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Incidence of Upward Fixation of Patella and Evaluation of Stab Method and Pinhole Method for Medial Patellar Desmotomy (MPD) in Cholistani Cattle

Hafiz Muhammad Athar[1], Muhammad Altaf[2], Nasir Iqbal[3](Corresponding Author), Abdul Qayyum[4], Muhammad Taslim Ghori[5]

[1] Department of Clinical Medicine and Surgery, FV&AS, The Islamia University of Bahawalpur, Pakistan, ORCID : https://orcid.org/0009-0006-3555-3467, Email: Atharsunny74@gmail.com
[2] Department of Clinical Medicine and Surgery, FV&AS, The Islamia University of Bahawalpur, Pakistan, ORCID : https://orcid.org/0009-0006-0654-6713, Email: muhammad.altaf@iub.edu.pk
[3] Department of Veterinary Surgery, Ondokuz Mayis University, Samsun, Turkey, ORCID: https://orcid.org/0000-0001-5135-3146, Email: Nasiriqbalvet3@gmail.com
[4] Department of Clinical Medicine and Surgery, FV&AS, The Islamia University of Bahawalpur, Pakistan, ORCID : https://orcid.org/0009-0006-5545-2680, Email: abdul.qayyum@iub.edu.pk
[5] Department of Clinical Medicine and Surgery, FV&AS, The Islamia University of Bahawalpur, Pakistan, ORCID : https://orcid.org/0000-0001-7064-220X, Email: taslem.ghori@iub.edu.pk

Abstract

Patellar fixation is a functional disease seen in cattle's tibia-femoral-patellar articulation. Medial Patellar Desmotomy (MPD) is a surgical procedure used in cattle and equine to treat certain disorders that affect the patella or kneecap in animals, as the lameness associated with the patellar fixation affects the working and feed-searching ability of animals. The upward fixation of the patella is one of the important diseases of cattle that leads to lameness, reduced production and increased culling of cattle and buffaloes. Mainly, two techniques of MPD, including the stab method and the pinhole method, are used frequently in the field conditions for correction of upward fixation of the Patella. The present study was conducted primarily to study the incidence of cases of upward fixation of patella cattle in Bahawalpur and comparison of its correction techniques, i.e., stab method and pinhole method. It was shown that the incidence of upward fixation of the patella was 0.04% (170 / 4, 20,000). In the current study, data from 170 Cholistani cattle were recorded clinically as having upward fixation of the patella. The condition (upward fixation of the patella) was more prevalent in female cows than in males. There were 30% males (51/170) and the remaining 70% (119/170) were female animals. The total cases that were found in field conditions were treated by two surgical techniques: the Pinhole method and the Stab method. It was found that the Stab method of surgical correction of upward fixation of the patella was better than the pinhole method, with minimal complications, early recovery, and fast wound healing. It was found that the wound healing was 5.9 times faster in the stab method as compared to the pinhole method, while the odds of age, sex, season, and parity had no significant effect on the wound.

Keywords: Desmotomy; Patella; Pinhole Method; Stab Method; Upward fixation.

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Introduction

Ththe e fixation of the patella in the upward direction has been considered as one of the major conditions that may lead towards decreased production, lameness and increased culling of the animals from the herd, resulting in severe economic loss to the farmers. It is a functional disease seen at the tibia-femoral-patellar articulation in bovines (Telila and Dugassa, 2022). The main probable reasons contributing to this condition are hereditary factors, dietary deficiencies, overexploitation, breeding practices, external injuries, severe contraction of the crural triceps muscle, and morphological alterations in the stifle joint (Abushhiwa *et al.*, 2021). This condition occurs when the patella is momentarily stuck in a raised position, leading to lameness and pain in animals (Sherif, 2017; Di Dona *et al.*, 2018). Medial Patellar Desmotomy (MPD) is a surgical method that has been used in bovines and equine to overcome the cause that affects the patella in large animals, as the lameness associated with the patellar fixation affects the normal production and growth of animals (Di Dona *et al.*, 2018; Sherif, 2017; Chandrapuria *et al.*, 2012). This surgical correction involves the intentional cutting or loosening of the medial patellar ligament, which is essential for maintaining the stability of the patella's position (Abushhiwa *et al.*, 2021).

As per the need of the time, two minimally invasive techniques have been mainly used frequently for the treatment of incidences of upward fixation of the patella. These include the stab method and the pinhole method (Telila and Dugassa, 2022; Mahla *et al.*, 2023). The Stab Method is a technique that involves the intentional insertion of a sharp instrument to aid in the liberation of the medial patellar ligament. In contrast, the Pinhole Method utilizes a process using perforation to accomplish it. Both techniques have the same objective of mitigating patellar luxation and restoring optimal joint functionality (Singh *et al.*, 2015; El-Sherif, 2019b). The current research was planned for the incidence of clinical cases of patellar fixation and evaluation of both techniques of MPD in terms of specific advantages, limitations, surgical outcomes, rate of recovery, and potential complications associated with each surgical method.

Materials and Methods

The study was carried out for the incidence of upward fixation of the patella and evaluation of both techniques of MPD in 1 1-year study period starting from 01-05-2023 to 30-04-2024 in Tehsil Bahawalpur. The cattle with upward fixation of the patella were diagnosed on the basis of history and clinical signs. For the sake of proper signalment and diagnosis, a questionnaire has been compiled and filled out. The different assumed risk factors with the occurrence of upward fixation of the patella, including age, sex, season, and parity number, were also recorded on a questionnaire. The different blood parameters, Complete Blood Count (CBC) and enzymes including Creatinine Phosphokinase (CPK), Aspartate Aminotransferase (AST) and Lactate Dehydrogenase (LDH) were recorded before and after performing both surgical techniques (Stab and Pinhole method) for correction of upward fixation of patella. While surgical manipulation, proper sterilization has been maintained, and proper basic surgical protocols have been followed as per field conditions. After surgical intervention, proper preventive treatment, including antiseptics and antibiotics, has been administered and followed for at least 3-5 days. Thorough examination and follow-up have been managed every second week for 3 months.

Confirmation of cases having upward fixation of the Patella

The clinical cases of upward fixation of the patella were examined by palpation of the ligament while keeping the animal in a standing position. The thumb was placed on the medial femoral condyle, the last finger on the cranial tubercle tuberosity, and the first finger was pressed from the caudal tubercle tuberosity to the cranial tubercle tuberosity (Singh *et al.*, 2015). The slippery medial ligament was identified using the forefinger. In chronic cases, the medial patellar ligament appeared to be hard and fibrous. The animals were graded based on ligament nature to grade the luxation of the stifle joint according to (Singleton, 1969; Sodhi et al., 2022) as shown in the following Table 1.

Table 1: Classification of the degree of medial patellar luxation in animals.

Grade I	Intermittent dislocation of the patella	-The patella readily dislocates but reverts to its original position with the cessation of physical strain. -No or minimal deviation of the tibial crest
Grade II	-Frequent luxation of the patella -Leg sometimes carried	-The patella can be manually reduced; however, it is prone to easy relaxation. -Up to 30 degrees of tibial torsion
Grade III	Permanently luxated patella	The tibia was promptly rotated

Surgical Intervention of MPD by Using the Pinhole Method

Xylazine HCl (My-lab Pvt, Pharma) was injected into the cows through intravenous administration at a dosage of 0.1 mg/kg to induce sedation in them. After sedating the animal, the animal was positioned by resting the affected limb elevated. The area around the knee joint of the leg was trimmed and cleaned using alcohol wipes, and then a 10% solution of povidone-iodine was applied. Cows were injected with a 2% lidocaine solution in the epidural space between the first and second coccygeal vertebrae using a supernal needle (20-gauge, 5 cm length) diluted with normal saline to a volume of 5ml according to Ismail, 2016. To rectify upward patella fixation in all cows, the medial patellar desmotomy was performed by the pinhole method using the lateral recumbency method of restraining as shown in Figure 1 (a).

The required instruments were a half-circle reverse cutting needle #3, a needle, and a silk strand (USP 1) of suitable length. A Sterile Non-Absorbable Silk (USP 1) suture material was inserted 2cm on the medial aspect of the medial patellar ligament just above the tibial crest through skin through the skin (El-Sherif, 2019a). The needle was directed underneath the ligament and emerged on the opposite side, between the middle and medial patellar ligaments. The two ends of the silk were held firmly by both hands, which were then used to cut the ligament by making sawing movements manually. This procedure usually lasts for a few seconds to a few minutes, depending on the size of the ligament and the overall body condition of the animal. The sawing motion ceased with the detection of a distinct "POP" sound, indicating the successful completion of the desmotomy as shown in 1 (b). (Sherif, 2017). The skin was not cut; afterward, the silk strand was extracted, and the surgical site was once again disinfected using a povidone-iodine solution. After surgery, the cow was standing in a normal position by putting equal weight on all four legs, and no leg was elevated. Proper antiseptic and antibiotic treatment has been followed for 3-5 days in all animals.

Fig 1: Surgical (a) and post-surgical intervention (b) of MPD by Pinhole Method.

Surgical Intervention of MPD by Using the Stab Method

This technique of MPD was done in a standing position and lateral recumbency (Uddin *et al.*, 2009; Kolangath et al., 2025). For the stab technique, the animals were first cast properly by using the Burley Method of casting and the animal was prepared for surgical intervention on lateral recumbency with the affected hind limb downwards while the non-affected hind limb was tied to avoid any hindrance. The affected limb was drawn somewhat backward with a fully flexed stifle joint. The limb was secured slightly above the fetlock joint with a rope to the center of thick cotton (Lee *et al.*, 2014). The index finger was moved up the cranial border of the tibia until it reached the lateral tibial tuberosity, where three straight patellar ligaments were attached (Pagdal, 2021). The finger was inserted into the groove between the cranial and medial ligaments at the tibia's medial condyle level as shown in Figure 2 (a and b).

Fig 2: Identification of medial patellar luxation (a) and medial patellar ligament (b).

A small cut was made on the upper third portion of the medial patellar ligament using a surgical knife. The ligament (Figure 3) was cut using either BP blade no.11 or BP blade no.24 while stretching the skin upwards and releasing it with the blade to minimize the size of the cut(Lioce *et al.*, 2019).

Fig 3: Cutting of the Medial Patellar Ligament with a Blade by using the Stab technique of MPD.

The remaining parts of the ligament that were still intact were cut using a desmotomy bistoury (Uddin *et al.*, 2009; McCoy and Goodrich, 2012). The stab wound was cleaned by flushing it with a solution of 5% povidone-iodine. The ligament felt hard like a conspicuous cord when palpated with a finger. A small incision was made in the skin across the medial ligament, beginning in front of the medial tibial tuberosity and moving towards the cranial tibial tuberosity (Seo *et al.*, 2016; Zhalniarovich *et al.*, 2018). The index finger was inserted into the wound to remove the skin from the fascia. The fascia was dissected to reveal the white, shining medial patellar ligament. To exteriorize the patellar ligament, curved scissors were slipped under it. The ligament was then cut at its insertion with a blade. The incision was explored with the index finger and the undivided fibres of the ligament using scissors. The incisions

were sutured using a simple interrupted suture pattern (Jelinek et al., 2024).

Post-Operative Care

The wound was dressed after performing the stab technique and pinhole technique of MPD daily for a period of three consecutive days by applying an antiseptic solution containing 10% povidone-iodine, and the animals were injected with Antibiotics (Penicillin 5 g) and NSAIDs for 3-5 days. Sutures had been removed after 10 days of surgery. A period of steady rest lasting for four weeks was recommended. Examination of animals was performed daily as part of the postoperative assessment. The purpose of this examination was to identify any signs of lameness and the presence of visible indications of inflammation, such as swelling, heat, pain, and redness.

Statistical Analysis

The data of 170 animals was arranged by using Microsoft Excel and analyzed statistically by using logistic regression and a T-test on the SPSS system. Male to female ratio, incidence of upward fixation of patella, percentage of affected males, percentage of affected females, healing efficacy, blood parameters and concentration of various enzymes had been analyzed.

Results

The study was conducted to find out the incidence of cases of upward fixation of the patella in Cholistani cattle in Bahawalpur. The research was basically focusing on a comparison between the stabs and pinhole method of correction for the incidences of upward fixation of the patella in Cholistani cattle. It was shown that the incidence of upward fixation of the patella was 0.04% (170 / 4, 20,000). After proper diagnosis, a total of 170 cattle were considered for the research and were found affected by an upward fixation of the patella involving either one or both limbs while walking. The condition (upward fixation of the patella) was more prevalent in female cows than in males. There were 30% males (51/170), and the remaining 70% (119/170) were female animals for economic reasons in rural regions. The majority of cases were found at an average age of 5 years. It was found that the Stab method of surgical correction of upward fixation of the patella was better than the pinhole method, with minimal complications, early recovery, and fast wound healing. In the comparison of both surgical correction techniques, different blood parameters (RBCs, WBCs, Hb, TLC, neutrophils, monocytes, eosinophils) and concentration of different enzymes (CPK, AST and LDH) were also evaluated before and after the surgical technique. It was found that there was no significant difference between blood parameters and the concentration of enzymes in both surgical techniques.

Logistic regression analysis was used for evaluation of different risk factors such as season, age, parity number and sex of animals for association with wound healing of MPD. It was found that the wound healing was 5.9 times faster in the stab method as compared to the pinhole method, while the odds of age, sex, season, and parity had no significant effect on the wound healing after the surgical procedure of both techniques of upward fixation of the patella.

Discussion

Upward fixation of the patella in cattle is one of the major economic crises for farmers nowadays, leading to culling of animals (Choudhary *et al.*, 2015; Sherif, 2017; Telila and Dugassa, 2022). The medial patellar Desmotomy (MPD) procedure has been a reliable surgical intervention to treat patellar luxation in cattle (Di Dona *et al.*, 2018).

The upward fixation of the patella can be handled through MPD using different surgical techniques, including the open surgical method, stab method, and pinhole method. Open surgical techniques are invasive and not commonly practiced due to being more time-consuming and requiring

more post-operative care, while the stab and pinhole techniques are frequently used techniques to resolve this issue.

The present study was designed to study the incidence of upward fixation of the patella in Cholistani cattle and to evaluate the stab method and pinhole method to determine which surgical technique is more useful in terms of early recovery, wound healing, and minimal complications. Similarly, the levels of different blood parameters, enzymes, and risk factors with wound healing were recorded in both techniques before and after the surgery. There is very scarce data available on cattle that evaluate the stab method and pinhole method, comparing their effectiveness, complications, levels of different blood parameters, and enzymes.

The findings are in line with Telila and Dugassa (2022), as this technique ensures quick and everlasting relief from the condition with minimal post-operative surgical care (Telila and Dugassa, 2022). Furthermore, the study concluded that the stab method of MPD was better than the pinhole method in terms of minimal complications, early recovery, and fast wound healing. The stab method takes only 5-7 minutes from preparation to closure. Most of the veterinary surgeons performed in the recumbent position of the animal in the current study; the animals were also kept in lateral recumbency to enhance the safety of the surgeon and the animal.

The findings of the study are in contrast to Agarwal *et al.* (2020) and Sherif (2017), who reported that the pinhole method is more advantageous as compared to the stab method (Agarwal *et al.*, 2020). The underlying reason that can be consider is that the cutting of ligament by the pinhole method can be somewhat risky, which may result in incomplete desmotomy or partial desmotomy, and the chances of recurrence may be sustained as incomplete cutting of ligament may become one of the most important post-operative complications that may require multiple corrections (Sherif, 2017). It was found that the condition (upward fixation of the patella) was more prevalent in female cows than in males. There were 30% males (51/170), and the remaining 70% (119/170) were female cows for economic reasons in rural regions. The majority of cases were found at an average age of 5 years.

Conclusion

As the pinhole method of medial patellar desmotomy is somewhat risky as it requires more surgical skills and experience, therefore, the present study concluded that with the help of proper experience, the stab method is time-saving, safe, quick, provides quick wound healing, and has almost no post-operative complications as compared to the pinhole method.

Recommendation

The experienced veterinary surgeons must perform medial patellar desmotomy by using the Stab method of desmotomy in bovines and should confirm proper desmotomy to avoid any serious complications and ease while performing surgery.

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