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Original Article

Analysis of the early signs of septic sacroiliitis on computed tomography

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Abstract

Objective: Septic sacroiliitis is a difficult diagnosis rarely considered in an emergency in case of pelvic pain associated with fever. In these cases, a computed tomography (CT) is classically performed to exclude digestive or gynecological disorder, but the sacroiliac joint is not systematically analyzed. The aim of the present study was to detect the early signs of septic sacroiliitis on CT.

Methods: In a monocentric retrospective study, the characteristics, biology, and imaging of patients with septic sacroiliitis were analyzed.

Results: Seven cases of septic sacroiliitis were included in the study. For all patients, a CT scan with contrast-enhanced acquisitions of the pelvis was performed. The 4 early signs of septic sacroiliitis frequently not evocated by a radiologist in an emergency were highlighted as follows: fat infiltration in front of the sacroiliac joint (83%), anterior bulging of the sacroiliac capsule (46%), and piriformis and iliac muscles swelling (71% for both). All patients had at least one of these signs; 86% had at least 2 signs. Magnetic resonance imaging was performed for 5 out of 7 patients and confirmed the aspect of infectious sacroiliitis.

Conclusion: Systematic analysis of the sacroiliac joint and adjacent muscles on pelvic CT scan is necessary to avoid the unrecognition of septic sacroiliitis in case of pelvic pain with fever.

Keywords: Septic sacroiliitis, computed tomography, diagnosis, early signs

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Introduction

The sacroiliac joint is a rare localization of septic arthritis (1) with heterogeneous clinical presentation as follows: inflammatory pelvic pain, low back pain, hip pain, and truncated sciatica. Mobilization of the sacroiliac joint and the "finger test" described by Fortin and Falco are interesting to focus on the sacroiliac origin of pain but relatively non-specific (2). This difficult diagnosis is often not considered in an emergency, and a computed tomography (CT), with contrast-enhanced acquisitions, is classically performed to eliminate digestive or gynecologic origin. The sacroiliac joint could not be examined thoroughly if the radiologist is not aware of this potential etiology and could induce a delay in diagnosis. In musculoskeletal infections, magnetic resonance imaging (MRI) is obviously the gold standard imaging technique when these conditions are suspected with better performance than CT (3), but access to MRI in an emergency in some countries is difficult, and long duration of this examination is sometimes not well tolerated. The aim of the present study was to analyze the potential early signs of septic sacroiliitis on CT performed in an emergency.

Methods

This was a monocentric retrospective study of all the cases of septic sacroiliitis at the University UFR SMP Besançon between January 2013 and March 2018. The hospital International Classification of Diseases-10 coding system was used to search all the cases with keywords "unclassified sacroiliitis" (code M46.1) as principal diagnosis, joined diagnosis, or associated diagnosis. For each patient, their characteristics (gender, age, comorbidities, clinical presentation, fever, and side of infection), biology (white blood cell count, C-reactive protein, procalcitonin, and bacteriological documentation), and imaging (CT and/or MRI and delay of imaging performance) were analyzed. A radiologist and a rheumatologist in collaboration analyzed imaging data. Patients aged <18 years were excluded from the study. No statistical software have been used for this study. Ethics committee approval was received for this study from the Ethics Committee of Besançon University UFR SMP.

Results

A total of 15 cases of "unclassified sacroiliitis" were found, with 7 cases of septic sacroiliitis, 5 cases of ankylosing spondylitis, and 3 cases of degenerative sacroiliac changes. Overall, 7 cases of septic sacroiliitis were included in the study. The study included 4 male and 3 female patients. The mean age of the patients was 44.1 years. There was fever in 57% of the cases, and the left side was affected in 4 cases. Mean C-reactive protein was 184 mg/L, mean leukocyte count was 12,500/mL, and serum procalcitonin was increased in 50% of the cases (2/4). Three patients had immunosuppression-associated conditions (one multiple myeloma, one acute myeloid leukemia recently diagnosed, and one psoriatic arthritis under conventional synthetic disease-modifying antirheumatic drugs), one patient was in postpartum, one patient was in the postoperative period for abdominal pathology, and one patient was under isotretinoin for severe acne. Clinical presentation was truncated lombosciatica in 4 cases, lumbar cruralgia in 2 cases, and coxalgia in one case. Bacteriological confirmation was available for 5 patients (one methicillin-sensitive *Staphylococcus aureus*, one *Streptococcus pneumoniae*, one *S. dysgalactiae*, and 2 Gram-negative bacilli) as follows: 3 patients had positive blood culture, one patient had positive blood culture and positive sacroiliac joint aspiration under CT, and one patient had only positive joint aspiration. For the last 2 patients, no bacteriological confirmation (blood culture and joint aspiration) was available because of the onset of antibiotics prior to hospitalization. Their presentation and evolution under antibiotic treatment was compatible with infectious origin.

All patients had early pelvic CT scan during their hospitalization (mean of 6 days after the start of pelvic pain) with signs in favor of septic sacroiliitis for all. In 4 cases, only contrast-enhanced acquisitions were performed, and in 3 cases, non-contrast-enhanced acquisitions and contrast-enhanced acquisitions were available. In 4 cases, suspicion of septic sacroiliitis was not considered by the clinicians on the imaging request. In 3 cases, the radiologists did not consider the potential signs of sacroiliitis initially. Retrospectively, 4 CT signs have been highlighted as follows (Table 1): fat infiltration in front of the sacroiliac joint in 86% of the cases, anterior bulging capsule in 43% of the cases, piriformis muscle swelling in 71% of the cases, and iliac muscle swelling in 71% of the cases (Figure 1, 2). Tissue density values in Hounsfield unit (HU) of fat in front of both sacroiliac joint of all patients were compared as follows: mean density −1.5 (±22.2) HU on pathologic sacroiliac (density close to the HU value of water) and −73 (±15.9) HU on non-pathologic sacroiliac (Figure 3). One patient had early signs of osteitis (erosions and peripheral osseous densification). All patients had at least one of these 4 radiological signs, and 86% of them had at least 2 signs. In 4 cases, iodinated contrast agent injection did not provide additional information compared with non-injected sequences. Contrast enhancement of the anterior capsule of the sacroiliac joint had been highlighted in 3 cases. On contrast-enhanced acquisitions, muscular abscesses (iliac, piriformis, and obturator internus muscles) were reported. Pelvic MRI was performed for 5 patients during hospitalization (mean of 5 days after CT) and was consistent with septic sacroiliitis in all cases. In one case, MRI detected an osteomyelitis of the sacrum and iliac bones. Except for intra-articular hyperintensity on T2-weighted images (80%) and better visualization of abscesses, MRI highlighted the same imaging signs compared with CT for our patients. No bone scintigraphy has been performed in our series.

Discussion

The prevalence of septic sacroiliitis was estimated at approximately 1%–2% of osteoarticular infections due to low vascularization and, in consequence, small risk of hematogenic dissemination. As explained in the Introduction section, accurate diagnosis is frequently delayed due to the lack of awareness by clinicians and non-specific clinical presentation (4). Differential diagnoses frequently observed are lumbar disc herniation, spondylodiscitis, or septic arthritis of the hip joint, with often a delayed diagnosis, as seen in our study with an initially lack of diagnosis in approximately 40% of the cases after CT.

Table 1. CT signs of septic sacroiliitis

Case no., sex, age	Microorganism	Delay between CT scan and pain onset (days)	Fat infiltration in front of the sacroiliac joint	Anterior bulging of the capsule	Piriformis muscle swelling	Iliac muscle swelling	Osteitis
Case 1: man, 22 y.o	Methicillin -sensitive *Staphylococcus aureus*	2	-	-	+	-	-
Case 2: woman, 54 y.o	-	2	+	-	+	-	-
Case 3: man, 29 y.o	*Enterobacter aerogenes*	3	+	+	+	+	-
Case 4: woman, 28 y.o	-	6	+	+	-	+	-
Case 5: man, 44 y.o	*Serratia marcescens*	6	+	-	+	+	-
Case 6: man, 57 y.o	*Streptococcus dysgalactiae*	8	+	+	N/A	+ (abscess)	+
Case 7: woman, 75 y.o	*S. pneumoniae*	15	+	-	+ (abscess)	+	-
Positivity of sign (%)			86%	43%	71%	71%	14%

y.o: years old; N/A: not applicable; - : absence of sign; +: presence of sign; CT: computed tomography

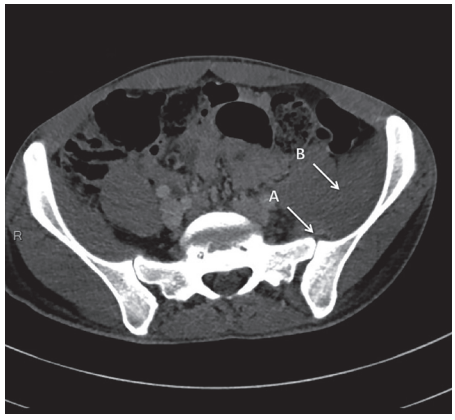

Figure 1. Contrast-enhanced axial CT scan of the pelvis. Enhanced anterior bulging of the capsule (arrow A) and left iliac muscle swelling (arrow B)

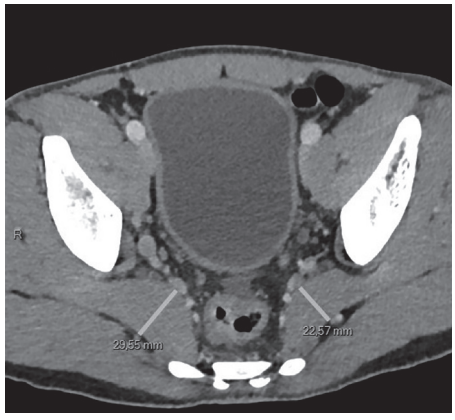

Figure 2. Contrast-enhanced axial CT scan of the pelvis. Piriformis muscle swelling in right septic sacroiliitis

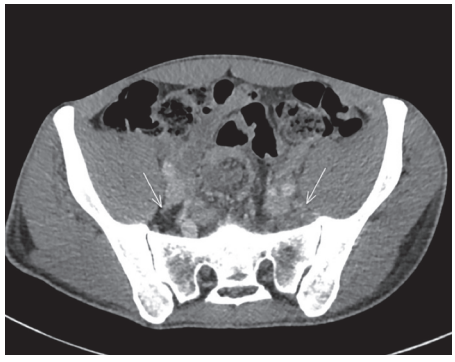

Figure 2. Contrast-enhanced axial CT scan of the pelvis. Fat infiltration in front of the left sacroiliac joint (–2 HU) compared with the right sacroiliac joint (–70 HU) (arrows)

In the literature, *S. aureus* is the most common bacteriological agent in septic sacroiliitis (1, 5, 6). In our short series, *S. aureus* was found in only one case. As expected in infectious osteoarticular diseases, a predisposing context was frequently found. Immunosuppression, particularly hematological malignancies (2 cases here), needs to be eliminated systematically in the presence of this kind of infection. Our study confirmed that postpartum was a predisposing factor of septic sacroiliitis, as previously reported (7).

Historically, bone scintigraphy was frequently used in the past before the advent of MRI (8) or more recently with good results (9). Then, MRI became the gold standard imaging technique in this condition (10). Indeed, MRI has better performance than CT in evaluating soft tissue abscess formation and early detection of bone marrow edema and effusion. MRI has the ability to access different degrees of inflammation and edema and to prove a possible spread to muscles (iliac or piriformis muscles) (6). Rarely reported (11), the use of 18-fluorodeoxyglucose positron emission tomography does not appear to be useful in this indication. Ultrasonography, performed by a well-trained operator, could perhaps allow visualizing the indirect signs of septic sacroiliitis, notably abscesses of the posterior part of the sacroiliac joint near the piriformis muscle, but to our knowledge, any such case has never been reported.

In the study by Doita et al. (4) of 9 cases of septic sacroiliitis, all CT scans performed beyond 17 days following the onset of symptoms (7 patients) were positive. Two of the 9 cases had been initially negative. No details about CT signs of infection were described, except for one image of iliac abscess. In the study by Matt et al. (9), CT was performed in 11 of 18 patients and contributed to diagnosis for 9 of them. Performance of MRI appeared to be similar in their study with 14/16 positive imaging. No data about the delay of CT realization were mentioned. *Hermet et al. (6) in a* retrospective, multicenter study of 39 adults with infectious sacroiliitis found normal CT in 22.4% and advised to be cautious notably when CT was performed <3 days after the onset of symptoms. Even <3 days after the start of symptoms, high sensitivity of CT abnormalities was highlighted in our short series, and all our patients had at least one positive sign. In the literature, publications focused on bone changes, and there was no detailed description of soft tissue abnormalities on CT. In our study, 4 early signs were described to serve as a guide in an emergency and to advise radiologist to the diagnosis of septic sacroiliitis. It was impossible to determine the chronology of apparition of different signs on such a short series. Fat infiltration in front of the sacroiliac joint was the most sensitive sign in our study with 83% positivity. Anatomical relationship between sacroiliac joint and iliac muscle in the anterior part and piriformis muscle in the inferior part explained why they were the first part affected in the beginning of infection with edematous infiltration. Muscle spread may explain sciatica or coxalgia described by patients, and clinicians needed to be aware in front of this clinical presentation associated with fever or biological inflammatory syndrome. Muscular involvement represented an important argument in favor of infectious for the differential diagnosis of inflammatory sacroiliitis in case of the first flare of spondyloarthritis.

Although some publication suggested the potential toxicity of gadolinium in MRI (12), the non-radiating character of MRI was an advantage compared with CT scan. However, *for patients requiring frequent narcotic analgesic for pain control,* larger accessibility, better analysis of bone structure, *and short acquisition time of CT scan compared with MRI were, in addition, important elements. Contrast media injection was not obligatory because most of these CT signs were apparent on contrast-enhanced acquisition, except* for contrast enhancement of the sacroiliac joint capsule. On the other hand, contrast media injection may allow better visualization of deep abscesses that may not be obvious on non-contrast-enhanced acquisition. Finally, contrast media injection remained essential for the differential diagnosis of other abdominal or pelvic infections. In that case and for radioprotection reasons, a single contrast-enhanced acquisition should be performed at once, with no precontrast acquisition.

Limitations of the present study included the small number of patients, meaning that conclusions need to be approached with caution. The potential lack of specificity of CT scan signs and the absence of the control group, for example, patients with inflammatory sacroiliitis in axial spondyloarthritis, represent other limitations. However, in the current practice, clinical presentations between inflammatory and septic sacroiliitis were really different. CT scan signs of sacroiliitis in patients with suspected spondyloarthritis have been well described and have a different infectious etiology (13, 14). In our study, the normality of the contralateral sacroiliac joint was an important argument for the sensitivity of signs we described.

In conclusion, CT appears to be useful for the early diagnosis of septic sacroiliitis with the first description of 4 signs. Good performances of CT do not replace MRI in case of septic sacroiliitis suspicion, but CT is interesting in an emergency for the differential diagnosis of digestive or gynecologic infection and sometimes the only imaging tool available.

Ethics Committee Approval: Ethics committee approval was received for this study from the Ethics Committee of Besançon University UFR SMP.

Informed Consent: Informed consent was not received due to the retrospective nature of the study.

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