RECONSTRUCTION OF MAJOR ABDOMINAL WALL DEFECTS BY USING BOVINE PERICARDIUM BIOPROSTHESIS

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ABSTRACT

This investigation aimed to study the usefulness of fresh and 0.5% glutaraldhyde preserved bovine pericardium (GPBP) for the reconstruction of full thickness abdominal wall defects in dogs and to overbridge their use in repairing large hernias in sheep and goats. Bovine pericardia collected from abattoir were processed and preserved. Full thickness abdominal wall defects were created surgically in 16 dogs and repaired with the same size of fresh (8 dogs) and 0.5% glutaraldhyde preserved bovine pericardium (8 dogs). Four dogs from each group were euthenised at 6 and 12 weeks postoperation for macroscopic and microscopic evaluation. All dogs survived the procedure without apparent clinical complications. Adhesions between the patches and the greater omentum were recorded. Neovascularization, neoperitoneum, fibrous tissue formation, and inflammatory cells were evident. Calcification was seen in GPBP group at 3 months. All the operated sheep and goats with large ventral abdominal hernias were tolerated the operation well without rejection of the implant, infection or recurrence until four months observation period postoperation. The fresh and 0.5% (GPBP) patches are considered to be useful materials for reinforcement of abdominal wall defects in dogs and for reconstruction of ovine large abdominal hernias.

INTRODUCTION

Massive full-thickness defect in the abdominal wall occurring due to extensive infections, excision of abdominal tumors **(Mays and Weakly, 1971)**, trauma ,gas gangrene **(Long et al., 1976)** and electric burns **(Boyd, 1977)**. Surgical repair of large abdominal wall defects remains a significant problem. The standard anatomical closure of large defects is performed under pressure, so the compression of intra-abdominal content occasionally produce cardiac and pulmonary embarrassment. In some cases the gap is too large to be bridged by mere anatomical apposition of wound edges. In these cases there is a need to be strengthened and supported with extraneous material **(Park & Lakes, 1992)**.

There were several options for primary closure of large defects under tension, augmentation by insertion of synthetic material, closure after performing relaxing incisions, sometimes muscles with or without a supporting mesh **(Dibello and Moore, 1996; Temudon et al., 1996; Disa et al., 1996; Jacobsen et al., 1997, Vix et al, 1997; Paul et al., 1998 and Shestak et al., 2000)**. Surgical correction of an incisional hernia may be done by primary closure or mesh herniorrhaphy. Regardless of which procedure was used, most surgeons delay surgery for at least 2-3 months so that all infections and active inflammation were resolved and formation of a dense fibrous ring which holds sutures better than inflammed tissue **(Tulleners and Fretz 1983 and Mellwraith & Turner 1987)**.

More than 80 types of synthetic meshes were used for the replacement of lost abdominal wall and fascia for the reinforcement of repair accomplished by primary approximation of native tissue **(Klingsnorth & LeBlanc, 2003)**. Post-repair clinical complications as wound infection, bowel fistula, erosion into abdominal viscera, increased recurrence rate (25%), repair failure and mesh extrusion had been reported. Also the high cost associated with synthetic material initiated the search for safe and cheap biodegradable material **(Luijendijk et al., 2000)**.

Several types of connective tissues and muscles have been used experimentally and clinically in reconstructing congenital or acquired soft tissue defects. These were fascia lata, pericardium, duramater, diaphragm and collagen based materials derived from small intestine submucosa **(Mericka, 1991; Parizek et al., 1997; Saaverda et al., 2001; Hafeez et al., 2004)**. However, the repair of large soft tissue defects especially abdominal wall defects is still a challenge for surgeons. The ideal biomaterial for this purpose should possess adequate strength, no hypersensitivity reactions and biocompatibility to facilitate tissue ingrowths **(Lal et al., 2003)**. Naturally derived materials including glutaraldehyde tanned bovine pericardium **(James et al., 1991)** and small intestine submucosa **(Prevel et al., 1994)** have been tried in animal models. These biomaterials are less susceptible to infection and cause less foreign body response **(Hiles et al., 1995 and Badylak et al., 1998)**.

Bovine pericardium had been used as a biomaterial to manufacture various bioprosthesis because of their inherent strength and biocompatibility **(Schmidt and Baier, 2000)**. Glutaraldehyde-preserved bovine pericardium (GPBP) is a biological material with sufficient resistance to be used for repair of thoracoabdominal defects. The ideal concentration of glutaraldehyde to be used in the preparation-preservation of the material is 0.5% **(Santillan-Doherty et al., 1996)**.

Degradable material used for the repair of large abdominal wall defects must have enough strength to support the defect during the healing process. The resorption rate of biodegradation materials is affected by pre-implantation preservation methods **(James et al., 1991)**. The use of

natural tissue derived from an animal source require that the tissue be treated to minimize immunogenicity of the graft and to stabilize the tissue against rapid enzymatic and chemical degradation in the body. Glutaraldhyde crosslinking accomplish this goal for the most part but its use has also been associated with several problems including altered mechanical properties and early mechanical failure, calcification, cytotoxicity and incomplete suppression of immunological recognition **(Jayakroshnan and Jameela (1996)**.

This study aimed to evaluate the usefulness, healing, macroscopic and microscopic changes of fresh bovine pericardium during reconstructing experimentally induced large abdominal wall defects in dogs, and to compare its use with glutaraldehyde preserved bovine pericardium(0.5%). Also to overbridge similar experimental defects in dogs with clinical cases in sheep and goats suffered from ventro-lateral abdominal hernias.

MATERIALS AND METHODS

Preparation of the pericardial patch grafts:

a) Fresh Patches:

The pericardia were freshly harvested from 12-24 months old healthy bulls, immediately after slaughter under veterinary supervision in an abattoir. The pericardia were washed in physiological saline solution and then stripped mechanically for their external loose connective tissue coat including adipose tissue, vessels and nerves (Fig.1). The remaining fibrous membrane was stored in sterile plastic container filled with sterile physiological saline solution (at atmospheric temperature) whereas the two surfaces were exposed to the solution. Then it was ready for use two hours after collection and preparation.

b) Glutaraldehyde-preserved Patches:

The fresh pericardia were collected and cleaned as mentioned. They were stored for 2 weeks in 0.5% glutaralgehyde solution at normal atmospheric temperature. Immediately before hernioplasty they were removed from the preservative solution and flushed for several times in normal physiological saline solution.

I-Experimental cases:

This study was carried out on 16 adult apparently healthy dogs of both sex, 20kg average weight. They were premedicated with intramuscular injection of atropine sulphate (ADWIA) at a

dose of (0.04mg/kg.b.wt.) followed by intramuscular injection of xylazine Hcl (Xylaject-ADWIA) at a dose of 1mg/kg b.w. Thiopental sodium was intravenously injected (25 mg/kg b.wt.). The animals were placed in dorsal recumbency and the skin at the mid-abdominal region (from xiphoid to the pubic symphesis) and at both flank regions were aseptically prepared. A rectangular skin flap (15x10cms) was incised from 3 sides and reflected. Full-thickness abdominal wall defect (12x7cms), including muscles and peritoneum was created at the same site (Fig.2).

After control of bleeding, the defects were bridged by rectangular patches of either fresh or glutraldehyde-preserved bovine pericardium (GPBP) of similar dimensions to the defects. The patches were placed where their cardiac sides facing the abdominal cavity. The pericardial patches were fixed to the cut edges of the abdominal wall by No. (2/0) polypropylene by simple continuous sutures and interrupted only at the corners (Figs 3&4). The stitches were placed 0.5cm apart taking 1 cm thick bites of the abdominal wall involving all muscles and peritoneum. Mild tension was maintained on the patches to avoid bulging. The skin was closed by simple interrupted sutures using silk No. (1/0).

Postoperative care and followup:

Cage rest was provided for all dogs in the immediate postoperative period. Dogs were injected with ketoprofin (AMR, Co. Egypt) in a dose of 1mg/kg body weight after the operation and 12 hours interval and systemic broad spectrum antibiotics were intramuscularly injected at 8 hours interval for 3-5 successive days. The wounds were dressed 2 times daily using povidone iodine. Dogs were clinically observed daily during the study period. The skin stitches were removed 10 days post-operatively.

Euthanasia and necropsy :

The animals were divided into two groups according to the time of euthanasia. The first group consisted of 8 dogs (4 GPBP + 4 fresh patches) were euthanized at six weeks postoperatively. The second group of experimental dogs consisted of the same numbers were euthanized at twelve weeks after operation. The dogs were euthanized with a large dose of thiopental sodium as bolus injection of the cephalic vein and the abdominal wall was routinely opened. The following points were recorded:

1- Local changes at the operated area.

2- Intraperitoneal changes which involved;

a) Healing of the pericardial patch to the under surface of the incision and to the peritoneum.

b) Adhesions to the incisions and to the patch.

c) Formation of neoperitoneum.

d) Presence or absence of neovascularization.

Specimens were collected from the center of the pericardial patch grafts and from the line of its suturing with the abdominal muscles. The specimens were fixed in 10% buffered formalin for 48 hours and then the histopathological processing was completed according to **(Banks, 1981)**.

Clinical cases:

Four sheep and 3 goats suffered from large ventral abdominal hernias after parturition (Figs. 5&8). The animals were fastened for 12 hours from food and water prior to surgical operation. They were premeditated with atropine sulphate (0.2mg/kg b.w.) followed by intramuscular injection of xylazine (xylajeel-ADWIA) in a dose of (0.05 & 0.01 mg/kg in sheep & goats respectively). Circular infiltration analgesia was applied using lidocaine Hcl 1% after aseptic preparation of the surgical site. The animals were placed in lateral recumbence and a half circle or an elliptical skin incision was performed.

The fibrous adhesions were dissected and the devitalized tissues were removed to expose the hernial rings. Following proper haemostasis, a suitable size of pericardial patches (fresh or glutaraldhyde treated) were sutured to the ring (Fig.6). The skin was sutured by interrupted horizontal mattress sutures using No.(1) silk (Figs.7 and 8B). The wounds were daily dressed with povidone iodine and were supported for 8 days following the operation by cloth-made abdominal belt, which was changed every 2 days. A prophylactic dose of antitetanic serum (15 i.u./ kg b.w.) was subcutaneously injected and systemic broad spectrum antibiotic was injected for 5 successive days. The operated animals were observed for four months after operation.

RESULTS

A) Experimental animals:

1)- clinical findings:

All the experimental dogs tolerated the surgical procedure well and survived until the determined date for euthanasia. Mild to moderate swelling at the site of operation was seen and disappeared within the first week following the operation. There was no evidence of herniation in

any of the experimental animals. Skin wound dehiscence and areas of infection were grossly observed at the site of operations in two dogs operated with fresh grafts. However complete healing was achieved following the use of local antiseptic (povidone iodine) with daily dressing for three weeks.

2)- Results of postmortem examination:

a) Group (I): Euthanised at six weeks postoperatively:

The rectangular skin wound appeared to be equally secured in the eight animals. All the bovine pericardial patches were remained in their original shape (rectangular) and position and they were held firmly by the sutures. The experimentally induced abdominal wounds appeared to have been contracted with a slight decrease in their diameter (10x5cms. average). The used suture material (prolene) was present in situ in all the experimental animals. There were no evidence of adhesions between the pericardial patches and the underlying visceral organs in all the operated dogs (Figs. 9 and 10).

New peritoneum was formed at the visceral side of the GPBP patches. It was smooth, whitish and glistening (Fig.9). This was unnoticed in cases of fresh pericardial patches. New blood vessel formation (neovascularization) was clearly seen by naked eye observation at the marginal borders of the GPBP patches and not in the fresh patches (Figs.9 and 10). There was slight adhesion between the greater omentum and the center of the peritoneal side of the GPBP patches (Fig.9). Separation of the omentum was easy and without macroscopically identifiable changes in the neoperitoneum. In cases of fresh pericardial patches, there were extensive adhesions between the greater omentum and the whole visceral side of the patches (Fig.10). The omentum was firmly fixed and its removal was difficult and resulted in abrasions to the peritoneal side of the patches.

b) Group (II): Euthanized at twelve weeks postoperatively:

In addition to the macroscopical findings at 6 weeks of euthanasia. The rectangular skin wounds appeared to be equally secured in the eight animals. All the bovine pericardial patches were remained in their original shape (rectangular) and position and they were held firmly by the sutures. The experimentally induced abdominal wounds appeared to have been contracted with a noticeable decrease in their diameter (7x4cms. average) . The used suture material (prolene) was present in situ in all the operated animals. Adhesion was noticed between the visceral side of the patches and the greater omentum in both experimental groups. Dense adhesions were ob-

served to the serosa of small intestinal loop in one dog from the fresh pericardium group (Fig.11).

2-Microscopical findings:

a) Group I :

At six weeks after implantation the (GPBP) patches were healed to the surrounding tissues by fibrous connective tissues. Also fragments of myofibrils could be seen (Fig.12 A).Newly formed capillaries were seen embedded in the connective tissues which infiltrated with few polymorphonuclear leukocytes and round cells (Fig. 12 B). Highly vascular granulation tissue was noticed inside the patch in three specimens only (Fig.12 C).

Numerous leukocytic infiltration was found around the newly formed capillaries in two specimens of GPBP (Fig. 13 A). While in the other two specimens, the patch appeared well vascularized with few leukocytic infiltrations (Fig. 13 B). Newly formed peritoneal bridge was seen under the patch in three specimens (Fig. 13 C). In case of fresh non treated graft, the patches were invaded with numerous fibroblasts arranged perpendicular on newly formed capillaries (Figs.14 A & B). Some well formed vessels appeared in the specimens with infiltration of fibroblasts, lymphocytes and macrophages (Fig. 14 B & C)

b) Group II :

At twelve weeks after implantation, the patches were completely healed with the neighboring structures (Fig.15 A). Numerous mononuclear, polymorphonuclear leukocytes were present around the suture material which remained in situ (Fig.15 B) Newly formed capillaries with adhesion were seen in the patches with fibrous connective tissues infiltrated with numerous mononuclear cells and siderocytes (Fig. 15 C). Calcification and foreign body giant cell formation were observed in two GPBP specimens. As minimally hyalinized and calcified fibrous connective tissues was demonstrated at the junction or at the healing area (Figs. 16 A & B). New peritoneum was also seen bridging the inner surface of the patch.

The fresh graft specimens appeared highly vascularized particularly at the periphery (Fig.17 A). Minimal oedema inside the normally arranged collagen bundles was observed. Mild leukocytic infiltration seen in the interface between the graft and the subcutaneous tissues in two specimens (Fig 17 B).

B) Clinical cases:

Seven animals (4 sheep and 3 goats) suffered from large ventral abdominal hernias. The hernial swellings were observed at the left side (2 sheep and 3 goats) and at the right side in 2 sheep (Figs.5 and 8).The hernial rings were nearly circular and were easily palpated except in two cases (one sheep and a goat). They varied in size from admission of five to nine fingers except one goat where the average diameter of the ring was 25cm. All the operated cases were females and the hernial swellings were appeared following parturition. The hernial sac was formed from the skin and subcutaneous tissues and it may or not lined with thin piece of muscles and peritoneum.

All operated animals recovered uneventfully from surgery. Seroma and typical signs of local inflammation were observed in all sheep and slightly evident in goats. It was subsided at the day 12 post-operation. No hernial recurrence was recorded through the four months of observation. The skin wounds were secured and healed to the neighboring tissues after removal of the stitches (Fig.7B).

DISSCUSION

The biological tissues have been used in manufacturing heart valve prosthesis , small diameter vascular graft and biological patches **(Gabbay et al., 1984, Araujo et al., 1987 and Segesser et al., 1987)**. However these biological tissues have fixed with a crosslinking agents and subsequently sterilized before they can be implanted **(Nimni et al., 1987)**. The fixation of biological tissues is to reduce antigenicity, immunogenicity and prevent enzymatic degredation. These crosslinking agents are mostly synthetic chemicals such as formaldhyde, glutaraldhyde **(Nimni et al., 1987)**, dialdhyde starch **(Rosenberg 1078)** and Epoxy compound **(Noishiki et al., 1989)**. Bovine pericardia have been used as abiomaterial to manufactur varies bioprosthesis because of their inherent strength and biocompatibility **(Schmidt and Daier, 2000)**.

Glutaraldhyde treatment does not completely eliminate the immune response to allograft and xenograft and elicit a cytotoxic T-cell and a humoral response due to both residual cellular debris and extra cellular matrix protein **(Colto and Kupiec-Weglinski, 1996)**. Many approaches are under investigations as a mean to detoxify or neutralize the toxic effects of glutaraldhyde on processed tissues as alternate storage solutions, in addition to extensive bioprosethetic rinsing, **(Gendler et al., 1984)**.

In our study, the bovine pericardium was evaluated as a bioprosthesis for the reconstruction of experimental and clinical abdominal defects in dogs, sheep and goats. These results indicated that the bovine pericardium is a biocompatible tissue replacer. Biocompatibility involves the ac-

ceptance of the biomaterials by the surrounding tissues and by the body as a whole (Park and lakes, 1992). Where the attack of body immune system in the implant can cause failure of the biomaterials to serve as the tissues replacement.

The infection and abscess formation encountered in this study in (2 dogs) were related to skin suture breakdown. The dogs survived until they were euthanised. This may be due to the animal bite and the suture thread which caused their removal and spread of infection. These results are similar with those of Disa et al., (1996) who reported that the resistance of biological material to infection is high compared with synthetic materials. While Werkmeister et al., (1998) recorded that postoperative wound infection is a common complication in the repaired abdominal wall defects while using prosthesis.

All the operated clinical cases were manipulated after parturition. This may be due to abdominal distension due to pregnancy or to violent straining during parturation leading to ventral hernia in sheep and goats. This is in agreement with Krishnamurthy, (1996). Postoperative seroma in both experimental and clinical cases were explained by a host inflammatory reactions to the implanted material as demonstrated in histopathological examinations. While Amid, (1997) added that the dead space created between the implant and the host tissues plays a role in the formation of such complications.

In this study, there were no signs of fragmentation of the bovine pericardium in both experimental and clinical cases. The experimentally implanted patches retained in their original shape but decreased in their diameter (10x5cm, group 1 and 7x3 cm group 2 respectively). This could be attributed to the contraction of the fibrous connective tissues after maturation of the healing sites around the patches. Also there was no evidence of herniation in both the experimental and clinical animals at any time of evaluation. This may be due to the firm incorporation of the biomaterial with host tissues. New blood vessels formation (neo-vascularization) could be clearly seen under naked eye observation. Blood vessels were protruded and gradually progressing into the biomaterial from the surrounding host tissue especially in (GPBP) group. The same results were obtained by **Tung et al., (2002)**.

Kader et al., (2005) recorded a recurrence of one of four experimentally induced umbilical hernias in sheep despite the use of two folds of ovine pericardium. The condition which did not occur in our clinical cases. This may be due to the thickness and quality of bovine pericardium

which is considered to be more superior than ovine type.

The results of this study demonstrated that processed bovine pericardium can be placed in direct contact with underlying viscera without stimulating intra-abdominal adhesions. However adhesion was formed between the peritoneal side of the patch and the greater omentum. The use of human duramater **(Rodgers et al., 1982)** and processed bovine tunica vaginalis **(Tung et al., 2002)** had shown similar results. Glutaraldhyde delay the biodegradation and resorption of the biological implant in the animal model, but it has a cytotoxic effect and calcification effect **Gendler et al., (1984) and James et al., (1991)**. Tissue adhesion as undesired phenomena commonly occurs with the use of prosthetic materials. Adhesions have been reported to be due to lesion caused by abrasion, ischemia, desiccation, infection and foreign body **(Thompson, 1998)**. When the omentum was present, adhesions were far more prevalent if the abdominal wall had been resected as in this study. It is well documented that the mesothelial cells on the neoperitoneal surface prevent adhesions **(Baptista et al 2000)**.

This investigation demonstrated absence of significant differences between the use of fresh and glutaraldhyde preserved bovine pericardium in treating experimentally induced large abdominal defects in dogs, where extensive omental adhesions were attached to the fresh patches, in addition to attachment of one patch to the serosa of a small intestinal loop and not in the (GPBP) patches. This could be attributed to bridging of peritoneal lining above the inside surface of the glutaraldhyde preserved bovine pericardia which was appeared during macroscopical and microscopical examinations. **Trowbridge and Crofts,(1988); Lee et al., (1989) and Santillan-Doherty, et al., (1996)** recorded that treatment of bovine pericardium with glutaraldhyde increased its tensile strength and shear properties. But our results may be explained on the basis that bovine pericardium in comparison with the small abdomen in dogs is stiff and strong enough to prevent recurrence. Also the macroscopical and microscopical examinations revealed no signs of rejection.

Mild inflammatory reaction cells was seen in the interface between the fresh patches (12 weeks P.O) and the subcutaneous tissues in two specimens. The calcification which was reported at 12 weeks in the glutaraldhyde treated group was minimum. However calcification of bioprothesis is clearly multifactorial and the exact mechanisms are yet to be elucidated **(Kader et al., 2005)**. Autolytic cell debris has been speculated to constitute the early nuclei of calcification in long term explants, so cell extraction of biological tissues may reduce its calcification **(Valente et al., 1985)**. Residual alkaline phosphatase activity and presence of lipids and cellular debris in glutaraldhyde treated tissues presumably is a factor in the pathogenesis of mineralization and the selective removal of lipids prior to treatment help to attenuate calcification **(Rossi et al 1990)**. However, this phenomena must be put under further investigations for longer periods

postoperation.

Histologically host cells (inflammatory cells and fibroblast) and neocapillaries were able to infiltrate into the patch. A new peritoneum was observed consisted of organized vascularized connective tissue covered by intact layer of mesothelial cells. Minimal calcification was recognized as small blue patches. This emphasizes that the host body has accepted these patches as a part of its own tissue. Similar results were recorded by **Tung et al., (2002)**.

In the present study, the bovine pericardium was evaluated as a bioprosthesis for the reconstruction of experimental and clinical abdominal defects. The results indicated that the bovine pericardium is considered to be a good biocompatible tissue replacer. **Timpl, (1982)** explained the acceptability of bovine and proeine xenogenic collagenous tissues for long-term implantation and attributed it either to the homology of collagen structure from different species (a low level of foreigness) or to certain structural features associated with collagen.

In conclusion, the bovine pericardium has significant advantages as an abdominal wall replacement in dogs, sheep and goats as the results had demonstrated its effective use in repairing large abdominal wall defects. Furthermore, it prevents herniation of abdominal contents. As well as, it is cheap, available and not rejected by the host tissues either the fresh or the glutaraldhyde preserved. Therefore it is considered a successful and effective alternative for repairing large abdominal wall defects in dogs, sheep and goats.

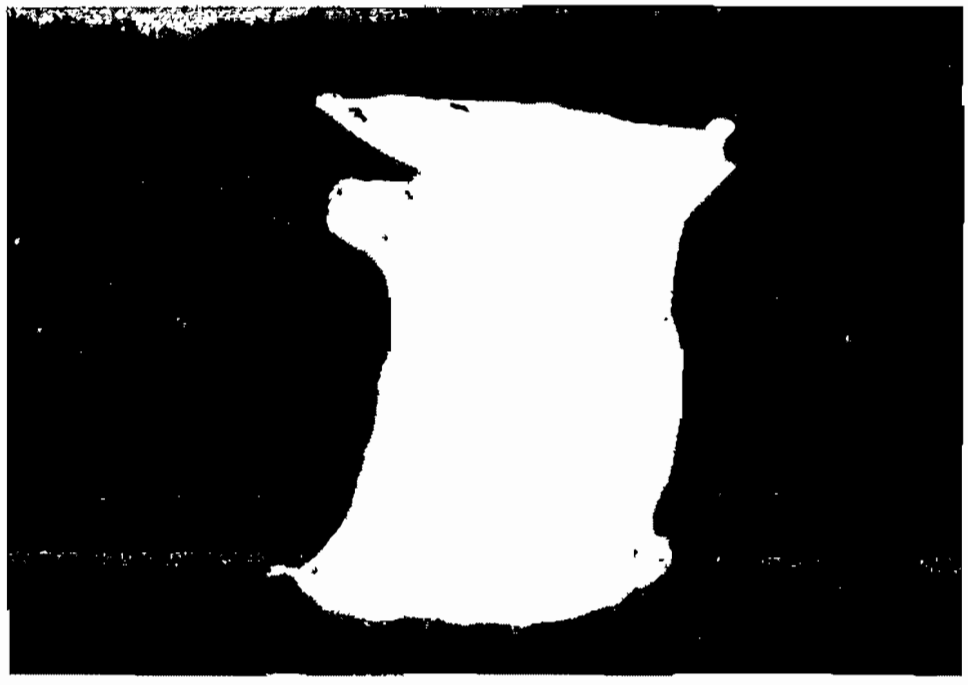

Fig. 1 : Showing the fresh bovine pericardium after removal of all adhering structures.

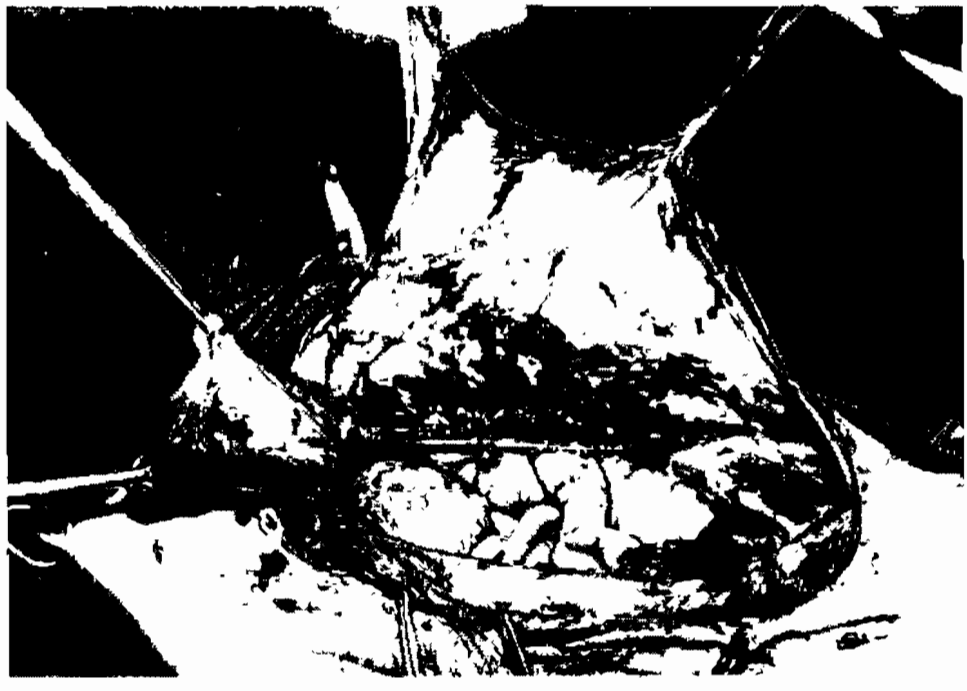

Fig. 2 : Showing full thickness abdominal defects in a dog before complete removal of muscles.

Fig. 3 : Showing closure of the abdoutnal defect in a dog by fresh bovine pericardium using prolene suture material

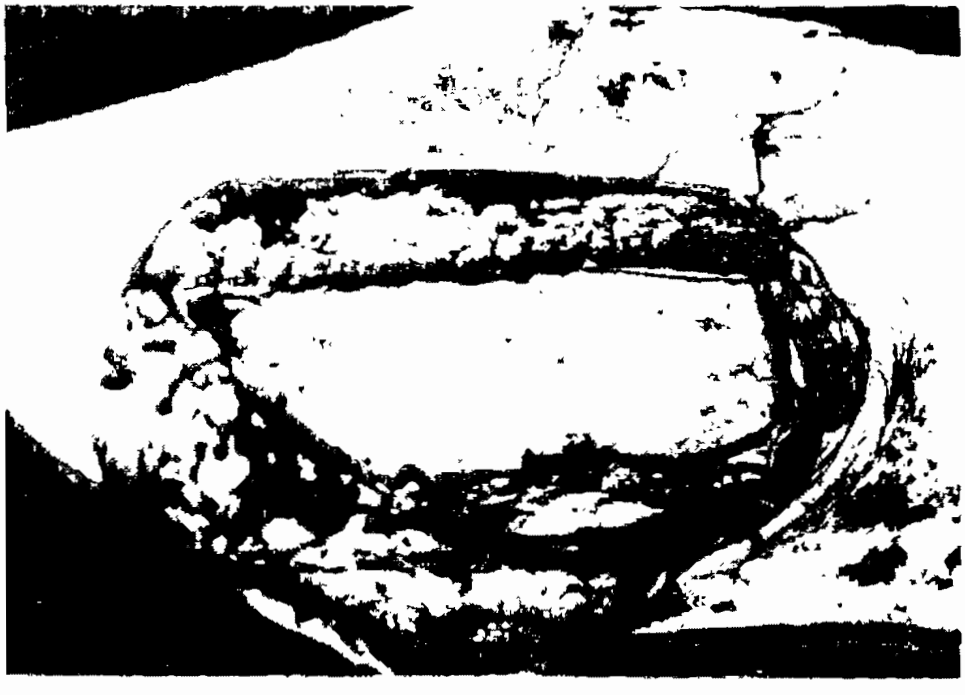

Fig. 4 : Showing the abdominal wall defect in a dog after reconstruction by glutaraldhyde preserved bovine pericardium.

Fig. 5 : Showing ventral abdominal hernia at the left side of a three years old goat, 15 days after parturition

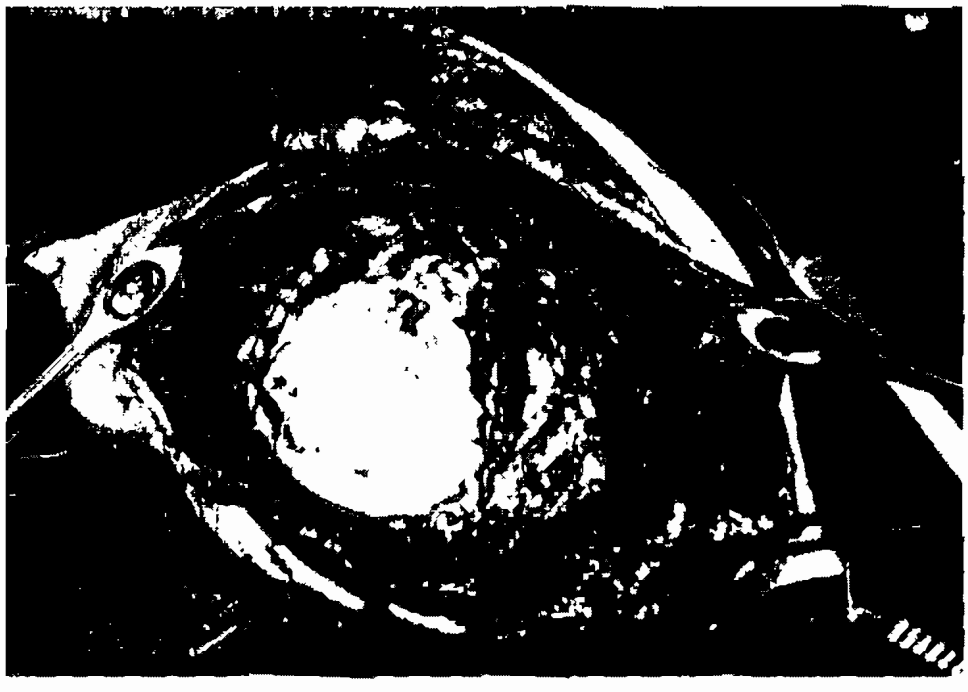

Fig. 6 : Showing closure of the hernial ring by GPBP patch in a goat.

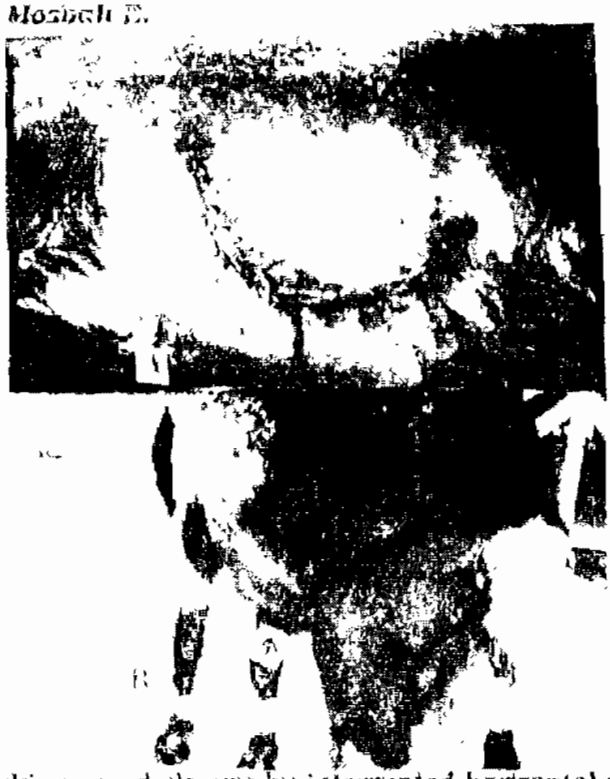

Fig. 7 : Showing the skin wound closure by interrupted horizontal mattress (A) with disappearance of the hernial swelling (arrow,B) in a goat.

Fig. 8 : Showing ventral abdominal hernia in an ewe at the left side (arrow A) and after closure (arrow B) by fresh bovine pericardium.

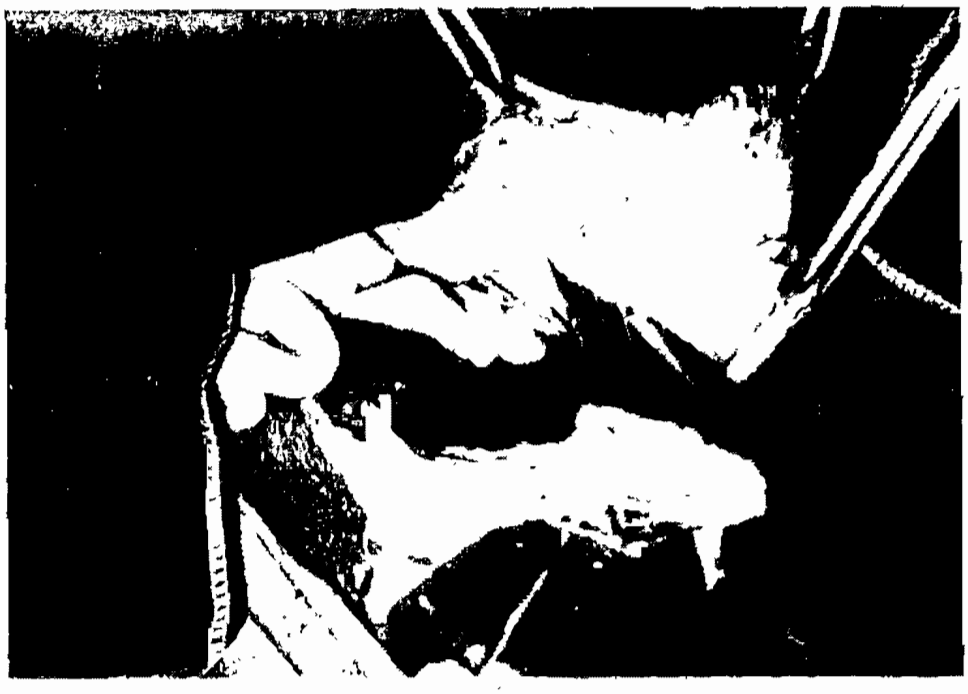

Fig. 9 : Showing the formation of new peritoneum covering GPBP patch with slight adhesions in small portion with the greater omentum, 6 weeks postoperation.

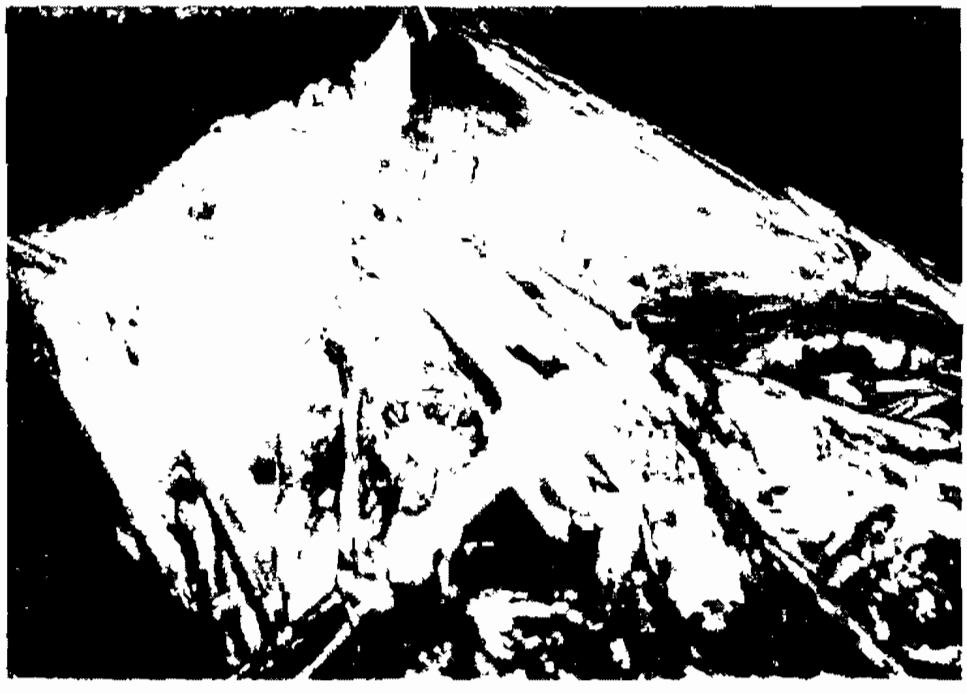

Fig. 10 : Showing extensive adhesion to the fresh bovine pericardium patch with the greater omentum in a dog, 6 weeks postoperation.

Fig. 11 : Showing adhesion of small intestinal loop to a fresh bovine pericardium patch in a dog, 12 weeks postoperation.

Fig. 12 : Showing healing of GPBP (6 weeks postoperation) to the neighboring structures with fragments of myofibrils (A) with a newly formed capillaries (B) and highly vascular granulation tissue inside the patch (C). H&E. X: 130 (A) and 520 (B&C).

Fig. 13 : Showing numerous (A) and mild (B) lenkocytic infiltration of GPBP specimens (6 weeks postoperation) with the extension of peritoneal bridge (C). H&E-X: 130.

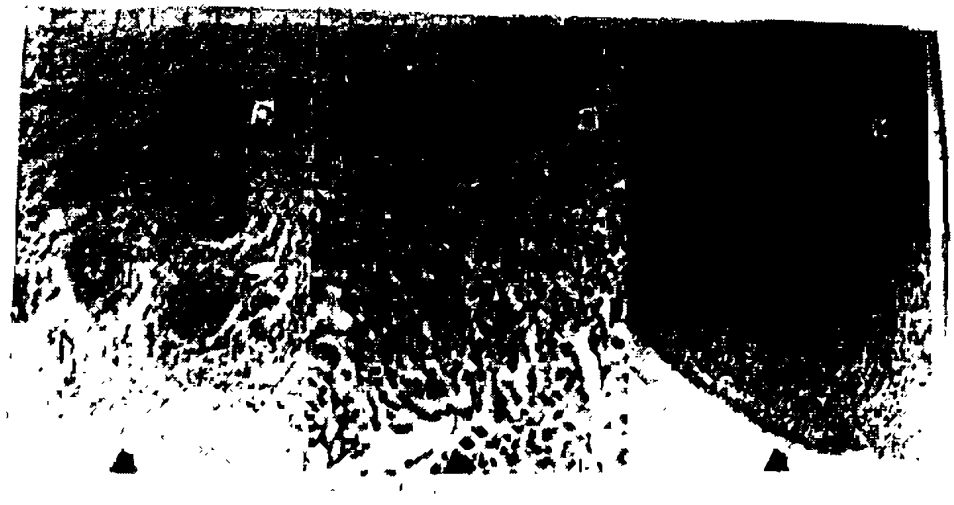

Fig. 14 : Showing invasion of fresh patches, 6weeks postoperation with numerous fibroblasts arranged perpendicular on newly formed capillaries (A&B) with appearance of well formed vessls (C). H&E-X:130(A&C) and 520(B).

Fig. 15 : Showing healing of the patches to the surrounding structures (A) with presence of numerous polymorphonuclear leukocytes around suture materials(B) and siderocytes(C). (GPBP specimens, 12 weeks postoperation).H&E-X:130(A) and 520(B&C).

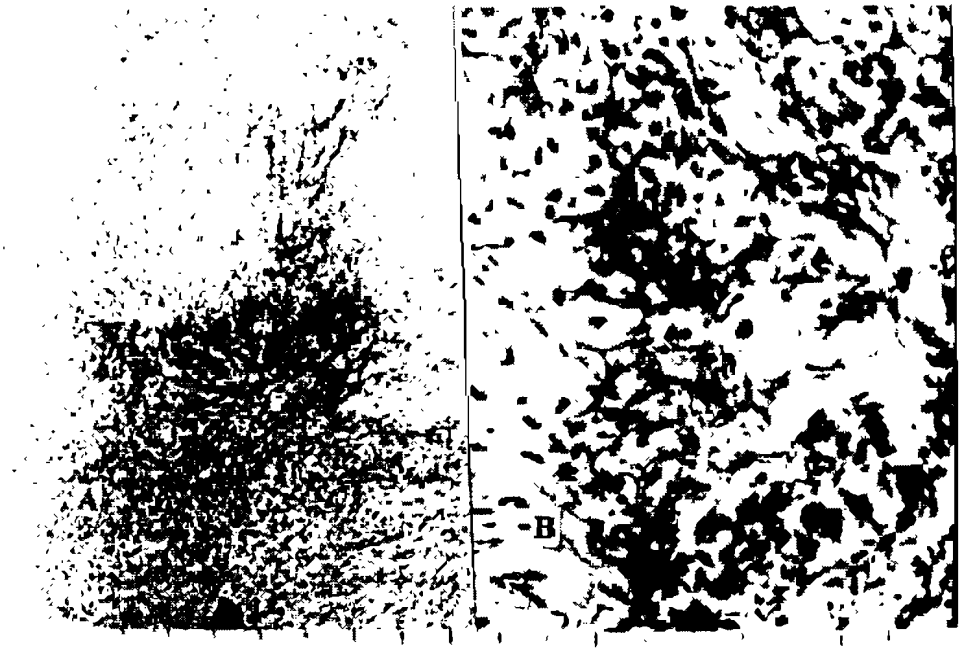

Fig. 16 : Showing calcification of GPBP specimen (12 weeks postoperation) (A&B). H&E-X: 130 (A) and 520 (B).

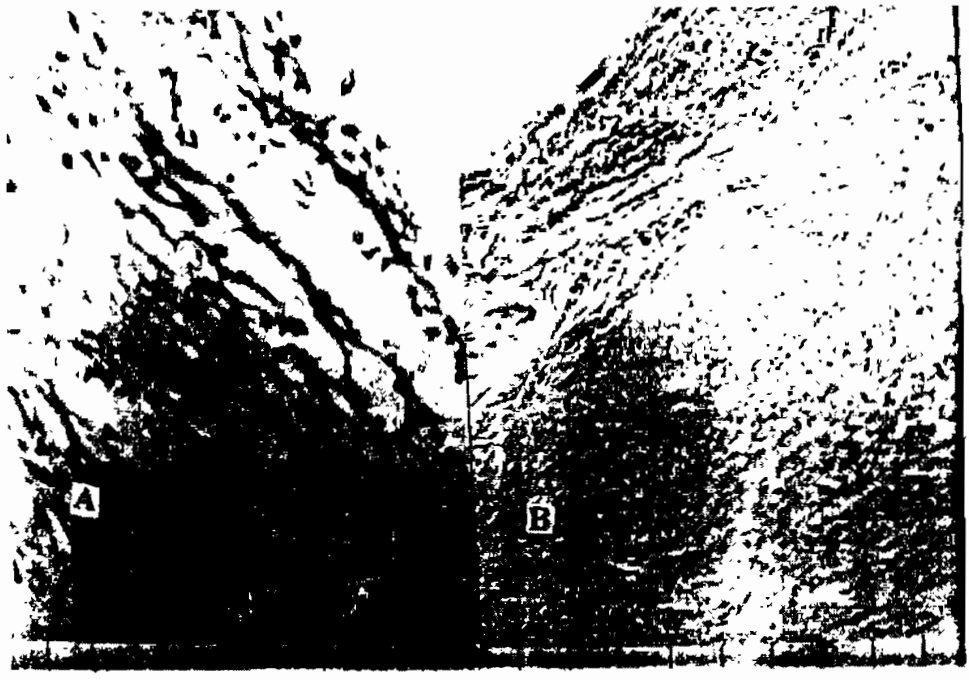

Fig. 17 : Showing well vascularized fresh patches (A) and presence of minimal oedema (B) (12 weeks postoperation). H&E-X: 520 (A) and 130 (B).

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الملخص العربى

إستخدام تامور الماشية لإصلاح قصور الجدار البطنى (رقعات إستبدالية)

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هدفت هذه الدراسة إلى تقييم إستخدام غشاء التامور المغلف لقلب الماشية الغير معامل كيميائياً والمحفوظ فى ٥ر٠ ٪ جلوتار الدهيد لمدة خمسة عشرة يوماً وذلك لترقيع قصور الجدار البطنى الكامل فى الكلاب وإصلاح الفتوق البطنية كبيرة الحجم فى كل من الماعز والنعاج، وقد أجريت الدراسة التجريبية على إحداث قصور كبير فى جدار البطن فى (١٦) كلب، قسمت إلى مجموعتين تم إصلاح كل مجموعة بغشاء التامور الغير معامل كيميائياً (٨ كلاب) والمعامل (٨ كلاب) وقد أظهر الفحص السريرى للحيوانات عدم وجود مضاعفات خطيرة، أما الفحص المورفولوچى والمجهرى النسيجى بعد ٦ و ١٢ أسبوع من إجراء الجراحات أوضح وجود إلتصاقات بسيطة بين الرقعة المستخدمة والترب الكبير مع ظهور أوعية دموية جديدة وغشاء بريتونى جديد، وأظهر الفحص الميكروسكوبى وجود تفاعلات التهابية عبارة عن إرتشاح لخلايا متعددة، ظهور نسيج ليفى وآخر حبيبى، كما أظهرت نتائج إستخدامها إكلينيكياً وجراحياً فى النعاج والماعز إنهاشفيت جميعاً دون ظهور أى أعراض جانبية خلال مدة ملاحظاتها لأربعة شهور، وقد تمت مناقشة النتائج ومقارنتها بمثيلتها، وقد أستخلص هذا البحث بإمكانية إستخدام غشاء تامور الماشية فى ترقيع الفتق البطنى كبير الحجم فى الكلاب والماعز والنعاج.