Manipulation Under Anesthesia With Lysis of Adhesions Is Effective in Arthrofibrosis After Sulcus-Deepening Trochleoplasty

A Prospective Study

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Background: Sulcus-deepening trochleoplasty has been established as an effective treatment for patellar instability due to trochlear dysplasia. However, arthrofibrosis is a known complication following trochleoplasty, which may require manipulation under anesthesia (MUA) with or without lysis of adhesions (LOA) to increase the knee range of motion (ROM), especially flexion.

Purpose: To prospectively follow patients for ROM improvements and subsequent complications after undergoing MUA with or without LOA in the setting of sulcus-deepening trochleoplasty.

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

Methods: A total of 76 knees with severe trochlear dysplasia were prospectively enrolled and underwent sulcus-deepening trochleoplasty, with a mean (±SD) follow-up of 32.5 ± 19.3 months. Concomitant procedures included medial patellofemoral ligament reconstruction, lateral retinacular release, and tibial tubercle osteotomy. Physical examination including ROM and findings of recurrent patellar instability were collected for all patients. Arthrofibrosis was defined as active and passive flexion less than 90° within 3 months of surgery combined with a plateau in progress with physical therapy. Paired-samples and independent-samples *t* tests were used. A *P* value less than .05 was considered significant.

Results: A total of 62 knees met inclusion and exclusion criteria and were included in the study. Of these patients, 11 experienced arthrofibrosis as a complication and underwent MUA within 3 months of their index procedure. Of these 11 patients, 9 subsequently underwent arthroscopic LOA following MUA because acceptable ROM could not be achieved with manipulation alone. Patients with arthrofibrosis had a premanipulation mean ROM that was significantly different from those without arthrofibrosis (77.3° ±18.6° vs 133.3° ± 12.7°, respectively; $P < .001$). In the arthrofibrotic group, postoperative ROM increased significantly after MUA and/or LOA compared with the preoperative ROM (127.3° ± 12.5° vs 77.3° ± 18.6°, respectively; $P < .001$). ROM in the arthrofibrotic group after MUA/LOA was not significantly different from that in the nonarthrofibrotic group (flexion, 127.3° ± 12.5° vs 133.3° ± 12.7°, respectively; $P = .156$). No complications from the MUA or LOA were reported at subsequent follow-up visits.

Conclusion: When indicated in the setting of severe trochlear dysplasia, sulcus-deepening trochleoplasty is a treatment for disabling recurrent patellar instability with a known complication of arthrofibrosis. Initiation of postoperative physical therapy within 3 days of surgery may reduce the incidence of arthrofibrosis. If arthrofibrosis is encountered after a sulcus-deepening trochleoplasty, MUA without LOA is not as effective as when following other procedures of the knee, whereas MUA with LOA is an effective procedure likely to result in ROM and patient outcome scores similar to those of a nonarthrofibrotic knee after the same procedure. Both MUA and LOA appear to be safe based on the limited number of patients in this study without complication.

Keywords: arthrofibrosis; sulcus-deepening trochleoplasty; patellar dislocation; patellar instability; complication; stiffness

Patellar instability is a major problem affecting many individuals in the second and third decades of life. The risk of dislocation is approximately 5.8 per 100,000 cases, although it is significantly higher in active military members, ranging from 69 to 77 per 100,000 cases.[14] The anatomic characteristics of the distal femur have been explored with multiple studies addressing specific biomechanics of the patellofemoral joint and basic anatomic features. With a better understanding comes the development of more applicable surgical techniques to address abnormality of the distal femur outside the field of arthroplasty. Although uncommon, patellar instability can be caused by severe trochlear dysplasia and can be treated with a sulcus-deepening trochleoplasty. Deepening trochleoplasty has

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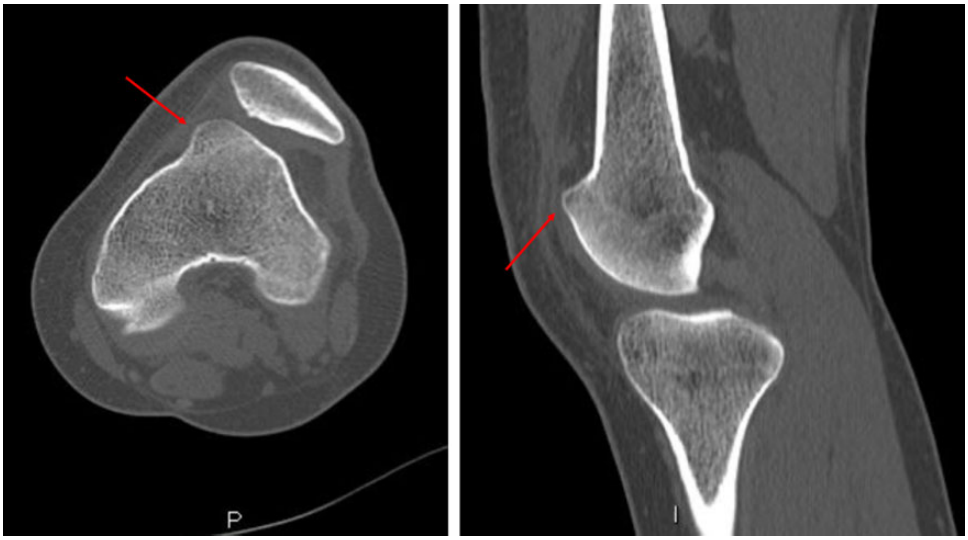

Figure 1. Preoperative computed tomography images for a 19-year-old woman with Dejour type D trochlear dysplasia. This patient has a supratrochlear spur (arrows) measuring 9 mm with lateral patellar dislocation, which is an indication for sulcus-deepening trochleoplasty with medial patellofemoral ligament reconstruction.

been popularized in Europe and is a powerful, albeit technically challenging, procedure for correcting dysplastic distal femoral structure and restoring patellar stability.[11,18,26] Although it has been studied in isolation, trochleoplasty can be performed concurrently with other, more traditional, patellar stabilizing procedures such as medial patellofemoral ligament (MPFL) reconstruction, tibial tubercle anteromedialization, and lateral retinacular release.[2,3,6,23-25,27]

Manipulation under anesthesia (MUA) and lysis of adhesions (LOA) are well-described procedures in the arthroplasty and trauma literature.[15,20,30,31] Both procedures afford patients improved range of motion (ROM) should they experience arthrofibrosis. MUA is often performed within 12 weeks of the index procedure in order to address stiffness, although the appropriate timing is debated in the literature.[34] In a systematic review of MUA following total knee arthroplasty, Gu et al[16] found that MUA performed within 4 to 12 weeks of surgery provided clinically significant gains in ROM and was the optimal timing to maximize those gains while providing adequate time for physical therapy.[16] Should MUA be insufficient, LOA may be performed, usually arthroscopically. A systematic review by Fitzsimmons et al[15] showed that timing of LOA did not have a similar effect to that of MUA, with significant gains in ROM out to 1 year beyond the index procedure regardless of timing.

As with any intra-articular knee procedure, arthrofibrosis may occur after trochleoplasty, and MUA or MUA with LOA may be required to increase the knee ROM, especially flexion.[33] When this occurs, the decision to intervene must be made in the context of the risks and benefits of repeated general anesthesia. To our knowledge, no study has prospectively evaluated patients for ROM improvements and subsequent complications after undergoing MUA or MUA with LOA in the setting of sulcus-deepening trochleoplasty.

METHODS

Patients

After we obtained institutional review board approval, 76 patients (76 knees) with severe trochlear dysplasia were prospectively enrolled and underwent sulcus-deepening trochleoplasty between 2011 and 2018. Inclusion criteria consisted of radiographs and cross-sectional imaging demonstrating a large supratrochlear spur consistent with severe trochlear dysplasia (Dejour type B or D), recurrent lateral patellar instability, and failure of indicated, nonoperative treatment[7] (Figure 1). Nonoperative treatment was indicated in the absence of large chondral defects or other abnormalities caused by repeated patellar instability and dislocation. Exclusion criteria consisted of open physes,

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unwillingness to participate in data collection for the study, and less than 6 months of postoperative follow-up.

Clinical Assessment and Outcomes

Basic demographic information was recorded, including age, sex, height, weight, and body mass index. Prior knee surgeries were recorded at the preoperative visit. Physical examination including ROM and findings of recurrent patellar instability were collected for all patients at preoperative and postoperative follow-up visits. Postoperative follow-up was scheduled at 2 weeks for suture removal, at 6 weeks to ensure adequate progression, at 6 and 12 months, and annually thereafter. At the 6-week visit, patients were instructed to return sooner to clinic if having issues prior to their 6-month follow-up.

The ROM was measured by the senior author (D.R.D.) using a goniometer to provide a crude measurement of flexion. Arthrofibrosis was defined as active and passive flexion less than 90° within 3 months of sulcus-deepening trochleoplasty combined with a plateau in progress with physical therapy. Physical therapists sent letters to the senior author regarding patient progress, and if progress was inadequate, the patient was scheduled for a follow-up visit in clinic.

Postoperative ROM was the primary outcome in this study, both after the index procedure and following MUA or MUA with LOA when performed. Secondary outcomes included validated Kujala and International Knee Documentation Committee (IKDC) scores preoperatively and at 6 months, 1 year, and each successive postoperative year.[17,19] Additionally, data were collected on return to postoperative sport and work participation, patient satisfaction, and recurrent dislocation events.

Radiographic Analysis

Preoperative radiographic analysis was performed to measure the trochlear sulcus angle and the Caton-Deschamps ratio.[9,13] A preoperative magnetic resonance image (MRI) was obtained for all patients, and computed tomography (CT) scans were obtained for select patients who had contraindications for MRI or whose images were obtained at outside facilities prior to arrival at our institution. Radiographic indications for sulcus-deepening trochleoplasty included at least 1 established criterion for trochlear dysplasia (as defined by a supratrochlear spur $\geq$4 mm,[12,23] trochlear depth $<$3 mm,[28] or sulcus angle $\geq$145°[13]). The tibial tubercle–trochlear groove distance was measured by use of cross-sectional imaging, and a concomitant tibial tubercle osteotomy (TTO) was considered if the distance was greater than 24 mm on MRI or greater than 21 mm on CT.[1] When considering TTO, the clinician should bear in mind that the groove can be lateralized by approximately 45 mm during sulcus-deepening trochleoplasty alone. No postoperative cross-sectional imaging was performed unless clinically indicated, such as for a recurrent effusion or mechanical symptoms.

Index Procedure, Rehabilitation, and Arthrofibrosis Management

Sulcus-deepening trochleoplasty with MPFL reconstruction was performed in every patient as described previously by Laidlaw et al.[21] A medial parapatellar arthrotomy was used to expose the dysplastic trochlea. The goal of the procedure was to reduce the supratrochlear spur, beginning with removal of subchondral bone at the articular margins with a ½-inch straight osteotome. This also provided access for further bone removal with a 3-mm egg-shaped bur to create a cavity while leaving an approximately 5 mm–thick osteochondral shell.

A Swann-Morton No. 20 scalpel blade and a bone tamp were used to make central and lateral cuts in the osteochondral shell, thus creating ballotable flaps that are pushed posteriorly to form the new central depression. Prior to fixation, bone fragments removed by the osteotome were placed under the medial and lateral edges to create a deeper trochlear groove. The osteochondral surface was then secured with 2 No. 2 Vicryl sutures held in compression by 3 suture anchors. At that time, MPFL reconstruction was performed using the senior author's preferred technique, as has been previously described.[5] Finally, the arthrotomy and overlying tissue were closed in standard fashion.

Concomitant procedures during the trochleoplasty for this cohort included MPFL reconstruction (100.0%), lateral retinacular release or lengthening (53.2%), and TTO (35.5%). For the first 26 patients in this cohort, physical therapy was not started until after their first follow-up visit, around 2 weeks postoperatively. Midway through the data collection period, the initiation of the postoperative physical therapy protocol was altered, and the remaining patients started immediately following surgery. At our institution, patients are placed into a long-leg hinged knee brace that is locked straight out when walking for the first day (or 3 days if a nerve catheter has been placed). Patients begin physical therapy within 3 days of surgery. We keep our patients at 50% weightbearing for 6 weeks; following this time period, they may begin full weightbearing. During postoperative weeks 1 to 2, flexion is limited from 0° to 70°. Patients then progress to 0° to 90° for postoperative weeks 3 to 4. At 4 weeks postoperatively, they are permitted to pursue full motion, and the brace is removed at 6 weeks.

As previously described by Laidlaw et al,[21] the physical therapist can assist with flexion 15° beyond each brace setting and guide the patient in performing heel slides with the brace removed. At 6 to 12 weeks, quadriceps activation and strengthening are performed, progressing toward stationary bicycle, elliptical, and leg press. No earlier than 12 weeks postoperatively, patients may begin jogging if there is appropriate muscle control and lack of effusion. Following sports-specific reconditioning, return to sporting activity may occur at 5 to 6 months. This protocol is the same regardless of concomitant procedures.

For those patients meeting our criteria for arthrofibrosis, the decision to perform MUA was made within 3 months postoperatively, when motion had plateaued and the patient was no longer making week-to-week gains for ROM. MUA was performed at a mean ± SD of 2.8 ± 0.7 months

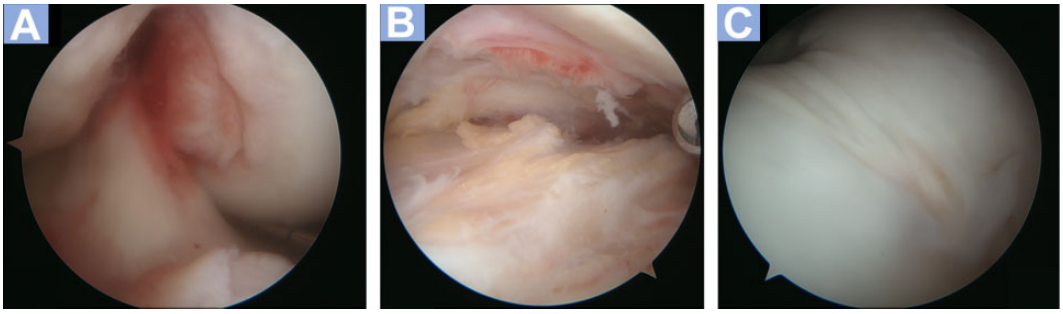

Figure 2. Images for a 24-year-old woman at 2.5 months after trochleoplasty with flexion limited to 90°. After a firm endpoint was found during manipulation under anesthesia, (A) arthroscopy was performed showing dense arthrofibrosis. (B) Lysis of adhesions was performed. (C) The trochleoplasty was well healed. Range of motion was 144° at most recent follow-up.

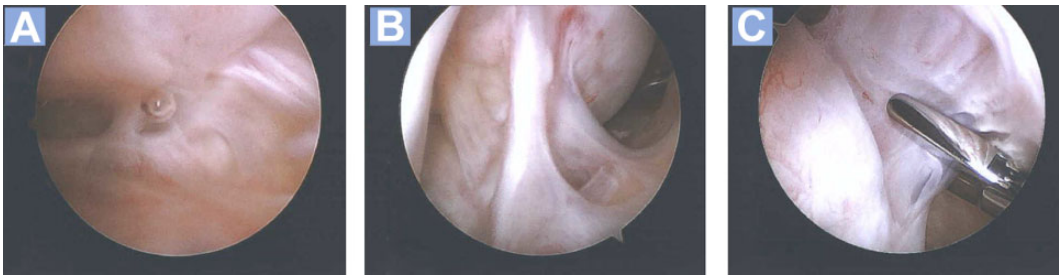

Figure 3. Images for a 25-year-old woman at 3.3 months after trochleoplasty with flexion limited to 90°. After a firm endpoint was found during manipulation under anesthesia, (A and B) arthroscopy was performed showing dense arthrofibrosis. (C) Lysis of adhesions was performed. Range of motion was 130° at most recent follow-up.

from the trochleoplasty. When MUA did not achieve sufficient ROM, LOA was performed on the same day as MUA. At our institution, this time period was used to provide adequate time for the newly formed trochlear groove to heal prior to performing a manipulation and to give therapy a chance to improve ROM. Under general anesthesia, the knee was initially moved manually to assess ROM, and then gentle manipulation was performed until a firm, solid endpoint remained. Further untoward pressure was not applied to attempt a closed manipulation, and instead attention was immediately turned to LOA. The decision to quickly transition to LOA was based on concern for damaging the trochleoplasty itself and consideration of the dense fibrosis that was found with subsequent LOA (Figure 2).

Through medial and lateral portals, the joint space was assessed arthroscopically for intra-articular fibrosis and adhesions (Figure 3). Narrow up-biters were introduced to cut through adhesions in the suprapatellar pouch, medial and lateral gutters, and intercondylar notch. Shavers were used to complete the debridement of fibrotic tissue and hypertrophic synovium. The senior author, who performed all of the trochleoplasty procedures, was impressed with the density of a curtain of fibrosis extending around the corners of the trochlea during arthroscopy. This dense arthrofibrosis exhibited after trochleoplasty makes this procedure unique compared with arthrofibrosis following other knee procedures. The healed trochleoplasty was well visualized during each arthroscopy for LOA and showed absorption of the originally placed Vicryl sutures. After adequate debridement, the knee was manipulated, ensuring full flexion and extension (0°-130°) prior to closure.

Statistical Analysis

Paired-samples and independent-samples t tests were used. Data analysis was performed with SPSS Statistics for Windows, version 24 (IBM Corp) with P values less than .05 considered significant.

RESULTS

Trochleoplasty was performed on 76 patients (76 knees) who met inclusion criteria and were enrolled into the study. Of these patients, 14 were excluded for having less than 6 months of follow-up. Thus, the final cohort included 62 patients (62 knees). Nearly 73% of patients were female, and the mean age was 20.5 ± 7.1 years (Table 1). Preoperative radiographic assessments for indication for sulcus-deepening trochleoplasty are listed in Table 2. Of the 62 patients in the cohort, 11 (17.7%) experienced arthrofibrosis as a complication and underwent MUA within 3 months of their index procedure. Of these 11 patients, 9 subsequently underwent arthroscopic LOA after their manipulation procedure because acceptable ROM could not be achieved with manipulation alone.

TABLE 1
Cohort Demographics[a]

Arthrofibrosis, n (%)	11 (17.7)
Age, y	20.5 ± 7.1 (13.2-47.0)
Female sex, n (%)	45 (72.6)
Body mass index	26.9 ± 6.1 (15.9-41.6)
Smoking history, n (%)	1 (1.6)
Diabetes mellitus, n (%)	1 (1.6)
Duration of symptoms, mo	85.0 ± 78.8 (4-370)
Prior surgery, n (%)	31 (50)
MUA, n (%)	11 (17.7)
MUA with LOA, n (%)	9 (14.5)
MUA timing, mo	2.8 ± 0.7 (1.6-4.2)
MUA/LOA complications, n (%)	0 (0)
Follow-up, mo	32.5 ± 19.2 (6-81.4)

[a]Values are expressed as mean ± SD (range) unless otherwise noted. LOA, lysis of adhesions; MUA, manipulation under anesthesia.

TABLE 2
Preoperative Radiographic Measures[a]

Dejour type B, n (%)	50 (80.6)
Dejour type D, n (%)	12 (19.4)
Caton-Deschamps ratio	1.19 ± 0.20 (0.8 to 2.0)
Sulcus angle, deg	143.6 ± 9.4 (127.1 to 180.0)
Trochlear depth, mm	–0.29 ± 2.8 (–7.7 to 6.3)
Spur height, mm	7.7 ± 1.8 (2.7 to 12.4)
Tibial tubercle–trochlear groove, mm	20.5 ± 5.5 (5.1 to 30.0)

[a]Values are expressed as mean ± SD (range) unless otherwise noted.

Because of a high incidence of arthrofibrosis after the first 26 trochleoplasty procedures (34.6%; 9/26), the postoperative protocol was modified to the current version, which emphasizes early initiation of ROM exercises. Consequently, only 2 MUAs with LOA were required in the last 36 knees (2/36; 5.6%), and both of these patients were noted to be apprehensive about flexing the knee throughout physical therapy. A significant difference was noted in incidence of arthrofibrosis ($P = .009$) between patients commencing ROM exercises at 2 weeks and those commencing physical therapy in the first 3 days following the index procedure. The incidence of arthrofibrosis was reduced by 29.0% after early initiation of physical therapy.

None of the demographic, preoperative, intraoperative, or postoperative factors listed in Table 3 were statistically significantly different in terms of means or prevalence between knees that developed arthrofibrosis and those that did not.

The patients with arthrofibrosis had a premanipulation mean ROM of 77.3° ± 18.6° (range, 30°-90°), which was significantly different from those without arthrofibrosis, who had ROM of 133.3° ± 12.7° (range, 80°-147°) ($P < .001$). In the arthrofibrotic group, postoperative ROM increased significantly following intervention compared with preoperative ROM (127.3° ± 12.5° [range, 100°-144°] vs 77.3° ± 18.6° [range, 30°-90°], respectively; $P < .001$). Outcomes in the arthrofibrotic group after intervention were not significantly different from those in the nonarthrofibrotic group for all primary and secondary outcome measures (Table 4). No complications from the MUA or LOA were reported at subsequent follow-up visits; the most recent follow-up was at 32.5 ± 19.2 months postoperatively (range, 6-81.4 months). Lastly, 15.8% of patients had incomplete follow-up at the time of the study.

TABLE 3
Independent-Samples *t*-Test Results Between Patients in the Arthrofibrotic and Nonarthrofibrotic Groups[a]

Variable	*P* Value
Demographic	
Age	.984
Sex	.490
Laterality	.079
Body mass index	.509
History of diabetes mellitus	.640
Active smoking	.640
Preoperative	
Knees with Dejour type B trochlear dysplasia	.989
Knees with Dejour type D trochlear dysplasia	.989
Caton-Deschamps ratio	.403
Tibial tubercle–trochlear groove	.314
Duration of symptoms	.639
History of prior surgeries performed	.325
Tibial tubercle osteotomy	.870
Medial patellofemoral ligament reconstruction	.235
Medial imbrication	.608
Lateral release	.989
IKDC score	.491
Kujala score	.289
Sulcus angle	.740
Spur height	.956
Trochlear depth	.445
Intraoperative	
Concomitant procedures performed	
Tibial tubercle osteotomy	.430
Lateral release/lengthening	.457
Any cartilage procedure	.836
Shaving chondroplasty	.339
DeNovo (Zimmer Biomet)	.465
Microfracture	.927
Removal of loose body	.237
Postoperative	
IKDC score	.165
Kujala score	.124
Satisfaction	.909
Return to work	.656
Return to sport	.800
Range of motion at most recent follow-up	.156
Sulcus angle change	.998
Follow-up duration	.251

[a]IKDC, International Knee Documentation Committee.

DISCUSSION

Although arthrofibrosis following trochleoplasty, and the management of this condition when it does occur, have been described in the literature, prospective studies evaluating

TABLE 4
Comparison of Outcomes Between Patients in the Arthrofibrotic and Nonarthrofibrotic Groups[a]

	Arthrofibrotic	Nonarthrofibrotic	*P* Value, Independent-Samples *t* Test
Range of motion at most recent follow-up, deg	127.3 ± 12.5 (100-144)	133.3 ± 12.7 (80-147)	.156
IKDC score at most recent follow-up	69.5 ± 17.0 (43.7-93.1)	78.9 ± 20.7 (19.5-100)	.165
Kujala score at most recent follow-up	77.3 ± 16.4 (53-98)	85.9 ± 16.6 (36-100)	.124
Return to sport, n/N (%)	6/8 (75)	32/37 (86.4)	.800
Return to work, n/N (%)	8/8 (100)	38/39 (97.4)	.656
Satisfaction	9.2 ± 1.0 (7-10)	9.3 ± 1.8 (1-10)	.909
Recurrent dislocations, n	0	0	—

[a]Values are expressed as mean ± SD (range) unless otherwise noted. Dash indicates no recurrent dislocations occurred. IKDC, International Knee Documentation Committee.

these patients are lacking. Additionally the reported incidence of arthrofibrosis varies widely in the literature from 0% to 38%, making it difficult to draw conclusions.[2,4,6,26,32] In a retrospective cohort study, Camathias et al[6] reported that 4 of 50 (8%) patients with postoperative stiffness went on to require arthroscopic LOA. Similar results were seen in a prospective case series by Banke et al,[2] with 2 of 18 (11.1%) patients requiring surgical intervention to specifically address postoperative stiffness. Given concerns of arthrofibrosis following the originally described open knee procedure, an arthroscopic trochleoplasty technique has been developed.[3,4] In their initial study outlining the technical procedure, Blond and Schöttle[4] had no cases of postoperative stiffness in 8 knees. Blond and Haugegaard[3] separately performed arthroscopic trochleoplasty in combination with MPFL reconstruction in 29 knees and reported no complications, redislocations, or arthrofibrosis. Of note, however, Ntagiopoulos et al[26] used an open approach in 31 knees and also reported no cases of postoperative stiffness.

In the current study, 11 of 62 patients (17.7%) developed arthrofibrosis requiring MUA, and all but 2 of those required concomitant knee arthroscopic LOA. Saini and Trikha[29] evaluated the success of MUA in posttraumatic knees, finding a success rate of 75% (36/48), in contrast with our success rate of 18.2%. Sassoon et al[30] reported a success rate of 59% (13/22) with MUA for posttraumatic knee arthrofibrosis. For arthrofibrosis following total knee arthroplasty, Choi et al[10] reported a success rate of 74% (106/143) with MUA. Cates and Schmidt[8] reported similar success, 87% (20/23), with MUA following total knee arthroplasty. The low rate of success of MUA (18.2%) in our cohort is likely a result of the low threshold for transition to LOA and the unique, dense fibrosis that can follow trochleoplasty.

Our timing for MUA and our low threshold for transitioning from MUA to LOA were established out of concern for damaging the healing trochleoplasty and because of the nature of the dense arthrofibrosis exhibited during arthroscopy after trochleoplasty procedures. Despite the high proportion of arthrofibrotic knees requiring LOA following MUA, we continue to attempt MUA prior to LOA in cases of arthrofibrosis to determine whether guarding contributes to the restricted ROM and because it was effective in some cases (18.2%) in the current study with only gentle manipulation. Complications specific to MUA outside the risks of general anesthesia can be catastrophic, although they occur rarely (<1%) and have yet to be reported in MUA following trochleoplasty.[22,34] We limit manipulation to cases when a firm endpoint is reached, which appeared to be safe given the limited number of patients who underwent MUA in the current study, all without complication.

Of the demographic, preoperative, intraoperative, and postoperative variables assessed in the current study, the timing of initiation of physical therapy was the only one to have a significant impact on the incidence of arthrofibrosis. Physical therapy plays a significant role in the setting of intra-articular knee operations in an effort to regain ROM. When high rates of arthrofibrosis were recognized during this study, we adjusted the protocol to begin immediate postoperative physical therapy. This decision was made to minimize immobilization, which is a well-established risk factor for postoperative knee arthrofibrosis.[22] Our results suggest that immediate physical therapy may reduce the incidence of arthrofibrosis and obviate the need for MUA with or without LOA. The only 2 cases of arthrofibrosis occurring after early initiation of physical therapy were in patients who were apprehensive about flexing the knee during physical therapy, further stressing the importance of immediate postoperative physical therapy. Further validation is required to appreciate the impact of early physical therapy on incidence of arthrofibrosis.

A few limitations of this study deserve mention. Given the short-term follow up, we are limited in drawing significant long-term conclusions from the data. The wide range in patient follow-up times and the incomplete follow-up in 15.8% of the sample was likely affected by both the length of the study and the fact that many patients traveled from across the United States to undergo the index procedure. In-office visits to assess ROM at follow-up were therefore limited in some patients, which potentially created a selection bias for our results. Additionally, the small sample size of patients with arthrofibrosis indicates that further studies are warranted. Because the timing of the start of the physical therapy protocol was changed midway through the data collection period, the overall incidence of arthrofibrosis following sulcus-deepening trochleoplasty in this study may be unreliable. However, because patients were not randomized to a specific physical therapy protocol, we are unable to say with certainty that the change in protocol was

responsible for the reduced incidence of arthrofibrosis. The ROM was measured by the senior author using a goniometer to provide a crude measurement of flexion at postoperative visits, although the P values of $<.001$ for changes in ROM following MUA with LOA and in comparison with the control group ROM suggest that the precision of the tool would not affect the significant outcomes in this study following MUA with LOA.

CONCLUSION

When indicated in the setting of severe trochlear dysplasia, sulcus-deepening trochleoplasty is a treatment for disabling recurrent patellar instability with a known complication of arthrofibrosis. Initiation of postoperative physical therapy within 3 days of surgery may reduce the incidence of arthrofibrosis. If arthrofibrosis is encountered after a sulcus-deepening trochleoplasty, MUA without LOA is not as effective as when following other procedures of the knee, whereas MUA with LOA is an effective procedure likely to result in ROM and patient outcome scores similar to those of a nonarthrofibrotic knee after the same procedure. Both MUA and LOA appear to be safe based on the limited number of patients in this study without complications.

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