Arthroscopic Release of the Medial Femoropatellar Ligament for Canine Medial Patellar Luxation

Five dogs of varying breeds and ages were presented for evaluation of medial patellar luxation that was unresponsive to conservative treatment. Arthroscopy of each affected stifle was performed, and adequacy of the femoral trochlea and patellar tracking in the trochlea were assessed. Medial femoropatellar ligament release was then performed using a bipolar radiofrequency electrosurgical system with or without a tibial tuberosity transposition. The procedure resulted in good to excellent outcomes for four dogs and a fair outcome for a fifth dog. *J Am Anim Hosp Assoc* 2004;40:321-330.

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**Introduction**

Patellar luxation is a disease in which the patella deviates medially or laterally from its normal tracking position within the femoral trochlea. Medial patellar luxation occurs more commonly than lateral luxation in the dog, but both have been associated with direct trauma or congenital musculoskeletal abnormalities. Patellar luxation is a common orthopedic disease in the dog and has been reported in cats. Similar patellar disease has also been reported in humans.

Patellar luxation is often a congenital, bilateral disease and is commonly found in female, small-breed dogs. Clinical signs are variable but usually include chronic, intermittent, weight-bearing pelvic-limb lameness. Ultimately, the severity of the disease is related to the degree of luxation; thus, a generalized grading system has been developed for classification of canine patellar luxations [Table 1]. Diagnosis is based on signalment, history, physical examination findings, and radiography. Standard and specialized radiographic views of the stifle help to confirm the luxation and often reveal both degenerative joint disease (DJD) and anatomical abnormalities of the trochlea, distal femur, and proximal tibia. Differential diagnoses for patellar luxation include soft-tissue injury of the stifle (e.g., cruciate ligament, collateral ligament, meniscal, or joint capsule injury), osteochondritis dessicans, and muscle strain.

The patella is the largest sesamoid bone in the dog and acts as a lever arm to alter the direction of pull of the quadriceps muscles, thereby decreasing the amount of force required to extend the stifle joint. The extensor mechanism of the pelvic limb is composed of the quadriceps muscles, the patella, the femoral trochlea, the patellar ligament, and the tibial tuberosity. Any abnormality of one or more of these components can predispose the patella to medial or lateral luxation. The patella is supported and maintained in appropriate articulation with the femoral trochlea by the medial and lateral trochlear ridges, the joint capsule and associated femoral fascia, the parapatellar fibrocartilages, and the femoropatellar ligaments. The medial and lateral parapatellar fibrocartilages help support the patella by extending from either side of the patella.
Table 1

Grades of Severity of Canine Patellar Luxation

<table>
<thead>
<tr>
<th>Grade</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Grade I</td>
<td>Patella luxates with manual pressure, and luxation spontaneously resolves with release of the pressure.</td>
</tr>
<tr>
<td>Grade II</td>
<td>Patellar luxation occurs frequently during stifle flexion or with manual pressure. The patella remains luxated but reduces with manual pressure.</td>
</tr>
<tr>
<td>Grade III</td>
<td>The patella is permanently luxated, but temporary manual reduction is still possible.</td>
</tr>
<tr>
<td>Grade IV</td>
<td>The patella is permanently luxated and cannot be manually reduced.</td>
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</tbody>
</table>

into the adjacent femoral fascia. The femoropatellar ligaments are bands of loose connective tissue that connect the patella to the fabella laterally and to the peristem of the femoral epicondyle medially.

The majority of animals with patellar luxation have some degree of structural deformity of the pelvic limb, ranging from soft-tissue changes to marked skeletal abnormalities. The abnormalities associated with medial patellar luxation include coxa vara, medial displacement of the quadriceps muscles, lateral torsion and/or lateral bowing of the distal femur, femoral epiphyseal dysplasia (i.e., shallow trochlea, hypoplastic medial trochlear ridge), medial bowing of the proximal tibia, and internal rotation of the distal tibia. Different theories exist about the origin and progression of these developmental changes, and the causal relationship between patellar luxation and these abnormalities has yet to be determined. Despite the origin of these changes, the final result is malalignment of the extensor mechanism, which places abnormal forces on the patella, predisposing it to luxation.

A thorough understanding of these underlying abnormalities is very important to properly manage the disease. Conventional surgical options are categorized into joint stabilization (e.g., medial release and lateral imbrication of the joint capsule) and reconstruction (e.g., trochleoplasty, tibial tuberosity transposition, and femoral/tibial osteotomies) techniques.

The diagnosis of medial patellar luxation was made based on physical examination findings and radiography. Each affected stifle was assigned a luxation grade, and the animal was considered a surgical candidate if a Grade I or II medial patellar luxation was diagnosed as the only cause of lameness; if clinical signs persisted despite conservative therapy (i.e., restricted exercise and nonsteroidal antiinflammatory drug [NSAID] therapy); and if radiographic and arthroscopic findings confirmed trochlea adequacy and minimal cartilage wear of the patella and the medial trochlear ridge.

Materials and Methods

The affected stifle was clipped and surgically prepared. An arthroscope was introduced through a cannula in the standard cranial lateral arthroscopic portal (lateral to the edge of the patellar ligament and just proximal to the proximal surface of the tibia near an unnamed bony protuberance, commonly referred to as Gerdy’s tubercle). A fluid pump system was attached to the scope cannula, and sterile lactated Ringer’s solution was infused into the joint space to aid visualization. A 2.7-mm arthroscope was introduced into the medial joint pouch through a proximal medial portal located just proximal and medial to the patella. A thorough examination of the stifle joint was performed, including examination of the trochlea and
assessment of patellar tracking in the trochlea through a full range of motion.

A bipolar radiofrequency electrosurgical system\(^c\) was introduced into the joint through a 2.9-mm cannula via a cranial medial portal (same level as the lateral portal but at the medial edge of the patellar ligament).\(^{19}\) The standardized default settings of the radiofrequency unit for each particular probe were used. Adequate joint capsule distension was achieved by increasing the fluid rate to provide an approximate pressure of 80 mm Hg to facilitate release of the medial femoropatellar ligament. Following distension of the joint capsule, the fibrous bands of the medial femoropatellar ligament were visualized. The bipolar radiofrequency probe with a hook tip was used to sever the ligament and adjacent joint capsule and femoral fascia in a slow, continuous, sweeping arc motion [Video 1; legend on next page]. The incision was made just medial and parallel to the patella, extending from the distal pole of the patella to just proximal to the proximal pole of the patella, as dictated by the physical limitations of the arthroscopy unit. Arthroscopic visualization and probing of the tissues assisted in determining the adequacy of the incision (i.e., fluid extravasation into the subcutaneous tissue) and avoiding damage to the medial parapatellar fibrocartilage. When using the radiofrequency unit, a high fluid flow rate (approximately 100 to 120 mL per minute) was used to help dissipate the heat generated by the unit and protect any surrounding cartilage.

If thermal shrinkage of the lateral joint capsule was performed (as in case no. 3), the scope was reintroduced into the joint via the medial portal, and the radiofrequency unit was introduced into the lateral portal. The bipolar radiofrequency probe was used in a unidirectional sweeping manner over the inner aspect of the lateral joint capsule to cause lateral capsular shrinkage [Videos 2, 3; legends on next page]. The surgeon relied on visual assessment of the morphological tissue changes (e.g., darkening, roughening, and contraction of the treated joint capsule) and capsular volume reduction to quantify the degree of capsular shrinkage.

The patella was again observed tracking in the trochlea through a full range of motion. The bipolar radiofrequency system, instrument cannula, egress cannula, and scope were removed, and 1.0 mL of bupivacaine\(^d\) was injected into the joint. If needed, a tibial tuberosity transposition was accomplished via a small incision made medially to the tibial crest. The osteotomized tibial tuberosity was reattached laterally.

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**Table 2**  
Recommended Treatments for Canine Patellar Luxations

<table>
<thead>
<tr>
<th>Grade</th>
<th>Treatment</th>
</tr>
</thead>
<tbody>
<tr>
<td>Grade I</td>
<td>Soft-tissue stabilization (minimal lateral imbrication and medial desmotomy) or no treatment if the dog is asymptomatic</td>
</tr>
<tr>
<td>Grade II</td>
<td>Soft-tissue stabilization and tibial tuberosity transposition</td>
</tr>
<tr>
<td>Grade III</td>
<td>Soft-tissue stabilization, tibial tuberosity transposition, and trochleoplasty</td>
</tr>
<tr>
<td>Grade IV</td>
<td>Soft-tissue stabilization, tibial tuberosity transposition, trochleoplasty, and possible femoral and/or tibial osteotomy</td>
</tr>
</tbody>
</table>
in a position to achieve femoropatellar axis neutrality with multiple Kirschner wires or Steinmann pins.13,16,17 If performed, a tension band fixation was completed using orthopedic wire. The subcutaneous tissue was closed with 3-0 polydioxanone in a simple continuous pattern, and the skin incisions were closed with sterile skin staples.

A soft-padded bandage was applied to the affected stifle for 24 to 48 hours postoperatively, depending on the degree of fluid extravasation. Each animal was discharged on oral NSAID therapy. Home care instructions prohibited running, jumping, and all off-leash activities. Application of ice packs to the area was advised for 10 to 15 minutes three to four times a day for 1 week, and crate rest was recommended when the dog was left alone. Short, controlled leash walks were allowed for 10 to 15 minutes two to three times a day for 4 to 6 weeks.

All dogs were reevaluated 10 days postoperatively for staple removal. Tracking of the patella was palpated, and modest attempts to manually induce patellar luxation were made. Assessment of the surgical site and evaluation of the gait at a walk were also performed. Follow-up evaluations occurred initially at approximately 1 and 2 months postoperatively. The dog’s gait was evaluated at a walk and a trot, and modest attempts to luxate the patella were made. The affected stifle joint was evaluated for effusion and pain, and patellar tracking was assessed through a full range of motion. Standard radiographic views of each treated stifle were obtained to assess healing of the tibial tuberosity (if performed) and to monitor for evidence of DJD and stifle effusion. As previously described, axial radiography of the affected stifle was also performed to evaluate the position of the patella and the adequacy of trochlear depth. Fluoroscopy of the stifle was performed to assess patellar tracking along the trochlea and patellar stability through an almost full range of motion. The fluoroscopy was performed using a similar technique to that described for axial radiography.

Any postoperative lameness was assigned a Grade of 0, I, II, III, or IV, based on the following definitions: Grade 0 was a normal stance (full weight bearing) and no apparent lameness at a walk or trot; Grade I was a slightly abnormal stance (partial weight bearing) with lameness, but weight bearing on >95% of strides at a walk and trot; Grade II was a moderately abnormal stance (toe-touch weight bearing) and lameness, with weight bearing on >50% and <95% of strides at a walk and trot; Grade III was a severely abnormal stance (dog holds limb off the floor) and lameness, with weight bearing on >5% and <50% of strides at a walk and trot; Grade IV was the inability to stand on the affected limb and nonweight-bearing lameness or weight bearing on <5% of strides at a walk and trot.

Results

Case No. 1

A 2-year-old, 23-kg, spayed female Dalmatian was presented for an acute, Grade IV lameness of the left pelvic limb after falling from a porch. Physical examination revealed pain on manipulation of the left stifle joint as well as mild left stifle effusion. A traumatic medial patellar luxation was confirmed with standard radiographic views of the stifle joint. Surgery was recommended, and a tibial tuberosity transposition, trochlear wedge recession, medial desmotomy, and lateral imbrication of the joint capsule were performed.

The animal was reassessed 1 month later. There were no abnormalities of the left pelvic limb, but physical examination revealed a Grade I to II right medial patellar luxation and a Grade I right pelvic-limb lameness. There was no...
radiographic evidence of effusion or DJD in the right stifle. A medial femoropatellar ligament release and a tibial tuberosity transposition, using three 0.062-inch Kirschner wires, were performed on the right stifle. Mild fluid extravasation from the medial aspect of the stifle occurred postoperatively but resolved spontaneously within 1 to 2 days. The dog was evaluated at 10 days, 1 month, 5 months, and 17 months postoperatively [Table 3]. Physical examination revealed luxation of the right patella medially with significant manual pressure, with spontaneous reduction occurring immediately (Grade I luxation). Patellar tracking and the gait at the walk and the trot were both normal.

Upon reexamination at 17 months, there was no radiographic evidence of stifle effusion or DJD, and the tibial tuberosity was healed. On fluoroscopy of the stifle, trochlear depth appeared adequate, and there was no evidence of patellar luxation or subluxation unless significant manual pressure was applied to the patella. Further treatment was not recommended, and the overall outcome was rated as “good.”

Case No. 2
A 1-year-old, 25-kg, male neutered mixed-breed dog was presented for a right pelvic-limb lameness of 1-month duration. Physical examination revealed a Grade II right lameness, a Grade II right medial patellar luxation, a positive Ortolani sign of the right coxofemoral joint, and a Grade I left medial patellar luxation. Radiographic findings of both stifles included mild effusion and the presence of small osteophytes on the periarticular surfaces. Axial radio-graphic views revealed normal patellar positioning and adequate trochlear depth. A medial femoropatellar ligament release and a tibial tuberosity transposition, using two 3/32-inch Steinmann pins, were performed on the right stifle.

Two months later, examination revealed a Grade I lameness of the left hind leg. A medial femoropatellar ligament release and a tibial tuberosity transposition, using two 0.062-inch Kirschner wires, were performed on the left stifle. Mild fluid extravasation from the medial aspect of each stifle occurred postoperatively but resolved spontaneously within 1 to 2 days. The only abnormality noted on physical examination of each limb at the respective 10-day, 1-month, and 2-month postoperative examinations was a Grade I lameness of the left pelvic limb at the 10-day examination [Table 3]. At the 2-month postoperative examination for the left limb (4 months postoperative for the right limb), no significant radiographic abnormalities of either stifle were found, and return to normal activity was recommended.

Five months later, the only abnormality reported by the owner was abduction of the right pelvic limb while the animal was in a sitting position and intermittent pelvic-limb skipping (i.e., holding the limb in a flexed position for one to two strides and then returning to a normal gait). Physical examination revealed no lameness at a walk, a Grade III left medial patellar luxation, a Grade II right medial patellar luxation, and no significant pain on palpation of either stifle. Radiographs of the right stifle revealed mild DJD similar to that seen preoperatively. Radiographs of the left stifle revealed a tibial tuberosity avulsion and patella alta. Fluoroscopy of the right stifle revealed adequate trochlear depth and no evidence of patellar luxation or subluxation through an almost full range of motion. Fluoroscopy of the left stifle revealed inadequate trochlear depth, medial patellar luxation throughout the full range of motion, and patella alta, but no apparent movement of the tibial tuberosity. The overall outcome was rated as “fair” for the right pelvic limb and “poor” for the left pelvic limb.

Case No. 3
A 16-month-old, 32-kg, spayed female golden retriever was presented for a Grade II right pelvic-limb lameness. Physical examination revealed a Grade II medial patellar luxation. There was no radiographic evidence of effusion or DJD. A medial femoropatellar ligament release and a tibial tuberosity transposition, using two 3/32-inch Steinmann pins, were performed with the addition of thermal shrinkage of the lateral joint capsule. The bipolar radiofrequency probe was used as previously described in a unidirectional sweeping manner over the inner aspect of the lateral joint capsule. The result was visible shrinkage of the capsule, leading to imbibition of the lateral soft-tissue supporting structures.

Upon reexamination postoperatively, no lameness (Grade 0 lameness) or patellar luxation was detected [Table 3]. Mild fluid extravasation from the medial aspect of the stifle was present postoperatively, but it resolved spontaneously within 1 to 2 days. Radiographically, no evidence of stifle effusion or DJD was noticed 2 months and 7 months after surgery. At 7 months postoperatively, fluoroscopy indicated that the trochlear depth was adequate, and there was no evidence of patellar luxation or subluxation. The overall outcome was rated as “excellent.”

Case No. 4
A 3-year-old, 18-kg, intact male soft-coated wheaten terrier was presented for an intermittent, left pelvic-limb lameness. Physical examination revealed a Grade I left medial patellar luxation and a Grade II lameness with short, intermittent episodes of nonweight-bearing lameness. Radiography did not reveal significant abnormalities of either the coxofemoral or stifle joint. Axial radiographic views showed normal patellar positioning and adequate trochlear depth.

The dog remained unresponsive to conservative therapy (i.e., exercise restriction), and a medial femoropatellar ligament release was performed 1 month later. Mild fluid extravasation from the medial aspect of the stifle occurred postoperatively, but it resolved spontaneously within 1 to 2 days. At suture removal 10 days later, no significant abnormalities were noted [Table 3]. On reexamination 3 weeks later, modest manual pressure did not luxate the patella, and no lameness (Grade 0 lameness) was observed at a walk. However, intermittent episodes of a toe-touching lameness of the left pelvic limb were observed at a trot. Physical therapy was performed, including underwater treadmill exercises and
Table 3
Clinical Information From Five Dogs Treated Via Arthroscopic Release of the Medial Femoropatellar Ligament for Medial Patellar Luxation

<table>
<thead>
<tr>
<th>Case No.</th>
<th>Signalement*</th>
<th>Clinical Findings†</th>
<th>Surgery‡</th>
<th>Time</th>
<th>Walk§</th>
<th>Trot§</th>
<th>Complications¶</th>
<th>Post-op PL§</th>
<th>Patellar Tracking</th>
<th>Final Outcome</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>2-y-old, 23-kg, SF Dalmatian</td>
<td>Right Grade I-II MPL and Grade I lameness</td>
<td>MFPL release and TTT</td>
<td>10 d</td>
<td>0</td>
<td>NE</td>
<td>None</td>
<td>None</td>
<td>Normal</td>
<td>Good</td>
</tr>
<tr>
<td>2</td>
<td>1-y-old, 25-kg, CM, mixed-breed dog</td>
<td>Right Grade II MPL and Grade I lameness</td>
<td>MFPL release and TTT</td>
<td>10 d</td>
<td>I</td>
<td>0</td>
<td>None</td>
<td>None</td>
<td>Normal</td>
<td>Fair</td>
</tr>
<tr>
<td>3</td>
<td>16-mo-old, 32-kg, SF golden retriever</td>
<td>Right Grade II MPL and Grade II lameness</td>
<td>MFPL release, lateral joint capsule shrinkage, and TTT</td>
<td>10 d</td>
<td>0</td>
<td>0</td>
<td>None</td>
<td>None</td>
<td>Normal</td>
<td>Excellent</td>
</tr>
<tr>
<td>4</td>
<td>3-y-old, 18-kg, M soft-coated wheaten terrier</td>
<td>Left Grade I MPL and Grade II lameness</td>
<td>MFPL release</td>
<td>10 d</td>
<td>0</td>
<td>NE</td>
<td>None</td>
<td>None</td>
<td>Normal</td>
<td>Good-</td>
</tr>
<tr>
<td>5</td>
<td>6-mo-old, 36-kg, CM Labrador retriever</td>
<td>Right Grade II-III MPL and Grade II lameness</td>
<td>Right MFPL release and TTT</td>
<td>14 d</td>
<td>0</td>
<td>0</td>
<td>None</td>
<td>None</td>
<td>Normal</td>
<td>Good-</td>
</tr>
</tbody>
</table>

Continued on next page
**Table 3 (cont’d)**

Clinical Information From Five Dogs Treated Via Arthroscopic Release of the Medial Femoropatellar Ligament for Medial Patellar Luxation

* SF=spayed female; CM=castrated male; M=male
† MPL=medial patellar luxation
‡ MFPL=medial femoropatellar ligament; TTT=tibial tuberosity transposition
§ 0=Grade 0 lameness; I=Grade I lameness; IV=Grade IV lameness; II=no lameness at walk, but intermittent episodes of a toe-touching lameness of the left pelvic limb at the trot; NE=not evaluated
\ TT=tibial tuberosity
¶ PL=patellar luxation; I=Grade I medial patellar luxation; II=Grade II medial patellar luxation; III=Grade III medial patellar luxation; I LPL=Grade I lateral patellar luxation
electrical stimulation of the vastus lateralis muscle every 3 to 4 days for 1 month.

Three months postoperatively, no lameness was seen at a walk, but occasional flexing of the limb occurred at a trot. Physical examination with mild sedation (to avoid interference with pain sensation) revealed a normal range of motion, no pain on palpation of both stifles, and an inability to manually luxate the left patella medially. Significant manual pressure was able to luxate the left patella laterally, but the patella would return to its normal position spontaneously.

Approximately 6 weeks later, the dog was reexamined, and at this time the left patella could not be luxated laterally. No evidence of effusion or DDJ was seen on radiographs, and fluoroscopy indicated adequate depth to the trochlea and no evidence of patellar luxation or subluxation. The overall outcome was rated as “good-excellent.”

**Case No. 5**

A 6-month-old, 36.8-kg, neutered male Labrador retriever was presented for a lameness evaluation. Physical examination revealed a Grade II-III right medial patellar luxation, a Grade II right pelvic-limb lameness, a Grade II left medial patellar luxation, and a positive Ortolani sign of the left coxofemoral joint. Radiographic findings included bilateral medial patellar luxation, bilateral stifle effusion, and mild hip dysplasia. Trochlear depth and patellar positioning appeared adequate on axial radiographic views. The dog did not respond to further exercise restriction.

A right medial femoropatellar ligament release and a tibial tuberosity transposition were performed, using two 0.062-inch Kirschner wires and 18-gauge orthopedic wire in a tension band fixation. Mild fluid extravasation from the medial aspect of the stifle occurred postoperatively but resolved spontaneously within 1 to 2 days. At suture removal 2 weeks later, no significant abnormalities were found [Table 3].

The animal was presented 1 month later for evaluation of an acute-onset Grade IV right pelvic-limb lameness. There was a Grade III right medial patellar luxation, and radiographs of the right stifle revealed a tibial tuberosity avulsion and a medial patellar luxation. The avulsion was corrected using fluoroscopy to place a tension band fixation using two 0.062-inch Kirschner wires and 18-gauge orthopedic wire. A lateral splint was applied, and the dog was sent home with instructions for owners to provide strict crate rest for 3 to 4 weeks.

The animal was reevaluated 12 days later, after having prematurely removed the splint. Physical examination revealed partial proximal wound dehiscence secondary to self-inflicted trauma. The wound was cultured (no growth occurred after 48 hours), a 10-day course of antibiotics (cephalexin 22 mg/kg per os [PO]) was initiated, and the splint was reapplied. One month later, the pins were removed from the proximal tibia. No lameness (Grade 0 lameness) was evident at a walk or trot, no patella luxation developed, and radiographs revealed adequate healing of the tibial tuberosity and resulting patella alta.

Fourteen months later, no lameness was seen at a walk or trot, no obvious effusion or pain was noticed on palpation of either stifle, and modest attempts to manually luxate the right patella were unsuccessful. The dog was easily restrained for examination, and sedation was not used. Radiographs of the right stifle joint revealed the tibial tuberosity was healed, and there was no evidence of effusion, DJD, or medial patellar luxation. On fluoroscopy, trochlear depth appeared adequate, and no evidence of patellar luxation or subluxation was seen. Fluoroscopy in a lateral view did not reveal movement of the tibial tuberosity, and the patella appeared to be in an anatomically normal position. The overall outcome was rated as “good-excellent.”

**Discussion**

Treatment of Grade I patellar luxations includes soft-tissue stabilization techniques and is usually restricted to symptomatic cases. Historically, treatment for Grade II patellar luxations has involved soft-tissue stabilization (e.g., medial desmotomy and lateral joint capsule imbrication) with a tibial tuberosity transposition.9,12,17 Realignment of the extensor mechanism is the goal of these conventional techniques. The arthroscopic-assisted procedure described in this report provides an alternative means to achieve the same realignment.

Preoperative radiography and direct arthroscopic visualization of the stifle joint allow assessment of concurrent anatomical abnormalities (including trochlea adequacy), patellar tracking in the trochlea, the presence or degree of osteoarthritis, the status of the cruciate ligaments and menisci, and the health of the articular cartilage. Arthroscopic transection of the medial femoropatellar ligament provides medial release of the patella, and lateral imbrication can be achieved by arthroscopic thermal shrinkage of the lateral joint capsule. With the surgical technique employed in this report, tibial tuberosity transposition is performed as previously described, but without a standard arthrotomy.13 Based upon results in the five cases reported here, the advantages of this procedure included less tissue trauma, a quicker healing time, and a more rapid return to function. However, prospective studies are required to quantify and compare postoperative pain and limb functionality in dogs treated with this procedure versus conventional techniques requiring an arthrotomy.

Four of the five cases reported here had a good or excellent outcome [Table 3]. In case nos. 3, 4, and 5, the patellar luxation and the associated clinical signs resolved completely. In case no. 1, clinical signs resolved completely, and the grade of the patellar luxation improved. The results of these four cases appear similar to those obtained with conventional techniques, but further studies comparing the efficacy of conventional surgical techniques to this procedure are warranted.

Clinical signs resolved in case no. 2, but there was worsening of the luxation grade of the left pelvic limb and no change in luxation grade of the right pelvic limb. The poor outcome for the left pelvic limb was attributed to the postoperative tibial tuberosity avulsion that caused malalignment...
of the quadriceps mechanism. A variety of factors may have contributed to the outcomes for each of the stifles in this case, including inadequate medial femoropatellar ligament release, failure to identify inadequacy of the trochlea, insufficient neutralization of the musculoskeletal deformity with the tibial tuberosity transposition, and failure to imbricate the lateral joint capsule and retinaculum. The results of this case reflect the importance of case selection prior to utilizing this surgical technique.

Although the arthroscopic release of the medial femoropatellar ligament involves transection of the medial joint capsule, the medial femoropatellar ligament release remains less invasive than a standard arthrotomy and medial desmotomy, and it may allow earlier use of the limb postoperatively. In all five cases reported here, significant use of the operated limb was seen within 4 to 5 days (as reported by the owners), and almost normal use of the limb was observed within 10 days. Although controlled use of the limb postoperatively is beneficial to strengthen the supporting structures of the patella in its proper alignment, overuse of the limb in the early postoperative period may result in recurrent luxation and complications associated with the tibial tuberosity transposition. Thus, strict exercise restriction for at least 6 weeks is important to allow adequate healing of the tibial tuberosity and reestablishment of muscle function and support. Physical therapy activities aimed at strengthening the supporting musculature (e.g., electrical stimulation of the vastus lateralis muscle and home exercises to strengthen quadriceps muscles) are strongly recommended for at least 1 month to hasten the development of a stable quadriceps mechanism.

In case nos. 2 and 5, tibial tuberosity avulsion was a postoperative complication. In both cases, the owners reported difficulty restricting the dog’s level of activity during the first 6 weeks postoperatively. Although different procedures were used to stabilize the tuberosity in each of the two cases, the authors are aware that surgical technique may have contributed to the tibial tuberosity avulsions. However, overuse of the limb early in the postoperative period and overbearing forces on the tibial tuberosity may have resulted in the tibial tuberosity avulsion. Thus, it is the authors’ opinion that conservative, significant postoperative exercise restriction and rehabilitation should be utilized with the procedure described in this study.

A less severe complication found in all five cases was fluid extravasation into the medial subcutaneous tissue of the stifle. During transection of the medial femoropatellar ligament, the underlying joint capsule and femoral fascia were also transected to allow sufficient medial release of the patella, allowing varying amounts of synovial and arthroscopically infused fluid to extravasate into the subcutaneous tissue. No related complications were observed in the cases of this report, but further studies are required to assess complications that may result from this fluid extravasation.

Fluoroscopy and axial radiographic views of the stifle were utilized in this study to evaluate adequacy of trochlear depth and patellar tracking through an almost complete range of motion of the stifle joint. The authors are unaware of any standardized recommendations for performing and interpreting these diagnostic modalities, so the results should be considered as subjective. As previously described by Merchant, et al., comparative medical imaging modalities exist in humans, but further studies in the dog are required to develop a standardized technique for the axial view of the stifle. A limitation of the axial view is the inability to evaluate the seating of the patella in the most proximal aspect of the trochlea, where patellar luxation is most likely to occur during extension of the stifle. However, the fluoroscopic and axial radiographic findings in each case were consistent with those found on standard radiographic views, arthroscopy, and physical examination. While these specialized imaging techniques helped with postoperative assessments of the surgical procedure, additional studies are required to standardize the techniques.

Electrosurgical (i.e., radiofrequency energy) devices are widely used in human medicine. The thermal effect of radiofrequency energy can be modified to perform a wide range of tasks, from coagulation to cutting. Currently, radiofrequency units are available as monopolar and bipolar devices. The bipolar units have the advantage of increased cutting efficiency and decreased thermal damage to the adjacent tissues. Despite the type of unit used, contact with articular cartilage must be avoided, since both devices have been shown to destroy cartilage cells and underlying subchondral bone.

In contrast, the effects of radiofrequency energy on joint capsule tissue have proven to be beneficial. The application of radiofrequency energy to capsular tissue in multiple, single linear passes causes significant tissue shrinkage related to collagen denaturation and contraction. Prolonged application of the radiofrequency energy results in ablation of the tissue, as is the case when performing the described medial femoropatellar ligament release procedure. The principles, procedures, and equipment used in this study to incise and release the components of the medial supporting structures, as well as to provide thermal shrinkage of the lateral joint capsule of the stifle, were similar to those described in humans.

The procedures used in this study have only recently been described in the veterinary literature. Similar disease processes and corrective procedures have been well documented in humans. Recently, techniques utilizing only arthroscopy have been reported for lateral patellar instability that involved placement of medial joint capsule sutures and a lateral capsular release using a standard electrosurgical device in people. The majority of people in each study had minimal anatomical changes and good to excellent results (e.g., significant improvement in pain, swelling, and function). Other studies have shown that young children with congenital luxation of the patella that were surgically treated with primarily soft-tissue techniques to realign the patella had a good long-term outcome and developed normal femoral trochleae, despite the almost complete absence of a trochlea preoperatively. Similarly, a clinical study in
dogs showed that tibial tuberosity transposition performed before 60 days of age in puppies with medial patellar luxation and associated distal femur abnormalities corrected these abnormalities completely.27 The authors believe results similar to those found in infants treated with soft-tissue techniques to correct patellar luxation may be possible in dogs with medial patellar luxation when treated early in the disease process (<6 to 11 months of age), before radiographic closure of the femoral and tibial physes.28 Realignment of the patella with soft-tissue techniques alone may prevent the development of the anatomical abnormalities seen with patellar luxation, resulting in an anatomically correct and stable extensor mechanism. The combination of an arthroscopic medial femoropatellar ligament release and lateral joint capsule shrinkage provides a procedure that is minimally invasive and may be appropriately utilized in younger animals to combat the occurrence of these anatomical abnormalities and patellar luxation. Unfortunately, the limited number of cases in this report does not allow statistically significant conclusions to be drawn. Further studies are warranted to evaluate the use of an entirely arthroscopic procedure (i.e., medial femoropatellar ligament release and lateral joint capsule shrinkage) in the management of Grade I-II patellar luxation in young dogs.

Conclusion

The combination of an arthroscopic medial femoropatellar ligament release and tibial tuberosity transposition with or without thermal shrinkage of the lateral joint capsule appeared to be a viable treatment option in dogs with Grade I or II medial patellar luxation. Although the limited number of cases did not allow statistical analysis, four of the five cases had good to excellent outcomes. These results were consistent with conventional surgical techniques. A well-designed prospective study is warranted to compare the morbidity and efficacy of this procedure with those of conventional surgical techniques.

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References