Case Series

Intrapelvic Obturator Internus Muscle Injections: A Novel Fluoroscopic Technique

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The obturator internus (OI) muscle is important in adult chronic noninfectious pelvic, perineal, gluteal, and retrotrochanteric pain syndromes. Evaluation and management of these patients' pain can be challenging because of the complex anatomy of this region, broad differential diagnosis, and lack of specific physical examination findings. Consequently, several clinicians have advocated the use of image guided injections to assist in the accurate diagnosis of OI-related symptoms and provide symptomatic relief to affected patients. We present 2 case series describing a novel fluoroscopically guided contrast controlled transpectineal approach to intrapelvic OI injections. Unlike prior fluoroscopically guided OI injection techniques, the approach described in the present 2 cases utilized multiple standard pelvic views, thus facilitating optimal needle positioning in three-dimensional space. This technique utilized standard fluoroscopic pelvic views to accurately measure needle depth within the pelvic cavity permitting the bulk of the OI to be injected in a controlled and safe fashion. The first patient underwent a left intrapelvic OI muscle injection with bupivacaine 0.25% and 40 mg methylprednisolone. The average pre- and postprocedural visual analog pain scale scores were 5 out of 10 and 2 out of 10, respectively, with a self-reported 75% pain reduction. The second patient underwent a right intrapelvic OI muscle injection with bupivacaine 0.25% and 40 mg methylprednisolone. The average pre- and postprocedural visual analog scale scores were 8 out of 10 and 1 out of 10, respectively, with a self-reported 90% pain reduction. Larger scale studies should be undertaken to evaluate the therapeutic efficacy and generalized accuracy of this technique.

Key words: Obturator internus muscle, pelvic, perineal, gluteal, retrotrochanteric pain, fluoroscopic, transpectineal

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Multiple recently published reports have emphasized the importance of the obturator internus (OI) muscle in adult chronic noninfectious pelvic, perineal, gluteal, and retrotrochanteric pain syndromes (1-15). Evaluation and management of these patients' pain can be challenging because of the complex anatomy of this region, broad differential diagnosis, and lack of specific physical examination findings (1-8). There appears to be considerable overlap between signs and symptoms arising from the OI and other potential pain generators in this region, including the piriformis and leveator ani (1-7,10,16-23). Additionally, pudendal or sciatic nerve irritation have been associated with OI dysfunction due to the close proximity of the OI with these nerves (1,3-6). Furthermore, magnetic resonance imaging (MRI) findings do not appear to preclude symptoms arising from the OI (5,7,9-10). Consequently, several clinicians have advocated the use of injections to assist in the accurate diagnosis of OI-related symptoms and provide symptomatic relief to affected patients (1,2,6-8,16,17).

Injection of the OI muscle can be challenging due to its small anatomical size, deep location, and prox-

imity to important neurovascular structures (6,8,17,24). Thus, the use of image guidance has been recommended to improve accuracy and to reduce risk (1,24). Image guided OI-specific injections have been reported by clinicians using fluoroscopy with contrast control, ultrasound (US), computed tomography (CT), and MRI; however, only fluoroscopy and ultrasound techniques have been specifically described in the literature (6-8,17,25).

The OI is one of 6 external rotator muscles of the hip and comprises both intra- and extrapelvic portions (5,18-20,26-28). The OI originates within the pelvis at the medial surface of the pubis and along the obturator foramen (OF) and its membrane, a membrane that encloses all but the superior border of the pubis and ischium. Thus, the OI is broad in origin with the bulk of the OI being located intrapelvically along the medial ischial wall (6,8,16,26-28). The OI tapers to a narrow tendon as it exits the pelvis through the lesser sciatic foramen by sharply curving around the posterior ischium, then courses lateral passing deep to the sciatic nerve towards its common insertion with the superior and inferior gemelli on the medial greater tronchanter (1,3,6,16,17,26-28). Of note, the fascia on the medial aspect of the OI muscle contributes to the formation of the pudendal canal and nerve that provides sensorium to the perineal nerve and dorsal nerve of the penis or clitoris (6,29-30).

To date there exist 2 fluoroscopically guided contrast controlled OI injections specifically described in the literature. Dalmau-Carolà (17) provided a case report detailing an extrapelvic transgluteal OI injection performed in prone position using the center of the ramus ossis ischii (ischial ramus forming part of the OF) as the injection target. Gajraj (6) also provided a case report; however, detailing an intrapelvic transgluteal OI injection that was performed in prone position, but used the lateral border of the OF (inferior to the ischial spine) as the injection target. Both clinicians confirmed needle placement with iohexol injection.

The purpose of this 2 case series is to describe a novel fluoroscopically guided contrast controlled transpectineal approach to intrapelvic OI injections.

Case Description #1

At presentation, the patient was a 27-year-old woman with complaints of a 1.5 year history of chronic pelvic floor pain, mainly located deep and left of the public symphysis with some radiation to the hip. The pain was rated on average at a level of 5 out of 10 on a visual analog scale. The pain was aggravated by intercourse, sitting (especially with legs crossed), and riding horses, and mildly improved with pelvic floor physical therapy (PT). Prior workup, including a cystoscopy, laparoscopy, and MRI were non-diagnostic. In the past the patient had trialed numerous medications as well as receiving a ganglion impar block, pubic symphysis injection, and an intravaginal botulinun toxin A injection with little benefit. On physical examination, the patient exhibited superior and left lateral pubic symphysis pain with palpation, as well as tenderness in the retrotronchanteric region posteriorly. A vaginal exam was not performed at that time but had been performed by a previous physician and revealed tenderness at the left posterolateral region.

The patient underwent a left intrapelvic OI muscle injection with bupivacaine 0.25% and 40 mg methylprednisolone. The average pre- and postprocedural visual analog pain scale scores were 5 out of 10 and 2 out of 10, respectively, with a self-reported 75% pain reduction.

Case Description #2

At presentation, the patient was a 53-year-old man with complaints of a 5 week history of sharp constant right-sided perineal, testicular, and penile pain. The pain initially began one year prior after a right total hip replacement that was initially found to be an OI muscle hematoma by CT. Gradually, this healed and the pain resolved until 5 weeks prior to the current presentation, when the patient experienced an intense return of the aforementioned symptoms after physical therapy. The pain was rated on average a level of 8 out of 10 on a visual analog scale. The pain was aggravated by sitting and walking, and mildly improved with oxycodone. Prior injections included 2 pudendal nerve blocks with no relief.

The patient underwent a right intrapelvic OI muscle injection with bupivacaine 0.25% and 40 mg methylprednisolone. The average pre- and postprocedural visual analog scale scores were 8 out of 10 and 1 out of 10, respectively, with a self-reported 90% pain reduction.

Procedure Description

The patient was placed in supine position. Standard monitors were applied consisting of electrocardiogram, pulse oximetry, temperature, end tidal C02, and an automated blood pressure device. Skin was prepped with povidone-iodine solution and draped in a sterile fashion. Fluoroscopy was used to optimally visualize the OF in the outlet view of the pelvis by placing the C-arm

Fig. 1. *Fluoroscopy showing the needle insertion site used with the finder probe positioned slightly radial from the center of the obturator foramen (OF) at the 6 o'clock position in the outlet view of the pelvis. This view is obtained by placing the C-arm approximately 60 degrees caudad from the AP position. PS, pubic symphysis; SPR, superior pubic ramus; IPR, inferior pubic ramus; IT, ischial tuberosity; Ac, acetabulum; FH, femoral head.*

Fig. 2. *Fluoroscopy shown here evaluating needle depth in the inlet view of the pelvis. This view is obtained by placing the C-arm approximately 40 degrees cephalad from the AP position and manipulating the angle until the superior and inferior pubic rami (PR) overlap. InP, intrapelvic; PS, pubic symphysis; Ac, acetabulum; FH, femoral head.*

approximately 60 degrees caudad from the anteroposterior (AP) position (31). Skin and subcutaneous tissues were anesthetized using 0.5% lidocaine. With an aseptic technique and transpectineal approach, a 22-gauge 3.5 inch spinal needle was inserted perpendicular to the skin slightly radial from the center of the OF at the 6 o'clock position (Fig. 1). Fluoroscopy was then used to square the OF for needle depth visualization by placing the C-arm approximately 40 degrees cephalad from the AP position and lining up the superior and inferior pubic rami until they overlapped, known as the inlet view of the pelvis (Fig. 2) (31). The needle was then advanced 2 – 3 mm beyond the posterior edge of OF. While in the inlet view, needle placement was evaluated by injecting 1 mL of iohexol and visualizing the presence of the presumed intrapelvic OI contrast pattern (contrast tracking posterolaterally along the medial ischial wall towards the posterior ischial tuberosity; Fig. 3). This contrast pattern was additionally evaluated in the AP view of the pelvis (Fig. 4) and lastly the outlet/obturator oblique Judet view of the pelvis (attained by arcing the C-arm approximately 45 degrees lateral from the outlet view of the pelvis; Fig. 5). Finally, 40 mg methylprednisolone

Fig. 3. *Fluoroscopy showing the presumed intrapelvic (InP) OI contrast pattern (contrast tracking posterolaterally along the medial ischial wall towards the posterior ischial tuberosity) in the inlet view of the pelvis. This view is obtained by placing the C-arm approximately 40 degrees cephalad from the AP position and manipulating the angle until the superior and inferior pubic rami (PR) overlap. InP, intrapelvic; PS, pubic symphysis; Ac, acetabulum; FH, femoral head.*

Fig. 4. *Fluoroscopy showing the presumed intrapelvic OI contrast pattern in the AP view of the pelvis. OF, obturator foramen; PS, pubic symphysis; SPR, superior pubic ramus; IPR, inferior pubic ramus; IT, ischial tuberosity; Ac, acetabulum; FH, femoral head.*

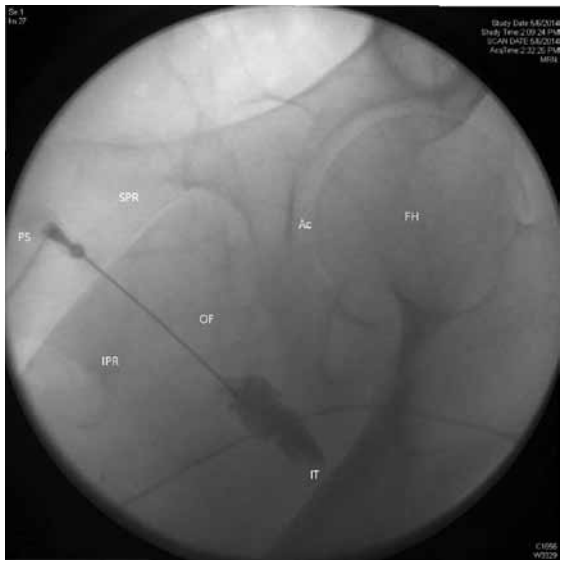

Fig. 5. *Fluoroscopy showing the presumed intrapelvic (InP) OI contrast pattern in the outlet/obturator oblique Judet view of the pelvis. This view is obtained by arching the C-arm approximately 45 degrees lateral from the outlet view of the pelvis. OF, obturator foramen; PS, pubic symphysis, SPR, superior pubic ramus; IPR inferior pubic ramus; Ac, acetabulum; FH, femoral head.*

in 4 mL 0.25% bupivacaine was injected.

Discussion

Over the past 20 years, fluoroscopy has revolutionized many medical treatment options for pain, including OI-related pain syndromes (32-48). It should be noted that for OI-related pain syndrome, as with so many other pain related states, the use of fluoroscopy to ensure correct needle placement for accurate delivery of injectate is critical for success (32-55).

Unlike prior fluoroscopically guided OI injection techniques, the approach described in the present 2 cases utilized multiple standard pelvic views, thus facilitating optimal needle positioning in three-dimensional space. The primary advantage of fluoroscopy in this technique was the ability to square the OF. This was achieved by lining up the superior and inferior pubic rami until they overlapped while in the inlet view of the pelvis. This enabled accurate needle depth within the pelvic cavity, thereby permitting the bulk of the OI (intrapelvic portion) to be injected in a controlled and safe fashion. Furthermore, the use of fluoroscopy enhances the viability of this technique in obese patients and reduces the risks associated with landmark-based approaches. Utilization of standard views enhances the reproducibility and generalizability of fluoroscopically guided OI injections and should be considered in future descriptions when applicable.

Since fluoroscopic images were obtained with the patient in supine position, a transpectineal approach was employed to reach the intrapelvic portion of the OI. This approach is especially helpful in populations with physical limitations, such as elderly and obese patients.

It is important to be aware of certain neurovascular bundles when performing this technique. By targeting the more medially located intrapelvic portion of the OI, the sciatic neurovascular bundle can be safely avoided. The obturator neurovascular bundle runs within the superior portion of the OF and was avoided by positioning the needle slightly radial from the center of the OF at the 6 o'clock position. Lastly, the femoral neurovascular bundle lies just anterolaterally to the OF and should be identified and avoided prior to needle insertion.

Intra- versus extrapelvic OI muscle pathologies have been previously theorized and Sang Chul Lee et al (2) suggested that the intrapelvic portion was responsible for pelvic floor pain and the extrapelvic portion for gluteal/retrotronchanteric pain. Both cases discussed in this study presented with pelvic floor pain and were treated successfully with intrapelvic OI injections. Smith

et al (1) demonstrated that intrapelvic OI injections delivered injectate into both the intra- and extrapelvic portions, surmising that injection of the largest part of the muscle facilitated injectate flow along the muscle and within its sheath to the extrapelvic region. Thus, performing an intrapelvic injection could theoretically treat a greater degree of OI-related pathologies.

It is important to highlight the limitations of these 2 cases. First, the primary focus of this investigation was technical and not clinical. A full discussion outlining the differential diagnosis of pelvic, gluteal, and retrotrochanteric pain, as well as the identification and management of patients with suspected OI-related pain, is beyond the scope of this report. Secondly, this was a clinical case series of 2 patients, and a larger-scale investigation to evaluate therapeutic efficacy is necessary in addition to an investigation demonstrating the feasibility and generalized accuracy of this technique. Thirdly, research has suggested that contrast patterns in this region can be misleading, and ideally the fluoroscopic appearance of an accurate intra-OI contrast pattern needs to be validated (24).

Conclusion

In summary, the OI muscle is gaining importance in adult chronic noninfectious pelvic, perineal, gluteal, and retrotrochanteric pain syndromes. Evaluation and management of these patients' pain can be challenging, with many clinicians advocating the use of injections to assist in the diagnosis and treatment of OI-related pathologies. Image guided OI-specific injections have been reported in the literature by clinicians using fluoroscopy, US, CT, and MRI. These 2 cases described a novel fluoroscopically guided contrast controlled transpectineal approach to intrapelvic OI injections with positive results. The essential utilization of multiple standard fluoroscopic pelvic views enabled accurate needle depth within the pelvic cavity thereby permitting the bulk of the OI to be injected in a controlled and safe fashion. Larger scale studies should be undertaken to evaluate the therapeutic efficacy and generalized accuracy of this technique.

Disclaimer

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Conflict of interest

Each author certifies that he or she, or a member of his or her immediate family, has no commercial association (i.e., consultancies, stock ownership, equity interest, patent/licensing arrangements, etc.) that might pose a conflict of interest in connection with the submitted manuscript.

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