Clinical Presentation, Surgical Treatment, and Outcome of Traumatic Patellar Luxation in 11 Dogs and 5 Cats: A Single-Centre Retrospective Study between 2011 and 2022

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Vet Comp Orthop Traumatol

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Abstract

Objective Patellar luxation (PL) is commonly diagnosed in dogs and cats; however, a traumatic cause is poorly reported in the literature. The aim of this study was to report the clinical presentation, surgical treatment, and outcome in dogs and cats surgically treated for traumatic PL.

Study Design This is a retrospective study. Medical records of dogs and cats operated for traumatic PL were reviewed. Short- and long-term follow-ups were assessed with medical records and telephone interviews with owners and referring veterinarians. Data on signalment, lameness, PL characteristics, surgery, complications, and outcome were recorded.

Results Eleven dogs and 5 cats were included. Both species had a median lameness grade of 4/5 and a median PL grade of 3/4. PL was medial in most cases (13/16). Joint capsule lesions were identified in 15 cases, 4 cases had trochlear ridge cartilage damage. All cases had a capsular imbrication, 12 cases had a fabello-patellar suture (FPS). Mean long-term follow-up time was 70.8 ± 42.5 months in 9 dogs and 4 cats. Ten cases out of 13 had no lameness at the 2-month follow-up, and 11/13 cases had no long-term lameness. Eleven cases out of 13 had no PL at the 2-month follow-up. No long-term PL was reported by owners. Complications were mild in 5 cases, moderate in 1, severe in 3. Functional outcome was full in 10 cases and acceptable in 3.

Conclusion Soft tissue techniques and FPS were effective in the surgical treatment of traumatic PL in dogs and cats, resulting in acceptable to full long-term function in all cases, with limited severe complications.

Keywords
- stifle joint
- fabello-patellar suture
- orthopaedic surgery
- acquired orthopaedic disorders

Introduction

Patellar luxation (PL) is a common cause of hindlimb lameness in dogs and cats.[1] Its reported prevalence varies between 1.30[2] and 9.2%[3] in dogs and between 32.7[4] and 58%[5] in cats. The cause of PL is mostly developmental, with some degree of skeletal deformity.[6–8] Less commonly, PL is reported as a surgical complication of cranial cruciate ligament disease or tibial and femoral fractures[8–10] and as a consequence of a trauma resulting in disturbance of the joint capsule or parapatellar tissue.[7]

Treatment of PL depends on the severity of the disease and its clinical impact regarding lameness and limb deformity. Surgery is indicated for grade 3 and 4 PL, whereas

received
December 22, 2023
accepted after revision
August 12, 2024

Georg Thieme Verlag KG,
Rüdigerstraße 14,
70469 Stuttgart, Germany

DOI https://doi.org/10.1055/s-0044-1790220.
ISSN 0932-0814.

conservative treatment is usually recommended for grade 1 PL.[7] The choice of therapy for grade 2 PL is complex as dogs are often mildly lame but may later develop a worsening PL or osteoarthritis (OA).[7,8] This was recently supported by a retrospective study, which reported that, after a minimum 4-year follow-up period, 50% of dogs with occult grade 2 medial PL developed chronic lameness or required surgery because of their PL.[11]

Numerous surgical techniques have been described, all with the aim of restoring alignment to the quadriceps mechanism and stabilizing the patella in the trochlear groove. The most common procedures include femoral trochleoplasty, tibial tuberosity transposition, and capsular/retinacular release and imbrication. Decision-making is at the discretion of the attending surgeon and depends on the severity of the PL, skeletal deformities, patient's age and weight, and concomitant orthopaedic disease such as cranial cruciate ligament disease. Nonetheless, soft tissue reconstructive techniques alone are not recommended, except in young growing patients or in grade 1 PL with no skeletal abnormalities.[7,8]

Traumatic PL in dogs and cats is seldom described in the literature, being mostly only cited as a possible cause of PL.[3,7,8,12–16] According to two studies, PL is considered to be of traumatic origin in 15% of dogs[17] and 17% of cats[6] with PL, including direct trauma to the stifle as well as cases with previous hindlimb surgery. Treatment of traumatic PL is also poorly reported. To the authors knowledge, guidelines for treatment of traumatic PL are solely given in veterinary surgical textbooks.[7,8] Soft tissue techniques such as joint capsulorrhaphy and imbrication of the fascia are recommended[7,8] and may be augmented with fabello-patellar suture (FPS) to reach sufficient patellar stability.[8] Treatment of any predisposing factors such as shallow trochlear groove or medialized tibial tuberosity is also advised if present.[7] Despite being acknowledged as a cause of PL, there are no specific studies about traumatic PL in dogs and cats. Furthermore, only a few clinical cases have been reported in miniature pig,[18] cattle,[19] lynx,[20] and alpaca.[21] This absence of specific studies on traumatic PL in dogs and cats precludes surgeons from making evidence-based surgical decisions and prevents owners from being provided with precise prognostic information for their pets.

The objective of this retrospective study was to describe the clinical presentation, surgical treatment, and outcome in dogs and cats surgically treated for traumatic PL.

Materials and Methods

Population

Medical records of dogs and cats at a small animal referral hospital that had corrective PL surgery from January 2011 to December 2022 were retrospectively reviewed. Cases were included if they had surgery for PL performed by an ECVS (European College of Veterinary Surgeons) diplomate or a supervised resident and had a history of observed or strongly suspected trauma. Cases were excluded, if they had clinical, radiographic, or surgical findings consistent with ipsilateral concomitant orthopaedic or neurological disease, had a history or radiographic and surgical findings consistent with developmental PL (including abnormal femoral trochlear ridge, tibial crest malalignment, femoral or tibial angular deformity), or underwent a previous PL surgery at another institution. Femoral varus was considered significant, if the anatomical lateral distal femoral angle was 8 to 10 degrees greater than the reported values of the breed or that of the contralateral limb or the target value of 94 degrees.[22] Tibial deformities were considered significant, if the mechanical medial proximal tibial angle was greater than the reported reference ranges.[23]

Data collected included species, breed, age, gender, body weight at the time of surgery, history, affected limb, lameness grade, and PL grade at the time of surgery and at follow-ups, direction of PL, type of preoperative imaging assessment and associated findings, details of surgical findings and treatment, the time required for lameness to resolve, complications, and subjective clinical outcome. Informed client consent was sought prior to surgery, and no ethical approval was required due to the retrospective nature of the study. Severity of PL was graded according to the Roush's adaptation of the Putnam's grading system[24,25] and lameness was graded according to the grading system developed for dogs with PL (►**Table 1**).[26]

Surgical Procedure

Patients were premedicated with acepromazine (25 µg/kg intravenously [IV]) or diazepam (0.2 mg/kg IV) in combination with morphine (0.2 mg/kg IV) and general anesthesia was induced with propofol IV to effect in combination with ketamine (2 mg/kg IV) at the discretion of the surgeon. Anesthesia was maintained by inhalation of isoflurane. Ampicillin–sulbactam (22 mg/kg IV) was administered 30 minutes before surgery and given every 90 minutes depending on surgery duration. Patients were positioned in dorsal recumbency and a standard lateral approach to the stifle was performed. After arthrotomy, the femoral trochlea was visually assessed for abnormal conformation. Its ridges had to have symmetrical heights and enclose around 50% of the patella to be considered correctly conformed, according to the current recommendations.[7] If these criteria were not met, a trochleoplasty was performed. The patella, the joint capsule, and other intra-articular structures were also inspected.

Table 1 Lameness grading system

Grade	Definition
0	No lameness
1	Occasional weight-bearing lameness
2	Frequent but intermittent weight-bearing lameness
3	Continuous weight-bearing lameness
4	Weight-bearing lameness with occasional nonweight-bearing lameness
5	Permanent nonweight-bearing lameness

Source: Reproduced with permission from Roy et al.[26]

The presence of a torn or stretched joint capsule led to capsular imbrication on the side of the lesion. If the patella was still manually or spontaneously luxating intraoperatively, an FPS was then performed on the side opposite to the direction of the luxation. A nonabsorbable suture (30–60 pound-test monofilament nylon leader line or USP 1 monofilament nylon, depending on patient size and bodyweight) was placed around the medial or lateral fabella and around the patella in a figure-of-eight pattern, tightened enough to prevent PL, and secured either with a crimp or a knot.

Routine closure was performed, and a modified Robert Jones bandage was applied for 2 weeks. Patients were discharged within 24 hours postoperatively, unless they had signs of discomfort and received amoxicillin–clavulanate (20 mg/kg per os [PO] twice daily) for 5 to 8 days and meloxicam (0.05–0.1 mg/kg PO once daily) for 5 to 10 days. Activity was restricted for 1 to 2 months. Stitches were removed 2 weeks postoperatively. Follow-up examinations were performed 1 and 2 months postoperatively by the surgeon or the referring veterinarian.

Complications and Outcome

Follow-up information was obtained from medical records when available and from telephone interviews with referring veterinarians and owners.

Postoperative complications were defined according to the contracted form of the Accordion Classification of postoperative complications (►**Table 2**).[27] Clinical outcomes were defined according to Cook and colleagues criteria (►**Table 3**).[28] Short-term period was defined as <2 months, medium-term as between 2 and 12 months, long-term as >12 months.

Statistical Analysis

Categorical data were expressed as counts and percentages. Numerical data were tested for normality visually and with the Shapiro–Wilk test. They were expressed as median and interquartile range (IQR) for non-normally distributed data and mean ± standard deviation for normally distributed data. Analysis was performed using a statistical software (JASP v0.17.1, JASP team, Amsterdam, The Netherlands).

Results

Patients

In total, 200 cases had surgery for PL during the study period and 184 cases were excluded leaving 16 cases for analysis, of which 11 were dogs and 5 were cats (►**Fig. 1**). Traumatic PL represented 6.1% (95% confidence interval = 2.6–9.7) of dogs and 23.8% (95% confidence interval = 5.6–42.0) of cats surgically treated for PL in the same period.

The median age of dogs was 13.3 months (IQR: 10.4–20.1). The median age of cats was 72.6 months (IQR: 11.1–119.6). Among dogs, there were 6 males (54.5%), 3 females (27.3%), and 2 neutered females (18.2%). Among cats, there were 1 male (20.0%), 1 neutered male (20,0%), 1 female (20.0%), and 2 neutered females (40.0%). Mean body weight of dogs was 18.4 ± 9.6 kg. Mean body weight of cats was 4.0 ± 0.7 kg. Dog breeds included one each of Coton de Tulear, Brittany Griffon, Brittany dog, Pyrenean Sheepdog, Border Collie, Siberian Husky, Griffon Nivernais, Labrador Retriever, Gascon Saintongeois, Porcelaine, Cane Corso. Cat breeds included 4 Domestic Shorthair and 1 Turkish Van (►**Table 4**).

The identified causes were: fall (1 dog, 2 cats), hunting accident (3 dogs), exercise (6 dogs), dog attack (1 cat). A trauma was strongly suspected in 3 cases: 2 cats were lame

Table 2 Contracted form of the Accordion Classification of postoperative complications

Complication severity	Criteria
Mild	Requires only minor invasive procedures that can be done at the bedside and drainage of wound infections. Physiotherapy and some drugs (antiemetics, antipyretics, analgesics, diuretics, electrolytes) allowed
Moderate	Requires drugs other than those allowed for minor complications, blood transfusion, or total parenteral nutrition
Severe	Requires endoscopic or interventional radiologic procedures or reoperation Complications resulting in failure of one or more organ systems
Death	Postoperative death

Source: Reproduced with permission from Strasberg et al.[27]

Table 3 Clinical outcomes and corresponding criteria

Clinical outcome	Criteria
Full	Restoration to, or maintenance of, full intended level and duration of activities and performance from preinjury or predisease status (without medication)
Acceptable	Restoration to, or maintenance of, intended activities and performance from preinjury or predisease status that is limited in level or duration and/or requires medication to achieve
Unacceptable	All other outcomes

Source: Cook et al.[28]

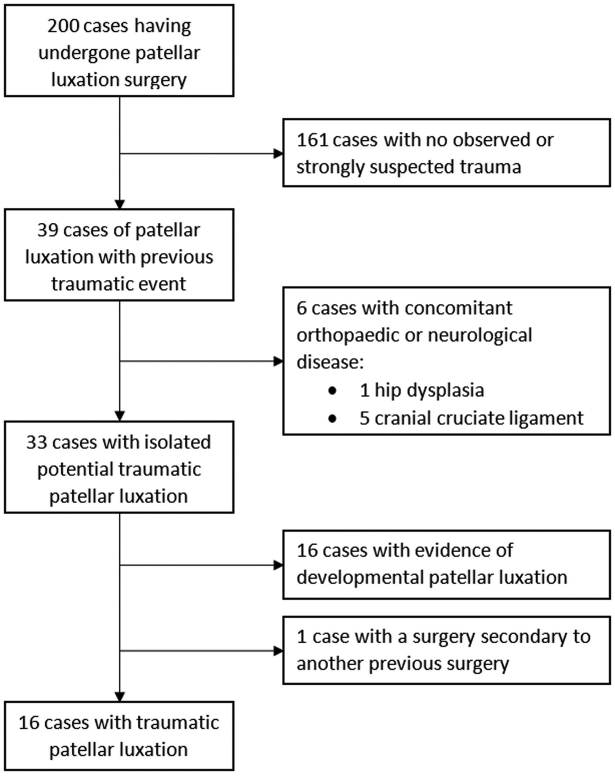

Fig. 1 Flow diagram for selection of dogs and cats with surgically treated traumatic patellar luxation.

after an outing and 1 dog was found vocalizing and lame at home. The median time from trauma to presentation was 4.0 days (IQR: 1.0–10.0) for dogs and 10.0 days (IQR: 7.0–30.0) for cats. These data were missing in 2 dogs.

Fourteen out of 16 cases had a recorded lameness grade, 2 cases (1 dog and 1 cat) had a weight-bearing lameness reported but had no grade recorded. Median lameness grade was 4 (IQR: 3–5) in dogs and 4 (IQR: 3.8–4.3) in cats. For dogs, lameness occurred on the right in 5/11 cases (45.5%) and on the left in 6/11 cases (54.5%). For cats, lameness occurred on the right in 2/5 cases (40.0%) and on the left in 3/5 cases (60.0%).

PL was medially directed in 13 cases (81.3%; 10 dogs, 3 cats), laterally directed in 2 cases (12.5%; 1 dog, 1 cat), and bidirectional in 1 case (6.2%; 1 cat). All cases had unilateral PL. Median PL grade was 3 (IQR: 3–3) in both dogs and cats.

All cases had preoperative radiographs only, and 1 cat (11.9 years) had mild bilateral stifle OA. No case had significant femoral or tibial deformity or tibial tuberosity malalignment.

Surgical Findings and Treatment

Eight cases (50.0%) had joint capsule tears on the side opposite the luxation, 1 cat (6.2%) had lateral and medial joint capsule tears, 5 cases (31.2%) had joint capsule distension on the side opposite the luxation without obvious tear, and 1 dog (6.2%) had combined joint capsule tears and distension on the side opposite the luxation. Six cases (37.5%) had joint capsule thickening and 1 case (6.2%) had joint capsule bruising. One cat (6.2%) had no joint capsule lesion. Two cases (12.5%) had trochlear ridge cartilage damage on the side of the luxation, 2 cases (12.5%) had trochlear ridge cartilage damage on the side opposite to the luxation (►**Table 5**). Femoral trochlear ridges conformation and groove depth were intraoperatively subjectively assessed as appropriate in all cases.

Fifteen cases (93.8%) had a single-sided capsular imbrication. One case (6.2%) had a capsular imbrication on both sides. Eleven cases (68.8%) had an FPS on the side opposite to the direction of the luxation. One dog (6.2%) had an FPS on both sides. No intraoperative complications were reported.

Table 4 Demographic date and clinical characteristics of cases with traumatic patellar luxation

Case number	Species	Breed	Age (mo)	Weight (kg)	Time before presentation (d)	Lameness grade	Patellar luxation grade	Patellar luxation direction
1	Dog	Britany dog	10.2	14.0	7	5	4	Medial
2	Dog	Siberian Husky	4.1	10.0	NR	3	3	Lateral
3	Dog	Cane Corso	10.4	40.0	3	Weight-bearing	3	Medial
4	Dog	Border collie	13.3	17.6	NR	5	3	Medial
5	Dog	Coton de Tulear	14.2	6.1	1	5	3	Medial
6	Dog	Britany Griffon	108.2	11.6	1	1	3	Medial
7	Dog	Pyrenean Sheepdog	25.2	12.5	14	0	3	Medial
8	Dog	Porcelaine	47.0	26.0	21	5	3	Medial
9	Dog	Labrador Retriever	15.0	18.1	1	5	3	Medial
10	Dog	Gascon Saintongeois	10.4	20.0	4	3	2	Medial
11	Dog	Griffon Nivernais	13.3	27.0	10	3	3	Medial
12	Cat	Domestic Shorthair	72.6	5.0	7	Weight-bearing	2	Bidirectional
13	Cat	Domestic Shorthair	9.2	4.0	7	4	4	Medial
14	Cat	Turkish Van	142.7	3.5	42	3	3	Lateral
15	Cat	Domestic Shorthair	119.6	4.0	30	5	3	Medial
16	Cat	Domestic Shorthair	11.1	3.2	10	4	3	Medial

Abbreviation: NR, not reported.

Table 5 Surgical findings, treatment, complications, and outcome of cases with traumatic patellar luxation

Case number	Surgical findings	Surgical treatment	Short term			Long term		Clinical outcome
			Lameness grade	Patellar luxation grade	Complications	Lameness grade	Complications	
1	Lateral CT	Lateral CI	NR	NR	NR	NR	NR	NR
2	Medial CD Medial capsule thickening	Medial CI Medial FPS	0	0	No	NR	NR	NR
3	Lateral CT	Lateral CI	3	4	Tearing of CI	3	OA with NSAID	A
4	Lateral CT	Lateral CI Lateral FPS	0	0	Licking wound	0	OA needing no drugs	F
5	Lateral CT	Lateral CI Lateral FPS	0	0	No	0	No	F
6	Lateral CT Lateral capsule bruising	Lateral CI Lateral FPS	0	0	No	0	No	F
7	Lateral CT + CD	Lateral CI Lateral FPS	0	0	Wound infection	0	No	A
8	Lateral CD Capsule thickening, fibrin deposits Lateral TD	Lateral CI Bilateral FPS	5	4	Bilateral tears of FPS fabellar attachment	0	OA needing no drugs	F
9	Lateral CT	Lateral CI Medial RR	0	0	No	0	No	F
10	Lateral CT	Lateral CI Lateral FPS	1	0	No	1	OA with NSAID	A
11	Lateral CD Capsule thickening Lateral TD	Lateral CI Lateral FPS	0	0	No	0	No	F
12	Bilateral CT	Bilateral CI	0	0	No	0	No	F
13	Lateral CD Capsule thickening Medial TD	Lateral CI Medial RR Lateral FPS	NR	NR	NR	0	No	F
14	Lateral TD	Medial CI Medial FPS	0	0	No	0	No	F
15	Lateral CD Capsule thickening	Lateral CI Lateral FPS	NR	NR	NR	NR	NR	NR
16	Lateral CT Lateral capsule thickening	Lateral CI Lateral FPS	0	0	Stifle septic arthritis	0	No	F

Abbreviations: A, acceptable; CD, capsule distention; CI, capsule imbrication; CT, capsule tear; F, full; FPS, fabello-patellar suture; NR, not reported; NSAID, nonsteroidal anti-inflammatory; OA, osteoarthritis; RR, retinacular release; TD, trochlear damages.

Short-Term Outcome

Two-month follow-up was available in 13 cases (10 dogs, 3 cats). Ten cases (76.9%) had complete resolution of lameness with a median time to full recovery of 30.0 days (IQR: 12.0–61.0). Three cases (23.1%) had persistent lameness. Two dogs had grade 3 and grade 5 lameness respectively, and 1 cat had a grade 1 lameness. Eleven cases (84.6%) had no PL and 2 dogs (15.4%) had grade 4 PL.

Eight cases (61.5%) had no complications. One dog (7.7%) had a mild complication (a licking wound that healed with nonsteroidal anti-inflammatory drug [NSAID]), 1 dog (7.7%) had a moderate complication (wound infection that required antibiotic therapy), and 3 cases (23.1%) had severe complications (►**Table 6**).

The first severe complication was a tear of the capsulorrhaphy in a 10-month-old Cane Corso, which displayed a grade 3 lameness and a grade 4 medial PL after a jump 2 weeks postoperatively. Capsulorrhaphy reinforcement was performed, and a lateral FPS was added. The second severe complication was a tear of the fabellar attachments of both FPS in a 3-year-old Porcelaine with a persistent grade 5 lameness and a grade 4 medial PL 6 weeks postoperatively. Part of the gastrocnemius tendon was torn caudally and distally to the fabella. Revision surgery was performed with a larger gauge (60 vs. 30 pound-test). For both dogs, the patellae were stable 8 weeks later. The former had a persistent mild limb stiffness, the latter was lameness free. The third severe complication was a stifle septic arthritis that occurred in a 11-month-old Domestic Shorthair 1 month postoperatively. The patella was stable. A *Staphylococcus aureus* was cultured after arthrocentesis. A 3-week course of amoxicillin–clavulanate was performed according to susceptibility testing prior to FPS removal. The lameness resolved 1 month later.

Table 6 Short-term, long-term, and overall complications details according to the Accordion Classification system[27]

Complications	Short term, $N = 13$ *n* (%)	Long term, $N = 13$ *n* (%)	Overall, $N = 14$ *n* (%)
Mild			
Licking wound	1 (7.7)	0 (0)	1 (7.1)
Osteoarthritis	0 (0)	4 (30.8)	4 (28.6)
With NSAID		2 (15.4)	2 (14.3)
Without drugs		2 (15.4)	2 (14.3)
Total mild	1 (7.7)	4 (30.8)	5 (35.7)
Moderate			
Wound infection	1 (7.7)	0 (0)	1 (7.1)
Total moderate	1 (7.7)	0 (0)	1 (7.1)
Severe			
Tear of capsular suture	1 (7.7)	0 (0)	1 (7.1)
Tear of fabellar attachments	1 (7.7)	0 (0)	1 (7.1)
Septic arthritis	1 (7.7)	0 (0)	1 (7.1)
Total severe	3 (23.1)	0 (0)	3 (21.4)
Death	0 (0)	0 (0)	0 (0)
Total death	0 (0)	0 (0)	0 (0)

Abbreviation: NSAID, nonsteroidal anti-inflammatory.

Long-Term Outcome

Long-term follow-up was available in 13 cases (9 dogs, 4 cats) at a mean time of 70.8 ± 42.5 months. Eleven cases (84.6%) had no lameness and 2 dogs (15.4%) had grade 1 and 3 lameness, respectively. In no case did the owners report clinical signs (such as acute lameness or deterioration in locomotor function) suggesting recurrence of PL. Nine cases (69.2%) had no complications and 4 cases (30.8%) had mild complications (2 dogs with OA needing no drugs, 2 dogs with OA requiring NSAID). Overall, there was 35.7% of mild complications, 7.1% moderate and 21.4% severe. Ten cases (76.9%) had full function and 3 cases (23.1%) had acceptable function.

Discussion

Surgical treatment of traumatic PL resulted in an acceptable to full functional long-term outcome in all cases, with a limited rate of severe complications and no long-term clinical recurrence reported by owners.

Medial PL is more common than lateral, accounting for 85 to 97% of cases in dogs[3,14] and 58 to 100% of cases in cats.[5,6] This was also a finding in our study. In humans, traumatic PL is exclusively lateral and damage to the medial patellofemoral ligament, which is the main stabilizer of the patellofemoral joint, is identified in all cases.[29] This is comparable to our study in which all but one case had lesions of the joint capsule, which was located on the side opposite to the luxation direction. Patellar stability in dogs and cats is provided by proper alignment of the extensor mechanism and integrity of the parapatellar soft tissues. Of these, the lateral retinaculum is reported to be more developed than the medial one,[30] and its lesion may then allow medial PL even without disruption of the extensor mechanism. The lateral aspect of the hindlimb may be more exposed to external forces during a traumatic event, promoting lesions to the lateral retinaculum and thus resulting in medial PL.

Grade 3 PL was overrepresented in our study. In a multicentric retrospective study of 801 PL in dogs, grade 3 PL accounted for 27% of PL and grade 2 PL was predominant (46%).[3] In cats, a multicentric retrospective study of 85 PL found that grade 3 accounted for 39% of PL and that grade 2 PL was predominant (42%),[31] whereas a cross-sectional study of 78 cats reported 78% of grade 1 in those with PL.[5] We propose that this higher PL grade in our study is a direct consequence of the traumatic disruption of the parapatellar soft tissue restrains, which may act as the main stabilizers of the patella in animals with no anatomical abnormalities of the hindlimb.

A few cases (4/16) had damage to the trochlear ridges, which is often encountered in developmental PL as a result of chronic abnormal patellar tracking over the trochlea. In our cases, one had chondromalacia and the other three had mild cartilage abrasion. This could be the result of chronic wear of the cartilage as the cases were presented relatively late after the trauma (1–6 weeks). However, 2 of the cases had damage to the trochlear ridge opposite to the PL direction, which is presumably the direct consequence of the trauma.

The complication rates were similar to those reported in the literature, despite the high proportion of cases with grade 3 and grade 4 PL and the relatively high body weight of the dogs included in the study, two factors which are reported to be associated with higher complication rates.[3,9,31,32] Four cases developed OA even though they had no chronic PL. We assume that it is a long-term consequence of the direct

trauma to the joint rather than a consequence of the PL itself, as some of the cases had evidence of capsule remodelling at the time of surgery. The first case with a severe complication had no FPS initially placed. As it was a heavy active dog, an FPS would have helped the capsulorrhaphy in withstanding the forces exerted on it and possibly prevent its tearing. Beside considering the use of the FPS as a stabilizer in the case of an unstable patella after standard soft tissue technique, it should also be considered as a reinforcement to limit complications in dogs at risk. The second case with a severe complication had a bilateral tear of the fabellar attachment of the suture. This complication has been described with the use of orthopaedic wire for extracapsular stabilization of cranial cruciate ligament rupture,[33] and the potential weakness of the perifabellar tissues, together with the search of quasi-isometric points for extracapsular stabilization has led to the development of modified techniques with bone tunnel in the femoral condyle,[34] or use of bone anchors.[35] In our study, the suture was placed around the fabellae, which are described as the center of rotation of the patella, thus allowing constant tension on the patella during its tracking.[8] However, a radiographic study showed that using the fabella did not achieve isometry of the suture and that the center of the best-fitting circle passing through the trochlea was determined more isometric in small and large breed dogs.[36] Thus, modifying the surgical technique by anchoring the suture to the femoral condyle may prevent some complications and achieve a better outcome.

Patellar reluxation is a common complication following surgical treatment, reported in 4.3 to 48% of dogs.[37,38] In our study, 2 dogs had reluxation in the short-term postoperative period. In both cases, it was secondary to a severe complication leading to recurrent patellar instability and resolved once these complications were addressed. Ultimately, no case had long-term recurrence of PL reported by owners despite the high grade of PL in our study sample and the absence of bone reconstructive technique, which are also associated with recurrent PL.[8,39] Similarly, lameness improved significantly after surgery despite higher than usual initial lameness grade. This high lameness grade is due to the traumatic nature of the PL and the early presentation of the cases after trauma, which favored acute joint inflammation and pain in addition to mechanical discomfort caused by PL. The results of our study are in accordance with those previously reported for lameness in the case of surgically treated developmental PL, with the majority of dogs and cats exhibiting minimal to no postoperative lameness.[6,14,31,32,37,39] Because surgery restored the patella to its preinjury location, thus correcting the quadriceps alignment, this allowed rapid lameness improvement regardless of the underlying cause of PL.

All cases available for long-term follow-up had an acceptable to full functional outcome. Bosio and colleagues have reported a good overall outcome in 88% of dogs surgically treated for PL.[3] In that study, grade 3 PL was reported to have the highest number of cases with a poor clinical outcome (17%) and the lowest number of cases with a good clinical outcome (81%). Our results are consistent with this study, as most of cases had grade 3 PL and 76.9% of cases had a full functional outcome, although direct comparisons cannot be made as different surgical techniques and outcome criteria were used. They are also consistent with the results of the study by Cortina and colleagues in which 76.2% of respondents to the canine brief pain inventory questionnaire estimated that PL surgery did not interfere with daily life.[37]

Our study has several limitations. Because of its retrospective nature, some cases may have been missed because of incomplete medical records. We used very strict exclusion criteria to evaluate cases with isolated traumatic PL. Consequently, cases with skeletal abnormalities or concomitant orthopaedic disease were excluded, which precludes generalizing the results to a larger population. This also resulted in a small sample size. A larger sample size from multiple institutions would make the results more representative of the general population. Moreover, trochlea depth and tibial tuberosity position were subjectively assessed during surgery, and some cases may have been considered abnormal if computed tomography or specific radiographs were performed. Finally, long-term recurrence of PL was reported by owners based on their observations or by their veterinarian. This may have led to underestimating the recurrence rate of PL as subclinical or low-grade PL may have gone unnoticed. To mitigate this potential bias, we nonetheless specifically asked owners if their pet had clinical signs consistent with PL. However, the encouraging results of this study pave the way for further studies in a larger and more heterogeneous population.

Soft tissue techniques and the use of FPS were effective in surgically treating clinical cases of traumatic PLs in dogs and cats.

Authors' Contribution

J.B. and C.B. contributed to conception and design of the study, acquisition of the data, data analysis and interpretation, drafting and revising the manuscript, approved the submitted manuscript and are publicly accountable for relevant content. P.S., E.G., and S.G. contributed to data acquisition, drafting and revising the manuscript, approved the submitted manuscript and are publicly accountable for relevant content. A.D.M. contributed to conception of the study, data acquisition, drafting and revising the manuscript, approved the submitted manuscript, and is publicly accountable for relevant content.

Conflict of Interest

None declared.

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