GANGLION CYSTS OF THE HAND AND WRIST
• Soft cyst-like mass containing mucinous fluid

• Attached to the adjacent underlying tendon sheath or joint capsule

Angelides, AC. Green’s Operative Hand Surgery. 4th edition. 1999
Epidemiology

- Most common soft tissue tumor in the hand
  33-70% of masses

- Sweden
- Annual incidence wrist 34 per 100,000
- The general incidence is higher

Angelides, AC. Green’s Operative Hand Surgery. 4th edition. 1999

Epidemiology

- W>M 1:7:1 (2:1 to 3:1)
- Age distribution varies with location
- 2nd to 4th decades (70%)

Angelides, AC. Green’s Operative Hand Surgery. 4th edition. 1999

- Not rare in children

Angelides, AC. Green’s Operative Hand Surgery. 4th edition. 1999
Rosson JW et al. JBJS (1989) 71B: 707-708
Epidemiology

- Majority in the wrist
- Dorsal 60-70%
- Volar 17-20%
- Volar retinacular cyst 5-12%

- No difference
  - hand dominance
  - ethnic groups

Angelides, AC. Green’s Operative Hand Surgery. 4th edition. 1999
Pathogenesis & Pathophysiology

• Hippocrates in 400 BC
  “knot of tissue” containing “mucoid flesh”.

• Eller 1746
  Ganglion adherent to a tendon sheath
  Synovial membrane hernia from a joint or tendon sheath caused the ganglion
  Entrance of the hernia was self-sealing
Pathogenesis & Pathophysiology

- Heister in 1757
  Leaking synovial fluid
- Henle in 1847 - Volkmann in 1882
  Mucinous tumors
  “New growth” from the synovial membrane
- Ledderhose in 1893
  Degeneration of periarticular connective tissue following a trauma
Pathogenesis & Pathophysiology

• **Thorn in 1896**
  Cystic degeneration secondary to impaired blood supply.

• **Carp and Stout 1928**
  Degeneration theory

• **Soren 1966 & 1982**
  Develops from connective tissue by myxoid degeneration and disintegration of collagen fibers
Tissue trauma leads to the production of mucin. Mucin formed dissects through the joint ligament and capsule and forms capsular ducts which form a cyst.

Angelides AC et al, J Hand Surg. (1976) 1: 228-235
Angelides, AC. Green’s Operative Hand Surgery. 4th edition. 1999
Pathogenesis & Pathophysiology

- Damage joint capsule
- Valve like mechanism

Herald from a degenerative process in the subjacent joint

- Pediatric population?
- Alterations in the collagen fibers.

Where does the Jelly come from?

- Synovial fluid? → Never demonstrated

- Valvular Mechanism → Arthrography
- Connection underlying joint - ganglion.
- Dye demonstrated in the ganglion after injection into the joint but non vice versa

Where does the Jelly come from?

- Ghadially and Mehta

Some cells in the wall produce the jelly

Elongated cells
- Resembled smooth muscle cells
- Rough endoplasmic reticulum with distended cisternae
- Smooth-walled vesicles and Golgi complexes
  - Production of mucopolysaccharides

- Multifunctional mesenchymal cells

Ghadially FN, Ann Rheum Dis (1971); 30: 31-42
Gross Anatomy

- **Main Cyst**
  Firm, globular pearl-coloured body
  Simple or multilobular

- **Pedicle or Stalk**
  From the ganglion body to the joint capsule or tendon sheath.

- **Attachment**
  Dependent on the anatomical location of the cyst.
Histology

- Main Cyst → dense fibrous tissue
  poorly vascularized
Histology

- Main Cyst → dense fibrous tissue
  poorly vascularized
Histology

- Carp and Stout → No cellular lining
Histology

- Stalk → Intercommunicating ducts
Histology
Age of Ganglion

- Soren

One large cavity and several smaller cavities

Septa → softer in younger ganglions
denser in older ganglions

It is possible that the cellular lining of a ganglion is only present when it is small and disappear as it enlarges and its vascularity diminishes.
Electron Microscopy

- Collagen bundles with random orientation

Psaila JV et al. JBJS (1978); 60B: 228-233
Location

- Located everywhere
- Where a synovial tissue exists.

- Hand specific locations
- Reported to arise from almost every joint

- Less common other conditions
  - Metacarpal boss
  - De Quervain’s
  - Heberden Nodes

Angelides, AC. Green’s Operative Hand Surgery. 4th edition. 1999
Nomenclature

• Most common wrist
• Dorsal → Dorsal Wrist Ganglions
• Volar → Volar Wrist Ganglions
Nomenclature

- A1 or A2 pulley → Volar Retinacular Cysts
Nomenclature

- De Quervain’s → Dorsal retinacular ganglions
- DIP OA → Mucoid or Myxoid cysts
Nomenclature

- Intraosseous ganglions
Nomenclature

- Intratendinous Ganglions
Nomenclature

• Subperiosteal Ganglions

Clinical Features

- According to their location and size
  - Pain ➔ Pressure effect
  - Swelling ➔ Cosmetic - Anxiety
  - Weakness

- Minor trauma

- There is no evidence that a single injury can cause a ganglion
Clinical Features

- Asymptomatic mass
- Mass fluctuates in size
- Relation Activity
- Rupture or disappear spontaneously
- Minority of the patients present because the lesion is painful
Clinical Signs

- Compressible
- Smooth surfaced
- Subcutaneous
- Transilluminable
- Semi-mobile
• Pressure on the median and ulnar nerves

Irritative neuritis of the dorsal sensory branch of the ulnar nerve from underlying ganglion
Compression of the ulnar nerve in the hand by a ganglion
Diagnosis

- Clinical
- Aspiration
- Dx Images → ganglions vs periarticular cysts

To confirm cystic nature of lesion
Associated disorders of joints

Diagnosis
Plain Radiographs

- SL instability
- Intraosseous ganglions
- OA
Diagnosis
Ultrasound

- Demonstrate a cystic lesion
- Location
- Size
- Poor resolution \textarrow{minor communication Joint abnormalities
- Debris \textarrow{Solid lesion
- Operator-dependent
### Ultrasound

- **Agreement Clinical vs US diagnosis in hand**

<table>
<thead>
<tr>
<th>Ultrasound</th>
<th>Clinical Impression</th>
</tr>
</thead>
<tbody>
<tr>
<td>45/52pt</td>
<td>35/52 pt</td>
</tr>
<tr>
<td>S:86.5% [75-93]</td>
<td>S:67% [53-78]</td>
</tr>
<tr>
<td>PPV 59% [48-69]</td>
<td>PPV 46% [35-57]</td>
</tr>
</tbody>
</table>

k index 0.22 p<0.001

US statistically more accurate than the clinical impression

US very accurate to diagnose ganglions

Clinical Significance?

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**EVIDENCE TYPE III**

Oxford Guidelines EBM

Teefey SA et al. JHS (2004); 29A: 393-399

Accuracy of High-Resolution Ultrasound for Evaluating Focal Lesion of the Hand and Wrist
Teefey SA et al. JHS (2004); 29A: 393 -399

Accuracy of High-Resolution Ultrasound for Evaluating Focal Lesions of the Hand and Wrist

Longitudinal
Teefey SA et al. JHS (2004); 29A: 393-399
Accuracy of High-Resolution Ultrasound for Evaluating Focal Lesions of the Hand and Wrist
Diagnosis MRI

- Gold standard for imaging of soft tissue
- IV contrast → Nature of the structure
  Rim enhancement of cystic lesions
- Associated joint anomalies
Diagnosis - Arthrography

- Actually in disuse
- Communication joint – ganglion
- MRI
Differential Diagnosis

- Other soft tissue masses
- Lipomas
- Epidermal inclusion cysts
- Giant cell tumors
- Malignancies
  - Fluctuation in the size of the mass
  - Transillumination sign
Differential Diagnosis

• Extensor digitorum brevis manus
• Until 2003 295 cases reported
• Albinus 1734
• Similar aching
• Position
• Sessile character

Nakano, M Dermat Onl J (2003); 9(5): 21
TanST, J Hand Surg (1999); 24A: 449-455
Differential Diagnosis

- Metacarpal Boss
Treatment

• The inspissated matter of a recent ganglion may often be happily dispersed by rubbing the tumor well each morning with the fasting saliva, and binding on a plate of lead upon it afterwards for several weeks successively.

• Many attribute a stronger discutient virtue to the lead when it has first had some mercury rubbed upon it, and others, with less reason, prefer a bullet that has killed some wild creature, especially a stag......

• HEISTER 1743
Non Surgical Treatment

EXPECTANT

• Asymptomatic
• No indication for active treatment
• 50% of ganglions
  – Resolve
  – Spontaneously rupture

Non Surgical Treatment

• BIBLIC TREATMENT

• Distal radius fracture

• Mc Evedy BV, Br J Surg (1962) 49; 585-594
Non Surgical Treatment

**DIGITAL PRESSURE**

- Method of self-treatment
- Recurrence rates 22 to 78%


- Non trial comparing rupture against no treatment
Non Surgical Treatment

ASPIRATION

- Alone 85% Success*
- Combined Steroid
- Hyaluronidase +/- steroid Injection
- Recurrence 15% to 64%
- Repeat aspiration
- Multiple puncture
- Resolution Stalk size

Evidence Type IV – Oxford Guidelines
Non Surgical Treatment

- Randomized Clinical Trial
- Aspiration vs Aspiration + Steroid Injection
- 85 Patients
- Success rate 33% both groups \( p > 0.001 \)
- Steroid injection has no benefit compared to aspiration alone
- Subcutaneous fat atrophy
- Skin depigmentation

Conservative Management of Wrist Ganglia. Aspiration vs. Steroid Infiltration
Non Surgical Treatment

HYALURONIDASE

- Hyaluronic acid is a component of the ganglion fluid
- Breaks down the polymeric hyaluronic acid
- Allows easier aspiration
- Recurrence rate 5% *
- Cure rate of only 49%

*Otu et al. J Royal College Edinburgh 1992
Non Surgical Treatment

- Randomized Clinical Trial
- Hyaluronidase Injection + Aspiration vs. Surgical Excision
- 44 patients in each
- Recurrence rate
  - Hyaluronidase 77%
  - Surgical 24%

Dorsal Wrist Ganglions
Open Technique

- Angelides and Wallace 1976
- 100% SL Joint Other origins
- Standardized procedure
- Excision of the cyst
- Follow the stalk
- Remove segment capsule
- Preserving SL ligament
- 3 recurrences

Angelides, AC. Green’s Operative Hand Surgery. 4th edition. 1999
Angelides AC et al, J Hand Surg. (1976) 1: 228-235
Dorsal Wrist Ganglions
Open Technique
Dorsal Wrist Ganglions
Arthroscopic Technique

• 1995 Osterman
• Dorsal ganglions visible 70% cases

Dorsal Wrist Ganglions
Arthroscopic vs. Open

**Artroscopy Advantages**
- Easy to do
- Appropriate to degree of pathology
- Allow joint visualization
- Diagnosis other intraarticular pathology
- High patient satisfaction
- Recurrence same or lower

**Open Advantages**
- Remove cyst
- Protect EPL, ECRL/B, EDC
- Trace origin to SL ligament
- Remove traces of origin
- Excise PIN for painful cyst
- Leave capsule open
- Doesn’t cut the SL ligament or any tendon

<table>
<thead>
<tr>
<th>Recurrency Arthroscopic</th>
<th>Recurrency Open</th>
</tr>
</thead>
<tbody>
<tr>
<td>-Osterman</td>
<td>-Angelides</td>
</tr>
<tr>
<td>Hand Clinics 1995</td>
<td>JHS 1976</td>
</tr>
<tr>
<td>1%</td>
<td>0,8%</td>
</tr>
<tr>
<td>-Luchetti</td>
<td>-Clay</td>
</tr>
<tr>
<td>6,7%</td>
<td>3%</td>
</tr>
<tr>
<td>-Nishikawa</td>
<td></td>
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<tr>
<td>JHS 26B 2001</td>
<td></td>
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<tr>
<td>5,4%</td>
<td></td>
</tr>
<tr>
<td>-Rizzo</td>
<td></td>
</tr>
<tr>
<td>JHS 29A 2004</td>
<td></td>
</tr>
<tr>
<td>5%</td>
<td></td>
</tr>
</tbody>
</table>
Dorsal Wrist Ganglions
Arthroscopic vs. Open

**Artroscopy Disadvantages**
- Cyst not removed
- Origin no identified 40%
- PIN not excised
- Clinically irrelevant “Red herrings” may be found
- 35 min by Dr Osterman
- Anecdotically tendons cut around the country
- What if the cyst did not come from the SL ligament?

**Open Disadvantages**
- Trade a lump by scar
- Wrist Stiffness
- High Recurrence
Surgical Treatment
Volar Wrist Ganglions

- Radioscaphoid joint
- Scaphotrapezial joint
- Radial Artery
- Median Nerve Irritation
- Ulnar neuritis in Guyon’s canal
Surgical Treatment
Volar Wrist Ganglions

- Vascular structures
- Allen’s test
Mucoid Cysts