CT-guided percutaneous radiofrequency denervation of the sacroiliac joint

Abstract Defining the origin of low back pain is a challenging task. Among a variety of factors the sacroiliac joint (SIJ) is a possible pain generator, although precise diagnosis is difficult. Joint blocks may reduce pain, but are, in cases, of only temporary effect. This study was conducted to evaluate CT-guided percutaneous radiofrequency denervation of the sacroiliac joint in patients with low back pain. The procedure was performed on 38 patients who only temporarily responded to CT-guided SIJ blocks. The denervation was carried out in the posterior interosseous sacroiliac ligaments and on the dorsal rami of the fifth spinal nerve. All interventions were carried out under CT guidance as out-patient therapies. Three months after the therapy, 13 patients (34.2%) were completely free of pain. Twelve patients (31.6%) reported on a substantial pain reduction, 7 patients (18.4%) had obtained a slight and 3 patients (7.9%) no pain reduction. The data of 3 patients (7.9%) was missing. There were no intra- or postoperative complications. Computed tomography-guided percutaneous radiofrequency denervation of the sacroiliac joint appears safe and effective. The procedure may be a useful therapeutic modality, especially in patients with chronic low back pain, who only temporarily respond to therapeutic blocks.

Keywords Sacroiliac joint · Low back pain · Radiofrequency denervation

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Introduction

Low back pain (LBP) is a complex clinical phenomenon that is mostly conditioned upon a variety of factors. Pain can be reproduced in cases of spondylarthrosis in the facet joints and can be reduced with anesthetic and corticosteroid injections [1] or denervation using ethanol or radiofrequency heat, in connection with or after a course of physical therapy. The role of the sacroiliac joint (SIJ) in LBP has been frequently discussed in the past decade [3, 4, 5, 6, 7]. Although there is no current standard criterion for SIJ-generated pain, positive image-guided diagnostic blocks [8] and clinical examination [9, 10, 11, 12] can indicate the need for specific SIJ treatment to reduce symptomatic pain that can be found in the lumbar spine, the gluteal region with radiation into the dorsal thigh, the popliteal space, the groin, and even the dorsal lower leg [13]. Current SIJ treatments include anesthetic as well as corticosteroid injections and denervation with ethanol. In our experience, especially patients with advanced arthropathy and resistant, chronic LBP often just temporarily benefit from injections and SIJ denervation with ethanol does offer only limited precision. These facts have motivated us to search for an alternative, precise, and lasting therapy modality.

Image-guided radiofrequency (RF) denervation is a reliable method of denervation in the cervical, thoracic, and lumbar spine [2, 14, 15]. Current flowing through the electrode generates heat in adjacent tissue based on its resistance or impedance, until the temperature of the probe and that of surrounding tissue reach equilibrium. This causes the desired lesion in a controllable size and enables a precise denervation.
The purpose of this prospective study was to evaluate the role of CT-guided RF denervation of the SIJ in the management of non-radicular LBP.

Materials and methods

Forty-three patients with resistant pain were included in a prospective observational study (22 women and 21 men; age range 30–79 years, mean age 57.2 years). LBP was present for at least 3 months. All patients complained about persistent LBP after one to two facet joint injections with local anesthetic, steroids, and adjacent ethanol denervation in levels L3/4, L4/5, and L5/S1. Although pain related to the facet joints was reduced, persistent LBP was localized in the SIJ area with radiation into the gluteal region, the dorsal thigh, the popliteal space, and occasionally the dorsal lower leg. Patients reported severe LBP during specific provocative maneuvers such as Patrick’s test and pressure application to the sacroiliac ligaments at the sacral sulcus in prone position.

Consequently, all 43 patients underwent CT-guided diagnostic sacroiliac joint blocks with a mixture of 2 ml 0.5% bupivacaine, 20 mg of methylprednisolone (Volon A), and 0.5 ml ionic contrast medium (Fig. 1). The SIJ injections were performed with the patient positioned prone. On the follow-up 2 weeks later, 38 patients reported a definite, but only temporary pain relief. They were scheduled for RF denervation of the SIJ after complete informed consent was obtained. Five patients did not feel any pain difference within the 2 weeks after the injections and were therefore not considered for the RF denervation. The remaining 38 participants met the requirements according to Table 1, which also presents the indications for a RF denervation of the SIJ.

Radiofrequency denervation of the sacroiliac joint

The CT-guided interventions were performed on an outpatient basis only. A total of 51 interventions were carried out on 38 patients. Thirteen patients were treated bilaterally and 25 patients received unilateral denervation. The patient was placed on the CT table in prone position. Following that was a short scout image of the pelvis. The SIJ was scanned with a section thickness of 3 mm and a table advancement of 3 mm, viewing in the bone window on a Somatom Plus 4 Volume Zoom CT (Siemens) or EBT (Imatron C-150XLP). For the therapy we used a 50-W radiofrequency generator (NEURO NSO, Leibinger GmbH, Freiburg, Germany).

The denervation was carried out on two locations.

Posterior interosseous sacroiliac ligaments

The section position with the most suitable access to the posterior interosseous sacroiliac ligaments was set as the intervention position. The planning line was drawn on the monitor mediolateral in an extremely plane angle (approximately 40°) and marked accordingly on the patient’s skin. A neutral electrode was placed on the contralateral side, on a level with the RF denervation. After preceding skin disinfection, sterile covering, and local anesthesia, a 10- or 15-cm, 23-G insulated RF cannula with 5-mm uninsulated tip (Leibinger) was placed percutaneously in the target region as planned on the monitor. Two to three corrections were necessary until the cannula was in the desired position controlled by two 5-mm axial CT scans after each correction. Once the cannula was securely positioned and after corresponding anesthesia with 2–4 ml bupivacaine 0.5%, we injected 3–5 ml 0.9% isotonic saline for enhanced temperature spreading and to reduce local impedance. We then led the monopolar RF electrode into the insulated therapy cannula and started RF coagulation. Current temperature was measured by the cannula tip during the whole procedure. To produce an overlapping coagulation we used three steps with 90°C applied temperature. In each step we drew the set backwards approximately 5 mm after 90 s of heat application (Fig. 2).

The passage of sacral ala and transverse process of the vertebral body L5

We then replaced the sound to the upper part of the junction sacral ala and transverse process of the segment L5/S1 to lesion the dor-

Table 1 Inclusion and exclusion criteria for radiofrequency denervation of the sacroiliac joint (SIJ)

<table>
<thead>
<tr>
<th>Inclusion criteria</th>
<th>Exclusion criteria</th>
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<tr>
<td>Persistent, non-radicular back pain in the SIJ region after CT-guided facet joint denervation in at least two segments, L4/5 and L5/S1, and possibly L3/4</td>
<td>Preceding, negative, CT-guided, intraligamentous neural blockade of the SIJ</td>
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<tr>
<td>Preceding, positive, CT-guided intraligamentous neural blockade of the SIJ</td>
<td>Hemorrhagic diathesis</td>
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<td>Chronic SIJ pain</td>
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