

# **CLINICAL OBSERVATION AND SURGICAL MANAGEMENT OF EXTERNAL HERNIAS IN RUMINANTS IN DOHUK GOVERNORATE**

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## **ABSTRACT**

This study was conducted to determine the prevalence of external hernias in ruminants in Dohuk governorate in relation to the species, age, and sex of the animals. During a period of seven years, fifty eight cases of external hernias were presented for surgical correction. Eighty one percent of the hernia cases were in ovine species, 15.6% were in caprine; bovine constituted only 3.4% of the cases. High incidence of hernias was recorded in females; the sex distribution was 72.4% females and 27.6% males. Umbilical hernias constituted 44.8% of all hernias, followed, in reducing frequency, by ventral (31%), scrotal (13.8%) and inguinal hernias (10.4%). Clinical and surgical findings which include the size of the hernial rings, reducibility of the contents, the condition of the peritoneum, suture patterns and materials used and surgical outcome were described.

## **INTRODUCTION**

External hernia is a displacement of an organ, part of an organ, or a tissue outside the abdominal cavity through an abnormal opening in the abdominal wall which can be noted from the outside of animal's body and can be detected with external examination. External hernias are classified according to their anatomical locations into umbilical, inguinal, scrotal, femoral, perineal, and ventral (or abdominal) hernias. Ventral hernias



occur in the abdominal wall other than through a natural orifice, they may occur high or low in the flank, along the costal arch, on the midline, and in the area of the prepubic tendon **1**.

Herniorrhaphy is among the most commonly performed operations in animal and human surgical practices. Most hernias enlarge over time and, if not repaired surgically, they may cause pain, anorexia, weight loss, or it may cause dystocia when a gravid horn is found in the hernial sac **2**. Incarceration and strangulation of the bowel are the most dangerous life threatening sequela of herniation **3**.

Hernias were either reported in ruminants as individual cases **4, 5, 6, 7, 8, 9, 10** or in studies involving different types of hernias **11, 12, 13, 14**.

Because there is a dearth of informations concerning the prevalence of different types of hernias in ruminants in relation to species, age, and sex of the animals in Dohuk governorate/Kurdistan region/Iraq, this study was performed. Clinical signs of these hernias, their surgical management and outcome were described in details

## **MATERIALS AND METHODS**

### **Animals:**

This study was conducted on animals having external hernias referred from different parts of Dohuk governorate to the department of Medical Sciences/ Faculty of Veterinary Medicine/Duhok University/ Kurdistan region/ Iraq and to Summel veterinary teaching hospital during the period from October 2008 to July 2015.

Informations concerning the species, age, and gender of the animals, the history of the cases and the locations of the hernias were recorded on medical cards. A thorough body examination was carried out to identify the physical status of the animals and to detect any defect in other parts of the body. The hernias were palpated to detect pain, heat, presence of hernial rings, reducibility of the contents, and the presence of infection. Some of these cases were documented by photographs.



### **Preoperative preparations:**

Food was withheld for 36 hours and water for 6-12 hours only from adult animals especially those having large hernias. Hernias of immature animals (up to 6 months old) were repaired at the day of arrival without withholding food and water.

Procaine penicillin (24mg/kg) and dihydrostreptomycin sulphate (30mg/kg) (Pen & Strep<sup>®</sup> Norbrook G.B.) was given intramuscularly one hour before the operation and repeated for five days thereafter. Hernia repairs were performed aseptically (clipping, shaving of the site of the operation, skin scrubbing with povidone iodine and ethyl alcohol and using sterile surgical instruments and drapes).

### **Anesthesia:**

Field block anesthesia by making walls of infiltration of 2% lidocaine hydrochloride (pil, India) enclosing the hernial borders was used for umbilical, small ventral hernias, and, inguinal and scrotal hernias of immature animals. For large ventral hernias, in addition to the local anesthesia, intravenous injection of 0.05mg/kg xylazine (Xyla, interchemie, Holland) was used. Epidural (lumbosacral) anesthesia was used for inguinal and scrotal hernias in adult animals using 10 ml of 2% lidocaine.

### **Hernia repair:**

The animals were placed on dorsal position for umbilical and ventral midline hernias or lateral position for inguinal, scrotal (with upward elevation of the uppermost hind limb of the affected side), ventrolateral and paracostal hernias.

For umbilical, all ventral and inguinal hernias, a single linear skin incision was made through the center of the hernial sac, starting 2 cm beyond the anterior border of the hernia and extended for 2 cm posterior to it (Fig.1).





Figure1. A single linear skin incision is made over the center of the hernial sac.

For umbilical hernias in males, the posterior part of the skin incision was made lateral to the prepuce. For scrotal hernias a circular incision was made around the scrotal neck and extended up to the inguinal region of the affected side.

The skin was bluntly dissected from the underlying tissues to expose and open the hernial sacs. The condition of the peritoneum (intact or teared) was recorded. All the adhesions between the hernial contents and the hernial sacs and/or the rings, if present, were freed gently. The herniated contents were examined and pushed into the abdominal cavity and the length of the rings was measured.

The technique and the suture materials used to close the hernial rings depended on the size of the rings, the amount of tension on the suture line, and the type of suture material available at the time of the repair. Ford interlocking No.2 catgut or No.1 polyglycolic acid suture was used to close small (4-6 cm long) umbilical rings. The rings of larger umbilical hernias, inguinal hernias of mature animals, and all the ventral hernias were closed by modified Mayo closure (vest-over-pants) (Fig.2) using nonabsorbable suture materials like No.2 silk, No.1 nylon or No.1 polypropylene. The free overlapping upper edges were sutured to the adjacent tissue by simple continuous No.1 polyglycolic acid.





Figure 2. Preplacing modified Mayo sutures before tying the knots.

Bilateral castration with scrotal ablation was performed for scrotal hernias. The rings of inguinal hernias of immature females and all those of scrotal hernias were closed with simple interrupted No.1 nylon, polypropylene or polyglycolic acid.

The tissues overlying all the repaired rings, including the subcutaneous tissue, were sutured in a single or multiple layers (depending on the thickness of the abdominal wall at the surgical area) with simple continuous No1 polyglycolic acid or No.1 chromic catgut.

Excess skin was removed and skin wounds were closed using simple interrupted No.1 silk or polypropylene. Drains were placed in the lower parts of the repaired ventrolateral and inguinal hernias of adult animals to prevent seroma formation and accumulation of blood in the dead spaces. The owners were asked to remove the drains when no swelling is seen in the surgical area and no fluids or blood is coming out from the drains.

Because most of these cases were brought from remote and rural areas, postoperative care (daily wound dressing, antibiotic injection and removal of skin stitches 10 days after the operation) was done in local veterinary hospitals. Postoperative complications and follow up information were obtained from the owners through phone calls.



## RESULTS

Fifty eight cases of hernias were recorded over a period of seven years, 47(81%) cases were in sheep, 9 (15.6%) in goats and 2 (3.4%) in calves. Forty two cases (72.4%) were Females (35 sheep, 6 goats and 1 calf) and 16 (27.6%) were males (12 sheep, 3 goats and 1 calf). Anatomically, twenty six cases (44.8%) were umbilical, eighteen (31%) were ventral, eight (13.8%) were scrotal and six (10.4%) were inguinal (table1).

**Table 1.** Distribution of the different types of hernias in relation to the species and sex of the animals.

Type of hernia	Species						Total
	Ovine		Caprin e		Bovine		
	♀	♂	♀	♂	♀	♂	
Umbilical	18	2	2	2	1	1	26 (44.8%)
Ventral							
Ventrolateral	8	3	1	-	-	-	12
Paracostal	1	-	2	-	-	-	3
Ventral mid line	2	-	1	-	-	-	3
							18 (31%)
Scrotal	-	7	-	1	-	-	8 (13.8%)
Inguinal	6	-	-	-	-	-	6 (10.4%)
Total	35	12	6	3	1	1	58

♀= female, ♂= male

Most animals had a normal physical condition and appetite even those having very large hernial sacs. Diagnosis was mainly based on clinical signs, presence of hernial rings with retraction of the hernial content back into the abdominal cavity in reducible hernias. For irreducible hernias with impalpable rings, aseptic needle aspiration was used to exclude other conditions and palpation of movable loops of intestine in the hernial sacs confirmed the diagnosis.

Nineteen umbilical, 5 scrotal and 2 inguinal hernias were observed in 10 days to 3 month old animals, they were detected by the owners shortly after birth (table 2).





**Table 2.** The distribution of the hernias in relation to the age of the animals.

Type of hernia	The age of the animals												Total	
	da ys	Months						Years						
	10	1	2	3	5	8	2	3	4	5	6	7		
Umbilical	-	3	9	7	1	1	-	1	3	1	-	-	26	
Ventral	-	-	-	-	-	1	2	2	6	5	1	1	18	
Scrotal	-	3	1	1	-	-	-	-	1	1	1	-	8	
Inguinal	1	1	-	-	-	-	-	-	2	1	1	-	6	
Total	1	7	10	8	1	2	2	3	12	8	3	1	58	

All the remaining hernias were observed in older animals. They were found by the owners accidentally with an unobvious cause. Most ventrolateral and inguinal hernias were detected during pregnancy or after parturition in 4-5 years old females with no history of trauma.

Twenty one hernias (ten ventrolateral, two paracostal, 5 scrotal, and 4 inguinal) were left-sided. Eight hernias (2 ventrolateral, one paracostal, 3 scrotal, and 2 inguinal) were right-sided, and three were at the ventral midline (fig. 3, 4, 5, and table 3).

**Figure 3.** Left sided hernias: Scrotal (1); Inguinal (2); Ventrolateral (3); Paracostal (4) Inguinal (5 and 6)



**Figure 4.** Right sided hernias: Scrotal (1, 2); ventrolateral (3); Inguinal (4, 5) and Paracostal (6).



**Figure 5.** Ventral midline hernia located anterior to the udder in a goat.





**Table 3.** The distribution of the hernias in relation to the side.

Type of hernia	The side of the hernia		
	Left sided	Right sided	Ventral midline
Ventral	12	3	3
Scrotal	5	3	-
Inguinal	4	2	-
Total	21	8	3

The incidence of umbilical hernias was higher in females than in males. The sizes of the umbilical hernias and rings were related to age. They were larger in mature animals (fig.6).

**Figure 6.** Umbilical hernias in mature animals (upper pictures) and in immature animals (lower pictures)

All umbilical hernias were reducible with palpable rings except in one, 2 months old, male lamb with irreducible umbilical hernia, showed signs of pain and anorexia suddenly one day before admission for repair. On palpation, the hernia was firm, hot and painful with impalpable ring (fig.7). Part of the abomasum was seen incarcerated by a 6 cm long ring.



**Figure 7.** Irreducible umbilical hernia in a lamb containing part of the abomasum.

The peritoneum was teared in 5 umbilical hernias, and was intact but tightly adhered to the skin and the ring in the remainders.

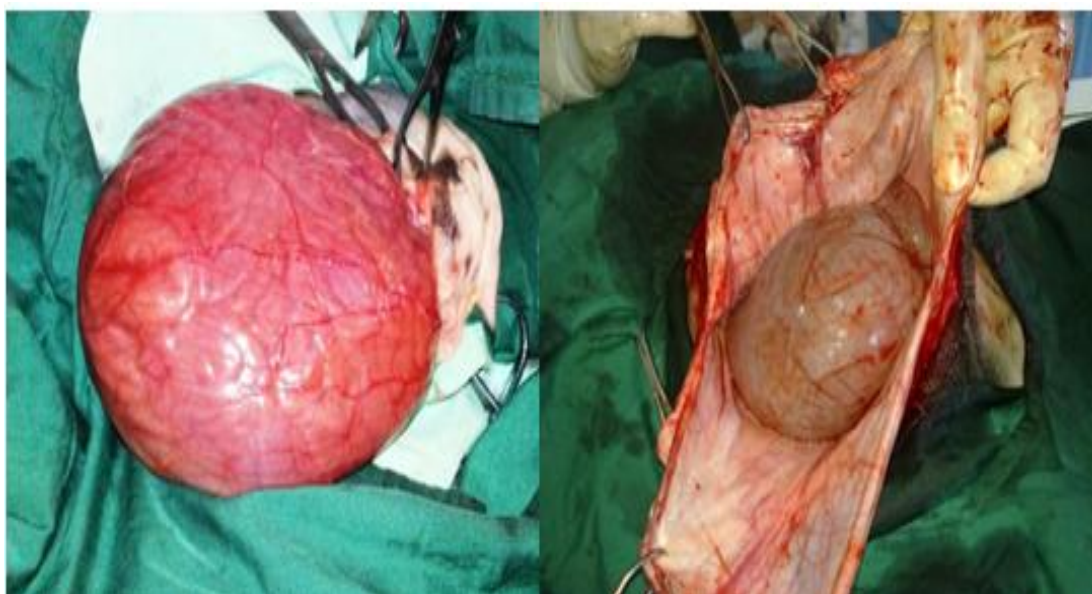
The midline ventral, paracostal and most of the ventrolateral hernias were reducible with palpable rings. Five ventrolateral hernias were irreducible with impalpable rings which were due to severe adhesions of the contents with the hernial rings and hernial sacs (Table 4).

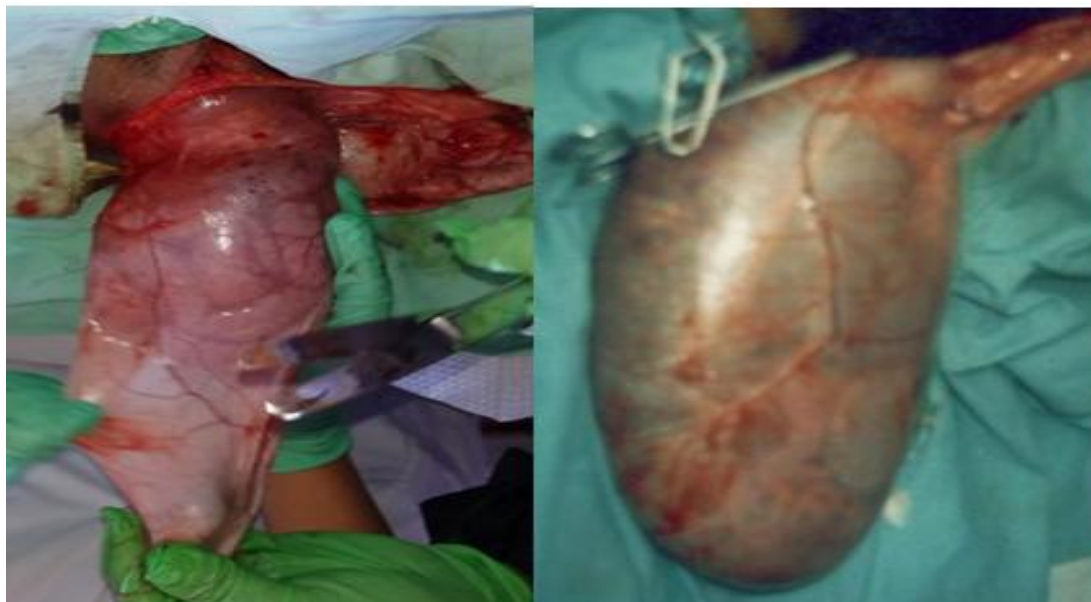


**Table 4.** The conditions of the peritoneum and the hernial contents.

Type of hernia	The condition of the peritoneum		The condition of the herniated contents	
	intact	teared	Reducible	Irreducible
<b>Umbilical</b>	<b>21</b>	<b>5</b>	<b>25</b>	<b>1</b>
<b>Ventral</b>	<b>-</b>	<b>18</b>	<b>13</b>	<b>5</b>
<b>Scrotal</b>	<b>8</b>	<b>-</b>	<b>-</b>	<b>8</b>
<b>Inguinal</b>	<b>2</b>	<b>4</b>	<b>4</b>	<b>2</b>
<b>Total</b>	<b>31</b>	<b>27</b>	<b>42</b>	<b>16</b>

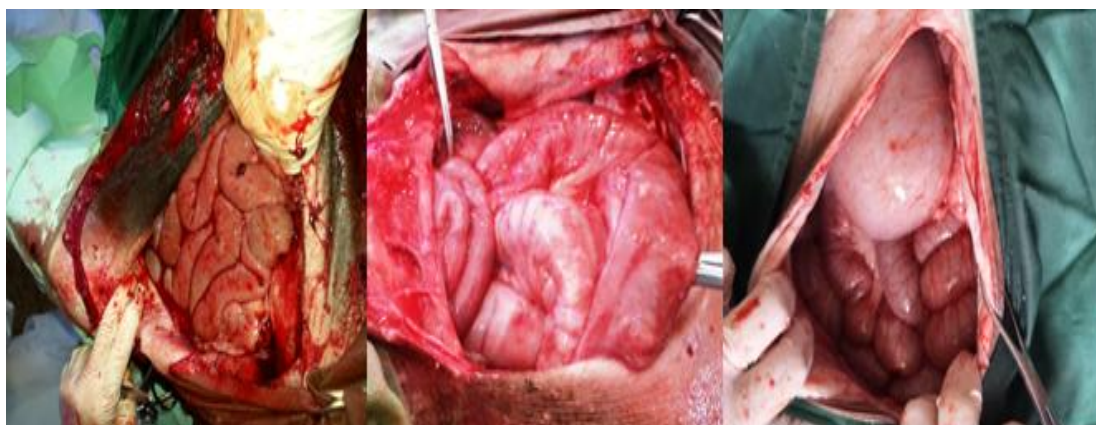
For scrotal hernias and inguinal hernias of 2 female lambs, the sizes of the rings were small with large hernial sacs. They were irreducible with impalpable rings due to stacked hernial contents (intestine) with relatively small rings compared to the voluminous contents, the peritoneum was intact with no adhesion between the contents and the peritoneum (fig.8 and 9) which facilitated easy reduction of the contents into the abdomen after enlarging the hernial rings. The inguinal hernias in the remaining 4 ewes were reducible with large palpable rings.

**Figure 8.** Intact peritoneum in two female lambs with inguinal hernias.



**Figure 9 .** Intact peritoneum (tunica vaginalis) in scrotal hernias.

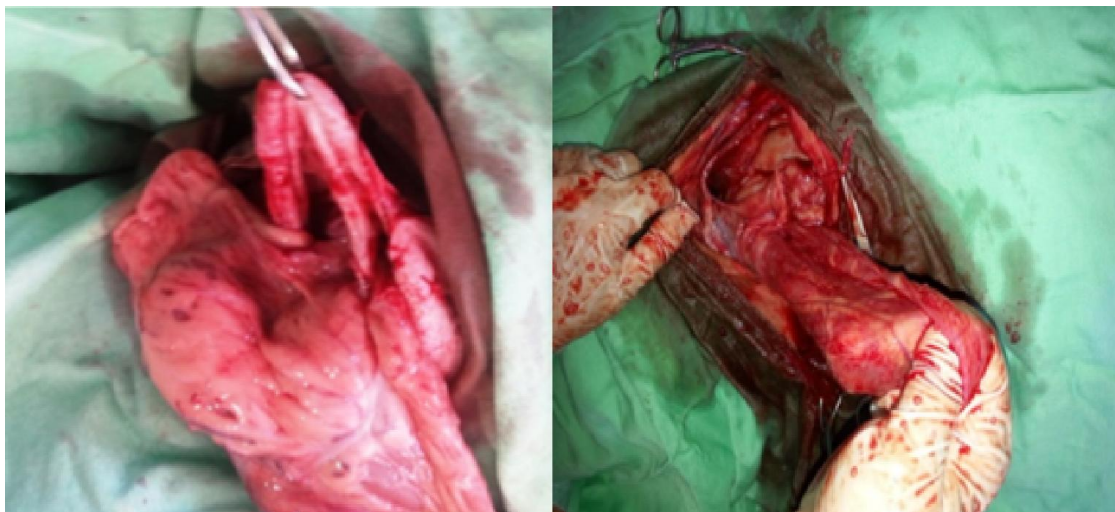
The peritoneum in all ventral and inguinal hernias of the 4 mature females was torn and the herniated organs (mainly intestine and omentum, and with the rumen in one case) (fig.10) were found under the skin forming large dead spaces particularly in mature females with ventrolateral and inguinal hernias which extend ventrally above the udder and, in some cases, to the level of the milk vein. Severe adhesions of the contents to the rings and the inner surface of the sacs were detected (fig.11).



**Figure 10.** Hernias with ruptured peritoneum with the presence of the herniated contents (intestine in the left and middle pictures and rumen in the right one) under the skin.







**Figure11.** Adhesions of the contents (omentum) to the hernial sacs.

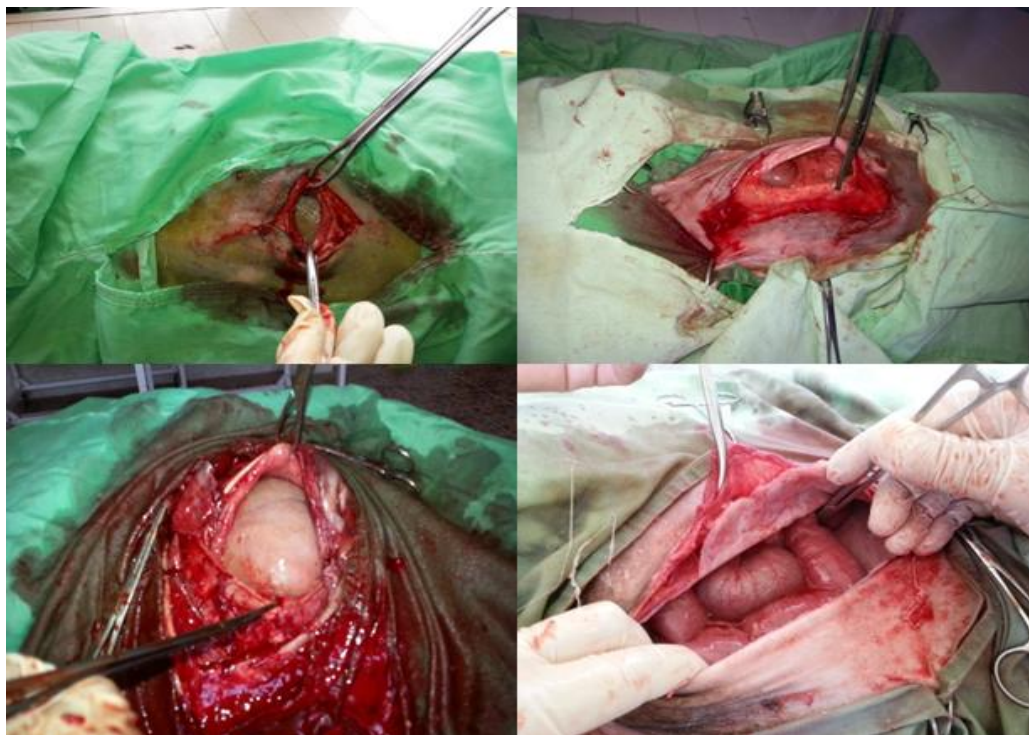
Table 5 shows the length of the hernial rings. Hernias with different ring lengths are shown in fig. 12.

**Table 5.** The length of the rings of recorded hernias

Type of hernia	Length of the rings (cm)				
	4	6	10	15	20
<b>Umbilical</b>	2	17	5	2	-
<b>Ventral</b>	-	-	7	8	3
<b>Scrotal</b>	3	4	1	-	
<b>Inguinal</b>	2	-	-	3	1
<b>Total</b>	7	21	13	13	4







**Figure 12.** Hernial rings with different sizes.

All umbilical, scrotal, paracostal, midline ventral hernias, and, inguinal hernias of female lambs were successfully repaired, even in those with large rings, and no postoperative complications and hernial recurrence was recorded. Withdrawal of food for 36 hours was very helpful in reducing the volume of the digestive tract and facilitated ring closure and administration of large dose of prophylactic antibiotic prevented infection.

Difficulties were encountered in repairing some large ventrolateral and inguinal hernias of mature females, the normal anatomy of these region was deformed, leaving large ( $\geq 15$ cm long), irregular, weak, and thin edged rings which were approximated using excessive tension particularly the middle portions of the rings, and with difficulties in obliterating large dead spaces after resecting the large hernial sacs. Hernia recurrence was



recorded in four ewes (one with inguinal and three with ventrolateral hernias) which were eventually slaughtered.

## DISCUSSION

This study showed that hernias were more frequently encountered in sheep followed by goats; this is because sheep is the major livestock type raised in Dohuk governorate, goats rank the second. Cattle are raised in few numbers with small ruminants in some farms.

Higher incidence of these hernias were observed in females (42 cases) than in males (16 cases) this is because of the fact that males in Dohuk governorate are slaughtered regularly at a lifespan of 6 months to 1 year; few are kept solely for breeding, moreover, the owners are apathetic about treating hernias in males as males will eventually be slaughtered.

Umbilical hernia was the commonest type recorded especially in sheep, and was much more common in females than males, followed, in order of decreasing frequency, by ventral, scrotal, and inguinal hernias.

Many studies performed in developing countries showed that prevalence of different types of hernias in animals is nearly similar and does not differ to the results in the present study.

Umbilical hernias were the most common type observed in goats by **11** followed by abdominal hernias, the incidence of hernias were more in females than in males.

The researcher **12** found that hernias were more common in sheep than in goats with high incidence of abdominal hernias followed by umbilical hernias.

In Egypt, a study by **13** showed that hernias were recorded more in buffaloes followed, in reducing frequency, by cattle, sheep, donkeys, goats and horses. They found that the most common type was diaphragmatic hernia in buffalo, umbilical hernia in cattle, and ventral hernia in sheep and goats.

In Nigeria, ovine species had the highest percentage of hernias followed by caprine and bovine species, ventral abdominal hernias were the most common type recorded **14**.



Inguinal, scrotal, and perineal hernias were the least frequent types recorded in literatures **11, 12, 14**.

In this study, most umbilical, scrotal and two inguinal hernias were congenital seen upon birth in the early postpartum period.

Umbilical hernia occurs due to failure of closure of the umbilical ring at birth, it may have a genetic component and considered to be inherited in sheep **15** and in many cattle breeds **16, 17, 18, 19**, animals with these hernias should not be used for breeding purposes **1**. Some umbilical hernias are not inherited, they may develop due to infection and abscess formation in the umbilical vessels **1**.

Congenital inguinal and scrotal hernias are inherited and considered as a genetic autosomal recessive disorder in sheep as in other animal species **5** particularly in Merino sheep **20** and Swiss sheep **21**.

The researcher **22** recorded that inguinal and scrotal hernias were found in lambs rather than in older sheep as a result of raised intra-abdominal pressure in lambs fed on artificial or highly fermentable diets and this pressure is believed to force intestinal loops through the inguinal ring.

The researcher **4** stated that scrotal hernia is thought to be of traumatic causes that weakens the inguinal area especially in group-housed rams.

Ventral hernias are considered to be traumatic [2] due to violent impact with blunt objects like horn thrust separating the abdominal muscles **1**.

In this study ventral hernias were seen in adult animals, especially multiparae females. Of the 18 ventral abdominal recorded hernias, 12 were ventrolateral with left-sided predominance without a clear cause, this result is in contrast to Roberts [2] who mentioned that these hernias in ruminants is commonly seen on the right side of the abdominal floor.

In addition to trauma, increased intra-abdominal pressure during pregnancy, loss of abdominal wall strength with age, and under nutrition weakens the muscles and tendinous support of the abdominal wall and contributes in causing ventral hernias **22**.



The flank and ventrolateral abdominal region in ruminants lacks a continuous muscle covering, it has a rather narrow fleshy portion with holly tendinous nature and an extensive aponeurosis **23, 24**.

The researcher **25** described a region on lateral abdominal wall of the ox which lacks a muscle covering. In this region, the transverse and the oblique muscles form a purely aponeurotic zone of the abdominal wall, it begins medial to stifle and extend forward for a variable distances along the lateral border of the rectus, hernias sometimes result from injury to this area.

In ewes, intestinal herniation through a rupture of the weakened abdominal muscles has been observed 1-3 weeks before lambing in multiple pregnancies **3**.

In different studies, for closing the hernial rings, different suture materials and patterns have been used. A study by **26** showed that hernial recurrence was minimal when polypropylene was used to close umbilical hernial rings in calves compared to silk and catgut using Mayo overlapping mattress or horizontal mattress suture.

Absorbable suture materials like polyglactine 910, polydioxanone, or polyglycolic acid is recommended to close umbilical ring by simple interrupted, simple continuous or interrupted cruciate patterns; tension relieving sutures such as near-far-far-near is used to close large abdominal wall defects **27, 28**.

No.2 chromic catgut was used to close umbilical hernial rings of calves **29**. In goats, No.5 Dexon or polyester with mattress or Mayo-mattress was used to close umbilical and ventral hernial rings and figure-of-eight-suture pattern for closing inguinal rings **11**.

The researchers **12** used catgut or polydioxanone to close small hernial rings in young animals, and used silk for larger hernial rings in older animals. They stated that the types of suture material used had no effect on the surgical outcome.

In the present study, absorbable suture materials were not used to close large hernial rings because they may lose their tensile strength or become absorbed before the healing process is completed, causing reherniation.

Modified Mayo closure (vest-over-pants) was a suitable suture pattern for large hernias to support and reinforce the thin and weak parts of the abdominal wall



particularly the ventrolateral region. In scrotal hernias and inguinal hernias of immature females, simple interrupted pattern was used to close the external inguinal rings to preserve the blood vessels and nerves passing through the ring and prevent their compression and blockage by the suture materials which may occur if a continuous pattern is used.

Reherniation occurred only in some cases with very large hernial rings which may be due to tissue ischemia or cutting of the ring edges by the suture materials caused by excessive tension applied on the suture line. Hernioplasty is the best option for repairing such rings using prosthetic materials **28, 30**.

Polypropylene mesh is the only prosthetic material available in Dohuk local market but, due to financial constraints, the owners cannot afford the costs and prefer to slaughter the animals rather than paying for these relatively expensive meshes (\$ 80 for 30 cm x 30 cm mesh).

### الملاحظات السريرية ونتائج التدخل الجراحي للفتوق الخارجية للمجترات في محافظة دهوك

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#### الخلاصة

أجريت هذه الدراسة لمعرفة نسبة انتشار الفتوق الخارجية للمجترات في محافظة دهوك وعلاقتها بنوع وعمر وجنس الحيوانات. تم إجراء التدخل الجراحي لثمان وخمسون حالة فتق خلال فترة سبعة سنوات (من تشرين الأول 2008 إلى تموز 2015).

نسبة الفتوق في الأغنام كانت 81% ، 15.6% في الماعز و 3.4% في الأبقار. نسبة حدوث الفتوق في الإناث كانت أعلى من الذكور وخاصة في الأغنام.

شكلت الفتوق السرية نسبة 44.8% تلتها، تنازليا، الفتوق البطنية (31%)، فتوق الخصية (13.8%)، ثم الفتوق الأربية (10.4%). تم وصف العلامات السريرية والجراحية المتعلقة بحجم حلقة الفتق، رجوعية محتويات الفتق إلى البطن، حالة البريتون، نوع الخياطه والخيوط الجراحية المستعملة، و نتائج التدخل الجراحي.





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