Refractory osteitis condensans ilii: Outcome of a novel mini-invasive surgical approach

Mostafa A. Ayoub

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Abstract

Purpose Osteitis condensans Ilii (OCI) is an orthopaedic mystery until now and the refractory type poses a great challenge in its management. Surgical resection and sacroiliac arthrodesis are major procedures with no guarantee of success for an unknown disease entity with a normal sacroiliac joint. The aim of this retrospective study was to evaluate results of a novel mini-invasive surgical approach for the refractory type after failure of conservative management.

Materials and Methods Fourteen females were included with an average age 35.5 ± 5.8 years. Nine cases were multiparous and five were nulliparous. The pathology was bilateral in all cases; however, seven cases suffered bilateral symptoms, while seven cases had only unilateral complaints. Preoperative computed tomography was mandatory. All cases had three to five percutaneous iliac core decompressions through a cannulated drill bit. The Bath ankylosing spondylitis functional index (BASFI) was used for functional outcome evaluation.

Results The mean follow up was 23.3 ± 4.1 months. The mean BASFI improved from 3.7 ± 0.6 preoperatively to 1.3 ± 0.2 during follow up ($P < 0.001$). There was a significant improvement with the four drillings over five decompression drillings ($P = 0.011$). Sacral side sclerosis was associated significantly ($P = 0.009$) with less improvement. No relapse or substantial complications were encountered.

Conclusions This novel approach can be of great benefit for refractory OCI cases with almost no added morbidity or complications. It has advantages of the mini-invasive techniques in addition to sparing the physiological functions of the affected sacroiliac joints.

Introduction

Osteitis condensans ilii (OCI) is a benign cause of recurrent axial low back pain. It is an incidental finding on plain X-ray, characterised by sclerosis of predominantly the iliac bone adjacent to an otherwise normal sacroiliac joint. It has an average frequency of 0.9–2.5 %, and particularly affects women [1, 2].

Although its aetiology is unclear, various hypotheses have been proposed; the most widely accepted being the mechanical stress hypothesis. The fact that the disease is more commonly observed among patients who have given birth supports this hypothesis; however, no clear association between pregnancy and OCI has been shown. Males and nulliparous females have also been afflicted with the disorder [1, 3].

The lesions are commonly bilateral with diffuse pain in the lower lumbar region. However, the pain coincides with the X-ray lesion in unilateral cases. Some patients also had radiating pain in the lower limbs. The disease has a chronic course with a tendency to relapse. Clinicians must be guided by history, radiographic findings, and laboratory studies in differentiating OCI with other inflammatory and non-inflammatory sacroiliac joint disorders [1, 4].

Treatments for OCI are primarily conservative through physiotherapy, non-steroidal anti-inflammatory medications, and steroid injections, with open surgical resection or sacroiliac arthrodesis being reserved for persistent cases [1, 5–7].

The aim of this retrospective study was to evaluate the results of a novel mini-invasive surgical approach for the refractory OCI after failure of conservative management.

Patients and methods

Fourteen cases between June 2008 and February 2012 were included in this study. All patients gave informed consent

M. A. Ayoub (✉)
Department of Orthopaedic Surgery and Traumatology,
Faculty of Medicine, University of Tanta, Al-Geish Street,
Tanta, Egypt
e-mail: maayoub@yahoo.com

prior to being included in the study, and the study was authorised by the local ethical committee and performed in accordance with the ethical standards of the 1964 Declaration of Helsinki as revised in 2000. Cases with high inflammatory parameters, positive HLA-27 testing or any other suspected pathology on computed tomography (CT) scans were excluded from the study. All cases had failure of conservative treatment for an average 12.5 ± 2.3 months (Table 1). All patients were females with an average age 35.5 ± 5.8 years. Nine cases were multiparous and five were nulliparous. According to the body mass index seven cases (50 %) were overweight. Multiparous patients started their complaints in the last months of their previous pregnancy; while nulliparous patients gave a history of repeated urinary tract infections. The pathology was bilateral in all cases; however, seven cases suffered bilateral symptoms, while seven cases had only unilateral complaints. Encountered symptoms were local pain in all cases, distal lumbosacral stiffness in ten cases and radiating posterior pain, in a non-radicular fashion, down to the ipsilateral knee in eight cases. No patients had any motor or sensory deficits. Although plain pelvis radiographs showed bilateral iliac side sclerosis of variable degrees in all cases, flexion-abduction-external rotation (FABER) test and local posterior iliac tenderness were positive only on the symptomatic sides. Computed tomography scans were mandatory for all cases to confirm: diagnosis by its triangular characteristic; bilaterality; integrity of the sacroiliac joints; to exclude other local lesions; to diagnose sacral side sclerosis; and to aid in the preoperative planning.

Mini-invasive procedure idea

The goal of the mini-invasive procedure is to decompress the symptomatic iliac bone sclerosis via multiple percutaneous cannulated drillings.

Surgical technique

All patients were operated upon in the supine position, under good quality image intensifier control for pelvic anteroposterior, inlet, and outlet views in addition to the acetabular obturator view. The instruments used were the cannulated drill bits for the 7-mm cannulated screws applied through the same entry points for the placement of iliosacral screws in pelvic injuries. The guide wires (three to five wires) were directed into the sclerosed iliac bone under image control. The cannulated drill bit was advanced over the first wire until it began to enter the sclerosed area, then the wire was withdrawn and thereafter the bit was advanced to enable adequate core decompression. Penetration of the sacroiliac joint was avoided through the conjoined outlet-obturator view image control. The process was repeated in the same way, after clearing the cannulated drill bit of its sclerosed bone content, over other guide wires until adequate decompression was achieved for the sclerotic area. Then simple skin stitches were applied. In bilateral conditions the whole procedure was repeated on the other side. The extracted bony tissues were very hard, stick-like ivory pieces without any gross evidence of soft tissue or purulent

Table 1 Demographic and perioperative data of the patients

Case no.	Age (years)	Weight (BMI)	Para	Symptomatic side(s)	Sacral side sclerosis	Conservative treatment duration (months)	Past history	Number of drilling	BASFI	
									Preoperative	At final follow up
1	26	Normal	Multipara	Right	Absent	12	2 deliveries	3	2.8	1.2
2	29	Over	Multipara	Both	Present	10	3 deliveries	5	4.2	1.5
3	33	Normal	Multipara	Both	Absent	14	3 deliveries	4	4.4	1.3
4	43	Over	Nulliparous	Both	Present	11	Recurrent UTI	3	4.1	1.6
5	34	Over	Multipara	Both	Present	13	3 deliveries	3	4.3	1.4
6	37	Under	Multipara	Left	Absent	10	4 deliveries	4	3.2	1.1
7	41	Under	Nulliparous	Right	Absent	12	Recurrent UTI	4	3.4	1.2
8	35	Over	Multipara	Both	Present	15	3 deliveries	5	4.5	1.4
9	42	Normal	Nulliparous	Right	Absent	12	Recurrent UTI	3	3.6	1.1
10	28	Normal	Multipara	Both	Absent	11	2 deliveries	4	3.8	1.3
11	39	Over	Nulliparous	Left	Absent	10	Recurrent UTI	3	3.2	1.1
12	36	Normal	Multipara	Left	Absent	18	3 deliveries	4	2.9	1
13	44	Over	Nulliparous	Right	Present	13	Recurrent UTI	4	3.1	1.2
14	30	Over	Multipara	Both	Absent	14	2 deliveries	5	4.2	1.4

BMI body mass index, UTI urinary tract infection, BASFI Bath ankylosing spondylitis functional index

materials content. They were not sent for either histopathological study or bacteriological culture.

Postoperative regime

The patients were encouraged to start early ambulation as soon as possible with the aid of physiotherapy. The clinical and radiological follow up was arranged every two months during the first six months postoperatively and thereafter every three months.

Evaluation of results

As the presentation of OCI is somewhat similar to early ankylosing spondylitis, the Bath ankylosing spondylitis functional index (BASFI) was used for functional outcome evaluation [8]. Statistical analysis was done using SPSS version 11.0.1 for Windows (SPSS Inc., Chicago, Illinois). The one-sample t-test was used for dependent variables means comparison, and t-test was applied for independent variables means comparison. One-way analysis of variance (ANOVA) test was used for more than two means comparison. A P -value ≤ 0.05 was considered to be statistically significant.

Results

The mean follow up of the cases was 23.3 ± 4.1 months (range 18–30); no case was lost during its review. The mean BASFI of all patients improved from 3.7 ± 0.6 preoperatively to 1.3 ± 0.2 during their follow up. This improvement was found to be of high statistical significance ($P < 0.001$).

The subjective satisfactory improvement was achieved, postoperatively, in a mean of 2.4 ± 0.6 months (range two to four). Radiating pain was the first to improve abruptly after surgery, followed by gradual simultaneous amelioration of local pain and stiffness. There was no relapse of the symptoms in any case; moreover, two multiparous cases conceived ten and twelve months after surgery without any recurrence.

The final BASFI showed no statistical significance among the different age groups, the different body mass indices, and the previous multiparous or nulliparous state (Table 2). However, it showed a high statistical significance in greater improvement among unilateral cases ($P < 0.001$). It showed also a statistical significance in less improvement among overweight cases ($P = 0.023$).

The different decompression drilling numbers did not significantly affect the final BASFI; nevertheless there was a significant improvement with the four drillings over five decompression drillings ($P = 0.011$). There was no significant difference ($P = 0.368$) between the three and four decompression drillings on the final outcome.

Sacral side sclerosis was encountered in five cases (35.7 %) (Fig. 1); although it was mild, its presence was associated significantly ($P = 0.009$) with less improvement in BASFI.

During radiological follow up, it was noted that the dense iliac sclerosis had begun to fade gradually in a mean of 6.6 ± 1.9 months (range four to ten) with stepwise bone remodelling around the decompression tunnels. However, 30 months postoperatively, very mild juxta-articular sclerosis could still be traced on the plain radiographs of two studied patients with the longest follow up duration (Fig. 2). The non-operated sides showed spontaneous remodelling in all related cases.

There were no substantial complications among the studied cases; however, two overweight cases had superficial wound infections.

Discussion

Low back pain is an extremely common complaint with a major social and economic impact. Among the numerous causes, we must not forget to consider OCI, especially in female patients during the fertile decades.

The diagnostic criteria of OCI were defined as unilateral or commonly bilateral radiographic sclerosis of the lower part of the iliac bone adjacent to a normal sacroiliac joint, predominantly in females with normal inflammatory parameters, negative HLA-B27 antigen, normal bone scan, and no bone destruction or erosion [1, 9]. These radiological and laboratory criteria in addition to the history and other clinical findings can differentiate it from similar conditions affecting the sacroiliac joint, such as ankylosing spondylitis, seronegative spondyloarthropathies, sacroilitis, primary hyperparathyroidism, Paget's disease, renal osteodystrophy, lymphoma and bone secondaries [1–3, 7, 10].

Although the prevalence of OCI is 1.6–2.5 % in literature, and usually it has a benign course, some cases are refractory to conservative management resulting in different degrees of disability [1, 3, 9, 10].

Osteitic iliac bone resection and sacroiliac arthrodesis are the management options for resistant cases in the literature [5–7]. However, these major procedures have many complications and unsatisfactory long-term results, especially with bilateral interference in young adult patients. Moreover, the indication for arthrodesis finds little favour with the orthopaedic surgeon as the sacroiliac joint is intact. Therefore, the novel approach in this study tries to attack the pathology of the iliac side through a minimally invasive technique without insult to the nearby normal sacroiliac joint or inducing iatrogenic posterior pelvic instability.

In this study, the BASFI improved significantly in all patients in a mean of 2.4 months after the mini-invasive

Table 2 Factors affecting clinical outcome

Factor		BASFI at final follow up		Statistical analysis	
Group	Subgroups	Mean	Standard deviation	Statistical value	P value
Age in years	21–30	1.350	0.129	0.676 ^a	0.528
	31–40	1.217	0.172		
	41–50	1.275	0.222		
Weight	Under	1.150	0.071	3.145 ^a	0.083
	Normal	1.180	0.130		
	Over	1.371	0.170		
Para	Multipara	1.289	0.162	−0.493 ^b	0.316
	Nulliparous	1.240	0.207		
Symptomatic side(s)	Unilateral	1.129	0.076	5.755 ^b	0.001
	Bilateral	1.414	0.107		
Number of drills	3 drills	1.280	0.217	2.622 ^a	0.117
	4 drills	1.183	0.117		
	5 drills	1.433	0.058		
Sacral side sclerosis	Absent	1.189	0.127	−3.082 ^b	0.009
	Present	1.420	0.148		

BASFI Bath ankylosing spondylitis functional index

^aThe *F* value of one-way analysis of variance test

^b*t* value of *t*-test

procedure without major complications or sacrificing the sacroiliac joint motion. Also, no relapse or disease progression was encountered in any cases, even the two cases who conceived after surgery.

The pathophysiology of OCI is unknown. It has been postulated that the gravid uterus may compress the abdominal aorta and cause ischemia in the inferior portion of the ilium; however, this has never been substantiated [11, 12]. Other studies have suggested that mechanical stress of pregnancy itself may overload the sacroiliac articulation and cause the disorder [3, 4]. Gillespie and Lloyd-Roberts described 21 cases, all occurring in females who had borne

children; they felt that the probable pathogenesis was an obliterative endarteritis that follows parturition [13]. An extension of this process to involve the nutrient artery supplying the affected region of the ilium could lead to ischaemic changes in the bone. Rendich and Shapiro have drawn attention to the constant position of a nutrient artery in the inferior juxta-articular region of the ilium, and this would account for the characteristic situation of the lesion [6]. Szabados reported five cases, in three of which there was evidence of a chronic urinary infection, while in another two cases a history of pyelitis was obtained. He considered that the renal and ureteric infection could spread to the nutrient foramina in the iliac bone leading to ischaemia [14].

According to this study's findings, ischaemic iliac bone necrosis is the main contributing hypothesis for OCI, as multiple core drillings, in a way similar to that of early hip avascular necrosis decompression, succeeded in abolishing the clinical complaints and reversing the ischaemic process. However, the histopathological difference between both anatomical sites favours complete creeping substitution of the iliac bone. The iliac bone is a huge store for the osteoprogenitor cells and growth factors that can be activated greatly after core decompression. On the other hand, fundamental research and clinical studies have shown that the number of bone progenitor cells in the uninvolved part of the necrosed femoral head and in the trochanteric region is less than normal [15–17].

No clear association between pregnancy and OCI has been shown in this study, as five nulliparous females with repeated urinary tract infection had also been afflicted with the disorder. This finding has been confirmed by many authors [1, 3]. However, all cases in this series were females; this could be related to prevalence of the risk factors

Fig. 1 Case no. 4. **a** The plain AP radiograph shows bilateral typical OCI with left side sacral sclerosis. **b** The axial CT scan that confirms diagnosis and shows normal sacroiliac joints. **c** The plain AP radiograph after one month of bilateral percutaneous three core decompressions. **d** Plain AP radiograph after 24 months shows almost complete remodelling of the posterior ilium in both sides

Fig. 2 Case no. 12. **a** The plain AP radiograph shows bilateral OCI with more left side affection; the right side was asymptomatic. **b** The axial CT scan that confirms more sclerosis on the symptomatic left side and negates the presence of sacral side sclerosis. **c** The AP plain radiograph after two months of left side percutaneous four core decompressions. **d** Pelvic outlet view after nine months shows complete remodelling of the bone around the most inferior core decompression tunnel, and partial remodelling around the superior tunnels. **e** AP plain radiograph after 12 months shows complete remodelling around the most superior tunnel. **f** AP view after 30 months shows almost complete bone remodelling on the operated side. The non-operated asymptomatic side had spontaneous remodelling

among them such as pregnancy and repeated urinary tract infection due to their short urethra.

Although sacral side sclerosis was mild in five cases, it was associated significantly with less BASFI improvement. This could be related to its association with all four overweight cases with bilateral symptomatic OCI.

Overweight cases had significantly less favourable BASFI in this study; this finding has been confirmed by many other studies [4, 7]. This could be related to increased strain on both joints with induction of sacral side sclerosis.

In this series, the three cases with five drillings had a significantly lower outcome than the other cases with four and three drillings. This could be explained by the increased iliac bone stress riser after five decompression drillings, especially in the overweight cases.

Although five cases, in this study, had a history of repeated urinary tract infection, no bacteriological culture was done for the extracted bone pieces, as their preoperative clinical examination, laboratory findings, and CT scans were enough to exclude posterior iliac bone osteomyelitis or infected sacroilitis. Also no case had a histopathological examination of its extracted bone, as OCI pathology was well documented in the literature. However, absence of the histopathological studies and bacteriological culture are prominent shortcomings of this study. Rendich and Shapiro obtained a biopsy specimen from one patient whose sections showed marked condensation of the osseous tissue with

obliteration of the lacunae. No osteoblasts or osteoclasts were seen. The marrow spaces contained an unusual number of myocytic and plasma cells. There were occasional depositions of lime salts in the condensed bone, occurring more or less parallel to the lamellae of the bone [6]. Hare and Haggart studied the biopsy specimens of two cases. The bony trabeculations were greatly increased in density, but the lacunae were still discernible. The bone marrow showed focal areas of fibrosis. There was osteoblastic activity in excess of the normal in the form of clumps of osteoblasts and occasional osteoclasts. These findings were thought to represent a low-grade, non-specific ischaemic process [11]. Gillespie and Lloyd-Roberts obtained a biopsy specimen from a patient with marked bilateral condensans ilii. They reported that the articular cartilage and ligaments were normal, and the main findings in the bone were of concentric osseous deposits, thickened lamellae and narrow Haversian canals [13].

All cases in this study had almost complete remodelling of both iliac bones. The symptomatic and more sclerosed sides responded greatly to core decompression; whereas, the asymptomatic non-operated sides had spontaneous regression. This finding confirms the literature, as some authors mentioned that sclerosis remains unchanged, where the more dense pathology needs interference, while others suggest that it reverses spontaneously when sclerosis is mild [9, 18, 19].

In spite of the small number of cases in this study, this novel approach can be of great benefit for refractory OCI cases with almost no added morbidity or complications. It has the

advantages of the mini-invasive techniques in addition to sparing of the physiological functions of the affected sacroiliac joints.

Conflict of interest The authors declare that they have no conflict of interest.

References

- Mitra R (2010) Osteitis condensans Ilii. *Rheumatol Int* 30(3):293–296. doi:[10.1007/s00296-009-1100-7](https://doi.org/10.1007/s00296-009-1100-7)
- Jenks K, Meikle G, Gray A, Stebbings S (2009) Osteitis condensans ilii: a significant association with sacroiliac joint tenderness in women. *Int J Rheum Dis* 12(1):39–43. doi:[10.1111/j.1756-185X.2009.01378.x](https://doi.org/10.1111/j.1756-185X.2009.01378.x)
- Cidem M, Capkin E, Karkucak M, Karaca A (2012) Osteitis condensans ilii in differential diagnosis of patients with chronic low back pain: a review of the literature. *Mod Rheumatol* 22(3):467–469. doi:[10.1007/s10165-011-0513-9](https://doi.org/10.1007/s10165-011-0513-9)
- Thompson M (1954) Osteitis condensans ilii and its differentiation from ankylosing spondylitis. *Ann Rheum Dis* 13(2):147–156
- Servodio Iammarrone C, Grillo G, Lalla E, Fazioli F (1989) Osteitis condensans ilii: therapy and diagnostic problems. Presentation of a case study. *Chir Organi Mov* 74(3–4):101–107
- Rendich RA, Shapiro AV (1936) Osteitis condensans ilii. *J Bone Joint Surg* 18:899–908
- Shipp FL, Haggart GE (1950) Further experience in the management of osteitis condensans ilii. *J Bone Joint Surg* 32A:841–847
- Calin A, Garrett S, Whitelock H, Kennedy LG, O’Hea J, Mallorie P, Jenkinson T (1994) A new approach to defining functional ability in ankylosing spondylitis: The development of the Bath ankylosing spondylitis functional index. *J Rheumatol* 21:2281–2285
- Rodríguez-Pla A, Moreno Muelas JV, Urgell JR, Benach JO, Roldós EA (2004) Osteitis condensans Ilii: a cause of low back pain? A case-controlled, retrospective study. *J Musculoskelet Pain* 12(2):65–70. doi:[10.1300/J094v12n02_08](https://doi.org/10.1300/J094v12n02_08)
- Thompson M, Newton DR, Grainger RG (1957) Discussion of the clinical and radiological aspects of sacro-iliac disease. *Proc R Soc Med* 50(10):847–858
- Hare HF, Haggart GF (1945) Osteitis condensans ilii. *J Am Med Assoc* 128:723–727
- Demy NG (1975) Letter: osteitis condensans ilii. *Lancet* 1(7916):1135–1136
- Gillespie HW, Lloyd-Roberts G (1953) Osteitis condensans. *Br J Radiol* 26:16–21. doi:[10.1259/0007-1285-26-301-16](https://doi.org/10.1259/0007-1285-26-301-16)
- Szabados MC (1947) Osteitis condensans ilii; report of three cases associated with urinary infection. *J Fla Med Assoc* 34(2):95–99
- Hernigou P, Manicom O, Pognard A, Nogier A, Filippini P, Abreu LD (2004) Core decompression with marrow stem cells. *Oper Tech Orthop* 14:68–74. doi:[10.1053/j.oto.2004.03.001](https://doi.org/10.1053/j.oto.2004.03.001)
- Gangji V, Hauzeur JP, Schoutens A, Hinsenkamp M, Appelboom T, Egrise D (2003) Abnormalities in the replicative capacity of osteoblastic cells in the proximal femur of patients with osteonecrosis of the femoral head. *J Rheumatol* 30(2):348–351
- Hernigou P, Beaujean F, Lambotte JC (1999) Decrease in the mesenchymal stem-cell pool in the proximal femur in corticosteroid-induced osteonecrosis. *J Bone Joint Surg Br* 81(2):349–355
- Olivieri I, Gemignani G, Pasero G (1990) Ankylosing spondylitis with exuberant sclerosis in the sacroiliac joints, symphysis pubis and spine. *J Rheumatol* 17:1515–1519
- Olivieri I, Gemignani G, Camerini E, Semeria R, Pasero G (1990) Computed tomography of the sacroiliac joints in four patients with Behçet’s syndrome—confirmation of sacroilitis. *Br J Rheumatol* 29(4):264–267. doi:[10.1093/rheumatology/29.4.264](https://doi.org/10.1093/rheumatology/29.4.264)