

Using of autogenous cutaneous trunkii muscle for ventral hernioplasty in sheep

M. G. Thanoon

College of Veterinary Medicine\ University of Mosul

Abstract

The study was conducted to use autogenous cutaneous trunkii muscle flap (CTMF) for repairing of large ventral hernia in sheep. A large ventral hernia was induced experimentally in eight adults' healthy Awassi sheep (4 males and 4 non-pregnant females). A protocol of general anesthesia was performed via an intravenously injection of a mixture of Xylazine hydrochloride 0.05 mg/kg B.W. and Ketamine hydrochloride 2mg/kg B.W. One month after surgical producing of a large ventral hernia the animals underwent for hernioplasty using autogenous CTMF. The results revealed no characteristic postoperative complications as infection, recurrent herniation or wound dehiscence during a period of 12 month postoperation. In conclusion, using autogenous CTMF is a suitable natural prosthetic material for reconstruction of large ventral hernial defect in sheep, as it is inexpensive and repair with strength equal to normal tissue.

الترقيع الذاتي للفتوق البطنية بوساطة العضلة الجلدية الجذعية في الاغنام

ميسر غانم ذنون

كلية الطب البيطري/ جامعة الموصل

الخلاصة

ان هدف الدراسة الحالية هو استخدام العضلة الجلدية الجذعية في علاج الفتوق البطنية الكبيرة في الاغنام. احدث فتق بطني كبير في ثمان من الاغنام العواسي البالغة والسليمة صحيا (4 كباش و4 نعاج غير حوامل). استخدم التخدير العام حقنا في الوريد وبوساطة مزيج من الزايلازين 0.05 ملغم/ كغم والكيتامين 2 ملغم/ كغم من وزن الجسم. وبعد مرور شهر من احداث الفتق البطني الكبير، تم تحضير حيوانات التجربة لعملية الترقيع الذاتي بوساطة سدلة من العضلة الجلدية الجذعية. نتائج هذه الدراسة اظهرت عدم وجود اي تعقيدات واضحة بعد العملية مثل الخمج، رجوع الفتق مرة اخرى او انفتاح جرح العملية ولفترة متابعة ومراقبة استمرت لمدت 12 شهر بعد العملية. بينت الاستنتاجات ان الترقيع الذاتي بوساطة العضلة الجلدية الجذعية تعتبر تقنية جيدة لاستخدامها مادة بديلة طبيعية في علاج الفتوق البطنية الكبيرة في الاغنام، وذلك بسبب ان هذه السدلة غير مكلفة وان الألتئام فيها يكون تقريبا بنفس قوة النسيج الطبيعي.

Introduction

Hernia is a protrusion of internal organs or part of it's through a normal or abnormal opening of the body wall. This opening may be an accidental or a normal anatomically, which does not completely fulfill its physiological function. Hernia when treated with reinforced by autogenous or heterogeneous, it's termed hernioplasty as opposed to herniorrhaphy in which no autogenous or heterogeneous material is used for reinforcement (1, 2). Acquired abdominal hernia may result from trauma such as vehicle accident or horning injuries. It tends to enlarge progressively and repair is indicated to prevent strangulation, pain or inconvenience (3). Operative repair of giant ventral hernia remains a technical challenge to surgeon to close the wide abdominal wall defect (4). When the edges of the hernial ring cannot be adequately approached by means of the classic techniques of suturing or muscular transposition, synthetic or biological implants

are used (5). Polypropylene (Marlex), stainless steel, mersiline, polytetrafluoroethylene and plastic (Proxplast) mesh; are the most commonly prosthetics products used for closing of large size hernia (6). Autogenous or heterologous tissue has been used for treatment of large hernia such as autogenous skin transplant for repair of traumatic ventral hernia in sheep, pericardium for closure of large abdominal wall and diaphragmatic defects in children, also bovine pericardium has been used as a bioprosthesis for the closure of abdominal wall defects in calf (3), autogenous fascia lata graft for perineal herniorrhaphy in dogs (7), and bovine tunica vaginalis was used as implants for the repair of experimentally-created umbilical hernias in sheep (8). The most frequently observed reactions when such materials are used in the hernioplasty surgical procedure are underlying tissue irritation and rejection (5). In addition, other complications such as hematomas, seromas, and sinus formation result from the use of foreign material (9), but the recurrent herniation and peritonitis are considered more serious potential complications (8). The aim of this study was conducted by using autogenous cutaneous trunkii muscle as a technique for reconstruction of large ventral hernia in Awassi sheep.

Materials and Methods

This study was conducted on eight physically healthy adult Awassi sheep (4 males and 4 non-pregnant females), mean aged 3 ± 0.211 years (\pm SE), and mean body weight 41.5 ± 7.566 kg, were used. The animals had ear tagged and housed indoor under the same feed and management conditions, in the animals' house of Veterinary Medicine College, University of Mosul. Food was withheld for 24 hours and water for 12 hours before operation. The operation site between xiphoid cartilage and pubic region was prepared for aseptic surgical technique. Animals anesthetized with protocol of general anesthesia by a mixture of Xylazine hydrochloride 2% (0.05 mg/kg.B.W.) and Ketamine hydrochloride 5% (2 mg/kg. B.W) intravenously. The animal was restrained in a dorsolateral recumbency; the air-way was protected by stomach intubation. Ventral hernia was induced in paramedian line at right side. About 8-12 cm long linear incision was performed through the skin and parts of abdominal muscles. The transverse abdominal muscle was separated bluntly from the peritoneum which remained intact, and then a circular ring was created by excision about 3-4 cm from abdominal muscles in either sides of incision. The incised circular edge was sutured by simple continuous suture technique, using catgut (No.1) to create hernial ring (8). The skin was closed by horizontal suture mattress technique with silk (No.1). Post-operative care represented by intramuscular injection of penicilline-streptomycine at a dose 10000 I.U. and 20 mg/kg B.W., respectively for 5 consecutive days post operation with daily wound management and dressing. The skin stitches were removed at the 10th post-operative day. The animals were left until the complete characteristic feature of ventral hernia was developed (about 35.37 ± 1.43 days postoperation). Then the experimental animals prepared routinely for hernooplasty with autogenous CTMF under the same aseptic precautions and anesthesia used for inducing the ventral hernia. An elliptical skin incision over the hernial sac was done to expose the hernial ring. The hernial sac with its contents pushed back into the abdominal cavity. The Cutaneous trunkii muscle (CTM) which is strongly adhered with the skin therefore gently separated (Fig. 1), and by blunt dissection it was separated from the external abdominal oblique muscle (Fig. 2). After liberation of CTM from the skin and underlying tissue, it was incised caudally (posterior) edge, finally cutting a suitable portion enough to cover the hernial ring by longitudinal incision with keeping its cranial attachment intact for blood supply maintenances (Fig. 3). The liberated portion of CTM used to close the hernial ring with myomattress suture technique using catgut (No.1) (Fig. 4 and 5). The surplus skin removed then sutured by tension suture; far-near, near-far technique using silk (No.1). The beginning and the end of the suture line were kept unclosed as drainage openings rather than using drain tube.



Fig. (1) Showing separation the CTM from the skin by blunt dissection: S, skin; C, CTM; E, external abdominal oblique muscle

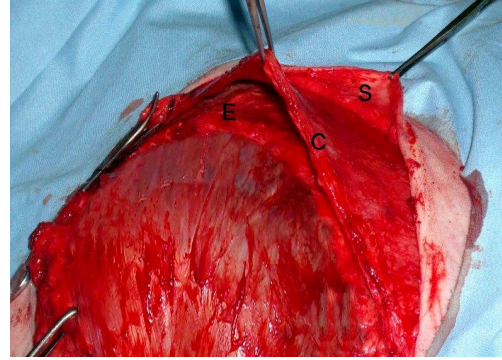


Fig. (2) Showing separation the CTM from the skin and underlying tissue (external abdominal oblique muscle) by blunt dissection: S, skin; C, CTM; E, external abdominal oblique muscle

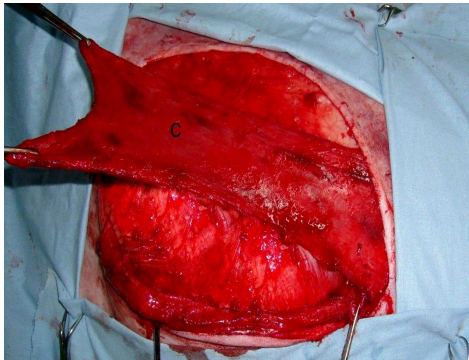


Fig. (3) Showing liberated CTMF with keeping on its cranial attachment for blood supply maintenances: C, CTMF

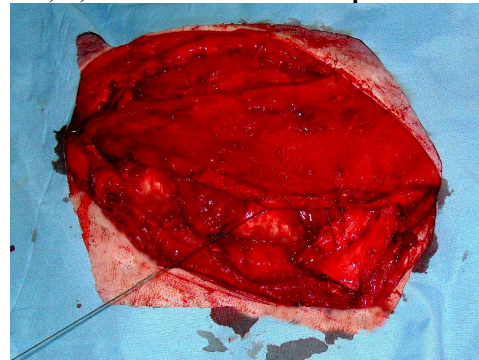


Fig. (4) Showing myomattress suture technique to close hernial ring

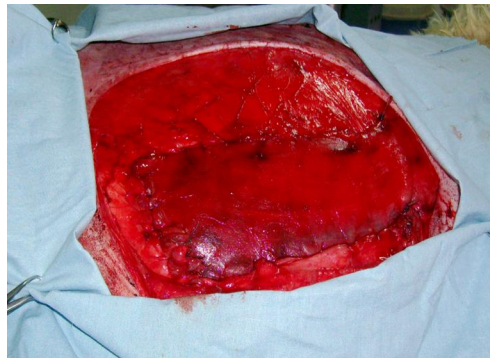


Fig. (5) Showing repairing the hernial ring with CTMF

Post operative care are similar to that's applied after experimentally induce ventral hernia. The animals were examined every day for 2 weeks then weekly monitored for 3 months and monthly noticed for 1 year after operation. Examination of animal includes inspection for general condition, appetite, defecation and urination then Physical examination by taking the body temperature, heart rate, respiratory rate and manual palpation at the site of the operation.

Results

The results of the experimentally induced hernia after one month of operation revealed that hernias developed successfully in all operated animals (Fig. 6). All operated animals survived along the entire period of experiment, although the size of induced ventral hernias in experimental sheep ranged from about four fingers up to

more than one hand breadth and all of these induced ventral hernias were reducible (Fig. 7). Signs of inflammation were appeared locally, at the site of hernioplasty after 1-2 days post operation exponentially up to 6 days, were represented by redness, swelling, oedema, transudate, heat and pain at the ventral area of abdominal region especially at the site of operation. These signs of inflammation were subsided within 8-10 days post-operation. One ram only showed complications after repairing with autogenous CTMF by developing infection represented by small necrotic foci within the skin stitches. The necrotic foci were treated successfully by drainage and daily irrigation with antiseptic (2% tincture of iodine) until complete healing. All experimental sheep were suffered from pain represented by partial loss of appetite with lethargy at the first 2 days post-operation and then subsided gradually until disappeared at the end of the first post-operative week. Signs of inflammation and odema in the site of hernioplasty were completely disappeared at the end of 3rd post-operative week. The site of operation was looked normal and healthy without any distinguished signs of protrusion of organs or tissue rather than digital palpations of the operative area reveal a firm consistency of tissues at the end of 4th post-operative week. There are no significant postoperative complications such as re-herniation, dehiscence or bulging during a period of follow-up of 12 months.



Fig. (6) Showing induced ventral hernia after 30 days

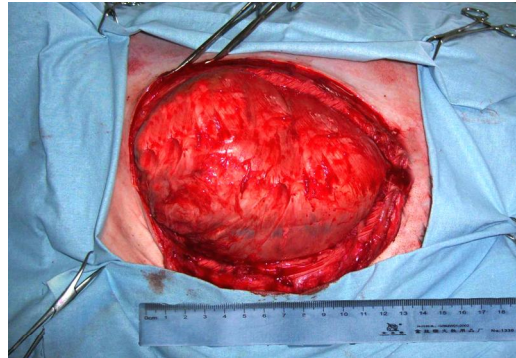


Fig. (7) Showing the size of hernial ring is 12 cm (about one hand breadth)

Discussion

Large ventral hernia remains the real challenge for some surgical solution so, the therapeutic problems of giant hernias of the abdominal wall are difficult to resolve and still perplexing to the surgeons (10). In this study the using of CTM provides an autogenous muscular flap which used for repairing of large ventral hernia and reconstruction of abdominal wall musculature. This procedure which dealing with large ventral hernia in sheep confirm the concept of other workers (11 and 12), who said that, the goals of the surgeon in managing complex abdominal wall defects are to restore the structural and functional continuity of the musculofascial system and to provide stable and durable wound coverage. The repair of large ventral hernia by autogenous CTMF is agreed with other authors (11 and 13), who said that the ideal material for hernia repair has been described as one of that is inexpensive, technically easy, healed a repair with strength equal to normal tissue, provides resistance to infection, elicits no enhanced inflammatory response, inhibits fistula formation, less tissue reactions and no harmful effects to other organs. Ventral hernia repair often includes the use of structural prosthetic materials, such as polypropylene mesh, that can induce dense abdominal adhesions to peritoneal structures, makes re-operation more complicated, and increases the risk of bowel obstruction and fistula (14), rather than the prosthetic material is usually contraindicated in the contaminated wound because of the high infection rate necessitating prosthetic removal and further abdominal wall debridement (15). While

the present study shows no intestinal obstruction, enterocutaneous fistula, re-herniation or skin dehiscence which indicated that there is no adhesion between the autogenous CTMF and internal organs. Also the decrease incidence of complications may be due to good cooperation between autogenous muscle flap and surrounding tissues. Only one case (the first operation) of experimental sheep was suffering from necrotic foci infection at the site of hernioplasty, this is might be due to poor blood supply to the skin wound edges after liberation of CTMF; rather than contamination of the wound by suppurative microbes from the surrounding of the animal. There are no reports on the use of autogenous CTMF in sheep, nor has there been a detailed study demonstrating the use of autogenous CTMF for repair of large ventral hernial defect in animals. In conclusion, of this study indicated that the use of autogenous CTMF was a successful treatment for surgical repair of large ventral hernia in sheep.

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