ILIQUINGUAL NEUROPATHY

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- About 60 Kilometers North of Boston
- Community Hospital
- Population of surrounding area 150,000
- Several Teaching and University hospitals within one hour drive
- Still a tremendous lack of treatment options for these patients

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Definition

- Neuropathic pain condition involving the areas enervated by the Ilioinguinal nerve.
- Often seen in conjunction with neuropathies of the Iliohypogastric and Genitofemoral nerves.
Symptoms

- Pain
  - Lancinating
  - Burning
  - Increased with hip flexion or activation of abdominal muscles
- Hypo and Hyper-esthesia
- Temporal relationship to surgery
- Pelvic floor dysfunction, Myofacial pain
Iliohypogastric

- Ventral Rami L1 and small contribution T12
- Between int. oblique and transversalis
- Pierces ext. oblique 2-3 cm cephalad to superficial inguinal ring
- Enervates skin superior to pubis
Ilioinguinal Nerve

- Fusion of T12 and L1 nerve roots, similar course to ilioinguinal
- Pierces the transversalis and int. oblique adjacent to iliac crest. Then runs on the anterior surface of the internal oblique.
- Sensory branches to pubis, superior and medial aspect femoral triangle, base of penis and anterior scrotum or labia majora
- Overlap with other nerves
Genitofemoral
- Ventral rami L1 and L2
- Decends on the ventral surface of psoas muscle. Then splits into Femoral and Genital Branch.
- Femoral Branch runs lateral to femoral artery and inferior to inguinal ligament
- Genital Branch inguinal canal usually inferior to spermatic cord.
  - Labia majora or scrotum and adjacent thigh
Anatomy

Figure 5. Dissection of the inguinal canal. A. The intact external oblique lamina is depicted. B. The external spermatic fascia and innominate fascia have been incised through the superficial inguinal ring. (C) The external oblique aponeurosis has been opened widely and the spermatic cord mobilized by transection of many of its areolar ( cremasteric fascia) attachments to the walls of the inguinal canal. (From Condon, R. E. In Nyhus, L. M. and Harkins, H. N.: Hernia. Philadelphia, J. B. Lippincott Company, 1964.)
Anatomy

Fig. 6 Right ilioinguinal nerve, perforator branch. a Ilioinguinal nerve; b perforator branch; c anastomotic branch; d ventral cranial iliac spine; e fascia of the external oblique muscle; f spermatic cord; arrow: aponeurotic buttonhole
Fig. 3  Right ilioinguinal nerve, perforation of the fascia of the external oblique muscle. a ilioinguinal nerve; b fascia of the external oblique muscle; c internal oblique muscle; d spermatic cord; arrow: aponeurotic buttonhole
Fig. 1 Right ilioinguinal nerve, overall path. 

- a Ventral cranial iliac spine
- b Fascia of the external oblique muscle
- c Inguinal ligament
- d Spermatic cord
- e Internal oblique muscle
- f Ilioinguinal nerve

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Fig. 5 Left ilioinguinal nerve, division. a ilioinguinal nerve; b pubic branch; c scrotal branch; d fascia of the external oblique muscle; e ligament inguinal. *arrow*: superficial orifice of the inguinal canal.
Several authors have shown significant variation

- Rab M. 2001
  - 4 major groups of variation A-D
- Ndiaye A. et al 2007
  - 100 dissections great color pictures
Fig. 2. Non-visualization of the right ilioinguinal nerve. a Ventral cranial iliac spine; b fascia of the external oblique muscle; c inguinal ligament; d spermatic cord; e internal oblique muscle

Ndiaye A. 2007

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Etiology

- The majority of cases result from surgical injury
  - Inguinal hernia repair
    - Mesh, laparoscopic, staples
  - Pfannenstiel incisions
  - Appendectomy
  - Laparoscopy (lower quadrant port placement)
  - Iliac bone harvesting
  - Node dissection etc.

- Non surgical
  - Muscle tear, Sportsman Hernia
Pathophysiology

- Nerve damage from direct surgical trauma
- Inflammation and scar formation
- Inflammation and retraction from permanent mesh
- Suture encirclement
- Tack impingement
- Fascial tear (external oblique aponeurosis)
Pathology

- Pathological Study Showed
  - Granuloma formation
  - Inflammation
  - Demyelination
    - Also up stream from entrapment
    - Findings may be exacerbated by mesh

- Miller et al 2008
Pfannenstiel Incision
- 8.8% had moderate-severe pain
- Odds ratio increased by 2.95 > 2 incisions
- 70% patients had pain at corners of incision
  - Loos M.J. et al 2008

Inguinal hernia
- Multiple studies ranging from 0.35%-10% for moderate to severe pain
Diagnosis

- Primarily Clinical
  - History
  - Exam
    - Iliohypogastric: pain and tenderness at the scar
    - Ilioinguinal: pain and tenderness at exit of inguinal canal, and medial to anterior iliac crest
    - Genitofemoral: hypo-esthesia anterior thigh below inguinal ligament
    - Carnett’s Sign
      - Abdominal wall flexion increases or does not change pain. With intra-abdominal pathology flexion will decrease pain.
**Diagnosis**

- **EMG ilioinguinal nerve**
  - Described by Ellis et al 1992
    - Limited published data
    - Specificity and Sensitivity is low
    - If used must be interpreted along with clinical data
Ellis R.J. 1992

 COMMENTS: A difference of 50% or more of the CMAP amplitude between the normal and affected side likely indicates abnormality in the affected side. Latency comparison between the left and right sides in individual subjects showed excellent agreement ($r = 0.94$). Using this technique, I was able to confirm the diagnosis of ilioinguinal neuropathy (116).
Nerve Blocks

- Office procedure
- Anterior abdominal wall just medial to anterior superior iliac spine
- Also can use point of maximal tenderness
- Patient will feel radiation to affected areas
  - Ultrasound guided described Gofeld 2006
  - Possibly safer to avoid femoral block
Re exam after block to confirm benefit
If no benefit from anterior block consider Genitofemoral neuropathy and proceed with L1L2 nerve root block to confirm diagnosis
Significant overlap can make differentiation difficult
  - Starling J. 1989
Herniorrhaphy

- Laparoscopic approach widely abandoned
- Avoid fixation of mesh with tacks, avoid plugs and flat mesh.
- Careful dissection, anatomy matters, preserve posterior aspect of spermatic cord where the genitofemoral n. usually lies. Described by Lichtenstein 1998
- Several studies on prophylactic neurectomy
  - Meta analysis no benefit for pain, increased paresthesia
    - Gravante et al 2008
  - RCT showed significant decreased pain and no change in paresthesia
    - Mui et al 2006
Pfannenstiel

- Incision length is risk factor
  - Avoid extending incision beyond rectus border
- Position of incision
  - The higher above the pubis the better
- Number of incisions is risk factor
  - After two incisions risk increased
  - Would a vertical incision work?
- Only close the external oblique aponeurosis when incision extends beyond the lateral border of the rectus.
Treatment

- Physical Therapy
  - Little published data
  - Tissue mobilization
  - Early intervention may help prevent scar entrapment
  - Helpful for associated myofascial pain and muscle dysfunction
Neuropathic pain modulators
- Tricyclic antidepressants
- Neuroleptics
- Case reports on Gabapentin
  - Very effective and well tolerated
  - Benito-Leon J. 2001
If a diagnostic block is effective a series may provide chronic relief
- Marcaine +/- anti-inflammatory
- Effects can be cumulative
- Anywhere from 4 -7 blocks
- Intervals vary
- May require retreatment
Neurectomy

- Open post herniorrhaphy
- Most reports involve mesh removal with genitofemoral and or ilioinguinal neurectomies
- Results overall were favorable with low complication rate
- Studies can’t be compared due to poor design
  - Aasvang E. 2005
Neurectomy

- Starling et al 1989
- 17 of 19 patients cured
- Flank incision for genitofemoral neurectomy
  - Loss of cremasteric reflex and Hypoesthesia
- Inguinal incision for ilioinguinal
  - Hypoesthesia

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Amid P.K. 2004

Triple neurectomy from anterior approach
- Genitofemoral hard to find but usually could be accessed at the lateral crus of the internal ring, within the ring or along the spermatic cord
- 89% success rate
Neurectomy

- Kim D. et al 2005
- Ilioinguinal and iliohypogatric
  - Anterior approach
  - 91% success rate
  - No significant complications
Neurectomy

- Post Pfannenstiel
- Anterior approach
- Complete scar excision
- Loos et al 2008
  - 73% good to excellent
  - 14% moderate
  - No significant complications

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Laparoscopic
Most reports use a retroperitoneal approach
Lateral incision and retroperitoneal space is created with a balloon
Genitofemoral and ilioinguinal nerves are identified and divided
  - Both branches of the genitofemoral
Retroperitoneal laparoscopy

Fig. 2 Position of the patient and exact localization for cannula insertion to perform retroperitoneal endoscopy in the lower retroperitoneal space

Krahenbuhl L. 1997

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Neurectomy

- Krahenbuhl et al 1997
  - 3 patients all cured
  - No complications
- Muto et al 2005
  - 6 patients
  - All cured
    - No complications
Pulsed radiofrequency nerve ablation

Rozen D. 2006

- 5 patients post inguinal herniorrhaphy
- Vertebral T12,L1,L2 nerve root
  - 42 degrees C for 120 seconds per level
  - 4 of 5 patients with pain relief lasting 4-9 months
Alternatives

- Neuromodulation
  - Several case reports published
  - Most using a peripheral placement
  - Two eight contact leads placed parallel above and below inguinal scar
  - All patients had significant reduction in pain
  - Small numbers and limited follow up
- Rauchwerger et al 2008
Figure 3. Diagram illustrating the placement of electrode leads and pulse generator.
Laparoscopic Placement of Neuroprothesis (LION) Procedure

- Possover M. et al. 2007
  - 3 patients with different neuropathies
    - Ilioinguinal + pudendal
    - Sciatic
    - Sacral nerve root

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Conventional Laparoscopy

- Retroperitoneum accessed medial to cecum and incised up the level of the ovarian origin from the inferior vena cava
- Single contact lead placed near the origin of the nerves (ilioinguinal, iliohypogastric, and lateral femoral cutaneous)
- Same approach to place leads at S2-S4 and the sciatic
- Operative time 2.5 hours
- No complications
- All three patients report excellent results
  - Small numbers
  - Limited follow up
These disorders are much more common than are recognized
We now have a variety of effective treatments
Challenges for the future is comparing these alternatives
Expanding availability for treatment
Finis