



Triplets delivered by caesarean section are kept warm with the use of felt jackets

Caesarean section in the ewe

MIKE THORNE AND PETER JACKSON



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THE current financial crisis in the farming industry undoubtedly means that fewer sheep suffering from dystocia will be presented for caesarean section, with the risk of compromising the welfare of lambing ewes. Many ewes which ideally require caesarean section are likely to be euthanased rather than presented for surgery. This article discusses the evaluation of the ewe and her unborn lamb(s) with a view to determining the prognosis and the economic aspects of the case. It also describes two alternative techniques by which the operation may be carried out in practice in a humane, and economical, manner.

ASSESSMENT OF THE EWE AND HER UNBORN LAMB(S)

Before any decision can be made as to whether to perform a caesarean section, a full clinical examination and thorough obstetrical examination of the ewe and her litter is essential. With this knowledge and after discussion with the owner and consideration of the welfare and economic aspects of the case a decision can be made as to whether to proceed to surgery.

CLINICAL EXAMINATION OF THE EWE

The ewe will often be presented at the surgery with a history which will include details of the duration of her

CAUSES OF DYSTOCIA IN THE EWE

	Relative occurrence*
Fetal maldisposition	50%
Obstruction of the birth canal	35%
Fetopelvic disproportion	5%
Fetal monsters/abnormalities	3%
Others	7%

*Data based on the findings of a number of surveys
NB. The incidence of the different causes of dystocia can vary greatly in individual flocks from year to year

Indications for caesarean section in ewes

The indications for caesarean section in the ewe fall into two main categories:

Treatment of existing dystocia when successful vaginal delivery is impossible or very risky*

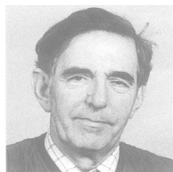
- Fetal maldisposition which cannot be safely corrected by manipulation
- Incomplete or non-dilation of the cervix ('ring-womb') which has failed to respond to medical treatment
- Fetopelvic disproportion – seen chiefly in ewe lambs carrying a single large fetus which cannot pass through the maternal pelvis
- Severe vaginal prolapse with traumatic damage

where vaginal delivery is likely to greatly worsen the existing damage

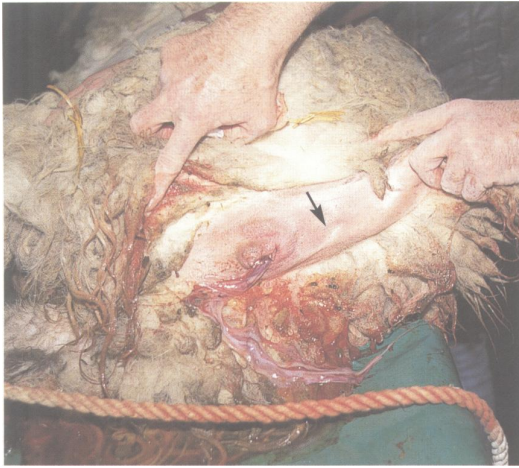
Elective caesarean section

- Treatment of cases of severe pregnancy toxæmia in which rapid termination of the life-threatening pregnancy cannot be quickly achieved by non-surgical means
- Delivery of a fetus at term from a ewe known to be unlikely to lamb by the vaginal route (eg, with an existing fractured pelvis)

*Caesarean section is required in approximately 1 per cent of all cases of ovine dystocia



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An unusual case requiring caesarean section. This ewe lamb has an underdeveloped vagina and imperforate anus (arrow)

labour, the shepherd's findings on vaginal examination and any attempts at delivery of the lamb(s). A further professional examination is essential at this stage. This should commence with a general clinical examination to evaluate the health of the ewe, followed by an obstetrical examination to confirm the cause of the dystocia. A poor condition score, a foul-smelling vaginal discharge, detachment of the chorioallantois, the presence of dead fetuses, vaginal or uterine tears, mastitis and toxæmia are all ominous signs for survival of the ewe. In animals suffering from advanced pregnancy toxæmia, severe uraemia is often present along with other life-threatening biochemical abnormalities which may compromise maternal survival even if living lambs are present. Ewes in either category should perhaps not be presented for surgery.

EVALUATION OF THE UNBORN LITTER

Unless an exact service date is available fetal age can usually only be estimated from the dates of the ewe's raddle marking. Scanning for pregnancy diagnosis may have provided an estimate of the number of lambs present. The health and function of the chorioallantois can be assessed by vaginal examination. The absence of amniotic fluid and a lack of reflex movement in the lambs may suggest prolonged second stage labour and, possibly, fetal death. In cases of 'ringwomb', direct access to the lamb(s) is impossible but fetal movement may be palpable through the fornix of the vagina and externally through the abdominal wall. Excessive movement may indicate developing fetal anoxia.

Further evaluation of the litter may be achieved using either Doppler or B-mode ultrasonography, if available. This will add to the cost of treatment but may provide helpful information regarding both litter size and fetal life. In late gestation, scanning may not always determine the litter size with accuracy, but positive signs of fetal life, including a beating heart, are reliable. However, if the cervix is open and some air has gained access to the uterus the results of scanning may be unreliable.

Fetal dysmaturity

In most cases of existing dystocia requiring caesarean section the fetus(es) are mature and ready for delivery. The greater the time that dystocia has been present,

however, the greater the risk of fetal death as a result of placental separation; the fetus is unlikely to survive for more than eight hours of second stage labour. When an elective caesarean section is contemplated, fetal dysmaturity can severely increase the risk of fetal death after delivery. The fetal lamb is particularly vulnerable if it is delivered more than 48 hours before term. Lung surfactant is severely deficient in such dysmature lambs. They may appear quite normal at the time of delivery but often develop respiratory distress and die within eight hours of birth.

IS SURGERY ECONOMICALLY VIABLE?

With the current financial difficulties in the sheep industry the prognosis for survival of both the ewe and the lambs has to be good if a decision is to be made to perform a caesarean section. Details of the clinical findings and the financial implications must be discussed in advance with the owner. Currently, the gross margin per ewe is about £30 based on an average of 1.6 lambs sold per ewe. Therefore, a ewe caesarean has to be charged at around £25 to be of any cost-benefit to a commercial sheep producer. A replacement ewe, on the other hand, costs on average £28, making euthanasia and removal of the live lambs an alternative procedure – although ethically unpalatable.

Options for a ewe suffering from dystocia

- EWE IN GOOD CLINICAL CONDITION/LIVING LAMBS: Caesarean section
- EWE IN POOR CLINICAL CONDITION/LIVING LAMBS: Slaughter of ewe and retrieval of lambs from the uterus
- EWE IN GOOD CONDITION/DEAD LAMBS: Euthanasia
- EWE IN A TERMINAL CONDITION/DEAD LAMBS: Euthanasia

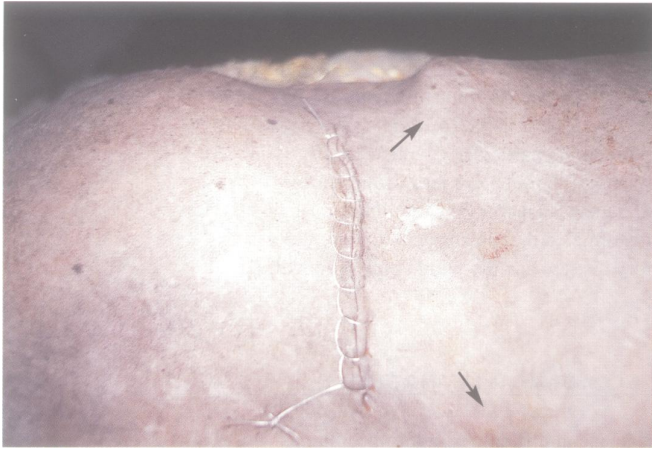
PREOPERATIVE PREPARATION

SURGICAL APPROACH

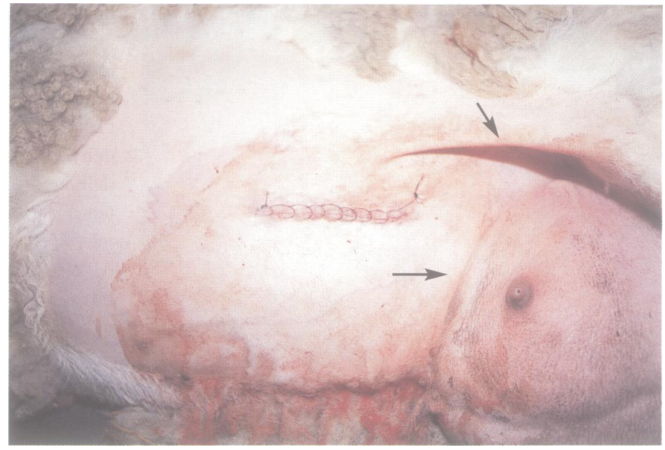
The ideal outcome in any sheep caesarean is the delivery of living offspring from a ewe which is undamaged and capable of rearing her young. The traditional surgical approach is via a left flank laparotomy. An alternative is to use a paramedian approach to the abdomen. The relative advantages and disadvantages of the two approaches are listed in the table below. The midline approach

COMPARISON OF SURGICAL APPROACHES

Surgical site	Advantages	Disadvantages
Flank	Little risk of damage by feeding lambs Easy postoperative wound observation Little risk of postoperative wound contamination	Extensive preoperative clipping required Rumen may obstruct access to the uterus Haemorrhage from flank muscles may occur, requiring haemostasis
Paramedian	Little preoperative clipping required Good access to uterus (not obscured by rumen) Very little haemorrhage Surgical repair involves aponeurotic muscle layers and skin only	Operation site may be butted by lambs Postoperative wound observation is slightly more difficult
Midline	Good access to uterus	Greater risk of wound contamination Anaesthesia expensive and presents a greater risk Monitoring of wound healing is difficult



Surgical site for a left flank laparotomy showing the left tuber coxae (top arrow) and the left stifle (bottom arrow)



Surgical site for a left paramedian approach showing the fold of the left flank (top arrow) and the udder (bottom arrow)

CHOICE OF SEDATIVE

Agent	Dose
Xylazine (Rompun 2% solution; Bayer)	0.01-0.1 mg/kg im
Diazepam/butorphanol combination (Diazemuls; Dumex)/ (Torbugesic; Fort Dodge)	0.2 mg/kg diazepam iv 0.02 mg/kg butorphanol iv
Acepromazine (ACP injection; Vericore)	0.03 mg/kg im

im Intramuscularly, iv Intravenously

NB. None of these agents is licensed for use in sheep

cannot be recommended because it requires general anaesthesia, which is not only expensive but is associated with inherent risks in ruminants.

RESTRAINT AND SEDATION

Most ewes remain relatively calm if restrained on a table. This is achieved using a halter to secure the head and cords to secure the front and back legs to the table. The ewe is restrained in either right lateral recumbency for a flank approach or right dorsolateral recumbency for a paramedian approach.

Sedation is generally only needed if a ewe persistently struggles prior to surgery. There are no licensed sedatives for use in sheep and selection of an agent is,

PREOPERATIVE THERAPY

	Agent	Dose
Antibiotic	Oxytetracycline (Engemycin 10% DD; Intervet)	20 mg/kg im
Analgesic	Ketoprofen* (Ketofen 10%; Merial)	3 mg/kg iv
	Carprofen**† (Rimadyl Large Animal Solution; Pfizer)	1 mg/kg iv
Spasmolytic	Clenbuterol* (Planipart; Boehringer)	0.01 mg/kg im

*Not licensed for use in sheep

†Carprofen is the preferred analgesic as it is prostaglandin sparing, but is more expensive
im Intramuscularly, iv Intravenously

therefore, based on the cascade principle. Sedatives that have been used successfully prior to ovine caesarean section are listed in the table on the left. It should be noted that any sedation will cause fetal depression.

ANAESTHESIA

For a flank approach, a paravertebral or an inverted infiltrated L block using 40 to 60 ml of 2 per cent lignocaine (Lignavet Injection; Vericore) will provide regional anaesthesia of the surgical site. A paramedian approach requires only local infiltration. An epidural should not be performed routinely as the postoperative hindlimb ataxia may increase the risk of the lambs being smothered by the ewe, or the lambs may have to be temporarily removed.

PREOPERATIVE ANTIBIOTIC AND ANALGESIC THERAPY

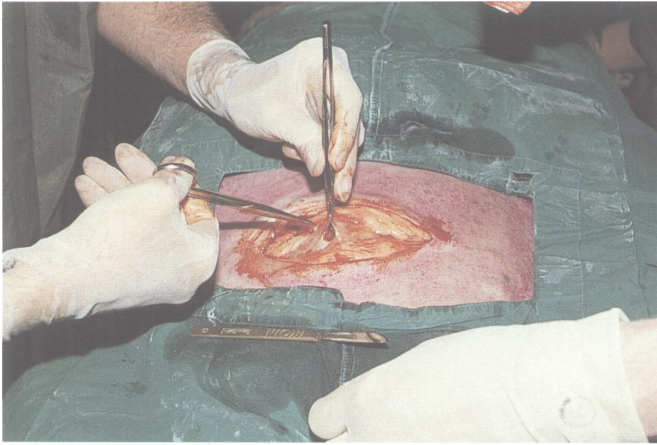
An antibiotic, analgesic and spasmolytic are given preoperatively (see table, below left). The analgesics and spasmolytic recommended are not licensed for use in sheep. The cascade principle applies and a 28-day meat withdrawal period must be observed. Inevitably, sophisticated drug therapy increases the cost of treatment but the welfare and prognosis of the patient is improved.

PREPARATION OF THE SURGICAL SITE

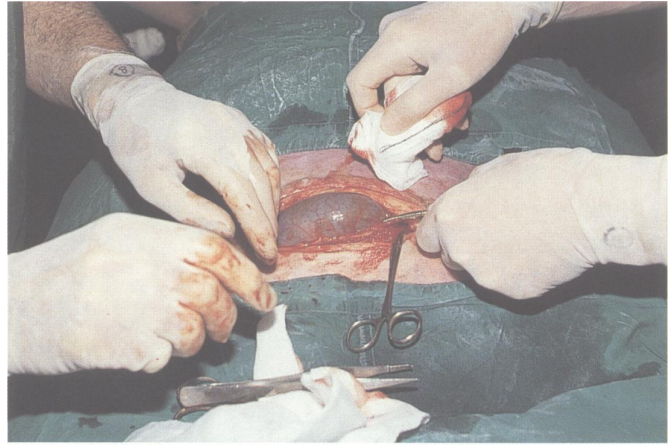
Whichever surgical approach is chosen, strict asepsis should be observed at all times. The surgical site should be prepared routinely as for any surgical procedure and the surgeon and assistant scrubbed and gloved. The use of a disposable drape is preferable but can be cumbersome.

SURGICAL TECHNIQUE

The skin and cutaneous trunci muscle are incised. The muscles or aponeuroses of the external and internal abdominal oblique muscles, depending on whether a flank or paramedian incision is made, are parted along the plane of their fibres or are transected. The transverse abdominis muscle is incised and the peritoneum entered; this is associated with the sound of air being drawn into the abdomen. If undertaking a flank approach, care must be exercised to ensure that the rumen is not inadvertently perforated.



The peritoneum is opened with care via a left flank approach



The pregnant uterus can be seen bulging through the opened left flank

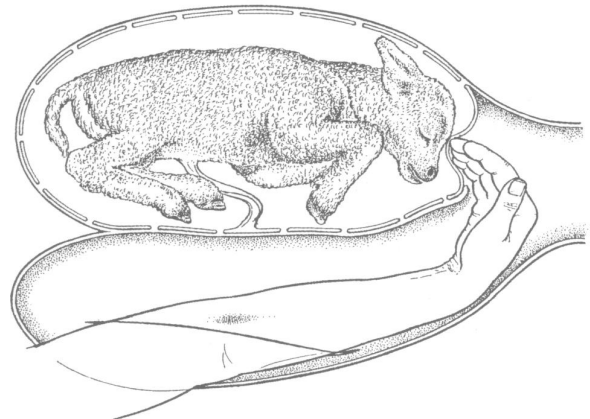
The rumen is moved forwards, exposing the uterus. A fetal limb within the uterus is then drawn to the incision site and the uterus is incised over the limb. Uterine fluid should be drained externally; this is especially important if the fetus(es) are necrotic. The fetus is removed and the umbilicus clamped using artery forceps. Any further fetuses within this horn are removed in the same way. The uterus is then re-entered, with the surgeon's hand directed caudally and medially towards the body of the

uterus. The contralateral uterine horn is entered caudal to the septum to grasp and draw another fetus, if present, towards the incision site. Before preparing to close the uterus it must be carefully searched internally and palpated externally to ensure that no further lambs have been left undelivered.

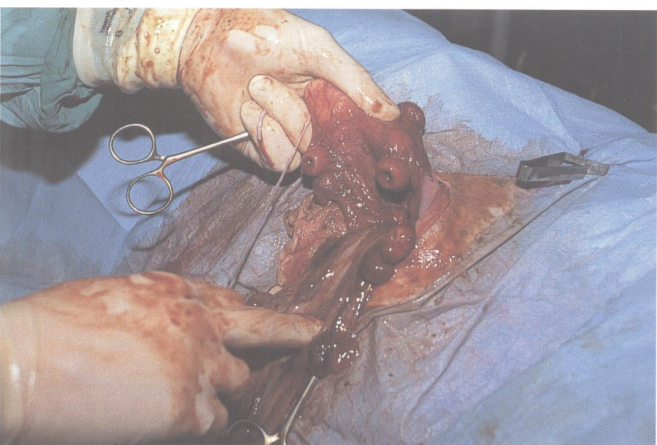
The fetal membranes are removed if they separate easily. If they cannot be readily removed, they are trimmed and replaced in the uterus to be expelled



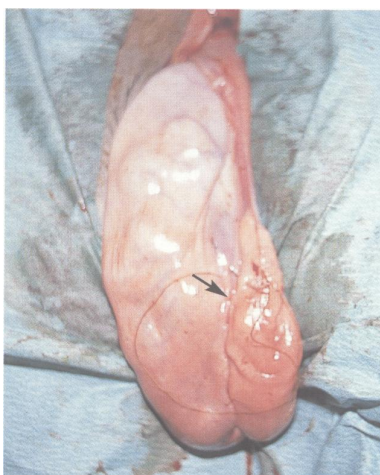
A fetus is removed from the left uterine horn



The contralateral uterine horn is explored by passing a hand caudal to the intercornual septum. Reproduced, with permission, from the Handbook of Veterinary Obstetrics (1995), by P. G. G. Jackson, W. B. Saunders, London



An attempt is made to remove the fetal placenta from the uterine caruncles



Uterine closure using a double layer of inverting sutures (arrow)

later via the vagina. Three antibiotic pessaries (Utocyl; Novartis) are placed in the uterus prior to closure. An absorbable suture material (3 metric chromic catgut; Ethicon) is used to close the uterus with an inverting suture pattern. Care must be taken not to fully penetrate the lumen of the uterus. It is preferable to oversew the uterus to guard against future wound dehiscence.

The abdominal incision is closed in three layers: the peritoneum and transverse abdominis muscle; the internal/external oblique muscles with the cutaneous trunci muscle and subcutaneous fat; and finally the skin. The choice of suture is 4 metric chromic catgut (Ethicon) in a continuous pattern for the muscle and subcuticular layers, and 3 metric pseudomonofilament polyamide (Supramid; Bayer) in a forward interlocking pattern for the skin.

AFTERCARE OF THE EWE AND LAMB(S)

The lambs need to be cared for by an assistant as soon as they are delivered. Mucus has to be drained from the respiratory tract and a respiratory stimulant, such as one unit of etamiphylline camsylate (Dalophylline Gel; Arnolds), may be applied under the tongue. The lambs should be rubbed dry using a towel and tincture of iodine dressing applied to their navel. They should be placed in a box under an infrared heat lamp, with a woollen coat for additional protection, as they are particularly susceptible to hypothermia.

Once the lambs are capable of standing they may be drenched with an antibiotic (eg, 1 ml spectinomycin [Spectam Scour Halt 50 mg/ml; Sanofi]) to prevent watery mouth if this is a flock problem and placed with the ewe to receive colostrum. If the lambs are weakly they must be stomach tubed twice within six hours of

birth with 100 ml of their mother's thawed-frozen colostrum or a colostrum substitute (Lamb Colostrum Substitute; Volac International). Normal suckling should be encouraged as soon as possible. Care of the neonatal lamb has been further discussed in a recent article (Winter 1999).

Postoperatively, the ewe may be given 10 iu oxytocin (Oxytocin-S; Intervet) by intramuscular injection to encourage uterine involution. Antibiosis and analgesia, having already been administered preoperatively, are not necessary.

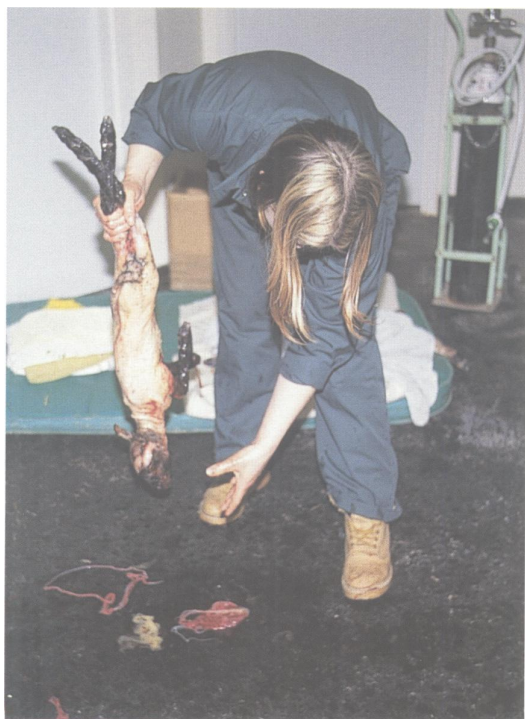
POSTOPERATIVE COMPLICATIONS

Ewes which have undergone caesarean section do not normally show an increased incidence of retained fetal membranes, metritis or infertility when compared with normal births. However, endotoxaemia, adhesions and death of the ewe are potential complications, particularly if an attempt is made to deliver dead lambs. Inevitably, the skill of the surgeon and length of the procedure also dictate the outcome of the operation.

SUMMARY

Undoubtedly, veterinary surgeons will continue to perform caesarean sections in sheep despite the current depression affecting the industry. In each case presented for surgery a full preoperative clinical examination of the ewe and her lambs is essential. The surgical technique must always be carried out under the highest possible standards of asepsis and the lambs must be carefully monitored after delivery to maximise the success rate. Above all, the welfare of the ewe and her lambs must always take precedence over all other considerations.

Further reading
WINTER, A. (1999) Dealing with dystocia in the ewe. *In Practice* **21**, 2-9



Drainage of fluids from a newborn lamb delivered by caesarean section

The Veterinary Record
In Practice website

www.vetrecord.co.uk

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