

Multicenter Outcomes of Endoscopic Pubic Symphysectomy for Osteitis Pubis Associated With Femoroacetabular Impingement

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Purpose: To investigate outcomes of athletic patients treated with concurrent femoroacetabular impingement (FAI) and osteitis pubis (OP) surgery including endoscopic pubic symphysectomy. **Methods:** We performed a multicenter retrospective case series of 7 consecutive adult patients (4 men) with a mean age of 33 years with symptomatic FAI and OP who underwent arthroscopic surgery for the former and endoscopic pubic symphysectomy for the latter with a mean follow-up period of 2.9 years (range, 2.0 to 5.0 years). The visual analog scale (VAS) score, the Non-Arthritic Hip Score (NAHS), and patient satisfaction were measured. Complications and revision surgical procedures were reported, and preoperative and postoperative radiographs were assessed. **Results:** The mean preoperative VAS score of 6.7 (range, 4 to 8) improved to a mean postoperative VAS score of 1.5 (range, 0 to 7) ($P = .03$). The mean preoperative NAHS of 50.2 points (range, 21 to 78 points) improved to a mean postoperative NAHS of 84.7 points (range, 41 to 99 points) ($P = .03$). The mean patient satisfaction rating was 8.3 (range, 3 to 10). Two male patients had postoperative scrotal swelling that resolved spontaneously. There were no other complications. Preoperative and postoperative radiographs showed no anterior or posterior pelvic ring instability. One patient underwent pubic symphyseal arthrodesis because of continued pain. **Conclusions:** Endoscopic pubic symphysectomy is a minimally invasive treatment for athletic OP with encouraging early outcomes that may be performed concurrently with surgery for FAI in co-afflicted patients. **Level of Evidence:** Level IV, therapeutic case series.

Osteitis pubis (OP) is a relatively well-known painful affliction of the pubic symphysis that may occur in athletic patients.¹ It is considered one of several pathologic conditions encompassing athletic pubalgia.^{2,3} Patients may have central pubic and/or medial groin pain that is associated with high-agility activities such as running, kicking, or cutting and that may be exacerbated by resisted hip adduction or rectus

abdominis contraction.¹ The pain, disability, and classic waddling gait seen in OP may resolve with nonsurgical management (e.g., sport modification, relative rest, nonsteroidal anti-inflammatory or analgesic medications, physical therapy, and cortisone injections)⁴⁻⁶; however, the “conservative” treatment course is typically protracted. Athletic patients, especially male patients, may be afflicted for 9.5 months or more with a 25% recurrence rate⁷ and may continue to have recalcitrant pain and disability.

Athletic pubalgia in general and OP in particular have been associated with femoroacetabular impingement (FAI).⁸ In a recent study of National Football League prospects, radiographic evidence of OP and FAI was seen in 53.6% and 90% of prospects, respectively.⁹ There is some evidence that a secondary stress transfer from restricted hip motion in FAI may be causative.^{10,11} For patients in whom either conservative treatment fails or there is a desire for a potential earlier return to sport (or both), surgical options include wedge resection,¹² arthrodesis,¹³ percutaneous mesh grafting,¹⁴ open pubic symphyseal curettage,¹⁵ and most recently, endoscopic pubic symphysectomy,¹⁶ developed by the senior author

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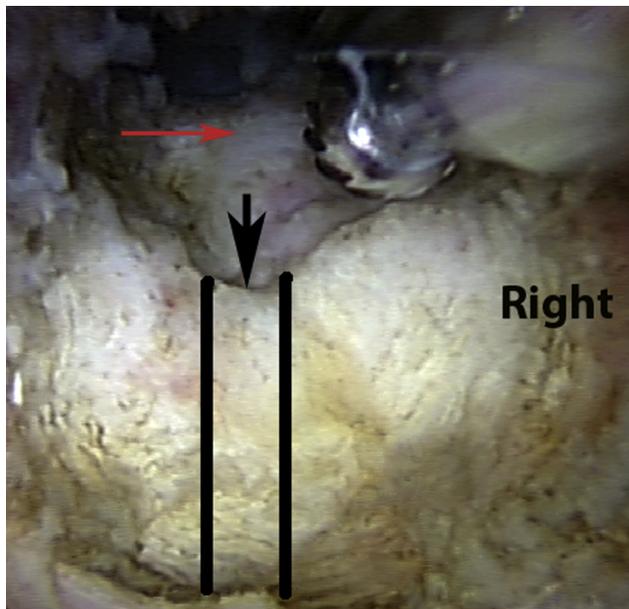


Fig 1. Endoscopic view from suprapubic portal with a 30° arthroscope during pubic symphysectomy with a 4-mm burr (outer sheath removed) to enable removal of fibrocartilage and pubic endplates. One should note the ossified pubic symphysis (black arrow) and bone spur (red arrow) in this case.

(D.K.M.). In the typical setting of FAI and athletic pubalgia, there is support for surgical treatment of both conditions to optimize outcomes.¹⁷

The purpose of this study was to investigate outcomes of athletic patients treated with concurrent FAI and OP surgery including endoscopic pubic symphysectomy. We hypothesized that these patients would show clinical improvement on patient-reported outcome measures and satisfaction.

Methods

This multicenter retrospective study was performed by 3 separate high-volume hip specialty surgeons (D.K.M., M.R., B.G.D.) in the United States and Spain from December 2008 to June 2012. All patients who underwent endoscopic pubic symphysectomy with a minimum of 2 years' follow-up were studied (3 from Los Angeles, 2 from Chicago, and 2 from Barcelona), and all of these patients had undergone concomitant surgery for coexisting symptomatic FAI. The inclusion criteria were adult patients with symptomatic OP and FAI (1 or both hips) with both conditions failing conservative treatment (rest, sport modification, nonsteroidal anti-inflammatory drugs, steroid injections into hip and pubic symphysis), as well as completion of a visual analog scale (VAS) score for pain, the Non-Arthritic Hip Score (NAHS), and a postoperative satisfaction rating on a 10-point scale (where 1 indicates highly dissatisfied and 10 indicates highly satisfied). The exclusion criteria included prior surgery of either hip or pubic symphysis, recent or

current infection, pregnancy, or follow-up of less than 24 months. Postoperative radiographs including anteroposterior pelvis standing and flamingo views¹⁸ (with more than 2 mm of vertical translation defined as radiographic instability) were obtained and reviewed for all patients. Complications and revision surgical procedures were obtained by medical record review.

Endoscopic Pubic Symphysectomy

After arthroscopic or mini-open surgery for FAI (e.g., acetabuloplasty, labral refixation, and femoroplasty) and after re-draping and sterile preparation of the pubic region, outpatient dual-portal endoscopic surgery was performed with the patient in the supine lithotomy position under hypotensive general anesthesia. An indwelling urethral catheter was used, not only because of the longer cumulative operative time but also for bladder decompression to minimize the risk of iatrogenic damage. Initial anteroposterior fluoroscopic spot imaging was used to confirm the pubic symphyseal location. Two midline portals were made, one 2 cm proximal to the palpable superior border of the pubic symphysis (suprapubic portal) and one directly anterior to the midlevel of the pubic symphysis (anterior portal). The anterior and superior aspects of the pubic symphysis were endoscopically visualized with a 30° arthroscope after initial removal of the overlying bursal tissue. After demarcation of the area of planned resection on the anterior surface of the pubic symphysis with a radiofrequency probe, pubic symphysectomy was performed (Fig 1) with a 4-mm unhooded round burr from anterior to posterior under endoscopic visualization with intermittent fluoroscopic guidance. A retractable sheath burr (Retractable Sheath Hip Burr; Smith & Nephew, Andover, MA) is an option. The resection was somewhat wider anteriorly than

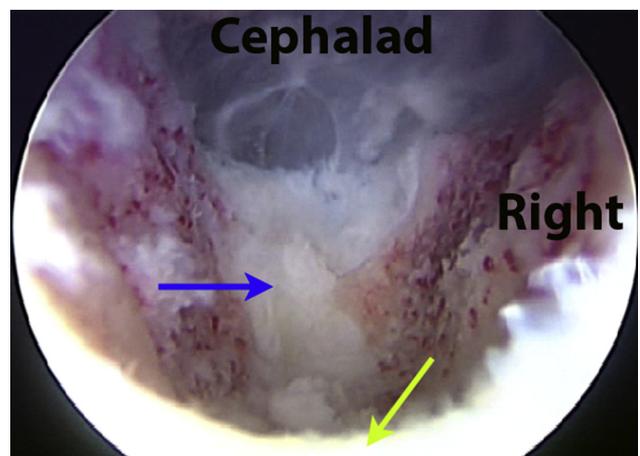


Fig 2. Endoscopic view toward completion of endoscopic pubic symphysectomy with retention of arcuate ligament (yellow arrow) and posterior capsule and ligaments (blue arrow).

Table 1. Patient Demographic Data and Preoperative Findings

	Age, yr	Sex	BMI, kg/m ²	Pubalgia*	Groin Pain*	Pubic TTP*	Symptom Duration, mo	Preoperative Treatments	PS Injection Response*
Patient A	46	M	26.1	+++	++	+++	19	AM, PT, NSAIDs, Inj	++
Patient B	26	M	23.8	+++	+++	+++	5	AM, PT, NSAIDs, Inj	++
Patient C	44	M	23.7	+++	+++	+++	25	AM, PT, NSAIDs, Inj	+++
Patient D	19	F	19.9	+++	+	+++	32	AM, PT, NSAIDs, Inj	+
Patient E	28	M	24.9	+++	+++	++	26	AM, PT, NSAIDs, Inj	++
Patient F	31	F	22.8	+++	++	++	23	AM, PT, NSAIDs, Inj	+++
Patient G	35	F	26.2	+++	++	+++	17	AM, PT, NSAIDs, Inj	++

AM, activity modification; BMI, body mass index; F, female; Inj, injection; M, male; NSAIDs, nonsteroidal anti-inflammatory drugs; PT, physical therapy; PS, pubic symphysis; TTP, tenderness to palpation.

*One plus sign indicates small; 2 plus signs, medium; 3 plus signs, large.

posteriorly. Endoscopic resection of the anterior capsule, pubic symphyseal fibrocartilage, and subchondral endplates was performed while the deep (posterior) and thick arcuate (inferior) ligaments were preserved (Fig 2). The indwelling catheter was removed after routine portal closure.

All procedures were performed as outpatient surgery, and postoperative rehabilitation included initial weight bearing as tolerated with 2 crutches (1 to 2 weeks) and early exercise cycling with minimal resistance. Gradual advancement to running was permitted at approximately 3 months postoperatively and return to sport at 5 months or later.

Statistical Analysis

Nonparametric statistical analysis was performed with the Wilcoxon signed rank test with a 2-tailed hypothesis and significance level set at .05.

Results

The mean preoperative VAS score of 6.7 (range, 4 to 8) improved to a mean postoperative VAS score of 1.5 (range, 0 to 7) ($P = .03$). The mean preoperative NAHS of 50.2 points (range, 21 to 78 points) improved to a mean postoperative NAHS of 84.7 points (range, 41 to 99 points) ($P = .03$). The mean patient satisfaction rating was 8.3 (range, 3 to 10). The mean length of follow-up was 2.9 years (range, 2.0 to 5.0 years). Two

male patients had postoperative scrotal swelling that resolved spontaneously after 2 and 14 days. There were no other complications. Preoperative and postoperative radiographs showed no anterior or posterior pelvic ring instability. No patients were excluded; however, 1 patient underwent revision surgery in the form of pubic symphyseal arthrodesis because of continued pain and did not complete the postoperative patient-reported outcome measures. Key demographic data and preoperative findings are summarized in Table 1. Key findings related to FAI are summarized in Table 2. Outcomes are summarized in Table 3 and Figures 3-6.

Discussion

The main finding of this study is the encouraging outcomes of co-afflicted patients undergoing concurrent less invasive surgical procedures for both OP and FAI. Typical improvement after arthroscopic FAI surgery is an approximately 20-point improvement in the NAHS, whereas the patients in this series had a mean improvement of almost 35 points. Admittedly, a quantitative improvement of 15 points cannot be attributed to endoscopic pubic symphysectomy; however, the decrease in pubic pain and the mean satisfaction rating, along with the improved NAHS, suggest a qualitative clinical contribution from concurrent endoscopic pubic symphysectomy. Moreover, endoscopic pubic symphysectomy nicely complements less

Table 2. Concurrent FAI Findings and Procedures

	Side	Cam FAI	Pincer FAI	Femoroplasty	Acetabuloplasty	Labral Treatment	Other
Patient A	R	X (97°)	X (42°)	X	X	Refix	MicroFx
Patient B	R	X (58°)	X (27°)	X	X	Refix	
Patient C	R	X (73°)	X (29°)	X	X	SD	IR
Patient D	L	X (95°)	X (37°)	X	X	SD	
Patient E	R	X (78°)	X (38°)	X	X	Refix	
Patient F	B	X (69°, 67°)	X (35°, 34°)	X	X	Refix	
Patient G	L	X (76°)	X (36°)	X	X	Refix	

NOTE. For Cam FAI, the numbers in parentheses are alpha angles. For Pincer FAI, the numbers in parentheses are the center-edge angle, with all patients exhibiting positive crossover signs.

FAI, femoroacetabular impingement; IR, iliopsoas release; L, left; MicroFx, microfracture; R, right; Refix, refixation; SD, selective debridement.

Table 3. Patient Outcomes

	Age, yr	Sex	FU, yr	VAS Score		NAHS		Complications	Satisfaction Rating	Revision
				Preop	Postop	Preop	Postop			
Patient A	46	M	3.5	4	1	61	96		10	
Patient B	26	M	2	5	0	78	99		10	
Patient C	44	M	2.8	8	0	30	100	Scrotal swelling	10	
Patient D	19	F	2.1	7	0	70	84		7	
Patient E	28	M	2.2	8	7	21	41	Scrotal swelling	3	
Patient F	31	F	5	8	1	41	88		10	
Patient G	35	F	2.4							Arthrodesis
Mean	32.3		2.9	6.7	1.5	50.2	84.7		8.3	

F, female; FU, follow-up; M, male; NAHS, Non-Arthritic Hip Score; Postop, postoperative; Preop, preoperative; VAS, visual analog scale.

invasive procedures (arthroscopic or mini-open) when performed in co-afflicted patients.

Currently, no consensus exists as to the best operative procedure to treat recalcitrant OP. A recent systematic review of studies mainly with Level IV evidence was unable to determine whether curettage, mesh, or pubic bone stabilization procedures gave significantly better outcomes regarding pain relief and functional outcome.¹⁸ There was no convincing evidence of one surgical procedure being significantly better than the others in terms of pain relief and functional outcome. In a recent notable study that was not included in the aforementioned systematic review, open pubic symphysis curettage was found to provide satisfactory outcomes in athletes who either had recalcitrant OP or simply did not want to wait protracted lengths of time with more conservative measures.¹⁴ More recently, 2 small case series have reported safe and successful preliminary outcomes after isolated pubic symphyseal curettage using open techniques with arthroscopic assistance.^{19,20}

Because of the prevalence of athletic patients co-afflicted with OP and FAI seen in our practices, we chose to treat recalcitrant patients with simultaneous surgery for both conditions.¹⁷ Although Larson et al.¹⁷ reported a 50% success rate in this patient population

with FAI surgery alone, 89% of patients had successful outcomes with surgery for both conditions. It can be hypothesized that some of the observed overall clinical improvement could be attributable to the concomitant FAI operation with decreased stress transfer to the pubic symphyseal region. Surgical treatment of only athletic pubalgia without treating coexisting FAI yielded the poorest outcomes. We recommend either concurrent surgery for FAI and OP or initial surgery for FAI, reserving possible OP surgery if central pubic pain persists. Furthermore, FAI surgery may lessen the risk or severity of degenerative consequences from its untreated state.

Scrotal swelling from endoscopic fluid extravasation was an acute and transient complication in 2 patients. In 1 case the scrotum was observed postoperatively to be the size of a volleyball. The scrotal swelling resolved in both patients after 2 and 14 days, but 1 patient continues to have occasional testicular pain with a negative urologic workup. These cases occurred in patients who also underwent arthroscopic rather than mini-open FAI surgery; however, the small patient study size precludes establishment of a protective effect from the latter approach. To minimize fluid extravasation, we recommend using the lowest arthroscopic pump pressures needed for adequate endoscopic

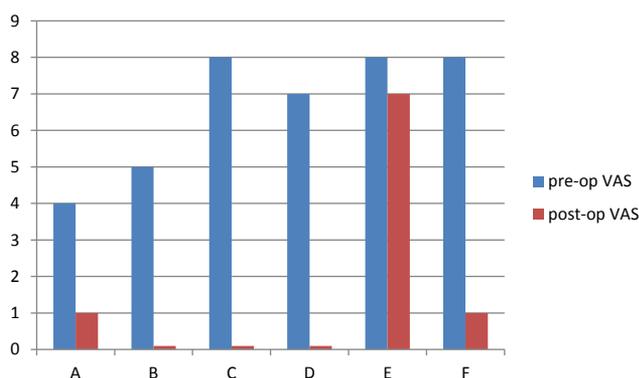


Fig 3. Bar graph showing preoperative (pre-op) and latest postoperative (post-op) visual analog scale (VAS) score for patients A through F.

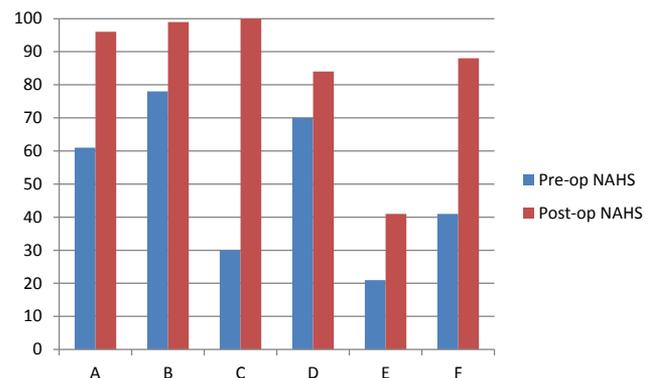


Fig 4. Bar graph showing preoperative (Pre-op) and latest postoperative (Post-op) Non-Arthritic Hip Score (NAHS) for patients A through F.

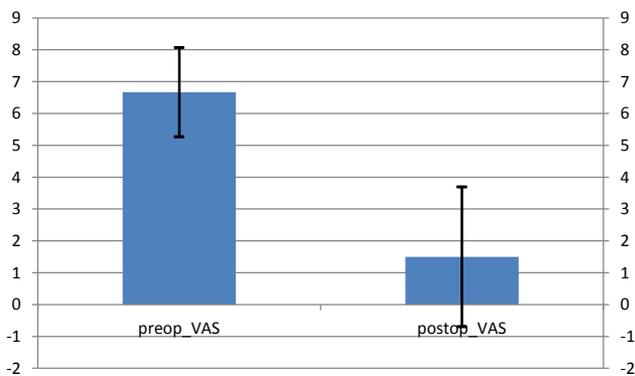


Fig 5. Bar graph showing mean preoperative (preop) and postoperative (postop) visual analog scale (VAS) score for pain with standard error of mean.

visualization; an acromioplasty study suggested that 41 mm Hg may provide sufficient endoscopic visualization if the systolic blood pressure is 90 mm Hg.²¹ Dry endoscopy with intermittent fluid irrigation may be a feasible alternative to prevent this complication.

There was 1 revision that involved a 35-year-old woman who underwent elective pubic symphyseal arthrodesis after failed postoperative measures including hip and pubic symphysis injections for continued postoperative pain. She exhibited no evidence of anterior or posterior (sacroiliac) instability on weight-bearing and flamingo views.²² Moore et al.²³ reported delayed posterior instability at 18 and 20 years after wedge resection surgical procedures. We emphasize the importance of preserving the inferior arcuate ligament as a primary stabilizer. Moreover, preservation of the posterior capsule and ligaments aids stability while protecting the underlying bladder during endoscopic pubic symphysectomy.

Although the majority of patients (n = 5) had significant clinical improvement and were satisfied with the outcome from endoscopic pubic symphysectomy and FAI surgery, 2 were not. There were no independent predictors of poorer outcomes. Along with emerging successful outcomes from arthroscopic-

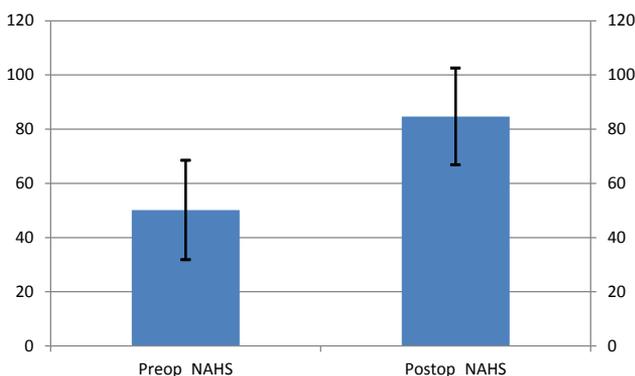


Fig 6. Bar graph showing mean preoperative (Preop) and postoperative (Postop) Non-Arthritic Hip Score (NAHS) with standard error of mean.

assisted open curettage,^{18,19} the findings of this study suggest that there may be a role for endoscopic pubic symphysectomy with concomitant FAI surgery in the patient co-afflicted with athletic OP and FAI.

Limitations

There are several imitations to this study including the small size and retrospective design lacking a control cohort. The contribution of concomitant procedures from FAI surgery to the outcomes is another limitation; however, we believe that the study group with co-existing FAI and OP may be more common than isolated OP. The NAHS may be of limited use as an isolated outcome measure, being designed for the hip and not central pubic symptoms/function. The VAS adds a generalized measure of patient-assessed pain; however, in this study it was not limited to central pubic pain.

Conclusions

Endoscopic pubic symphysectomy is a minimally invasive treatment for athletic OP with encouraging early outcomes that may be performed concurrently with surgery for FAI in co-afflicted patients.

References

- Hiti CJ, Stevens KJ, Jamati MK, Garza D, Matheson GO. Athletic osteitis pubis. *Sports Med* 2011;41:361-376.
- Meyers WC, McKechnie A, Philippon MJ, Horner MA, Zoga AC, Devon ON. Experience with "sports hernia" spanning two decades. *Ann Surg* 2008;248:656-665.
- Meyers WC, Yoo E, Devon O, et al. Understanding "sports hernia" (athletic pubalgia)—The anatomic and pathophysiologic basis for abdominal and groin pain in athletes. *Oper Tech Sports Med* 2007;15:165-177.
- Pizzari T, Coburn PT, Crow JF. Prevention and management of osteitis pubis in the Australian Football League: A qualitative analysis. *Phys Ther Sport* 2008;9:117-125.
- Holt MA, Keene JS, Graf BK, Helwig DC. Treatment of osteitis pubis in athletes. Results of corticosteroid injections. *Am J Sports Med* 1995;23:601-606.
- O'Connell MJ, Powell T, McCaffrey NM, O'Connell D, Eustace SJ. Symphyseal cleft injection in the diagnosis and treatment of osteitis pubis in athletes. *AJR Am J Roentgenol* 2002;179:955-959.
- Fricker PA, Taunton JE, Ammann W. Osteitis pubis in athletes. Infection, inflammation or injury? *Sports Med* 1991;12:266-279.
- Voos JE, Mauro CS, Kelly BT. Femoroacetabular impingement in the athlete: Compensatory injury patterns. *Oper Tech Orthop* 2010;20:231-236.
- Larson CM, Sikka RS, Sardelli MC, et al. Increasing alpha angle is predictive of athletic-related "hip" and "groin" pain in collegiate National Football League prospects. *Arthroscopy* 2013;29:405-410.
- Verrall GM, Hamilton IA, Slavotinek JP, et al. Hip joint range of motion restriction precedes athletic chronic groin injury. *J Sci Med Sport* 2005;8:77-84.

11. Verrall GM, Slavotinek JP, Barnes PG, Esterman A, Oakeshott RD, Spriggins AJ. Hip joint range of motion restriction precedes athletic chronic groin injury. *J Sci Med Sport* 2007;10:463-466.
12. Grace JN, Sim FH, Shives TC, Coventry MB. Wedge resection of the symphysis pubis for the treatment of osteitis pubis. *J Bone Joint Surg Am* 1989;71:358-364.
13. Williams PR, Thomas DP, Downes EM. Osteitis pubis and instability of the pubic symphysis. When nonoperative measures fail. *Am J Sports Med* 2000;28:350-355.
14. Radic R, Annear P. Use of pubic symphysis curettage for treatment-resistant osteitis pubis in athletes. *Am J Sports Med* 2008;36:122-128.
15. Paajanen H, Heikkinen J, Hermunen H, et al. Successful treatment of osteitis pubis by using totally extraperitoneal endoscopic technique. *Int J Sports Med* 2005;26:303-306.
16. Matsuda DK. Endoscopic pubic symphysectomy for recalcitrant osteitis pubis associated with bilateral femoroacetabular impingement. *Orthopedics* 2010;33.
17. Larson CM, Pierce BR, Giveans MR. Treatment of athletes with symptomatic intra-articular hip pathology and athletic pubalgia/sports hernia: A case series. *Arthroscopy* 2011;27:768-775.
18. Choi H, McCartney M, Best TM. Treatment of osteitis pubis and osteomyelitis of the pubic symphysis in athletes: A systematic review. *Br J Sports Med* 2011;45:57-64.
19. Hopp SJ, Culemann U, Kelm J, Pohlemann T, Pizanis A. Osteitis pubis and adductor tendinopathy in athletes: A novel arthroscopic pubic symphysis curettage and adductor reattachment. *Arch Orthop Trauma Surg* 2013;133:1003-1009.
20. Hechtman KS, Zvijac JE, Popkin CA, Zych GA, Botto-van Bemden A. A minimally disruptive surgical technique for the treatment of osteitis pubis in athletes. *Sports Health* 2010;2:211-215.
21. Morrison DS, Schaefer RK, Friedman RL. The relationship between subacromial space pressure, blood pressure, and visual clarity during arthroscopic subacromial decompression. *Arthroscopy* 1995;11:557-560.
22. Garras DN, Carothers JT, Olson SA. Single-leg-stance (flamingo) radiographs to assess pelvic instability: How much motion is normal? *J Bone Joint Surg Am* 2008;90:2114-2118.
23. Moore RS Jr, Stover MD, Matta JM. Late posterior instability of the pelvis after resection of the symphysis pubis for the treatment of osteitis pubis. A report of two cases. *J Bone Joint Surg Am* 1998;80:1043-1048.