

An Alternative Method for Rumenotomy Repair with One Layer Closure Using the Fishing Line as a Suture Material

Mokhtar Benchohra

Department of Biomedicine, Institute of Veterinary Sciences,
Ibn-Khaldoun University, Tiaret (14000), Algeria

Abstract: In this surgical case of rumenotomy, rumen and abdominal wall sutures were performed using fishing line only. Closure of abdominal wall incision was made with a single layer, including peritoneum, flank muscles and skin. So, no complications occurred postoperatively and after sutures removal. However, the technique could be subject to further improvement.

Key words: Rumenotomy sutures • Fishing line • Mass closure including skin

INTRODUCTION

Rumenotomy is a common surgical technique for many diseases in cattle, such as traumatic reticuloperitonitis; overload and bloat; spoiled roughage and impactions [1]. Routinely, a flank laparotomy incision in cattle is closed in three layers; using chromic catgut no. 2 or 3 for muscular plans and nonabsorbable suture for the skin [2].

The single layer or mass closure is the closure of all layers of the abdominal wall (except the skin) as 1 structure. Many surgeons have tested fishing line (nylon 6/6) as suture material and approved its utility for abdominal mass closure [3-5].

The veterinary surgeon must adapt to the challenging conditions of the field such as emergency cases, or when suture material is few or not available and when the owner is unable to pay the cost of a heavy surgery. The present report aims to describe a nonconventional method of surgical repair after rumenotomy; with a tested, easily available and cheap material.

Case Description: A 10-year-old 350kg native cow was examined for recurrent digestive disorders. So, the cow showed a mild but progressive traumatic reticulitis symptoms. A metal detector was applied over the median and lateral regions of the chest and abdomen to detect a ferromagnetic foreign body; result was positive.

The decision was taken to perform a rumenotomy for reticulum prospection and eventually removal the foreign bodies. The cow was restrained in a standing position; her right side against the wall and the surgical area of the left flank was shaved and flushed with iodine (PVP 10%), just before starting the operation.

At the beginning, flunixin meglumine 3mg/100kg (Lhiflunex, Lhiza) was administered intravenously. Then, local anesthesia lidocaine 2% (30ml of xylocaine, Astra Zeneca) was instituted by line block; a flank incision of 16cm for laparotomy was made caudal and parallel to the last rib (paracostal laparotomy), with intention to place the incision closer to the reticulum.

The skin and the three muscular layers of the abdominal wall (external oblique, internal oblique and the transverse abdominal) and peritoneum were incised and the rumen fixed, by stray sutures using a thick nylon line; maintained by two assistants and pulled over the flank incision. Rumen wall was incised longitudinally 20cm in the vertical direction on the dorsal compartment; so, reticulum was explored and several sharpness foreign bodies were removed.

Suture material consisted only of fishing line (pure polyamide 6/6); which was sterilized by soaking in 10% iodine solution for 10minutes. The rumen incision was closed by double line continuous inverting sutures (Fig. 1) using fishing line no. 0 USP ($\phi = 0.34\text{mm}$, Nederland). A simple interrupted suture was performed,



Fig. 1: Rumen incision sutured by continuous inverting



Fig. 2: The fishing line crossing the edges of the wound (abdominal wall and skin)



Fig. 3: Suture material : surgical needle, intramuscular injection needle and fishing lines.

with fishing line no. 1 USP ($\phi = 0.45\text{mm}$, Germany), for peritoneum, flank muscles and skin; using a mass suture method (Fig. 2) and knots were reinforced as three-throw. An ordinary large curved needle was used for suturing the rumen and the abdominal wall; however, for a better handling, the line was passed through the skin using an intramuscular injection needle (1.2x40 mm, Terumo, Belgium) (Fig.3).

Antibiotic treatment was initiated with amoxicillin (1.5g/100kg, Amoxoil, Syva) by intraperitoneal route; continued for 8 successive postoperative days. For two postoperative days, flunixin meglumine was administered intravenously to reduce inflammatory pain. To prevent further complications, the cow was kept on a restricted diet for two weeks.

DISCUSSION

The surgical operation was achieved without incident; except that it has taken little more time during suture of the abdominal wall, because of the translucency of the fishing line. All physiological functions were regular immediately after the operation and the cow has recovered its appetite. Given the precarious financial situation of the owner; the choice was made to minimize the total cost of the surgical operation by using fishing line as an inexpensive suture material. We have used a twice line for more secure the continuous suture of the rumen, also, to reduce the mechanical irritation or discomfort and to avoid disruption of organ contractions; which can result from the use of a thicker line.

According to Hodges, the fishing line can be used in most situations, even where an absorbable suture is more traditionally used; it has been most commonly used for mass closure of the abdomen; the strong thicker line is the most recommended and is very effective with low rates of wound dehiscence [4]. In human surgery, the mass closure was performed for all layers of the abdominal wall, except the skin for cosmetic reasons [4,6,7]; however, in cattle surgery, the cosmetic aspect is of minor importance.

It is well known that postoperative wound dehiscence could lead to an incisional hernia [8]; but, in the abdomen flank area, there is no risk considering that the upper parts of the abdominal cavity of a cow are not subject to digestive organs pressure. However, the high rumen pressure resulting from overfilling or bloat might cause stitch opening if restricted diet was not followed. Thus, for counteracting the decreases of the knot-holding capacity of the fishing line we have resorted to a three-throw knot for enough secure.



Fig. 4: Stages of the wound healing:

- A - 11-day postoperative: dry appearance of the skin around the wound.
- B - 21-day postoperative: formation of a necrotic tissue in the upper part of the wound.
- C - One month postoperative: a good healing.

During the 11 postoperative days, no complications were observed; neither wound infection, nor sepsis. The cow has shown a good health status and the wound was in the process of healing. Wound contours palpation did not cause pain, the edges remain firmly joined and knots well tied, however, around the wound, the skin appeared dry (Fig.4A). After wound assessment, five alternate stitches were removed, until the end of the incision line. The removal of the remaining six sutures was made at the 21th postoperative day. At that moment, skin remained dry and the upper part of the wound presented necrosis and was frailty (Fig. 4B). Necrosis was may be due to two main reasons; the first one would be the wound edges strangulation by over-tightening the knots. In the case where excessive tension was applied, tissue will become ischemic and develop necrosis; which leads to delay wound healing [2,9]. Good perfusion of the wound is an essential factor in healing [10]. The second reason, being the skin reaction to a foreign body; in fact, according to our previous experience with fishing line use, in skin closure, we notice that skin reaction begins around the tenth postoperative day if the stitch is not removed. Thus, we have removed sutures partly in order to limit the skin reaction; once the knot has been pulled out, the wound heals uneventfully [4]. Effectively, that is what we have seen during the following week after the removal of all stitches (Fig.4C).

Besides that, undernourishment to which the cow has been subjected, particularly, in amino acids, vitamins and minerals, may be responsible for skin disorders and delayed wound healing [11,12].

Recent works comparing suture materials has tended to show the advantages of non-absorbable material over catgut and in consequence, there has been a marked swing towards the use of this material in abdominal closure; therefore, several reports in human surgery had shown that many operations can be performed entirely with fishing line [4-6,13]. Surgeons who have widely used this material describe it as a tried and tested alternative to commercial sutures when cost and availability limit their use [3-5]. In fact, the cost of the fishing line used in our case was about 40 times lower than commercial suture material. Narasimharao *et al.* [13], who have widely resort to the mass abdominal closure, including the skin, in pediatric, describe it advantages as easy closure in difficult cases; no wound dehiscence risk; no foreign body left in the wound and a greatly reduced infection rate, author recommend this technique as a routine. While the surgeons have had assessed the efficiency and safety of the fishing line as suture material and the method of

abdominal mass closure for decades now, in human medicine [4-6,13,14]; the use of this material and method remains not well known by the veterinary surgeons.

In conclusion, the abdominal mass closure with appropriate fishing line seems an alternative for the conventional method of laparotomy repair. However, the technique might be subject to improvement as the need arises. The fishing line appears to have real advantages, in terms of cost and availability; and material sterilization is quick and easy.

REFERENCES

- Hendrickson, D.A. and A.N. Baird, 2013. Suture materials and needles Techniques in Large Animal Surgery. John Wiley & Sons 4th Ed., pp: 323.
- Turner, A.S. and C.W. McLwraith, 1989. Techniques in large animal surgery. Lippincott Williams & Wilkins 2nd Ed., pp: 373.
- Longombe, A.O., A. Ralaimiarison and K.M. Lusi, 1993. The use of fishing nylon for surgery in rural areas in North East Zaire. *Trop. Doct.*, 23(4): 179-180.
- Hodges, A.M., 2001. Fishing line: a valuable suture material. *Trop. Doct.*, 31(2): 98-99.
- Pereira, E.A.C. and M.H. Cotton, 2006. Methods and Devices: Using fishing line for suturing. *Trop. Doct.*, 36(2): 155-156.
- Bewes, P., 2000. Abdominal closure. *Trop. Doct.*, 30(1): 39-40.
- Ceydeli, A., J. Rucinski and L. Wise, 2005. Finding the best abdominal closure: an evidence-based review of the literature. *Curr. Surg.*, 62(2): 220-225.
- Kingsnorth, A., 2006. The management of incisional hernia: a review. *Ann. R. Coll. Surg. Engl.*, 88: 252-260. Doi: 10.1308/003588406X106324
- Kudur, M.H., S.B. Pai, H. Sripathi and S. Prabhu, 2009. Sutures and suturing techniques in skin closure. *Indian J. Dermatol. Venereol. Leprol.*, 75: 425-34.
- DeLancey, J. and R. Hartman, 2008. Operations on the abdominal wall glob. Libr. Women's Med. DOI 10.3843/GLOWM.10038
- Asplund, J.M., 1994. Principles of protein nutrition of ruminants Chap. 8: Amino acid and protein metabolism in the whole body and individual tissues of ruminants. CRC Press (Ed), Inc USA. pp: 155.
- Haresign, W. and D.J.A. Cole, 1988. Recent developments in ruminant nutrition - 2: Effect of proteins on health of dairy cows. Butterworths (Ed) London, pp: 184.
- Narasimharao, K.L., H. Chatterjee and S. Parkash, 1983. Single layer abdominal wound closure in children. *Aust. N. Z. J. Surg.*, 53: 577-579.
- Pollock, V., M.J. Greenali and M. Evans, 1979. Single-layer mass closure of major laparotomies by continuous suturing. *J. R. Soc. Med.*, 72: 889-893.