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Rohit Kumar Sharma
College of Veterinary and Animal Science, Navania, RAJUVAS-SOUTH, Campus, Udaipur, Rajasthan, India

Jagdish Das
College of Veterinary and Animal Science, Navania, RAJUVAS-SOUTH, Campus, Udaipur, Rajasthan, India

Manish Sharma
College of Veterinary and Animal Science, Navania, RAJUVAS-SOUTH, Campus, Udaipur, Rajasthan, India

Shiv Kumar Sharma
College of Veterinary and Animal Science, Navania, RAJUVAS-SOUTH, Campus, Udaipur, Rajasthan, India

Corresponding Author:
Rohit Kumar Sharma
College of Veterinary and Animal Science, Navania, RAJUVAS-SOUTH, Campus, Udaipur, Rajasthan, India

Clinical study on different surgical techniques for the management of upward fixation of patella in bovines

Rohit Kumar Sharma, Jagdish Das, Manish Sharma and Shiv Kumar Sharma

Abstract
Three different methods of medial patellar desmotomy to manage UFP (upward fixation of patella) in 18 limbs of 17 clinical cases of bovines showing lameness were performed and clinical findings, intraoperative problems, postoperative complications were recorded and documented in this article. Blind stab incision, aseptically open approach and silk suture technique were performed for management of UFP.

Keywords: Upward fixation of patella, cattle, buffalo, surgery, stab, open, silk-suture

Introduction
Upward fixation of patella, especially hilly region, is a common surgical problem in bovines and can be treated quickly and magically. Despite the fact that it has been documented in practically all domestic animal species but occasionally (Krishnamurthy and Tyagi, 1978; Cahill *et al*.,1985; Shettko and Trostle, 2000; Takahashi *et al*., 2002; Duzgune, 2005; Araujo *et al*., 2008) [8, 2, 13, 15, 6, 1]. This is very common surgical problem reported in ruminants by field practitioners. Pallai (1944) [10] defined chronic patella luxation as a transient displacement of progression. One of the most common functional disorders of the tibia-femoral-patellar articulation (Stifle joint) in bovines is patellar fixation, which is usually characterized by the patella's temporary or permanent displacement (common in buffaloes) from its normal position during movement. Sharp angle between the femur and tibia, young and disabled animals are more likely to have their patella fixed upward. This results from the strain which put on the femuro-patellar articulation's tendon and immature ligaments during their initial stages. The disease causes significant economic loss because lameness impairs bullocks' ability to work and affects Animals movement. Two technical methods (Krishnamurthy and Tyagi, 1978; Takahashi *et al*., 2002; Chandrapuria *et al*., 2012) [8, 15, 3] are already explained in many literature but here one other technique is also used clinically and standardized.

Case presentation findings of whole study
Total 18 cases (6 cases with each technique in 7 cattle (38.88%) and 11 buffaloes {61.11%}) were presented and operated at Veterinary Clinical Complex, Navania. All cases were examined for neurological defects and reflexes from central nervous system in healthy limbs. However all animals were reported without recumbency and in alert mode. Stifle joint were clinically evaluated to rule out patellar luxation and presence of distal femur fractures. Out of 18- cases, 4 cases of buffaloes were reported as reoccurrence case and were operated by field veterinarians. Total 2- cases of buffaloes were reported with gonitis due to faulty operation and broken surgical blades along with persistence of UFP even after surgery at field level. Various parameters and clinical findings like body weight, heart rate, respiration rate and temperature of all cases were noted immediate after reporting of cases at clinic and further evaluated. Body weight ranged from 250 to 525 Kg measured through modified Shaeffer's formula (B.W. = Body length X {Chest girth}^{2} divided by 300). Temperature was reported higher in recently parturated buffaloes might be due to travelling stress because of 40-50 km of distance of clinic in most of cases. Detailed findings of all cases are mentioned in Table.1

Table 1: Detailed findings of all cases are mentioned

Total cases (on which study have been conducted)	Species				Time of occurrence to time of surgery (in days) (Mean ± S.E.)			History
18	C	M	1	7	C1	243	302.44 ± 43.19	a. Early to mid gestation (upto 4.5 months) = 16. 66% (n=3) b. Late gestation (4.5 to 9 months) =50% (n=9) c. Post parturition= 33.33% (n=6) d. Partial weight bearing lameness = 33.33% (n=6) e. Severe jurk = 22.22% (n=4) f. Complete extension of limb = 44.44% (n=8)
					C2	274		
					C3	365		
					C4	243		
		F	6		C5	243		
					C6	183		
					C7	365		
	B	M	0	11	B1	91		
					B2	365		
					B3	730		
					B4	61		
		F	11		B5	730		
					B6	61		
					B7	365		
					B8	243		
					B9	274		
					B10	365		
					B11	213		

C= cattle; B= Buffalo, M=Male, F=Female

All the cases were selected after complete clinical examination of affected limb. In doubtful cases of distal femur/patella/ tibial tuberosity fracture or luxation, surgery was not recommended to owner and conservative management was suggested. However in present study, only healthy cases were selected and discussed. Materials and techniques used during study period were mentioned in Table 2.

Type of technique used in present study along required instruments

All the cases were operated in lateral recumbency with affected limb towards the ground. Affected limb was extended properly and surgical site was prepared aseptically. 5-10ml of 2% lignocaine was infiltrated within skin and medial ligament. Standard protocol using index finger just cranial to tibia upto cranial tubersity was performed as mentioned by Singh *et al.*, (2020) [14] in all the cases. However problems were faced by surgeon in many buffaloes (54.54%, n=6) due to presence of large udder in heavy breeds but no fracture was reported due extension of affected limb during desmotomy. Medial ligament was severed directly with B.P. blade no.24. Sutures were required in 83.33% (n=5, all were buffaloes) cases due larger stab to skin and minor vessels injury during desmotomy. For 4 to 5 times limbs were extended and flexed to clear few adhesions if left during surgery especially in delayed cases. After surgery analgesic (meoxicam@0.02 mg/kg) and antibiotic (Strepto-penicillin @ 2 to 7 gm. {on the basis of animal's body weight}) were prescribed to owner for 3 and 5 days respectively. For open approach, animals were deeply sedated with xylazine. Incision was given directly over the medial ligament after following protocols as mentioned for blind stab incision. For silk-suture friction technique, silk no.2 of 80 cm in length was taken and inserted in the eye of surgical traumatic cutting needle. Then needle is inserted beneath the ligament from medial to cranial side and then suture is lifted to make very close contact with ventral surface of medial ligament. Afterwards, ligament was resected through 12 to 18 fast friction. Rest of the protocol is similar as blind stab technique.

Table 2: Type of technique used in present study along required instruments

Details of Techniques				Material Required	
Technique	No. of Cases Selected	Species		Specific to Technique Planned	Common Material
1. Blind stab incision	N=6	C	1	B.P blade no 24 without handle was tried with good success. Index figer and thub were used for desmotomy	a. Surgical gloves b. Povidone iodine solution c. 10 ml and 20 ml syringe with 18G needle d. Shaving blades safety e. 2% lignocaine HCL f. Cutting needle with silk (no.1) in few cases where haematoma has been observed
		B	5		
2. Aseptically Open approach	N=6	C	3	Xylazine @ 0.05 mg/kg intramuscular. Large animal major surgical pack.	
		B	3		
3. Silk suture and friction technique	N=6	C	4	Surgical large half moon cutting (traumatic) needle. Silk no.2, 80 cm in length	
		B	2		

C=cattle, B=Buffalo, N= number of cases, HCL=Hydrochloride

Results and Discussion

A. Intraoperative Hurdles

Presence of large udder in heavy breeds in milk phase, more force on index finger (in blind method) especially in buffaloes, inadequate analgesia to skin and ligament during blind and suture-friction method, suture breakage and needle bending in suture-friction technique, post operative haematoma formation were reported as major issues during this study. Here note one point that blade breakage is not observed during blind stab method. The reason behind is, B.P. blade No.24 without handle. It is hypothesis of author that when B.P. handle is used, uneven force is distributed at joint of B.P. handle and B.P. blade during desmotomy of taut ligament. Hence study was conducted in group-I without handle. However no technical measurements were recorded about this hypothesis and therefore further biomechanical study is required. Moreover, author was able to perform this

technique because of particular expertise. For beginners author's advice is, to use this technique first on cadaver.

B. Follow-up, post-operative complications and further management

After surgery owner was contacted telephonically (wherever possible) for follow-up of the cases upto 5-6 months. Gonitis, hematoma formation at stabbing site, lameness, maggoted wound were reported as early stage complication. Recurrence was not recorded might be due to unavailability of long term follow-up. All the postoperative details are mentioned in Table.3

Table 3: Details of postoperative complications and further management

Post-operative complication	Percentage of occurrence	Possible reason behind and Further management
1. Subcutaneous hematoma immediate after surgery	27.77% (n=5 out of 18 cases) or 83.33% (n=5 out of 6 cases of technique-I)	1. Minor vessels around the incision were severed due to large area of B.P. blade no.24 2. One cross-mattress suture was placed in 4- cases where in 1 cases bleeding stopped spontaneously. 3. Injection of Tranexamic Acid @ 20 mg/Kg body weight
2. Gonitis and abscess	11.11% (n=2 out of 18) or 16.66% (n=1 out of 6 in blind method) 16.66% (n=1 out of 6 in open method)	1. Both cases were reported due to owner's ignorance to use prescribed medicine. Owners gave history that they have not used antibiotics, analgesics and fly repellent as prescribed postoperatively. 2. Both cases were treated with drainage of abscess, antiseptic dressing along with flushing of stifle joint, prolonged use of antibiotics and analgesics. However follow-up is not available as of yet.
3. Lameness and prolonged extended limb	11.11% (n=2 out of 18) or 33.33% (n=2 out of 6) both were buffalo treated with blind method)	1. Unknown reason. Might be delayed reporting of cases. Because ligament was resected well but presence severe adhesions covered large joint area and bone in cases reported late. 2. No management was possible
4. Maggot wound	5.55% (n=1 out of 18) or 16.66% (n=1 out of 6 in open method)	1. Ignorance of prescribed application of fly repellent spray regularly after surgery. 2. All the visible maggots were removed after placement of animal in lateral recumbecy under sedation with xylazine @ 0.05 mg/kg. Further prescribed regular application of fly repellent. Injection Ivermectine @ 0.02 mg/kg body weight once. Antibiotics and analgesics were also prescribed similar to postoperative management.

C. Discussion

Surgeon's expertise, selection of patient for surgery, surgical recumbecy, anaesthesia, stage of parturition, oestrus cycle, type of surgical technique and stage of case presentation usually affects outcomes of medial patellar desmotomy in bovines (Moussu and Dollar, 1905; Dhillon *et al.*,1972) [9, 4]. Sometimes due severe adhesions, middle ligament is also severed upto 30% to obtain better outcomes after MPD (Singh *et al.*, 2020) [14]. Many researchers (Patra, 1954; Gadgil *et al.*, 1972; Tyagi, *et al.*, 1972; Dhillon *et al.*, 2009 Singh *et al.*, 2020) [11, 7, 15, 5, 14] mentioned in their research that cutting of little portion middle ligament along with whole medial ligament is essentially required otherwise lameness can persist ahead (Rajkumar, 2017) [12]. Blind technique is faster and can be performed quickly even in standing condition in buffaloes than other techniques. Techniques other than blind stabbing required lateral recumbency as essential part of surgery which further demands manpower. However lateral recumbency is safe and accurate dissection can be done with minimum chances of reoccurrence of fracture. Choice of technique is completely depends on surgeon. Use of larger size B.P blade (No.24) is usually responsible for subcutaneous hematoma formation immediate after surgery but can be subsided after proper management in postoperative days. Breakage of B.P blade is common problem associated with this surgery but in this study such complication is not reported. According to author's expertise, use of B.P. blade No.11 attached with B.P. handle is more prone to breakage. The philosophy behind is, uneven distribution of force especially at handle and blade joint during desmotomy of taut medial ligament. However it is not documented anywhere and further biomechanical study is required to make ultimate conclusions. Auhtor is perticulary having expertise to perform blind stabbing without B.P. handle and hence it is advised to others that kindly practice first on cadaver and the only apply on affected limb. However if blade is get broken during standard protocol of blind stabbing with B.P. handle then the metallic piece of broken blade is usually drained in abscess during postoperative period.

Conclusion

Upward fixation of patella is very common surgical affection of bovines including both cattle and buffaloes. However it can also occur in equines. Surgical treatment is essentially required. Blind method with stab incision is less time consuming and choice of technique under field conditions. Reoccurrence and complication are common in delayed cases especially in buffaloes.

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