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Ultrasonographic Evaluation of Hernioplasty of Experimentally Induced Large Ventro-lateral Hernia in Bucks

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Summary

The present study is assigned to evaluate the efficiency of hernioplasty in reconstruction of experimentally induced ventro-lateral hernia in bucks using two types of sutures (silk and polypropylene) and to find which thread is more safe and suitable for closure of the hernia, based on ultrasonographic examination.

Sixteen adult local breed bucks were enrolled for this study. All subjected to inducing artificial ventro-lateral hernia (12x10) cm in the right flank under the effect of local anesthesia (2% Lidocaine), then left for one month. After that, animals divided randomly and equally into two groups. In the first group, hernia repaired with silk, while in the second group, hernia closed by polypropylene. Sewing technique is used in both groups. The final appearance was (mesh-like).

Ultrasonographic examination in silk group and after 2 months there was slight improvement in echogenecity and collagen fibers. Polypropylene group and at the same period revealed an increased in echogenecity and decreased lesion size earlier in compare with silk group. In 4 months polypropylene group, reflected high echogenecity and complete infilling of the sewing holes with mature collagen fibers.

Keywords: Ultrasonographic, Hernioplasty, Ventral Hernia, Bucks.

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تقويم الفتق البطني الجانبي المستحدث تجريبيا في ذكور الماعز وتقيمه باستخدام الامواج فوت الصوتية

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الخلاصة

صممت الدراسة الحالية لتقويم الفتق البطني– الجانبي المستحدث تجريبيا في ذكور الماعز بأستعمال نوعين من الخيوط الجراحية (الحرير والبولي بروبلين) و معرفة ايهما الاكثر امننا وملأئمه لاصلاح الفتق.

اختير للدراسة (16) من ذكور الماعز المحلية البالغة. اخضعت جميعها لعمل فتق مستحدث في منطقة الخاصرة اليمنى (12×10) ثم تركت لمدة شهر بعدها قسمت الحيوانات عشوائيا وبالتساوي الى مجموعتين :– المجموعه الاولى تم اصلاح الفتق بأستعمال خيوط الحرير.اما المجموعه الثانية فأستعمل لها خيوط البولي بروبلين لغلق الفتق بأسلوب الحياكة وكانت النتيجة هي غلق حلقه الفتق بما يشبة الشبكات الجراحية في كلا المجموعتين.

اظهر الفحص بالامواج فوت الصوتية في مجموعة الحرير في الشهر الثاني تحسنا طفيفا في الصدى وانتظام الياف الغراوين. اما في مجموعة البولي بروبلين فكان هناك زياده ملحوظه بالصدى وقله سعة الافه.اظهرت نفس المجموعة في الشهر الرابع صدى عالٍ مع غلق فتحات الحياكه بشكل كامل بالياف الغراوين الناضجة.

Introduction

A hernia is a weakness in the abdominal wall that allows abdominal contents, including the intestines, to push through the abdominal muscles, creating a bulge under the skin (1). A ventral hernia does not imply an anatomical site as the name would suggest. Ventral hernias are mainly of traumatized origin (violent force) but may result from over stretching of the abdominal muscles, and may cause discomfort from sharp pain to dull aches or they may not cause any symptoms .In either case, hernia do not go away on their own and require surgery to correct it (2 and 3). Repair of large ventral hernia is a difficult surgical problem and commonly encountered as a challenge for surgeon with recurrence being a common outcome especially when the hernia ring is greater than 10 cm (4).

Tension-free repair: used for large-size hernia ring; mainly prosthetic material such as mesh is used, which fixed by simple stitches over the hernia ring. This foreign material stimulate tissue ingrowths. Recently mesh is used with the help of laparoscope. The recurrence rate in this technique is lower than tension repair (5).

Due to high recurrence rate in tension repair and high costly mesh implantation, we tried to perform, an economic and safe technique (free-tension sewing repair) by using suture materials for veterinary hernia repair, therefore the objectives of the present study include:

1- Inducing large ventro-lateral hernia in bucks then repaired it by sewing method using silk and polypropylene sutures.

II- To find the most appropriate suture that enable to close the hernia based on ultrasonographic evaluation.

Materials and Methods

Sixteen local breed bucks purchased from local market, aged (2-3) years and weighing (35-38) kg were enrolled in this study. Food was withheld for 24 hours and water for 12 hours prior to surgery. The right para-lumber fossa was clipped free of hair, and the skin was prepared for aseptic surgical operation. The buck was sedated with an intramuscular administration of (2%) Xylazine hydrochloride (Xylapan®, Switzerland) at a dose of 0.2 mg/kg.,B.W and restrained in lateral recumbancy. Operations were done under the effect of linear infiltration of local analgesia represented by (2%) lidocaine hydrochloride (Xylocaine, Fatro, Italy 20 mg/ml) at a dose of 10 mg/kg., B.W. (6).

The animals were submitted to surgical procedure to provoke artificial hernia in the ventro-lateral abdominal wall. Under aseptic condition a right flank skin incision was made in about (15) cm. length (fig. 1) and bleeding was carefully arrested .The subcutaneous tissue was dissected to identify the abdominal muscles (external abdominal oblique, internal abdominal oblique, and transverses abdominis). These muscles were opened bluntly, and then part of them was cut and discarded (fig. 2) to create a hernia ring in a diameter of (12 × 10) cm (fig. 3). The skin and subcutaneous tissue were restitched with non-absorbable suture material (silk no.1) (fig. 4) and the hernia was developed directly when animal recovered from analgesia (fig. 5). All bucks were left for one month post-operation. Bucks were randomly allocated into two treatment groups (eight bucks/ group). In the first group, which numbered from (1-8), hernia repaired via sewing technique using silk thread; while, in the second group, which have the frequency from (9-16), hernia repaired by the same technique with polypropylene.

After 30th day post experimental creation of hernia, each buck was prepared for the procedure of hernioplasty. The pre-operative surgical preparation and

anesthetic procedure were similar to those followed and described during creation of ventral hernia. All repaired ventral hernia were reducible once with a clear palpable hernia ring. The animal restrained in dorso-lateral recumbancy on a surgical table, and then skin incision of sufficient length parallel to the first one had been done directly over the hernia. The skin edges were reflected and separated from the peritoneal sac up to hernia ring by blunt dissection to expose the circumference of the abdominal wall defect .Once this has been achieved, the herniated intestine pushed back into the abdomen (fig. 6). In the first group, hernia repaired with silk suture (no.1). The second animals group, hernia ring was closed by polypropylene suture (no.1). The final appearance of sewing suture in both groups is looked-like silk mesh (fig. 7) or polypropylene mesh. Finally, the access skin was cut and removed, then skin was closed by interrupted horizontal mattress with non-absorbable suture materials (silk no.1).Thus hernia swelling was disappeared.

Ultrasonography was performed during the first week post hernioplasty then monthly for four months to monitor the post-operative complications and identification and excluding any failure of the sewing technique, in addition to verify the orientation of collagen fibers. Prior to Ultrasonographic examination, hair coat was clipped from the related part of the body and Ultrasonographic gel was applied. Then Welld Ultrasonographic Machine (WED-9018 V, China) with a linear (7.5) MHz tranducer was used.

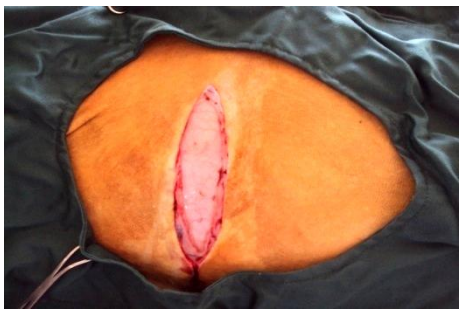

Fig.1- The skin and subcutaneous tissue are incised.

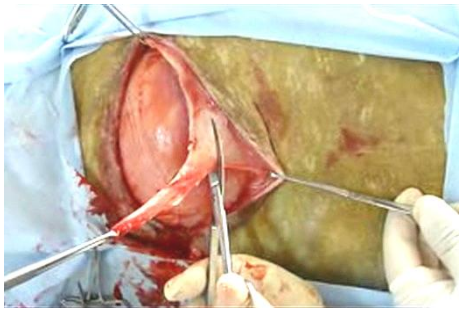

Fig.2- The abdominal muscles are opened and cutting off part of them.

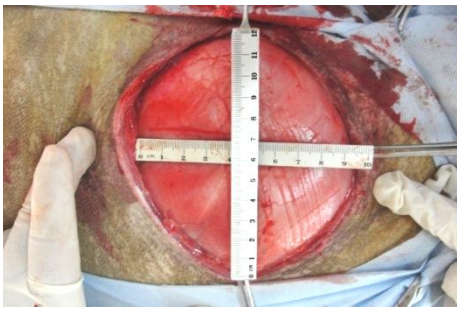

Fig.3- Measurement of the induced hernia ring (12 x 10) cm.

Fig.4- The skin is sutured with interrupted horizontal mattress by silk (no.1).

Fig.5- Artificial Ventro-lateral hernia in buck (arrow)

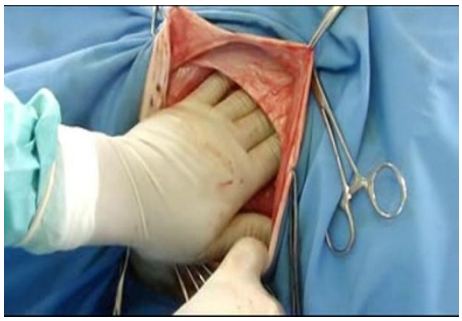

Fig.6- The hernia ring is detected by manual palpation.

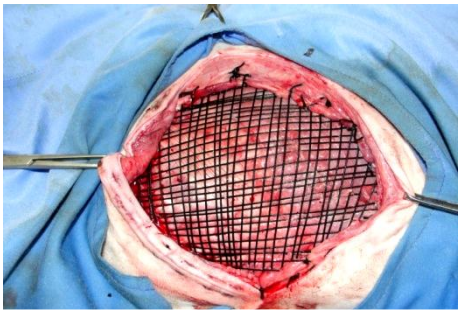

Fig.7- Tension-free sewing repair (cross mattress suture with silk). The final appearance is mesh-like.

Results and Discussion

Ultrasonography is an effective tool for identification of sewing, monitoring the post-operative complications and excluding any failure of the sewing technique. Ultrasound images which were taken in the first week post hernioplasty revealed seroma (in the third day) in two animals related to silk group. Seroma may be due to inadequate hemostasis while repairing the hernia or may be rough excessive dissection to separate the hernia sac from the subcutaneous tissue which left dead space, this hypothesis is consistent with the earlier report (7). The lesion appears as anechoic area surround by hyperechoic line (fig. 8). Complete resolution of seroma (echoic area) noticed on day seven (fig. 9). Abscess formation or purulent collection represented by anechoic area (fig. 10) was observed in two animals (one of each group). Infection is a common complication of surgery and may be due to bacteria at the site of operation. Avtan *et al*., (8), indicated that there are two types of infection must be distinguished in patients with prosthesis repair: superficial subcutaneous infection and infection around the mesh. The first usually has no clinical significance. In the second, vigorous treatment is always necessary. In silk group and after 2 months there was slight improvement in echogenecity and fibers alignment (fig. 11). In 4 months, there was incomplete filling of the defect with collagen fibers (fig.12). Polypropylene group and in 2 months revealed an increased in echogenecity and decreased lesion size (fig.13) earlier in compare with silk group. In contrast; in 4 months polypropylene group, reflected complete infilling of the sewing holes with mature collagen fibers (fig.14), which lead to reformat the normal architecture of the abdominal wall.

The ultrasonography always proved the stability and correct positioning of the mesh and verified the local inflammatory edema and its resolution. The mesh ultrasonographically appeared as a thin hyperechoic line (9). In recent study (10), polypropylene mesh was inplanted to repair umbilical hernias in goat. The mesh stability was confirmed 6 months after surgery. Two goats out of 8 were pregnant and labor occurred without complications. Ultrasonography also made it possible to monitor the status of the abdominal viscera near the mesh to exclude the formation of any adhesions.

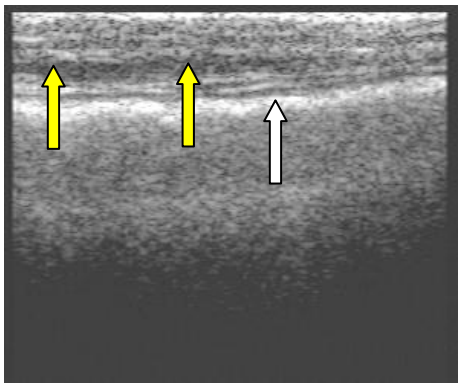

Fig. 8 – Ultrasonographic examination, 3days post-implantation of silk suture show's anechoic area of post- operative edema (yellow arrows) surrounded by hyperechoic line (white arrow)

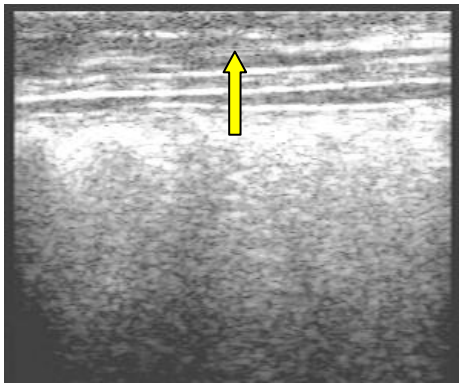

Fig. 9 – Ultrasonographic examination, 7 days post-implantation of silk reveal's complete resolution of edema (echoic area) (arrow).

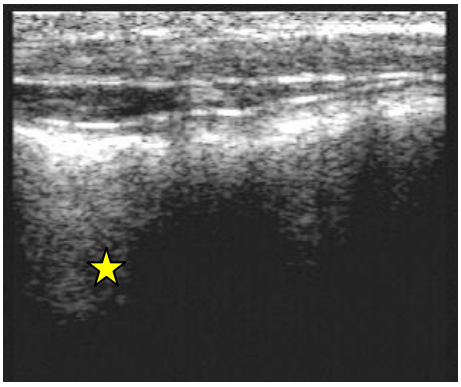

Fig.10 –Ultrasonographic examination show's, sewing-related infection. The silk suture is surrounded by a purulent collection represented by anechoic area (star).

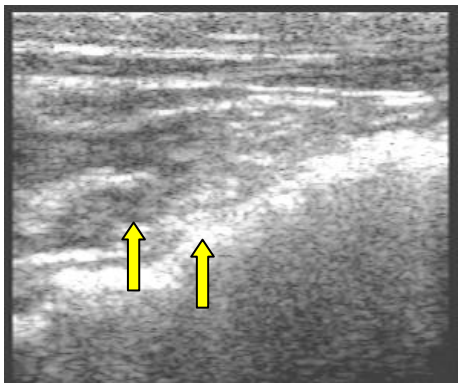

Fig.11- Ultrasonographic examination of silk sewing, 2months post-implantation show's anechoic area (left arrow) surrounded by hyperechoic line (right arrow).

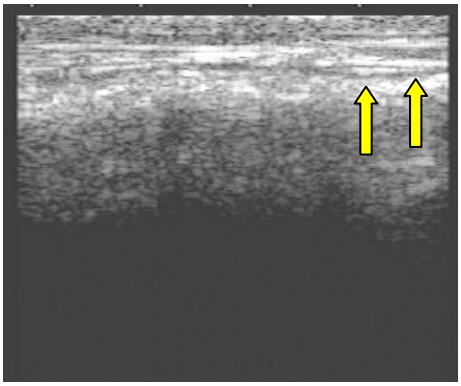

Fig.12– Ultrasonographic examination of silk sewing, 4 months post-implantation reveal's incomplete infilling of the sewing holes by collagen fibers represented by narrow echoic area(right arrow) in the hernia center enclosed by bundles of collagen fibers (hyperechoic area) (left arrows).

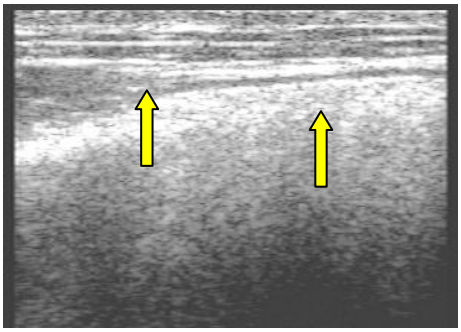

Fig.13– Ultrasonographic examination of polypropylene sewing, 2months post-implantation show's narrow echoic space between collagen fibers (left arrows) surrounded by hyperechoic line about 2mm in diameter (right arrow)

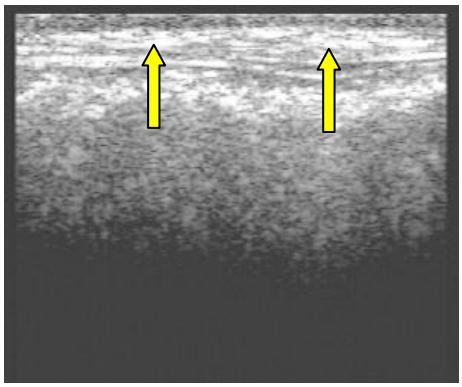

Fig.14– Ultrasonographic examination of polypropylene sewing 4months post-implantation reveal's, complete infilling of the sewing holes with regular orientated collagen fibers (hyperechoic area) (arrows).

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