

Corrective surgery for canine patellar luxation in 75 cases (107 limbs): landmark for block recession

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Abstract

Canine medial patellar luxation (MPL) is a very common orthopedic disease in small animals. Because the pathophysiology of this disease involves various pathways, the surgical techniques and results vary according to the veterinarian. Further, the landmark for block recession is not completely clear. We retrospectively evaluated 75 dogs (107 limbs) with MPL in whom our landmark for block recession was used from July 2008 to May 2013. Information regarding the breed, age, sex, body weight, body condition score (BCS), lateral *vs* bilateral, pre-operative grading, surgical techniques, removal of implants, concomitance with anterior cruciate ligament (ACL) rupture, re-luxation, re-operation, and rehabilitation was obtained from the medical records. The breeds were as follows: Chihuahua (n=23), Pomeranian (n=12), Yorkshire Terrier (n=9), and so on. The study group consisted of 33 males (castrated n=13) and 42 females (spayed n=21). The median age was 53.3±35.9 months (32-146 months); 13 cases were less than 12 months of age (17.3%). The pre-surgical BCSs were as follows: 1 (n=0), 2 (n=20), 3 (n=24), 4 (n=24) and 5 (n=7). The body weight was 4.51±3.48 kg (1.34-23.0 kg); 71 cases (94.7%) were less than 10 kg. The MPL grades (each limb) were G1 (n=1), G2 (n=18), G3 (n=78), and G4 (n=10); 32 cases were bilateral and 43 cases were unilateral (right n=27; left n=16). The specific surgical procedure (distal femoral osteotomy) was 3 stifles in Chihuahuas. Concurrent with ACL rupture was 16/107 stifles (15.0%) corrected with the over-the-top method or the extracapsular method in Papillons (5/6), Chihuahuas (5/23), and so on. The occurrences of re-luxation and re-operation were 3 out of 107 stifles (2.8%) and 0%, respectively. In this retrospective study, we present a potentially good surgical landmark for block recession of MPL in dogs.

Introduction

Medial patellar luxation (MPL) is a common orthopedic disease in dogs, and this condition accounts for many of the corrective surgeries that are performed in dogs. Consequently, several studies have reported the outcomes after corrective surgery for MPL in dogs.¹⁻⁵ The outcome has generally been considered in terms of either post-operative limb function or the development of osteoarthritis. However, few studies have examined in detail the incidence and the types of complications after corrective surgery for patellar luxation. A recent study reported that the complication rate after surgery is 18% and the occurrence of re-luxation requiring re-operation is 8%.¹ However, these variables may depend on the experience of the surgeon, breed distribution, and several other factors.

Sulcoplasty deepens the trochlear groove and reportedly reduces patellar instability, and these effects have been confirmed in canine stifles.¹ Femoral trochlear sulcoplasty significantly reduces the frequency of MPL, suggesting that femoral trochlear sulcoplasty should be performed as part of MPL surgery to minimize the risk of MPL. In a comparison between trochlear block recession (TBR) and trochlear wedge recession (TWR) for trochleoplasty in canine patellar luxation using a cadaver model, TBR increased the proximal patellar depth and the patellar articular contact with the recessed proximal trochlea, recessed a larger percentage of the trochlear surface area, and resulted in a greater resistance to MPL in an extended position as compared with TWR. TBR may help limit the development of stifle degenerative joint disease in dogs treated for canine MPL.⁵⁻⁷ Further, rectangular recession trochleoplasty for treatment of MPL in dogs has been well described.⁸ However, no landmark has been established for the surgeon during procedure. The aims of this study were as follows: to review the medical records of dogs that had corrective surgery for MPL, to compare the descriptive epidemiology with previous reports, to report the complications that occurred after the surgery, and to calculate and compare the frequency of complications for correction of MPL when using a new landmark.

Materials and Methods

We retrospectively evaluated 75 dogs (107 limbs) with MPL from July 2008 to May 2013. Information regarding the breed, age, sex, body weight, body condition score (BCS), lateral *vs* bilateral, pre-operative grading, surgical techniques, removal of implants, concomitance with anterior cruciate ligament (ACL)

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rupture, re-luxation, re-operation, and rehabilitation was obtained from the medical records. MPL grading is shown in Table 1. The following surgical techniques were used: i) medial restraint release (release of the medial retinaculum), ii) lateral restraint reinforcement (imbrication of the joint capsule), iii) capsulolabral reconstruction, iv) trochlear groove deepening (block recession and trochlear chondroplasty), and/or v) tibial tuberosity transposition, by 2 surgeons (Dr. Isaka and Dr. Befu). Partial meniscectomy was performed if the meniscus was injured. The landmark for block recession was between the femoral trochlear notch and the attachment of the posterior cruciate ligament (PCL) (Figure 1). Subcutaneous robenacoxib (1 mg/kg) was used for pre-operative pain control and continuous intravenous fentanyl (1-5 g/kg/h) was used intra-operatively. Robert Jones bandages were applied for 10 days for post-operative management. Ice was applied to the surgical site [10 min, twice a day (b.i.d)] and Cefotax (20 mg/kg, b.i.d.) was administered intravenously for 3 days, and the skin suture was removed 10 days after the operation.

Results

We reviewed 75 cases (107 limbs) of MPL. As shown in Table 2, the following breeds were included in this study: Chihuahua (n=23), Pomeranian (n=12), Yorkshire Terrier (n=9), Toy Poodle (n=7), Papillon (n=6), mixed breed (n=4), Maltese (n=3), Cavalier King Charles Spaniel (n=2), Shiba (n=2), Bulldog (n=2), Yunbancyen (n=1), Miniature Dachshund (n=1), Boston Terrier (n=1), Shetland

Sheepdog (n=1), and West Highland White Terrier (n=1). All evaluation variants are shown in Table 3. The study sample included 33 males (castrated n=13) and 42 females (spayed n=21). The median age was 53.3±35.9 months (32-146 months); 13 cases were less than 12 months of age (17.3%). The pre-operative BCSs were 1 (n=0), 2 (n=20), 3 (n=24), 4 (n=24), and 5 (n=7). The body weight was 4.51±3.48 kg (1.34-23.0 kg); 71 cases (94.7%) were less than 10 kg. The MPL grades (each limb) were G1 (n=1), G2 (n=18), G3 (n=78), and G4 (n=10). Of the total cases, 32 were bilateral and 43 were unilateral (right n=27; left n=16). The specific surgical procedure (distal femoral osteotomy) was 3 stifles in Chihuahuas. Concurrent with ACL rupture was 16/107 stifles (15.0%) corrected with the over-the-top method or the extracapsular method in Papillons (5/6), Chihuahua (5/23), and so on. Hip dysplasia was found in only 2 limbs with MPL. Re-luxation and re-operation were noted in 3 out of 107 stifles (2.8%) and in 0%, respectively. However, re-luxation was not observed after January 2010. In addition, trochlear sulcoplasty was not performed in any of the re-luxation cases.

Discussion

Numerous surgical techniques of trochlear groove deepening for canine MPL have been reported. In TBR, an osteochondral block is developed from the femoral trochlea by utilizing 2 abaxial osteotomies that are initiated slightly axial to the peak of each trochlear ridge and a transchlear (basilar) osteotomy that is angled approximately 90° to the trochlear sulcus. The abaxial osteotomies are angled approximately 10° from the sagittal plane so that they converge. The wedge is carefully removed once the 3 osteotomies are complete. Bone can be removed from the base of the recipient bed or from the basilar surface of the osteochondral block to achieve recession of the osteochondral block and the articular surface. The osteochondral block is replaced and is firmly pressed into the recipient bed to achieve a press fit.⁸ However, the success of this surgical technique depends on the experience of the surgeon. In our method, we used the attachment point of the PCL and the femoral trochlear notch as the landmark for trochlear groove deepening, and this technique provided good surgical results.

Bilateral MPL is common, occurring in 50% (Arthurs *et al.*, 2007) to 65% of cases.^{5,9} Bilateral cases were comprised 42.7% of the cases in our study, which is similar to the previous studies. The higher incidence of MPL in males compared with females is consistent with 3 previous reports.³⁻⁵

In a recent report, Linney *et al.* reported that the incidence of re-luxation and re-operation was 6.6% in total for 91 cases of MPL in dogs after non-block recession.² In addition, Arthurs *et al.* reported that the complication and re-operation rates after MPL surgery were 18% and 8%, respectively.¹ Our surgical results were better compared to this previous study. Further, no re-luxation case was observed after 2010. Finally, trochlear sulcoplasty was not performed for any of the re-luxation cases in our study. Interestingly, the incidence of concomi-

tance with ACL rupture was approximately 15.0% in our study, whereas the incidence was 41% in a previous study.³ Although this difference may be due to different breed distributions such a variation would not completely explain this disparity.

In a small breed study, the overall recurrence rate was 10% in Pomeranians. The outcome of surgery was considered good for grade II luxation with a 100% success rate. Recurrent MPL was diagnosed in approximately 11% of dogs with grade III and in 36% of dogs with

Table 1. Grades of patellar luxation.

Grade	Description
1	Patella can be manually luxated but returns tonormal position when released
2	Patella luxates with stifle flexion or on manual manipulation and remains luxated until stifle extension or manual replacement occurs
3	Patella luxated continually. Patella can be manually replaced but reluxates spontaneously when manual pressure is removed
4	Patella luxated continually and cannot be manually replaced

Table 2. Breeds.

Breed	Number of stifle	Case number
Chihuahua	33	23
Pomeranian	16	12
Yorkshire Terrier	15	9
T. Poodle	9	7
Papillon	6	6
Mix	7	4
Maltese	4	3
Cavalier King Charles Spaniel	3	2
Bulldog	2	2
Shiba	3	2
Yunbancyen	2	1
Dachshund	1	1
Boston terrier	2	1
Shetland sheep dog	1	1
West highland white terrier	1	1

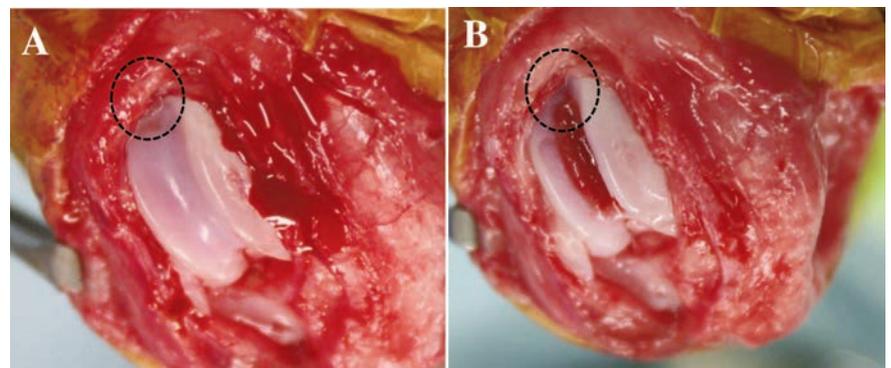


Figure 1. Surgical Landmark in pre-(A) and post-(B) block recession.

Table 3. Luxation related variables in all dogs.

Variable	Number		Percentage	
	Stifles	Cases	Stifles	Cases
Body weight				
<10 kg	102	71	97.1	94.7
>10 kg	5	4	2.9	5.3
Pre-operative BCS				
1	-	0	-	0
2	-	20	-	26.7
3	-	24	-	32.0
4	-	24	-	32.0
5	-	7	-	9.3
Age				
<12 months	16	11	15.2	14.7
>12 months	91	64	84.8	85.3
Male				
Intact and castrated	44	33	41.1	44.0
Castrated	14	13	13.1	17.3
Female				
Intact and syayed	63	42	58.9	56.0
Spayed	29	21	27.1	28.0
Lateral				
Left and right	-	43	-	57.3
Left hind-limb	-	16	-	21.3
Right hind-limb	-	27	-	36.0
Bilateral	-	32	-	42.7
Trochlear sulcoplasty	22	-	20.5	-
Trochlear sulcoplasty	85	-	79.4	-
Pre-operative grading				
G1	1	-	0.9	-
G2	18	-	16.8	-
G3	78	-	72.9	-
G4	10	-	9.3	-
Concomitant with ACL	16	16	15.0	21.3
Re-luxation	3	3	2.9	4**
Re-operation	0	0	0	0
Removal of implant	33	20	30.8	26.7
Needs rehabilitation	27	21	25.2	28.0

**All re-luxation cases was without trochlear sulcoplasty.

grade IV luxation.¹⁰ Patellar luxation recurred in 2.6% of the dogs in our study, and this result is better than those reported by Alam (6%), and Linney (19.8%), who treated MPL with a combination of the lateral retinaculum imbrication and tibial tuberosity transposition techniques, but without the TBR technique.^{2,4} Thus, it appears that TBR is a definitive surgical method for MPL, resulting in a high surgical success rate. We agree with the previous recommendation that at least 1 corrective osteotomy such as tibial tuberosity transposition, femoral trochleoplasty, or tibial plateau leveling osteotomy with tibial axial re-alignment should be performed to reduce the patellar re-luxation rate.¹¹ In our study, the treatment outcomes of grade II and III MPL after TBR were 100% and 88%, respectively, and weight bearing and lameness improved following surgery.

TBR is a cartilage-sparing technique that was developed to achieve adequate trochlear depth and width, to maximize the preservation

of hyaline articular cartilage, and to provide secure fixation of the osteochondral autograft.⁸ However, until now, a good landmark for TBR did not exist. In our TBR, we created a landmark between the attachment point of the PCL and femoral trochlear notch, which might not depend on the experience of the surgeon.

In our study, post-operative rehabilitation was required for approximately 25% of the cases. A protocol has been established for canine ACL rupture.¹² To our knowledge, post-operative rehabilitation is definitely required for all canine ACL rupture. Thus, a rehabilitation protocol for canine MPL will be needed in the near future.

Conclusions

In conclusion, this retrospective study suggested that the area between the femoral trochlear notch and the attachment point of PCL is good surgical landmark for block reces-

sion in canine MPL, and that the use of this landmark leads to satisfactory surgical results.

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