

Third Edition

Bovine Surgery and Lameness

A. David Weaver
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WILEY Blackwell

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Preface

Having discarded the prefaces of the first two editions of “Bovine Surgery and Lameness”, the third edition has some changes in its format. However, the emphasis of this paperback, designed to be available in the car for easy access (rather than gathering dust on the practice bookshelf), has the same aims as its predecessors. It should give the “nuts and bolts” or “how to . . .” of the previous editions. It has an additional author, Owen Atkinson, a dairy consultant veterinarian who has over twenty years experience of intensive dairy cattle practice in England. Owen has completely rewritten the lameness chapter, and has also reorganised the introductory sections to give greater emphasis to supportive therapy and certain selected diagnostic procedures.

Other changes include expansion of the surgical management of abomasal disorders to include laparoscopic techniques introduced into veterinary medicine over the last 15 years. These techniques have been clarified by greater use of line drawings, that were appreciated in the second edition. Three such line drawings illustrate the front cover.

As well as ethical considerations, the problems of the economic viability of any surgical intervention in cattle must be carefully assessed. The importance of sterile surgical packs, effective anaesthesia and asepsis cannot be over-emphasised. Failures in operative procedures in cattle lead to a natural reluctance by farmers to agree to repeat such operations. The attention today (2018) on the worldwide attempts to reduce antibiotic usage is also relevant to bovine surgery, where effective asepsis often makes post-operative antibiotic cover unnecessary.

The quality of veterinarian-farmer communication is particularly relevant at a time when ethical considerations have become more important. The general public is now more conscious of animal welfare and their view, as consumers and customers, should not be ignored. The veterinary profession has an important role here. For example, the need for pain relief should be promoted in routine procedures such as disbudding/dehorning and castration, frequently performed by the unsupervised farmer following instruction by the veterinarian. The relatively recent recognition of the usefulness of NSAIDs to reduce post-operative pain is applauded and their more widespread use is encouraged in this revised edition.

Other challenges in the bovine surgical field cannot be avoided, such as surgery in a suboptimal environment e.g. a dusty dark cowshed late at night, or the ill-lit corner of a field. More hypothetical challenges such as the layperson's question: "is castration justified?" fall outside our remit in this book. However, wherever possible a practical approach has been suggested, including some handy tips often learned the hard way.

Despite this book often describing the surgical correction of conditions once they occur, the reader is encouraged to make efforts to prevent problems, such as an unacceptable incidence of displaced abomasum cases, or of digital dermatitis. Whilst other books, (see further reading section) are able to explore preventive measures in greater depth, we have included in this edition some discussion boxes to promote a preventive approach.

The authors would welcome comments and suggestions for improvements. We have often given only our personal preferred surgical technique, aware that in other hands there can be excellent alternatives.

A. David Weaver, Owen Atkinson, Guy St. Jean and Adrian Steiner
March 2018

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Figs. 1.9, 4.5, 5.2, 5.12 Dr. K.M. Dyce, Edinburgh and W.B. Saunders 'Essentials of Bovine Anatomy', 1971 by Dyce and Wensing

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The authors have made every effort to ensure that medicines and their dosage regimes are accurate at the time of publication. Nevertheless, readers should check the product information provided by the manufacturer of each medicine before its use or prescription. In particular, medicine authorisation by regulatory authorities varies from country to country. Some medicines included in the text are not authorised for use for food-producing animals in some countries. The reader should exercise individual judgement in coming to a clinical decision on medicine usage, bearing in mind professional skill and experience, and should at all times remain within the regulatory framework of the country.

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About the Companion Website

This book is accompanied by a companion website:

www.wiley.com/go/weaver/bovine-surgery

The website includes:

- Videos
- Annotated PDF documents of videos

CHAPTER 1

General considerations and anaesthesia

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1.1 Pre-operative assessment

Introduction

The bovine patient is a stoical animal and modern crushes and physical restraint options allow many techniques to be carried out in the field. However, this should not excuse a thorough **clinical** and **ethical** assessment prior to any surgical procedure.

Assessment should include numerous factors apart from the physical condition of the subject:

- welfare implications of the procedure
- potential duration of a productive life
- economic situation including insurance status and economic return on the surgery
- surgical risk regarding complete recovery
- future breeding prospects including heritability of the condition being corrected
- pathology of other body systems directly or indirectly related to the primary condition

General physical examination is essential before emergency or elective surgery to assess risks and concurrent disorders.

Welfare and quality of life

Animal welfare may be judged using a number of criteria. Making these judgements is an essential part of the vet's role. Vets must also lead by example. Decisions to perform surgery, and how it is to be done, are complex. Foremost in the process must be the welfare of the cow or calf. The surgeon should ask themselves:

- How necessary is this procedure: will benefits to the animal outweigh any pain or discomfort?
- What will the animal's quality of life be afterwards? Is the procedure likely to lead to a 'life worth living' or preferably 'a good life' for the animal in question?
- How does this procedure compare with an alternative option of humane slaughter or euthanasia?
- To what extent can pain and discomfort be mitigated during and after the procedure?
- To what extent can fear and distress be mitigated during and after the procedure?
- What can we learn from this situation to make life better for cows and calves in the future?

The last question is vital: sometimes it is easy for the surgeon to focus on the individual animal in question (that is important too) but lose sight of the greater picture. For example: performing surgery on a cow with toe necrosis can greatly improve her quality of life, but what measures can be put in place to prevent further cases? You are asked to dehorn or castrate some yearling cattle: could it be done at a younger age next time?

Warning

Some procedures are deemed to be simply unethical and there is legislation in place preventing them, though there are regional variations. Examples in the UK of illegal procedures include:

- tail docking in calves or adult cattle (except in cases of injury)
- castration over one week by means of an elastrator
- castration without anaesthetic for animals over two months of age

Furthermore, the Veterinary Surgeons Act means that any surgery involving entering a body cavity (e.g. joint spaces; abdomen; thoracic cavity) can only be carried out by a qualified veterinary surgeon in the UK. It is incumbent on the vet to provide suitable anaesthesia and analgesia.

Anaesthesia techniques are described in Section 1.7–1.9. Peri-operative analgesia is discussed in Section 2.11, though there is clearly overlap in these two areas of pharmacology and surgical preparation. The use of a crush/squeeze chute should never replace adequate analgesia and sedation for surgical procedures.

Tip

Learn and practice good communication techniques. Effective communication between farm vet and producer is vital to ensure that pain and suffering are reduced to a minimum among stock. Vets should be the leaders in animal welfare: this leadership requires exact personal skills, which is in addition to any technical abilities or scientific knowledge required of vets.

Laboratory tests

Under farm practice conditions laboratory tests may not be performed, but major parameters very simply estimated with minimal apparatus are:

- packed cell volume: microcentrifuge, microhaematocrit apparatus
- total protein: refractometer

Normal haematological and biochemical parameters of cattle are listed in Table 1.1.

In some abdominal conditions (abomasal torsion or volvulus, intestinal obstruction) estimation of plasma electrolytes (e.g. chloride) is valuable in assessing prognosis and calculating requirements for fluid replacement. Fluid therapy is discussed in Chapter 2.

Congenital defects

Incidence of congenital defects in cattle is 0.2–3%, with 40–50% born dead. Most defects are visible externally. Congenital defects reduce the value of affected calves and economic losses are most severe when combined with embryonic or foetal mortality, particularly if it results in an extended subsequent calving interval. Close collaboration between the vet, farmer and geneticist is essential and good breeding records are vital.

Tip

'Congenital' is not synonymous with 'heritable' or 'genetic'. Where it is likely that the condition is inherited, steps should be taken (e.g. castration, sterilisation) to avoid breeding from such stock. As it is not always easy to know if a congenital defect is heritable, a precautionary approach is best.

Table 1.1 Reference ranges (haematology and plasma biochemistry) in cattle.

	Units	Average (%)	Range (\pm 2SD)
<i>Haematology</i>			
Erythrocytes	$\times 10^{12}/l$	7.0	(5–10)
Haemoglobin	g/dl	11.0	(8–15)
PCV (haematocrit)	l/l	35.0	28–38
Fibrinogen	g/l	4.0	(2–7)
Leucocytes	$\times 10^9/l$	7.0	(4–12)
Neutrophils (non-segmented bands)	$\times 10^9/l$	0.02 (0.5%)	0–1.12 (0–2%)
Neutrophils (segmented mature)	$\times 10^9/l$	2.0 (28%)	0.6–4 (25–48%)
Lymphocytes	$\times 10^9/l$	4.5 (58%)	2.5–7.5 (45–75%)
Monocytes	$\times 10^9/l$	0.4 (4%)	0.02–0.8 (2–7%)
Eosinophils	$\times 10^9/l$	0.65 (9%)	0–2.4 (0–20%)
Basophils	$\times 10^9/l$	0.05 (0.5%)	0–0.2 (0–2%)
Neutrophil: lymphocyte ratio	—	0.45 : 1	—
<i>Plasma biochemistry</i>			
Urea	mmol/l	4.2	2.0–6.6
Creatinine	$\mu\text{mol}/l$	100	44–165
Calcium	mmol/l	2.5	2.0–3.4
Inorganic phosphate	mmol/l	1.7	1.2–2.3
Sodium	mmol/l	139	132–150
Potassium	mmol/l	4.3	3.6–5.8
Chloride	mmol/l	102	90–110
Magnesium	mmol/l	1.02	0.7–1.2
Total protein	g/l	67	51–91
Albumin	g/l	34	21–36
Globulin	g/l	43	30–55
Glucose	mmol/l	2.5	2.0–3.2
Alkaline phosphatase	iu/l	24	20–30
AST SGOT	iu/l	40	20–100
ALT SGPT	iu/l	10	4–50
Lactate dehydrogenase (LDH)	iu/l	700	600–850
Bilirubin	$\mu\text{mol}/l$	4.1	0–6.5
Cholesterol	mmol/l	2.6	1.0–3.0
Creatine phosphokinase	mmol/l	3.0	0–50

The above values refer to healthy adult (> 3 years old) cattle, and have been compiled from various sources. Interpretation of possible deviations from the above ranges should consider variations due to the laboratory technique, breed, lactational and nutritional status, and should always be related to the presenting signs and symptoms of the individual or group. Units are given as SI units

A limited number of conditions can be corrected surgically.

Examples of the more common defects of each body system are:

- **skeletal:** single and isolated defects include spinal abnormalities such as scoliosis, kyphosis, tibial hemimelia, polydactyly, syndactyly
- **systemic skeletal defects:** chondrodysplasia (dwarfism), osteopetrosis
- **joint defects:** arthrogryposis and congenital muscle contracture ('ankylosis'), hip dysplasia, bilateral femorotibial osteoarthritis
- **muscular:** arthrogryposis, congenital flexed pastern and/or fetlocks, muscular hypertrophy, spastic paresis
- **CNS:** internal hydrocephalus, spina bifida, Arnold Chiari malformation (herniation of cerebellar tissue through *foramen magnum* into cranial cervical spinal canal), cerebellar hypoplasia, cerebellar ataxia, spastic paresis, spastic syndrome
- **skin:** epitheliogenesis imperfecta, entropion
- **cardiovascular:** ventricular septal defect, patent *ductus arteriosus*
- **digestive:** atresia of ileum, colon, rectum and anus
- **hernias:** umbilical, scrotal/inguinal, schistosomus reflexus
- **reproductive:** testicular hypoplasia, intersex (hermaphrodite and free-martin), ovarian hypoplasia, rectovaginal constriction (Jerseys) and prolonged gestation

Many of the above musculoskeletal defects (e.g. muscular hypertrophy or double muscling in the Belgian Blue) can give rise to dystocia.

Surgical correction of several of these defects is considered elsewhere: umbilical hernia (see Section 5.13), rectal and anal atresia (see Section 5.15) and spastic paresis (see Section 9.27).

1.2 Instrumentation

A good worker needs good tools. Maintain instruments in good condition and store in sterile surgical packs for the common procedures (caesarean section, laparotomy and teat surgery).

Sterilisation

Instrument sterilisation methods include the following (the first two are recommended) (see Tables 1.2. and 1.3):

- **autoclaving** by pressurised steam, 750 mm/Hg at 121 °C for 15 minutes or at 131 °C for three minutes for non-packed instruments, or for a shorter time in high vacuum or high pressure autoclaves; 30 minutes for packs at 121 °C or 18 minutes at 134 °C.
- **gas sterilisation** by ethylene oxide followed by air drying for several days to avoid diffusion of residual gases from the materials into animal tissues.

Table 1.2 Suitability of various surgical materials for sterilisation.

	Dry heat	Autoclave	Boiling water	Ethylene oxide	Liquid chemicals
PVC (e.g. endotracheal tubes)	no	yes	yes	yes	doubtful
Polypropylene (e.g. connectors)	no	yes	yes	yes	yes
Polyethylene (e.g. catheters, packing film)	no	no	yes*, no [†]	yes	yes
Nylon (e.g. i.v. cannulae)	no	yes	yes	no	doubtful
Acrylic (e.g. perspex)	no	no	doubtful	yes	yes
Silicon rubber	yes	yes	yes	yes	doubtful

* high density,

[†] low density

Some acrylic plastic materials, polystyrene and certain lensed instruments may be damaged during this process.

- **cold (chemical) sterilisation** in commercially available solutions (e.g. containing glutaraldehyde). Prolonged immersion is necessary. Most equipment that is safe for immersion in water is safe for immersion in 2% glutaraldehyde. After the proper immersion period, instruments should be rinsed with copious amounts of sterile water.
- **simple boiling** of instruments: a poor, slow and tiresome means of reduction of infectious agents likely to cause damage. The minimal period of boiling is 30 minutes, longer at altitudes over 300 m. Addition of alkali to the steriliser increases bactericidal efficiency and boiling time may be safely reduced to 15 minutes. Corrosion is avoided by the addition of 0.5–1% washing soda (Na_2CO_3). Accumulation of lime in serrations or joints is removed by leaving instruments in 5% acetic acid overnight and then brushing off.

Table 1.3 Efficiency of different methods of sterilisation.

	Bacteria	Dry spores	Moulds	Fungi	Viruses
Autoclaving	+	+	+	+	+
Gas sterilisation	+	+	+	+	+
Chemical antiseptics	+	—	+	(+)	+
Boiling	(+)	—	(+)	(+)	(+)

Abbreviations: + = effective; (+) = limited efficacy; — = not effective

Warning

Ethylene oxide and glutaraldehyde are carcinogenic: environmental and safety hazards associated with these chemicals are numerous and severe.

Basic instruments for caesarean section or laparotomy

The following is a suggested list of equipment to cover most eventualities (see Figure 1.1):

- towel clamps (Backhaus) × 4, 8.8 cm
- haemostatic forceps (Spencer Wells) × 4 straight 15.2 cm, (Criles) × 2 curved 14 cm, (Halsted) × 2 mosquito straight 12.7 cm
- scalpel handle (Swann-Morton® or Bard-Parker®) × 2, P (no. 4, blades no. 22, or handle no. 3 and blade no. 10)
- rat tooth dissecting forceps (Lane) 15.2 cm
- plain dissecting forceps (Bendover) 15.2 cm
- straight scissors (Mayo) 16 cm
- needle holder (McPhail's or Gillies), right- or left-handed 16 cm
- Allis tissue forceps × 4, 15 cm
- sterile nylon calving ropes for caesarean section × 4
- embryotomy finger knife (for incision into the uterine wall, which cannot be brought near the body wall)

Also needed are suture needles. Two each of the following types and sizes are recommended (see Figure 1.2):

- 3/8 circle cutting-edged 4.7 cm and 7.0 cm
- 3/8 circle round-bodied (taper cut) 4.5 cm
- 1/2 circle cutting-edged 4.6 cm
- 1/2 curved cutting-edged 6.7 cm
- swaged-on curved round-bodied needle 4.5 cm
- intestinal straight round-bodied (Mayo) 6.2 cm
- straight cutting-edged (Hagedorn) 6.3 cm
- double-curved post-mortem needle 12.5 cm

1.3 Asepsis

Surgery involving regions where adequate skin preparation is feasible (i.e. with avoidable microbial contamination of tissues or sterile materials) should be performed under aseptic conditions. Instruments and cloths should be sterile.

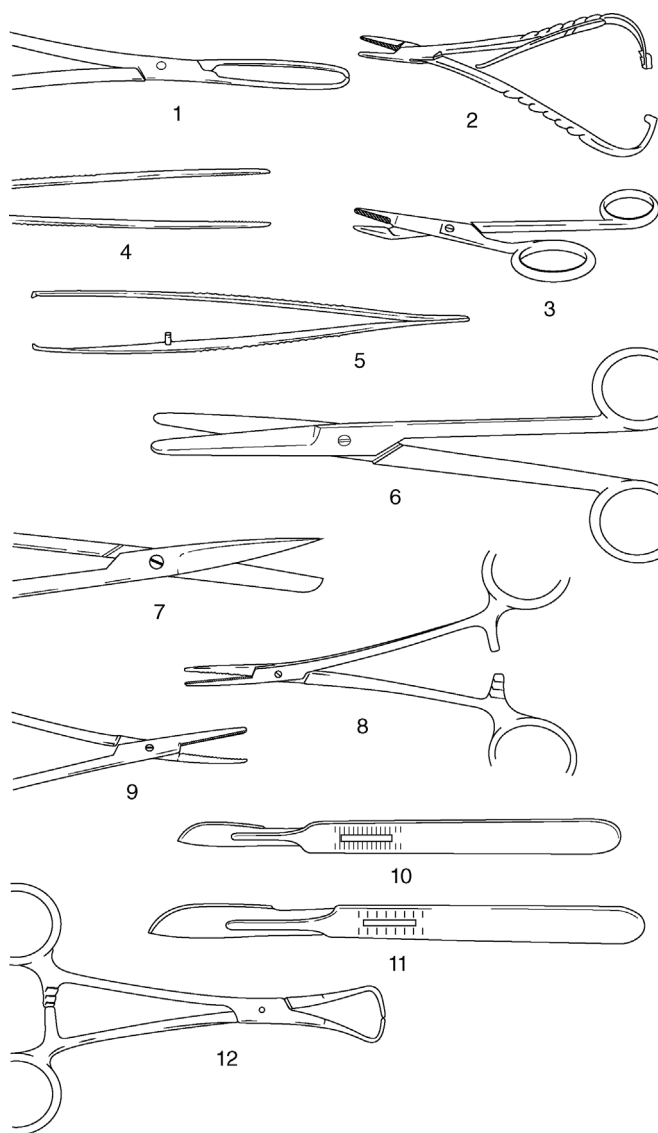


Figure 1.1 Basic instruments for caesarean section or laparotomy.

1. Allis tissue forceps; 2. McPhail's needle holder; 3. Gillies combined scissors and needle holder; 4. plain forceps; 5. rat tooth forceps; 6. Mayo scissors (blunt/blunt), slightly curved; 7. Mayo scissors (pointed/blunt), straight; 8. straight haemostatic forceps; 9. curved haemostatic forceps; 10. scalpel handle no. 4 and no. 22 blade; 11. scalpel handle no. 3 and no. 10 blade; 12. towel clip (Backhaus).

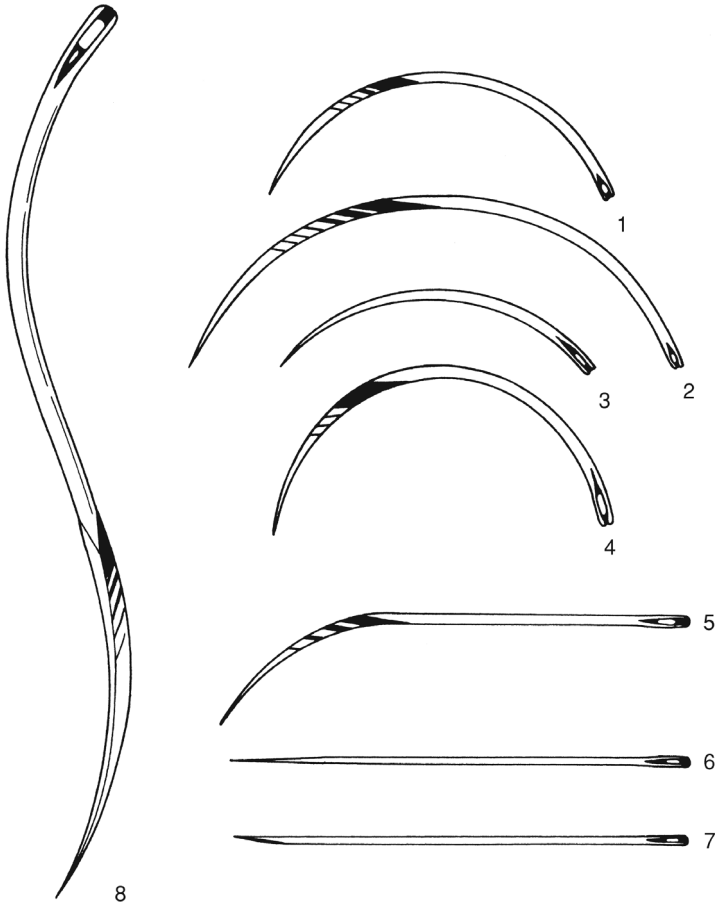


Figure 1.2 Suture needles (shown full scale).

1 and 2. 3/8 circle cutting-edged 4.7 and 7 cm; 3. 3/8 circle round-bodied (taper cut) 4.5 cm; 4. 1/2 circle cutting-edged 4.6 cm; 5. 1/2 curved cutting-edged 6.7 cm; 6. intestinal straight round-bodied (Mayo) 6.3 cm; 7. straight cutting-edged (Hagedorn) 6.3 cm; 8. double-curved post-mortem needle 12.5 cm.

Preparation of operative field

This example is for the flank:

- close clip wide area, minimum 60 cm cranial-caudal and 90 cm vertically (preferable to shaving)
- alternatively shave operative field after application of disinfectant, soap and water (Schick razor is suitable)

- wash area with soap and water twice, then scrub with povidone-iodine solution or 4% chlorhexidine gluconate, dry off, wash with 70% alcohol and rescrub
- repeat this procedure three times before respraying with diluted povidone-iodine solution or chlorhexidine solution
- large impervious sterile towels or disposable drapes (rubber or plastic) are useful for placing on the site
- place sterile towel on suitable flat surface for instruments, use sterilised gauze swabs, instruments and suture materials, and sterile gloves

Tip

Using sterile isotonic saline instead of alcohol for rinsing after scrubbing with chlorhexidine is preferable as it does not reduce the long-term effect of chlorhexidine. Never mix povidone-iodine with chlorhexidine solution.

Hand disinfection

For 'scrubbing up', effective hand and forearm sterilisation procedures include (see Table 1.4):

- commercial chlorhexidine 'scrubs'
- 0.5% chlorhexidine concentrate in 90% ethyl alcohol with 1% glycerine as emollient (cheapest)
- commercially available povidone-iodine soaps
- hexachlorophane suspension (requires a full rinse-off after a 5 minute scrub)
- 10 ml is first applied to clean dry hands and permitted to dry, before further application and a 5 minute scrub-up. At least five minutes contact time is required for all disinfectants
- sterile surgical gloves should be worn whenever practicable after scrubbing up

1.4 Sutures and suturing

Suture materials are constantly being improved and new products come on to the veterinary market at regular intervals (see Table 1.5). This section selects a limited number of materials and methods of usage, and attempts to justify the selection. In few cases can the cost of the material be considered an important factor in selection.

Table 1.4 Properties of three common antiseptic compounds.

Generic name	Povidone-iodine	Chlorhexidine gluconate or acetate	Benzalkonium chloride
Bactericidal	+	+	(+)
Fungicidal	+	+	+
Virucidal	+	—	—
Dilution for instruments	undiluted (5%, 7.5% or 10%)		10% diluted 1:500
Skin ('scrub')	undiluted (0.75%)	4% or 15 ml of 7.5% solution + 485 ml of 70% alcohol	10% diluted 1:100
Wound lavage	0.1%	0.05%	—
Disadvantages	brown skin when dry	incompatible with soap and anionic detergents	incompatible with soap and anionic detergents; fails to kill spore-bearing organisms
Advantages	not inactivated by organic matter	not inactivated by organic matter	—

Abbreviations: + = active; (+) = limited activity; — = no activity

Suture materials

Non-absorbable suture materials:

- monofilament nylon (e.g. Ethilon®): skin
- monofilament polypropylene (e.g. Prolene®): skin
- pseudomonofilament polyamide polymer (e.g. Supramid®): skin
- mono- or multifilament surgical steel: skin, bone; exceptionally *linea alba*

Absorbable suture materials:

- chromic catgut: subcutis, muscle, peritoneum, bowel, urinary bladder, uterus, penis
- multifilament polyglycolic acid or PGA (e.g. Dexon®): bowel, muscle including teat intermediate layer
- multifilament polyglactin 910 (Vicryl®): subcutis, muscle including teat intermediate layer, bowel, urinary bladder
- monofilament polyglyconate (e.g. Maxon®): subcutis, bowel, teat intermediate layer, urinary bladder, uterus

Table 1.5 Comparative qualities (graded undesirable to desirable, + to +++), of nine selected suture materials for cattle.

Generic name (trade name examples)	Origin	Tensile strength	Knot security	Handling	Tissue reaction	Resistance to infection	Absorption without inflammation after tissue repair	Cost
<i>Absorbable</i>								
Chromic catgut	collagen	(+)	+	++	+++	+	+	low
Coated braided PGA (PGS), (Dexon Plus®)	glycolic acid polymer, coated surfactant	++(+)	++	++(+)	++	++	++	high
Polydioxanone monofilament (PDS)	polymer of paradiioxanone	+++	++	++	+	+++	+	high
Coated braided Polyglactin 910 (coated Vicryl®)	glycolic-lactic acid copolymer	++(+)	++	+	++	++	++	high
Monofilament polyglyconate (Maxon)	copolymer of glycolic acid and trimethylene	+++	++		+	+++	+	high
<i>Non-absorbable</i>								
Polypropylene monofilament (Prolene, Surgelene®, Prodek®)	polymerised polyolefin hydrocarbons	+++	(+)	+(+)	(+)	+++	NA	low
Surgical steel	alloy of iron	+++	+++	+	+	+++	NA	low
Monofilament nylon (Dermalon®, Ethilon, Surgidek®)	polyamide filament	++(+)	+	+	+	+	NA	low
Polyfilament polyamide polymer (Suprylon®, Vetafil®, Braunamid®)	polyamide polymer	++(+)	++	+++	+	++	NA	low

NA = not applicable

- monofilament polydioxanone (PDS): bowel, muscle, *linea alba*
- 'soft' gut (Softgut®): muscle, bowel, teat intermediate layer

Tip

Suture patterns are discussed under the specific procedures. Skin under considerable or potential tension at certain sites, such as the vulval lips and peri-anal region (e.g. following replacement of prolapsed cervix or rectum), is usually sutured with sterile woven nylon tape 3–5 mm in diameter.

Discussion

Selection of suture material should be based on the known biological and physical properties of the suture, wound environment and tissue response to the suture.

- **Monofilament nylon** remains encapsulated in body tissues when buried, but the inflammatory reaction is minimal. It has a great size-to-strength ratio and tensile strength. It is somewhat stiff and is therefore not particularly easily handled, an important point when operating in sub-optimal conditions of poor light and awkward corners. Knot security is only fair.
- **Multifilament polyamide polymer**, encased in an outer tubular sheath (pseudomonofilament), has good strength and provokes little tissue reaction unless the outer sheath is broken, but it loses strength when autoclaved. It is therefore usually drawn from a sterile spool as and when required. It is very easily handled.
- **Surgical steel** has the greatest tensile strength of all sutures and retains strength when implanted. It has the greatest knot security and creates little or no inflammatory reaction. Surgical steel, however, tends to cut tissue, has poor handling and cannot withstand repeated bending without breaking. It is sometimes used in tissues that heal slowly (e.g. infected *linea alba* or bone).
- **Chronic catgut**, of the six absorbable materials listed, is still most commonly used, but synthetic absorbable material does have distinct advantages. Catgut has relatively good handling characteristics, but has disadvantages of relatively rapid loss of strength in well vascularised sites (50% in the first week) and poor knot security (tendency to unwrap and loosen when wet). The potential minute risk of the transfer of infectious prion material into food-producing

animals and hence into the human food chain has led to a ban on the use of chromic catgut in some countries (vCJD risk)

- **Multifilament polyglycolic acid (PGA)** has greater strength that is lost evenly, provoking much less tissue reaction than chromic catgut. PGA is non-antigenic, has a low coefficient of friction and therefore requires multiple throws to improve knot security, but is easily handled.
- **Monofilament polydioxanone (PDS)** is very strong, retaining its strength for many weeks (58% at four weeks), is characterised by its strong memory and has low knot security, but provokes minimal tissue reaction. *Linea alba* is best sutured with PDS.
- **'Soft' catgut** is undoubtedly the most easily handled absorbable material for delicate bowel anastomoses. Plain or soft catgut is absorbed quickly and maintains its strength for a short time.
- PDS and PGA are slowly replacing chromic catgut, which will retain its place as a general purpose material. Vicryl® in its coated form is very easy to handle and has minimal tissue reaction and tissue drag. It is stable in contaminated wounds. Polyglyconate monofilament (Maxon™) has three times the strength of Vicryl® at day 21 of wound healing.

1.5 Restraint

Introduction

Restraint is necessary for:

- administration of drugs for (a) pre-medication and sedation, (b) infiltration of local analgesic drugs and (c) induction of general anaesthesia
- examination and minor procedures carried out without sedation or analgesia/anaesthesia
- prevention of movement during surgery
- safety of operators

Restraint may involve physical manipulation of tail, head or nostrils, or involve application of halter and ropes.

Techniques

Physical restraint by a stock person includes:

- halter
- nose grip (fingers or nose tongs)
- tail elevation

- skin grip of crural fold
- calves in lateral recumbency: lifting bottom fore leg and hind leg with elbow pressure on neck

Rope restraint includes:

- hind limb elevation by a rope above the hock and round an overhead bar
- Reuff's method of casting (see Figure 1.3), employing a rope squeeze of the abdomen

Many forms of cattle crush or squeeze chute are available with an excellent head restraint, which are suitable for surgery of the head and cranial neck (e.g. tracheotomy) and of the perineum. Many are unsuitable for flank laparotomy, caesarean sections or rumenotomy, though an increasing number of manufacturers offer modified crushes to improve access to the paralumbar fossa. A veterinary practice may find it advantageous to have such a crush available for surgery on the practice premises or to be transported to the farm. Some crushes have poor facilities for the elevation and restraint of hind or fore limbs for clinical examination and digital surgery. The Wopa crush is an example of an excellent crush for digital surgery.

Warning

An essential feature of crushes or chutes is the need to release the head rapidly should the animal collapse. Asphyxiation can result, or pressure on the point of the shoulder can cause irreversible radial nerve paralysis and a 'downer cow'.

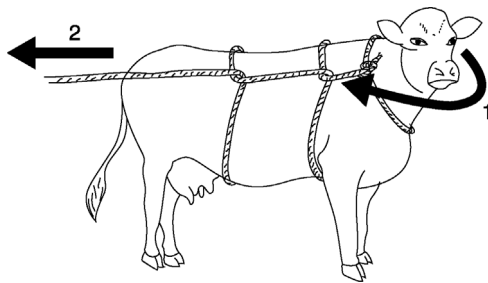


Figure 1.3 Reuff's method of casting a cow with a rope and maintaining in lateral recumbency.

The first operator (1) brings the cow's head round tightly to her right shoulder, using a halter. The second operator (2) pulls the rope so that it tightens around the cow's abdomen: this will force her to lie down. In this example the cow will go into lateral recumbency on her left side. Maintaining tension on the rope (2) will prevent her rising.

1.6 Pre-medication and sedation

Pre-medication and sedation (see Table 1.6) have six aims:

- to improve handling and restraint; improve safety
- to enhance the analgesic effect produced by other anaesthetic agents
- to reduce the induction and maintenance doses of general anaesthesia (GA) agents
- to reduce the possible disadvantageous side-effects of anaesthesia
- to promote smooth post-operative recovery
- to improve the well-being of the animal

Very few anaesthetic drugs are approved for use in farm animals. Those known to the authors include azaperone, procaine, lignocaine (lidocaine), methoxyflurane and thiamylal (USA). Xylazine is approved for use in cattle in Canada, the UK and Switzerland, and acepromazine (ACP) is also approved for

Table 1.6 Activity and dosage of selected analgesic, anti-inflammatory and sedative drugs in cattle.

Drug (example trade name)	Analgesic	NSAID	Sedative	Dosage (mg/kg)	
				i.m.	i.v.
Butylscopolamine bromide/metamizole (Buscopan® Boehringer)	+	+	–	5 ml/100 kg ^a	
Meloxicam (e.g. Metacam® Boehringer)	+	+	–	0.5 ^b	0.5
Carprofen (Rimadyl® LA soln, Zoetis)	+	+	–	1.4 ^b	1.4
Xylazine (e.g. Sedaxylan® 2%, Dechra)	+	–	+	0.05–0.3	0.03–0.1
Diazepam (Valium®)*	+	–	+	0.5–1.0	0.2–0.5
Flunixin meglumine (e.g. Finadyne®, MSD)	+	+	–	–	2.2
Ketoprofen (e.g. Ketofen® 10%, Merial)	+	+	–	3	3
Acetylpromazine* (ACP®)	–	–	+	0.03–0.1	0.03–0.1

* Not authorised for use in cattle in UK and EU, may only be given 'off label' under cascade prescribing

^a not authorised in lactating cattle

^b by s.c. route, not i.v.