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Single strip lesions radiofrequency denervation for treatment of sacroiliac joint pain: two years' results

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Abstract

Background: Sacroiliac joint pain can be managed by intra-articular injections or radiofrequency of its innervation. Single strip lesions radiofrequency denervation is a new system. The objective of this study was to present one of the first utilizations of this innovative technique.

Methods: 60 patients who met the diagnostic criteria for sacroiliac joint syndrome were enrolled in the study. In total, 102 single strip lesions radiofrequency denervations were performed. Pain intensity was measured with the Oswestry low back pain disability questionnaire and the Oswestry Disability Index whose scores were assessed at 1, 3, 6 and 12 months after the procedure.

Results: 91.8 % of the 102 radiofrequency treatments resulted in a reduction of more than 50% pain intensity relief at 1 month, 81.6% at 3 months and 59.16% at 6 months. In 35.7% of cases, the relief was continuative up to 1 year. No relief was observed in 12.24% of cases. The ODI scores improved significantly 1 month after the procedure, compared with the baseline scores. The ODI scores after 6 months improved very clearly compared with the baseline scores and with the 3-month scores.

Conclusions: Single strip lesions radiofrequency denervation using the Simplicity III probe is a potential modality for intermediate term relief for patients with sacroiliac pain.

Key words: sacroiliac, pain, radiofrequency, single strip, multilesion

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The largest axial joint in the body is the sacroiliac (SI) joint [1]. Understanding the innervation of the SI joint is essential when contemplating denervation procedures[2]. The lateral branches of the S1-S3 dorsal rami comprise the primary innervation of the posterior SI joint in humans, with contribution from the L5 dorsal ramus in most individuals. The posterior lateral branch nerves are inconsistent in their anatomic locations, varying in number and location from patient to patient, side to side, and level to level. Sacroiliac joint SIJ pain accounts for approximately 15–20% of all chronic low back pain cases. Sacroiliac joint pain and dysfunction is most often diagnosed based upon the history and physical examination tests [3]. Currently the most reliable method of diagnosing SIJ pain is a diagnostic block of local anaesthetic directly into the SIJ. Current evidence favours lateral branch radiofrequency (RF) lesioning as the most effective treatment option. Moreover, it is an alternative treatment for refractory cases of SI joint pain. Percutaneous RF neurotomy of sacroiliac joint innervation has been described as providing long term pain relief [4]. Unfortunately, due to the physiological anatomical variability of sacroiliac innervation, the standard procedure takes long time, is complicated and its results are unpredictable. The nerves also turn their anatomic courses at different depths, with some situated on bone and others embedded in soft tissue. These wide and unpredictable anatomical variations have significant implications when contemplating denervation treatments as small, single plane lesions are unlikely to interrupt all afferent nociceptive information. Our multielectrode RF probe is easily positioned using a single percutaneous entry point, and consistent broad RF lesioning of the nerves that innervate the sacroiliac joint. Single strip lesions avoid multiple punctures. Using a single percutaneous entry point, the probe was placed along the sacrum lateral the

sacral foramina and medial to the SIJ [5]. A series of RF lesions (five in total) was created by three active areas along the probe. We evaluated the new probe, which provides a wide radiofrequency field, using three unipolar and two bipolar lesions with a single entry point.

PATIENTS

We enrolled 60 patients who met the diagnostic criteria for sacroiliac joint syndrome [6]. Patients diagnosed with persistent low back pain below L5 and buttock pain, in response to intra-articular SI joint injections, and presenting a VAS score more than 50 (0–100) were deemed candidates for treatment using the single strip lesions system.

The included patients underwent fluoroscopically guided diagnostic intra-articular injections of bupivacaine and steroids before radiofrequency treatment due in order to identify the pain source. Although the duration of pain relief is variable, this is very useful in determining that the SI joint is the source of the pain. Injections into the SI joint can provide one with both diagnosis and treatment. The injections can be repeated each month for a total of three each year. Oral anti-inflammatory medications (non-steroid anti-inflammatory drugs, NSAIDs — ibuprofen, naproxen) are often effective in pain relief as well. These can be taken long term if the patient does not have any other medical problems that prevent them from taking these medications. Oral steroids (prednisone) are provided for short periods of time in some cases, as well to treat the inflammation. The enrolled patients enrolled need a more defined palliative treatment.

SINGLE STRIP LESIONS RADIOFREQUENCY DENERVATION

The first step is creating a bipolar lesion between electrode 1 and 2, with the second lesion, also bipolar, located between electrode 2 and 3. The third lesion is located on electrode 1, the fourth on electrode 2 and, finally, the fifth on electrode 3.

Patients were in the prone position with a pillow beneath the abdomen to reduce lumbar curvature, a dispersive plate applied to the posterior thigh and the lower lumbar region and buttocks draped on the operative side. An anteroposterior (AP) projection, with the vertical position of the C-arm, centered on the inferior border of the ipsilateral sacrum, was obtained. A percutaneous entry point at the ipsilateral, lateral, inferior border of the sacrum, one centimeter lateral of and below the S4 foramen was identified. A 25-Gauge 3–1/2 inch (10 cm) spinal needle, with 1% buffered lidocaine, was used. Once the periosteum was contacted, the needle was advanced in a lateral direction, staying lateral to the sacral foramen, in contact with the sacrum, and medial to the SI joint, and then was advanced into the ligamentous tissue between the sacrum and ilium. Following this, the stylette was removed and 4 cm^3 of a 2% lidocaine solution was injected together with 1 cm^3 of steroid while the needle was withdrawn, in order to anesthetize the lesion track. Appropriate positioning should be confirmed by changing the caudal/cephalad tilt of the C-arm parallel to the superior endplate of S1 and verifying, once again, that the entire length of the Simplicity III electrode have been advanced to the ipsilateral sacral ala and that the three independent active contacts have been positioned adjacent to the S1, S2, S3, and S4 lateral branch innervation pathways. A lateral view should then be obtained, confirming that the Simplicity III electrode had remained in contact with the sacral periosteum, had followed the curvature of the sacrum up to the sacral ala, and that the three active contacts are in an appropriate position to lesion the lateral branches of S1, S2, S3, and S4 and that the most proximal contact was away from the dermis to prevent skin injury. Protocol is 85° C and every step 1.5 minutes.

Pain was measured with the Oswestry low back pain disability questionnaire and the Oswestry Disability Index (ODI) whose scores [7] were assessed 1, 3, 6 and 12 months after the procedure.

Table 1. ODI scores obtained during study period

	ODI scores Mean ± SD	*P*-value (compared with initial score)
Baseline	64 ± 4.3	
1 months	45 ± 3.2	< 0.0001
3 months	43 ± 2.2	< 0.0001
6 months	13 ± 4.0	< 0.0001
12 months	12 ± 3.5	< 0.0786

ODI — oswestry disability index; SD — standard deviation

RESULTS

No adverse effects were noted during the performed procedures.

Moreover, 91.8 % of the 102 radiofrequency treatments resulted in a reduction of more than 50% pain intensity relief at 1 month, 81.6% at 3 months and 59.16% at 6 months. In 35.7% of cases, the relief was continuative up to 1 year. No relief was observed in 12.24% of cases. Table 1 shows the Oswestry Disability Index (ODI) scores which improved significantly 1 month after the procedure, compared with the baseline scores. The ODI scores after 6 months improved very clearly compared with the baseline scores and with the 3-month scores.

DISCUSSION

Most people experience low back pain at some point in their life with one common cause of back pain being sac-

roiliac dysfunction [8–11]. In particular, SI joint pain causes axial back pain affecting between 15 and 25% of people: it may be the result of direct trauma, unidirectional pelvic shear, repetitive and torsional forces, inflammation or idiopathic onset [3]. Pain generated in the SI joint or surrounding structures can present as low back pain, leg pain, sacral pain, pelvic pain, or gluteal pain. Unilateral pain is more common than bilateral. Pain may also be present in the groin and thighs. In many cases, it can be difficult to determine the exact source of the pain [12–15]. The pain is typically worse while standing and walking and improved when lying down. Inflammation and arthritis of the SI joint can also cause stiffness and a burning sensation in the pelvis [16–19].

In patients who obtain significant but short term benefit from diagnostic blocks, RF denervation may provide a reasonable treatment alternative. Based on preclinical and clinical studies [20–23], the ideal candidates for RF denervation may be younger patients with suspected extra-articular pathology. When selecting patients, neither double comparative blocks nor prognostic lateral branch blocks have proved to enhance outcomes. Studies in cadavers have demonstrated that the L5–S3 levels should be targeted in most people, although some individuals may benefit from lesioning L4 and S4 as well [21, 22]. Indirect evidence has shown that cooled probe technology can enhance lesion size, and may this improve treatment outcomes [24]. The principal purpose of RF denervation procedures is to provide prolonged pain relief compared with more conservative measures in patients suffering from injection-confirmed SI joint pain.

These retrospective case series have confirmed and completed the case series of Vorenkamp *et al.* [5] who found a 71.4% rate of pain relief after 6 weeks, 54.4% after 6 months, 15.6% after 12 months, while 20.8% of lesions failed.

The results of our series of 60 patients confirm the long term efficacy of the Simplicity III probe for multiple radiofrequency denervation of sacroiliac joint pain. The ODI scores reflect a functional improvement, especially between the baseline and the third month, and between the sixth month and one year.

One limitation of the ODI scores is the patient's self-reporting of pain [25], and the fact that the patient's psychological status affects their interpretation of pain.

CONCLUSIONS

Our experience suggests that RFA using the Simplicity III probe is a potential modality for intermediate term relief for patients with SIJ pain. Further studies may help to improve patient selection criteria and outcomes.

This device provided short and long term analgesia in patients with sacroiliac joint pain. Thus, it may be an option in the treatment of pain.

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