FACIAL PLASTIC AND RECONSTRUCTIVE SURGERY

CLINICAL REFERENCE GUIDE
FACIAL PLASTIC AND ReconSTRUCTIVE SURGERY

CLINICAL REFERENCE GUIDE

Shaun C. Desai, MD
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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.

—Ira D. Papel, MD
Associate Professor
Division of Facial Plastic and Reconstructive Surgery
Department of Otolaryngology-Head and Neck Surgery
Johns Hopkins University School of Medicine
Baltimore, Maryland

—Patrick J. Byrne, MD
Professor and Director
Division of Facial Plastic and Reconstructive Surgery
Department of Otolaryngology-Head and Neck Surgery
Johns Hopkins University School of Medicine
Baltimore, Maryland
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.
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 whiny, 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
Tina S. Alster, MD
Director
Washington Institute of Dermatologic Laser Surgery
Clinical Professor of Dermatology
Georgetown University Medical Center
Washington, District of Columbia
Chapter 20

Kenneth J. Andrews, MD
Department of Otolaryngology-Head and Neck Surgery
University of Illinois at Chicago
Chicago, Illinois
Chapter 37

Demetri Arnaoutakis, MD
Resident
Department of Otolaryngology-Head and Neck Surgery
University of Texas Southwestern Medical Center
Dallas, Texas
Chapter 6

Gregory H. Branham, MD
Professor and Chief
Facial Plastic and Reconstructive Surgery
Department of Otolaryngology-Head and Neck Surgery
Washington University School of Medicine
Saint Louis, Missouri
Chapters 16, 17, 18, and 42

Tara E. Brennan, MD
Assistant Professor
Facial Plastic and Reconstructive Surgery
Department of Otolaryngology-Head and Neck Surgery
The University of New Mexico
Albuquerque, New Mexico
Chapter 53

Patrick J. Byrne, MD, FACS, MBA
Professor and Director
Division of Facial Plastic and Reconstructive Surgery
Department of Otolaryngology-Head and Neck Surgery
Johns Hopkins University School of Medicine
St. Louis, Missouri
Chapter 9

Hamad Chaudhary, MD, MS
Instructor
Head and Neck Surgical Oncology
Department of Otolaryngology-Head and Neck Surgery
Johns Hopkins University
Baltimore, Maryland
Chapter 40

John J. Chi, MD
Assistant Professor
Division of Facial Plastic and Reconstructive Surgery
Washington University in Saint Louis, School of Medicine
Saint Louis, Missouri
Chapter 3
Steven M. Couch, MD, FACS  
Assistant Professor of Ophthalmology and Visual Sciences  
Oculofacial Plastic and Reconstructive Surgery  
Washington University in Saint Louis  
Saint Louis, Missouri  
*Chapters 11, 12, and 13*

Andrew T. Day, MD  
Clinical Instructor  
Head and Neck Oncologic Surgery and Microvascular Reconstruction  
Department of Otolaryngology-Head and Neck Surgery  
Johns Hopkins Medical Institutions  
Baltimore, Maryland  
*Chapter 40*

Adeeb Derakhshan, BS  
Cleveland Clinic Lerner College of Medicine  
Case Western Reserve University  
Cleveland, Ohio  
*Chapter 44*

Shaun C. Desai, MD  
Assistant Professor  
Division of Facial Plastic and Reconstructive Surgery  
Department of Otolaryngology-Head and Neck Surgery  
Johns Hopkins University School of Medicine  
Baltimore, Maryland  
*Chapters 41, 44, and 52*

Zachary Farhood, MD  
Department of Otolaryngology-Head and Neck Surgery  
Medical University of South Carolina  
Charleston, South Carolina  
*Chapter 46*

Jennifer C. Fuller, MD  
Resident  
Department of Otolaryngology-Head and Neck Surgery  
Massachusetts Eye and Ear Infirmary  
Boston, Massachusetts  
*Chapters 5 and 19*

Matthew C. Gropler, MD  
Resident  
Department of Otolaryngology-Head and Neck Surgery  
Saint Louis University School of Medicine  
Saint Louis, Missouri  
*Chapter 1*

Samuel Hahn, MD  
Clinical Instructor  
Facial Plastic and Reconstructive Surgery  
Department of Otolaryngology-Head and Neck Surgery  
Washington University  
Baltimore, Maryland  
*Chapters 16, 17, 18, and 42*

Rebecca C. Hoesli, MD  
Resident Physician  
University of Michigan  
Ann Arbor, Michigan  
*Chapter 43*

John B. Holds, MD, FACS  
Clinical Professor  
Departments of Ophthalmology and Otolaryngology-Head and Neck Surgery  
Saint Louis University  
Saint Louis, Missouri  
*Chapter 12*
Qasim Husain, MD
Resident
Otolaryngology
New York Presbyterian Hospital
Cornell University
Colombia University
New York, New York
*Chapter 20*

Zain Husain, MD
Fellow
Procedural Dermatology
Montefiore Medical Center
Albert Einstein College of Medicine
Arlington, Virginia
*Chapter 20*

Lisa Ishii, MD, MHS
Associate Professor
Facial Plastic and Reconstructive Surgery
Johns Hopkins School of Medicine
Baltimore, Maryland
*Chapters 28 and 29*

Andrew W. Joseph, MD, MPH
Resident
Department of Otolaryngology-Head and Neck Surgery
Johns Hopkins University School of Medicine
Baltimore, Maryland
*Chapter 52*

Nancy P. Judd, MD
Head and Neck Oncology
Head and Neck Surgery
MAPMG
Falls Church, Virginia
*Chapter 45*

Natalie Justicz, MD
Harvard Medical School Residency Program

Otolaryngology
Boston, Massachusetts
*Chapter 39*

Sheldon S. Kabaker, MD, FACS
Clinical Professor
Department of Otolaryngology-Head and Neck Surgery
University of California, San Francisco
San Francisco, California
*Chapter 30*

Wee Tin K. Kao, MD
Otolaryngology Resident
Washington University in Saint Louis
Saint Louis, Missouri
*Chapter 42*

Robert M. Kellman, MD
Secretary Treasurer
Eastern Section Triological Society President
American Board of Facial Plastic and Reconstructive Surgery
Syracuse, New York
*Chapters 32, 33, 34, 35, and 36*

Irene A. Kim, MD
Resident Physician
Head and Neck Surgery
University of California, Los Angeles
Los Angeles, California
*Chapter 8*

Leslie R. Kim, MD, MPH
Instructor in Facial Plastic and Reconstructive Surgery
Department of Otolaryngology-Head and Neck Surgery
Johns Hopkins School of Medicine
Baltimore, Maryland
*Chapters 9, 24, and 26*
Saint Louis, Missouri
Chapter 2

Lindsey M. McDaniel, MD
Resident Physician
Department of Ophthalmology
University of Missouri
Columbia, Missouri
Chapter 11

Lauren B. Moneta, MD
Resident Physician
Department of Otolaryngology-Head and Neck Surgery
Oregon Health and Science University
Portland, Oregon
Chapter 49

Sahar Nadimi, MD
Clinical Fellow of Facial Plastic and Reconstructive Surgery
Aesthetic Facial Plastic Surgery Clinic
Oakland, California
Chapter 30

Michael G. Neimkin, MD
Ophthalmic Plastic and Cosmetic Surgery, Inc.
Instructor of Ophthalmology and Visual Sciences
Washington University in Saint Louis
Oculus Plastic Surgery
Atlanta, Georgia
Chapter 12

Jason C. Nellis, MD
Resident Physician
Department of Otolaryngology-Head and Neck Surgery
Johns Hopkins University School of Medicine
Baltimore, Maryland
Chapter 9

Teresa O, MD, M.Arch
Co-Director
Facial Nerve Center
Vascular Birthmark Institute of New York/AVM Center
Lenox Hill Hospital
Manhattan Eye, Ear, and Throat Hospital
New York, New York
Chapter 53

Adrian A. Ong, MD
Department of Otolaryngology-Head and Neck Surgery
Medical University of South Carolina
Charleston, South Carolina
Chapter 47

Samuel L. Oyer, MD
Assistant Professor
Facial Plastic and Reconstructive Surgery
Medical University of South Carolina
Charleston, South Carolina
Chapter 31

Peter Papagiannopoulos, MD, MS
Otolaryngology Resident
Rush University Medical Center
Chicago, Illinois
Chapter 10

Ira D. Papel, MD
Associate Professor
Division of Facial Plastic and Reconstructive Surgery
Department of Otolaryngology-Head and Neck Surgery
Johns Hopkins University School of Medicine
Baltimore, Maryland
Chapters 24 and 26
Christian A. Paquet, MD  
Division of Facial Plastic and  
Reconstructive Surgery  
Caruso Department of  
Otolaryngology  
University of Southern California  
Los Angeles, California  
Chapter 25

Andrea M. Park, MD  
Resident  
Department of Otolaryngology  
Washington University in Saint  
Louis  
Saint Louis, Missouri  
Chapter 16

Krishna G. Patel, MD, PhD  
Associate Professor  
Director of Facial Plastic  
Reconstructive Surgery  
Medical University of South  
Carolina  
Charleston, South Carolina  
Chapters 46 and 47

Sachin S. Pawar, MD  
Assistant Professor  
Division of Facial Plastic and  
Reconstructive Surgery  
Department of Otolaryngology  
and Communication Sciences  
Medical College of Wisconsin  
Milwaukee, Wisconsin  
Chapter 51

Jon-Paul Pepper, MD  
Director  
USC Facial Nerve Center  
Assistant Professor  
Facial Plastic and Reconstructive  
Surgery  
Otolaryngology-Head and Neck  
Surgery  
Keck School of Medicine  
University of Southern California  
Los Angeles, California  
Chapter 25

Chau Pham, MD  
Department of Ophthalmology  
and Visual Sciences  
Washington University in Saint  
Louis  
Saint Louis, Missouri  
Chapter 13

Peter C. Revenaugh, MD  
Assistant Professor  
Section Head, Facial Plastic and  
Reconstructive Surgery  
Director, Facial Nerve Disorders  
and Rehabilitation Program  
Department of Otolaryngology-  
Head and Neck Surgery  
Rush University Medical Center  
Chicago, Illinois  
Chapters 10 and 27

Jeremy D. Richmon, MD  
Associate Professor  
Johns Hopkins University School  
of Medicine  
Baltimore, Maryland  
Chapter 40

Regina Rodman, MD  
Instructor  
Division of Craniofacial, Facial  
Plastic and Reconstructive  
Surgery  
Department of Otolaryngology  
and Communication Science  
SUNY Upstate  
Syracuse, New York  
Chapters 32, 33, 34, 35, and 36

Neil S. Sachanandani, MD  
Fellow, Reconstructive  
Microsurgery
Department of Plastic Surgery
Chang Gung Memorial Hospital
Houston, Texas
Chapter 41

Jordan P. Sand, MD
Fellow in Facial Plastic and
Reconstructive Surgery
Department of Otolaryngology-
Head and Neck Surgery
University of California, Los
Angeles
Los Angeles, California
Chapter 41

Sarah A. Saxon, MD
Assistant Professor
University of Texas Southwestern
Medical Center
Dallas, Texas
Chapter 6

Rahul Seth, MD, FACS
Assistant Professor
Facial Plastic and Reconstructive
Surgery
Department of Otolaryngology-
Head and Neck Surgery
University of California, San
Francisco
San Francisco, California
Chapter 38

Jeffrey D. Sharon, MD
Assistant Professor
Division of Otology, Neurotology,
and Skull Base Surgery
Department of Otolaryngology-
Head and Neck Surgery
University of California, San
Francisco
San Francisco, California
Chapters 4 and 7

David A. Shaye, MD
Massachusetts Eye and Ear
Harvard Medical School
Office of Global Surgery
Department of Global Health and
Social Medicine
Harvard University
Department of Otolaryngology
Centre Hospitalier Universitaire
Kigali
University of Rwanda
Boston, Massachusetts
Chapters 5, 19, and 54

Ryan M. Smith, MD
Department of Otolaryngology-
Head and Neck Surgery
Rush University Medical Center
Chicago, Illinois
Chapter 27

Justin C. Sowder, MD
Otolaryngology Resident
Department of Otolaryngology-
Head and Neck Surgery
University of Utah
Salt Lake City, Utah
Chapter 23

Emily Spataro, MD
Resident
Department of Laryngology-Head
and Neck Surgery
University of Minnesota
Minneapolis, Minnesota
Chapter 18

Kristin Stevens, MD
Resident Physician
Department of Laryngology-Head
and Neck Surgery
University of Minnesota
Minneapolis, Minnesota
Chapter 22
Chaz L. Stucken, MD
Assistant Professor
Department of Otolaryngology
Divisions of Head and Neck
Surgery and Facial Plastic and
Reconstructive Surgery
University of Michigan
Ann Arbor, Michigan
Chapter 43

Sherard A. Tatum, MD, FACS, FAAP
Professor
Otolaryngology and Pediatrics
Cleft and Craniofacial Center
Division of Facial Plastic Surgery
Upstate Medical University
Syracuse, New York
Chapter 50

Andrew J. Thomas, MD
Resident Physician
Department of Otolaryngology-
Head and Neck Surgery
University of Utah
Salt Lake City, Utah
Chapter 23

J. Regan Thomas, MD, FACS
Mansueto Professor and Chair
Department of Otolaryngology-
Head and Neck Surgery
University of Illinois at Chicago
Chicago, Illinois
Chapter 37

Travis T. Tollefson, MD, MPH, FACS
Professor
Facial Plastic and Reconstructive
Surgery
Cleft and Craniofacial Program
Department of Otolaryngology-
Head and Neck Surgery
University of California, Davis-
Medical Center
Davis, California
Chapter 48

Suzanne W. van Landingham, MD
Resident
Wilmer Eye Institute
Johns Hopkins University
Baltimore, Maryland
Chapters 14 and 15

Scott Walen, MD, FRCS(C)
Assistant Professor
Chief of Facial Plastic and
Reconstructive Surgery
Saint Louis University
Saint Louis, Missouri
Chapters 1 and 2

Milton Waner, MD
Director
Vascular Birthmark Institute of
New York/AVM Center
Lenox Hill Hospital
Manhattan Eye, Ear, and Throat
Hospital
New York, New York
Chapter 53

Tom D. Wang, MD
Professor and Director
Division of Facial Plastic and
Reconstructive Surgery
Department of Otolaryngology-
Head and Neck Surgery
Oregon Health and Science
University
Portland, Oregon
Chapter 49

P. Daniel Ward, MD, MS, FACS
Associate Professor
Facial Plastic Surgery
University of Utah School of
Medicine
Salt Lake City, Utah
Chapter 23
Joseph Zenga, MD
Resident Physician
Department of Otolaryngology-
   Head and Neck Surgery
Washington University School of
   Medicine
Saint Louis, Missouri
Chapter 44
Dedicated to my wonderful supportive family:
Dad, Mom, Neel, Debbie, Ethan, Jay, Michelle, and Courtney
PART

Facial Plastics Essentials
# Instrumentation and Tissue Handling

Matthew C. Gropler and Scott Walen

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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 Suturing Closures

- **Simple interrupted suture:** single rectangular/trapezoid shaped loop; approximates tissue edges; allows for adjustment 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 stitch 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 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

<table>
<thead>
<tr>
<th>Suture</th>
<th>Brand Name</th>
<th>Composition</th>
<th>Filament</th>
<th>Strength Retention</th>
<th>Uses</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Natural</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Plain gut</td>
<td></td>
<td>Purified animal-derived collagen</td>
<td>Monofilament</td>
<td>7–10 days</td>
<td>Skin, subcutaneous, conjunctival</td>
</tr>
<tr>
<td>Chromic gut</td>
<td></td>
<td>Chromium salt-treated plain gut</td>
<td>Monofilament</td>
<td>14–21 days</td>
<td>Mucosa, subcutaneous, tarsal structures</td>
</tr>
<tr>
<td>Fast absorbing gut</td>
<td></td>
<td>Heat-treated plain gut to accelerate breakdown</td>
<td>Monofilament</td>
<td>5–7 days</td>
<td>Skin</td>
</tr>
<tr>
<td><strong>Synthetic</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Polyglycolic acid</td>
<td>Dexon</td>
<td>Polyglycolic acid strands</td>
<td>Braided</td>
<td>14–21 days</td>
<td>Fascial deep closures</td>
</tr>
<tr>
<td>Polyglyconate</td>
<td>Maxon</td>
<td>Glycolic acid and trimethylene carbonate</td>
<td>Monofilament</td>
<td>14–21 days</td>
<td>Subcutaneous</td>
</tr>
<tr>
<td>Polydioxanone</td>
<td>Polydioxanone II, PDS</td>
<td>Polyester of polydioxanone</td>
<td>Monofilament</td>
<td>21–42 days</td>
<td>Subcutaneous</td>
</tr>
<tr>
<td>Polyglecaprone 25</td>
<td>Monocryl</td>
<td>Copolymer of glycolide and caprolate</td>
<td>Monofilament</td>
<td>7–14 days</td>
<td>Subcutaneous</td>
</tr>
<tr>
<td>Polyglactin 910</td>
<td>Vicryl</td>
<td>Copolymer of lactide and glycolide</td>
<td>Braided</td>
<td>21–28 days</td>
<td>Subcutaneous, Mucosa</td>
</tr>
<tr>
<td>Polyglactin 910</td>
<td>Vicryl Rapide</td>
<td>Glycolide and lactide copolymer</td>
<td>Braided</td>
<td>5–7 days</td>
<td>Skin, mucosa</td>
</tr>
<tr>
<td>Polyglactin 910 plus antibacterial</td>
<td>Vicryl Plus</td>
<td>Glycolide and lactide copolymer with antibacterial coating</td>
<td>Braided</td>
<td>21–28 days</td>
<td>Subcutaneous</td>
</tr>
<tr>
<td>Suture</td>
<td>Brand Name</td>
<td>Composition</td>
<td>Filament</td>
<td>Strength Retention</td>
<td>Uses</td>
</tr>
<tr>
<td>----------</td>
<td>------------</td>
<td>----------------------------------------------------------------------------</td>
<td>----------</td>
<td>--------------------</td>
<td>------------------------------------------------</td>
</tr>
<tr>
<td>Natural</td>
<td>Silk</td>
<td>Fibrin protein strands spun and braided, wax coated</td>
<td>Braided</td>
<td>1 year</td>
<td>Dry portion of lips, mucosa</td>
</tr>
<tr>
<td>Synthetic</td>
<td>Nylon</td>
<td>Synthetic Polyamide</td>
<td>Monofilament</td>
<td>5 years</td>
<td>Skin closure</td>
</tr>
<tr>
<td></td>
<td>Polyester</td>
<td>Polyethylene terephalate</td>
<td>Braided</td>
<td>1 year</td>
<td>Deep tissue closure</td>
</tr>
<tr>
<td></td>
<td>Ethibond</td>
<td>Polyethylene terephalate coated with polybutylate</td>
<td>Braided</td>
<td>1 year</td>
<td>Deep tissue closure</td>
</tr>
<tr>
<td></td>
<td>Polypropylene</td>
<td>Polypropylene</td>
<td>Monofilament</td>
<td>1 year</td>
<td>Long-term deep tissue closure, vascular repair</td>
</tr>
</tbody>
</table>
**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

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**TABLE 1–3. Suture Size and Tissue Location**

<table>
<thead>
<tr>
<th>Tissue</th>
<th>Cutaneous Sutures</th>
<th>Subcutaneous/Fascial Sutures</th>
</tr>
</thead>
<tbody>
<tr>
<td>Eyelid and periorbital</td>
<td>6-0, 7-0</td>
<td>4-0, 5-0</td>
</tr>
<tr>
<td>Nose</td>
<td>5-0, 6-0</td>
<td>4-0, 5-0</td>
</tr>
<tr>
<td>Pinna</td>
<td>5-0, 6-0</td>
<td>4-0, 5-0</td>
</tr>
<tr>
<td>Lips and vermilion</td>
<td>5-0, 6-0</td>
<td>3-0, 4-0</td>
</tr>
<tr>
<td>Nasal and oral mucosa</td>
<td>3-0, 4-0</td>
<td>3-0, 4-0</td>
</tr>
<tr>
<td>General facial and neck</td>
<td>4-0, 5-0, 6-0</td>
<td>3-0, 4-0</td>
</tr>
<tr>
<td>Scalp</td>
<td>3-0, 4-0</td>
<td>2-0, 3-0</td>
</tr>
<tr>
<td>Musculocutaneous flaps</td>
<td>4-0, 5-0</td>
<td>2-0, 3-0</td>
</tr>
</tbody>
</table>