Original Article
Epidemiological study on postpartum osteitis condensans ilii and efficacy of extracorporeal shock wave therapy for treating this disease

Xinghua Zhou, Ruirui Sun, Ying Zhang
Health Management Center, Binzhou People’s Hospital, Binzhou, Shandong Province, China
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Abstract: Objective: We aimed to conduct an epidemiological study on osteitis condensans ilii (OCI) during the postpartum period and investigate the efficacy of extracorporeal shock wave therapy (ESWT) for treating this disease. Methods: A total of 560 women who had child delivery in Binzhou People’s Hospital were selected as subjects. Of them, 68 women with postpartum OCI were randomized to either the study group or the control group of 34 cases each. Patients in the control group were given usual treatment, whereas patients in the study group underwent ESWT. Epidemiologic features of OCI in these women were analyzed, and the efficacy and safety of the treatment were investigated. A three-month follow up was conducted to compare patient satisfaction between the groups. Results: The incidence rate of OCI among 560 subjects was 12.14% (68 cases). The lesion was unilateral in 43 women (63.24%) and bilateral in 25 women (36.76%). The total effective rate in the study group was higher than that in the control group (P=0.026). After treatment, both groups exhibited improved results assessed by Visual Analogue Scale and Japan Orthopaedic Association scores (all P<0.05), but the improvements in the study group were greater than those in the control group (P<0.001, P=0.032); also, the study group showed greater remission rates of symptoms than the control group (all P<0.05). Meanwhile, occasional mild adverse reactions occurred similarly in the two groups (all P>0.05). After a three-month follow-up, we found a higher patient satisfaction rate in the study group than in the control group (P=0.032). Conclusion: OCI has a high prevalence in women during postpartum period. ESWT, which can achieve good treatment outcome, can serve as a safe and reliable method for treating women with this disease.

Keywords: Postpartum, osteitis condensans ilii, extracorporeal shock wave, efficacy, epidemiology

Introduction
Osteitis condensans ilii (OCI) is a nonspecific inflammatory response due to an increase in bone density in the auricular joint between ilium and sacrum [1]. The disease can be unilateral or bilateral, and sacroiliac joint pain is the main clinical manifestation. OCI has a high prevalence in young and middle-aged women and is especially common in women after childbirth. In recent years, the incidence of OCI in women during the postpartum period has been increasing. This condition can make patients feel pain in the lumbosacral area and can induce and even exacerbate postpartum depression or anxiety, which severely affects the physical and emotional health of the patients and brings a burden to their families [2, 3].

Currently, non-steroidal anti-inflammatory drugs including Celebrex are often used for the symptomatic treatment of postpartum OCI, and sacroiliac joint block or hormone therapy is performed in some severe cases [4]. However, women during the puerperium and lactation period are usually reluctant to take medicines for the treatment. Thus, finding a non-drug therapy is essential for this population. Extracorporeal shock wave therapy (ESWT) is a non-invasive and non-surgical procedure. It can block the pain signal transmission of nociceptive fibers and induce the generation of endogenous pain-relieving substances in the lesion to increase the pain threshold and to relieve the pain. It is believed that ESWT can achieve good clinical outcome in treating the pain and dysfunction in the bones and joints of the
extremities. Some studies have revealed that this technique can bring satisfactory results in the management of non-union of bone, delayed fracture healing, early-stage osteonecrosis of the femoral head, and early or middle-stage knee osteoarthritis [5-7]. Due to advancements in electromagnetic medical technology, ESWT can now be safely applied for pain management in the sacroiliac joint area [8]. Yang et al. reported a safe and effective result achieved by ESWT in treating OCI, but their study did not demonstrate the efficacy of this method in women during the postpartum period [9]. Therefore, in order to provide more guidance for the prevention and treatment of OCI after pregnancy and labor, we conducted an epidemiological study and investigated the efficacy of ESWT in women with postpartum OCI.

Materials and methods

Participants

A total of 560 women who were admitted to Binzhou People’s Hospital for child delivery between Jan 2017 and Dec 2017 were selected for the epidemiological study. Of them, 68 women had postpartum OCI and were randomized to either the study group or the control group of 34 cases each. Patients in the control group received routine medical treatment, whereas patients in the study group underwent ESWT.

Criteria for the inclusion of patients with OCI: 1) women who had OCI within 100 days after child delivery and had positive tests of Patrick sign, straight leg raising, and pelvic separation [1]; 2) patients who had lesions in ilium adjacent to the sacroiliac joint on X-ray imaging and experienced occasional pain in low back and lumbo-sacral region as well as local tenderness; 3) patients who signed informed consent.

Exclusion criteria: 1) patients with osteoporosis, ankylosing spondylitis, reactive arthritis, rheumatoid arthritis, or osteoarthritis; 2) patients who had tumors; 3) patients with severe heart, liver, or kidney diseases; 4) patients who were unwilling to cooperate with the treatment.

The study was approved by the Ethics Committee of Binzhou People’s Hospital, and informed consent was obtained from all participants and their family members.

Methods

Data collection and diagnosis: Information including demographic characteristics, course of the disease, and educational background of 560 subjects was collected. Women were screened for OCI by performing tests of Patrick sign, straight leg raising, and pelvic separation; the patients with OCI were given treatment accordingly.

Treatment: The patients in the control group took Celebrex (Pfizer Pharmaceuticals LLC, USA) orally twice a day (200 mg each time); and the patients in the study group underwent ESWT. During ESWT, patients were instructed to lie in prone position to receive shock wave centering on the tender point of the sacroiliac joint and the iliac lesion as detected by X-ray (ESWT equipment model: RH-CJB-C, Rehamaster, Henan, China). The intensity of the shock wave was based on the actual tolerance in patients. The shock wave frequency was 90 times/min, and 5,000 times was applied on a single side. The patients received ESWT twice a week for three weeks as one course of treatment [10].

Evaluation of the treatment

Efficacy: The following criteria were used to determine the efficacy of the treatment: 1) patients were healed if the symptoms including pain in the low back and lower extremities were gone, patients could move the extremities freely, and no iliac bone lesion was observed on X-ray imaging; 2) the treatment was markedly effective if patients’ symptoms were almost gone, the pain in the low back and lower extremities were greatly reduced, the patients could move the extremities freely, and the iliac bone lesion disappeared on X-ray imaging; 3) the treatment was effective if patients’ symptoms were greatly relieved, the pain in the low back and lower extremities were greatly reduced, the patients had better range of motion in lower extremities, and the iliac bone lesion was greatly decreased on X-ray imaging; 4) the treatment was ineffective if patients’ symptoms were not alleviated or even aggravated after treatment [11-13]. The total effective rate was calculated using the following formula: total effective rate = (total number of cases - number of ineffective cases)/total number of cases × 100%.
Clinical symptoms and disease severity: Clinical symptoms were observed before and after treatment in the two groups including percussion pain and tenderness at sacroiliac joint, difficulty in leg raising, and difficulty in lumbar-sacral twisting. The pain level was defined using the Visual Analogue Scale (VAS) before and at 1, 2, and 3 weeks after treatment. The scale was scored from 0 to 10 points, with 0 point representing no pain and 10 points representing an excruciating pain.

Assessment of low back pain: Low back pain was assessed using the Japan Orthopaedic Association (JOA) low back pain score [14]. The total score was 29 points. A score of <10 points indicated a poor result, a score of 10-15 points indicated a fair result, a score of 16-24 points indicated a good result, and a score of ≥25 points indicated an excellent result. The improvement rate was calculated using the following formula: improvement rate = (number of good results + number of excellent results)/total number of cases × 100%.

Adverse reactions and patient satisfaction: During the treatment, patients’ adverse reactions were recorded including tissue edema, hemorrhage, gastrointestinal reaction, and proliferative responses. Patient satisfaction was also evaluated.

Statistical analysis
SPSS 19.0 software (SPSS Inc., Chicago, IL, USA) was applied for statistical analysis. Measurement data are expressed as mean ± standard deviation (sd), and comparison between groups was performed by t-test. Count data are presented as percentage, and differences between groups were compared by χ² test. Ranked data was examined by rank-sum test. P<0.05 indicated a statistically significant difference.

Results

Epidemiological data
Results of the epidemiological study showed that the incidence rate of postpartum OCI was 12.14% among the subjects, and the disease was highly prevalent in women aged above 30 years (80.88%). The lesion was unilateral in 43 cases (63.24%) and bilateral in 25 cases (36.76%). See Table 1.

Baseline data
There were no intergroup differences in the baseline data including age, course of the disease, BMI, and educational background (all P>0.05, Table 2).

Efficacy
After one course of treatment, the study group had a higher total effective rate than the control group (P=0.026, Table 3).

VAS score
Compared to the control group, the patients in the study group had lower pain level assessed by VAS score after treatment (all P<0.001, Table 4 and Figure 1).

JOA score
At the end of follow-up, the patients in the study group achieved better results defined by the JOA score than those in the control group (P=0.032, Table 5).

Adverse reactions
No intergroup differences were observed in the incidences of the adverse reactions (P>0.05, Table 6).

Remission of clinical symptoms
After treatment, the patients in the study group had greater remission rates of clinical symp-
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Table 2. Baseline data in the two groups (n (%))

<table>
<thead>
<tr>
<th></th>
<th>Control group (n=34)</th>
<th>Study group (n=34)</th>
<th>t/χ²</th>
<th>P</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age range (year)</td>
<td>23-40</td>
<td>23-41</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Age (x ± sd, year)</td>
<td>32.6±3.4</td>
<td>32.9±3.4</td>
<td>0.352</td>
<td>0.726</td>
</tr>
<tr>
<td>Range of the disease course (month)</td>
<td>3-6</td>
<td>3-5</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Course of disease (x ± sd, month)</td>
<td>4.13±1.76</td>
<td>4.08±1.58</td>
<td>0.123</td>
<td>0.902</td>
</tr>
<tr>
<td>BMI</td>
<td>23.36±2.73</td>
<td>23.74±2.58</td>
<td>0.590</td>
<td>0.557</td>
</tr>
<tr>
<td>Puerpera</td>
<td>0.117</td>
<td>0.732</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Primipara</td>
<td>30</td>
<td>28</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Multipara</td>
<td>4</td>
<td>6</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Patient satisfaction

Patients in the study group had a higher satisfaction rate with the treatment than those in the control group (97.06% vs. 76.47%, P=0.032, Table 8).

Discussion

Postpartum OCI is a benign lesion characterized by increased bone density in ilium adjacent to the sacroiliac joint. The disease can induce Sjogren’s syndrome, ankylosing spondylitis, and rheumatoid arthritis if treatment is not given appropriately, which can severely affect patients’ quality of life and bring a bur-
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Table 5. JOA score in the two groups (n, %)

<table>
<thead>
<tr>
<th></th>
<th>Excellent result</th>
<th>Good result</th>
<th>Fair result</th>
<th>Poor result</th>
<th>Improvement rate</th>
<th>z</th>
<th>P</th>
</tr>
</thead>
<tbody>
<tr>
<td>Study group (n=34)</td>
<td>18 (52.94)</td>
<td>10 (29.41)</td>
<td>5 (14.71)</td>
<td>1 (2.94)</td>
<td>82.35</td>
<td>2.168</td>
<td>0.032</td>
</tr>
<tr>
<td>Control group (n=34)</td>
<td>9 (26.47)</td>
<td>9 (26.47)</td>
<td>13 (38.24)</td>
<td>3 (8.82)</td>
<td>52.94</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Note: JOA, Japan Orthopaedic Association.

Table 6. Adverse reactions in the two groups (n, %)

<table>
<thead>
<tr>
<th>Reaction</th>
<th>Tissue edema</th>
<th>Gastrointestinal reaction</th>
<th>Proliferative response</th>
<th>Hemorrhage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Study group (n=34)</td>
<td>1 (2.94)</td>
<td>2 (5.88)</td>
<td>0 (0.00)</td>
<td>0 (0.00)</td>
</tr>
<tr>
<td>Control group (n=34)</td>
<td>3 (8.82)</td>
<td>4 (11.76)</td>
<td>1 (2.94)</td>
<td>1 (2.94)</td>
</tr>
<tr>
<td>$\chi^2$</td>
<td>0.266</td>
<td>0.183</td>
<td>0.001</td>
<td>0.001</td>
</tr>
<tr>
<td>P</td>
<td>0.606</td>
<td>0.669</td>
<td>0.999</td>
<td>0.999</td>
</tr>
</tbody>
</table>

Table 7. Remission of clinical symptoms in the two groups (n, %)

<table>
<thead>
<tr>
<th>Symptom</th>
<th>Difficulty in leg raising</th>
<th>Percussion pain at sacroiliac joint</th>
<th>Tenderness at sacroiliac joint</th>
<th>Difficulty in lumbosacral twisting</th>
</tr>
</thead>
<tbody>
<tr>
<td>Study group (n=34)</td>
<td>1 (2.94)</td>
<td>0 (0.00)</td>
<td>0 (0.00)</td>
<td>1 (2.94)</td>
</tr>
<tr>
<td>Control group (n=34)</td>
<td>8 (23.53)</td>
<td>6 (17.65)</td>
<td>6 (17.65)</td>
<td>9 (26.47)</td>
</tr>
<tr>
<td>$\chi^2$</td>
<td>4.610</td>
<td>4.570</td>
<td>4.570</td>
<td>5.745</td>
</tr>
<tr>
<td>P</td>
<td>0.032</td>
<td>0.033</td>
<td>0.033</td>
<td>0.017</td>
</tr>
</tbody>
</table>

Table 8. Patient satisfaction in the two groups (n, %)

<table>
<thead>
<tr>
<th>Satisfaction level</th>
<th>Very satisfied</th>
<th>Satisfied</th>
<th>Unsatisfied</th>
<th>Total satisfactory rate</th>
</tr>
</thead>
<tbody>
<tr>
<td>Control group (n=34)</td>
<td>16 (47.06)</td>
<td>10 (29.41)</td>
<td>8 (23.53)</td>
<td>76.47</td>
</tr>
<tr>
<td>Study group (n=34)</td>
<td>26 (76.47)</td>
<td>7 (20.59)</td>
<td>1 (2.94)</td>
<td>97.06</td>
</tr>
<tr>
<td>$\chi^2$</td>
<td></td>
<td></td>
<td></td>
<td>4.610</td>
</tr>
<tr>
<td>P</td>
<td></td>
<td></td>
<td></td>
<td>0.032</td>
</tr>
</tbody>
</table>

Note: Total satisfactory rate = (number of patients who were very satisfied + number of patients who were satisfied)/total number of patients × 100%.

Of the 560 women investigated in our study, 68 (12.14%) were diagnosed with postpartum OCI, and most of the lesions were unilateral (63.24%). Moreover, the disease was highly prevalent in women aged above 30 years (80.88%). The onset of OCI can take place between the end of labor and several months after labor. This is because the pregnancy and delivery can induce the sacroiliac joint tear, and the hormone changes and gravity of the fetus during the late stage of pregnancy can increase the lumbosacral angle and cause the anterior-inferior tilt of the pelvis, which can tighten the ligament attached to the ilium and affect the blood supply to ilium. At the early stage of OCI, there can be local congestion, edema, and increase in exudation in the lesion; at the later stage, local proliferative response and degeneration can occur, and the lesion becomes sclerotic as the collagen fibers get densified. Meanwhile, the blood vessel wall can be thickened, and the vessel occlusion can lead to ischemia and hypoxia in auricular portion in ilium, thereby causing bone sclerosis [20].

Clinically, non-steroidal anti-inflammatory drugs are often used for treating OCI, and in some severe cases, a sacroiliac joint block may be performed [21]. However, conventional medical treatment is not highly acceptable to the woman during puerperium period, as they are not yet fully recovered from child delivery physically and emotionally, and some women need to breastfeed infants. Also, medicine alone cannot fully remove the pain and dysfunction in patients, and the symptoms can reoccur easily after patients stop taking the...
medications [22]. Due to the development of electromagnetic ESWT, it is now feasible to apply ESWT for sacroiliac joint treatment with less blast injury to peripheral nerves of the spine [23]. The results of our study showed that the total effective rate was higher in the study group than in the control group after one course of treatment. The higher effective rate of ESWT may result from the mechanical shock effect by electromagnetism, which can decrease intraosseous pressure, remove the inflammation in joints, promote blood circulation, and improve vegetative nerve function [24].

Furthermore, our study showed that compared to the control group, the study group achieved more improvements assessed by VAS and JOA scores and greater remission rates of symptoms after treatment. Occasional mild adverse reactions occurred similarly in the two groups. These results may be explained by the fact that the cavitation effect produced by ESWT through electromagnetism can help to reset subluxated joints caused by articular ligament injuries during the labor and can reduce the pain arising from local muscle spasm [25]. The shock wave in ESWT can induce blood vessel expansion, improve blood circulation, and promote new bone formation, thereby achieving the pain-relieving effect [26]. Moreover, the local high-intensity shock can greatly stimulate the nerve endings around the joint and lower their responses, thus blocking the nerve conduction and producing analgesia. In this way, patients’ conditions can be quickly controlled by the combined use of ESWT and medicine [27]. Furthermore, a three-month follow-up revealed that the patients undergoing ESWT had higher satisfaction rates than those receiving normal medications.

In conclusion, OCI is highly prevalent in women during the postpartum period, and ESWT can be recommended for the clinical treatment of OCI in this population, as the therapy can markedly relieve the pain, increase patient satisfaction, and improve the quality of life. However, since our study was a retrospective, single-center trial with a small sample size and a short follow-up period, the effect of ESWT on postpartum OCI cannot be fully demonstrated due to possible bias. Therefore, a multicenter trial with a larger sample size and a longer follow-up period needs to be conducted in the future for further verification.

Disclosure of conflict of interest

None.

Address correspondence to: Xinghua Zhou, Health Management Center, Binzhou People’s Hospital, No. 386 Huanghe Eighth Road, Bincheng District, Binzhou 256600, Shandong Province, China. Tel: +86-0543-3307735; E-mail: zhouxinghuabz1h@163.com

References

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