

Clinical Presentation and Outcomes Associated With Fabellectomy in the Setting of Fabella Syndrome

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Background: Clinical outcomes pertaining to isolated lateral fabellectomy in the setting of fabella syndrome are limited to small case reports at this time.

Purpose: To assess the most common presenting symptoms, clinical outcomes, and satisfaction after fabella excision in the setting of fabella syndrome.

Study Design: Case series; Level of evidence, 4.

Methods: Consecutive patients with a minimum of 21-month follow-up after isolated fabellectomy for fabella syndrome were reviewed retrospectively. Clinical outcome scores of the following domains were collected: Western Ontario and McMaster Universities Osteoarthritis Index (WOMAC) score and Lysholm knee survey, along with a simple numeric patient satisfaction score (range, 1-10; 10 = "very satisfied"). Statistical analysis was performed using paired *t* tests for all clinical outcome data.

Results: A total of 11 isolated fabella excisions were included in 10 patients with isolated lateral-sided knee pain in the setting of fabella syndrome (8 males, 2 females), with a mean age of 36.9 years (range, 23-58 years) and a mean follow-up of 2.4 years (range, 21-47 months). A total of 8 patients (80%) were able to return to full desired activities, including sports. Only 5 of 11 (45%) excisions had concomitant lateral femoral condyle cartilage pathology. There were significant improvements across multiple WOMAC domains, and the WOMAC total score improved from 28.5 ± 17.6 preoperatively to 11.6 ± 10.2 postoperatively ($P < .05$). Lysholm scores significantly improved from 66.6 ± 23.1 preoperatively to 80.2 ± 13.9 postoperatively ($P = .044$). Overall patient-reported satisfaction was 8.8 ± 1.6 .

Conclusion: Fabella excision in the setting of fabella syndrome demonstrated improvements in clinical outcome scores, high rate of returning to preinjury level of activities, and low risk of complications or need for additional surgical procedures.

Keywords: fabella syndrome; knee injury; painful fabella; posterolateral knee pain; sesamoid bone; outcomes

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The fabella is a sesamoid bone embedded within the lateral gastrocnemius tendon, being present in 20% to 87% of people.^{3,4,9} The fabella can be variably ossified or purely cartilaginous and can be a persistent source of pain regardless of its ossification status.^{8,10} Furthermore, the presence of a fabella is notably higher in the Asian population.²

Fabella syndrome involves a constellation of symptoms that typically encompass intermittent posterolateral knee pain in the setting of knee extension (compression of the fabella against the lateral femoral condyle) as well as pain with aerobic activities such as running and cycling.^{6,10,11} Acute injuries with associated pain and pathology can be recognized within 6 weeks, but, conversely, a delay in diagnosis (>6 weeks) can occur in the chronic setting both with and without an inciting mechanism. The clinical picture typically consists of focal tenderness and possible localized swelling of the posterolateral gastrocnemius origin on physical examination with the presence of an osseous fabella on plain radiographs, which is often overlooked.^{1,7}

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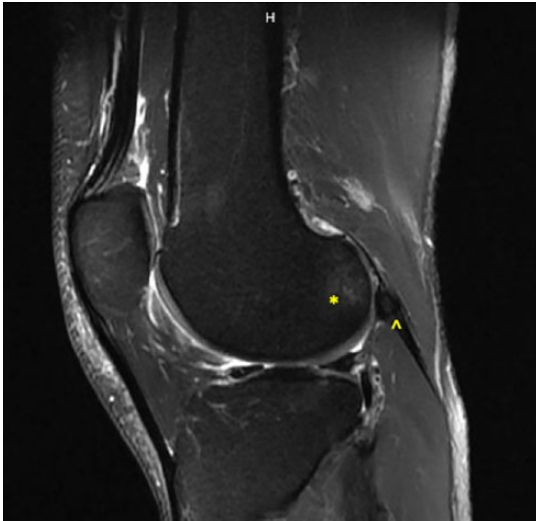


Figure 1. Moderate thickening of the lateral gastrocnemius tendon with intrasubstance edema (^) and posterolateral subchondral edema (*).

Obtaining magnetic resonance imaging (MRI) is essential for ruling out other possible sources of lateral knee pain, which can also include chondral pathology that may be the result of fabella impaction. Furthermore, other MRI findings can demonstrate thickening of the lateral gastrocnemius tendon, inflammation, and grooving of the lateral femoral condyle cartilage, best seen on axial or sagittal MRI sequences (Figure 1), because of its articulation with the fabella.

Management of fabella syndrome includes nonoperative management followed by operative intervention if nonoperative management fails. Nonsurgical management consists of activity modification, rest, immobilization,¹⁰ physician-guided physical therapy,¹ and corticosteroid injections into the local area.¹⁰ Both open and arthroscopically assisted fabella excision procedures have been described, but longitudinal follow-up studies are currently lacking in the literature.^{7,10} Therefore, the purpose of this study was to report on the clinical characteristics and outcomes of patients after an arthroscopically assisted fabella excision in the setting of fabella syndrome.

METHODS

Study Design

This study was exempt from institutional review board approval. Data were retrospectively gathered from patients who underwent an arthroscopically assisted fabella excision for a diagnosis of fabella syndrome performed by a single surgeon (R.F.L.) between January 2011 and March 2017. In all included patients, a diagnosis of isolated fabella syndrome was made under the care period of the senior author (R.F.L.). Standard radiographs and MRIs were obtained on all patients to rule out concomitant pathology and to confirm the presence of either a bony or a

cartilaginous fabella. Fabella syndrome was made as a diagnosis of exclusion after all other pathology had been ruled out. Additionally, characteristic MRI findings and tenderness to direct palpation of the fabella aided in diagnosing isolated fabella syndrome. Inclusion criteria consisted of patients who underwent arthroscopically assisted fabella excision with a minimum 21-month follow-up.

Surgical Technique

All included patients underwent an arthroscopically assisted fabella excision with thorough evaluation of the posterolateral femoral condyle according to a previously described technique.⁷ An 8- to 10-cm oblique incision was made in the midline of the lateral thigh, centered over the joint line extending to the Gerdy tubercle. The iliotibial band was incised in line with its fibers 2 cm anterior to its posterior border (taking note to always remain anterior to the long head of the biceps femoris tendon to avoid iatrogenic injury to the common peroneal nerve [CPN]). The triangular interval between the biceps femoris (posterior and inferior), lateral gastrocnemius origin (posterior and superior), and posterior capsule was exposed with the use of blunt dissection while also using a Cobb elevator to release adhesions between the posterolateral joint capsule and lateral gastrocnemius tendon. The fabella was easily palpated at the junction of the posterolateral capsule and the gastrocnemius tendon.

Knee arthroscopy was carried out with the use of standard anterolateral and anteromedial viewing portals with the use of both a 30° and 70° arthroscope. After this, a spinal needle was used to demarcate the margins of the fabella to avoid over-resection of the surrounding tissues under direct visualization arthroscopically. The fabella was then secured with an allis clamp and excised through the lateral incision sharply with a 15-blade scalpel under direct arthroscopic visualization attempting to minimize the volume of the lateral gastrocnemius tendon and lateral capsule that was removed. Incisions were closed in a standard layered fashion.

Postoperative Rehabilitation Protocol

After surgery, all patients were weightbearing as tolerated on the operative extremity with the use of crutches until they could ambulate without a limp; crutches were typically required for a total of 2 weeks. A knee brace was not used, and there were no restrictions on knee range of motion postoperatively. Physical therapy began on postoperative day 1, with focus on edema control, patellar mobility, and quadriceps activation exercises. Stationary cycling began at 6 weeks postoperatively, and patients were allowed to progress with resistance training exercises as knee swelling permitted. Return to full activities typically occurred around 3 to 4 months postoperatively, ensuring adequate time for the capsule and soft tissue to heal.

TABLE 1
Patient Characteristics^a

Patient	Age, y	Sex	Laterality	BMI, kg/m ²	Chronicity ^b	LFC Defect ^c	CPN	Bone (B) or Cartilaginous (C) Fabella
1	41	Male	Right	27	Chronic	No	No	B
2	54	Male	Left	25.6	Chronic	Yes	No	B
3	58	Female	Left	25.1	Chronic	Yes	No	C
4	26	Female	Left	22	Chronic	No	Yes	C
5	31	Male	Right	28.2	Chronic	No	No	B
6	22	Male	Right	27	Chronic	Yes	No	B
6	23	Male	Left	27	Chronic	Yes	No	C
7	39	Male	Left	25.1	Chronic	Yes	No	B
8	35	Male	Right	24.8	Chronic	No	Yes	C
9	33	Male	Right	20.7	Acute	No	No	C
10	31	Male	Left	21.2	Chronic	No	No	B

^aBMI, body mass index; CPN, common peroneal nerve; LFC, lateral femoral condyle.

^bPresentation chronicity defined by acute (symptoms ≤ 6 weeks) and chronic (>6 weeks).

^cConcomitant LFC defect requiring operative treatment.

Patient-Reported Outcomes, Failures, and Complications

All patients who underwent arthroscopically assisted fabella excision with a minimum 21-month follow-up were administered subjective questionnaires either at routine follow-up appointments or by email as part of a routine standard of care at the home institution, which included the following clinical outcome measures: Lysholm score, the Western Ontario and McMaster Universities Osteoarthritis Index (WOMAC) score, and patient satisfaction. Comparison was performed against preoperative outcome scores, which are collected as a routine practice for every surgical patient of the senior surgeon (R.F.L.). Patient satisfaction was measured on a scale from 1 to 10, with 10 being “very satisfied” and 1 being “very unsatisfied.” Additionally, patients reported their ability to return to all activities and sports participated in before surgery, with these data being obtained from chart review at routine follow-up visits. Patient characteristics were recorded, including age, sex, body mass index (BMI), cartilage status, and chronicity, and any reported injury was recorded from surgical and clinical notes. CPN pathology, which has been associated in prior case reports,⁵ was also recorded. Owing to the retrospective study design, CPN neuropathy was reported as a binary data point (0 = no, 1 = yes), and the extent of sensorimotor deficits could not be described in detail. Surgical failure was defined as any patient requiring revision surgery for recurrent lateral-sided knee pain. Complications were recorded, including reintervention surgery, continued complaints of CPN neuropathy, deep vein thrombosis, or arthrofibrosis requiring a lysis of adhesion surgery, and were identified through chart review.

Statistical Analysis

Pre- and postoperative outcome scores were compared with 2-tailed paired-sample *t* tests, and significance was

set at an alpha level of $P < .05$. Unless otherwise noted, means \pm SD were reported. All statistical analyses were performed by use of SPSS Version 9.4 (SPSS).

RESULTS

Patient and Clinical Characteristics and Reported Complications/Failures

Characteristics of patients diagnosed with fabella syndrome refractory to nonoperative management are presented in Table 1. Patient data were collected between 2011 and 2017, with 10 of 11 (91%) patients available for final follow-up at a mean 2.4 years postoperatively (range, 21-47 months). One patient did not complete postoperative questionnaires and was lost to follow-up. A total of 11 fabellas were excised in 10 patients with complete follow-up. The mean age of this cohort was 36.9 ± 11.5 years. The mean BMI of this cohort was 24.8 ± 2.5 kg/m². All but 1 patient reported chronic symptoms of lateral-sided knee pain without a distinct traumatic injury. Two (20%) patients had CPN symptoms preoperatively, and 5 patients (50%) had lateral femoral condyle cartilage pathology adjacent to the fabella requiring operative treatment. Representative imaging and arthroscopic view of a patient with lateral femoral condyle pathology is shown in Figure 2. On preoperative radiographs, 6 fabellas were ossified with the other 5 consisting of only cartilage. There were no reported surgical failures associated with recurrent posterior lateral knee pain, and 8 of 10 patients were able to return to their preinjury level of activities and sports as determined by chart review.

Complications

A single patient was identified as having a complication: postoperative arthrofibrosis requiring an arthroscopic lysis of adhesions.

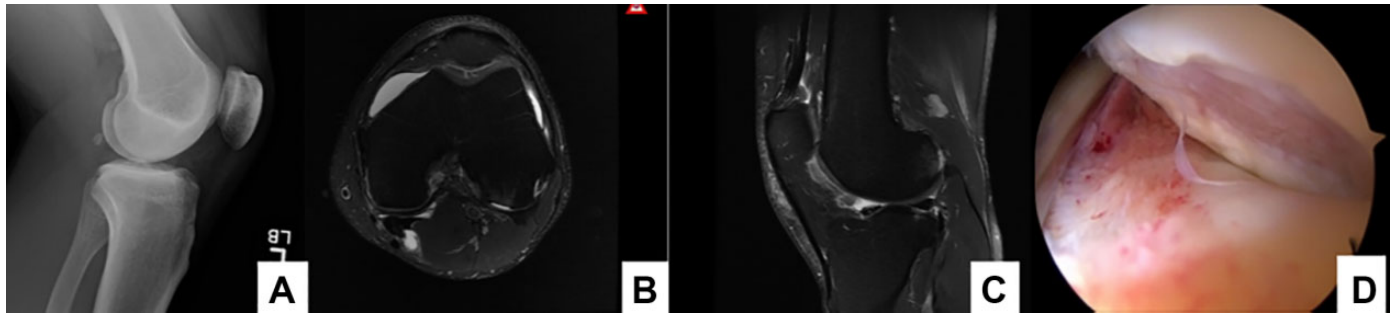


Figure 2. Representative imaging of patient 7. Chronic left lateral knee pain in the setting of fabella syndrome. (A) Bony fabella identified on preoperative radiographs. (B, C) A notable cartilage lesion was identified on both axial and sagittal T2 magnetic resonance imaging on the posterior lateral femoral condyle. (D) Arthroscopic view from the posterior lateral portal of the chondral defect caused by the fabella impaction.

TABLE 2
Mean Pre- vs Postoperative Outcome Scores
at a Mean 2.4 Years^a

Score	Preoperative	Postoperative	<i>P</i>
WOMAC total	28.5	11.6	<.01
WOMAC pain	7.6	2.6	<.01
WOMAC stiffness	2.3	0.9	.15
WOMAC function	18.5	8.1	<.01
Lysholm knee	66.6	80.2	.04

^aBoldface values indicate statistically significant difference between preoperative and postoperative outcome scores. WOMAC, Western Ontario and McMaster Universities Osteoarthritis Index.

Patient-Reported Outcomes

Postoperatively, mean WOMAC total scores significantly improved from 28.5 ± 17.6 to 11.6 ± 10.2 ($P < .05$) (Table 2). The WOMAC domains showing significant improvement were the WOMAC pain score, which improved from 7.6 ± 4.3 preoperatively to 2.6 ± 2.0 postoperatively, and the WOMAC function score, which improved from 18.5 ± 12.5 to 8.1 ± 7.8 ($P < .01$). No differences were seen from preoperative to postoperative status with the WOMAC stiffness scale (2.3 ± 2.2 vs 0.9 ± 1.2 , respectively; $P = .15$). The mean Lysholm knee score significantly improved from 66.6 ± 23.1 preoperatively to 80.2 ± 13.9 postoperatively ($P = .044$). The mean overall patient-reported satisfaction was 8.8 ± 1.6 at a minimum 21-month follow-up postoperatively. Individual component scores are summarized in Table 3.

DISCUSSION

Arthroscopically assisted fabella excision in the setting of fabella syndrome that was nonresponsive to nonoperative management demonstrated improvement in subjective outcomes at a minimum of 21-month follow-up. The domains of WOMAC pain, WOMAC function, WOMAC total, and Lysholm knee scores demonstrated significant

improvement. Patients were also able to return to full desired activities after fabella excision.

This series found that patients with fabella syndrome often had vague and complicated complaints and symptoms. Important findings from this study demonstrate common presenting symptoms, associated pathologies, and potential perioperative complications associated with an arthroscopically assisted fabella excision. Similar to the findings of Weiner et al,¹⁰ this study demonstrated reliable pain relief and improvement in outcomes when a diagnosis of fabella syndrome was made. This case series demonstrates improvement in subjective outcome scores from pre- to postsurgery at 21 months without recurrent pain. The majority of patients reported insidious onset of posterolateral knee pain, with only 1 patient reporting an acute injury. Also, 2 of the 11 cases had concomitant CPN pathology consistent with prior case reports.⁵ Our study demonstrates that the clinician should critically evaluate the exact locations of pain and tenderness in patients suffering from posterolateral knee pain that is not relieved with nonoperative management.

This study has limitations. The retrospective study design, lack of control group, and short-term follow-up limit the internal validity of results. The small sample size and single surgeon's outcomes limit the external validity to other sample populations. However, the homogeneity of this sample group is a strength of this study, as we attempted to minimize confounding variables by including only patients with an isolated painful fabella. Furthermore, the exact cause or mechanism of the chondral pathology adjacent to the fabella is not possible to determine; however, the removal of the fabella adjacent to the posterior lateral femoral condyle does provide pain and symptomatic relief as seen by this study. Although there was no comparison group with nonoperative management, all patients in this study had chronic symptoms that failed activity modification, physical therapy, and injections. Additionally, regardless of the duration of symptoms at presentation, the senior author prescribed an additional 8 weeks of nonoperative management, along with a single corticosteroid intra-articular injection if the patient so desired. Prospective comparative studies with larger cohorts are required to

TABLE 3
Individual Component Scores^a

Patient	SF-12		WOMAC				Lysholm Knee Score	IKDC	Tegner Score	Satisfaction
	PCS	MCS	Pain	Stiffness	Function	Total				
1	35.2	30.7	5	2	22	29	65	49.4	3	6
2	36.4	64.1	3	0	22	25	82	60.9	4	8
3	50.6	60.4	6	3	14	23	55	71.2	2	10
4	51	58.6	5	0	5	10	80	57.4	3	8
5	56.9	55.6	0	2	2	4	91	70.1	6	10
6	57.8	53	0	0	0	0	95	77	6	10
7	52.7	58.5	2	1	11	14	75	65.5	5	8
8	58.3	55.7	0	0	0	0	94	63.2	8	10
9	52.7	58.5	4	3	16	23	64	73.5	5	5
10	40.3	36.7	6	0	11	17	71	74.7	2	9

^aIKDC, International Knee Documentation Committee; MCS, mental component score; PCS, physical component score; SF-12, 12-Item Short Form Health Survey; WOMAC, Western Ontario and McMaster Universities Osteoarthritis Index.

evaluate the long-term effects of isolated fabella excision in the setting of fabella syndrome.

CONCLUSION

Fabella excision in the setting of fabella syndrome demonstrated improvements in subjective outcome scores, high rate of returning to preinjury level of activities, and low risk of complications or need for additional surgical procedures.

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