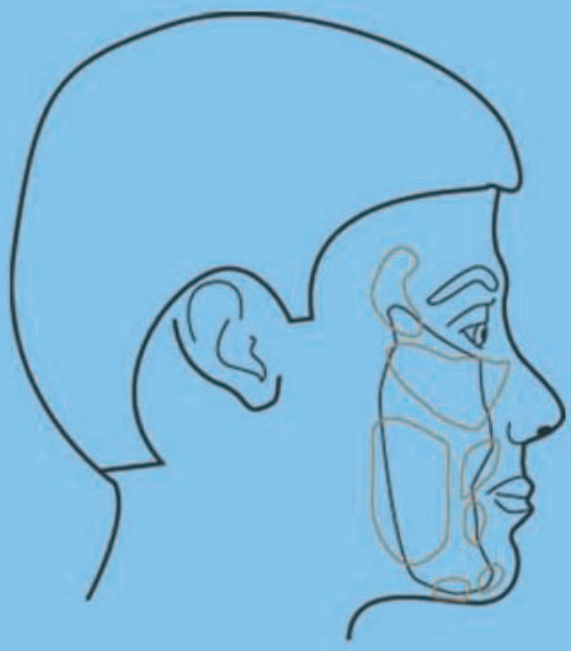
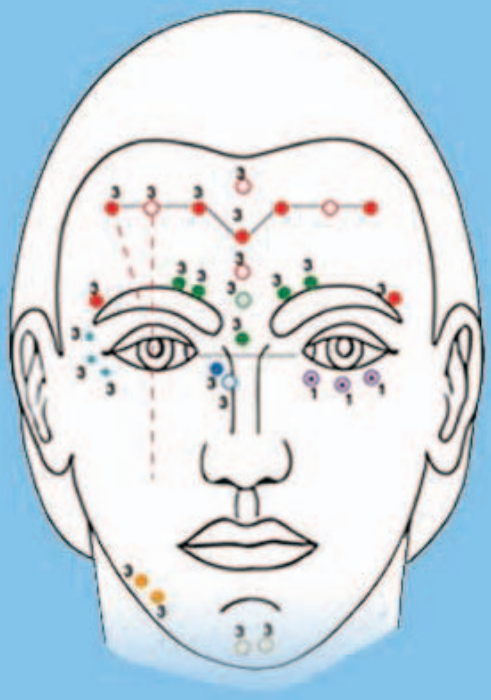
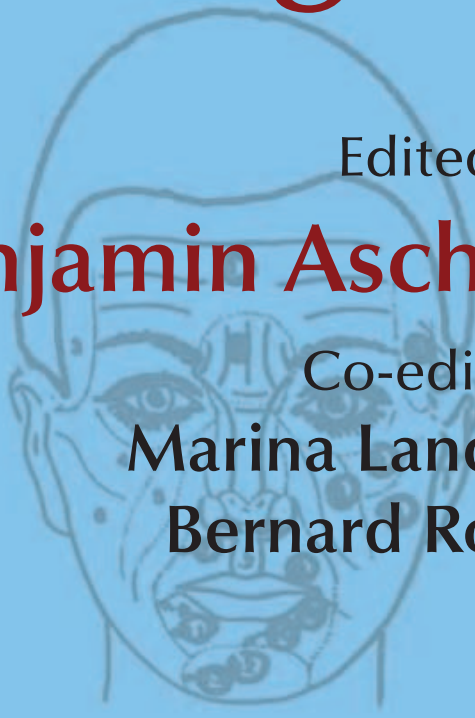
SERIES IN COSMETIC AND LASER THERAPY



Injection Treatments in Cosmetic Surgery





Edited by

Benjamin Ascher

Co-editors

Marina Landau

Bernard Rossi

informa
healthcare

INJECTION TREATMENTS IN COSMETIC SURGERY

Series in Cosmetic and Laser Therapy
Published in association with the *Journal of Cosmetic and Laser Therapy*

Already available

1. David J Goldberg
   Fillers in Cosmetic Dermatology, ISBN 9781841845098
2. Philippe Deprez
   Textbook of Chemical Peels, ISBN 9781841842954
3. C William Hanke, Gerhard Sattler, Boris Sommer
   Textbook of Liposuction, ISBN 9781841845326
4. Paul J Carniol, Neil S Sadick
   Clinical Procedures in Laser Skin Rejuvenation, ISBN 9780415414135
5. David J Goldberg
   Laser Hair Removal, Second Edition, ISBN 9780415414128

Of related interest

1. Robert Baran, Howard I Maibach
   Textbook of Cosmetic Dermatology, Third Edition, ISBN 9781841843117
2. Anthony Benedetto
   Botulinum Toxin in Clinical Dermatology, ISBN 978184214244
3. Jean Carruthers, Alastair Carruthers
   Using Botulinum Toxins Cosmetically, ISBN 9781841842172
4. David J Goldberg
   Ablative and Non-Ablative Facial Skin Rejuvenation, ISBN 9781841841755
5. David J Goldberg
   Complications in Cutaneous Laser Surgery, ISBN 9781841842455
6. Nicholas J Lowe
   Textbook of Facial Rejuvenation, ISBN 9781841840956
7. Shirley Madhere
   Aesthetic Mesotherapy and Injection Lipolysis in Clinical Practice, ISBN 9781841845531
8. Avi Shai, Howard I Maibach, Robert Baran
   Handbook of Cosmetic Skin Care, ISBN 9781841841793
9. Antonella Tosti, Maria De Padova
   Atlas of Mesotherapy in Skin Rejuvenation, ISBN 9780415419949

INJECTION TREATMENTS IN COSMETIC SURGERY

Edited by

Benjamin Ascher
Clinique Esthetic Iena
Paris, France

Co-editors

Marina Landau
Holon, Israel

Bernard Rossi
Rouen, France

informa
healthcare

First published in the United Kingdom in 1995

Second edition published in the United Kingdom in 2008 by Informa Healthcare, Telephone House, 69–77 Paul Street, London, EC2A 4LQ. Informa Healthcare is a trading division of Informa UK Ltd. Registered Office: 37/41 Mortimer Street, London W1T 3JH. Registered in England and Wales number 1072954

Tel: +44 (0)20 7017 5000
Fax: +44 (0)20 7017 6699
Website: www.informahealthcare.com

A CIP record for this book is available from the British Library.

Library of Congress Cataloging-in-Publication Data
Data available on application

ISBN-13: 978–0–415–38651–7

Distributed in North and South America by
Taylor & Francis
6000 Broken Sound Parkway, NW, (Suite 300)
Boca Raton, FL 33487, USA

Within Continental USA
Tel: 1 (800) 272 7737; Fax: 1 (800) 374 3401
Outside Continental USA
Tel: (561) 994 0555; Fax: (561) 361 6018
Email: orders@crcpress.com

Book orders in the rest of the world
Paul Abrahams
Tel: +44 (0) 207 017 6917
Email: bookorders@informa.com

Composition by C&M Digitals (P) Ltd, Chennai, India
Printed and bound in India by Replika Press Pvt. Ltd

Contents

List of contributors

Claude Aharoni
Plastic Surgeon
Clinique Cornette de St Cyr
Paris
France

K Roger Aoki
Researcher
Allergan
Irvine, California
USA

Benjamin Ascher
Plastic Surgeon
Clinique Iena
Paris
France

Martine Baspeyras
Dermatologist
Bordeaux
France

Ghislaine Beilin
Family Practitioner
Paris
France

Isaac Bodokh
Dermatologist
Centre Hospitalier de Cannes
France

Anne Bouloumié
Researcher
Frankfurt am Main
Germany

Patrick Bui
Plastic Surgeon
Paris
France

Daniel Cassuto
Plastic Surgeon
University of Catania
Italy

Louis Casteilla
Researcher
CHU de Rangueil
Toulouse
France

Audrey Charrière
Researcher
INSERM
Toulouse
France

Guillaume Charrière
Researcher
INSERM
Toulouse
France

Anny Cohen-Letessier
Dermatologist
Paris
France

Béatrice Cousin
Researcher
Institut Louis Bugnard
Toulouse
France

Taciana Dal'Forno
Federal University of Rio Grande do Sul
Brazil

Mauricio De Maio
Plastic Surgeon
Sao Paulo
Brazil

Elisabeth Domergue Than Trong
Dermatologist, Hôpital Saint-Louis
Paris
France

Gérard Flageul
Plastic Surgeon
Paris
France

Timothy C Flynn
Dermatologist
Cary Skin Center and University of North Carolina
USA

Jean Louis Foyatier
Plastic Surgeon
Clinique du Val d'Ouest
Ecully
France

Nelly Gauthier
Facial Plastic Surgeon
Paris
France

David J Goldberg
Dermatologist
Skin Laser & Surgery Specialists of New York & New Jersey
USA

Ahmad Halabi
Plastic Surgeon
Clinique Iena
Paris
France

Doris Hexsel
Dermatologist
Porto Alegre
Brazil

Antoine Jaklis
Otorhinolaryngologist
Hôpital Pasteur, Nice
France

Chung Jee-Hyeok
Facial Plastic Surgeon
Gyalumhan Plastic Aesthetic Clinic
Seoul
Korea

Park Jong-Beum
Facial Plastic Surgeon
Gyalumhan Plastic Aesthetic Clinic
Seoul
Korea

Philippe Kestemont
Facial Plastic Surgeon
Nice
France

Roger Kuffer
Stomatologist
Laboratoire d'Histopathologie de la Division de Stomatologie
University of Geneva
Switzerland

Daniel Labbé
Plastic Surgeon
Caen
France

Patrick Laharrague
Researcher
Institut Louis Bugnard
Toulouse
France

Marina Landau
Dermatologist
Wolfson Medical Center
Holon
Israel

Gottfried Lemperle
Plastic Surgeon
UCSD, La Jolla
California
USA

Rosemari Mazzuco
Dermatologist
Porte Alegre
Brazil

Vladimir Mitz
Plastic Surgeon
Hôpital Boucicaud
Paris
France

Ali Mojallal
Plastic Surgeon
Centre Hospitalier St Joseph & St Luc
Lyon
France

Maryelle Moreira Lima
Dermatologist
Brazilian Center of Studies in Dermatology
Porto Alegre
Brazil

Kim Nam-Ho
Facial Plastic Surgeon
Gyalumhan Plastic Aesthetic Clinic
Seoul
Korea

Arik Nemet
Ophthalmologist
Shearei Zedek Hospital
Jerusalem
Israel

Julien Nicolas
Plastic Surgeon
Caen
France

Pierre J Nicolau
Plastic Surgeon
Paris
France

Luc Pénicaud
Researcher
Laboratoire Neurbiologie et Metabolisme
Toulouse
France

Valérie Planat
Researcher
Centre Hospitalier Universitaire
Rangueil
Toulouse
France

Françoise Plantier
Anatomopathologist, Hôpital Tarnier-Cochin
Paris
France

Annick Pons-Guiraud
Dermatologist
Hôpital St-Louis
Paris
France

Daniele Ranoux
Neurologist
CHU Dupuytren
Limoges
France

Park Rho-Hyuk
Facial Plastic Surgeon
Gyalumhan Plastic Aesthetic Clinic
Seoul
Korea

Sabrina Rodrigues Talarico
Dermatologist
Sao Paulo
Brazil

Bernard Rossi
Dermatologist
Clinique Mathilde
Rouen
France

Berthold Rzany
Dermatologist
Charité University Clinic
Berlin
Germany

Sophie Sangla
Neurologist
Clinique Bizet
Paris
France

José Santini
Facial Plastic Surgeon
Hôpital Pasteur
Nice
France

Luca Scrimali
Plastic Surgeon
University of Catania
Italy

Sergio Talarico-Filho
Dermatologist
Sao Paulo
Brazil

Daphné Thioly-Bensoussan
Dermatologist
St Louis University Hospital
Paris
France

Hananya Vaknine
Pathologist
Wolfson Medical Center
Holon
Israel

Mikaël Veber
Plastic Surgeon
Centre Hospitalier St Joseph & St Luc
Lyon
France

Catherine Wintrebert
Anesthesiologist
Clinique Turin
Paris
France

Hassan Zahouani
Researcher
Ecole Centrale de Lyon
France

Gilbert Zakine
Plastic Surgeon
Hôpital Broussais
Paris
France

Débora Zechmeister do Prado
Dermatologist
Brazilian Center of Studies in Dermatology
Porto Alegre
Brazil

Preface

Preface from Benjamin Ascher

Plastic surgeons and dermatologists, as well as any other practitioner dedicated to the esthetic field, have to be concerned with every aspect of the use of injection treatments. Those training others need not only to be aware of the latest surgical developments; there is also an increasingly intense need for up to date information on the alternative medical, non-invasive treatments and accompanying procedures, which over the past 10 years have become essential aspects of our daily practice. Peelings, cutaneous lasers, bodyshaping techniques – as well as injections with botulinum toxin, fillers, volumetric implants, and fat grafts, both for face and body – are taking on an ever increasing importance which cannot be ignored if we want to optimize our clinical results.

For this reason, the first French and European University diploma dedicated to injection treatments, volumetric implants, and associated techniques in Plastic Surgery and Cosmetic Dermatology was created in 2002 by a group of doctors – Patrick Bui, Annick Pons Guiraud, and me – together with the Universities of Paris V and XII, and sponsored by Professors Jean Paul Escande (for the Dermatology field) and Laurent Lantieri (for the Plastic Surgery field). The goal of this diploma is to evaluate the use of various techniques and to offer teaching of the abovementioned practices, taking into account facial and body anatomy, semiology, and the physiology of facial and body aging. Complications and medical legal issues are broadly discussed throughout these chapters, which have largely been inspired by and developed on the basis of our courses. Further deepening the same concept, I was happy to create with Elisabeth Domergue Than Trong the first University Volumetry Unit at the Henri Mondor University Hospital Center in Paris, sponsored by Professors Martine Bagot (Dermatology) and Laurent Lantieri (Plastic Surgery). The aim of this unit is to assess different volume-enhancing products within the scope of the medical pathologies and cosmetic indications in relation to face and body lipoatrophies.

Exogenous fillers have been widely used since the development of collagen 20 years ago, and the introduction of hyaluronic acids 12 years ago. These modular injections, often reversible and efficient, must therefore be evaluated on their level of efficiency and their durability but, especially, on their safety. It seems logical to classify them according to their resorbability. The exogenous slowly and non-absorbable injection products have a significant durability and performance, notably in increase of volume, but they may produce somewhat serious complications as well as sequelae. In addition to the use of resorbable and non-resorbable products as fillers, they have been recently developed as volumetric implants and as such take an important place in our practice. In this regard chapters discussing fat as a volumetric implant, adipose tissue physiology, and survival of transplanted adipocytes are absolutely necessary additions to this book. A global approach and a technique overview of fat grafting for both face and body will be increasingly essential in the coming years.

Much attention is devoted in this book to the detection of side-effects and to their treatment and prevention. Some examples of inadequate European legislation regarding CE approval and the regulations governing production and distribution of products will be specifically described in the following chapters. In Europe CE marking is a prerequisite for any injectable products to be offered as safe; however, CE marking does not necessarily imply that the product's efficacy and side-effects have been assessed objectively during clinical studies. This marking is expected in time to fall into line with US legislation, where the marketing of any medicinal product is subject to FDA approval, based on comprehensive animal and clinical studies and on more systematic and better centralized side-effect reporting. The primary concerns involved are knowledge of the elaboration of the procedures, promotion of legal obligations, the publication of physiochemical data, and the realization of clinical studies with objective institutional results and possible medium- to long-term side-effects. All this will

allow us to measure and evaluate data of actual classification, uniquely and independently obtained by industry, compared to non-clinical procedures and invalid science which are sometimes picked up in the mass media. In our specialty, which is always rapidly evolving, it is logical to combine different techniques to optimize results. This alliance of injection treatments is the best example of the evolution of our specialty today and has become the main current trend in it.

These chapters constitute a collective work independent of the esthetic industry, but have obvious economic and legal constraints inseparable from our professional activities. I would like to thank all authors, my colleagues and friends, for having agreed to contribute to this effort in spite of numerous other solicitations for their precious time. There should be particular thanks to my friends, the Co-editors Marina Landau and Bernard Rossi (two brilliant and well known dermatologists and experts in the field of cosmetic injection treatments), and to Robert Peden, Commissioning Editor for Informa Healthcare, without whom this book would have never been published.

Benjamin Ascher
Plastic Surgeon (Board Certified)
Lecturer and Clinical Assistant, Paris Academy
Member of the French Society of Plastic, Reconstructive, and Aesthetic Surgery
Clinique Iena, 11 rue Fresnel,
75116 Paris, France
benjaminascher@wanadoo.fr

Preface from Marina Landau

Traditionally, dermatologists were responsible for taking care of the diseased as well as for the enhancement of allegedly healthy skin, mainly by topical preparations. Plastic surgeons were involved in reconstructive and esthetic procedures using a more invasive approach.

In the last 20 years esthetic medicine and surgery have changed tremendously. From procedures being accessible for the upper socioeconomic classes exclusively, they have become achievable and possible for almost everybody; from treatments being employed in secret by middle aged wealthy women, cosmetic treatments are now consumed by almost every age group and by both genders in the open; from social 'taboo' it has became one of the most popularly discussed topics in social encounters and by the printed and digital media.

In the professional milieu new interdisciplinary interactions have been created: dermatologists and plastic surgeons meet with ENT specialists, ophthalmologists, and maxillofacial surgeons. Moreover, non-traditional specialists such as gynecologists, anesthesiologists and cardiologists have entered the field of cosmetic medicine.

All this has happened because of the introduction of a vast variety of new non-invasive technologies for skin rejuvenation and enhancement. Injectable products, such as the botulinum toxins and dermal fillers, are the main cause for this revolutionary medical as well as social trend.

Injection Treatments in Cosmetic Surgery is a team operation and creation aiming to make the work with injectable products more rewarding for both you and your patient. It gathers an enormous amount of personal knowledge and the experience of a multinational, multidisciplinary group of experts.

I would like to thank all the colleagues who enthusiastically committed themselves to this complex project. I also want to deeply thank all my patients, who over the years have continuously encouraged me to introduce into my practice the novel cosmetic and anti-aging procedures. I want to thank my family for their patience and support. And above all thanks are due to Benjamin Ascher, who artistically conducted this symphony.

Marina Landau
Dermatology, Wolfson Medical Center,
Holon President of the Israel Society for Dermatologic Surgery
56 Joshua Ben Nun Street,
Herzlia Pituach, Israel 46763
mlandau@zahav.net.il

Preface from Bernard Rossi

It is a pleasure to acknowledge our contributors who spent their precious time working with us on this book, contributing their insight. Their chapters will be most valuable for us in our professional life and will have a significant impact on our view of the management of aging.

I am particulary grateful to Marina Landau for her masterful insight in esthetics and the science of peels, and to Benjamin Ascher for his ability and patience in communicating his masterful insight into the use of botulinum toxins and fillers and more generally the entire esthetic area and for his leadership throughout the development process of this book.

'The deepest thing in Man, is his skin', said the famous French poet, Paul Valéry ('L'idée fixe', 1932).

Our skin reflects our age. After 20 years of research and improvement many non-invasive technologies are now able to decrease the effects or the appearance of aging, and they have become achievable for a large part of the population. However, this proliferation of methods needs to be scientifically evaluated and compared to optimize the clinical results and avoid side-effects – side-effects which may be due in large part to the lack of European legislation regarding CE approval, especially for injectable products, but are also due to the lack of training for the practitioner.

In *Injection Treatments in Cosmetic Surgery* we share our multinational and multidisciplinary experience, for our mutual benefit and also for the benefit of our patients.

Bernard Rossi
Dermatologist (Board Certified)
Member of the French Society of Dermatology
Member of the American Academy of Dermatology
Member of the American Society for Laser Medicine and Surgery Member of European Society for Laser Dermatology
Expert près la Cour d'Appel de Rouen
Expert près la Cour Administrative de Douai
Clinique Mathilde
4 rue de Lessard, 76100 Rouen, France
bernard.rossi3@wanadoo.fr

1 Practical anatomy of the face

Philippe Kestemont, Antoine Jaklis, and José Santini

Introduction

Many reference textbooks offer an exhaustive description of the head and neck anatomy. This chapter is tailored to provide the reader with a comprehensive review of the subject, highlighting the functional aspect of facial anatomy with special emphasis on practical details concerning important, simple, and more complex structures involved in facial expression. These static and dynamic subtle structures control our facial mimetic, defining the way we look to others. For that matter, it is mandatory to have a thorough knowledge of these anatomical structures before we use any method or substance that could alter their shape or modify their function, namely the botulinum toxin.

Skin and subcutaneous tissue

The face and neck can be divided into two major regions according to the texture, thickness, and quality of the skin and the underlying subcutaneous fat tissue.

The periorificial craniofacial region

This constitutes the support for the facial dynamics. The eyes, the nose, and the mouth are surrounded by the thinnest skin of the face, with an extremely poor subcutaneous fat component overlying the muscles in these areas (Figure 1.1). The tight adhesions between these superficial muscles and the overlying dermis appear as fine periorificial wrinkles known as 'expression lines'.

The eyelids are covered by thin skin almost devoid of subcutaneous fat. When present, this fat tissue should not be confused with the retro-orbital and periorbital (retroseptal) fat pockets (Figure 1.2).

The cervicofacial region

This is characterized by an abundant subcutaneous fat tissue and thicker skin. The underlying layer is musculoaponeurotic, comprising the superficial musculoaponeurotic system (SMAS)–platysma sheath. It is a rather static segment, usually less vulnerable to wrinkle formation.

Figure 1.1 Magnetic resonance imaging (MRI): note the difference between subcutaneous fat in the periorificial craniofacial region and in the cervicofacial region.

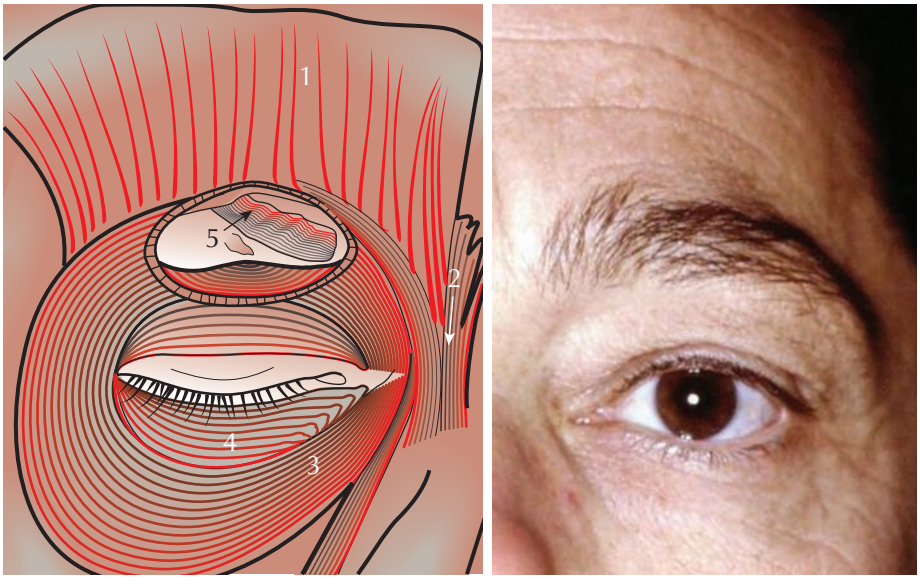


Figure 1.2 1: The frontalis muscle. 2: The procerus muscle. 3: The orbicularis oculi muscle, pars orbicularis. 4: The orbicularis oculi muscle, pars palpebralis. 5: The corrugator muscle.

The subcutaneous fat spreads all over the cheek area and the neck resulting in a homogeneous thick sheath, except in the malar area where the fat gains further volume forming the so-called 'malar fad pad' (Figure 1.1).

The subcutaneous fat plays an essential role in facial esthetics. It softens the bony landmarks, fills the facial contours, and enhances skin quality.

Platysma muscles and musculoaponeurotic structures

Periorificial and centrofacial region

This is the muscular region of the face. The perioral, perinasal, and periorbital muscles provide two essential functions:

- a primary protective function over the eye globes and the oral cavity
- a secondary dynamic function of facial mimics reflecting facial expression.

The periorbital region (Figure 1.2)

The eyebrow is a mobile structure subject to two antagonist groups of muscles: an eyebrow elevator group mainly made up by the frontalis muscle, and a depressor group made up by the orbicularis oculi muscle, the procerus muscle, and the corrugator supercilii muscle.

The musculoaponeurotic elevator group of muscles is formed by the association of the frontalis muscle, the galea aponeurotica (epicranial aponeurosis), and the occipitalis muscle.

The frontalis is a 6 × 7 cm quadrilateral-shaped muscle. Its medial fibers join at the level of the glabella where they intersect with fibers of the procerus muscle. Its central and lateral fibers overlay the corrugator supercilii muscle and intersect with the outer fibers of the pars orbitalis component of the orbicularis oculi muscle. It is located between the galea and the skin, closely adherent to the latter. From their lower insertions on the supraorbital margin, the frontalis fibers spread over the forehead, and fuse with the galea aponeurotica to join posteriorly, in the occipital region, the occipitalis muscle. The repeated contractions of this muscle lead to the formation of horizontal forehead wrinkles.

The galea aponeurotica or epicranial aponeurosis is a broad musculoaponeurotic layer covering the calvaria. Posteriorly, it is firmly anchored to the occipital protuberance and the superior nuchal line. It is separated from the outer table of the cranium by the loose connective tissue layer. This area, also called Merkel's space, allows smooth sliding of the scalp over the cranium. Laterally, over the temporal crest, the epicranial aponeurosis is continuous with the superficial temporal fascia. We find, at that level, the superficial temporal vessels and the temporal and frontal branches of the facial nerve.

The eyebrow depressor muscles are formed by the association of three distinct muscles: the corrugator supercilii muscle, the pyramidal or procerus muscle, and the orbicularis oculi muscle.

The corrugator supercilii muscle is a deep facial muscle (Figure 1.3). It is narrow and strong, with deep medial insertions on the glabellar periosteum and another more superficial lateral transorbicular insertion on the medial portion of the eyebrow. It depresses and brings closer the inner parts of the eyebrows. Its repeated contractions result in the formation of vertical glabellar wrinkles, also called 'lion's wrinkles'.

The pyramidal or procerus muscle appears as a medial extension of the frontalis muscle. It overlaps the nasal bones in which it inserts distally along with the upper lateral cartilages. It depresses the medial

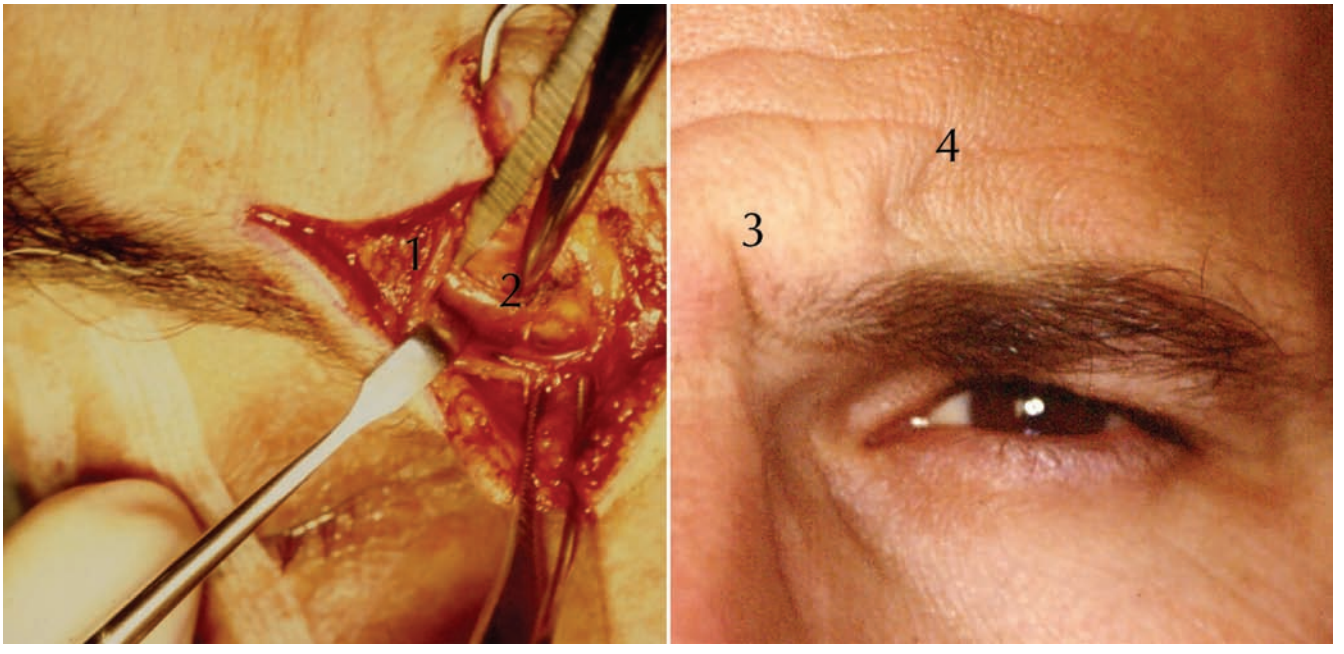


Figure 1.3 1: The procerus muscle. 2: The corrugator muscle. 3: Lion's line. 4: Corrugator's skin insertion.

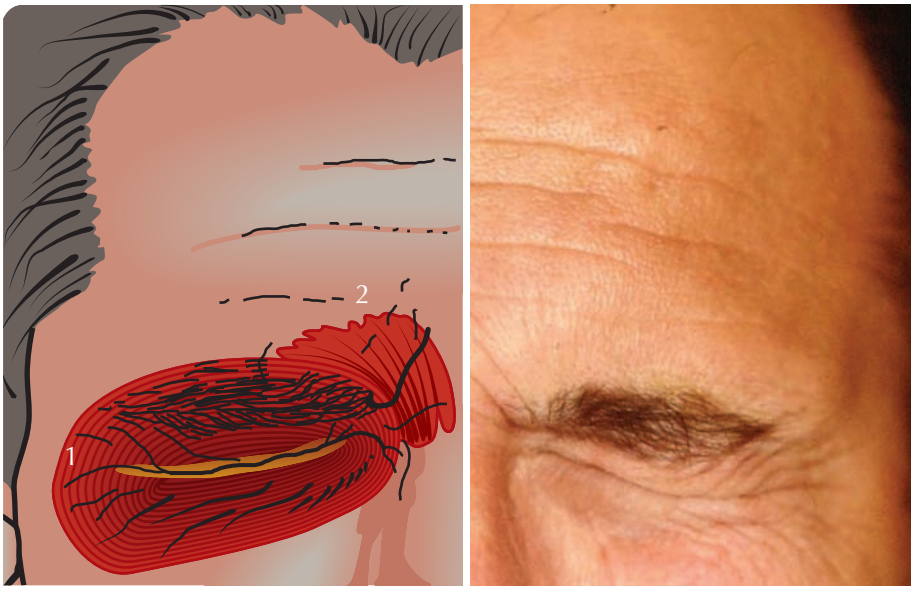


Figure 1.4 1: The orbicularis oculi muscle creates crow's feet and oblique glabellar lines. 2: The procerus muscle creates horizontal glabellar lines.

portion of the eyebrow. Its repetitive contractions lead to the formation of horizontal glabellar wrinkles.

The orbicularis oculi muscle is one of the largest muscles of facial expression. It is wide, circular, and diaphragmatic. It appears as a flat and narrow muscle sheath closely adherent to the skin. Its fibers sweep in concentric circles around the orbital margins and in the eyelids. It consists of three parts:

1. The orbital part, or pars orbicularis, is external and devoid of deep attachments. It forms a ring and inserts medially on the medial palpebral ligament. Its concentric fibers are often more spread than usually represented in the classical manuals of anatomy. Its repeated contractions lead to the formation of 'crow's feet' (Figures 1.4 and 1.5) and oblique glabellar lines. These lines result from the contraction of the internal superior fibers of the pars orbicularis, also recognized by some authors as an individual muscle, the 'depressor supracilii muscle' (Figure 1.4).
2. The palpebral part, or pars palpebralis, is internal, adherent to the tarsal plates and deeply inserted in the palpebral ligament. A muscle strip known as 'Horner's muscle' detaches from the palpebral muscle and runs towards the posterior lacrimal

Figure 1.5 1: Frontalis muscle. 2: Orbicularis oculi muscle.

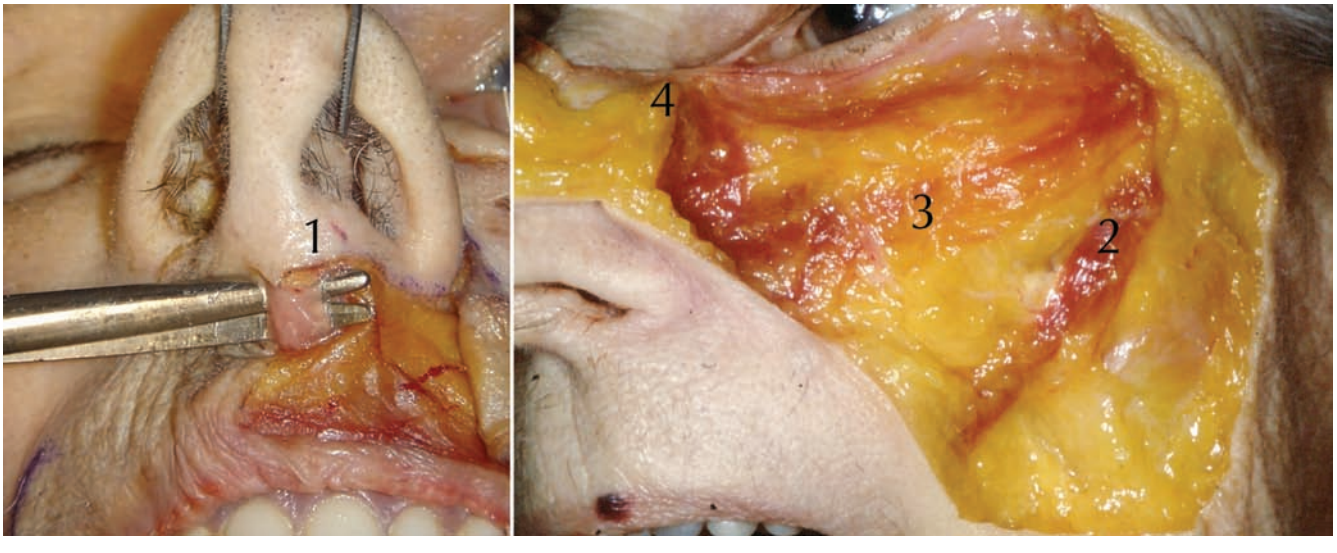


Figure 1.6 1: The depressor septi muscle. 2: The zygomatic major muscle. 3: The zygomatic minor muscle. 4: The levator labii superioris alaeque nasi muscle.

crest. This muscle encourages the emptying of the lacrimal sac and helps lymphatic drainage in the orbital region.

3. The orbitomalar crease corresponds to the inferior border of the orbicularis oculi muscle. It stands out as the limit between the orbital region and the cheek. It also delineates the superior border of the malar fad pad. Beneath the orbicularis oculi muscle there is a thin layer of fat continuous with the jugal fat called the suborbicularis oculi fat (SOOF). This layer provides a natural surgical plan of division.

The levator palpebrae superioris muscle in its retroseptal position raises the upper eyelid. It runs from its superior periosteal insertions in the orbital roof to its tight skin and tarsal insertions in the upper eyelid. Its posterior head, also called Muller's muscle, inserts in the superior border of the upper tarsal plate.

The fibroelastic layer is a continuous structure formed by the tarsus, the medial and lateral palpebral ligaments, and the orbital septum.

The nasal and perioral region (Figure 1.6)

The nasal muscles of expression are:

- the nasalis muscle, consisting of a transverse bundle (pars transversa) that depresses the nostrils, and an alar bundle (pars alaris) that dilates the nostrils
- the procerus muscle, a nasoglabellar muscle

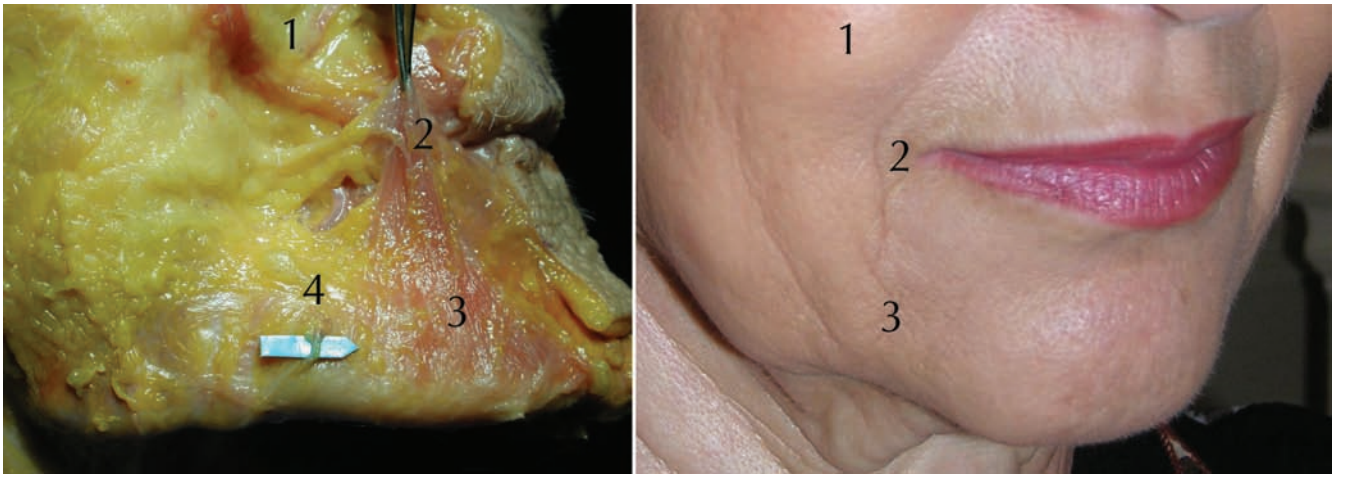


Figure 1.7 1: The zygomatic major muscle. 2: The modiolus. 3: The depressor anguli oris muscle. 4: The mandibular branch of the facial nerve.

Figure 1.8 1: The platysma muscle. 2: The platysma band.

- the depressor septi or myrtiform muscle, which depresses the nasal septum
- the levator labii superioris alaeque nasi muscle, which elevates the lip and the nose.

The oromental region (Figure 1.7)

Muscles appear in layers or strata as described by Freilinger:

- a superficial layer made of the zygomaticus minor muscle, the depressor anguli oris muscle, and the orbicularis oculi muscle
- a second layer made of the zygomaticus major muscle, the risorius muscle, the platysma muscle, and the depressor anguli oris muscle
- a third layer made of the orbicularis labii muscle and the levator labii superioris muscle
- a deep layer made of the mentalis muscle, the levator anguli oris muscle, and the buccinator muscle.

The platysma (Figure 1.8) is a wide and shallow extensive sheet of vertical muscle fibers covering part of the inferior third of the face and most of the anterolateral region of the neck. It extends from the lower cheek and the perioral region down to the clavicular region. The

right and left platysma muscles draw, as they diverge, an inverted V with the apex pointing towards the mandibular symphysis. The platysma is part of the SMAS–platysma sheath. The cervical component of this sheath is purely muscular (platysma muscle per se), whereas its parotid region component is mainly aponeurotic (fibrous platysma). This musculoaponeurotic sheath adheres to the underlying structures through the so-called 'facial ligaments'.

Vessels of the face

Arteries of the face

The face is mainly supplied by two distinct networks:

- a major superficial network derived from the external carotid artery
- a deep network derived from the internal carotid artery.

These two systems anastomose freely, explaining the great vitality of the facial skin.

The facial artery arises from the external carotid artery and lies superficial as it hooks around the inferior border of the mandible. In its course over the face, it runs along the nasolabial fold and follows a sinuous course between the muscle layers, running deep to the platysma and the zygomatic muscles. Near the angle of the mouth, it sends the labial and alar branches that anastomose on the midline with the contralateral arteries. Near the upper portion of the nasolabial fold it runs along the nose to the inner angle of the eye as the angular artery and anastomoses, only inconstantly, with the ophthalmic artery.

The superficial temporal artery begins in the parotid region where the external carotid artery divides into two branches, the superficial temporal artery and the internal maxillary artery. It ascends through the superficial temporal fascia, always lateral to the temporal branch of the facial nerve. Along its ascending course it gives off three collateral branches, the transverse facial artery, the zygomaticomalar artery, and the deep medial temporal artery. It ends in the scalp by dividing into two branches, an anterior frontal branch that contributes to the periorbital network of vessels and a posterior parietal branch that anastomoses with the contralateral arteries.

The internal maxillary artery contributes to the deep supply of the face. Among its 14 collateral branches we mention the buccal artery supplying the soft tissues of the cheek and the infraorbital artery emerging from the infraorbital foramen and supplying the lower eyelid and the cheek.

The ophthalmic artery branches from the internal carotid artery. It contributes to the vascular supply of the face through its terminal branching from the nasal artery, the angular artery. It has two facial branches: the supraorbital or external frontal artery, and the supratrochlear or internal frontal artery that runs upward and anastomoses with the frontal branch of the superficial temporal artery.

Veins of the face

The venous system of the face can be superposed to the arterial one. There is a superficial network made up mainly by the facial vein that arises from the union of the supratrochlear and the supraorbital veins. The facial vein runs inferiorly through the face and ends by draining into the internal jugular vein.

The superficial temporal vein drains the forehead and scalp. It unites with the maxillary vein, posterior to the neck of the mandible, to form the retromandibular vein. The retromandibular vein divides into an anterior branch that unites with the facial vein, and a posterior branch that joins the posterior auricular vein to form the external jugular vein. The external jugular vein drains into the subclavian vein.

There is a deep venous network linked to the superficial one through the angular vein that connects the cavernous sinus to the facial vein.

Nerves of the face

Motor nerves of the face: the facial nerve

Cranial nerve (CN) VII, the facial nerve, supplies the muscles of facial expression. Posteriorly, over the cheek, the extracranial portion of the facial nerve is protected by the parotid gland and then by the parotidomasseteric fascia. In fact, the facial nerve emerges from the skull through the stylomastoid foramen and runs within the parotid gland giving rise to a cervicofacial branch and a temporofacial branch. These, in turn, subdivide into five major branches. All the branches run superficially within the substance of the parotid gland before they supply the muscles of expression or mimetic muscles.

The cervical branch of the facial nerve is the most posterior and inferior of the five branches. It runs behind and below the mandibular angle and supplies the platysma muscle.

The mandibular branch of the facial nerve can be unique or divided into two branches. The inferior branch is always more significant. It runs superficially over the facial artery before giving rise to several motor branches supplying the inner surface of the mentalis muscle, the depressor labii inferioris, and the depressor anguli oris.

The buccal branch of the facial nerve divides early into two branches running over the masseter muscle just beneath the parotidomasseteric fascia:

- a superior ramus which follows an anterior and inferior oblique path, and crosses above Stensen's duct before supplying the outer surface of the buccinator muscle
- an inferior ramus supplying the inner surface of the orbicularis oris.

The zygomatic branch of the facial nerve passes transversely over the zygomatic bone before dividing into three major branches:

- the superior palpebral branch supplying the orbicularis oculi muscle and the corrugator muscle
- the inferior palpebral branch supplying again the orbicularis oculi muscle
- the infraorbital branch supplying the zygomatic muscles and muscles of the upper lip and nose.

There are many anastomoses between the buccal and zygomatic branches of the facial nerve.

The temporal branch of the facial nerve is the most vulnerable to injury during facial surgery. Its path can be outlined by drawing a line passing through a point 0.5 cm below the tragus and another 1.5 cm above the lateral border of the eyebrow. Its different branches anastomose among each other. It crosses the zygomatic arch approximately 2 cm anterior to the tragus, and reaches the superficial temporal fascia where it runs below the superficial temporal artery. It ends by supplying the inner surface of the frontal muscle.

Sensory nerves of the face: the trigeminal and the great auricular nerves

Knowledge of these is essential for the practice of local anesthesia of the face.

The trigeminal nerve provides sensory innervation of the face through its three branches:

1. The ophthalmic nerve is the superior division of the trigeminal nerve. It divides into three branches: the lacrimal, the frontal, and the nasociliary branches. The lacrimal nerve supplies the lacrimal gland, the upper eyelid, the conjunctiva, and the lateral angle of the eye. The frontal nerve further divides into two branches: supratrochlear and supraorbital. The supratrochlear nerve supplies the medial angle of the eye, the upper eyelid, the nasion, and part of the glabella. The supraorbital nerve emerges from the superior orbital margin through a foramen or a small canal before it supplies the lateral canthus, the upper eyelid, and the temporal and frontoparietal regions of the head. The nasociliary nerve in turn divides into two branches, one internal and one external supplying the nasal dorsum and the nasal tip.
2. The maxillary nerve is the intermediate division of the trigeminal nerve. In the infratemporal region, it gives off an orbital branch before it divides into a lacrimopalpebral branch supplying the lateral part of the upper eyelid and a temporomaxillary branch supplying the anterior temporal region. It emerges then below the inferior orbital margin, through the infraorbital foramen as a large terminal branch, the infraorbital nerve that supplies the the lower eyelid, the lateral aspect of the nose, the cheek, and the upper lip.
3. The mandibular nerve is the inferior division of the trigeminal nerve. It also has cutaneous sensory branches, namely, the inferior alveolar nerve. After passing through the inferior alveolar canal, the nerve emerges from the mental foramen giving the mental nerve that provides sensation to the chin and lower lip. Medial to the neck of the mandible, the mandibular nerve gives off the auriculotemporal nerve that supplies the tragus, the ear lobe, and the skin in the temporal region. These nerves arise from the posterior division of the mandibular nerve. The anterior division provides the the buccal nerve that supplies the skin over the cheek area.

The great auricular nerve belongs to the superficial cervical plexus. It is derived from the ventral rami of C2 and C3. It runs in the superficial cervical aponeurosis over the external surface of the sternocleidomastoid muscle, lateral to the external jugular vein. Below the ear, it becomes strictly subcutaneous before it supplies the ear lobe, the retroauricular region, and part of the cheek around the tragus.

Bibliography

Santini J, Krastinova-Lolov D. Chirurgie plastique de la face: rajeunissement-embellissement. Rapport de la Société Française d'ORL et de Chirurgie de la Face et du Cou. Paris: Lib Arnette, 1999.