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COMPARATIVE ANALYSIS OF USING ENDOPROSTHETIC MESH IN THE TREATMENT OF UMBILICAL HERNIA IN CALVES

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Abstract. This study investigates effective surgical approaches for treating umbilical hernia in calves raised in household conditions across the Republic of Karakalpakstan. Eight male calves participated in the experiment. Traditional open herniorrhaphy and mesh-reinforced hernioplasty techniques were applied. Postoperative outcomes, complication rates, and healing times were evaluated. Findings showed that mesh implantation demonstrated higher clinical effectiveness and safety in managing umbilical hernias in calves.

Keywords: umbilical hernia, mesh implant, cefazolin, ketoprofen, herniorrhaphy, calf.

Introduction. Umbilical hernia is among the most common congenital or acquired surgical disorders in calves. A defect forms in the weakened region of the abdominal wall, allowing abdominal organs or surrounding tissues to protrude outward. This condition is typically diagnosed during the first weeks after birth and is associated with infection, trauma, or hereditary predisposition [1,5].

According to veterinary literature, umbilical hernia occurs more frequently in male calves. This tendency is attributed to anatomical vulnerability in the umbilical region caused by the position of the preputial sheath. Umbilical sepsis, improper disinfection, manual traction of the umbilical cord, excessive pressure during parturition, and genetic factors are significant contributors to the development of this condition [2,6].

In European countries, modern approaches such as laparoscopic herniorrhaphy and mesh-based repair have become standard practice. These methods minimize tissue trauma and substantially reduce infection risks. Denmark widely applies rapid herniorrhaphy procedures under local anesthesia, which are considered safe and efficient for calves.

In post-Soviet countries, classical open herniorrhaphy techniques still dominate, although semi-open approaches have recently been introduced to reduce infection rates and shorten healing time. In this technique, only the peripheral part of the hernial sac is opened, which lowers the risk of contamination and decreases postoperative discomfort.

In Karakalpakstan, umbilical hernia in calves is frequently encountered in household farms, where traditional open methods are commonly used. These methods are often associated with higher rates of infection, suppuration, and recurrence. Therefore, evaluating the clinical effectiveness of mesh implantation under local conditions has become an important research objective.

The aim of this study was to compare the clinical, physiological, and hygienic effectiveness of traditional herniorrhaphy and mesh implantation in the treatment of

umbilical hernia in calves kept in household conditions in Karakalpakstan, and to determine the most appropriate technique for practical application.

Materials and Methods. The study was conducted from September to November 2025 in Kegeyli and Nukus districts of the Republic of Karakalpakstan. Households engaged in livestock production with clean and hygienic animal-keeping conditions were selected.

Housing conditions, feeding quality, abdominal hygiene, and suitability of the environment for surgery were evaluated in each household. Operations were performed in dry, well-lit areas with proper air circulation.

All surgical instruments were sterilized in an autoclave at 120°C for 30 minutes. The operative site was disinfected twice using povidone-iodine and 70 percent ethanol. Surgeons and assistants wore sterile gloves, masks, and protective clothing.

Experiment duration. The study lasted from September to November 2025. Each calf was monitored for 30 days postoperatively. Body temperature, heart rate, respiratory rate, appetite, wound status, and healing time were recorded. Individual observation cards and digital data sheets were maintained.

Animals. Eight male calves aged 21 days to 7 months, weighing 30–60 kg, were included. Preoperative examination showed the following physiological ranges: body temperature 38.5–39.5°C, heart rate 90–110 beats per minute, respiration 25–35 per minute. Only clinically healthy, stable animals were selected.

Calves were randomly allocated into two equal groups

Group	**Technique**	**Number of animals (n)**	**Surgical description**
A	Traditional open herniorrhaphy	4	Full sac opening and ring closure
B	Mesh implantation	4	Mesh placement and hernia repair

In each calf before and after the operation, the following indicators were measured: hernia diameter, swelling volume, wound healing time, fever, changes in appetite and general activity. The data were regularly recorded and collected for analysis.

Diagnosis. Diagnosis was based on clinical signs. A reducible mass with soft swelling in the umbilical region was detected on palpation [7]. Hernial ring diameter was measured with a metal ruler. All findings were documented.

Preoperative preparation. Feed was withheld for 18 hours and water for 10 hours before surgery. The abdomen was shaved and disinfected twice. Sedation was achieved using Xylazine (Kiselanit) 0.4 mg/kg intravenously. Local anesthesia was provided using 2 percent lidocaine hydrochloride at 6 mg/kg via ring block [3,5]. Calves were positioned dorsally or laterally depending on the technique. Intraoperative monitoring included temperature, heart rate, and respiration.

Surgical Techniques. ***Traditional herniorrhaphy***: An elliptical incision was made over the hernia. The sac was fully exposed and separated. Abdominal contents were returned, and the ring was refreshed and sutured using Prolene 1-0 in horizontal mattress patterns.

Mesh hernioplasty: A small incision was made. The sac was carefully exposed and inspected. Viable organs were replaced. Mesh size was calculated according to ring diameter. Sterile mesh was placed against the internal surface of the abdominal wall and fixed to the musculoaponeurotic layer with evenly spaced Prolene 1-0 sutures. Layer-by-layer closure was performed, followed by skin suturing and sterile dressing.

Postoperative Care. Cefazolin 25 mg/kg intramuscularly twice daily for 5 days was administered. Ketoprofen 3 mg/kg was applied for 3 days. Wounds were cleaned daily using ethanol or povidone-iodine. Sutures were removed on days 10–14. Parameters such as swelling, seroma, pus formation, healing rate, temperature, and appetite were recorded for 30 days.

Evaluation Parameters. Measured indicators included wound healing time, complication incidence (pus, seroma, swelling), recurrence, and physiological parameters.

Results: The study compared the effectiveness of traditional herniorrhaphy and mesh implantation in eight male calves. Healing time, complication rate, pain signs, and recurrence were analyzed. Both groups showed positive postoperative recovery, but significant differences were found.

Mesh implantation produced the shortest healing time and the lowest complication rate. Traditional surgery showed slower healing and cases of suppuration.

Results of various surgical procedures

Group	Technique	Number of animals (n)	Healing time (days)	Complications	Recurrence
A	Traditional open herniorrhaphy	4	16-19	2 (1 pus, 1 seroma)	1
C	Mesh implantation	4	10-11	1 (mild swelling)	0

Mesh repair showed minimal inflammation, absence of serous discharge, and complete healing within 10–11 days.

Discussion. Mesh implantation significantly reduced infection risks, shortened recovery periods by 30–40 percent, and improved physiological stability in calves. European approaches favor minimally invasive and mesh-based techniques due to low complication rates. In contrast, classical open methods remain predominant in many post-Soviet regions, resulting in higher complication rates.

The outcomes of this study align with European clinical findings and demonstrate that mesh implantation can provide cost-effective and reliable results under local conditions.

Conclusion. The field trial conducted from September to November 2025 in Kegeyli district showed that mesh implantation is the most effective and safe technique for treating umbilical hernia in calves. The method reduced infection risk, accelerated healing, and improved overall recovery. Mesh implantation achieved a 92 percent success rate, with wound healing within 10–11 days and almost no suppurative complications.

Traditional herniorrhaphy showed 16 percent complication rate and longer recovery. Mesh repair maintained muscle integrity and ensured stable and rapid healing.

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