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Ultrasound assessment of the posterior sacroiliac ligaments

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ABSTRACT

Objective. *Posterior ligaments of the sacroiliac joints (SIJ) are comprised of the long and the short posterior sacroiliac ligaments. They are recognised as a potential source of aspecific low back pain or peripartum pelvic pain. The aim of this study was to assess the characteristics of these ligaments using high resolution ultrasonography (HRUS).*

Method. *The features of the ligaments was first studied in a formalin-preserved intact cadaver. US characteristics were then recorded in 20 volunteers with a Philips HD11 XE unit using a multifrequency linear transducer (5–12 Mhz).*

Results. *US was performed in 8 men and 12 women, with a mean age of 45±15 year and mean body mass index (BMI) of 25.45 (±3.57). Ligaments were identified in all the volunteers. The short posterior sacroiliac ligament (median length 2.17 cm and 2.31 cm in the right and left SIJ respectively) was described as a fibrilar structure attached to the posterior tuberosity of the ilium and the sacrum. The long posterior sacroiliac ligament (median length 3.42 cm and 3.56 cm in the right and left SIJ, respectively) was a fibrilar structure attached superiorly to the posterior superior iliac spine and inferiorly to the third sacral transverse tubercle.*

Conclusion. *Our study shows that US can be used to identify the posterior ligaments of the sacroiliac joint. US could be useful to detect any pathological change associated with pain and to guide steroid injection in these ligaments.*

Introduction

Ligaments of the sacroiliac joints (SIJ) are strong ligaments joining the two parts of the SIJ, and play a major role in its stability (1). They consist of three different ligaments: the anterior ligament spans the anterior surface of the joint, the interosseous ligament connects the ligamentous surface of the sacrum and the ilium, and the posterior sacroiliac ligament covers the superficial posterior part of the joint. The posterior ligament consist of the short posterior sacroiliac ligament (SPSL) and the long posterior sacroiliac ligament (LPSL). The SPSL originates from the posterior tuberosity of the ilium and ends on the lateral part of the sacrum. The LPSL attaches to the posterior superior iliac spine (PSIS) and to the 3rd transverse tubercle of the sacrum between the third and forth dorsal sacral foramina (2). The main role of the posterior ligaments is to minimise the forces applied horizontally on the SIJ and to prevent the sacrum from rotating into the lesser pelvis.

Posterior ligaments of the sacroiliac joint have been identified as a potential source of atypical mechanical back pain (3). Their rich innervation is mainly provided by fine nerve branches derived from the dorsal rami of the spinal nerves. It has been suggested that an entrapment neuropathy of the lateral branches of the dorsal sacral rami (middle cluneal nerves) could occur under these ligaments (4). These ligaments could also be a source of peripartum pelvic pain (2) and inflammatory changes within the LPSL as been identified by MRI in patients with active spondylarthopathies (5). Finally, steroid injection and radio-frequency neurotomy of the LPSL has been shown to provide pain relief in patient with chronic and atypical buttock pain confirming that it could be therapeutic target in this clinical context (6, 7).

Little is known about the features and characteristics of the posterior SIJ ligaments on imaging. Current MRI or computer tomography (CT)-based investigations of the SIJ mainly refer to effusions, bone oedema or signs of sacroiliitis. Although MRI gives better information on the features of the ligaments than CT, it does not allow dynamic evaluation and is not easily available (8). Ultrasonography is an inexpensive technique widely used in daily rheumatologic practice. Its efficiency in detecting joint effusion and inflammation in SIJ has been already demonstrated in the context of spondyloarthropathies (9). It is considered a potential alternative to CT in guiding intra-articular steroid injection in the SIJ joint (10). The goal of this study was to characterise the features of the

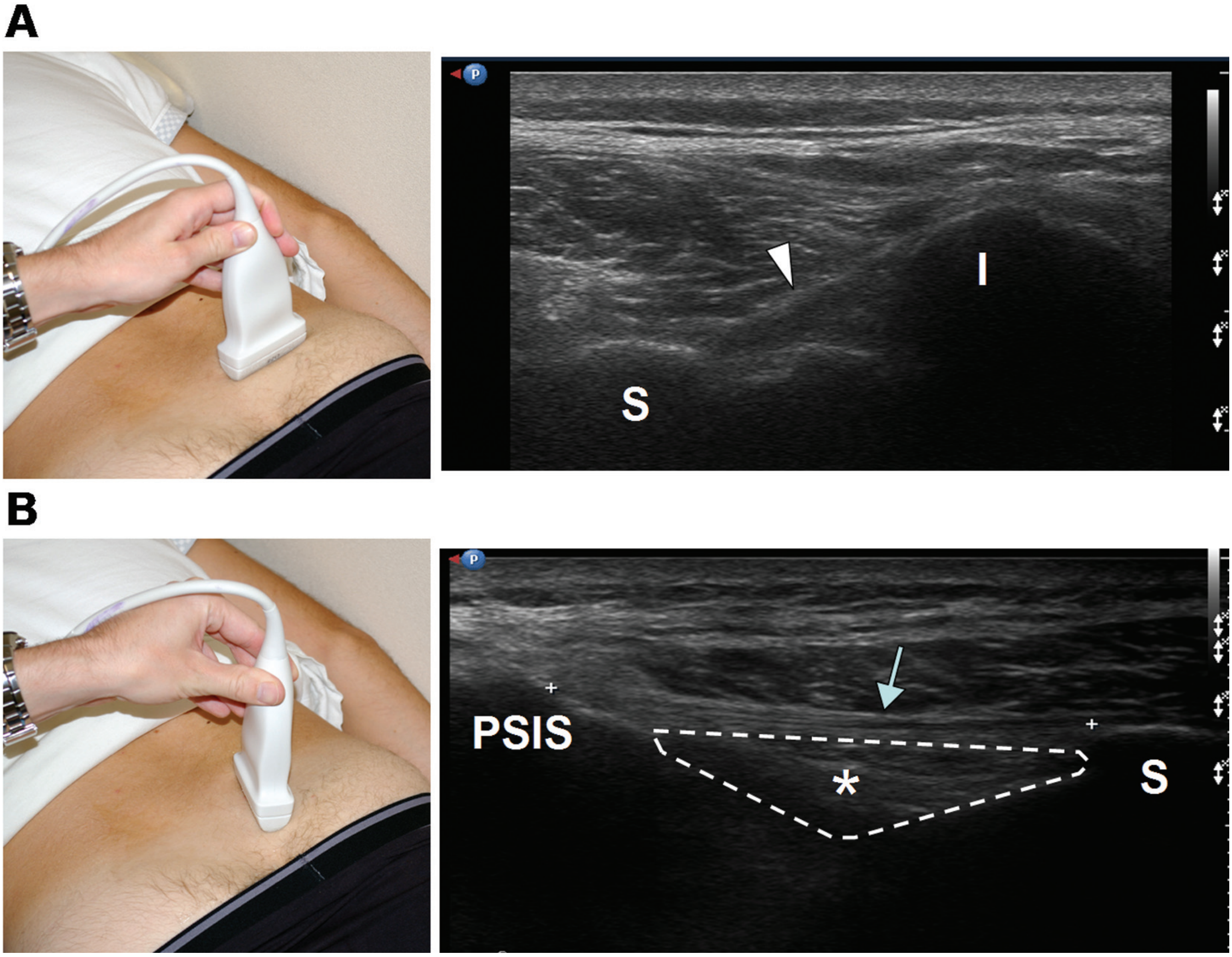

Fig. 1. A. Transverse scan of the short posterior sacroiliac ligament (SPSL) (arrowhead). The transducer is placed between the posterior tuberosity of the ilium (I) and the sacrum. The ligament is seen as a structure tighten between the ilium and the sacrum (S). Thoracolumbar fascia (double arrow), paraspinalis muscles (P). **B.** Long posterior sacroiliac ligament LPSL (arrow). Area under the ligament (dotted line).The transducer is placed in a longitudinal plan, slightly oblique. The LPSL is visualised as a fibrillar structure tighten between the PSIS and the sacrum.

posterior ligaments of the sacroiliac joint in healthy volunteers.

Material and methods

We first performed an anatomical study of the posterior SIJ ligaments in a formalin-preserved intact cadaver provided by the department of anatomy of the University of Nantes. Each step of the dissection was coupled with an ultrasonographic study of the muscular, ligamentous and bony structures and ultrasonographic (US) characteristics of the posterior ligaments of the sacroiliac joint were recorded. US was next performed in 20 healthy volunteers, 8 men and 12 women, with a mean age of 45±15 year and mean body mass index (BMI) of 25.45 (±3.57). Patients were aware of the goal of this study and gave their consent. Ultrasonography was performed using Philips HD11 XE unit using a multifrequency linear transducer (5–12 Mhz) by the same trained rhumatologist (BLG) who has previously completed the anatomic study.

Patients were examined in prone position. The US examination started with the identification of the bony spinous processes in the midline on sacrum, with the sacral wings seen as a regular echogenic line on each side of the spinous processes. The probe was then moved laterally until identifying the PSIL visualised as a curved echogenic line. The SPSL was depicted as the oblique ligament stretching from the posterior tuberosity of the ilium to the sacral wings. The transducer was then rotated into a sagittal, slightly oblique, plan. The LSIL appear as a ligamentous structure attached superiorly to the PSIS and inferiorly to the third sacral transverse tubercle. Characteristics of the ligaments were recorded during the US scanning; all the measurements are given as the median (IQR).

Results

Ligaments were accessible by US in all the patients. US showed the SPSL as a fibrilar structure attached to the posterior tuberosity of the ilium and the sacrum (Fig. 1). This ligament was covered by the paraspinalis muscles which were surrounded by the thoracolumbar fascia. When measured on a transverse

Table I. Ultrasound characteristics of the posterior sacroiliac joint ligaments measured on 20 healthy volunteers.

	Right SIJ	Left SIJ
LPSL		
Length (cm)	3,42 (3.08–3.83)	3.56 (3.28–4.06)
Depth (cm)	1.69 (1.39–2.3)	1.76 (1.41–2.04)
Area under the LPSL (cm2)	1.19 (0.8–1.55)	1.33 (0.76–1.52)
SPSL		
Length (cm)	2.17 (1.76–2.57)	2.31 (1.67–2.57)
Depth (cm)	1.87 (1.41–2.21)	2.18 (1.66–2.46)

Values are the median (IQR). SIJ: sacroiliac joint; LPSL: long posterior sacroiliac ligament; SPSL: short posterior sacroiliac ligament.

plane, its median length was 2.17 cm (1.76–2.57) and 2.31 cm (1.67–2.57) in the right and left SIJ respectively (Table I). The median depth, measured by placing calipers on the middle part of the ligament toward the skin, was 1.87 cm (1.41–2.21) in the right SIJ and 2.18 cm (1.66–2.46) in the left one. The LPSL was defined as a fibrilar structure attached superiorly to the PSIS and inferiorly to the third sacral transverse tubercle (Fig. 1B). The median length was 3.42 cm (3.08–3.83) cm and 3.56 cm (3.28-4.06) in the right and left SIJ respectively. The median depth, measured by placing calipers on the middle part of the ligament toward the skin, was 1.19 cm (0.8–1.55) in the right SIJ and 1.33 cm (0.76–1.52) in the left one. As it has been hypothesised that an entrapment neuropathy of the lateral branches of the middle cluneal nerves (dorsal sacral rami) could occur in the 'sub-ligamentous' space under the LPSL, we measured the space between this ligament and the sacrum (Fig. 1B). This space had a median area of 1.19 cm^2 (0.8–1.55) and 1.33 cm^2 (0.76–1.52) in the right and left SIJ, respectively.

Discussion

Posterior sacroiliac ligaments are important ligaments stabilising the SIJ. They are recognised as a potential source of inflammatory as well as mechanical sacroiliac pain. In this study, we describe the ultrasonographical features of the superficial posterior ligaments of the sacroiliac joint. We have shown that ultrasound can be used to indentify the short and the long sacroiliac ligaments. These ligaments were superficial fibrillar structures and consistenly seen in all the volunteers. However, we performed the study in healthy volunteer with a low mean BMI which could have facilitated ultrasonographic access to the ligaments. Moore *et al*. recently studied the US characteristics of the LSPL in 30 healthy women (11). They described it as an hyperechoic laminated linear structure with a mean length of 3.7cm. Our study confirms their findings and we were also able to visualise the SPSIL in our patients. US is easy and dynamic, and, as shown in our study, gives an easy access to the posterior sacroiliac ligament. A better knowlegdge on the characteristics of these ligaments in patients with atypical buttock or back pain is now needed.

It has been hypothesised that an entrapment neuropathy of the dorsal rami of spinal nerves could occur between the PSIS and the posterior sacroiliac joint (4). Indeed, these nerves were identified by histology under the median part of the ligament, within a region of adipose and loose connective tissue. US examination allowed us to indentify and characterise the space formed between the ligament and the posterior part of the SIJ in healthy patients. This region was seen as a hypoechogenic region but no nerve structure could be indentified because of the size of the rami. Further investigations that look for any modifition of the surface and volume under this ligament in patients with atypical back pain or during pregnancy would be useful.

US has become increasingly popular in rheumatology in guiding intra-articular as well as peri-articular injections. Its efficiency in sacroiliac injections in spondyloarthropathic patients has already been demonstrated. Interestingly, pain improvement after steroid injection seen in spondyloarthritis associated sacroiliitis is not necesseraly associated with the intra-articular localisation of the injection (12). This effect could be related to the spread of corticosteroid in the ligament around the joint. Open label studies have demonstrated efficiency of steroid injection inside the SI posterior ligament in patients with atypical pain fessalgia (6, 7). Ultrasonography could be a safe and easy way to guide injections in these ligaments in that context.

In conclusion, our study confirms that US can be used to characterise the short and long posterior sacroiliac ligament. Further studies are needed to determine any modification of these ligaments in pathological conditions and the usefulness of US in guiding steroid injections.

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