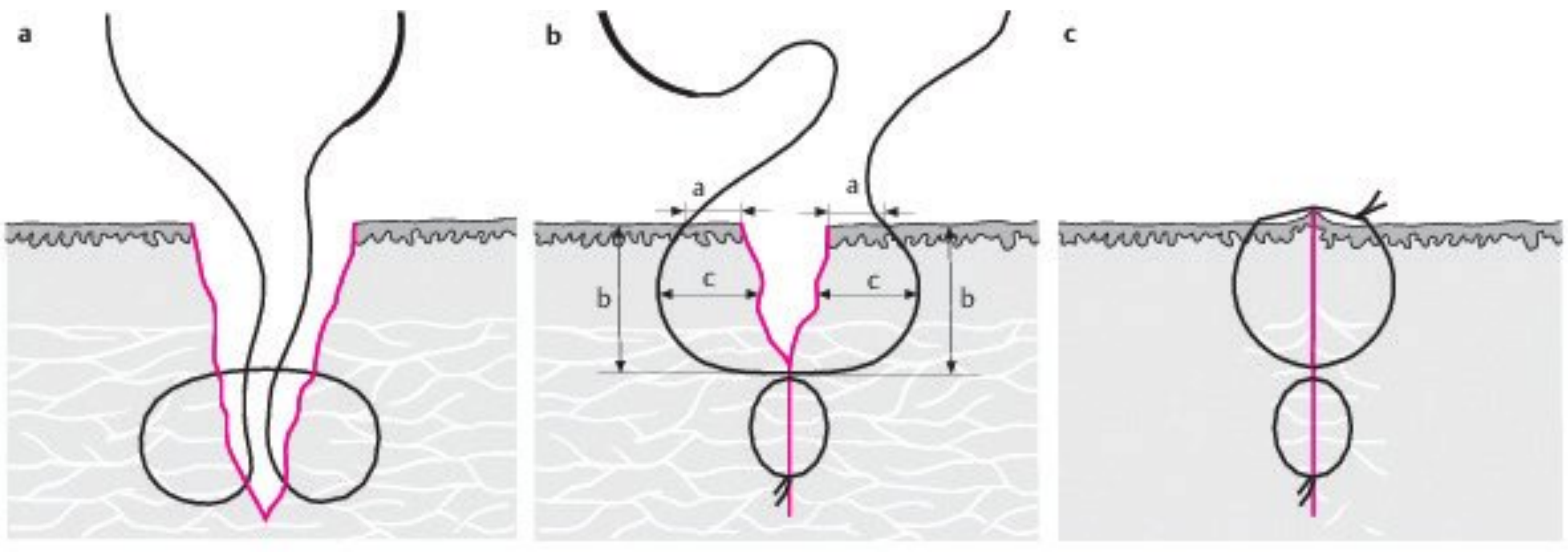


Fig. 1.9 Simple suture techniques. **(a)** Placement of a subcutaneous suture with a buried knot. **(b)** Placement of an interrupted suture with equal distances from the wound edge in order to achieve eversion. **(c)** Successfully completed wound closure.[3]

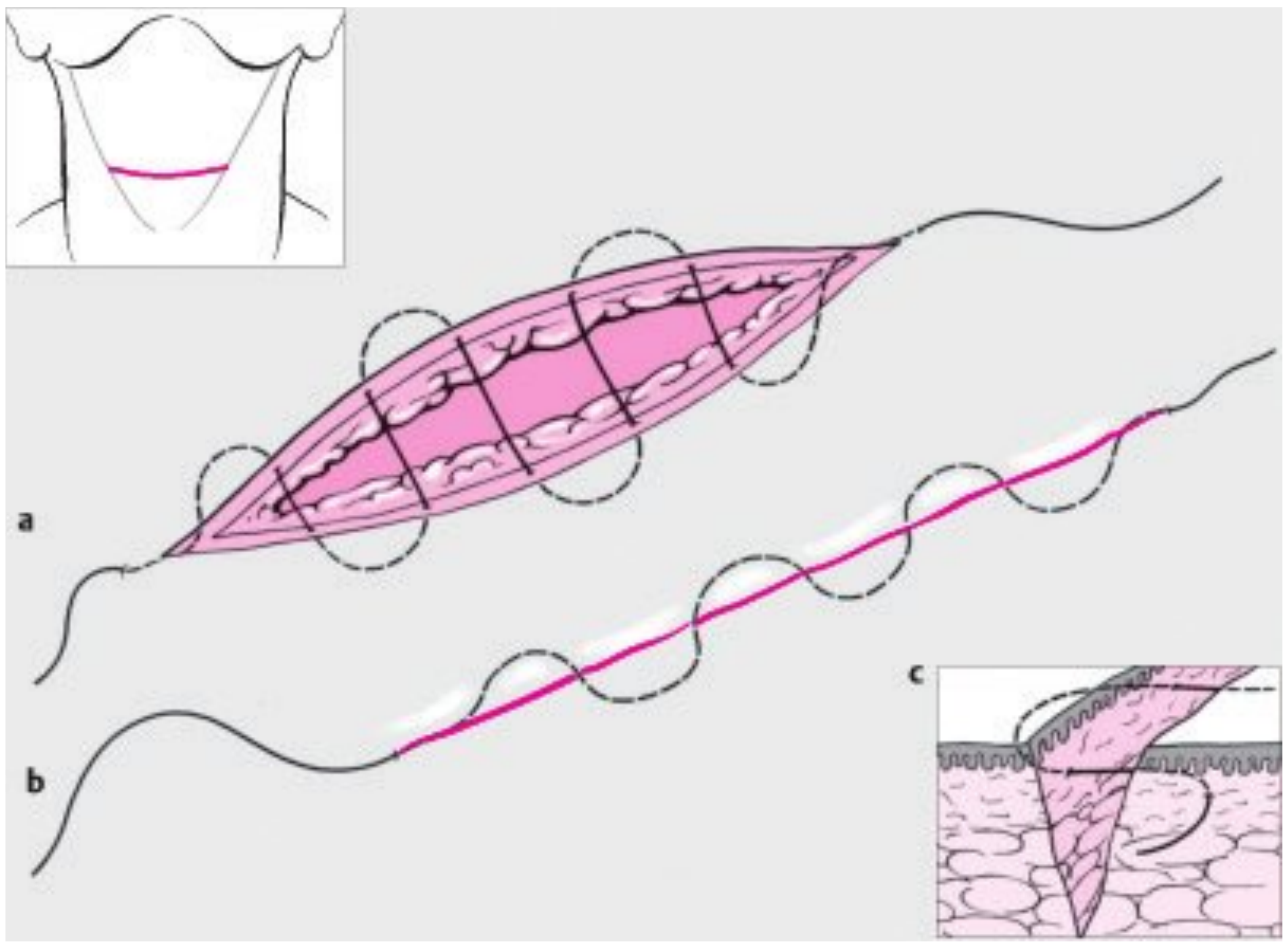


Fig. 1.10 Subcuticular suture.[3]

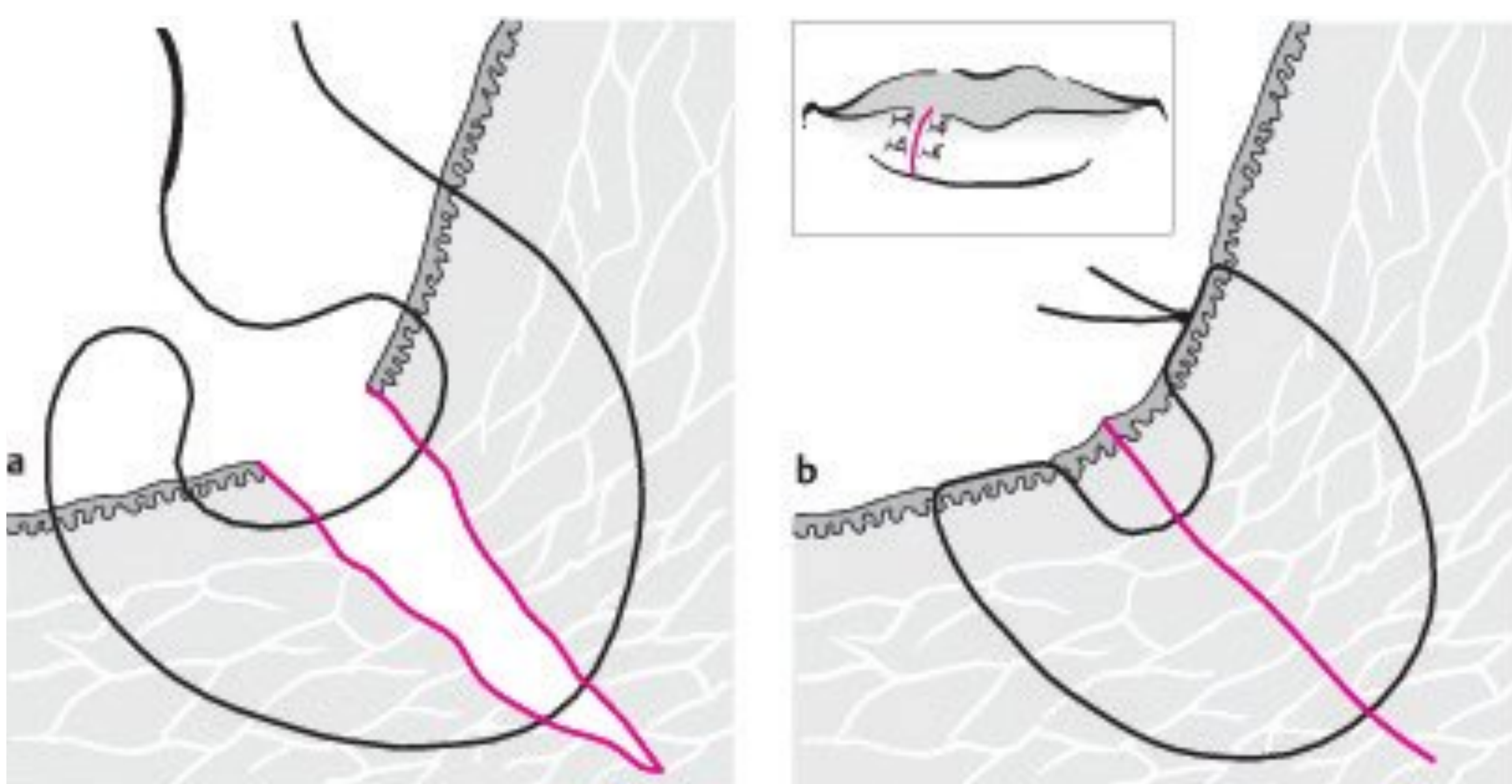


Fig. 1.11 Vertical mattress suture. **(a)** Placement of suture at equal points from wound edge. **(b)** Completed wound closure.[3]

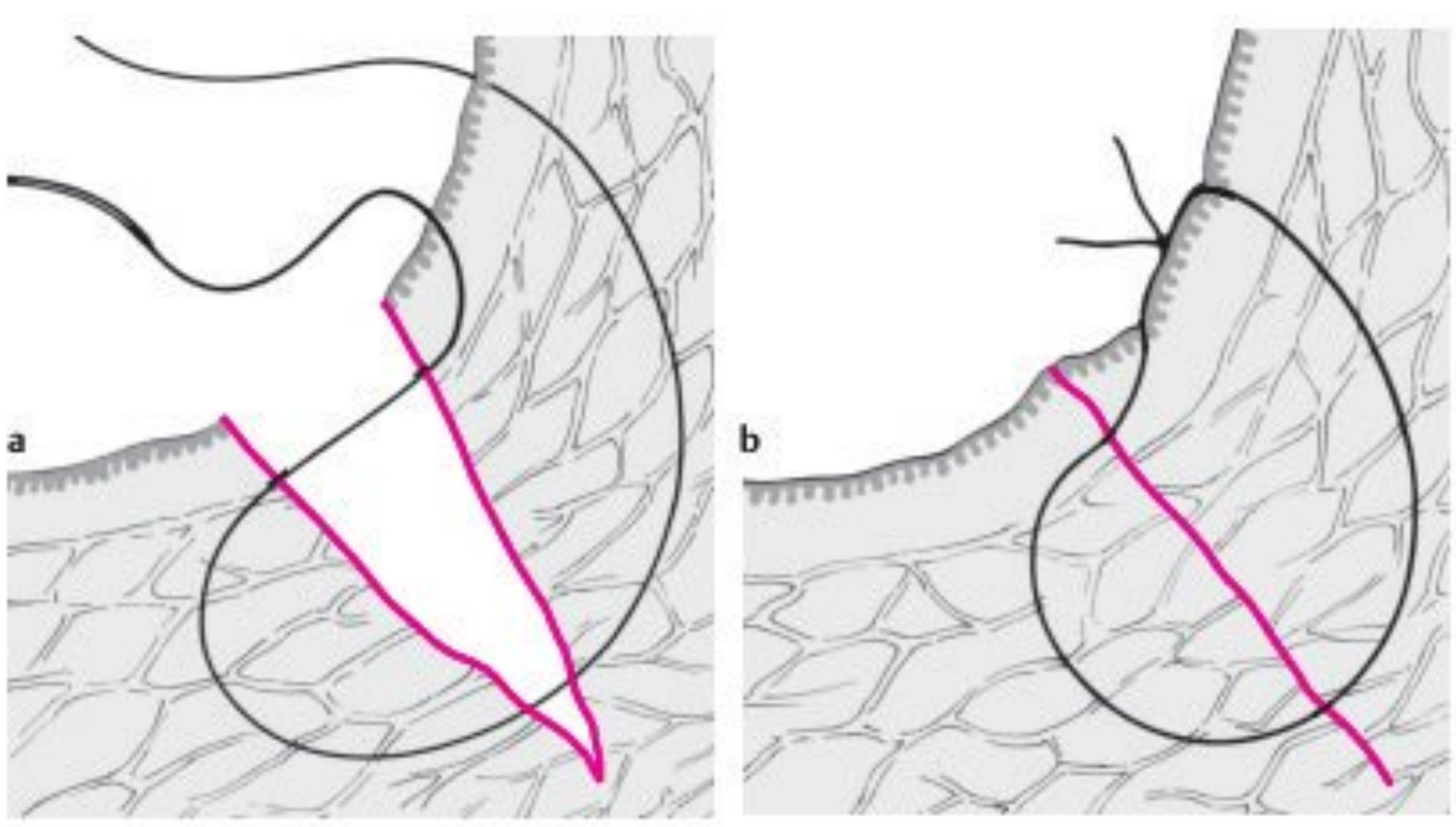


Fig. 1.12 Half-buried vertical mattress suture. **(a)** Placement of suture with start and finish points on same side of wound. **(b)** Completed wound closure.[3]

Fig. 1.13 Horizontal mattress suture placement.

A simple continuous over and over suture is a quick method to close a wound but can bunch up and strangulate the wound edges if tied too tightly. The sutures should be placed at equal distances away from the wound edge to encourage eversion of the wound edges (**Fig. 1.14**).

Before wound edges are sutured, it is vitally important that any debris or nonviable tissue is adequately debrided in order to avoid infection and any risk of debris tattooing. Wound edges should be opposed into their "normal" position by using landmarks to aid placement. Where there has been tissue loss, assessment should be made about whether the wound can be left to heal by secondary intention, whether primary closure is adequate or whether new tissue needs to be recruited either as a skin graft or flap.

Dog ears result when excess tissue remains at either end of a wound during direct closure. These unsightly swellings produce an unsatisfactory result and can improve over time but are easily managed by formal dog ear excision (**Fig. 1.15**). Initially the direction of the relaxed skin tension lines is noted and creating an equilateral triangle shortens the wound edge. An incision is made at the shorter edge that meets the wound before the resultant flap is draped across the wound to highlight the remaining excess. The excess is excised, enabling wound closure minus the dog ear. This acts to lengthen the scar further but produces a flattened and more pleasing scar.

Skin Grafts

A dermatome or Watson knife is used to shave a layer of epidermis, with a varying amount of dermis (**Fig. 1.16a-e**). The graft is transferred to a distal site, where it establishes a new blood supply with the bed of the wound (**Fig. 1.16f**). The graft can be unmeshed or meshed to enable drainage of underlying hematoma and coverage of a larger area. The bed should be free of infection, ischemia, or foreign bodies in order to ensure good take.

A bolster dressing is often applied to reduce shearing and hematoma between the graft and wound bed (**Figs. 1.16g** and **1.17**). The split skin graft is trimmed to size and sutured to the wound edges leaving the suture ends tied long. The graft may also be quilted to the underlying bed if desired (**Fig. 1.17a**). Jelonet gauze and a dressing such as proflavine-soaked wool or foam dressing are used to compress the graft, with the tie-over completed by tying the long ends of the sutures across it (**Fig. 1.17b**).

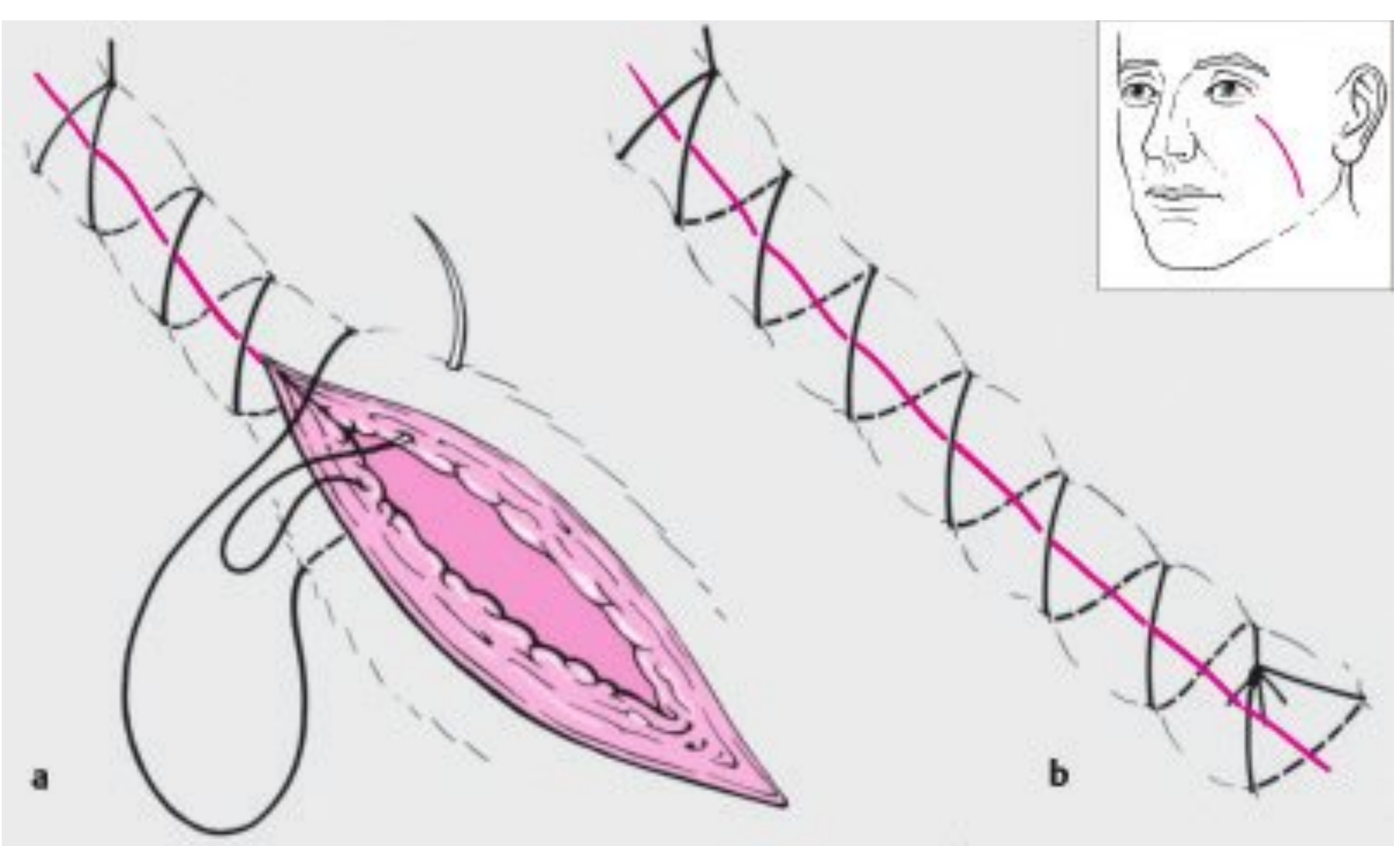


Fig. 1.14 Simple continuous suture. **(a)** Placement of suture with bites taken at equal distance from wound edge. **(b)** Completed wound closure.[3]

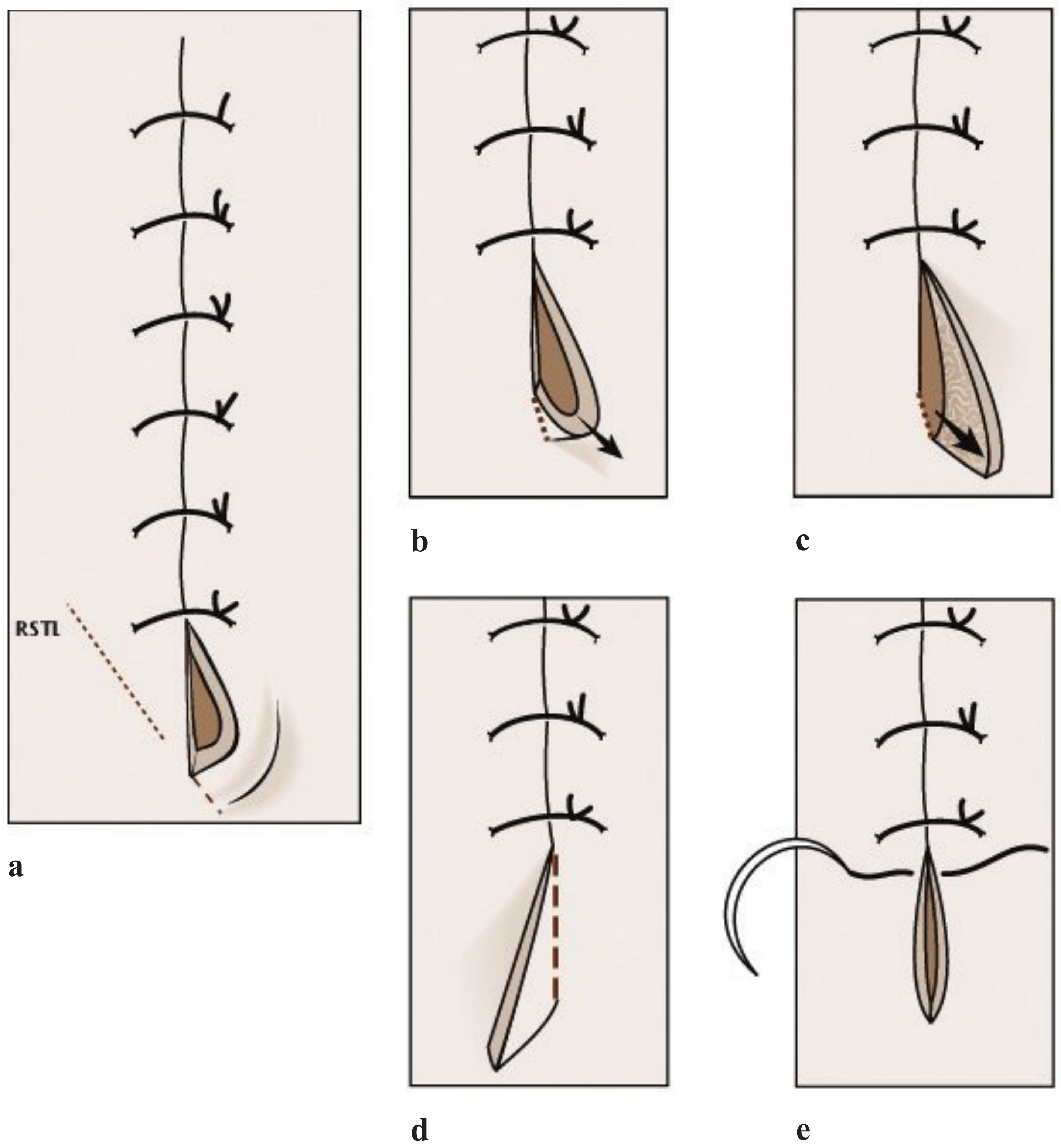


Fig. 1.15 Excision of dog ears. **(a)** Initial situation with direction of RSTL marked. **(b)** Shortening the lower wound edge by creating an equilateral triangle. **(c)** Incision at shorter edge meeting wound. **(d)** Extension of resulting flap over wound to show excess edge. **(e)** Excision of dog ear to enable desired wound closure.[2]

A split skin graft leaves some dermis at the donor site, whereas a full thickness skin graft takes the full dermis; therefore, the donor site needs to be directly closed or grafted. **Fig. 1.18** shows a picture of a patient following split skin graft to the anterior scalp following excision of a lesion.

Skin Graft Classification

- Autograft: same individual
- Allograft: same species
- Isograft: genetically identical donor
- Xenograft: another species

Skin Graft "Take"

- Adherence
- Imbibition
- Revascularization
- Remodeling

The graft immediately adheres to the wound bed due to the presence of fibrin. During the first 48 hours the skin graft begins to swell due to absorption of fluid. Vessel ingrowth into the skin graft occurs around day 4 either by inosculation, revascularization, or neovascularization. The histological architecture of the graft returns to that of normal skin during remodeling.

The donor site heals by epithelializing from the margins and from the dermal remains such as the appendages. Healing occurs over 1 to 2 weeks.

The donor sites for split skin grafts are the thigh, medial upper arm, buttock, and hypothenar eminence; and for full thickness skin grafts, the pre- or post-auricular area, supraclavicular area, groin, medial upper arm, and cubital crease.

Reasons for skin graft failure include the following:

- Hematoma
- Infection
- Seroma
- Shear
- Inappropriate wound bed
- Error in placement

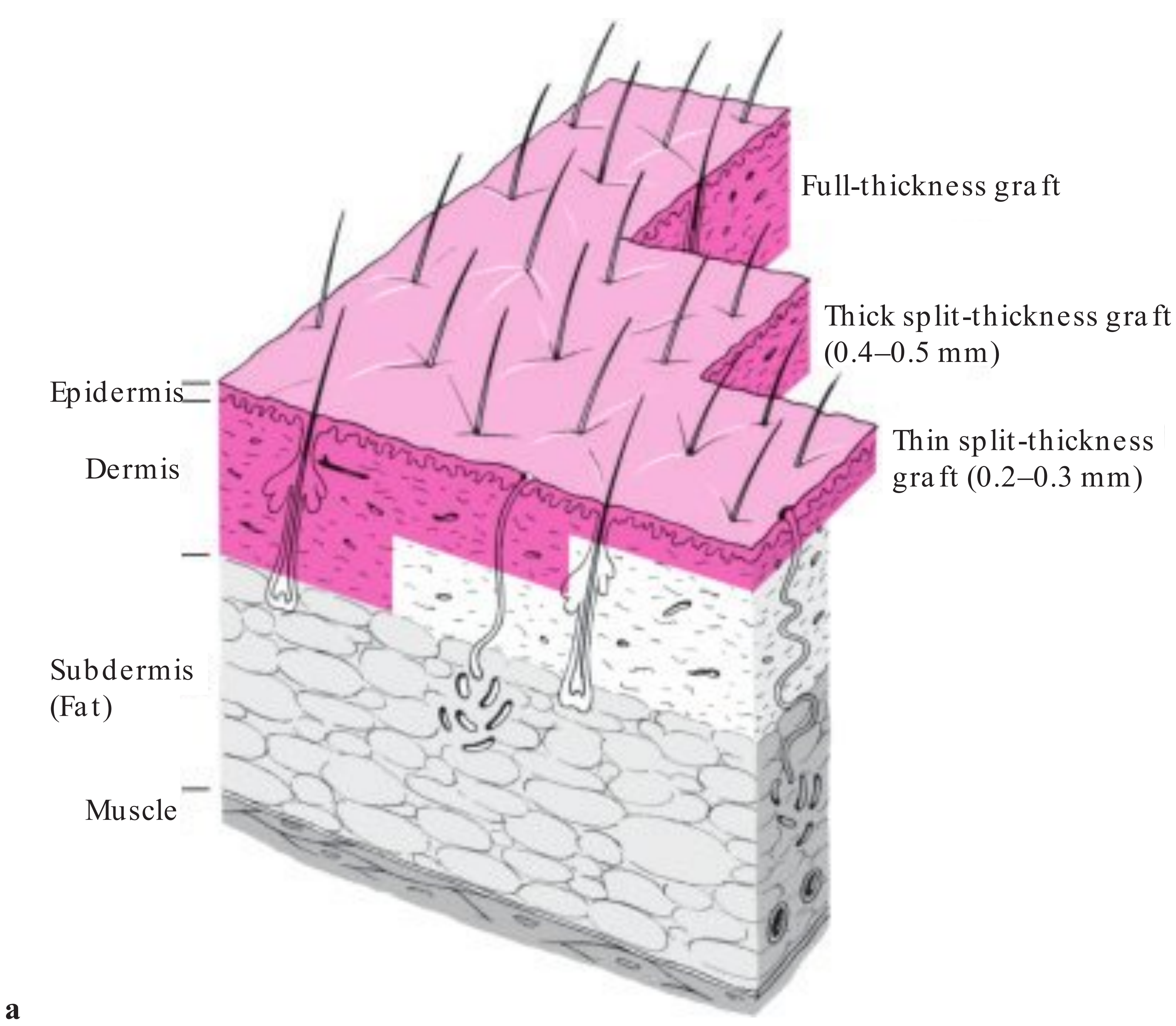


Fig. 1.16 Free skin grafts. **(a)** Skin grafts can be full thickness or varying levels of split thickness.[3] (continued)

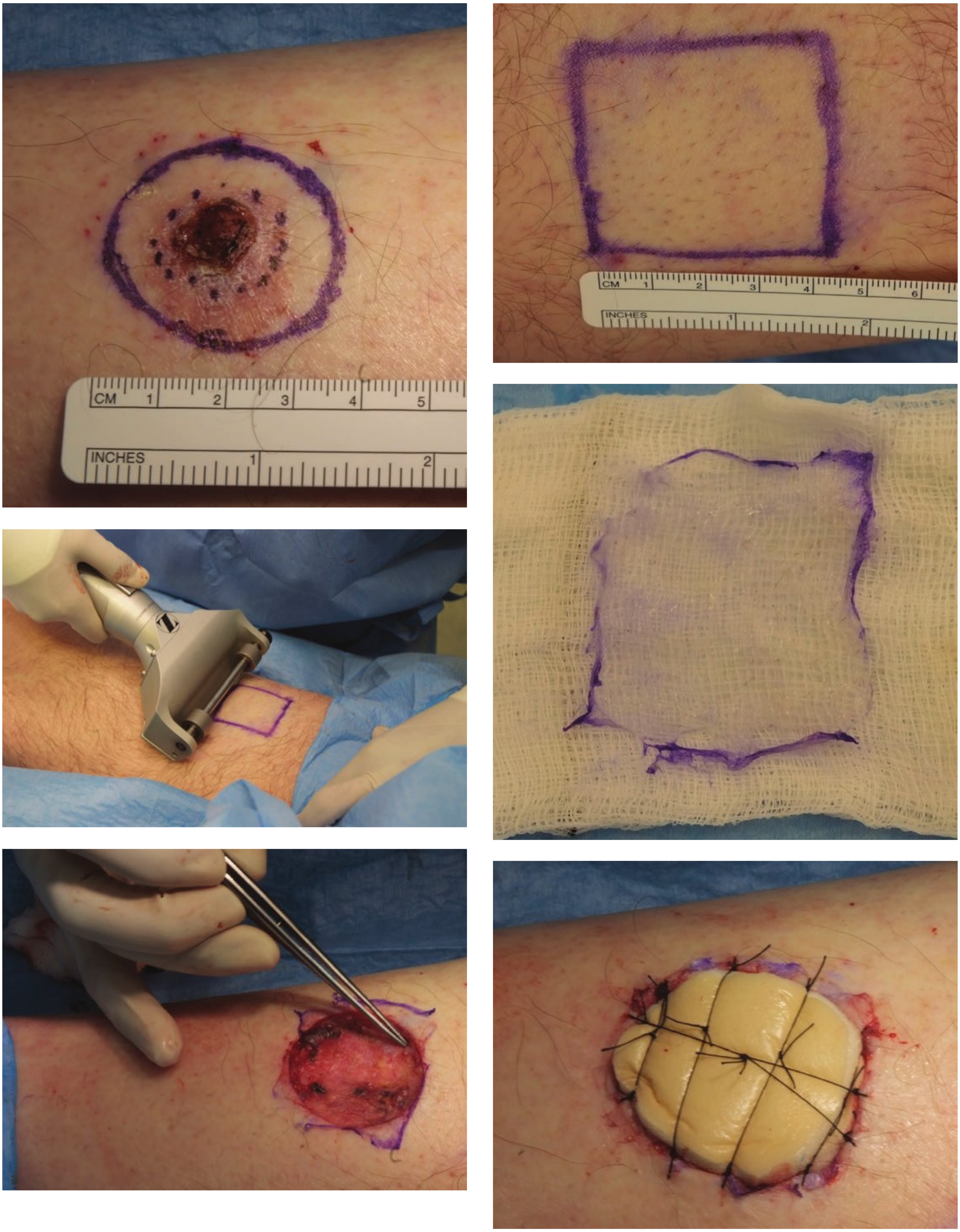


Fig. 1.16 (continued) **(b)** Photograph showing lesion on left leg marked with margin of 6 mm. **(c)** Photograph showing markings for split skin graft from left thigh. **(d)** Photograph showing a split skin graft being taken. **(e)** Photograph showing a split skin graft on a swab. **(f)** Photograph showing split skin graft being applied to defect. **(g)** Photograph showing bolster dressing over graft.