ENDOSCOPIC GANGLIONECTOMY OF THE FOOT AND ANKLE

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GANGLION CYSTS

- gelatinous fluid filled, encapsulated soft tissue masses
- adjacent to a joint or tendon
- Pain, mass effects, compression neuropathy
- Conservative treatment: observation and padding for comfort, aspiration+/-injection of steroid or sclerosing agent into the cyst

OPEN GANGLIONECTOMY

- rates of recurrence of foot and ankle ganglion cysts after surgical resection range from 7% to 43%
- painful or unsightly scar

ARTHROSCOPIC GANGLIONECTOMY

- well-described technique in wrist ganglion resection
- less invasive
- visualizing and treating other intra-articular pathology
- faster recovery
- lower complication and recurrence rates
- more satisfying cosmetic results

COMPARED TO FOOT AND ANKLE GANGLIONS

- Location of wrist ganglion is quite constant
- Arising from scapholunate junction
- In foot and ankle, ganglions at various locations, arising from different joints and tendon sheaths

FOOT AND ANKLE GANGLION MOST COMMONLY PRESENT AS FOOT DORSUM LUMP

- The joints are superficial at the dorsum and any lump at the dorsum of the joint will become obvious.
- The dorsal capsuloligamentous structure is weaker at the dorsum than the plantar side and the ganglion is easier to erupt from the dorsum of the joint.
- The single most common site of origin was the lateral column of the Lisfranc joint.
- Similarly, the first metatarsophalangeal joint ganglion will present at the proximal plantar medial aspect rather than at the distal plantar aspect of the joint because of the proximal insertion of the plantar plate is thinner than the distal insertion.
PRE-REQUISITE FOR ARTHROSCOPIC GANGLIONECTOMY IN FOOT AND ANKLE

- Master the techniques of foot and ankle arthroscopy and endoscopy
- Accurate pre-operative planning
- Patients should comply with post-operative rehabilitation plan

TECHNIQUE

- Positioning: depend on the location of the ganglion and the planned arthroscopy
- Thigh tourniquet
- Either an endoscopic internal drainage of the ganglion cyst to the adjacent joint or tendon sheath
- Or endoscopic resection of the ganglion cyst.

ENDOSCOPIC INTERNAL DRAINAGE

- The aim of arthroscopic ganglionectomy of the foot and ankle region is establishment of an adequate passage to a drainage site of adequate draining potential which may not be the site of origin of the ganglion and not resection of the ganglion stalk or breakage of the valvular mechanism. It is particularly true in case of huge foot dorsum ganglion which may span several joints.
  1. stalk identified in 10% of patients with arthroscopic resection of wrist ganglia and 6% of cases in our series.
  2. Most ganglia of the foot and ankle do not communicate with the joint space.

PORTALS: INTERNAL DRAINAGE

- The visualization portal is the portal of the planned internal drainage site (joint or tendon sheath) of the ganglion cyst and should be close to but not directly over the ganglion.
- The ganglion portal is the portal directly through the ganglion cyst to the planned internal drainage site
- How to design the portals?

CHOOSE THE JOINT FOR INTERNAL DRAINAGE

INTRA-OPERATIVE PLANNING: HUGE FOOT DORSUM GANGLION
INTRAOPERATIVE ASPIRATION AND INJECTION TEST: TO CONFIRM THE SITE OF ORIGIN

Sometimes, the exact location of the ganglion portal of the desired joint for internal drainage should be guided by pre-operative MRI study.

After determination of the site of drainage, the visualization portal is made first:
- Ganglion can be lightened by the arthroscope through the visualization portal.
- The superficial veins and cutaneous nerve overlying the ganglion can be identified.
- Ganglion portal can then be made away from these structures.
- A needle can be inserted through the planned ganglion portal into the planned drainage site to confirm proper location of the portal before the incision.

After establishment of the portals:
- The internal drainage site (joint or tendon sheath) can be examined for any pathology and treated accordingly.
- The joint capsule or the tendon sheath adjacent to the ganglion sac is resected to allow adequate internal drainage of the ganglion.
- "Capsular procedure" can be risky to the tendons and neurovascular structure.

IMPORTANT! POST OPERATIVE COMPRESSION DRESSING
- An essential component of success for internal drainage: Post-operative compression dressing with crepe bandage of the operative site for 4 weeks.
- It is not effective in case of ganglion in the retrocalcaneal space. Because of the presence of a potential space at this region, an extra-ganglion approach for complete resection of the cyst is feasible.

ENDOSCOPIC RESECTION OF THE GANGLION CYST
- Ganglia in the retrocalcaneal space which can be arise from posterior ankle, posterior subtalar or the flexor hallucis longus tendon.
- The posterolateral and posteromedial portals at the sides of the Achilles tendon.
GANGLIONS ARISING FROM THE EXTENSOR TENDONS: INTERNAL DRAINAGE OR RESECTION?

- At the foot dorsum or the anterior ankle
- do not have a fibrous tendon sheath
- the deep part of the ganglion sac can be resected with an arthroscopic shaver and the mucinous ganglion fluid is drained to the potential space deep to the extensor tendons.
- Recurrence, nerve and vascular injury

NORTH DISTRICT HOSPITAL’S EXPERIENCE

- From August 2006 to August 2010
- 89 ganglia in the foot and ankle of 88 patients
- 66 female, 22 male
- average age at operation of 44 years (ranged 16-73 years)
- mean follow up was 31 months (ranged 12-60 months)
- Six cases were recurrent ganglia after open ganglionectomy

3 GROUPS DEPEND OF SITE OF ORIGIN

- **Group 1**: joints (62)
- **Group 2**: tendons with fibrous tendon sheath (18)
- **Group 3**: tendons without fibrous tendon sheath (9)

RESULTS: SYMPTOMATOLOGY

- The presence of a mass (33)
- Mass with increasing size (16)
- Pain over the mass (24)
- Nerve impingement (7): One patient had impingement of the deep peroneal nerve by a 1 cm tarsometatarsal joint ganglion. The remaining six patients suffered from tarsal tunnel syndrome
- Shoegear difficulty (5)
- Repeated rupture of the cyst (5)

CERTAIN PATTERNS OF SYMPTOMATOLOGY

- All posterolateral ankle ganglia were present with local pain. It is because it is not readily observable and will be noticed when it is painful.
- The plantar ganglia of the toes frequently present with local pain. It is due to the pressure over the lump during toe-off phase of walking.
- The ganglia with repeated rupture were relatively large and were located in area of relatively thin skin and subject to repeated frictional force by the shoewear.
- Sustentaculum tali ganglia from the anterior subtalar joint presented as tarsal tunnel syndrome with the involvement of the medial plantar nerve. The ganglia impinged the nearby medial plantar nerve as the nerve is relatively fixed by its fibro-osseous tunnel.
RESULTS: INTRA-OPERATIVE FINDINGS

- Stalk of the ganglion (5): 6%.
- Pathological condition in the drainage site: Group 1 (32%); Group 2 (17%); Group 3 (6%); Overall (26%).
- The prevalence may be underestimated because the site of drainage may not be identical to the site of origin especially for huge foot dorsum ganglion.

<table>
<thead>
<tr>
<th>Group</th>
<th>Ganglion</th>
<th>Mass or Shoewear Problem</th>
<th>Pain of the Ganglion</th>
<th>Nerve Impingement</th>
<th>Repeated Rupture of the Ganglion</th>
</tr>
</thead>
<tbody>
<tr>
<td>Group 1</td>
<td>5</td>
<td>24 (89%)</td>
<td>22 (92%)</td>
<td>7 (86%)</td>
<td>43 (75%)</td>
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<tr>
<td>Group 2</td>
<td>2</td>
<td>21 (100%)</td>
<td>19 (100%)</td>
<td>6 (100%)</td>
<td>38 (100%)</td>
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<tr>
<td>Group 3</td>
<td>0</td>
<td>0</td>
<td>0</td>
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FOR RECURRENT GANGLIA AFTER OPEN RESECTION, THE PREVALENCE OF PRESENCE OF PATHOLOGY WAS 100%

- Prevalence of pathology was much higher in revision cases than primary cases.
- The presence of intra-articular pathology in the revision cases can be the source of recurrence or due to the previous operation.

TARSAL TUNNEL GANGLION

- Tarsal tunnel ganglion origins: posterior ankle, posterior subtalar, anterior subtalar, flexor digitorum longus.
- 1 ganglion with nerve impingement; 0 ganglion without nerve impingement.

RESULTS: CLINICAL OUTCOME

Symptomatology | Number of ganglia | Number of cases with resolution of symptoms after arthroscopic ganglionectomy (percentage)
--- | --- | ---
Presence of a mass or shoewear problem | 54 | 48 (89%)
Pain of the ganglion | 24 | 22 (92%)
Nerve impingement | 7 | 6 (86%)
Repeated rupture of the ganglion | 43 | 38 (88%)

COMPLICATIONS

- No wound complication
- Cutaneous nerve injury with numbness or paraesthesia
- Recurrence/residual lesion

CUTANEOUS NERVE INJURY

- 4 patients (4%)
- EDL ganglion at the ankle level (1);
- EDL ganglion at the foot dorsum (1);
- 1st tarsometatarsal joint ganglion (1);
- 1st metatarsoaphalangeal joint ganglion at the plantar medial side (1).
RECURRENT/RESIDUAL LESION

- Overall rate: 12% (11 cases)
- Group 1: 5% (2 cases of small residual lesions and one case of misdiagnosis)
- Group 2: 17% (2 cases of FHL ganglion at the toe pulp and 1 case of FDL ganglion at the tarsal tunnel)
- Group 3: 56% (3 cases of EDL ganglion at the ankle level, 1 case of EHL ganglion at the foot dorsum, 1 case of EHL ganglion at the plantar aspect of the foot)
- No recurrence for those revision cases after open ganglionectomy.
- The recurrence rate may be underestimated because recurrence of small deep seated ganglion at the posterior ankle or sole may be missed.

LOCATION OF GANGLION WITH HIGH RECURRENCE RATE

<table>
<thead>
<tr>
<th>Recurrence rate (%) after arthroscopic ganglionectomy</th>
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<tbody>
<tr>
<td>Group 1</td>
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<tr>
<td>5%</td>
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<td>Group 2</td>
</tr>
<tr>
<td>17%</td>
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<tr>
<td>Group 3</td>
</tr>
<tr>
<td>56%</td>
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<tr>
<td>Recurrence in the toe pulp of the hallux</td>
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<tr>
<td>67%</td>
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<tr>
<td>Recurrence of the foot dorsum</td>
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<tr>
<td>40%</td>
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<tr>
<td>Recurrence in the tarsal tunnel</td>
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<tr>
<td>20%</td>
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<tr>
<td>Recurrence in the intercuneiform joint</td>
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<tr>
<td>50%</td>
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<tr>
<td>Recurrence after open resection</td>
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<tr>
<td>0%</td>
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RELATION BETWEEN LOCATION OF THE CYST AND RECURRENCE AFTER RESECTION OF THE CYST

- No significant relationship between location of the cyst and recurrence after the open resection
- In arthroscopic ganglionectomy, ganglia arisen from the extensor tendons or the end of flexor tendon sheath (present as toe pulp ganglion) had a high risk of recurrence.

HIGH RECURRENCE RATE OF EXTENSOR TENDON GANGLION

- The deep potential space is not a site of good drainage potential.
- Drainage to the adjacent joints may not be feasible especially at the ankle.
  1. The tendency of bowstring at the ankle level and away from the anterior ankle capsule.
  2. The large gliding length of the extensor tendons and the ganglion sac during ankle and toe motion made a stable passage to the underlying joint impossible.
- Complete resection: Theoretically possible but is risky to the surrounding cutaneous nerve.

IMPORTANT TO DIFFERENTIATE WHETHER THE FOOT DORSUM GANGLION ARISES FROM THE JOINT OR THE EXTENSOR TENDONS

- Clinical examination: morphology and mobility of the lump and squeeze test are useful tests to differentiate the origins of the ganglion: dumbbell lump

HOWEVER, DUMBBELL GANGLION ≠ EXTENSOR GANGLION
MISDIAGNOSIS \(\rightarrow\) WRONG APPROACH

- The apparent high risk of the recurrence of intercuneiform joint ganglion was due to its rarity and the one incident of misdiagnosis as EDL ganglion with wrong approach used.

TOE PULP GANGLIA

- Usually multiloculated.
- The main body of the ganglion was usually at the side of the distal end of the flexor tendon sheath, probably because of pressure applied to the ganglion during walking.
- It was therefore difficult to establish an adequate passage between the ganglion and the flexor tendon sheath and then lead to a high recurrence rate.

INDICATIONS FOR PREOPERATIVE MRI

1. Uncertain diagnosis,
2. Tarsal tunnel ganglion,
3. Planning of the optimal location of the ganglion portal,
4. Posterior ankle or plantar ganglion,
5. Foot dorsum ganglion that covered the area of the intermetatarsal space,
6. Toe pulp ganglion.

MULTILOBULATION OF THE GANGLION CYST

- Not a contraindication for arthroscopic ganglionectomy
- but should be defined in details by clinical examination or MRI.
- The septa of all the lobulations should be broken down during the operation to allow adequate drainage of all the chambers and minimize recurrence after the operation.
- Nodular type vs chain-type

CONCLUSION

- Good results can be achieved in case of adequate internal drainage of the ganglion to the joints or fibrous tendon sheath.
- Arthroscopic management of the revision cases has the advantage of internal drainage of the cyst and treatment of the underlying disorders of the joints and tendons without the risk of extensive soft tissue dissection.
- Recurrence of the ganglion may be due to misdiagnosis (wrong approach was then used), inadequate passage to the drainage site (toe pulp ganglion) or inadequate drainage site (extensor tendon ganglion).

THANK YOU