

**Practical Manual on**  
**Veterinary Surgery & Radiology**  
**Unit 1 (VETERINARY GENERAL SURGERY)**



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**SCIENCE**  
**CHOMU, JAIPUR (RAJASTHAN)**

## **PREFACE**

This Laboratory Manual has been prepared for the undergraduate students of B.V. Sc. & A. H. in accordance with the syllabus designed by the Veterinary Council of India. The efforts have been made to make the manuscript worthy, realistic and easily understandable for the students, teachers and scientists in the field of Veterinary Surgery & Radiology. We hope this manual will serve very useful tool to the undergraduate and graduate students of Veterinary Science who are undergoing courses in Veterinary Surgery & Radiology (unit-1).

It's our pleasure to thanks Dean, Mahatma Jyotiba Fule College of Veterinary and Animal Sciences, Chomu, Jaipur for providing necessary facilities and rendering all helps in preparing this course manual.

Suggestions for improvement are welcome from scientists, teachers and students.

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## **FOREWORD**

I am very happy to go through the practical manual entitled “Veterinary Surgery & Radiology (unit-1)” Department of Veterinary Surgery & Radiology, M. J. F. College of Veterinary and Animal Sciences, Chomu, Jaipur (Raj.). The manual covers the practical syllabus of undergraduate course (Veterinary Surgery & Radiology, unit-1) prescribed by Veterinary Council of India (MSVE 2016) for B. V. Sc & A. H. programme.

The manual is a good attempt and is based on cumulative experience of teaching undergraduate courses. The language used in the manual is simple and lucid. The outline and description of practical exercises covering objectives, materials required, procedure and observations to be taken have been nicely presented which would be helpful in conducting practical more effectively.

I hope this manual will make its own place in the libraries of Veterinary and Agricultural Universities, Veterinary and Animal Science College and various Livestock Institutions in near future.

I congratulate the authors for the efforts put in bringing out this practical manual.

**Dean**

MJF College of Veterinary &  
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## **Introduction to layout of operation theatre and surgical unit**

An operation theatre complex is the “heart” of any major surgical hospital. It is a room within a hospital within which surgical and other operations are carried out. These are designed and built to carry out investigative, diagnostic, therapeutic and palliative procedures of varying degrees of invasiveness.

Four zones can be described in an OT complex, based on varying degrees of cleanliness, in which the bacteriological count progressively diminishes from the outer to the inner zones (operating area) and is maintained by a differential decreasing positive pressure ventilation gradient from the inner zone to the outer zone.

- (1) Protective zone: It includes - Change rooms for all veterinary and paravet staff with conveniences, Transfer bay for patient, material & equipment, Rooms for administrative staff, Stores & records, Pre & post-operative rooms, I.C.U. and Post Anaesthesia Care Unit and Sterile stores
- (2) Clean zone: Connects protective zone to aseptic zone and has other areas also like Stores & cleaner room, Equipment store room, Maintenance workshop, Firefighting device room, Emergency exits, Service room for staff, Close circuit TV control area
- (3) Aseptic zone - Includes operation rooms (sterile)
- (4) Disposal zone - Disposal areas from each operating room & corridor lead to disposal zone

The surgical areas should be located in an area within the practice where there is low general traffic flow, as people and animal traffic increases the levels of contamination in the environment. There should be a clear division between the clean and contaminated areas, with closed doors to minimize the risk of contamination entering the clean areas. Staff should don surgical attire when entering the clean area.

### **An ideal operation theatre**

1. Size should be 20' x 25' (Large animal) and 12' x 15' (Small animal).

2. Rumenotomy trevis with notch on left side.
3. Appropriate materials and equipment should be available for inducing and maintaining anaesthesia.
4. For patient preparation this area should also be equipped with: clippers; a vacuum cleaner for removing loose hair after clipping; and skin preparation materials.
5. Good lighting is important and movable spotlights can be useful for closer examination of the patient.
6. The scrub area is located close to operating theatres, with a deep stainless-steel sink is provided with taps operated by foot, knee, elbow or infrared sensor. The sink should be set at waist height to minimize splashing when scrubbing.
7. A separate area for gloving and gowning can be provided outside the theatre.
8. OT should be ventilated using a positive pressure ventilation (PPV) system, producing approximately 20 air changes per hour. Each air change reduces this contamination to approximately 37% of its former level. Temperature between 18° -22° C, humidity of 40%- 50% is the aim.
9. Equipment- Height-adjustable operating table, Positioning aids, Basic anaesthetic monitoring equipment, Stainless steel instrument trolleys, Stainless steel kick buckets, Patient-warming facility, Surgical suction, Diathermy and More advanced anaesthetic monitoring equipment.

**Practical-2**

**Date**

**INTRODUCTION OF COMMON SURGICAL EQUIPMENT AND INSTRUMENTS**

The majority of surgical instruments are manufactured from stainless steel. The most corrosion-resistant stainless steels contain at least 50% iron and the grades of stainless steel used in the manufacture of surgical instruments contain at least 80% iron. The iron within the steel is protected from oxidizing (rusting) by an envelope of chromium oxide. Tungsten carbide, which is usually added to increase hardness of stainless-steel instruments. Nickel is added to steel to increase ductility and toughness.

1. **SCALPEL**- Scalpel is used for sharp division of tissue with minimum damage to nearby tissue. It consists of Bard Parker handle (B.P. handle) and a disposable blade. B.P. handles are available in two numbers- (i) NO. 3 (ii) No. 4. The blade No. 10, 11, 12 & 15 are fixed on B.P. handle No. 3. The blade No. 20, 21 & 22 are fixed on B.P. handle No. 4 & are used for general surgery. It is sterilized by Gamma radiations. The sharp cutting edge becomes blunt on autoclaving (Heat sterilization). The Bard Parker No. 7 handle is long and slender, but has the attachment for the same blades as the No. 3 handle. The Swann Morton Beaver type handle has a different range of very fine blades, particularly suited to ophthalmic surgery.
2. **SCISSORS**- are used for cutting and dissecting the tissue i.e. blunt dissection. For this, the closed tip of scissor is inserted under the tissue and then opened, it will separate the tissue without damaging blood vessels and nerves. According to shape of blades, the scissors may be- (i) Curved or (ii) Straight. Different parts of scissor are- (i) Ring (ii) Joint (iii) Tip & (iv) Blades. Mayo scissor have blunt tip. The heavy Mayo scissors are ideal for cutting thick connective tissue, fascia, the linea alba, muscle, skin and fibrous tissue. The finer, lighter and typically longer Metzenbaum scissors are used when accurate precise dissection is needed through loose delicate tissue.
3. **HAEMOSTATIC FORCEPS**- The forceps crush and seal the bleeding end of vessels. These are varying in shape, size and direction of the striation. These are of three types- (I) Pean's haemostatic forceps (II) Kocher's haemostatic forceps- Always toothed (III) Halstead mosquito forceps-which is used for grasping the smaller blood vessels (IV) Spencer Wells (V) Kelly and (VI) Crile These forceps are available in both straight and curved form.
4. **ALLIS TISSUE FORCEPS**- It is used for holding the large portion of tissue, 5. fascia, tendon and wound edges (skin). It has mouth teeth at its tip.
5. **Thumb forceps**- Held in a pencil grip, typically in the non-dominant hand, thumb forceps are tweezer-like instruments that are an extension of the thumb and index finger and are used to help to stabilize tissue that is being sutured, cut or clamped. It is of two types- (i) Toothed (ii) Plain



6. GROOVE DIRECTOR- It is used to prevent the injury to the underlying organs during peritoneal dissection. First of all, a small slit opening is made in the peritoneum. The groove director is inserted just under the peritoneum, then peritoneum is divided by keeping the tip of scissor in groove of groove director.
7. DOYEN'S INTESTINAL CLAMP- It is used to grasp the intestine during - intestinal surgery. This will prevent leakage of intestinal contents into the abdominal cavity. It is applied on the intestine from antimesenteric border.
8. NEEDLE HOLDERS- Mayo hegar needle holders are commonly used for holding the needle during suturing. It has a notch in the jaw for holding the needle. Shorter needle-holders such as the Castroviejo are specialized for fine ophthalmological procedures. Olsen-Hegars and Gillies are combined scissor/needle-holder, which allows sutures to be tied and cut with the same instrument.
9. TOWEL CLAMP- are used for grasping the skin along with the surgical drapes or it is used to retain the drapes in position during the surgery: exposing only surgical site. Two types are available- (i) Jones towel clamp or cross bar towel clamp. (ii) Backhaus towel clamp.
10. PROBE- This is used to determine the depth and direction of the wound. It has a blunt tip.
11. CHEATLE FORCEPS- This is used to grasp the sterilized syringe and needles from the sterilizer and may be used in place of sponge forceps. It is kept near the sterilizer in a bottle containing antiseptic solution.
12. SETON NEEDLE - It is used to make counter opening at the dependent part of wound for passing the seton to make the continuous drainage from the wound. One end of the seton needle is sharp while others end has an eye for passing seton. Seton is a thread or a bandage.
13. CURETTE- It is used for debriding of the wound. It's both ends have spoon like structure with sharp margins. It is also used for removal of sequestrum (dead bone piece).
14. SWAB HOLDER OR SPONGE FORCEPS - It is used for holding the Sterilized swab of gauze pad.

15. BISTOURY- Bistoury are used to open the abscess. It may be- (i) Probe end or blunt end (ii) Pointed end. It is grasped like sickle i.e. the pointed end is always kept upward.
16. TONGUE FORCEPS - It is used for holding the tongue when the dog is under general anaesthesia to prevent occlusion of air passage by tongue.
17. CANINE MOUTH GAUGE OR DENTAL GAG - It is applied in the mouth of the dog when general anaesthesia is used to facilitated free flow of air. It is applied on the upper and lower canine teeth of same side.
18. RUMENOTOMY SET: It is used to perform Rumenotomy in bovines. It consists of weingarth's frame, vulsellum forceps, rumenotomy hooks and magnet. (i) Weingarth & Rumenotomy Frame - It is fixed in the dorsal commissure of surgical wound of skin only. It has got two eyes, one at upper and another at lower end. The rumen is grasped with the vulsellum forceps on its upper and lower part then the vulsellum forceps are hooked in the eye frame. (ii) Vulsellum Forceps — It is used to grasp the wall of rumen. For this a piece of sterilized gauze should be applied over the rumen wall to prevent damage to the rumen. After grasping the wall at dorsal and ventral part these forceps are fixed in the eye of frame. This rumen is grasped firmly during surgery. (iii) Rumenotomy Hooks- These are used to hook the ruminal wall to the frame. (iv) Magnet- It is used to remove the metallic object from the rumen and reticulum which are not identified with manipulation. Note: - Rumenotomy set is kept in a tray containing antiseptic solution such as savlon.

#### **TEAT INSTRUMENTS**

1. TEAT PLUG -It is made up of plastic. It is fixed in teat meatus to maintain drainage of milk after open teat surgery and constricted teat meatus (Hard milker). A teat plug with cap is known as Larson teat plug.
2. TEAT SYPHON - It is made up of metal & used to remove milk in case of teat obstruction.
3. TEAT BISTOURY — It has a blunt tip & below this a cutting edge. It is used for subcutaneous division of teat meatus (3, 6, 9, 12 O' clock position) in case of constricted teat meatus (Hard milker) after local anaesthesia in teat canal.

4. **TEAT TUMOR EXTRACTOR** - This is used to extract out teat tumour. The serrated part is kept against the tumorous mass and manipulated up and down, this will cut tumorous mass into small pieces, after infusing local anaesthesia 5- 10ml 2% xylocaine in teat canal.
5. **TEAT SLITTER** —This is used for removing the teat obstruction. The slitter has concealed blade. The slitter is inserted proximal to the obstruction and the blades are exposed to divide the obstruction (tumour) at 4-5 places. Slitter may have one or two blades.

### **ORTHOPAEDIC INSTRUMENTS**

1. **ORTHOPAEDIC HAMMER** - It is used to drive the intramedullary pin in the medullary cavity. It is used to strike the end of chisel and osteotome.
2. **SEQUESTRUM FORCEPS**- It is used to remove sequestrum (Dead bone piece).
3. **STEINMANN INTRAMEDULLARY PIN**- These are used for internal fixation of fracture in small animals. it is made up of special steel which is non- magnetic, non-corrosive and inert. These are available in 1.5, 2, 2.5, 3- & 4-mm diameter. The tip of pin may be- (i) Trocar/ Screw (ii) Plain trocar (iii) Chisel/Trocar (iv) Trocar/Trocar.
4. **ROD**- Rods are rounded at both the ends and are used for external fixation of the fractures.
5. **JACOB'S PIN CHUCK** - It is used to insert the pin in medullary canal.
6. **TREPHERNER**- It is used to drill a hole on the bone. They have a T- Shaped handle and cylindrical serrated cutting blade to cut the bone in case of sinusitis and Gid in goat.
7. **PLASTER SHEARS** - It is used to cut the light plaster cast in Dogs & Cat.
8. **PLASTER SCISSORS** - It is used for cutting the plaster bandage at the time of removal of plaster cast.
9. **PLASTER SAW** - It is used for cutting the plaster cast. It has serrated margin. A groove is made in the plaster cast.
10. **HENNING PLASTER SPREADER** - It is used or separating the plaster cast.

11. **RUSKIN BONE CUTTER** - It is used to trim or cut the bones, if the fractured fragments are sharp or angular. It is also used to remove extra bone growth in exostosis. It is used in large animals.
12. **LISTON BONE CUTTER** - It is used in small animals for cutting the bone.
13. **BONE RONGEURS** - are also used to cut the bone in case of non-union and bone grafting. It requires less force to cut the bone. It has two cups at their ends with sharp margins.
14. **KIRSCHNER PIN CUTTER** - It is used to cut excess length of the intramedullary pin after internal fixation by intramedullary pinning.
15. **CHISEL AND OSTEOTOME**- are used alone or with hammer (mallet) to cut the bone. Chisel is single bevelled whereas osteotome is double bevelled.
16. **RETRACTORS** - are used for visualization of operating site.
17. **FINOCHIETTO RIB RETRACTOR**- is used to retract the ribs during thoracic surgery.
18. **MUSCLE RETRACTOR**- is used to retract muscle during surgery of bone and abdomen.
19. **GIGLY WIRE SAW** - It is used to cut the bone and horn. It is attached to the handle to grasp the wire ends.

### **GENERAL INSTRUMENTS**

1. **TROCAR AND CANULA** - It is used for removal of gases from rumen in case of acute tympany.
2. **BURDIZZO CASTRATOR**- This is used for close method of castration in buck and male calves. Small burdizzo is known as baby burdizzo & is used for small animals. The castrator is applied on spermatic cord at two places and kept in position for two minutes. It causes testicular atrophy after 2-3 weeks.
3. **EMASCULATOR** - It is used for castration of large animals by open method. One side of emasculator has cutting edge and other has serrations. The cutting edge should always be kept towards the operator. It is kept in position for 5-7 minutes which causes complete sealing of vessels and cutting of spermatic cord.

4. VERNELLS MOUTH GAG- It is used for examination of mouth of cattle or facilitates passing a probing.
5. CANINE TOE NAIL CUTTER- It is used to cut the nails of canine & feline.
6. VAGINAL SPECULUM- It is used to examine vagina and os.
7. CATHETER- It is used in retention of urine to locate site of obstruction.
8. FIRING DEVICES- It is used to check the haemorrhage and as a strong counter irritant in chronic inflammation of tendon and bones.

### **HOOF INSTRUMENTS OR FARRIER SET**

1. HOOF TESTER- It is used to test the tenderness of hoof so as to diagnose the seat of lameness & infections.
2. HOOF KNIFE- It is used to make disc shape area in sole at infection site in fractured foot of animals.
3. HOOF PINCER - It is used to trim the elongated hoof.
4. HOOF RASPER - It is used to rasp the hoof after shoeing to make edges regular after cutting the hoof.

### **DENTAL INSTRUMENTS**

1. MOLAR TOOTH EXTRACTOR FOR CANINE- It is used to extract the diseased molar tooth.
2. DENTAL FLOAT OR RASPER- It is used to rasp irregular molar in large animals after applying mouth gag.
3. MOLAR TOOTH CUTTER- is used to cut the sharp molar teeth.

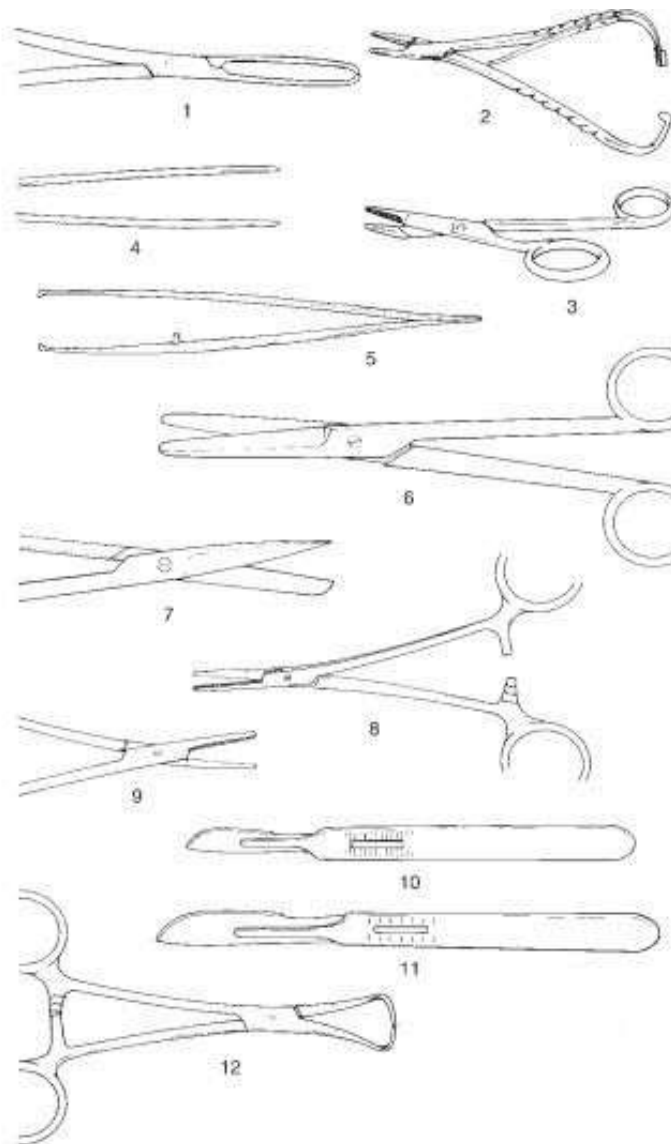
### **OPHTHALMIC INSTRUMENTS**

1. GRAEFE'S EYE SPECULUM- is used for retraction of eye lid for ophthalmic surgery.
2. IRIS SCISSOR- is used for sectioning the iris or cutting of eye tissues.
3. VON GRAFE FIXATION FORCEPS- are used for holding ocular tissue, delicately and firmly.
4. TISSUE FORCEP- is used for holding the ocular tissue.

5. CATARACT KNIFE- is used to incise the cornea at limbus.
6. LENS SPATULA- is used to take out lens after anterior capsulectomy.
7. TWO WAY CANULA- is used to irrigate anterior chamber to remove cell debris.
8. TONOMETER- is used to measure the intraocular pressure in case of glaucoma.
9. AIR INJECTION CANULA- is used for injection of air to re-establish the normal anatomy of eye.
10. OPHTHALMIC NEEDLE HOLDER- is used to hold the minute needle during corneal suturing.

### **Care of instrument**

1. Rinse soiled instruments in warm water and detergent. Dismantle instruments and use soft nylon brushes to remove adherent materials. Do not use DIY wire brushes or wire wool, which will damage the instrument surface.
2. Rinse in tap water.
3. Submerge the instruments with joints open, or in a disassembled state. Pay particular attention to cannulated or tubular instruments to ensure that the cleaning solution enters areas inaccessible to brushes.
4. Rinse in tap water.
5. Submerge the instruments in an ultrasonic cleaning bath filled with a proprietary cleaning agent. Do not use domestic dishwashing agents. which are too alkaline.
6. Rinse thoroughly in distilled water.
7. Immerse jointed instruments in a solution of instrument milk (an emulsion of instrument oil in water).
8. Wipe off excess instrument oil.
9. Examine for damage, faults and function.
10. Dry for storage, or pack for autoclaving.
11. Carefully follow the autoclave manufacturer's instructions to ensure that at the end of the cycle the instrument packs or boxes are dry. If they are not, they must be left in a warm dry place to dry out before storage.



**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).

## Practical-3

Date

### SUTURE MATERIALS, SURGICAL KNOTS AND SUTURE PATTERN

The word "suture" describes any strand of material used to ligate blood vessels or approximate wound edges. Sutures are classified according to their degradation properties. Sutures that undergo rapid degradation in tissues, losing their tensile strength within 60 days, are considered absorbable sutures. Sutures that generally maintain their tensile strength for longer than 60 days are nonabsorbable sutures.

#### Absorbable suture material

Type	Material	Duration at maximum strength (days)	Complete absorption time (days)	Colour
Catgut	Sheep's intestine submucosa	3-4	variable	Undyed
Chromic catgut	Sheep's intestine submucosa tanned with chromic salts	10-14	>120	Undyed
Dexon	Polyglycolic	10-14	90-120	Undyed/green
Vicryl	Polyglactin 910	14-21	90	Undyed/purple
Polyglyconate (Maxon)	Glycolic acid and trimethylenecarbonate	10-14	180	Undyed
Glycomer 631	Polyester of glycolide, dioxanone and trimethylene carbonate	12-20	90-110	Undyed
Polyglyton e6211	Polyester of glycolide, caprolactone, trimethylene carbonate and lactide	7-10	variable	Undyed



Polydioxanone (PDS)	Polymer of p-dioxanone	14	182	Dyed or undyed
Polysorb (Lactomer 9-1)	copolymer of glycolide (90%) and lactide (10%)	14	56-70	Dyed or undyed
Monocryl (Poliglecaprone 25)	Copolymer of glycolide and epsilon-caprolactone	7-14	91-119	Dyed or undyed
Panacryl	Poly(L-lactide/glycolide)	2-3 months	1.5-2 year	Undyed
Biosyn (Glycomer 631)	copolymer of glycolide (60%), dioxanone (14%) and trimethylene carbonate (26%)	14-21	90-110	Violet/undyed

- catgut is absorbed by phagocytosis/ proteolytic enzymatic digestive process while remaining absorbable suture material by hydrolysis.
- Methyl and ethyl, Butyl and Octyl monomers of cyanoacrylates are most widely used tissue glue. The setting time ranges from 2 to 60 seconds.
- Visceral and cutaneous wounds heal rapidly and are no longer reliant on the suture material for wound strength after 14- 21 days.
- Fascia heals at a slower rate and regains only approximately 20% of its original strength at 28 days and only about 70% at 9 months postoperatively. Hence healing of fascia relies on the inherent strength of the suture material to support the wound for a longer period of time

### Non-absorbable suture material

Type	Material	Thread structure	Colour
Silk	Silkworm cocoon	Braided	Black
Nylon	Polymers of nylon 6	Braided and mono/ multifilament	Undyed/dyed blue or green
Prolene, Surgipro, Surgilene	Polypropylene	Monofilament	Blue/undyed
Polyester (Surgidac, Mersilene)	Polyethylene terephthalate	Braided/multifilame nt	Undyed/dyed blue or green
Hexafluoro -propylene	Polyvinylidene fluoride and polyvinylidene fluoride-co- hexafluoropropylene	Monofilament	dyed blue
Cotton	Natural fibre	multifilament	Undyed
flexon	Stainless steel 316L	-	Dyed
Polyamide (Ethilon, Monosof, Dermalon, Bralon)	Polymer of hexamethylenediami ne and adipic acid	mono/multifilament	Dyed
Polymerize d caprolacta m (Supramid, Vetalil)	Polyamide polymer	multifilament	Smooth sheath of polyethylene/proteInaceo us material

**Guidelines for correct suture material handling:**

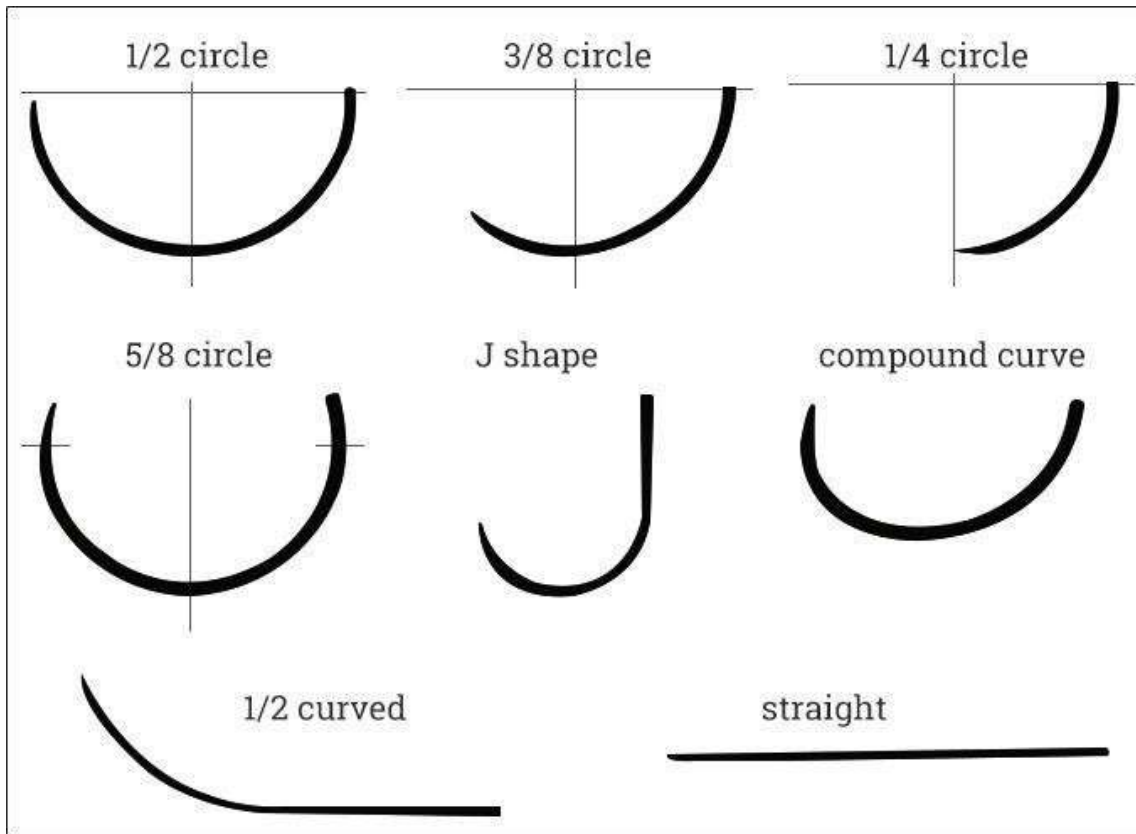
1. Protect suture materials from heat and moisture Do not autoclave absorbable suture materials.
2. Do not soak absorbable suture materials in fluid • Use suture material directly from the packet - do not handle before use.
3. Do not kink or crush suture material with instruments.
4. Straighten suture material with memory, using a gentle tug.
5. Check suture material for fraying or defects during use.







**Note:** Minimum and maximum number of throws for a stable knot is 3 and 7 respectively. generally, end knot in continuous pattern required 5-7 throws. Knot security is inversely proportional to the diameter of the suture.

**Suture size:** Two classification systems are in use: United States Pharmacopoeia (USP) or European Pharmacopoeia (PhEur); and the metric system.

Metric	USP/PhEur
0.2	10/0
0.3	9/0
0.4	8/0
0.5	7/0
0.7	6/0
1	5/0
1.5	4/0
2	3/0
3	2/0
3.5	0
4	1
5	2
6	3

## Surgical needle and their point shape



	POINT TYPE	SYMBOL
	TAPER POINT	●
	BLUNT TAPER POINT	○
	CUTTING EDGE	▲
	REVERSE CUTTING EDGE	▼
	TAPERCUT	⊗
	MICRO-POINT SPATULA CURVED	◄

## SUTURE PATTERNS / TECHNIQUES

The different suture patterns in surgery are as follows: -

<b>Name of Pattern</b>	<b>Wound Edge</b>	<b>Consideration</b>	<b>Possible Indications</b>
Simple interrupted	Apposition	Interrupted	Skin, subcutaneous tissue, fascia, nerve, blood vessels
Intradermal/subcuticular	Apposition	Interrupted/ continuous	Subcutaneous tissue
Cruciate/cross Mattress	Apposition	Interrupted	Skin, stump of tail, Digits
Horizontal mattress	Apposition/everted	Interrupted	Skin, subcutaneous Tissue
Vertical mattress	Apposition/everted	Interrupted	Skin, subcutaneous tissue, fascia
Far-near-near-fa	Apposition	Interrupted	Skin, subcutaneous tissue, fascia
Far-far-near-near	Apposition	Interrupted	Skin, subcutaneous tissue, fascia
Overlapping/Vest overpant	Overlapping	Sustain maximum tension	Ventral or abdominal hernias
Simple continuous	Apposition	Continuous	Subcutaneous tissue, fascia, muscles, blood vessels
Running	Apposition	Continuous	Peritoneum, thin muscle layer, loose connective tissue
Lock stich/ ford	Apposition	Continuous	Diaphragm, interlocking muscle

			layers
Lambert	Inversion	Interrupted/ continuous	Hollow organs like stomach, uterus, urinary bladder
Halsted	Inversion	Interrupted	Hollow organs like stomach, uterus, urinary bladder
Jobert	Inversion	Interrupted/ continuous	Hollow organs like stomach, uterus, urinary bladder
Cushing	Inversion	Interrupted/ continuous	Hollow organs like stomach, uterus, urinary bladder
Connell	Inversion	Interrupted/ continuous	Hollow organs like stomach, uterus, urinary bladder
Locking loop/ Modified Kessler	Apposition	Interrupted	Tendon
Intraneural	Apposition	Inverted	Nerve

### **APPOSITION SUTURES**

1. **SIMPLE INTERRUPTED SUTURE:** The most common pattern for skin closure is the simple interrupted suture. Needle pierced perpendicular to the plane of the tissue, with the ends emerging on opposite side of the wound. The knot should be on one side and not on the incision line. The distance between two sutures should be 0.75 cm in small & 1.25 cm in large animals. These sutures are more time consuming. Each stitch is tied independently. These are used in skin as well as muscle of small animals (Dogs).
2. **SIMPLE CONTINUOUS SUTURE:** It is a progressive series of sutures inserted perpendicular to the plane of tissues without interruption. A first stitch is placed as interrupted pattern & then subsequent stitches are taken right angle to the incision line or exposed portion of suture is diagonal to incision line & then tie last knot. This

pattern takes less time, but if one stitch break, the whole suture line disrupts. These are used close muscle in large animals.

3. **LOCK STITCH SUTURE:** Similar to simple continuous suture pattern except that the suture is passed through the preformed loop and tightened. It provides better apposition of wound edges and prevent diagonal crossing of wound edges by suture material. These are used to close skin wound of large animal & for closing of diaphragmatic hernia in ruminant. These are also known as ford interlocking suture. The only disadvantage is that greater quantity of suture material is required.
4. **SUB-CUTICULAR SUTURE:** are placed in subcutaneous tissues. These are used to eliminate dead space, Reduction of tension across the wound margins before placing the skin sutures and Approximation of wound margins.
5. **PIN SUTURE:** These are used in mobile part of body such as ear and eye. The pins are placed 1 cm from wound edges at 2 cm apart then silk is twisted in figure of "8" around each pin tie. These are used to oppose skin wound only.

### **INVERSION SUTURES (HOLLOW ORGANS)**

In this the edges of wound are inverted. They are used in hollow organs to prevent leakage.

1. **LAMBERT SUTURES:** The suture passes through serous and muscular layers but not the mucosal layers. The needle bites at right angle to the suture line. The course of suture material is far near & near far. It may be continuous or interrupted. These are used for hollow organs as rumen, intestine, bladder and uterus etc.
2. **CZERNY SUTURE:** It is double row of lambert suture.
3. **CUSHING SUTURE:** These are similar to lambert suture except that these are parallel to incision line.
4. **CONNEL SUTURE:** These are same as cushing except needle penetrates all the layer including mucosa.
5. **SCHMIEDEN'S SUTURE:** This is most suited for intestine. It causes minimum inversion of tissue means less narrowing of intestine. Needle always inserted from inside of lumen & use straight needle.

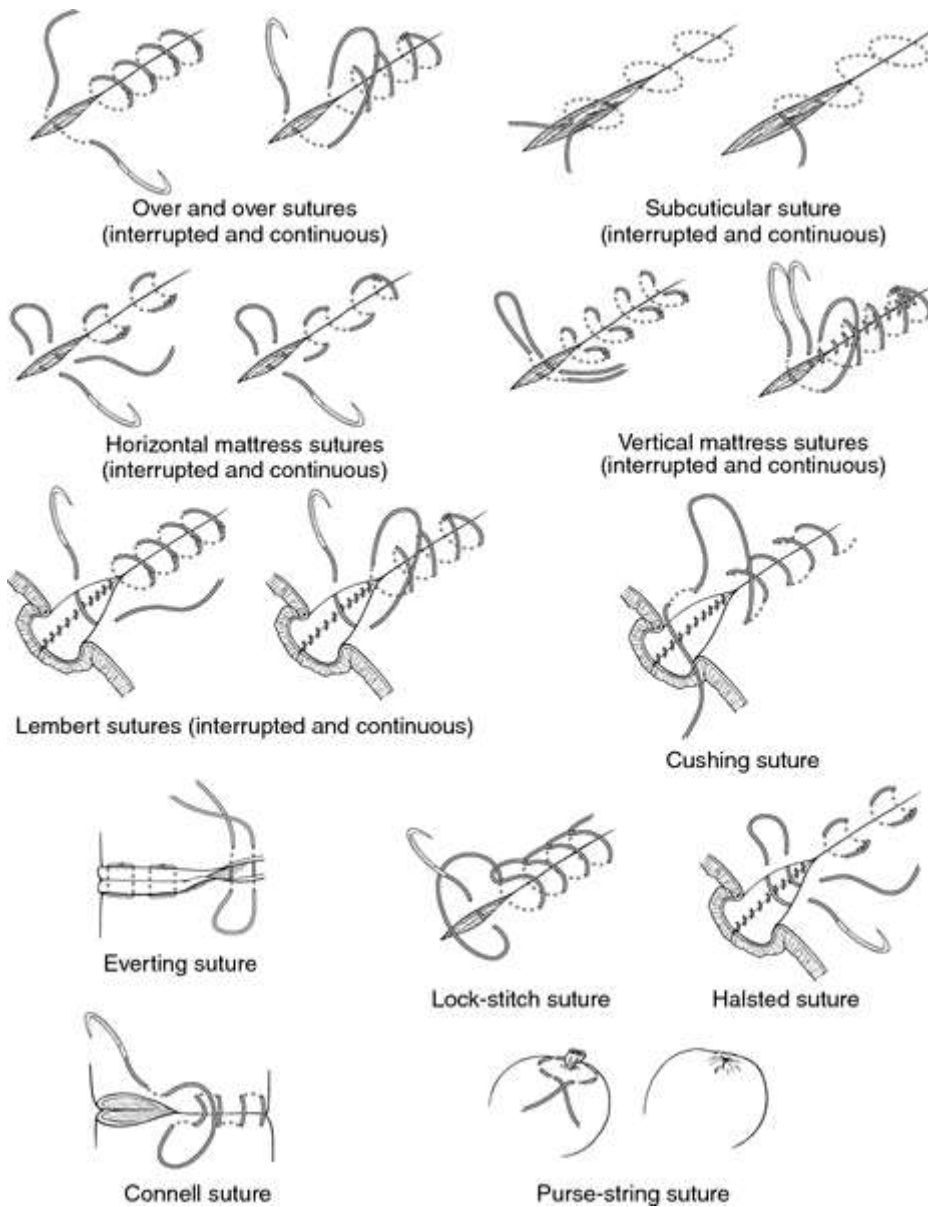
6. **JOBERT SUTURE:** It is just like Lambert suture. It penetrates mucosa also & chances of contamination are more.

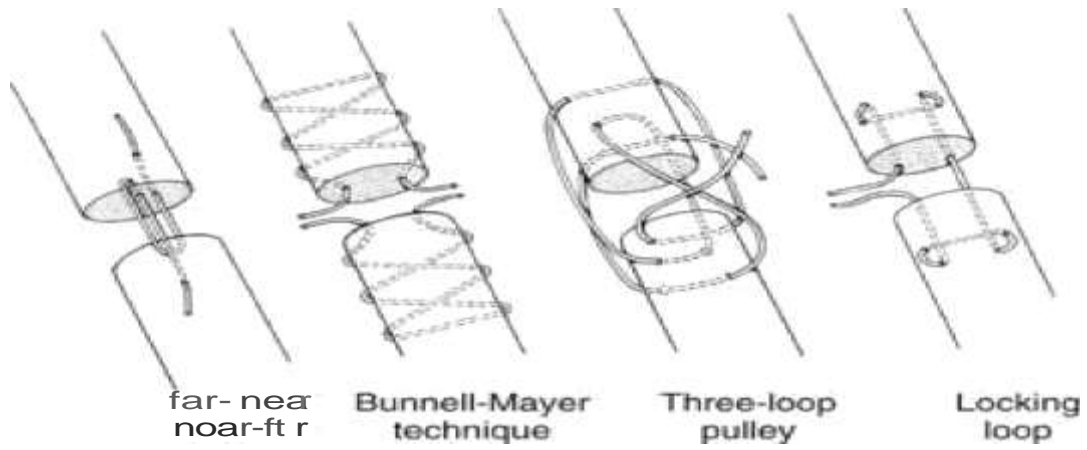
### **OTHER SUTURES**

1. **PURSE STRING SUTURE:** This suture is used to reduce opening and prevent prolapse of uterus & vagina. The needle passes through skin & muscles not mucosa.
2. **RELAXATION SUTURE OR TENSION SUTURE:** These sutures are placed at some distance from the wound through deeper tissue to produce relaxation at incision line.
  - **HORIZONTAL MATTRESS SUTURE:** The suture material is horizontal to incision line. The suture is started like interrupted suture but it returns to the same side of wound and tied. These are used on skin of large animals & are interrupted suture.
  - **VERTICAL MATTRESS SUTURE:** The suture material is vertical to the incision line. They cause less interference with blood supply or vertical mattress suture is a loop of suture material placed perpendicular to the tissue plane with both suture ends emerging on the same side of wound. These are used to suture teat fistula in cow, buffalo & goats.
3. **QUILT SUTURE:** is used in ear haematoma of dogs & goats. The needle passes from external surface of skin and emerges lateral to the wound margin on inner surface. The needle is returned to outer surface and ties a knot. These are compression suture.
4. **BUNNELL'S SUTURE OR 'Z' SUTURE OR TENDON SUTURE:** These are used to suture cut tendon. For this, two needles are used. The suturing is started on proximal stump from the middle of the cut tendon and needle is inserted transversely through tendon from medial to lateral aspect & then lateral to medial up to the cut end. The same procedure is repeated for distal end & then tie knot.
5. **OVER-LAPPING MATTRESS SUTURE:** These are applied on hernial ring where one side of tissue overlap on the other side.
6. **QUILL SUTURE:** These are vertical mattress suture in which pieces of quill are placed for equal distribution of tension.



7. **BUTTON SUTURES:** It is also relaxation suture where buttons are used instead of quill.
8. **NEAR AND FAR SUTURE (TENSION SUTURE):** These are used to prevent tension on the suture line.
9. **STAY SUTURE OR RETENSION SUTURE:** It is used to retain gauze on wound or protect the suture line.





(A) overhand knot



(B) reef knot



(C) square knot



(D) reef knot



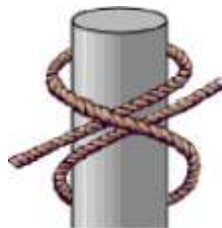
(E) half hitch



(F) Black wall hitch



(G) cat's-paw



(H) clove hitch



(I) sheet bend



(J) fisherman's bend



(K) sheepshank



(L) bowline

**General examination of surgical patients****History**

- Any previous anaesthetic problems or drug reactions are noted
- Relevant blood or lab tests are rechecked
- Any change in the clinical condition can be noted (for example, increase or decrease in size of lump, change in position, increase in number)
- Any concurrent illness is considered (for example, diabetes, epilepsy)
- Any prescribed current medication is noted

**Clinical and Physical Examination**

The animal should be systematically evaluated during the clinical and physical examination, and all body systems should be included.

- Examination of mucous membranes and evaluation of capillary refill time
- Temperature, pulse and respiration
- Any sign of dehydration
- Any sign of clotting disorder (petechiae, ecchymoses)
- Any concurrent disease (dental disease, skin infections, etc.)
- Any sign of cardiopulmonary disorder (Heart murmur, cough, etc)
- Body condition, attitude, and mental status
- Traumatized animals should have a neurologic examination and an orthopaedic examination

Evaluation of the preanesthetic physical status is one of the best determinants of the likelihood of cardiopulmonary emergencies during or after surgery; the more deteriorated the physical status, the higher the risk of anaesthetic and surgical complications.

Physical status	Animal's condition	Examples
I	Healthy with no discernible disease	Patient came for elective procedure (e.g., ovariohysterectomy, declaw, castration).
II	Healthy with localized disease or mild systemic disease	Patellar luxation, skin tumor, cleft palate without aspiration pneumonia
III	Severe systemic disease	Pneumonia, fever, dehydration, heart murmur, anemia
IV	Severe systemic disease that is life threatening	Heart failure, renal failure, hepatic failure, severe hypovolemia, severe hemorrhage
V	Moribund; patient not expected to live longer than 24 hours with or without surgery	Endotoxic shock, multiorgan failure, severe trauma

### Laboratory Data

- The animal's physical status and the procedure to be performed dictate the extensiveness of the laboratory work-up.
- Determination of hematocrit and total protein (TP) may suffice for young, healthy animals undergoing elective procedures (e.g., ovariohysterectomy, declawing) and for healthy animals with localized disease (e.g., patellar luxation).
- Limited biochemical and urine screening (e.g., blood urea nitrogen [BUN], creatinine, urine specific gravity) may be considered in these patients. If the animal is older than 5 to 7 years, even with a physical status of I or II, or has systemic signs (e.g., dyspnea, heart murmur, anemia, ruptured bladder, gastric dilation-volvulus, shock, hemorrhage),

then a complete blood count (CBC), a comprehensive serum biochemistry profile, and urinalysis should be done.

- Animals with neoplasia should be evaluated for metastasis (e.g., thoracic imaging [radiographs, computed tomography [CT], or positron emission tomography [PET/CT], abdominal ultrasound, lymph node aspiration).
- Those with cardiac disease should have thoracic radiographs, cardiac ultrasound scans, and/or electrocardiograms.
- Traumatized animals should have thoracic radiographs so that the diaphragm, pleural space, and lungs can be evaluated for conditions such as pulmonary contusion, pneumothorax, pleural effusion, or diaphragmatic hernia.

Although economic considerations are important, a thorough preoperative examination is cost-effective because it often prevents or predicts costly complications.

### **Determination of Surgical Risk**

Once the history, physical examination, and laboratory tests have been completed, the surgical risk can be estimated and a prognosis given:

<b>Prognosis</b>	<b>Criteria</b>
<b>EXCELLENT</b>	<ul style="list-style-type: none"> <li>• Potential for complications is minimal.</li> <li>• High probability that patient will return to normal after surgery</li> </ul>
<b>GOOD</b>	<ul style="list-style-type: none"> <li>• Some potential for complications</li> <li>• High probability of a good outcome</li> </ul>
<b>FAIR</b>	<ul style="list-style-type: none"> <li>• Serious complications are possible, but uncommon.</li> <li>• Recovery may be prolonged.</li> <li>• Animal may not return to its presurgical function.</li> </ul>
<b>POOR</b>	<ul style="list-style-type: none"> <li>• Underlying disease or surgical procedure is associated with many or severe complications.</li> <li>• Recovery is expected to be prolonged.</li> <li>• Likelihood of death during or after the procedure is high.</li> <li>• The animal is unlikely to return to its presurgical function</li> </ul>
<b>GUARDED</b>	<ul style="list-style-type: none"> <li>• Outcome is unknown or uncertain.</li> </ul>

## **Patient Stabilization**

- Patients should be stabilized as thoroughly as possible before surgery. Occasionally, stabilization is impossible, and surgical intervention must be done rapidly; however, replacing fluid deficits and correcting acid-base and electrolyte abnormalities before induction of anaesthesia usually are justified.
- Intravenous fluids are indicated for all animals undergoing general anaesthesia and surgery, including healthy animals having elective procedures.
- The need for perioperative antibiotics is dictated by the animal's disease and the procedure being performed.
- The patient's nutritional state often is critical in chronically diseased animals. Preoperative parenteral or enteral hyperalimentation sometimes is recommended to improve nutritional status before surgery.
- Oxygen therapy should be given to animals that appear to be in respiratory distress or that have other signs of oxygen deprivation

## Practical-5

Date

### **Sterilization, preparation of theatre, Surgeon and surgical pack**

**Sterilization** is the destruction of all microorganisms (bacteria, viruses, spores) on an item.

**Disinfection** is the destruction of most pathogenic microorganisms on inanimate objects.

**Antisepsis** is the destruction of most pathogenic microorganisms on animate (living) objects. **Cleaning** is generally restricted in meaning to the physical removal of surface contaminants, usually with detergents or soap and water, ultrasound, or other methods.

#### **Sterilization**

Any equipment that come in contact with body tissues or blood must be sterile. Methods of sterilizing surgical instruments include steam, chemicals, plasma, and ionizing radiation.

##### **1. Steam sterilization:**

- a. **Gravity displacement sterilizer:** The most commonly used steam sterilizer in veterinary practice is the gravity (or “downward”) displacement sterilizer. This sterilizer works on the principle that air is heavier than steam. The minimum time and temperature standards for a gravity displacement sterilizer are 10 to 25 minutes at 270° F to 275° F (132° C to 135° C) or 15 to 30 minutes at 250° F (121° C).
- b. **Prevacuum sterilizer:** The prevacuum sterilizer relies on air being actively pulled out of the inner chamber, thereby creating a vacuum. Steam is injected into the chamber to replace the air. This method of sterilization provides greater steam penetration in a shorter time than the gravity

displacement sterilizer. The minimum time and temperature standard for a prevacuum sterilizer is 3 to 4 minutes at 270° F to 275° F (132° C to 135° C).

- c. **Flash sterilizer:** Emergency or “flash” sterilization is performed when an unwrapped, nonsterile item must be sterilized quickly. A gravity displacement sterilizer is used for this purpose. The minimum time and temperature standard for a gravity flash sterilizer is 3 minutes at 270° F to 275° F (132° C to 135° C) for metal or nonporous items (i.e., items without a lumen) and 10 minutes at the same temperature for metal items with lumens, porous items (e.g., rubber, plastic), and autoclavable sterilized power tools.

## 2. Gas Sterilization

**Ethylene oxide** (EtO) is a flammable, explosive gas that kills microorganisms by altering their normal cellular metabolism and replication through alkylation of proteins, deoxyribonucleic acid (DNA), and ribonucleic acid (RNA). It can sterilize heat- or moisture sensitive medical equipment without deleterious effects on the material used in the medical devices (Endoscopes, cameras, plastics, power cables). Most items are sterilized at 54.4° C (130° F) for approximately 2.5 hours; heat-sensitive items are sterilized at 37.8° C (100° F) for approximately 5 hours and humidity 20-40%.

## 3. Plasma Sterilization

Plasma sterilization is a low-temperature sterilization technique that has become the method of choice for sterilizing heat-sensitive items (see Table 2-3). This process inactivates microorganisms primarily through the combined use of hydrogen peroxide gas and the generation of free radicals (hydroxyl and hydroperoxyl free radicals). Instruments can be sterilized at low temperatures (i.e., below 122° F [50° C]) and short time intervals (i.e., 45 minutes).

## 4. Peracetic Acid Sterilization

Peracetic acid is a highly biocidal oxidizer that maintains its efficacy in the presence of organic material. It denatures proteins, disrupts cell wall permeability, and oxidizes sulfhydryl and sulfur bonds in proteins and enzymes. The peracetic acid is diluted to 0.2% with filtered water (0.2 µm) at a temperature of approximately 50° C (e.g., flexible endoscopes).



## **5. Ionizing Radiation**

Gamma rays has been used for this type of sterilization. This low-temperature sterilization process is restricted to commercial use because of its expense. Items commonly used in the OR that are sterilized with ionizing radiation include suture material, sponges, disposable items (e.g., gowns, drapes, table covers), powders, and petroleum goods.

## **6. Cold Chemical Sterilization**

Chemicals used for sterilization must be noncorrosive to the items being sterilized. Glutaraldehyde has gained wide acceptance as a high-level disinfectant and chemical sterilant. It is noncorrosive to metals, rubbers, and plastics and provides a means of sterilizing delicate lensed instruments (e.g., endoscopes, cystoscopes, bronchoscopes). Immersion times for equipment in 2% glutaraldehyde: 10 hours at 68° F to 77° F [20° C to 25° C] for sterilization.

**Sterilization indicators** allow monitoring of the effectiveness of sterilization.

Indicators may undergo a chemical or biological change in response to some combination of time and temperature. Chemical indicators, which are available for steam, gas, and plasma sterilization, generally consist of paper strips or tape impregnated with a material that changes color when a certain temperature is reached

### **Preparation of operation theatre**

- At the Beginning of Each Day, wipe flat surfaces of furnishings and lights with a cloth dampened with a disinfectant solution.
- After Each Surgical Procedure
  - A. Collect used instruments and place them in a cool water and detergent or enzymatic solution.
  - B. Collect waste materials and soiled linens and place them in the proper containers.
  - C. Wipe instrument and surgical tables, stands, kick buckets, and heating pads with a disinfectant.
  - D. If necessary, clean the floor (move the surgical table and clean under it if body fluids have collected there).

- After the Last Surgical Procedure of the Day
  - A. Clean and disinfect kick buckets.
  - B. Check ceilings, walls, cabinet doors, counter surfaces, and all furniture, and clean as necessary.
  - C. Clean and care for individual items (e.g., monitoring devices, anesthesia equipment, surgical lights) according to the manufacturer's instructions.
  - D. Wipe counter surfaces and cabinet doors with a disinfectant solution.
  - E. Wipe instrument and surgical tables, stands, heating pads, and light fixtures with a disinfectant solution. Disassemble the surgical table if necessary, to clean it thoroughly.
  - F. Check supplies and restock as necessary.
  - G. Roll wheeled equipment (e.g., surgical table, monitoring devices) through a small amount of disinfectant solution placed on the floor.
  - H. Wet vacuum or damp mop the floor.
  - I. Scrub and disinfect sinks and clean and refill soap dispensers.

## **Preparation of surgeon**

### **1. Scrubbing**

All sterile surgical team members should perform a hand and arm scrub for 2-7 minutes before entering the surgical suite. The objectives of a surgical scrub include mechanical removal of dirt and oil, reduction of the transient bacterial population and skin's resident bacterial population. Chlorhexidine gluconate, Hexachlorophene, povidone-iodine, Parachlorometaxyleneol, Triclosan and alcohol-based solutions are used for scrubbing. For surgical scrubbing, follow below listed steps:

- Wet your hands and arms.
- Dispense the appropriate amount of solution into the palm of your hand by depressing the foot pump.
- Insert and twist the fingertips of your opposite hand into the solution for several seconds. Transfer the solution to your opposite hand and repeat this step with the fingers of your other hand.
- Rub your hands together, moving up the forearms to slightly past the elbows.

- Add water throughout the wash to create additional lather.
- Rinse thoroughly and repeat steps.

**Note:** During and after scrubbing procedures, the hands should be kept higher than the elbows. This allows water and soap to flow from the cleanest area (hands) to a less clean area (elbows). When drying your hands and arms, use one end of the towel to dry one hand and arm (work from hand to elbow). Then bring the dry hand to the opposite end of the towel and dry the other hand and arm in a similar manner.

## **2. Gowning**

All those entering the operating room suite should be appropriately clothed (Gown, cap, mask and footwear) to minimize microbial contamination. Steps to follow for gowning:

- Grasp the gown firmly and gently lift it away from the table.
- Step back from the sterile table to allow room for gowning.
- Hold the gown at the shoulders and allow it to gently unfold.
- Do not shake the gown because this increases the risk of contamination.
- Once the gown is open, identify the armholes and guide each arm through the sleeves.
- Keep your hands within the cuffs of the gown.
- Have an assistant pull the gown up over your shoulders, and secure it by closing the neck fasteners and tying the inside waist tie.
- If a sterile-back gown is used, do not secure the front tie until you have donned sterile gloves.

## **3. Gloving**

It can be performed by three separate methods: (1) gloving yourself using a closed method; (2) gloving yourself using an open method; and (3) assisted gloving.

### **Surgical pack preparation**

- Instruments should be cleaned as soon as possible after they have been used, as dried blood and debris are difficult to remove.
- Any linen or cotton drapes should be laundered and dried prior to packaging.

- Cotton muslin, Paper, Polypropylene fabric and Tyvek/Mylar can be used as wrapping material.
- Before loading instruments into the sterilization chamber, most are packaged together according to their intended use.
- All hinged instruments should be sterilized with their box lock fully open.
- Complex items must be disassembled.
- Instruments within each pack should ideally be separated by at least 3 mm.
- Items should be wrapped in such a way that they can be unwrapped easily without any break in sterile technique.
- sterilization indicator should incorporate into the pack.
- The chamber should not be overloaded, as this prevents adequate circulation of steam or gas; packs should be separated by 3- 5 cm and away from surrounding walls.
- Packaging materials are folded with small flaps folded outwards, so that these can be easily grasped during unwrapping of the package without contamination of the inner layer.
- The package is then taped closed with autoclave tape and is ready for sterilization.
- All instruments and surgical packs should be allowed to cool and dry before being stored away for later use.
- Packs that have been wrapped in cotton drapes can then be placed in a sterile plastic pouch, which is subsequently heat-sealed. This waterproof post-sterilization wrap greatly increases the shelf life of the surgical pack.
- Self-life of single-wrapped cotton muslin (2 layers) and double-wrapped cotton muslin (4 layers) surgical pack is 1 and 6 weeks, respectively.
- Heat-sealed plastic pouches (e.g. Tyvek) have self-life more than 12 months.
- After sterilization put a slip in pack mentioning the following information about type of pack, date and name of autoclaver.

### **Size of pack material**

Covering cloth: one of 1 x 1 meter. It forms the outer covering-of pack. It is also known as wrapper.

Base cloth: one of 1 x 1 meter. This is made multifold over which instruments are kept.

Gown (Full Sleeves): two required.

Shroud or drape: one of 1 x 1 meter with centrally placed window size 2'' x 6'' for small & 4'' x 12'' for large animals.

Towel: two of 0.5x0.5 meter.

**Steps of pack preparation:**

1. The wrapper is placed on the table.
2. Put the base in centre of it.
3. Set the instrument on the base of cloth.
4. The needle holder is held between thumb and little finger and all the instruments are placed one over the other as need; to secure them in position.
5. Allis tissue forceps are introduced through rings. Put the swab over this, then shroud which is folded in accordion fashion.
6. Over this put the gloves bag containing gloves with talcum powder.
7. Over the gloves bag, gowns and then towels are placed, finally this whole assembly is packed in wrapper or covering cloth.
8. The cap & mask are put inside the fold wrapper. The pack is then ready for autoclaving.

	<b>QUANTITY</b>
Halsted-mosquito hemostats, curved, 5 inch	2
Halsted-mosquito hemostats, straight, 5 inch	2
Kelly hemostats, curved, 5½ inch	2
Crile forceps, straight, 5½ inch	2
Rochester-Carmalt hemostats, curved, P Jq inch	4
Mayo-Hegar or Olsen-Hegar needle holders, 7 inch	
Brown-Adson tissue forceps	1
Allis tissue forceps, 5 × 6 teeth, 6 inch	4
Backhaus towel clamps, 5¼ inch	4
Metzenbaum scissors, curved, 8 inch	1
Mayo scissors, curved, 8 inch	1
Suture scissors, sharp-blunt, straight, 5 inch	1
<b>Insgrumer4 fray</b>	<b>1</b>
Blade handle, No. 3	1
Ovariohysterectomy "spay" hook	1
Saline bowl	1
Radio-opaque sponges (4 × 4 inches)	20

\*For spaying, laparotomy, wound or repair.

Jacobs chuck and key	1
Hohmann retractor	2
Army-Navy retractor	2
Periosteal elevator	1
Wire twister	1
<b>Stadium pin czdtar</b>	<b>1</b>
Kern or Lane bone-holding forceps	2
Reduction forceps	1
CMho\$zadic wire  l 8. 20. and 22 {§csugo)	1 ah
Kirschner wires	2 each
Intramedullary pins	2 each size

## **Practical-6**

**Date**

### **Preparation of surgical patients**

After finishing general examination, patients are prepared for surgery that held on next day. Following things should be given consideration for preparation of surgical patient.

- In adult animals, food intake generally is restricted 6 to 12 hours before induction of anaesthesia to avoid intraoperative or postoperative emesis and aspiration pneumonia. Food should not be withheld from young animals for longer than 4 to 6 hours because hypoglycaemia may occur. Water should withhold for 4-6 hours.
- Cattle that undergo elective surgical procedures under general anaesthesia in lateral or dorsal recumbency should be fasted 18 to 24 hours before surgery to decrease the ruminal content, ruminal distention, and risk of aspiration pneumonia. Water withheld for 8-12 hours.
- The animal should be allowed to defecate and urinate shortly before induction of anaesthesia.
- A general guideline is to clip at least 20 cm on each side of the incision. The clipping should be against the pattern of hair growth to obtain a closer clip.
- The animal is moved to the operating room, is positioned so the operative site is accessible to the surgeon, and is secured with ropes, sandbags, troughs, tape, or vacuum-activated positioning devices.
- The skin preparation is done (1) to remove soil and transient microorganisms from the skin, (2) to reduce the resident microbial count to subpathogenic levels in a short time and with the least amount of tissue irritation, and (3) to inhibit rapid rebound growth of microorganisms.

- Povidone-iodine, alcohol (isopropyl alcohol) and Chlorhexidine gluconate are generally used for skin preparation.
- Once the skin prepared, patient is draped to create and maintain a sterile field around the operative site. Draping is performed by a gowned and gloved surgical team member and begins with placement of field drapes to isolate the unprepared portion of the animal.



**Bandaging and basic wound management**

**Dressing** refers to the primary layer in contact with the wound.

**Bandage** comprises the primary layer, the secondary layer, which helps absorb exudates and provides support to varying degrees; and the tertiary layer, which helps protect the bandage and aids support.

**Desirable Characteristics of Wound Dressings**

- Removes exudates and toxic components
  - Maintains high humidity at the wound-dressing interface
  - Relieves pain
  - Protects from secondary infection
  - Protects from particulate or toxic contaminants
  - Allows dressing removal without wound trauma

**Wound Bandaging Materials**

Bandages have three basic layers:

1. The contact dressing (Primary) layer: remain in contact with wound surface. It may be adherent or nonadherent, and occlusive or semi-occlusive. It may be of following type:
  - a. Hypertonic saline
  - b. Calcium alginate
  - c. Polyurethane foam
  - d. Hydrogel
  - e. Hydrocolloid
  - f. Some topical medications
2. the intermediate (Secondary) layer: is an absorbent layer.
3. the outer (Tertiary) layer: holds the other bandage layers in place and protects them from external contamination.

## **Types of Bandages**

- 1. Absorbent bandages** are indicated for open contaminated and infected wounds. Absorbed debris is removed from the wound surface to allow better healing.
- 2. Adherent Bandages** are of wet-dry, wet-wet, and dry-dry types. These bandages are used early in the course of wound care for nonselective mechanical debridement of nonviable tissue and foreign material.
- 3. Nonadherent Bandages** Wet-dry, wet-wet, and dry-dry bandages are exchanged for nonadherent bandages when drainage becomes serosanguineous and granulation tissue forms on the wound.
- 4. Occlusive bandages** allow wound fluid and normal body moisture to accumulate and prevent external fluid contamination of the wound.
- 5. Tie-Over Bandages** The contact and absorbent layers of a bandage can be held in place with a tie-over bandage when the wound is in an area inaccessible to standard bandaging techniques (e.g., the hip, shoulder, axilla, or perineum).
- 6. Stabilizing Bandages** help immobilize fractures to minimize further tissue damage during transport for definitive fracture fixation. These bandages are heavily padded and often are referred to as Robert Jones bandages.
- 7. Postoperative or Closed Wound Bandages** may be applied to areas without an open wound to absorb fluid from a drain or incision line, to support the incision, to compress dead space, to apply pressure, or to prevent trauma or contamination. These bandages improve the patient's comfort by supporting wounds.
- 8. Pressure Bandages** facilitate control of minor hemorrhage, edema, and excess granulation tissue.
- 9. Pressure Relief Bandages** designed to prevent pressure over an area (usually a bony prominence) are used to treat or prevent pressure sores.
- 10. Moisture Retentive Dressings** provide a warm, moist wound environment that enhances cell proliferation and function during the inflammatory and repair healing stages.

## **Demonstration of surgery, control of haemorrhage and suturing**

### **Haemostasis**

The presence of blood during the course of an operation conceals the field of surgery and its accumulation in the wound afterwards it favours growth of bacteria and prevents primary healing.

### **Prevention of Haemorrhage**

- Use of Tourniquet: The tourniquet is applied in the form of band or cord tightly round the limb or appendage above the seat of the operation.
- Use of Esmarch's bandage: Elastic bandage applied from the distal part of the extremity to a point above the seat of operation. Tourniquet is then applied and bandage removed.
- Digital compression: Pressure maintained on the chief vessel of supply by the fingers of an assistant.
- Hypodermic injection of Adrenaline: Adrenaline can be injected hypodermically to prevent capillary haemorrhages.
- Thermocautery: Dull heat leads to retraction of the coats of the blood vessels and contraction resulting in diminished lumen and clot formation.
- Crushing: This can be practiced by using haemostatic forceps.
- Tearing: Tearing of the tissues often employed in the removal of tumours loosely attached situated in the vicinity of the vessels.
- Blunt dissection: Blunt dissection is performed by dissecting the tissues by the blunt instrument (Mayo scissor). This method is employed for isolation of large vessels like jugular and carotid.
- Ligation: Ligation of the bleeding vessels with silk or catgut. This is the surest method of arresting bleeding.

- Torsion: Torsion is sufficient to arrest haemorrhage from smaller vessels. Bleeding end of the vessel is secured with artery forceps drawn-out slightly and twisted on its long axis.
- Forcippresure: Forcippresure consists of applying an artery forceps to the end of the vessel and leaving it in position until it is convenient to apply a ligature.
- Crushing of arterioles: Performed by haemostatic forceps.
- Plugging of packing a hollow wound: Haemorrhage from the hollow wound can be prevented by packing the cavity with medicated gauze or cotton wool & applying one or two mattress sutures
- Application of styptics: Adrenaline, astringent lotions, tincture benzoin, ice and cold water can be applied to minimize bleeding

#### **Steps to follow for performing a surgery**

- Preparation and sterilization of surgical pack.
- Restraining of animal.
- Preparation of site.
- Administration of anaesthesia by anaesthetist.
- Preparation of surgeon and assistant surgeon (Scrub, donning, etc.).
- Handling of instruments in surgical pack.
- Placing the shroud with proper window positioning.
- Commencement of surgery under supervision of teacher.
- Practice of suturing
- Postoperative care.

