LESS TRAUMATIC SURGICAL LASER THERMONEURECTOMY TREATMENT FOR SACROILIAC JOINT (SIJ) PAIN SYNDROME

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INTRODUCTION:

- About 1/3 post lumbar fusion patients with related mechanical changes, leading to SIJ dysfunction/pain syndrome
- This chronic low back pain syndrome can be difficult to localize and to diagnosis
- SIJ is lending pelvic and lower extremity stability connecting to upper body stability
- It should be treated properly
- SIJ pain syndrome contributes up to 25-40% of patients with low back pain from various causes including minor trauma
- 39% of patients with SIJ pain found to have low back pain
- SIJ pain can radiate to the low back, buttocks, abdomen, groin or legs
PATHOANATOMY

- **Between the sacral and ileum** is a true SIJ
- The biomechanics of SI joint is then a medially directed force six times greater than the lumbar spine but only half the torsion and 1/20th of axial compression load.
- The **joint transmits** all the **forces** of the upper body to the pelvis through the SIJ down to the legs
- Currently there is **no standard SIJ treatment algorithm**
Patho-anatomy and Pathophysiology:

The factors predisposing SIJ Injury dysfunction/pain syndrome

- Capsular and synovial disruption
- Capsular and ligamentous tension
- Hypomobility or hypermobility
- Extraneous compression or sharing forces of the joint
- Abnormal joint mechanism
- Micro fracture or macro fracture
- Chondromalacia
- Soft tissue injury
- Inflammation
- Joint laxity
- Degenerative joint disease
- History of minor direct trauma with a fall onto the buttocks
Sacroiliac Joint Dysfunction Syndrome

Causes:

- Often major lumbar spinal surgery and spinal fusion can cause SIJ dysfunction
- Various minor traumatic injury to SIJ can initiate SIJ pain after minor traumatic event such as falling onto the buttocks or a slip while pushing a heavy object
- It is aggravated by transitional activities such as climbing stairs, getting up from chairs and getting out of a car
- Aggravated by activities requiring unequal loading through the lower extremities or pelvis
- Pathology of surrounding structures
- Capsular and ligamentous tension related to hypomobility or hypermobility, shearing forces, abnormal joint mechanics, fractures, soft tissue trauma, inflammation
Sacroiliac Joint Dysfunction Syndrome

- 22 year old active motorcyclist had lumbar fusion/instrumentation without including S1 vertebra for post traumatic disc herniation and scoliosis further junctional disc herniation syndrome at T12-L1 was treated with further extension of the fusion/fixation of thoracolumbar type.
- Then developed post fusion L5-S1 disc herniation and severe SI joint pain which was treated with MISS and SI Joint denervation with relief.
Anatomy of SI Joint with Nutation:

- The **pelvis consists** of the two **ilia** and the **sacrum**
- The **SIJ** is the **largest axial joint** in the body (17.5 cm²)
- The anterior side of the joint is lined with thick hyaline cartilage
- The posterior iliac side of the joint is lined with fibrocartilage
- **Anterior third - true synovial joint**
- The **rest** of the junction is a set of **ligamentous connections**
Articular Surface of SI Joint:

With nutation or **rocking, swaying, or nodding motion** of SIJ

Articular surface of SIJ
Innervation of SI Joint:

- The **innervation of the SIJ** is extremely complex, mostly believed to be:
  - **Posterior innervation** from medial branches of dorsal rami of spinal nerves, L4, L5, S1-3
  - **Anterior innervation**: The L4-S2 ventral rami

Posterior innervation
How to Diagnose SIJ Dysfunction:

The diagnostic criteria for SIJ syndrome:

- **Pain in** the region of SIJ with possible radiation to the groin, medial buttock and posterior thigh
- **Reproduction of pain** by physical examination technique that stresses the joint – please refer to physical signs and common tests
- **Elimination of pain with intra-articular injection** of local anesthetics and nerve blocks
- An ostentatiously morphological normal joint without demonstration of pathopneumonic radiographic abnormality
- **Point specific tenderness** over the sacral sulcus as well as the posterior superior iliac spine
Common Tests:

Common confirmatory tests and signs of SIJ dysfunction:

- **Fortin finger test** – patients one finger pointing to the area pain
- Positive result at the site within 1cm of inferior medial to the posterior superior iliac spine (PSIS)
- **Gaenslen test**
- **Patrick test**
- **Yeoman test**
Options for Treatment:

**PRIMARY INDICATION FOR TREATMENT of SIJ Pain Syndrome:**

- If **conservative** medications, physical therapy, exercise and acupuncture **fail then:**
- **SIJ injections intra-articular and extra-articular**
  - Injection anesthetic medication into the joint confirms whether or not the pain came from the joint
  - The local anesthesia and cortisone can help break a pain cycle or possibly facilitate a rehabilitation exercise program
- If **above fails** and SIJ pain continues to be intractable then:
- **Nerve blocks L4 to S3** are to be performed, if successful then:
- **Laser thermal neurectomy/rhizotomy** for denervation – including endoscopic **microdecompression** and laser neurolysis
Surgical Procedure/Technique:

SIJ Injection and nerve blocks:

- In the **prone position**
- Under **local anesthesia** with mild IV **sedation**, 22 gauge needle is inserted into the joint under fluoroscopic guidance
- **Contrast material** (isovue) is injected intra-articularly to confirm
- A mixture of **local anesthetics** and **steroids** is injected
- After the injection some may **benefit** by wearing a support belt
Surgical Laser Thermoneurectomy (LTN) of SIJ

Surgical Technique:

- In **prone position**
- The **C-arm fluoroscopic unit** is angled towards the visualized line of the posterior aspect of SIJ
- The **tube is angled caudally and obliquely** (15-20 degrees from the **opposite side** of the body) from the side opposite to the **SIJ to be denervated** with visualization of posterior SIJ line
- **LTN target** 5mm to the sacral neural foramen, superiorly and laterally along the foramen for sacral neurectomy of S1, S2, S3 in addition to L4 & L5 medial branch neurectomy for SIJ denervation
- **Two successful SIJ nerve blocks** are **required before LTN/rhizotomy**
Surgical Procedure/Technique:

- **Fluoroscopic Technique**
- The spine is in the **prone position**
- The fluoroscopic beam **aligns the anterior and posterior sacral foramina**
- A photograph of a sacrum from the anterior aspect
- The anterior and posterior foramina align
- **A/P fluoroscopic image** of the sacrum with **alignment of the anterior and the posterior foramina**

Rosto – caudal angle 30° +/- for fluoroscopic tube
LTN Surgical Technique

Application of *tissue modulation technology* with microdecompression and LTN (laser) and even radiofrequency

- **Holmium YAG laser** equipment and side firing laser probe are utilized for LTN at lower level laser energy for ablation

**Trimedyne**
Holmium YAG laser generator

Right angle (side firing) laser probe
LTN Surgical Technique

- The red spots and red curved line are the targets (medial branch of posterior roots of L4, L5, S1, S2, S3) for LTN.
- This procedure of laser denervation can be successfully performed with Holmium YAG laser system at 125 joules (5 watts, 10 hertz) for each site/nerve.
- During the LTN, continuous cold saline irrigation to dissipate the heat generated by laser application, caused by the LTN/rhizotomy.
LTN Surgical Equipment
Surgical Procedure/Technique:

- Patient **positioning and localization**
  - In **prone** position on 1-2 pillows
  - Localization – **skin marking** for **portal of entry** and placement of needle
  - Under **fluoroscopic guidance**
Surgical Procedure/Technique:

- Identifying sacral neural foramen under fluoroscopy
- Needle localization for denervation along the neural foramen
- Injection of local anesthetics before denervation
- Establishing working channel for microdecompression laser probe insertion
Surgical Procedure/Technique:

- Introduction of **working probe channel**
- **LTN** with laser probe in place
- Laser thermoneurectomy
- **LTN** post LTN
- Small surgical wound post LTN

**Mechanical endoscopic microdecompression** LTN of the L5 medial branch of dorsal root rami
Post Operative Care:

- **Ambulatory** usually in about 30 minutes and discharged subsequently
- May **shower** the following day
- **Ice pack** is helpful
- **Mild analgesics** and muscle relaxant are needed at times
- **Progressive exercises and able to start PT** the following day
- Rehabilitation compliments MISS and motion preservation
- **Return to work** in 3 days as tolerated (not for heavy work)
Surgical Outcome for Laser Thermoneurectomy:

- In **34 patients**, average follow-up **24 months** (12 months)
- Overall result: 31 (**91.2%**) patients with **good to excellent results**, fair results 3 (8.8%)
- **Response to treatment** evaluated by using: MacNab, modified Mac Nab criteria, ODI, VAS, patient satisfaction scoring, pain diagram and/or patient target achievement score (PTA)
- **Average satisfaction score** – 32 (**94%**) patients
- 3 (8.8%) patients had some mild residual pain
- **Intra-operative & post-operative complication**: 0%
- Preliminary report

![Pie chart showing surgical outcome](image)
Conclusion:

- **Intractable SIJ pain** can be treated **conservatively** with medication, PT, ice, heat, injection and even with **local nerve blocks with some relief**
- **If failure** of conservative treatment and SIJ pain syndrome continues
- It can be successfully treated with outpatient SIJ nerve blocks and subsequent laser thermoneurectomy (LTN) with endoscopic rhizotomy/decompression
- LTN with microdecompression of L4-S3 SIJ appears to be a **safe and efficacious outpatient surgical procedure**
- It provides **economical savings and speedy recovery**
References:

Hope you enjoyed this presentation!

Thank you for your kind attention!

“Danke schon”
“Merci”

“Thank you”

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