Syndactyly
Definition

Absence of complete separation between adjacent digits.

“Webbed fingers”
Embryology

- Clinical appearance of digits that have failed to complete the normal process of separation
- Development of individual digits = 5\textsuperscript{th}-8\textsuperscript{th} gestational weeks
- Separation of fingers normally occurs at the completion of embryogenesis by apoptosis
- Begins at tip of finger and proceeds proximally
- Syndactyly occurs if this fails or stops short
Prevalence

1 in 2000 (most common)

♂ : ♀ = 2:1

sporadic / familial (A.D. 40%)

syndromes associated with:
apert’s, polydactyly, constriction ring
symbrachydactyly
## Incidence

<table>
<thead>
<tr>
<th>Category</th>
<th>Caucasian 90%</th>
<th>Blacks 10%</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Race</strong></td>
<td></td>
<td></td>
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<tr>
<td></td>
<td>Caucasian</td>
<td>Blacks</td>
</tr>
<tr>
<td>Gender</td>
<td>Males 2/3</td>
<td>Females 1/3</td>
</tr>
<tr>
<td>Symmetry</td>
<td>Unilateral 50%</td>
<td>Bilateral 50%</td>
</tr>
<tr>
<td>Genetics</td>
<td>Isolated</td>
<td>Syndromes</td>
</tr>
<tr>
<td>History</td>
<td>Isolated 60%</td>
<td>Familial 40%</td>
</tr>
</tbody>
</table>
Anatomic Distribution

Syndactyly of 2nd & 3rd toes is most common.

Hand:

<table>
<thead>
<tr>
<th>Finger</th>
<th>0%</th>
<th>15%</th>
<th>30%</th>
<th>45%</th>
<th>60%</th>
</tr>
</thead>
<tbody>
<tr>
<td>1st</td>
<td>3%</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2nd</td>
<td>14%</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3rd</td>
<td>57%</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>4th</td>
<td>27%</td>
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</table>
Types of Syndactyly

- Involves only skin and fingertip components – Simple (pure) type
- Digits have remained together because of underlying conjoined skeletal elements, or have become secondarily joined by amniotic banding, or a part of syndromes – complex (complicated) type
Clinical Classification

Degree of webbing:
   a) Complete
   b) Incomplete

Tissue involved:
   a) Simple - soft tissues only
   b) Complex – bone/cartilage
   c) Complicated (Dobyns)
      Jumbled bony architecture
      Apert’s, polysyndactyly
Degree of Webbing
Simple vs. Complex
Complicated
Genetics

Sporadic

Autosomal Dominant

50% chance in offspring

Variable penetrance & expressivity

Syndromes

Syndrome dependent
Genetic Syndromes

Primary feature
- Poland’s
- Craniosynostoses:
  - Apert’s
  - Chotzen
  - Carpenter’s
- Oculodentodigital dysplasia
- Orofaciodigital syndrome

Minor feature
- 28 syndromes

Genetic counseling is indicated!
Associated Findings

Transverse metacarpals or phalanges
Polydactyly
Symphalangism
Phalanges:
  - Crooked, broad, short (brachysyndactyly), long
  - Hypoplastic
  - Delta
Deficient/shared tendons, nerves, ligaments
Deficient intrinsics
Presentation

- Simple vs complex
- Complete vs incomplete
- Complex – tufts of the involved adjacent distal phalanges are joined
Examination

- Most frequently involved web space = long ring interspace
- Check for differential motion between the fingertips – lack of bony involvement
- Synonomychia (confluence of the nails) = indicates a likelihood of underlying bony involvement
- X-rays are important!
Decision-Making

- Goal of surgical care – to improve both the function and the appearance of the hand
- Contraindications = severely diminished mental capacity, lack of concern with the syndactyly, and/or any condition that precludes elective surgery/anesthesia
Indications

Syndactyly release:
Enhance function: grip, pinch, span, opposition
Preserve growth potential
Prevent secondary deformity
Improve self-esteem & independence
Improve aesthetics
Operative Treatment

- Current most common techniques – uses a dorsal, proximally based flap to resurface the commissure and insert onto the palmar aspect of the web; lateral wall defects covered with FTSGs
Timing

- Decided individually
- Early separation (4-6 months) – for complex syndactyly involving border ring-small web space or other web space when continued growth is expected to cause tethering/abnormal growth
- Most other situations – surgery is technically easier and elective anesthesia safer when the child is at least 1 year old
Planning

- Parents must be told that this is a reconstructive procedure, not a simple separation of the fingers!
- Usually will need skin grafts
Multiple Web Involvement

- Complete syndactyly of adjacent web spaces should NOT be separated during the same procedure – risk of vascular compromise
- When all fingers are webbed, priority given to normalizing the thumb-index and long-ring web space
Aftercare

- Prophylactic abx given at onset of anesthesia and one dose post-op
- Most children go home same day
- F/U in 2 ½ - 3 ½ weeks – remove cast/dressings, wounds should be healed and sutures dissolved
- If completely healed, start lotion-massage routine
Polydactyly

- Condition in which more than 5 fingers are present in the hand
- Multiple forms
- Additional digit is rarely an exact duplicate of an adjacent normal digit – often small and dysplastic
- In most cases, the additional digit is not an entirely separate digit but a malformed incompletely bifurcated/split digit
Classification

- Proposed by Buck-Gramcko and Behrens
- Reflect both the location and the level of bifurcation of the involved ray
- 1\textsuperscript{st} number designates the involved ray – use roman numerals I-V
- 2\textsuperscript{nd} term reflects the level – DIST/DIP etc.
- RUD – small rudimentary digit
Thumb Polydactyly

- Wassel classification
- Treatment goal – reconstruction of a single mobile, stable thumb
- Often, reconstruction requires the combination and selective deletion of skeletal and soft-tissue elements
- Can have a triphalangeal component – often inherited (AD), assoc with duplication of the hallux in the foot
Central Polydactyly

- Affects the index, middle, or ring finger
- Often occurs in conjunction with syndactyly
- Frequently bilateral (AD)
- Ring finger involvement is more common
- Closely related to the cleft hand
- Uses the Stelling classification – 3 types and 2 subtypes
- Treatment = modified ray resection, preserve normal unscarred web space
SF Polydactyly

- Hereditary condition
- Common in black newborns
- Surveys cite this condition as the single most common hand malformation (8x more than other digits)
- Many are rudimentary – ligated in newborn nursery
- Often bilateral
- Classified as Type A – well formed, or Type B – poorly formed digit