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Caesarean Section in Ruminants Referred to the AL-Muthanna Veterinary Hospital

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Abstract

Caesarean section operations were carried out on twenty clinical cases of dystocia in ruminants at AL-Muthanna Veterinary Hospital (4 cows, 9 ewes and 7 does) between July 2016, and March 2017. Average age, ewe and doe 2-3 years and cow 3-5 years. The restraint of animals depends upon the operative site used and animal species. The surgery can be performed with the animal, either standing or lying down. Sheep and goats are restrained in right lateral recumbency with both fore legs and both hind legs tied separately in the left oblique ventrolateral approaches. In cow performed with standing position. Sedation may be required in anxious cows. Although two %xylazine hydrochlorides 0.03 to 0.1 mg/kg IM (Knight, 1980), is the most widely used sedative in bovine practice. A local anaesthetic line block of the flank with 2% lidocaine hydrochloride. Animals were operated with left flank oblique incision approach of caesarean section has been successful with moderate operative haemorrhage, the exteriorization of the uterus was facile in all cases, and abdominal closure was easy. They are considered by a few surgeons as a better operative site due to lesser postoperative complications and minimum contamination of the operative site during sternal recumbency. The commonest cause of dystocia was incomplete dilation of the cervix (2 cows, 4 ewes and 3 does). The second important cause of dystocia was uterine torsion (1cow, 2 ewes, and 2 does).The third cause was emphysematous (1cow, 2 ewes, and 2 does), also there was case of foetus anomaly. The study concluded the commonest cause of dystocia was incomplete dilatation of cervix as well as irreducible uterine torsion. Caesarean section in dystocia affected ruminants could be successfully carried out in lateral recumbent surgical restraint and left ventrolateral oblique incision.

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Introduction

Cesarean section is a widely used emergency operative technique for surgical delivery. The fetotomy/caesarean section has been based on poor dam survival rates and poor fertility (Singh et al., 2013). Dystocia in cattle can be relieved by different obstetric methods, including the caesarean operation and fetotomy. Nowadays, the caesarean operation is one of the most common surgical procedures performed by veterinarians in cattle practice and is considered as

a routine obstetric technique. It has high maternal and foetal survival rates and often is less exhausting, speedier and safer than fetotomy.

There are three main goals:

(1) survival of the cow

(2) survival of the calf

(3) maintenance of fertility

A prompt decision to perform a caesarean operation is essential for optimum success. Ideally, it is carried out when a live calf cannot be delivered after 15-20 minutes of manipulation. The cow is a good surgical risk, provided that the environment is suitable for aseptic abdominal surgery. The need for urgent intervention is indicated if there is evidence of foetal hypoxia, as shown by hyperactive movements of the foetus and expulsion of the meconium, identifiable in the amniotic fluid. A successful prognosis depends on several factors, such as the skill and speed of the surgeon, duration of dystocia, the physical condition of the dam, surgical environment, concurrent disease, and presence of a live calf (Jos, 2008). There are several indications for doing the caesarean section; these are including maternal and foetal indications. The maternal indications include immature heifers, pelvic deformities, failure of cervical dilation, uncorrectable uterine torsion, uterine tear, hydrops, and prepartum paralysis (Campbell and Fubini, 1990). Risk factors in cattle are increased by heifer's age less than 2 years compared with multiparous cows, and previous cesarean section calving compared with dams having previous normal calving (Barkema *et al.,* 1992)

Foetal indicators include normal and pathologic foetal conditions. Normal foetal conditions consist of absolute foetal oversize (relative to a normal maternal pelvis size) and malposition. A high-value calf, such as an embryo transfer, may be an indication for an elective caesarean section. Pathologic foetal conditions include foetal anasarca (generalized foetal body edema), hydrocephalus, conjoined twins, emphysematous, mummification, and prolonged gestation. Depending on the circumstances, including the availability of a fetotome and the practitioner's experience, a fetotomy is not always a viable option. Attempting a fetotomy on an emphysematous foetus when the uterus is tightly contracted, little uterine fluid is present, cervix is incompletely dilated, or uterus is friable is inadvisable (Campbell and Fubini, 1990)

The traditional approaches have been well described in the literature (Noorsdy, 1979). Restraint (appropriately based on the breed); space; light; help available; location; and the veterinarian's training, experience, and confidence (Campbell and Fubini, 1990).

The two main options are whether to do a caesarean section on standing or a recumbent cow. Depending on the demeanour of the dam, a recumbent approached using sedation and tying the legs forward and back. If the cow may not remain standing for the duration of the surgery, it may easier to start with her recumbent rather than having her fall down during the operation. The recumbent approach, because it facilitates the exteriorization of the uterus, especially when an oversized foetus is present, reduces the opportunity to contaminate the abdominal cavity. The recumbent approach can be midline or over the pregnant horn using a paramedian, low-flank (Noorsdy, 1979), or paramammary approach (Figure. 1).

The paramammary approach, located between the udder and the fold of the flank, is useful in dairy cows because it is more likely to avoid the caudal epigastric veins and ventral edema located on the paramedian and midline areas. The midline approach likely requires the longest incision because the linea alba is relatively inflexible. The standing flank approach may be done from either the left or the right; it is more commonly performed from the left (Frazer and Perkins, 1995).

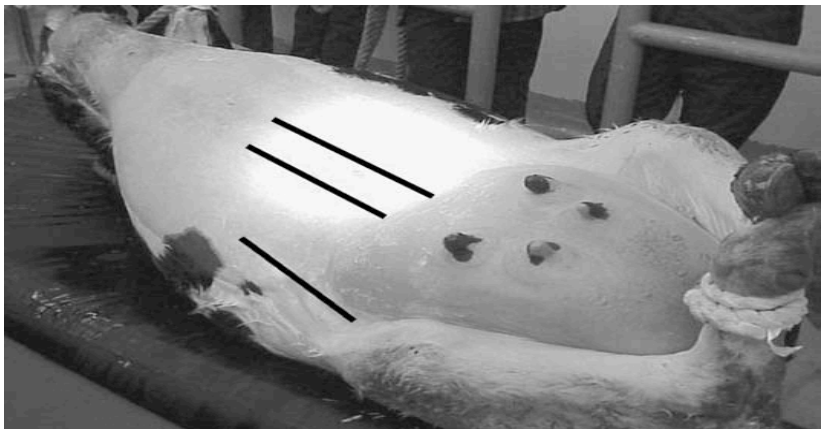

Figure. 1. The preoperative ventral view shows the locations of the midline (top line), right paramedian (middle line), and the right low oblique or paramammary approaches (bottom line).

The primary advantage of the left approach is that the rumen prevents evisceration of the small intestines, but rumen prolapse may occur if straining during surgery. When the pregnancy is located in the right horn, some practitioners find it easier to use the right approach, especially if the calf is big. The primary disadvantage of this approach is retaining the small intestines within the abdominal cavity. In cases in which the left approach has been used exclusively to perform several caesarean sections over time in the same cow, the practitioner may find it easier to use the right approach. More recently, a left oblique flank approach in standing cows has been described (Figure. 2) (Parish *et al.,* 1995). An incision is started 10 cm cranial and 8 to 10 cm ventral to the cranial aspect of the tuber coxae. The incision is extended cranioventrally at a 45_ angle, ending 3 cm caudal to the last rib. The apex of the uterine horn is more readily accessible, facilitating the manipulation and exteriorization of the uterus. This incision is larger and extends more cranioventrally compared with the traditional vertical flank incision. This technique may be useful to remove large calves or when the uterine contents are contaminated. The internal abdominal oblique muscle is incised parallel to the muscle fibers; the abdominal viscera apply tension to this muscle, facilitating apposition during the closure.

Figure. 2. The postoperative photograph shows the location of the left oblique approach for caesarean section. (Courtesy of Dr. Matt Miesner, The Ohio State University, Columbus, OH.)

Sedation may be required in anxious cows. Although xylazine hydrochloride (Rompum), 0.03 to 0.1 mg/kg intravenously (Knight, 1980), is the most widely used sedative in bovine practice, it also increases uterine tone, making manipulation and exteriorization of the gravid uterus more

difficult (Frazer and Perkins, 1995). A study using endoscopy showed that xylazine alters laryngeal and pharyngeal anatomy and impairs sensation in adult dairy cattle (Anderson et al., 1994), which likely increases the risk of aspiration pneumonia if the cow is positioned in either lateral or dorsal recumbency. Xylazine also may induce ataxia—an undesirable effect while doing a standing caesarean section. When a halter is the sole means of restraint in dairy heifers, the combination of 7.5 mg of acepromazine maleate and 10 mg of butorphanol tartrate (Torbugesic) administered intravenously provides adequate sedation (unless the cow is already in a highly excitable state) for standing surgery without causing either ataxia or increased uterine tone. The surgical approach determines which local anaesthesia technique is used. Techniques for local anaesthesia using 2% lidocaine hydrochloride are well documented in the literature (Turner and McIlwraith, 1989; Muir *et al.,* 2000).

The most common techniques are the proximal paravertebral and distal paravertebral, inverted ‘‘L,’’ and line blocks. The technique used reflects the surgeon’s preference. The proximal paravertebral block is technically more challenging because the needle is inserted just adjacent to the vertebral body, and the tip of the needle should be close to the nerve roots exiting the vertebral foramen, requiring more restraint and a long needle (18G, 10 cm long). Extremely muscular or fat beef cows may require a longer needle. An easier technique is the ‘‘modified’’ proximal paravertebral block, in which the needle is inserted midway between the spinous process and the tip of the transverse process (Figure. 3). This block uses the smallest dose of local anaesthetic, provides the maximal anaesthetic region, and induces maximal relaxation of flank musculature.

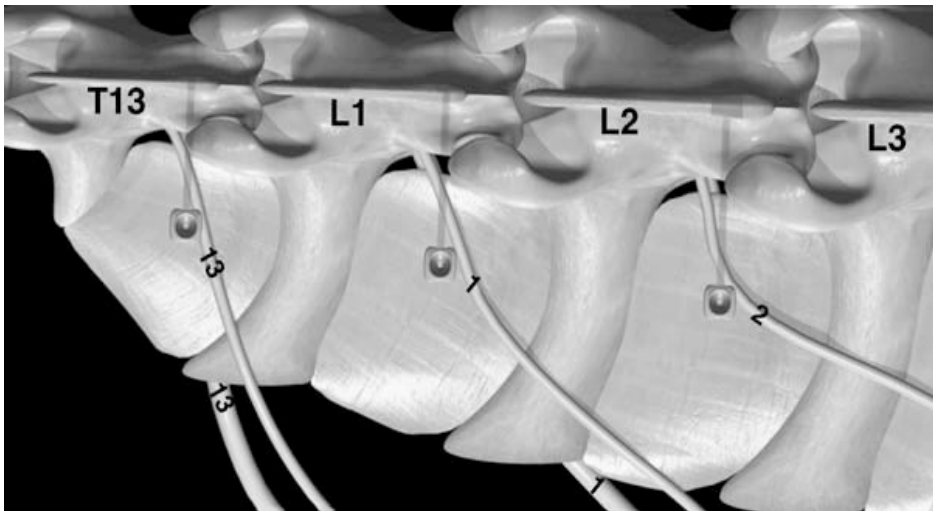

Figure. 3. The modified proximal paravertebral block, shown on this dorsal view of the left lateral aspect. T13, L1, L2, and L3 are the spinous processes of the last thoracic and first, second, and third lumbar vertebrae. Note the location of T13 (13), L1 (1), and L2 (2) nerves and the placement of needles.

The distal block requires less skill and may be performed using an 18G, 3.75-cm needle; this block works well, provided that the local anaesthetic injections are fanned above and below the edge of the transverse processes (Figure. 4). Although the line block is the least technically challenging, it requires the greatest amount of local anaesthetic. Lidocaine is available with or without epinephrine. Epinephrine reportedly increases the duration of the local anaesthesia by causing vasoconstriction; however, incisional complications, such as delayed healing and skin

slough, have been associated with the use of lidocaine with epinephrine for line blocks (Muir et al., 2000).

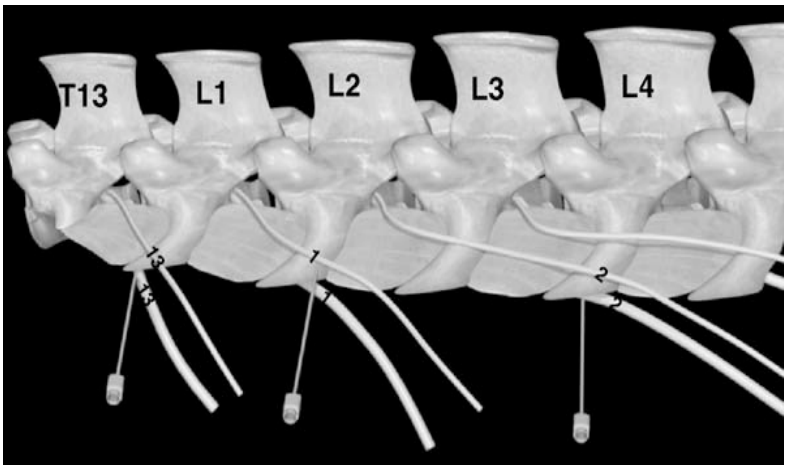

Figure. 4. The distal paravertebral block, shown on the left lateral aspect. T13, L1, L2, L3, and L4 are the spinous processes of the last thoracic and first, second, third, and fourth lumbar vertebrae. Note the location of T13 (13), L1 (1), and L2 (2) nerves and the placement of needles.

Caudal epidural anaesthesia, which desensitizes the caudal nerve roots as they emerge from the dura, often is indicated if the calf or obstetric manipulations have initiated strong abdominal contractions. An 18G, the 1.5-inch needle can be used to give 2% lidocaine hydrochloride (Lidocaine 2% Injection), 0.2 to 0.4 mg/kg (Turner and McIlwraith, 1989). Provided that the recommended maximal volume of 0.5 mL/50 kg is not exceeded, the caudal epidural should not affect motor control of the hind limbs. The onset of a properly placed epidural is usually within minutes. An anterior epidural anaesthesia can be used as an alternative that provides flank anaesthesia and may be administered using one of three techniques: at the lumbosacral (L6–S1) position (1 mL/4.5 kg) or either the sacral-coccygeal (S5–Co1) or the first intercoccygeal (Co1–2) space (40–150 mL for an adult cow) (Skarda, 1996).
When performing local anesthesia with small ruminants, the accumulation of a toxic dose of lidocaine (5 mg/kg) should be avoided. The clinical signs of systemic toxicity are predominantly central nervous system signs, including drowsiness, convulsions, respiratory depression, and cardiovascular collapse, potentially leading to death (Muir *et al.,* 2000).

Toxicity is treated with intravenous fluids and supportive care. The volume of 2% lidocaine required to elicit systemic toxicity is approximately 0.2 mL/kg or 9 mL/45kg. In small ruminants, safest first to draw up the maximal lidocaine dose for the patient in a syringe and dilute the lidocaine with 0.9% sodium chloride to achieve a final concentration of 1% lidocaine before administering the local block.

There are several surgical preparations including hair removal by clipping alone has been reported to incite fewer skin reactions with no significant difference in incisional infections compared with clipping and shaving (Bedard *et al.,* 2001). No significant difference was observed between chlorhexidine gluconate and povidone-iodine. When isopropyl alcohol was used after washing, there was significantly fewer colony forming units and more negative cultures when chlorhexidine gluconate was used compared with povidone-iodine (Desrochers et al., 1996).

Details of the surgical techniques for performing a caesarean section are well described in the literature. The abdominal wall incision should be sufficiently large to remove the foetus safely through the abdominal wall. A small abdominal incision tends to increase the level of difficulty in removing the foetus and increases the risk of subcutaneous emphysema or seroma formation or both. After identifying the uterus, the portion of the uterus containing a hind leg is pulled up into the abdominal incision. Placing one hand under the hock or hocks and the other on the dorsal aspect of the pastern facilitates ‘‘locking’’ the foot into the abdominal incision (Lee *et al.,* 2004; Turner and McIlwraith, 1989).

With breech or posterior presentations, the front limb is grasped. This presentation increases the level of difficulty of exteriorizing the uterus and may require a larger incision. During ventral approaches, the greater omentum often must be retracted cranially when the uterus is located within the omental sling. The greater curvature of the uterus should be partially exteriorized, and an incision made along the greater curvature of the uterus. This incision avoids most blood vessels and caruncles. A small uterine incision increases the risk of tearing the uterus during foetal extraction. Uterine tears most often occur at angles to the uterine incision; this increases the difficulty in closing the uterus. Under ideal circumstances, spillage of uterine contents into the abdomen should be avoided. When both legs are exteriorized, the calf is being extracted; the uterus needs to be held in place to prevent spillage of uterine contents into the abdomen. Large beef calves often are extracted without uterine exteriorization without affected morbidity or mortality in the cows because obstetric manipulations have been minimized, and the calf is usually alive. The umbilical cord should be stretched and ruptured in a controlled fashion by holding it adjacent to the abdominal wall. Normal retraction and contraction of the umbilical arteries may be impaired by surgical excision of the umbilical cord. If the elective caesarean section is performed, careful attention is paid to the umbilical vessels, as there is an increased likelihood of excess haemorrhage because the umbilical vessels are not prepared for spontaneous rupture. Temporary clamping of the umbilical arteries and vein may be required. After the calf is removed, the veterinarian should always check for a second calf. If the placenta readily detaches from the caruncles, it should be removed; otherwise, the veterinarian should trim the portion that is hanging outside the uterus to prevent its inclusion into the closure of the uterus.

If the calf is alive and the uterus is healthy (i.e., an elective procedure), one layer of closure with absorbable suture material, such as 2 chromic catgut. Two-layer closure is recommended if the calf is dead or contaminated uterine fluids are suspected to be present (i.e., an emergency or emphysematous procedure), or the uterine wall is compromised or torn during fetal extraction. Continuous inverting suture patterns, such as the Cushing and Lembert, should be used because they provide a tight seal, minimize suture exposure, and promote healing, as the uterus heals initially by serosal-to-serosal contact. The blood clots should be teased away gently using irrigation and a gloved hand because these clots may give rise to adhesions that can affect future fertility adversely. Gauze sponges should not be used to wipe the uterus clean because this causes serosal abrasion, which increases the likelihood of detrimental uterine adhesions. Changing to new surgical gloves after the uterus is closed potentially reduces the risk of abdominal contamination. The abdominal wall usually requires two to three layers of closure. The peritoneum and transversus are usually closed in one layer, using absorbable suture material (e.g., 3 chromic catgut) in a simple continuous pattern. The internal and external abdominal oblique muscles are closed together using absorbable suture material (e.g., 3 chromic gut) in a simple continuous pattern. The internal abdominal oblique may be incorporated into the first layer when peritoneum and transversus are tearing in thin or excessively straining cows; the external abdominal oblique is then sutured alone. Excessive straining may be minimized

using sedation, using an epidural, and or placing a nasotracheal tube. A nasotracheal tube prevents closure of the glottis, preventing positive thoracic pressure against the diaphragm, which restricts abdominal straining. To reduce dead space and potential seroma formation, the layers can be periodically tacked down to the preceding layer. The skin can be closed using either a continuous ford interlocking, simple interrupted cruciate, or simple interrupted sutures using 3 polyamides.

There are variations in the postoperative care such as the use, type, and frequency of antibiotics. The most commonly used antibiotics are penicillin G procaine; 22,000 U/kg intramuscularly every 24 hours for 3–5 days), oxytetracycline; 19.8 mg/kg intravenously, intramuscularly, or subcutaneously every 1–3 days), or ceftiofur 1 mg/kg intravenously, intramuscularly, or subcutaneously every 12–24 hours for 3–5 days). Flunixin meglumine (Banamine) (1 mg/kg intravenously or intramuscularly every 12 hours for 2 days) may be useful to prevent abdominal adhesion formation. Elective or uncomplicated caesarean sections in which there is a live calf, healthy cow, healthy uterus, minimal obstetric manipulation preoperatively, and minimal abdominal contamination during calf extraction likely do not require antibiotics. Antibiotics are indicated when the calf is dead when there is prolonged dystocia when there is a compromised uterus, when extensive obstetric manipulations occurred preoperatively, and when abdominal contamination has occurred. In the authors' experience, intravenous oxytetracycline for 5 to 7 days is the antibiotic of choice when the concern for postoperative peritonitis is deep (i.e., an emphysematous foetus). Standing flank incisions require little postoperative care and attention compared with ventral approaches. Cows with flank incisions often do not require stall rest that provides restricted activity and can be rebred using a bull without undue concern regarding abdominal wall herniation. In contrast, ventral approaches require strict stall rest for 6 weeks.

Different types of complications such as the preoperative, operative, postoperative, and long-term were reported previously (Dehghani and Ferguson, 1982). Preoperative complications include delayed delivery, anorexia, fetal death, emphysematous fetus, forced extraction, fetal abnormalities, fetal limb fractures, uterine inertia, uterine trauma, uterine rupture, obturator/sciatic nerve damage, and severe trauma during manipulation. Operative complications include excessive uterine trauma, peritoneal cavity contamination, gastrointestinal trauma, excessive trauma to the abdominal wall, and inadequate uterine closure. Postoperative complications include peritonitis, seroma formation, retained placenta, metritis, endometritis, skin suture dehiscence, subcutaneous emphysema, adhesions, mastitis, straining cow, and calf death. Long-term complications include downer cow, debilitated cows, production losses, spontaneous abortions (Cattell and Dobson, 1992).

The retained fetal membranes are one of the complication. The bovine placenta typically is shed within 24 hours after surgery (Dawson and Murray, 1992) a retained fetal membrane is the failure to shed the placenta within this period. In cases when the placenta was not removed during surgery, low doses (20–40 IU) of oxytocin frequently may be administered intramuscularly postoperatively, provided that the cervix is open. Administering oxytocin when the cervix is closed increases the pressure on the suture line and likely would increase the risk of uterine incisional dehiscence(Frazer and Perkins, 1995). Cows may become recumbent during surgery. It is believed that cows are more likely to become recumbent during attempts to exteriorize the uterus. Falling during surgery is believed to a consequence of pain that arises from traction on the broad ligament during difficult uterine manipulations. Administration of xylazine epidural preoperatively may reduce painful stimuli. Cows that remain standing during the procedure have a better chance of survival (Hoeben *et al.,* 1997).

In Iraq, a review of the literature revealed scarce publications regarding caesarean section operations in ruminants. Consequently, this study was designed to investigate the caesarean

section operations in ruminants suffered from dystocia that referred to Al Muthanna veterinary.

Materials and methods

Preoperative preparation

Animals

This research of caesarean section operations was carried out on twenty clinical cases of dystocia in ruminants at AL-Muthanna Veterinary Hospital (4 cows, 9 ewes, and 7 does) between July 2016 and March 2017. Average age, ewe and doe 2-3 years and cow 3-5 years.

Preoperative preparation

Included administration of sufficient fluid replacements, antibiotics is strongly recommended. Commonly, 10 mg/kg each of an antibiotic mixture of procaine penicillin and dihydrostreptomycin intramuscular.

Restraint

The restraint of animals depends upon the operative site used and animal species. The surgery can be performed with the animal, either standing or lying down. Sheep and goats are restrained in right lateral recumbency with both fore legs and both hind legs tied separately in the left oblique ventrolateral approaches. In cow performed with standing position.

Approach

Two surgical approaches have been used for the caesarean operation:
1. Standing the cow (left or right paralumbar fossa (flank approach).
2. Lateral recumbency in ewe and doe (ventrolateral and low-flank approach).

Surgical preparation

Clipping, shaving, cleaning, and disinfected the operative site with alcohol 70% and providing iodine 5%.

Anaesthesia

Sedation may be required in anxious cows. Although xylazine hydrochloride 0.03 to 0.1 mg/kg IM (Knight, 1980), is the most widely used sedative in bovine practice. A local anaesthetic line block of the flank with 2% lidocaine hydrochloride.

Surgical technique

A skin incision of 25 -30 cm long was taken at the respective site of the incision after checking the bleeding points, subcutaneous tissues and muscles were incised in the direction of their lay(Figure.5).

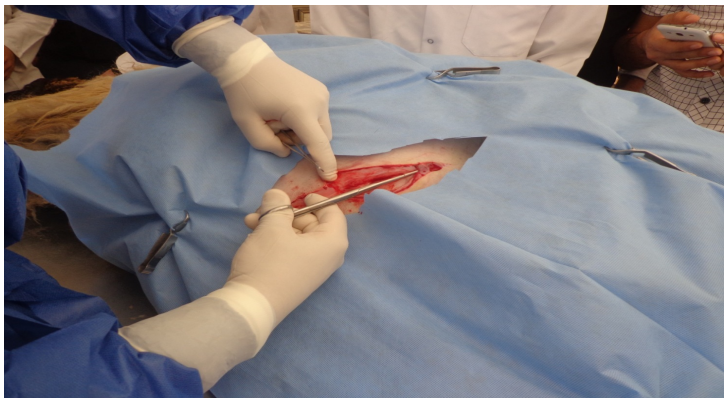

Figure.5: Skin and subcutaneous tissues and muscles were incised in the direction of their lay.

The peritoneum was incised, and omentum was pushed anteriorly. Every attempt was made to exteriorize the uterus outside the surgical wound in each case of caesarean (Figure.6). The incision was given from ovarian end and extended towards the cervix, avoiding the cotyledons, and every attempt was made to prevent an uneven tear of uterus and hemorrhage. The incised uterine wall was pulled out and was grasped firmly on either side by the assistant until the fetus and fluid were removed. The fetus was exteriorized by grasping both legs (fore or hind) and was removed gently, avoiding uterine tear (Figure.7).

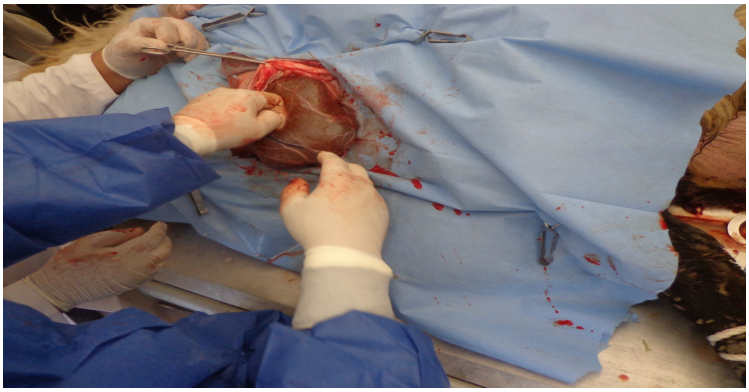

Figure.6: exteriorize the uterus outside the surgical wound.

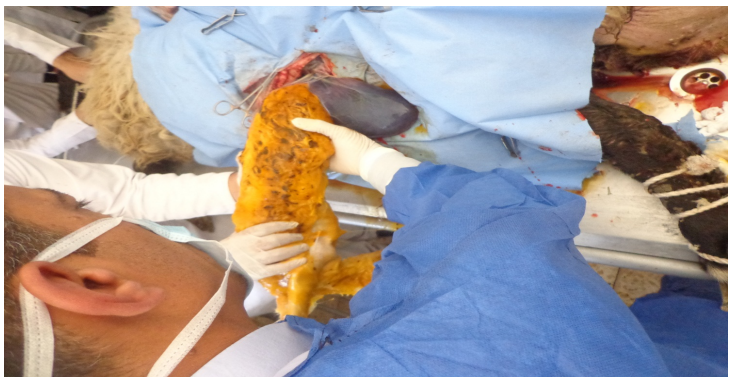

Figure.7: The fetus was exteriorized by grasping both fore legs.

The placenta was removed, and the uterine cavity was cleaned thoroughly with normal saline. Blood clots and any debris of the placenta were removed during caesarean in all the cases. Two-layer closure was used for uterus suturing. Continuous inverting suture patterns, such as the Shmedin and Cushing, were used because they provide a tight seal, minimize suture exposure, and promote healing (Figure.8).

The abdominal wall usually requires two to three layers of closure (Figure.9). The peritoneum and transversus are usually closed in one layer, using absorbable suture material (e.g., 2 chromic catgut) in a simple continuous pattern. The internal and external abdominal oblique muscles are closed together using absorbable suture material (e.g., 2 chromic gut) in a simple continuous pattern. The skin can be closed using a horizontal mattress interrupted sutures using 2 silk.

Figure.8: Two-layer closure was used for uterus suturing.

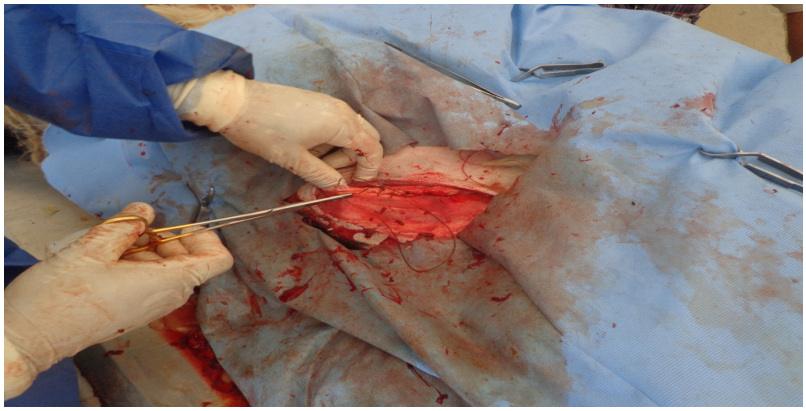

Figure.9: The abdominal wall usually requires two to three layers of closure.

Post-operative care

The success of the operation depends upon the post-operative care. Antibiotics and anti-inflammatory drugs are given for 3-5 days. The operative site cleaned daily with spirit. The sutures can be removed 8-10days post-operative.

Results and Discussion

The commonest cause of dystocia was incomplete dilation of the cervix (2 cows, 4 ewes and 3 does) these agree with Saxena *et al.,* (1989) and Shiv Prasad *et al.,* (2000). The second important

cause of dystocia was uterine torsion (1cow, 2 ewes, and 2 does). Third cause was emphysematous (1cow, 2 ewes, and 2 does), also there was case of fetus anomaly (doe). Similar observations were also recorded by Iyer *et al.,* (1987). Animals were operated with left flank oblique incision approach of caesarean section has been successfully carried out by Saxena *et al.,* (1989), and Shiv Prasad *et al.,* (2000) with moderate operative hemorrhage, the exteriorization of the uterus was facile in all cases, and abdominal closure was easy. Considered by a few surgeons as a better operative site due to lesser postoperative complications and minimum contamination of the operative site during sternal recumbency. (Purohit *et al.,* 2006). Only one retrospective clinical study on buffalo caesarean sections compared the complications of caesarean sections performed employing different operative sites, and suggested that the midline and paramedian operative sites resulted in more postoperative complications like wound dehiscence and hernia due to the heavyweight of abdomen resting on the suture line (Verma *et al.,* 1974).

Conclusions

1- The commonest cause of dystocia was incomplete dilatation of the cervix as well as irreducible uterine torsion.
2- Caesarean section in dystocia affected ruminants could be successfully carried out in lateral recumbent surgical restraint and left ventrolateral oblique incision.

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