

## **PAIN AND MUSCLE REFLEXES OF THE SACROILIAC JOINT**

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Aage Indahl<sup>1</sup>, Allison Kaigle<sup>2</sup>, Olav Reikerås<sup>3</sup>, and Sten Holm<sup>2</sup>  
<sup>1</sup>Kysthospitalet, Stavern, Norway, Department of Orthopedics, <sup>2</sup>Sahlgrenska University Hospital, Göteborg, Sweden, and <sup>3</sup>National Center for Orthopedics, Oslo, Norway

### **INTRODUCTION**

In search of causes of low back pain, the sacroiliac joint (SIJ) has gained renewed interest as a possible pain generator. Clinical assessment of this joint remains difficult. Several examination procedures have been developed to try and relate pain to the sacroiliac joint, but have failed to be validated as useful. Imaging studies have not provided any findings that correlate with pain, which is believed to originate from the sacroiliac joint. Therapeutic injections and diagnostic blocks have shown some evidence that gives reason to believe that the sacroiliac joint can be involved in low back pain. There is a special awareness of the sacroiliac joint as a source of pain in pregnant and post-partum women, and although the mechanism is not understood, the relaxation of the sacroiliac joint before childbirth is believed to play a role.

The SIJ is a true synovial joint, which is richly innervated. It bears tremendous loads but has a very limited amount of motion. Numerous spinal and gluteal muscles attach to the SIJ capsule and iliac crest.

The aim of this study was to determine if stimulation of nerve elements in the SIJ and SIJ capsule could elicit contractions in porcine gluteal or lumbar spinal muscles.

### **MATERIALS AND METHODS**

#### **Stimulation**

Via a lateral retroperitoneal approach and using hypodermic needles, bipolar stimulating wire electrodes were inserted into the ventral area of the SIJ and directly under the surface of the capsular membrane in 10 adolescent pigs (45 kg). This procedure was performed bilaterally, thus establishing 4 separate stimulation sites in the SIJs.

#### **Electromyography**

Six bipolar EMG needle electrodes were used for measuring compound motor unit action potentials (MUAPs). The EMG electrodes were inserted unilaterally into the following muscles:

EMG1	deep medial multifidus fibers lateral to L3
EMG2	deep medial multifidus fibers lateral to L4
EMG3	deep medial multifidus fibers lateral to L5
EMG4	central belly of the gluteus medius
EMG5	central belly of the gluteus maximus
EMG6	quadratus lumborum, lateral to L5

#### **Protocol.**

Each SIJ site was electrically stimulated with a set of 6 single square pulses (21V mean amplitude to the SIJ and 9V to the SIJ capsule; 0.1ms duration; 5s between pulses). The muscular responses were simultaneously recorded from the 6 EMG electrodes. The left and right sides were independently investigated; when stimulating a left SIJ site, the 6 EMG electrodes were inserted into the left side muscles, and likewise for the right side. The peak-to-peak amplitude of each MUAP was measured. For normalizing the data, the peak-to-peak amplitudes of each of the 6 MUAPs were divided by the largest MUAP peak-to-peak amplitude within that stimulation set.

#### **RESULTS**

##### **Stimulating within the Ventral Area of the SIJ**

Predominant muscular responses occurred in both the quadratus lumborum (EMG6) and gluteus maximus (EMG5), while only minor responses were observed in the remaining muscles.

##### **Stimulating the SIJ Capsule**

Predominant muscular responses occurred in the multifidus, with the greatest response in the multifidus fascicles lateral to the L5 spinous process (EMG3), which were closest to the SIJ; minor responses were observed in the remaining muscles.

#### **DISCUSSION**

Stimulation of nerves and mechanoreceptors in the SIJ, as well as in the joint capsule, elicited motor unit action potentials in different muscles, which revealed an interesting activation pattern. Stimulation of nerve elements in the ventral area of the SIJ produced significant contractions in muscles located more distally from the lumbar spine, namely the gluteus maximus and quadratus lumborum. However, stimulation of the SIJ capsule elicited significant responses in the medially located multifidus fascicles. These findings suggest that the SIJ is involved in activating muscles responsible for overall posture control, as well as control on the segmental level in the lumbar spine. It is possible that the different areas of the sacroiliac joint play different roles in regulating the locomotive system, and the response may therefore vary depending on the stimulation site. Pain generated from the joint and the area around the joint may be caused by dysfunction of this regulatory function. Disturbances in the sensory part of the joint innervation may lead to altered muscular activation. It is possible that in some cases the result is longstanding activation of some of the deep stabilizing muscles hard to detect by examination. Such a longstanding muscle activation with static work may result in pain. This can lead to a guarded behavior and increased muscle tension. A pelvic belt often made of flexible material, is difficult to imagine how it can stabilize the joint, but some research indicate that it seems to have some effect. On the other hand it is likely that a pelvic belt can make important input into the sensory system that may result in an altered muscular activation pattern. This supports the theory that muscular dysfunction due to altered sensory input from the joint may play an important part in pain generation.

**REFERENCES**

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