Case Report

Intractable sacroiliac joint pain treated with peripheral nerve field stimulation

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Abstract

As many as 62% low back pain patients can have sacroiliac joint (SIJ) pain. There is limited (to poor) evidence in regards to long-term pain relief with therapeutic intra-articular injections and/or conventional (heat or pulsed) radiofrequency ablations (RFAs) for SIJ pain. We report our pain-clinic experience with peripheral nerve field stimulation (PNFS) for two patients of intractable SIJ pain. They had reported absence of long-term pain relief (pain relief >50% for at least 2 weeks postinjection and at least 3 months post-RFA) with SIJ injections and SIJ RFAs. Two parallel permanent 8-contact subcutaneous stimulating leads were implanted under the skin overlying their painful SIJ. Adequate stimulation in the entire painful area was confirmed. For implantable pulse generator placement, a separate subcutaneous pocket was made in the upper buttock below the iliac crest level ipsilaterally. During the pain-clinic follow-up period, the patients had reduced their pain medications requirements by half with an additional report of more than 50% improvement in their functional status. The first patient passed away 2 years after the PNFS procedure due to medical causes unrelated to his chronic pain. The second patient has been comfortable with PNFS-induced analgesic regimen during her pain-clinic follow-up during last 5 years. In summary, PNFS can be an effective last resort option for SIJ pain wherein conventional interventional pain techniques have failed, and analgesic medication requirements are escalating or causing unwarranted side-effects.

Key words: Neuromodulation, peripheral nerve field stimulation, sacroiliac joint pain

Introduction

As many as 62% low back pain patients can have sacroiliac joint (SIJ) pain as diagnosed with analgesic efficacy of invasive diagnostic pain intervention/injection (fair to good evidence).[1] However, there is limited evidence for the diagnosis of SIJ pain by noninvasive tests.[2] Moreover, there is limited (to poor) evidence in regards to long-term pain relief with therapeutic intra-articular injections and/or conventional (heat or pulsed) radiofrequency ablations (RFAs) for SIJ pain.[2-4] Therapeutic intra-articular injections have lost favor in evidence-based medicine over time when compared to moderate evidence favoring them a decade ago.[3] However, there is new fair evidence for short-to-long-term analgesic efficacy of cooled RFA in SIJ pain.[4] Recently, there was a report about the novel use of peripheral nerve field stimulation (PNFS) for SIJ pain.[5] Hereby, we report our pain-clinic experience with PNFS for two patients of intractable SIJ pain although for reimbursement purposes, the third-party payers (medical insurance companies) consider PNFS as an investigational procedure in USA due to insufficient evidence for its analgesic efficacy.

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Case Report

The first patient was an 86-year-old male with failed back surgery syndrome who was being followed-up at our pain-clinic for chronic low back pain and left lower extremity pain for 2 years. Left SIJ was very tender to palpation. Magnetic resonance imaging (MRI) of the lumbar spine had revealed spinal stenosis, facet degenerative changes, and spondylosis. The patient reported inadequate pain relief (<50%) and unwarranted side effects with oral analgesics including mental status changes secondary to opioids. Per neurosurgery consult, no further surgery was indicated. At our pain-clinic, patient reported absence of long-term pain relief defined as pain relief >50% for at least 2 weeks postinjection, and at least 3 months post-RFA.

The second patient was a 62-year-old female who was being followed-up at our pain-clinic for chronic left side low back pain with radiation to the posterior aspect of the thigh. The pain was constantly present and worsened with physical activity. Physical therapy did not improve her functional status. Left SIJ was tender to palpation. Lumbar spine MRI showed lumbar spondylosis, spinal stenosis, anterolisthesis of lumbar levels L4 on L5, disc bulging and neural foraminal narrowing. The patient refused the recommended discectomy and fusion surgery. The patient was not interested in escalating the doses or switching her pain medications in spite of inadequate pain relief (<50%) as well as the absence of long-term pain relief postinjection and post-RFA.

After psychological testing and clearance for both patients, PNFS trials were planned. Preprocedure pain mapping (surface marking) and subsequent fluoroscopy confirmed that skin overlying SIJ was the most painful area. Under monitored anesthesia care, two parallel subcutaneous stimulating leads were planned around painful SIJ. With two small stab skin incisions using a surgical blade and 15-guage 5-inch Tuohy type epidural needle in the subcutaneous plane, two 8-contact trial leads were placed cranio-caudally up to the inferior aspect of SIJ [Figure 1]. Adequate neuro-stimulation (as adjudged by mild paresthesia-tingling sensation across the entirety of surface areas wherein chronic low back-pain was present) was confirmed from the responsive patient before fixing the trial leads to the skin surface with 2-0 silk sutures and adhesive tapes. For permanent lead placement, the same technique as trial lead placement was used, and adequate stimulation in a painful area was re-confirmed. For anchoring permanent leads, a small horizontal incision was made at the lead entrance, and deep fascia was dissected to anchor lead with a plastic anchor using 2-0 silk. For implantable pulse generator placement, a separate subcutaneous pocket was made in the upper buttock below the iliac crest level ipsilaterally. The leads were then tunneled to the generator pocket and connected to the generator. Both surgical incisions were closed in three layers after ensuring adequate hemostasis and irrigation with antibiotic and normal saline.

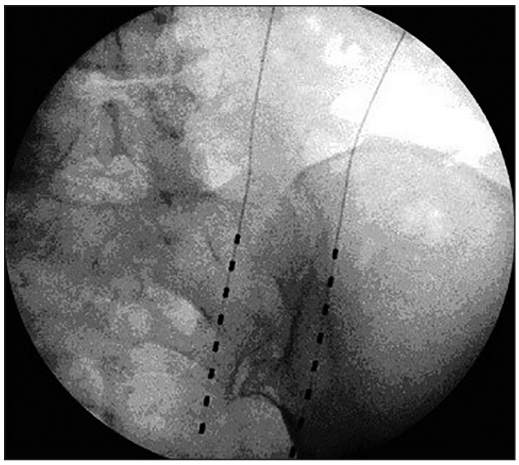

Figure 1: Postimplantation Skiagram showing two eight contacts leads, one on either side of left sacroiliac joint

In first patient, both trial leads and both permanent leads were Octrode 8-contact leads, and the generator was Eon C 16-channel IPG (St. Jude Medical-Neuromodulation, Plano, Texas, USA). In second patient, both trial leads and both permanent leads were 1 × 8 standard percutaneous leads, and the generator was 16-electrode RestoreAdvanced Neurostimulator (Medtronic, Inc., Minneapolis, Minnesota, USA). Both patients had significant pain relief during 1-week of PNFS trial. With subsequent permanent implantation 2-3 months later, the patients had reduced their pain medications requirements by half with an additional report of more than 50% improvement in their functional status during their follow-up. The first patient passed away 2 years after the PNFS procedure due to medical causes unrelated to his chronic pain. The second patient has been comfortable with PNFS-complemented analgesic regimen for last 5 years.

Discussion

Although the mechanism of PNFS's action is unknown,[6] it has been suggested that counter-stimulation/counter-irritation of skin and subcutaneous tissue innervated by terminal A-beta sensory nerve endings eventually inhibits pain pathways (A-delta and C fibers) by gate-control theory. Other biochemical implications elicited by PNFS can be endorphins release, changes in neurotransmitter release and local blood flow changes.[6] One advantage of subcutaneous lead implantation is that the continuity of subcutaneous tissue layer across the large areas of body allow the electrical stimulation currents across the leads (called cross-talking) to travel large distances[6] when compared to other neurostimulation techniques (spinal cord stimulation and peripheral nerve stimulation), wherein the leads have to be fixed within narrow distance of its efficacy (<10 mm for spinal cord stimulation vs. maximal >30 inches for PNFS)[6] to achieve appropriate stimulation in painful areas. Conversely, if pain extends over large surface areas and PNFS is not able to generate adequate electrical stimulation across those large areas, the patient will need supplementation with other analgesics and interventions[5] even though requirements of these supplementations for achieving appropriate analgesic efficacy may be much lower with PNFS than without PNFS.

Although there have been prospective multicenter trials with PNFS for low back pain in Europe (118 patients at 11 sites)[7]

and in USA (44 patients at 5 sites),[8] these trials did not specifically identify SIJ pain patients as a separate entity for analgesic efficacy assessment of PNFS. However, considering high prevalence of SIJ pain (as much as 62%) in low back pain patients,[1] it can be safely assumed that substantial percentage among 162 patients[7-8] would have been suffering from SIJ pain (even if not clearly reported in these multicenter trials). Per results of these multicenter trials, PNFS can be safe, easy and good treatment option for intractable low back pain patients who are not or have stopped responding to conventional medical and interventional pain management. Although it has been reported ($n = 23$) that age above 60 years can contribute to decreased analgesic efficacy of PNFS in chronic pain,[9] the report of 10 cases[5] had three patients aged 80 years and above but nevertheless concluded that 80% patients showed some benefits and 60% patients reported significant improvements[5] with PNFS for SIJ pain. Alternatively, even though PNFS will be the last resort treatment option (due to invasiveness, costs and clinical management/follow-up for standard complications related to implantable neurostimulators) for SIJ pain (diagnosed by default at the time of first-line diagnostic pain interventions),[1] PNFS permanent leads implanted at the most painful area in the lower back area for chronic pain can still provide analgesic efficacy irrespective of whether SIJ pain was confirmed or not confirmed by diagnostic pain intervention (approximately 20% are false-positives anyway)[1] as the underlying cause for chronic low back pain.

The technical advantages with PNFS are easy and simple to perform subcutaneous leads placements with minimal surgical exposure as compared to proper anatomical marker identification required for leads placements in the epidural spaces and large peripheral nerves' proximity. Subsequently, avoidance and/or management of lead migration for PNFS is easier than other modalities that have to sustain closer contact to intended spinal cord areas or peripheral nerve lengths for appropriate stimulations. Risk of infection is small for subcutaneous leads (4-5%).[7-8] Alternatively, the technical precautions that has to be considered with PNFS in SIJ area are large amounts of fat tissue around buttocks that may interfere with adequate cross-talking between subcutaneous leads due to linear correlation between electrical bio-impedance variability and variable thickness of subcutaneous fat layers.[10] In addition, as compared to vertical (cranio-caudal) leads placements performed by our team for unilateral SIJ pain, horizontal leads placements[5] may be a better option when SIJ pain is bilateral (that may often be the case);[5] however, the horizontal leads (due to their location and inter-lead distance) may be providing more generalized pain relief for the chronic low back and buttock pain when compared to the vertical leads implanted over painful SIJ area that may be providing more focused pain relief for SIJ pain.

Conclusion

Peripheral nerve field stimulation can be an effective treatment strategy for SIJ pain wherein conventional interventional pain techniques have failed, and analgesic medication requirements are escalating or causing unwarranted side-effects.

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