Interesting Cases in Pediatric Plastic Surgery

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Disclosure

• I have no relevant financial relationships with the manufacturers of any commercial products and/or provider of commercial services discussed in this CME activity
• I do not intend to discuss an unapproved/investigative use of a commercial product/device in my presentation
Pediatric Plastic Surgery

What do we do?
Origins of Plastic Surgery

plastic

*a\djective \nplas\t\ic \npla-stik*

derives from the *Greek* πλαστικός (*plastikos*) meaning "capable of being shaped or molded"
Plastic Surgery Statistics

2015 Statistics American Society of Plastic Surgeons
• 5.8 million reconstructive procedures

Top 5 Reconstructive Procedures
1. Tumor removal 4.5 million
2. Laceration repair 253,000
3. Maxillofacial Surgery 200,000
4. Scar Revisions 179,000
5. Hand Surgery 130,000

Top 5 Cosmetic Surgery Procedures
1. Breast augmentation 279,000
2. Liposuction 225,000
3. Rhinoplasty 218,000
4. Eyelid surgery 204,000
5. Tummy Tuck 128,000
Plastic Surgery Statistics

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### Top 5 Reconstructive Procedures

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### Congenital Deformities: 30,000 (0.5%)

### Top 5 Cosmetic Surgery Procedures

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Pediatric Plastic Surgery

Weird moles
Funny bumps
Cuts
Scars
“Deformities”
Pediatric Plastic Surgery

- Cleft lip and palate
- Vascular anomalies
- Congenital nevi
- Skin lesions
- Skin masses
- Facial trauma
- Scars and keloids
- Complex Wounds
- Pressure ulcers
- Nasal deformities
- Auricular deformities
- Facial palsy
- Breast anomalies
- Mammary hyperplasia
- Gynecomastia
- Burns
- Myelomeningocele
- Lacerations
- Pediatric microsurgery
- Congenital hand anomalies
- Hand and wrist trauma
- Deformational plagiocephaly
- Craniosynostosis
- Craniofacial anomalies
- Jaw deformities
- Speech abnormalities
### Skin Lesions/Masses/Tumors

- Congenital melanocytic nevi
- Acquired nevi
- Spitz nevi
- Sebaceous nevi
- Dermoids
- Pilomatrixomas
- Epidermal inclusion cysts
- Thyroglossal duct cyst
- Branchial cleft cysts
- Neurofibromas
- Lipomas
- Cutis aplasia
- Juvenile xanthogranuloma
- Dermatofibromas

**What is the most likely diagnosis?**
Congenital Melanocytic Nevi

Small: <1.5cm
Medium: 1.5-20cm
Large/Giant: >20cm

Small/Medium Lesion
- Observation
- Surveillance
- Growth rate
- Low risk
- Change over time
- Biopsy for local changes

Large/Giant Lesions
- Malignant Melanoma
- Increased risk 5-10%
- Change over time
- Screening MRI
- Neurocutaneous melanosis
  - Hydrocephalus, DD, seizures, CN palsies, tethered cord
Congenital Melanocytic Nevi

**Removal?**
- Change in appearance
- Unexpected growth
- Unsightly appearance
- Difficult to monitor location
- Anxiety over risk

**Surgical Options**
- Primary excision
- Staged excision
- Tissue expansion
- Laser
- Phenol

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**Lesion Excision**
- Too large for single-stage excision
- Serial excision to remove all of lesion, restore form
- Minimize final scar with normal function of neck
- Improved healing between stages

Stage 1 excision
Congenital Melanocytic Nevi

Tissue Expansion
What is the most likely diagnosis?  

**Spitz Nevi**

- Pink, red, or brown in color
- Macular or papular
- Typically benign
- Histological differentiation from melanoma difficult
- Can be found in regional lymph nodes
- Complete Excision
What is the most likely diagnosis?

Nevus Sebaceous

- Yellow or salmon colored patch
- Scalp or face
- Raised and verrucous in puberty
- Typically benign
- ~10% lifetime risk of malignancy
- Benign tumor growth
- Complete Excision
Linear Nevus Sebaceous Syndrome

- Large linear nevus sebaceous of face, scalp, or neck
- Intellectual disability
- Seizures
- Hemimegalencephaly
- Urogenital anomalies
- Eye abnormalities
- Heart defects
- Increased cancer risk

Cutis Aplasia Congenita

- Usually present as patch of alopecia
- 70% occur on scalp
- Congenital defects in skin
- Can involve deeper layers down to dura
- Treat conservatively
Cutis Aplasia Congenita

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- 70% occur on scalp
- Congenital defects in skin
- Can involve deeper layers down to dura
- Treat conservatively
• What is the most likely diagnosis?

Dermoid Cyst

• Mobile subcutaneous tumors
• Contain dermis, epidermis, sebaceous glands, hair
• Risk infection
• Sites embryologic fusion
  – Brow/peri orbital dermoid
  – Nasal
  – Temporal/skull
• Complete Excision
What is the most likely diagnosis?

Pilomatrixoma

- “Benign calcifying epithelioma of Malherbe”
- Benign tumor of hair follicle
- Most common during childhood
- Oblong in shape
- “teeter-totter” sign
- Skin with bluish tinge
- Extrude calcium
- Complete Excision
Vascular Malformations

• Capillary
• Arterial
• Venous
• Lymphatic
• Arteriovenous
• Venolymphatic
• Other combinations

What is the most likely diagnosis?
Infantile Hemangioma

- Most common benign tumor of infancy
- Benign capillary lesion
- 3:1 females:males
- Common in premature infants
- 60% head and neck
- 20% have more than one

Infantile Hemangioma

- Not present at birth
- Gets bigger, not smaller
- Grows faster than child
- Proliferates for 6-12 months
- Involutes over 5-10 years
- 70% regress adequately
Infantile Hemangioma

Like most veterinary students, Doreen breezes through chapter 9.
Infantile Hemangiomas
Infantile Hemangioma

Contraindications to Conservative Management

- Airway obstruction
- Visual axis obstruction
- Excessive blood loss
- High output cardiac failure
- Severe disfigurement

Infantile Hemangiomas

Confusion can occur:

- Visceral hemangiomas
- RICH
- NICH
- Reticular hemanigomas
- PWS vs hemangioma
Infantile Hemangiomas

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Children's Mercy
KANSAS CITY

Infantile Hemangiomas

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1 month
Infantile Hemangiomas

Confusion can occur:
- Visceral hemangiomas
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- PWS vs hemangioma

1 month 2 months

Infantile Hemangiomas

- Early hemangiomas
- What to do?
Treatment Options

- Observation only
- Laser
- Timolol
- Propranolol
- Topical steroid
- Intralesional steroid
- Oral steroid (prednisolone)
- Excision

Beta blocker therapy

The NEW ENGLAND JOURNAL of MEDICINE

Propranolol for Severe Hemangiomas of Infancy

Treatment Options

**Beta blocker therapy**

**Mechanisms of action**
- Vasoconstriction (blocks vasodilator response to β-adrenergic stimulation)
- Decreased expression of VEGF and bFGF
- Increased capillary endothelial cell apoptosis

**Beta blocker therapy**

**Potential adverse effects**
- Bradycardia <80 bpm
- Hypotension <70 mm HG
- Hypoglycemia <70 mg/dl
- Bronchospasm
- Hypothermia
Treatment Options

**Topical beta blocker therapy**

- Twice daily application
- Can taper as tolerated
- Can combine with laser therapy

“Isn’t there something you can do with lasers?”
Treatment Options

• “…a sophisticated heat beam which we called a ‘laser’…”

Treatment Options

*Laser Photocoagulation*

• Pulsed yellow dye laser
• Absorbed by oxyhemoglobin
• 1-2 mm penetration
• Eye protection mandatory
Treatment Options

**Laser Photocoagulation**

- Early, flat hemangiomas do best
- Rebound growth common
- May require multiple laser treatments every 2-4 weeks
- Can be combined with steroid therapy

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Treatment Options

**Laser Photocoagulation**

- Ulcerated hemangiomas
- May markedly relieve pain in 24-48 hours
- May accelerate healing
Treatment Options

Surgical Management

- Emergency intervention
- During proliferative phase
- Prior to complete involution
- After complete involution

Excessive bleeding of an ulcerated hemangioma

Anatomic distortion from mass effect
Treatment Options

Surgical Management

• Emergency intervention
• During proliferative phase
• Prior to complete involution
• After complete involution
Treatment Options

Surgical Management

- Emergency intervention
- During proliferative phase
- Prior to complete involution
- After complete involution

Vascular Malformations

- Capillary
- Arterial
- Venous
- Lymphatic
- Arteriovenous
- Venolymphatic
- Other combinations
Port Wine Stains

- Capillary vascular malformation
- Significant hypertrophy
- V I distribution common
- Associated with Sturge-Weber syndrome

Laser photocoagulation

- 595nm Pulsed yellow dye laser
- Multiple treatments needed
- Face, neck, chest
- Less effective on extremities
- Never 100% clearance
Port Wine Stains

*Laser photocoagulation*
- 595nm Pulsed yellow dye laser
- Multiple treatments needed
- Face, neck, chest
- Less effective on extremities
- *Never* 100% clearance

Venous Malformations
- Conservative therapy most often
- Compression garment
- Sclerotherapy
- Laser therapy
- Surgical debulking
**Lymphatic Malformations**

- Called “cystic hygromas” in the neck
- May have small or large cysts
- Often unresectable
- Palliative sclerotherapy or surgical debulking

**Spider Angiomas**

- Telangiectasia
- “spider-like” network
- Acquired VM
- Arteriolar dilatation
- Solitary in children
- Conservative observation versus laser
Pyogenic Granulomas

- Lobular capillary hemangioma
- Common, reactive proliferation
- Benign lesions
- Rapid growth
- Very friable, profuse bleeding
- Multiple trips to ER
- Can fall off and regrow
- Excision, laser, cautery
Polythelia

- Presence of supernumerary nipples or nipple-areola complexes
- Most common anomaly of the pediatric breast
  - Up to 6% of population
- Incomplete involution of the milk line

Polythelia

- Males and females
- May be associated with renal anomalies
- Some familial cases
- Cancerous degeneration possible
- Most commonly inframammary
- Can also occur on the breast itself
Polymastia

- Presence of accessory glandular tissue
- May occur anywhere along the embryonic milk line
- Often becomes noticeable during puberty, pregnancy, or lactation
- Cancerous degeneration possible

Polymastia

- Treatment requires resection of the accessory glandular tissue
- Close follow-up needed
- Possibility of developing cancer in any retained breast tissue
Macromastia

• Breast development begins with onset of puberty, but reach excessive size
  – Growth disproportional to remainder of the body
• Possible end-organ hypersensitivity to normal gonadal hormone levels
• Wide variability in size, shape, symmetry
• Can be familial

Macromastia

• Promotes physical symptoms
  – Neck and/or back pain
  – Shoulder grooving
  – Nerve Impingement
  – Inframammary intertrigo
• Often severe psychosocial distress
• Limits physical activity >> obesity
Macromastia

- Weight of breast tissue causes descent of tissue
- Areolar malposition
- Striae
- Weight loss will not promote adequate retraction of excess skin

Macromastia

- Treatment focuses on
  - Weight loss
  - Physical therapy
  - Surgical breast reduction
- Timing Important
  - Completion of breast growth
  - Increased need for secondary surgery
Macromastia

- Adolescents under-report their problems/concerns
- Providers avoid examination
- Breast cancer/tumors uncommon but risk not zero
- Breast nodules/masses need workup by dedicated breast surgeon
Gynecomastia

- Affects up to 65% of adolescent males
- Peak incidence age 14
- Typically bilateral
- Disk of rubbery tissue beneath nipple
- Tenderness
- Psychosocial distress

Gynecomastia

- Probable transient elevation of estradiol to testosterone ratio
- Ductal and stromal cell proliferation
- Less commonly from hormone secreting tumor, medications, syndrome
Gynecomastia

- Most cases begin to resolve in 12-18 months
- Beyond 18 months:
  - Fibrosis and hyalinization occur
  - Less likely to undergo spontaneous resolution
  - More likely surgery will be required

Gynecomastia

**Evaluation Includes:**

- Complete history
- Rule out endocrine abnormality
- Testicular exam
- Degree of enlargement
- Degree of skin redundancy
Gynecomastia

Treatment Options:
- Reassurance, observation
- Encourage weight loss and exercise
- Drug therapy
- Management off contributing factors
- Surgery
  - Direct excision +/- Liposuction

Poland Syndrome

- Incidence: 1 in 20,000-30,000
- Absence of pectoralis major and minor muscle
- Brachysyndactyly
- Chest wall hypoplasia
- Aplasia ribs II-IV
- Breast and nipple hypoplasia
Poland Syndrome

- Unilateral, rarely bilateral
- Sporadic, rarely familial
- 3:1 Male to female ratio
- Widely variable presentation
- Interruption subclavian artery blood flow 6th week
- Associated renal anomalies

Poland Syndrome

**Surgical Indications:**
- Chest wall depression
- Inadequate protection of mediastinum
- Paradoxical movement of chest
- Aplasia/hypoplasia of breast
- Cosmetic defects
Anterior Thoracic Hypoplasia

- Appears similar to Poland Syndrome
- Chest wall hypoplasia
- Variable breast hypoplasia
- Nipple malposition
- Pectoralis muscles intact
- ? Variant Poland’s

Breast Hypoplasia

**Surgical Management:**
- Symmetry
- Chest wall balance
- Nipple position
- Reduction/Lift
- Expansion/Implant
- Fat grafting
- Muscle flap
Pediatric Facial Trauma

- Facial volume is smaller relative to cranium in children vs adults
- Thicker soft-tissue over bones
Pediatric Facial Trauma

- Pediatric bones have greater elasticity
- Lack of developed sinuses in young children
- Un-erupted teeth strengthen the maxilla and mandible
- Greenstick and minimally displaced fractures

Soft Tissue Injuries

- Open versus closed injuries
- Abrasions
- Lacerations
- Avulsions
- Amputations
- Impaled objects/Foreign bodies
- Burns
Soft Tissue Injuries

Wound Examination

• Location
• Wound size and depth
• Characteristics of wound
  – straight versus irregular
  – missing tissue
• Contamination
• Exposed structures
  – cartilage, bone
Wound Examination

Trigeminal Nerve

- V1: Supraorbital notch
- V2: Infraorbital foramen
- V3: Mental foramen
**Wound Examination**

Possible frontal nerve or supraorbital nerve injury

Possible mental nerve injury

**Initial Management**

- Keep wounds covered and moist with saline
- Irrigation
- Antibiotics
  - Animal or human bites
  - Contaminated wound
  - Delayed closure
  - Exposed cartilage
  - Open fracture
- Radiographic evaluation?
Fundamentals of Repair

- Restore normal form and function
- Minimize scarring
- Optimize primary healing
- Debridement of all nonviable tissue and debris
- Precise approximation of skin edges
- Closure without tension

Fundamentals of Repair

- Anatomic alignment of laceration
- Use facial landmarks when available
  - Hair, vermilion, creases/wrinkles
- Use irregularities in wound
Animal Bites

- Dog Bites
- Caged Animal Bites
- Spider Bites
Animal Bites

**Dog Bite Musts**

- Consider potential blood loss
- Thorough exploration of all wounds
- Suspect crush and deep puncture injury
- Wash, wash, wash, wash, wash, wash
  - Antibiotics
- Close the wounds, avoid braided suture, need for late revision
Severe Dog Bite Injury to Face

• Blood loss
• Pain
• Contamination
• Intraoral involvement?
• Airway compromise?
• Fractures?
• Other Injured structures?
Severe Dogbite Injury to Face

What do we do?
- Intubated
- OR for exploration and repair

- Restore normal form and function
- Minimize scarring
- Optimize primary healing
Severe Dog Bite Injury to Face

1 week after injury       9 months after injury
Severe Dog Bite Injury to Face

Abrasions

Traumatic Tattooing

- Pigmented foreign particles imbedded into dermis
- Explosive tattooing
- Clean with non-destructive agents
- Large, deep abrasions may require skin grafts
Abrasions

- Viscous lidocaine or LET
- Surgical scrub brush
- Sterile toothbrush
- Side of scalpel blade
- Antibiotic ointment and Adaptic gauze or Xeroform
- Do not ignore embedded particles

Wound Dehiscence

- 2 days s/p repair with continuous stitch
- Re-repair?
- Heal secondarily?
Wound Dehiscence

- Higher risk for infection
- Scarring worse
- Do not reclose infected wound!!
- Clean wound:
  - ≤ 24 hours on the face
  - ≤ 6 hours on trunk/extremity
Wound Dehiscence

- Open wound from shrapnel injury
- 5 days old
- Clean wound
- Antibiotic ointment or Xeroform
- Delayed revision

Wound Care and Scarring

- “Scarless healing” in 1st trimester only
- Spectrum of scarring
  - fine line
  - hypertrophic scar
  - keloid
Factors that affect scarring

• The Patient
• The Wound
  – Pattern of injury
  – Infection
  – Foreign material
  – Excessive tension
  – Wound dehiscence

Wound strength:
- 20% of normal at 3 weeks
- 70% of normal at 6 weeks
- Healed scar 75-80% normal
- Continued collagen remodeling up to one year
Wound Care and Scarring

- Creams and lotions
- Silicone gel sheeting
- Massage
- Pressure therapy
- Steroid injection
- Laser
- Ultrasound
- Surgical revision

“Greaseless scar cream”
- Cepalin (Allium Cepa)
  - Onion extract
  - Antibacterial property
- Rub into scars 3x daily
- 6-8 weeks new scars
- 6 months for old scars
- $20-35
- Pediatric and SPF formulas
Wound Care and Scarring

- Liquid
- Silicone, cortisone, Vitamin E
- Paints on scar
- Dries to thin film
- Apply BID for 2-4 months
- Not recommended <2yrs
- $30

Wound Care and Scarring

- Gel-filled capsules
- Can penetrate skin
- Tocopherol thought to affect collagen formation
- Appropriate dosing unknown
- 33% incidence of rash
Wound Care and Scarring

- Silicone sheeting
- Worn over scar
- Silicone penetration?
- Microenvironment changes
- Increases moisture
- Poor compliance

Instructions to parents:

- Your child will have a scar
- Scars look their worst between 2-8 weeks
- Scars will initially be raised and red
- Takes one year for a scar to mature
- Stay out of the sun
- Options for scar treatment...
Wound Care and Scarring

- Wait until wound is healed – 2 weeks
- Avoid swimming/hot tubs/contact sports
- Sunscreen a must for up to one year
- Massage therapy
- Scar tape
- Scar remedy of choice
- Tincture of time
- Keloid prone patients are special
Thank You!