FACIAL PLASTIC AND RECONSTRUCTIVE SURGERY

CLINICAL REFERENCE GUIDE

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FOREWORD

In today's world of ever expanding medical knowledge, precise reference guides are in demand by practicing physicians, residents and fellows in training, and medical students. Even better is a book that provides both a comprehensive day-to-day clinical reference and board review source and can fit into the pocket of a white coat.

This text is a concise clinical reference guide solely devoted to facial plastic and reconstructive surgery. No such portable guide has existed up until now. Dr Desai has gathered an "all-star" multidisciplinary group of authors who are true experts in their fields. Many are paired with coauthors who recently finished training to give a unique combined perspective on each topic. One could say that the chapters are written "by former trainees for present trainees." The result is an easily accessible reference guide organized to help the reader find vital information quickly and efficiently.

Doctors in the specialties of facial plastic surgery, plastic surgery, oculoplastic surgery, oral and maxillofacial surgery, and dermatology will find this guide indispensable in preparing for surgery or patient care. Modeled after Dr Raza Pasha's popular *Otolaryngology Head and Neck Surgery Clinical Reference Guide,* this portable reference book fills a niche in the reference world left empty too long.

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PREFACE

As a resident, I memorized the famed "Pasha" textbook and carried it everywhere for studying otolaryngology and truly felt it captured some of the most important educational concepts in the field. However, during my residency and facial plastics fellowship, I felt there was a lack of an easy-to-read, concise, but comprehensive book encompassing all aspects of facial plastic and reconstructive surgery. ***I wanted a "Pasha" for Facial Plastic and Reconstructive Surgery.*** Hopefully, this clinical reference guide can help fill that void both in the clinical setting as well as preparing for board exams.

In this first edition, I have tried to incorporate authors from all specialties—Facial Plastic and Reconstructive Surgery, General Plastic and Reconstructive Surgery, Oculoplastic Surgery, and Dermatology—in an effort to demonstrate that ultimately our common goal is the same: *education and the advancement of medicine for the betterment of our patients*. Second, I believe a multidisciplinary approach brings a broader range of insight into often complex clinical challenges.

This reference book is organized into major sections of facial plastic and reconstructive surgery similar to the compendium articles that are suggested reading by the American Academy of Facial Plastic and Reconstructive Surgery. Therefore, this book should encompass all aspects of facial plastic and reconstructive surgery, from cosmetic to reconstructive to craniofacial. All chapters are coauthored by nationally recognized subspecialists. I have tried to combine senior authors with junior authors to help achieve a unique perspective on the relevant information needed for a trainee. Lastly, each chapter follows a uniform easy-to-read outline to facilitate quick review of a topic, but the comprehensive nature of each chapter provides the depth required for written and oral standardized tests.

Please enjoy this first edition, and as always please let me know if there are any errors that need to be corrected for future editions.

ACKNOWLEDGMENTS

It is believed in my culture that the teacher, or "guru," not only educates but also inspires and passes on experience and knowledge. I was raised to revere teachers as my elders and to respect them as such. I truly believe I would not be in such a fortunate position if it were not for the countless teachers in my life. While I could name hundreds of "gurus" that inspired me, I want to specifically thank all my professors and friends in residency and fellowship at Barnes-Jewish Hospital/Washington University in St Louis, particularly Ryan Brown, Jason Rich, Scott Walen, Dan Sdrulla, Courtney Voelker, Nancy Judd, Nsangou Ghogomu, Jordan Sand, Jason Diaz, Alan Sclaroff, Alan Harvey, John Chi, Randal Paniello, Brian Nussenbaum, and Bruce Haughey who gave me a chance to learn and supported me throughout my training and beyond. To Gregory Branham, who not only taught me facial plastic surgery, but more importantly the art of humility and the nature of being a true gentleman—I am forever indebted for your friendship and mentorship.

Also to my newer friends and colleagues in the Division of Facial Plastic and Reconstructive Surgery at Johns Hopkins (Patrick, Kofi, Lisa, Theda, and Ira) who continue to support me and my budding career. A special thanks to Murry, Clint, Nikki, Wojciech, and Wade for continuing to not only be genuinely great partners but for always having my back—I am truly honored to be in the same company with you all.

Furthermore, I want to thank all the authors for their dedication and hard work for which this book would not be possible. Writing book chapters can be quite laborious with a tremendous time commitment and oftentimes does not gain the recognition it so truly deserves. It is through the work of the 82 authors (attendings, fellows, residents, and medical students) that contributed to this book that will hopefully make this book a success.

To Jeff, the illustrator, and one of my best friends and "littermates," for his phenomenal drawings, brilliant insight, and dedication to making this project work—this could not have been done without you. Your sheer intelligence, witty humor, and massive heart never cease to amaze me. Good luck at UCSF; they are lucky to have you.

Finally, I want to thank my parents for their devout love and support —and who gave me the opportunity to follow my passion. They have the classic immigrant success story, and it is only through their selfless love and sacrifice that allowed me to succeed in this country and I thank God every day for how fortunate to have them both in my life. To my big brothers, Jay and Neel, for always picking me back up when I'm down,

and for always being there. To Giorgos, Yasha, Vik, Neal, Akshay, and Veena for their friendship. Finally, to Courtney, who has had to put up with a whiney, irritable, and stubborn 30-something-year-old unshaven Indian male for years but continues to somehow stick by his side with a relentless beautiful smile.

I thought it would be most appropriate to end with a quote from the famous Dr Charlie Cummings: "I truly have been blessed with more friends and family than I will ever deserve in this lifetime."

Thank you all and I hope you enjoy this first edition.

—Shaun C. Desai, MD

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Dedicated to my wonderful supportive family:
Dad, Mom, Neel, Debbie, Ethan, Jay, Michelle, and Courtney

PART

Facial Plastics Essentials

CHAPTER

1

Instrumentation and Tissue Handling

Matthew C. Gropler and Scott Walen

INSTRUMENTATION

Instruments

Blades

- **#11:** elongated tip with straight belly; stabbing incisions; straight cuts perpendicular to skin in sawing motion; use in complex skin incisions (geometric broken line scars, accurate angles with short sides)
- **#12:** small, pointed, and crescent shaped; use in mucosal cuts in intranasal and intraoral
- **#15:** sharp tip with rounded belly; most surgeon preferred facial soft tissue blade; angled incisions; use in undermining
- **#15c:** hybrid of 11 and 15 blade with elongated tip, low profile, rounded belly; improved accuracy for complex incisions
- **#69:** used with Beaver handle to make incision in tarsus

Forceps

Fine Tissue Forceps

- For aligning delicate thin cutaneous edges, not used on larger tissue pieces due to likelihood of cutting; narrow shaft does not obstruct view; designed to be held like a pencil, must avoiding applying too much pressure to prevent crush injury to skin edge
  1. **0.5-mm Castroviejo**: interdigitating with teeth angled forward for improved ease of tissue handling
  2. **Bishop-Harmon**: interdigitating with teeth set at a right angle

Tissue Forceps

- For aligning and manipulating thick cutaneous edges, used on large flaps of tissue, must avoid applying too much pressure to prevent causing pressure injury to skin edge
  1. **Adson**: interdigitating with single tooth at right angle
  2. **Brown-Adson**: interdigitating with multiple teeth at right angle; distribution of pressure over larger surface area; less traumatic

Needle Holders

- Must grasp smaller needles used in facial plastics; accommodate wrist pronation and supination
  1. **Webster**: most commonly used needle holder in facial plastics; smooth platform does not traumatize finer sutures typically used in facial plastics

2. **Castroviejo**: used for finest sutures in facial soft tissue reconstruction and microvascular surgery; locking and nonlocking forms; held like a pencil

Retractors

- **Single-prong skin hook:** single hook minimizes trauma on the skin; use in skin edge retraction; use in skin edge eversion during suture placement; avoid too much retraction force to prevent puncture wounds
- **Double micro-prong skin hook (Guthrie):** use in delicate thin skin edge retraction; increased distribution of forces over 2 prongs reduces likelihood of puncture wound
- **Wide double-prong skin hook:** use in thick skin retraction
- **Senn-Mueller (Cat's Paw):** small multiple pronged hook

Scissors

- **Kaye blepharoplasty scissors:** tissue scissors, beveled edge with slightly rounded tip and serrated cutting surface that grips tissue edges to prevent slipping
- **Wescott scissors:** use in dissection of delicate tissue in periorbital area; held like a pencil
- **Straight Iris scissors:** use in cutting of fine sutures used in facial plastic surgery
- **Stevens Tenotomy scissors:** curved and blunted tips
- **Freeman scissors:** facelift scissors, useful for elevation of larger flaps, outward beveled edge for undermining
- **Straight Mayo scissors:** large durable scissors; for cutting dressings and larger sutures

Calipers

- **Millimeter caliper:** for appropriate and accurate measurement and planning of reconstructions
- **Castroviejo caliper (0–20 mm):** use in flap design with accurate measurements and sharp edge for skin marking

SOFT TISSUE HANDLING

Incision

- **Incision principles:** incisions should be placed in skin creases and folds or parallel to skin creases or relax skin tension lines to minimize scarring and improve aesthetic outcome
- **Scalpel use:** Start with stabbing motion with scalpel tipàtransition to belly of blade to extend incisionàangle blade to bevel edge to promote tissue edge eversionàend incision with scalpel tip

General Wound Closure

- In every closure, detailed wound edge approximation key to successful closure

Cutaneous Edge Eversion

- Nontraumatic proper eversion skin edge margins to facilitate proper suture placement
- **Adson-Brown/Adson forceps:** grip and evert skin edge; teeth to reduce likelihood of crush injury to skin edge; must still apply limited pressure to reduce likelihood of crush injury
- **Single-prong hook:** single-prong hook grips the skin edge and middle finger is placed behind skin hook along skin to promote skin edge eversion; wound edge eversion without risk of skin edge crush injury

Tension-Free Closure

- Prevent wound dehiscence; promote tissue viability; improve long-term wound aesthetic outcome

Undermining

- Uniform undermining of primary wound to promote closure and aesthetic outcome; sharp dissection preferred in facial plastics is general rule; dissection in subcutaneous plane to minimize vascular injury and bruising
  1. Scalpel based undermining: single/double skin hooks or Adson-Brown/Adson forceps to control skin edge and apply gently countertraction in nondominant hand and scalpel in dominant hand

2. Scissors based undermining: single/double skin hooks or Adson-Brown/Adson forceps to control skin edge and apply gently countertraction in nondominant hand and scissors in dominant hand

Deep Dermal/Subcutaneous Suture

- Sutures placed at dermal level, which enter and exit on opposing edges at equal levels parallel to skin; proper placement promotes wound edge eversion, reduces tension on wound edge, and closes dead space; improper placement can lead to wound edge inversion

Mechanical Creep

- Elongation of skin beyond intrinsic extensibility using a constant load over time; skin is viscoelastic; based on collagen realignment, fluid displacement, and fragmentation of elastin fibers; use of a towel clap or other commercially available products to facilitate

Hemostasis

- Hemostasis should be achieved to improve view of surgical field and prevent hematoma occurrence
- Bipolar electrocautery used in facial plastics for hemostasis

Wound Apposition

- Goal to reduce wound tension and approximate edges
- Suture closure is the gold standard

Suturing Principles

- Sutures on the face should be placed 3–4 mm apart
- Goal of initial wound edge eversion due to scar contracture overtime; lack of eversion or inversion at initial closure leads to scar depression and worsened aesthetic outcome
- Full arc of needle should be used to promote edge eversion; too distant placement of sutures of wound edge with scything causes wound edge inversion, increased horizontal tension, and eventual pressure necrosis ("railroad track")
- **Principle of halving:** first suture placed at center of defect, remaining defects are closed in a similar fashion, reduces bunching at ends of defect
- **Equalizing of edges:** removal of a triangle of skin (Burow's triangle) from the long arm of the defect; creates equals arms and reduces bunching at end of defect

Basic Cutaneous Suture Closures

- **Simple interrupted suture:** single rectangular/trapezoid shaped loop; approximates tissue edges; allows for adjust height of suture level with each throw; good to use over high-tension/motion areas such as lips and irregular wounds; time-consuming
- **Simple continuous suture (running):** suture remains behind the needle; allows for even distribution of tension and increased speed; difficult to adjust varying wounds' height levels; ideal use in linear wounds under low tension
- **Continuous locking suture:** suture remains ahead of the needle and crosses inside; allows tension to be set on each stich similar to a interrupted suture while performing a continuous suture; places increased pressure along skin edge, easier to remove
- **Vertical mattress suture:** first pass is thrown far from skin edge (4–8 mm) and deep followed by a second pass thrown in same vertical plane near the skin edge and shallow in opposite direction of first pass; first pass takes tension off wound edge; second pass approximates wound edge; maximum wound edge eversion; closes dead space better than simple interrupted sutures
- **Horizontal mattress suture:** first pass thrown far from skin edge; second pass is thrown in same horizontal plane in opposite direction; maximum wound edge eversion; no improvement in dead space closure; high rate of strangulation of tissue
- **Intradermal/intracuticular suture:** continuous suture placed completely within the dermis; suture should be placed at exactly the same depth within the dermis with each pass of the suture; improved aesthetic outcome without penetrating epidermis; technically more difficult

Tape

- Apply to minimal tension wounds; placed perpendicular to line of closure with eversion wound edges with tissue forceps; subcutaneous sutures should be placed first

Staples

- Apply to flat skin; avoid over convexities or concavities; avoid delicate tissue or aesthetic borders; apply to wound with minimal skin edge discrepancy; use tissue forceps to evert edges

Postoperative Dressing

- No dressing needed for incisions with limited undermining and hemostasis

- Antibiotic ointment should be applied to incisions closed with dissolvable sutures

Suture Materials

- **Ideal suture:** easy to handle, high tensile strength, no tissue reactivity

Principles

- **Capillarity:** ease of fluids to be wicked along suture; related to suture's capability to carry and transmit bacteria
- **Elasticity:** capability to regain initial length after stretching; increased elasticity reduces pressure necrosis when tissue edema occurs at suture site
- **Coefficient of friction:** tendency to resist motion against tissue surface; increased friction leads to increased tissue damage; monofilaments typically have lowest coefficient of friction; braided sutures typically have higher coefficients of frictions; braided often coated to reduce friction with silicon, organic waxes, polymers, etc
- **Knot fixation:** force needed to cause knot to slip; directly related to coefficient of friction, elasticity, and plasticity
- **Memory:** ability to return or maintain original shape
- **Pliability (flexibility):** ease of use facilitates suture placement and knot-tying; braided sutures typically more flexible than monofilaments
- **Tissue reactivity/inflammation:** all tissues viewed as foreign by immune system and thus produce some degree of inflammation; natural sutures have greatest tissue response; synthetic absorbable sutures have moderate tissue response; synthetic nonabsorbable sutures have least tissue response
- **Tensile strength:** strain withstood prior to breaking; ability of suture to withstand forces associated with healing process

Suture Degradation

- **Synthetic absorbable:** degraded via hydrolysis; rate of hydrolysis proportional to degree of polymerization
- **Natural absorbable:** degraded via neutrophil proteolysis; variable process that is less predictable than synthetic absorbable suture hydrolysis

Suture Types and Applications

- Refer to Tables 1–1, 1–2, and 1–3

TABLE 1–1. Absorbable Sutures

Suture	Brand Name	Composition	Filament	Strength Retention	Uses
Natural					
Plain gut		Purified animal-derived collagen	Monofilament	7–10 days	Skin, subcutaneous, conjunctival
Chromic gut		Chromium salt-treated plain gut	Monofilament	14–21 days	Mucosa, subcutaneous, tarsal structures
Fast absorbing gut		Heat-treated plain gut to accelerate breakdown	Monofilament	5–7 days	Skin
Synthetic					
Polyglycolic acid	Dexon	Polyglycolic acid strands	Braided	14–21 days	Fascial deep closures
Polyglyconate	Maxon	Glycolic acid and trimethylene carbonate	Monofilament	14–21 days	Subcutaneous
Polydioxanone	Polydioxanone II, PDS	Polyester of polydioxanone	Monofilament	21–42 days	Subcutaneous
Polyglecaprone 25	Monocryl	Copolymer of glycolide and caprolate	Monofilament	7–14 days	Subcutaneous
Polyglactin 910	Vicryl	Copolymer of lactide and glycotide	Braided	21–28 days	Subcutaneous, Mucosa
Polyglactin 910	Vicyrl Rapide	Glycolide and lactide copolymer	Braided	5–7 days	Skin, mucosa
Polyglactin 910 plus antibacterial	Vicryl Plus	Glycolide and lactide copolymer with antibacterial coating	Braided	21–28 days	Subcutaneous

TABLE 1–2. Nonabsorbable Sutures

Suture	Brand Name	Composition	Filament	Strength Retention	Uses
Natural					
Silk		Fibrin protein strands spun and braided, wax coated	Braided	1 year	Dry portion of lips, mucosa
Synthetic					
Nylon		Synthetic Polyamide	Monofilament	5 years	Skin closure
			Braided		Deep tissue closure
Polyester	Mersilene	Polyethylene terephalate	Braided	1 year	Deep tissue closure
	Ethibond	Polyethylene terephalate coated with polybutylate	Braided	1 year	Deep tissue closure
Polypropylene	Prolene	Polypropylene	Monofilament	1 year	Long-term deep tissue closure, vascular repair

TABLE 1–3. Suture Size and Tissue Location

Tissue	Cutaneous Sutures	Subcutaneous/ Fascial Sutures
Eyelid and periorbital	6-0, 7-0	4-0, 5-0
Nose	5-0, 6-0	4-0, 5-0
Pinna	5-0, 6-0	4-0, 5-0
Lips and vermillion	5-0, 6-0	3-0, 4-0
Nasal and oral mucosa	3-0, 4-0	3-0, 4-0
General facial and neck	4-0, 5-0, 6-0	3-0, 4-0
Scalp	3-0, 4-0	2-0, 3-0
Musculocutaneous flaps	4-0, 5-0	2-0, 3-0

Suture Needles

Standard Needle Elements

- **Point:** tip of needle until full diameter
- **Body:** majority of needle; ends at change in contour of the swage
- **Swage:** end of needle that attaches to suture

Suture Needle Principles

- **Bending strength:** ability of needle to avoid deforming when passing through tissue
- **Ductility:** capacity to be deformed without breaking
- **Taper ratio:** length-to-width ratio used as a measure of needle point sharpness

Suture Needle Types and Applications

- Refer to Tables 1–4 and 1–5