COURSE CODE: **VCS 503**

COURSE TITLE: **Food Animal Medicine**

NUMBER OF UNITS:

COURSE DURATION:

COURSE DETAILS:

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COURSE CONTENT:

Indications and operative procedures for curative, palliative and cosmetic surgical interventions involving soft tissues of the head, neck, thorax, abdomen, perineum and limbs of small and large animals. Diagnosis and treatment of lameness in horses, ruminants and pigs.

COURSE REQUIREMENTS:

READING LIST:

E

LECTURE NOTES

**INTRODUCTION TO THE PRINCIPLES OF RECONSTRUCTIVE SURGERY**

**Definition of terms**

1. Surgery: The branch of medicine that deals with the diagnosis and treatment of injury, deformity, defect and diseases by manual, instrumental or operative means
2. Reconstructive surgery: A branch of surgery that deals with the correction, restoration and improvement in shape and appearance of body structures that is defective, damaged or misshapen by injury, diseases or growth.
3. Wound: Injury to any of the tissues of the body especially that caused by physical means and with interruption of continuity.

**Anatomy of the skin**

1. Epidermis is made up of five layers and has no blood vessels
2. Dermis composed of two layers consisting of loose and dense connective tissue

**Functions of skin**

1. Protection
2. Thermoregulation
3. Metabolism of proteins and vitamin D
4. Immunological role

**Properties of skin**

1. Elasticity due to the amount of areolar connective tissue
2. Resilience: the ability of the skin to return back to its original form

**Challenges of reconstructive surgery**

1. Wound infection
2. Wound size
3. Wound location
4. Wound tension
5. Scar formation

**Techniques of reconstructive surgery**

1. Wound Debridement
2. Wound Suturing
3. Wound Excision
4. Flap construction
5. Wound grafting

**Causes of wound**

1. Physical injury
2. Thermal injury
3. Chemical injury
4. Animal
5. Neoplasia
6. Surgeon

**Criteria for wound classification**

1. Aetiology of the wound:

Incision is a wound created by a smooth object under aseptic condition.

Laceration is a wound produced by rough objects with varying degree of contamination

Abrasion is a wound characterized by loss of varying degree of the skin epidermis and dermis. The wound is grossly contaminated.

Punctured wound is a wound produced either by a projectile or a sharp object which penetrates into the deeper aspect of the tissue with minimal damage to the surface but extensive damage to the deeper tissue.

1. Degree of contamination

Clean wound is a wound that is produce under aseptic procedure with no contamination. Most surgical wounds are clean wounds

Contaminated wound: is a wound produced by contaminated objects or grossly contaminated after production

Infected wound is a wound with gross contamination and physical evidence of infection such as exudates etc

1. Duration of wound

**Phases of wound healing**

1. Hemostasis
2. Inflammation
3. Proliferation or granulation
4. Remodeling or maturation

**Aim of wound closure**

1. Restore skin back to normal anatomy and function
2. Minimal time for wound closure
3. Minimal scar formation following wound closure

**Types of wound closure**

1. Primary closure: wound apposed primarily and sutured. Wound closure progress faster. Useful only in clean wounds. However, edges of contaminated wound can be debrided and then apposed primarily. It is also known as first intension healing
2. Secondary closure: Wound closed by granulation tissue formation and wound contraction. Wound closure progressed slowly and scar tissue formation may be extensive. Used for contaminated or infected wounds. It is also known as second intention healing
3. Delayed primary closure: wound allowed to heal by granulation tissue formation for few days to ensure wound debridement; the scar tissue is then removed and wound primarily apposed. It is also known as third intention healing

**Factors governing the choice of wound closure**

1. Size of wound
2. Location of wound
3. Tension present
4. Degree of infection
5. Aetiology of wound

**Wound debridement**

1. Removal of contaminants, dead and devitalized tissue from the edge of a wound
2. The aim is to make primary closure of wound possible
3. Methods of wound debridement include scalpel debridement, enzymatic debridement, mechanical debridement and hydrostatic debridement

**Criteria of suture selection for wound suturing**

1. Preference of surgeon
2. Tissue to be sutured
3. Degree of infection or oedema
4. Tensile strength required
5. Characteristics of tissues and organs.
6. Knowledge of the physical and biological characteristics of various suture materials.
7. Patient factors (age, weight, overall health status, and the presence of infection).

**Features of ideal suture materials**

1. High uniform tensile strength, permitting use of finer sizes.
2. High tensile strength retention *in vivo*
3. Consistent uniform diameter
4. Pliable for ease of handling and knot security.
5. Freedom from irritating substances or impurities for optimum tissue acceptance
6. Predictable performance

**Criteria for classification of suture material**

1. Size and tensile strength: absorbable versus non-absorbable
2. Number of strands of which they are composed: monofilament versus multifilament
3. Degradation properties: absorbable versus non-absorbable
4. Sources of material: natural versus synthetic

**Wound undermining**

1. The process of the skin from its subcutaneous attachment
2. It allows the use of the skin elasticity to cover a defect
3. Can be done via a sharp or a blunt dissection.
4. **Wound excision or geometry**
5. Fusiform excision
6. Crescent shaped wound
7. Triangular, rectangular or square excision
8. Chevron shaped excision
9. Circular excision

**Closure of crescent shaped wound**

1. Suturing of skin edges of unequal length with removal of dog-ears
2. Rule of halves
3. Half of bow-tie technique

**Cause of dog ears (Puckers) following wound closure**

1. Large discrepancies in lengths between the long axis of the defect and its sides
2. Angle between the long axis of the defect and its side greater than 300
3. Subcutaneous skin attachment
4. Presence of excision over a convex surface

**Correction of dog ears**

1. Extension of the incision and removal of two triangles
2. Incising the base of dogs ear and removal of a large skin triangle
3. Extension of the fusiform excision
4. Removal of an arrow -shaped piece of skin and closure in the shape of Y
5. Half Z correction

**Causes of wound tension**

1. Too large the size of a wound
2. Too little the amount of loose connective tissue fibre
3. Poor skin elasticity
4. Making incision on a convex surface

**Tension relieving techniques**

1. Simple relaxing incision
2. Multiple punctuate relaxing incision
3. Bipedicle flap
4. V-Y plasty
5. Z- plasty

**Cutaneous Flap**

1. A unit of tissue that is transferred from one site (donor) to another site (recipient) while maintaining its own blood supply
2. Sushrata Samita described the of cheek flap around 600BC
3. Pedicle flaps were used extensively during first and second world war
4. Axial pattern flap was introduced in the 1950s
5. Fasciocutaneous flap was introduced in the 1980s

**Classification of flaps**

1. Type of blood supply: random flap versus axial pattern flap
2. Type of tissue to be transferred
3. Location of donor site: local flap versus distant flaps

**Axial Pattern flap**

1. One vascular pedicle: tensor fascia lata
2. Dominant pedicle and minor pedicle: gracilis
3. Two dominant pedicle: Gluteus maximus
4. Segmental vascular pedicles: sartorius
5. One dominant pedicle and secondary segmental pedicles: latissimus dorsi

**Composite flaps**

1. Fasciocutaneous flap: radial forearm flap
2. Myocutaneous flap: transverse rectus abdominis muscle (TRAM)
3. Osseocutaneous flap: fibula flap
4. Tendocutaneous flap: dorsalis pedis flap
5. Sensory/innervated flap: dorsalis pedis flap with deep peroneal muscle

**General principles of reconstructive surgery**

1. Replace like with like
2. Think or re-construction in terms of unit
3. Always have a pattern and a backup plan
4. Steal from Peter to pay Paul
5. Never forget the donor area

**Skin graft**

A segment of the epidermis and dermis that is completely removed from the body and transferred to a recipient site

**Indications for skin graft**

1. Tumor removal
2. Injuries to skin of extremities where skin immobility precludes tissue shifting or flaps
3. To resurface full-thickness burns

**Features of an ideal graft bed**

1. Healthy granulation tissue
2. Wound surface vascular enough to produce granulation tissue
3. Surgically created raw surface or surgically clean surface
4. Clean abrasion and avulsion wound

**Types of un-ideal graft bed**

1. Stratified squamous epithelium surface
2. Bone, cartilage, tendon or nerve denuded of overlying connective tissue
3. Infected wound
4. Crushed tissues
5. Heavily irradiated tissues
6. Avascular fat
7. Long standing granulation tissue
8. Chronic ulcers

**Process of graft acceptance**

1. Degeneration begins immediately after a graft is taken from donor site and regeneration begins after placement on the recipient bed
2. Regeneration progresses more slowly than degeneration
3. Regeneration must overtake degeneration process by 7th or 8th postoperative day
4. Grafts adherence to recipient bed is facilitated by fibrin network and later by fibroblasts, leukocytes and phagocytes
5. Graft vessels are kept dilated through capillary action which pulls cells and serum into the dilated graft vessels. This is referred to as plasmatic imbibition
6. Anastomosis of graft vessels with the recipient bed vessels is known as inosculation

**Aftercare of graft**

1. Hematomas should be removed from under the graft by swirling a cotton tipped applicator under the graft
2. Graft should be irrigated with thrombin or saline
3. Antibiotic ointment should be placed around the edges of graft
4. Non adherent dressing pad should be placed over the graft
5. An absorbent conforming mesh should be wrapped over the area and then the dressing immobilized with tape
6. Bandage should be changed frequently depending on the temperament of the patient and bandage cleanliness

**Types of graft**

1. Split-thickness graft
2. Split-thickness meshed graft
3. Full- thickness meshed graft
4. Full-thickness unmeshed graft
5. Seed grafts
6. Strip grafts

**Advantages of split-thickness graft**

1. Better viability
2. Abundant capillary network on the exposed dermal surface
3. In-growing vessels have less distance to traverse
4. Results in expansion of the graft size after healing to prevent contraction

**Disadvantages of split-thickness graft**

1. Less durable
2. More subject to trauma
3. Hair growth may be absent or sparse
4. Graft may have scaly appearance and lack sebaceous gland
5. Grafts harvesting is expensive and requires special equipment

**Indications for full-thickness graft**

1. To cover wounds that are less ideal i.e one with exudate, blood or serum
2. To cover large skin defect when there are inadequate donor site
3. To reconstruct irregular surfaces that are difficult to immobilize

**Advantages of split-thickness graft**

1. The slit in the graft provides flexibility for graft to conform to either convex or concave surface
2. Graft is stable because it can be fixed to bed with sutures
3. Exudate, blood and serum can drain from the wound surface through the slits
4. It provides additional vascularization

**SURGICAL CONDITIONS OF THE EAR**

**INTRODUCTION: THE EAR (REVIEW)**

1. Anatomically & functionally, the ear can be divided into four sections
2. The pinna
3. The external ear canal
4. The middle ear
5. The inner ear
6. The pinna is the most externally obvious but least important (functionally and clinically)
7. It is either erect or pendulous in dogs; short and erect in cats and erect in horses.
8. The pinna is attached to the cartilages that forms the external ear canal
9. The external ear canal is made up of two cartilages; the auricular and annular cartilages
10. These cartilages (auricular & annular) form a cartilaginous tube lined by stratified squamous epithelium and a rich layer of sebaceous (ceruminous) glands.
11. The external canal ends medially at the tympanic membrane.
12. The middle ear cavity (osseous bulla) begins at the tympanic membrane; It is an air filled bony shell lined by ciliated columnar epithelium
13. The middle ear cavity has a large lateral opening covered by the tympanic membrane, a medial opening (the auditory tube) leading to the pharynx and a dorsal openings in the epitympanic recess, the round and oval windows leading to inner ear structures.
14. The tympanic membrane and oval window are connected by the ear ossicles, which transmit and amplify sound waves.
15. The inner ear consists of fluid-filled tubes & neural structures that transmit sound and perceptions of equilibrium to the brain.

**I. AURAL HEMATOMA**

1. Aural hematomas occur most frequently in dogs with pendulous ears, although occasionally they occur in dogs with erect ears and in cat.
2. Although it is generally accepted that the primary cause is self-inflicted trauma from head shaking, scratching and rubbing the ear, the exact cause/pathogenesis is not known.
3. Underlying causes for irritation to the ear include acute or chronic inflammation, ectoparasite, foreign bodies and ear canal tumours and polyps.
4. The shearing forces from trauma to the ear rupture blood vessels and the blood accumulates between the skin and layers of cartilage in the pinna, forming a haematoma cavity.
5. Hematomas usually form on the concave surface of the ear but can occur on the convex surface or on both sides.
6. The size of a hematoma and its consistency is determined by the duration of the haematoma and severity of the trauma to the ear.

**TREATMENT CONSIDERATION**

1. Examination of both ears
2. Identification and treatment of the source of irritation to ear
3. Drainage of the haematoma
4. Maintaining opposition of the skin & cartilage
5. Preventing recurrence of the condition
6. Client education

**ANAESTHETIC TECHNIQUE**

1. General anaesthesia is recommended to examine, clean the ears and surgically treat (drain) the hematoma.
2. If general anaesthesia is not desired or contraindicated, sedation combined with local/regional anaesthesia may be adequate.

**MANAGEMENT TECHNIQUE**

Conservative treatments of hematoma include a variety of technique to drain the hematoma such as:

1. Aspiration with a needle (16-18 gauge)
2. Lancing with a scalpel blade
3. Suturing an indwelling Penrose drain into the hematoma cavity for continuous drainage.

**SURGICAL TECHNIQUE**

1. Clip/shave the ear on both side, scrub and drape
2. Open the hematoma with a longitudinal incision along its entire length
3. Remove the hematoma and curette/flush the cavity with saline to remove fibrin deposits.
4. Place mattress sutures parallel to the skin incision (5-10 mm in width and apart in each row, 2-4mm in cat).
5. Do not oppose the edges of the skin incision to promote drainage.
6. Full ear thickness sutures are placed and tied on the convex surface with enough tension to oppose cartilage and skin, obliterate dead space and pockets of hematoma cavity.
7. Synthetic absorbable or non absorbable suture can be used e.g. 2-0 or 3-0 nylon or polypropylene swaged on cutting needle.

**NON-SUTURE TECHNIQUE**

1. One disadvantage of suture technique is possibility that the treated ear may thicken, wrinkle and cauliflower.
2. These unwanted changes do not occur with sutureless method.
3. Make an elliptical incision on the concave surface over the swelling (after shaving, cleaning & drape) to expose the hematoma cavity from end to end.
4. Clean the cavity & thoroughly lavage it with saline.
5. Tape the ear firmly so that the incision is exposed and the pinna is reflected over a large roll of cast padding.
6. Place a non-stick dressing material on the incision surface & change as required.

**POST OPERATIVE CARE**

1. Bandage the ear, to protect it in the early stage of wound healing, stabilize ear flap and promote drainage.
2. Remove bandage 5-7 days
3. Remove sutures in 3 wks (if used)
4. Provide Elizabethan collar if patient show signs of traumatizing the ear.

**CLIENT EDUCATION**

1. Communication with client improves treatment outcome and reduces frustrations.
2. Explain causes of hematoma & different mgt opt.
3. Occasionally aural haematoma can reoccur in the same ear or in the opposite ear.

**SURGERY OF THE EYE**

**Causes of eye diseases**

1. Heredity
2. Trauma
3. Metabolic disorder
4. Infection
5. Neoplasm
6. Foreign body

**Signs of eye disease**

1. Pain
2. Inflammation
3. Eye discharges
4. Changes in the size of the eye
5. Changes in the coloration of the eye structure
6. Non -specific signs
7. Blindness

**Signs of eye pain**

1. Squinting
2. Blepharospasm
3. Excessive eye discharges (tearing)
4. Tenderness to touch
5. Sensitivity to light
6. Anorexia
7. Whining
8. Prolapse of third eye lid

**Classification of eye diseases**

1. Diseases of the eye lid: Ectropion, entropion, prolapse of the third eye lid
2. Abnormalities in the size of the eye: microphthalmia, lagophthalmia etc.
3. Disease of nasolacrimal apparatus: Dacrocystitis, keratoconjuctivitis sicca .
4. Diseases of the cornea: laceration, opacity, keratitis
5. Diseases of the globe: proptosis, rupture, glaucoma
6. Disease of the lens: cataract
7. Neoplasia of the eye
8. **Diagnosis of eye condition**
9. History: family history, breed etc.
10. Physical examination: symmetry, conformation, gross lesions
11. Schirmer tear testing
12. Fluorescein staining
13. Conjuctival cytology and culture
14. Tonometry
15. Ophthalmoscopy
16. Slit lamp biomicroscopy
17. Radiography
18. Ultrasonography
19. Electroretinography

**Treatment of ocular diseases**

1. Vasoconstrictor: tetrahydrozoline hydrochloride
2. Antibiotics: gentamycin, chloramphenicol, ciprofloxacin
3. Anti-inflammatory: betamethasone
4. Antipruritic: Doxepin, terfenadine
5. Miotics: cholinergics and anticholinesterases
6. Osmotic: Urea, Mannitol, Glycerol
7. Carbonic anhydrase inhibitors: Acetazolamide, methazolamide
8. Β blocking adrenergics: Timolol, nadolol, sotalol

**1. Meibomian gland adenoma**

1. Most common eye tumors
2. Extremely benign
3. Can suddenly enlarge due to chalazion formation
4. Base of the tumor is in the eye lid
5. More prevalent in dogs with hypothyroidism
6. Cause irritation by touching the cornea and secreting unusual inflammatory lipids

**Management of Meibomian gland adenoma**

1. Goal of treatment is to completely excise the tumor, maintain smooth eye lid margin and prevent secondary entropion, ectropion or trichiasis
2. Surgical resection with excision of up to 30% of eyelid margin
3. Cryoablation and surface debulking.
4. Blepharoplasty

**2. Prolapse of the third eyelid (Cherry eye)**

1. The tear producing gland located at the base of the third eye lid becomes loose and protrudes beyond the margin of the third eye lid
2. Appears as a pink bulge at the inner corner of the eye.
3. Sequelae can result in inflammation, cornea ulceration and scarring
4. Seen mostly in young dogs, while the Neapolitan mastiff, cocker spaniel, English bulldog, and Lhasa apso are more represented than other breeds.

**Management of prolapse of third eye lid**

1. Surgery is aimed at replacing the gland to its normal position.
2. A pocket can be created on the underside of the third eyelid into which the gland is positioned, and then the edges of the pocket are sutured together to hold the gland in place
3. Second technique involves suturing the gland in place
4. Complications include recurrence after surgery and dry eye despite replacement of the gland resulting in keratoconjuctivitis sicca.

**3. Entropion**

1. Inward rolling of the eyelid resulting in the hair on the surface of the eyelid to rub on the eyeball.
2. Often results in corneal ulceration or erosion
3. It is usually caused by genetic factors and may be congenital
4. It can also occur secondary to eye pain
5. Usually the dog squint and tear excessively
6. Upper or lower eyelid may be involved

**Management of entropion**

1. Surgical correction involves blepharoplasty
2. Excessive fold and section of the eyes are removed and the eyelids tightened.
3. Temporary sutures can be placed to roll out the eyelid in young dogs

**4. Ectropion**

1. It is an everted lid margin, usually with a large palpebral fissure
2. Causes include contracting scars in the lid, facial nerve paralysis and heredity
3. Result in exposure of the conjunctiva with resultant chronic or recurrent conjunctivitis

**Management of ectropion**

1. Mild cases with repeated, periodic lavage using mild decongestants
2. Topical antibiotics-corticosteroids preparation can temporarily control intermittent infection
3. Surgical lid shortening procedure are often indicated

**Ocular proptosis and rupture**

1. Protrusion of the eyeball from the socket
2. Often due to trauma resulting from attack, dog bite, fracture of the periorbital bone, gunshot etc.
3. Often result in severe pain, nervousness, bleeding from eye or nose.
4. Management depend on the severity of damage to ocular tissue
5. Ruptured eye is normally managed by enucleation followed by a permanent tarsorrhaphy.

**5. Cornea laceration**

1. Commonly results from trauma, foreign body, chemicals, misdirected eyelashes
2. Breeds such as Pekingese, Maltese, Boston Terrier, Pugs and Spaniels are more susceptible
3. Clinical signs include squinting, tearing, avoidance of light and corneal opacity
4. Diagnosis is by fluorescein staining
5. Use broad spectrum antibiotics and avoid preparations that incorporates corticosteroids

**6. Cataract**

1. Cataract is any opacity within the lens.
2. It can be inherited or may be acquired secondary to diabetes mellitus, toxic reaction in the lens, trauma, nutritional deficiency, birth defect, radiation and infection
3. Cataract often result in partial or complete blindness

**Management of cataract**

1. Phacoemulsification is the surgical removal of the central nucleus of the lens and the replacement with artificial lens
2. A circular incision is made at the corner of the lens capsule.
3. The lens nucleus is then liquify and aspirated using a metal probe
4. Artificial lens is then inserted to replace the focusing power and the capsule sutured back
5. A temporary tarsorrhaphy is then performed to prevent blepharospasm

**7. Glaucoma**

1. One of the most important causes of blindness in dogs and cats
2. It is usually associated with increase in intraocular pressure.
3. Most frequent in poodle, cocker spaniels, beagles, Jack Russell, Dalmatians etc.
4. It is define as a progressive optic neuropathy associated with a level of intraocular pressure non-compatible with normal function of retinal ganglion cells
5. Clinical signs include episcleral congestion, mydriasis, corneal oedema, and buphthalmia
6. Diagnosis is by clinical signs , tonometry , gonioscopy and ophthalmoscopy

**Management of glaucoma**

1. Aimed at draining the aqueous humor so as to reduce the intraocular pressure
2. Topical prostaglandin such as bimatoprost, travoprost and unoprostone can reduce intraocular pressure by increasing uveoscleral outflow through an enzymatic mechanisms
3. Other drugs that can be used to reduce the intraocular pressure are beta adrenergic blockers, carbonic anhydrase inhibitors etc.
4. Laser surgery is performed to selectively destroy the ciliary body in order to reduce aqueous humor production.
5. Other surgical techniques are enucleation, intraocular evisceration and implantation, canine specific intraocular shunt, valve shunts and Cyclocryotherapy

**Anaesthesia consideration for ocular surgery**

1. Age of patients
2. Interaction between ocular drugs and anaesthetic agent
3. Changes in intraocular pressure
4. Oculocardiac reflex
5. Local anaesthesia: Retrobulbar block
6. Premedication: Benzodiazepines preferred
7. Induction: Avoid ketamine. Thiopentone preferred
8. Maintenance: Halothane or isoflurane

**Enucleation**

1. Enucleation: surgical removal of the entire eye
2. Evisceration: surgical removal of the contents of the eye, leaving the white part of the eye and the eye muscle intact

**Indications for enucleation**

1. Eye rupture or prolapse
2. Abnormality in the size of the eye
3. Eye neoplasm
4. Eye infection with the risk of cranial
5. Surgical treatment of glaucoma
6. Control pain in a blind eye
7. Cosmetic improvement of disfigured eye
8. Reduce the risk of autoimmune condition e.g. sympathetic ophthalmia

**Technique of enucleation**

1. General anaesthesia is preferred, although sedation with retrobulbar block can be used.
2. Temporary tarsorrhappy is performed by suturing the two lids together using nylon monofilament.
3. Elliptical incision is made round the orbit and the ocular structure dissected free from the extraocular structure.
4. The Tenon capsule is ligated and then severed to remove the eye.
5. The lost eye volume is replaced by attaching implant such as. Polyethylene, hydroxyapatite to extraocular muscle.
6. The globe is then packed with sterile gauze and closed in two layers.
7. Ocular prosthesis can be inserted several weeks after surgery.

**SURGICAL CONDITIONS OF THE ESOPHAGUS**

**1. OESOPHAGOTOMY**

**INTRODUCTION**

1. Surgical conditions affecting of the neck region usually manifests clinically as difficult swallowing, excessive salivation, retching and vomiting, dyspnea, pain and general discomfort to the animal.
2. Some surgical conditions of the neck region are primarily conditions of the oesophagus and the trachea.

**REVIEW OF THE ANATOMY AND PHYSIOLOGY OF THE OESOPHAGUS**

1. The esophagus begins at the pharynx and terminates at the cardia of the stomach.
2. It consists of cervical, thoracic and abdominal portions being enveloped by pleura and peritoneum in the thoracic and abdominal cavities respectively.
3. No true serosa is present. It consists of four layers viz: loose areolar adventitia, two oblique layers of striated muscularis, submucosa and mucosa.
4. The absence of a serosa layer in the oesophagus which is present elsewhere in the GIT is of surgical consideration because serosa exude a fibrin clot that creates an early “seal” following surgical incision and closure of the intestinal tract .
5. Prevention of leakages following surgery thus requires meticulous technique and careful opposition of tissue.
6. The submucosa has mucous glands and loosely holds the mucosa (which contributes the most to suture holding capacity) to the muscular layer.
7. The role of the oesophagus is to transport food and liquid from the pharynx to the stomach: It has no absorptive or digestive functions.

**I. OESOPHAGEAL FOREIGN BODIES (OFB)**

**INTRODUCTION:**

1. OFB is the ingestion of foreign bodies (most commonly bone) that becomes embedded/ lodged in the oesophagus.
2. Most typical sites of F.B entrapment in the esophagus are the thoracic inlet, the base of the heart and just proximal to the cardia.
3. Highest incidence occurs in young dogs because of their indiscriminate eating habit howbeit, it is also seen in any age and species of animal.
4. Early detection is critical in reducing the risk of oesophageal damage or death.

**OESOPHAGEAL OBSTRUCTION**

1. Obstruction of oesophagus in the dog and cat is usually due to foreign bodies
2. Strictures and neoplasia are less common
3. Obstruction may either be partial or complete

**DIAGNOSIS**

1. A history of foreign body ingestion by the animal may or may not be

 provided by the owner

1. The clinical sign shown by an animal with OFB depends on the

 degree of oesophageal obstruction; the severity of injury to the mucosa

 or submucosa and the presence or absence of esophagus perforation

1. In partial obstruction with minimal mucosa injury, signs may be

 difficult to detect.

1. In complete obstruction and or with longer duration; regurgitation

 listlessness ,drooling , disphagia and pain are classic signs to be

 observed.

1. Cervical oesophageal perforation secondary (squeal) to obstruction may

 cause subcutaneous emphysema, local cellulitis, draining sinus tract(s)

 swelling and pain.

1. Intrathoracic oesophageal perforation will result into thoracic pain and

 respiratory distress due to preumothorax, pyothorax & pleuritis.

1. Not all foreign bodies are radiopague objects thus negative findings on

 survey radiographs do not exclude the presence of a foreign body in a

 dog with sings of oesophageal disease.

1. Barium sulphate suspension (meal) may be use for eosophagram

 (contract radiograph) / organic iodide -- gastrograffin

1. Endoscopic examination which allow direct visualization of the foreign

 body is a method of choice for determining the location of a foreign

 body, the degree of oesophageal damage and the most appropriate

 method of removal.

**MANAGEMENT**

1. Management of OFB/Obstruction could be non surgical or surgical.
2. Non-surgical removal of OFB should be attempted before surgical intervention except where there is evidence of oesophageal perforation.
3. Many instrument can be use to manipulate OFB but the choice of instrument should be based on the size and shape of the foreign body.
4. Rigid tube endoscope or fiber optic endoscope can be used.

**SURGICAL MANAGEMENT: OESOPHAGOTOMY**

Depending on the location of the OFB, the site of oesophagotomy can becervical, thoracic or abdominal.

 **CERVICAL OESOPHAGOTOMY**

1. Place the dog on dorsal recumbency under general anaesthesia and prepare the ventral cervical region aseptically for surgery (i.e. clip/shave hair, scrub and drape).
2. Make a veitral midline incision through the skin and subcutaneous tissue (judge the length by the size of the f. b).
3. Bluntly separate the sternolyoideus muscles on their midline and retract laterally to expose the trachea which is then held to the right (Exercise great care to avoid injury to the adjacent carotid sheath and left recurrent laryngeal nerve). This allows access to the oesophagus which lies to the left of the midline in the beck.
4. Isolate and pack off the oesophagus with moistened laperatomy sponges to minimize contamination and insert a large-bore tube per os to aspirate oesphageal content, immobilize it and serve as a “cutting board” to protect the deeper layer during incision.
5. Make a longitudinal incision in a healthy portion of the oesophagus near (caudal) or over the foreign body.
6. Grasp the f.b with appropriate forceps/instrument, gently manipulate and remove.
7. After removal of the insulting f.b, lavage the tissue with sterile saline and inspect for viability.
8. Close the oesophagus in 2 layers; the mucosa and submucosa with simple interrupted sutures with knots tied within the lumen using 3 –0 absorbable synthetic materials (e.g polydioxanone) while the muscularis is closed with same material and pattern.
9. Test for patency after closure by dilating the oesophagus with saline and observe for leakage.
10. Close the skin and subcutaneous incision routinely using simple interrupted suture with 2-0 Nylon.
11. **THORACIC OESOPHAGOTOMY**
12. The cranial and caudal thoracic oesophagus can be approached through either a left or right lateral intercostals thoracotomy**.**
13. The location of the f.b, as seen on a lateral thoracic radiography will determine the intercostal space to be used.
14. Perform thoracotomy (to be discussed later).
15. Follow every steps highlighted for cervical oesophagotomy.

**POST – OPERATIVE CARE**

1. Withdraw food and water for 48 hours.
2. Maintain the patient on intravenous fluids (Balanced electrolyte; Dextrose Saline solution, lactated Ringers etc) until oral intake is adequate.
3. Gradually return diet to normal between 7-10 days
4. Use antibiotics with discretion

**COMPLICATION AND MANAGEMENT**

1. Aspiration pneumonia due to oesophageal obstruction and repeated regurgitation of food and saliva. Removal of d f.b and appropriate correction of the perforation or diverticulum created by the f.b during surgery correct this.

**3. MEGA – OESOPHAGUS**

**DEFINITION/ INTRODUCTION**

1. A dilated oesophagus of any cause.
2. The dilatation can be secondary to neuro-muscular dysfunction or obstruction from neoplasia, structure or external composition.
3. Primary megaesophagus (Idiopathic, congenital) and Acquired form do exist.
4. The term megaoesophagus describe more appropriately, a syndrome in which the esophagus is dilated and hypomotile due to neuromuscular dysfunctions.
5. The little or no oesophageal peristalsis results in retention of ingesta in the oesophagus and thus esophageal distension.
6. Aspiration pneumonia is a common sequela to regurgitations and often may be the cause of death or euthanasia.

**HISTORY, CLINICAL SINGS AND DIAGNOSIS**

1. Clinical signs usually begin during puppyhood (Around 10 weeks when pup is weaned to solid food) but several reports have suggested that some 30-60% of dogs are adult when the condition is diagnosed.
2. Regurgitation of undigested food or water (oral or nasal) is the most common clinical sign which may occur immediately after eating or may be delayed up to 24 hours.
3. M.O affects most breeds of dogs but Great Danes, Irish setters and German shepherds are at high risk
4. Other clinical signs include:

 - Normal or ravenous appetite but poor weight gain,

 - Distension of the cervical esophagus (more pronounced when the

 dog coughs or when the chest is compressed),

 - Mucopurulent nasal discharge,

 - Coughing, dyspnea and poor hair coat.

1. Diagnosis is suggested/aided with the presenting complaint of chronic vomiting as usually perceived by the owner.
	1. Vomition is a reflex mediated via the brain stem and often

 associated with hypersalivation, frequent swallowing and vigorous

 abdominal contraction while.

* 1. Regurgitation is a passive process by which retained ingesta is

 expelled secondary to intrathoracic pressure.

1. Upper Barium series and fluoroscopy should confirm diagnosis.
2. Searching for an underlying disorder is recommended because correcting the underlying problem may allow oesophageal signs to go.

**Primary disorders associated with mega-osophagus in dog are:**

 - Myasthenia gravis - Systemic hupus erythematosus

 - Polyneuritis - Familial canine dermatomyositis

 - Polymyositis - Glycogen storage disease type II

 - Giant axonal neuropathy - Bronchiesiophgal fistula

 - Ganglioradiculitis - Spinal muscle atropy

 - Botulism - Polyadicloneuritis

 - Lead poisoning - Medulatry disease – Canine distemper,

 truma, neoplasia.

**Causes of Regurgitation**

* 1. Megaoesophagus (i.e congenital/ idiopathic or secondary)
	2. Esophagistis - Oesoph. Stricture
	3. Vascular ring anomaly - Neophasia
	4. Foreign body - Regional motility disorder
	5. Extra oesoph. Compression - Granuloma
	6. Diverticula - Gastroesophageal intussusception
	7. Hiatal hernia.

**TREATMENT**

1. Feeding of small amount of food to the animal from an elevated platform.
2. Cardiomytomy: reduction of functional obstruction associated with hypo motility of the oesophasus, asynchrony of the peristaltic wave in d caudal oesophagus and opening of the gastroesophgeal sphincter GES.

 The goal of cardiomyotomy is to allow the oesophagus to empty more easily

 however, **it does not resolve all cases of megaoesophagus.**

**VASCULAR RING ANOMALIES (VRA)**

  **INTRODUCTION**

1. It is a congenial heart problem or defect.
2. The oesophagus is entrapped by the abnormal position of the persistent right fourth aortic arch.
3. There is gradual dilatation of the oesophagus proximal to the obstruction as food accumulates, leading to eventual regurgitation and peristalsis disruption.
4. Persist Right Aortic Arch (PRAA) is the most predominant form of vascular ring anomalies. Other forms are: Persistent Patient Ductus Arteriosus (PPDA); Pulmonary Stenosis (PS)
5. VRA can occur in any bread but most prevalent in German shepherds and Irish setters. No sex prdilection has been demonstrated.

**HISTORY, CLINICAL SIGNS AND DIAGNOSIS**

1. Early signs are seen between 4 & 8 weeks when weaning pups to solid food. And the presenting sign is of persistent regurgitation shortly after eating, usually within 1 hour.
2. Affected animals are underweight, have good/ravenous appetite but demonstrate poor growth; often emaciated and cachectic.
3. There are some degrees of cervical ballooning (or distension) especially during cough
4. There is chronic coughing due to aspiration pneumonia which is a possible sequela to death in this condition.
5. Diagnosis is based on history, clinical signs, physical examination, radiography, oesophagoscopy and fluoroscopy.

- Plain radiograph of the thorax reveals an enlarged, air – filled and fluid-

 filled oesophagus cranial to the heart with some ventral displacement of

 the heart.

- Contrast oesophagram demonstrates precardia saccular dilation of the

 oesophagus that narrows at the base of the heart

- Fluoroscopy done prior to surgery could assist to evaluate oesophageal

 motility both cranial and caudal to the constricted portion.

 **MANAGEMENT**

1. Institute an aggressive supportive medical therapy before surgery aimed at correctly dehydration and nutritional deficits (these may last several days; up to 2 wks)
2. Treat co-existing aspiration pneumonia with antibiotics.

**SURGICAL PROCEDURE**

(Anaesthetic requirement is general inhalational anesthesia e.g.

 Oxygen / halothane).

1. In PRAA, the oesophagus is trapped between the aorta, the main stem of pulmonary artery and the ligamentum arteriosum LA (thus surgical intervention is based on severing the LA and associated fibrous constricting bands).
	1. Perform a left-sided thoracotomy through the fourth intercostals space. (This allows good access to the LA and the oesophagus)
	2. Gently retract the left apical lung lobe with care to break down the mediastinal pleura to reveal the vascular ring, which can be identified at the posterior end of the oesophageal dilatation (be very careful lest you damage the adjacent thoracic ducts).
	3. Bluntly dissect free the LA from the oesophagus and ligate it with 2 suture of 3-0 silk close to its aortic and pulmonary artery connections. Follow this with transection.
	4. Further free the oesophagus by blunt dissection of the mediastinum and adventitia for a distance of 1-2cm above and below the constricted portion beneath the ligamentum.
	5. Dilate the oesophagus by inserting a large Foley catheter or balloon dilator into it per os and pass it down to the site of constriction. (This ensures that the site of obstruction is well dilated to forestall recurrence of clinical signs due to structure).
	6. Reposition the left apical lobe of the lung and close the thoracotomy incision routinely (This will be discussed later).

POST OPERATIVE CARE

1. Provide water ad libitum and feed on bland diet/meal 3-4 times daily for 48 hours.
2. Restore normal diet over a period of 7 – 10 days
3. Feed animal on standing position of the hind limbs from an elevated platform.

POSSIBLE COMPLICATION

1. Regurgitation may re-occur because of stenosis at the surgery site or formation of extraluminal scar tissue.
2. Thus ensure adequate transection of fibrous band and balloon dilatation of the site.
3. Beware of aspiration pneumonia!

**OESOPHAGEAL DIVERTICULUM (OD)**

DEFINITION/INTRODUCTION

1. Circumscribed pouch or sac of variable size created by herniation of the mucosal lining through a defect in the muscular coat of the oesophagus.
2. It generally occurs in dog either cranial to the thoracic inlet or most often cranial to the diaphragm (epipheric diverticulum)
3. It may be congenital or acquired; pulsion or traction type.
4. OD is often associated with other lesions of the oesophagus or diaphragm (e.g. hiatal hernia, chronic oesophagitis, ulceration, and stricture).
5. The thin wall of the O.D may become ulcerated, weaken and rupture resulting in mediastinitis.
6. Motor function (i.e. peristalsis) remains normal unlike in megaoesophagus.
7. Aspiration pneumonia may be a sequela.

**HISTORY, CLINICAL SIGNS AND DIAGNOSIS**

1. Client report a history of progressive dysphagia, regurgitation, coughing and weight loss in prolong cases.
2. Contrast oesophagram demonstrates out-pouching and sacculation of the oesophagus.

**MANAGEMENT**

1. Perform a left thoracotomy through the eight intercostals approach.
2. Identify the oesophagus and isolate the diverticulum by blunt dissection down to its base.
3. Place a non-crushing clamp across the diverticulum at its base and excise below the clamp.
4. Close the oesophagus in an open, two-layer technique (as discussed during oesophagotomy).
5. Place a chest tube for drainage and close the thoracotomy incision routinely (to be discussed later during thoracotomy lecture).

**POST-OPERATIVE CARE AND POSSIBLE COMPLICATIONS**

As for cervical oesophagotomy

**SURGERY OF THE NECK IN HORSES**

**I LARYNGEAL VENTRICULECTOMY**

 **INTRODUCTION**

* 1. Laryngeal hemiplegia occurs in the horse when there is a paralysis of the left recurrent laryngeal nerve followed by paralysis of the intrinsic muscles of the larynx.
	2. These paralysis results in failure of the affected side of the larynx to dilate during inspiration; so that the flaccid vocal cord with a relaxed arytenoids cartilage encroaches on (i.e obstructs) the lumen of the larynx.
	3. During exercise, inspiratory dyspnea results in production of a characteristics noise known as “roaring” or “whistling”.
	4. Roaring is a recognized unsoundness in horses and this warrants correction.
	5. The cause of the nerve damage and subsequent muscle paralysis is yet to be understood. Possible trauma or congenital.

**DEFINITION**

* 1. Laryngeal ventriculectomy is the stripping of the mucous membrane of the laryngeal succule via the lateral ventricle in order to widen the airway and prevent obstruction on inspiration.

**INDICATION**

1. Laryngeal hemiplegia (roaring).

**ANAESTHETIC REQUIREMENT**

1. General anaesthesia (i.e. Gaseous inhalation with trachea intubation.
2. Standing chemical restraint with local anaesthesia ( Xylazine +Acepromazine +Lignocaine )

**PRE-OPERATIVE**

1. Prepare the throat region for surgery

 - Share any hair

 - Scrub with povidone

 - Drape appropriately for asepsis

 **SURGICAL PROCEDURE**

1. Make a 10- 12cm midline skin incision over the larynx from a line joining the posterior borders of the mandibular rami to the level of the first tracheal ring.
2. Dissect through the midline junction of the omohyoid and sternothyrohyoid muscles and place a Rigby self- retaining retractor to hold the muscles apart.
3. Expose the larynx and identity the crico-thyroid ligament (the ligament is triangular and its edges are bordered by the wings of the thyroid cartilage which converge to a point posteriorly and is crossed by a pair of blood vessels)
4. With the point of the scalpel blade, make an incision along the exact midline of the circothyroid ligament and its underlying mucous membrane extending anteriorly to the body of the thyroid cartilage and posteriorly to the cricold cartilage (exercise great care not to damage either cartilage).
5. Inspect the interior of the larynx and the component structures (the lateral ventricle is located under the vocal cord; and to obtain a good view of it, the vocal cord should be retracted laterally).
6. Remove the mucous membrane of the left laryngeal saccule in its entirely by hookings its mucosa on the edges of burr which is passed through the lateral ventricle in a postero-ventral direction till it engages the depth of the laryngeal saccule.
7. Push the burr firmly and slowly rotate it until it picks up the entire mucous membrane (continue this slowly and at the same time gradually withdraw the blurr from the ventricle wit the attached mucous membrane).
8. The laryngeal saccule is thus twisted to evert the membrane.
9. Clamp the base of the saccule with a gall bladder forceps and remove the burr.
10. Apply traction on the laryngeal saccule (with the gall bladder forceps to ensure it’s completely everted) and cut with myo-scissor along is attachment to the edge of the lateral ventricle.
11. Leave the incision/operative site open to drain.

**POST-OPERATIVE CARE**

1. Confine/ rest the horse in stable for 10wks.
2. Clean the wound of all discharges two or three times daily.
3. Healing takes place by granulation in about 3-4 wks

**POSSIBLE COMPLICATION**

1. Laryngeal obstruction due to oedema
2. Laryngeal spasm
3. Chondroma of either the typhoid or circoid cartilages

**PREVENTION/MANAGEMENT OF COMPLICATION**

1. Place a laryngotomy/tracheotomy tube to guard against laryngeal obstruction by post-operative oedema and also to prevent spasm of the larynx.
2. Avoid injuring the cartilages during the operation. (Halsted principle of surgery: be gentle on tissue/gentle handling of tissue).

**II. TRACHOSTOMY**

**DEFINITION**

1. TRACHEOTOMY: Vertical split (incision) in the anterior wall of the trachea at the level of the 3rd and 4th cartilaginous rings.
2. TRACHEOSTOMY: Fenestration in the anterior wall of the trachea by removal of a circular piece of cartilage (from the 3rd and 4th rings, species dependent), for establishment of a safe airway and reduction of dead space.
3. It could be temporary or permanent tracheostomy.

**INDICATION**

1. To relieve dyspnea due to stenosis or acute high obstruction
2. Substitute for laryngeal ventriculectomy to relieve the effect of paralysis of the intrinsic muscles.
3. Fracture of the tracheal ring
4. Tracheal Neoplasm
5. Ossification of larynx.
6. For placement of a trachostomy tube (permanent tracheastomy).

**ANAESTHETIC REQUIREMENT**

1. Horse standing under sedation (xylazine 0.5-1. 1mg/kg i/v or 1.1- 2.2mg/kg/ 1/m) and local analgesia (lignocaine 2%).

N.B: Under sedation, the horse lowers its head thus an assistant should support its head and neck extended so that the trachea is fixed and accessible.

1. Prepare the surgical site (i.e. shave and scrub).

**SURGICAL PROCEDURE:**

1. Make a longitudinal skin incision, 6 –7cm in length over the 4th to 6th tracheal rings in the midline of the under aspect of the neck.
2. Dissect longitudinally the aponeurosis of the sternohyoid muscles to expose the trachea.
3. Hold apart the skin and muscles by a self-retaining retractor and ligate/control any bleeding point.
4. Use the plug of the tracheotomy tube to be inserted as a guide to gauge the size of the disc to be removed.
5. Using a solid scalped, incise a semi-disc of cartilage from two adjacent tracheal rings (This leaves a strip of each ring intact and prevents the ring from collapsing.)
6. Insert the scalpel blade through the annular ligament and severe the upper ring while the disc of cartilage being removed is sized securely with kocher forceps (this prevents the possibility of the incised disc from slipping and getting lost into the trachea).
7. Complete the circular incision through the cartilage and remove the disc. (thus a tracheal window is created).
8. Insert the tracheotomy tube and place a permanent (self-retaining tube and set it in place.
9. Excise semicircles of skin and suture the edges around the tube

**POSSIBLE COMPLICATION AND POST-OPERATIVE CARE**

1. Oedema and mucous discharges due to local inflammatory reaction
2. Remove the tube and clean; lubricate daily until the border of the fistula is firm.
3. Keep the central stopper (plug) for the tube in place except during exercise to prevent accidental inhalation of foreign materials.

**III. OESOPHAGOTOMY**

**DEFINITION:** An opening /incision into the oesophagus.

**INDICATION (**Cervical oesophagotomy)

1. To relieve pharyngeal and cervical oesophageal obstruction caused by intra-oesophageal masses.
2. To feed a valuable animal that has pharyngeal paralysis.

**ANAESIHETIC REQUIREMENT**

General anaesthesia with tracheal intubation

**SURGICAL PROCEDURE**

1. Position the horse on dorsal recumbency and support the nose to prevent over extension of the neck.
2. Make a 20cm midline incision starting at the cricoid cartilage.
3. Dissect through the sternothyrohyoid muscles and retract the trachea to the right side.
4. Identify the oesophagus and dissect free the carotid artery and vagus nerve (Exercise great care to avoid damaging these structures and the left recurrent laryngeal nerve)
5. Insert a large-bore tube per os into the oesophagus to aspirate its contents, immobilize it and serve as a ‘cutting broad’ to protect the deeper layer during incision.
6. Use extra moistened drapes to isolate the oesophagus before you open it.
7. Make a 7-8cm longitudinal incision (preferably over the obstructing mass or just caudal to it in healthy tissue. The length of the incision also depends on the mass) through the oesophageal wall and then elevate the incision edges with tissue forceps.
8. Aspirate the lumen and remove the obstructing object.
9. Irrigate the surgical field liberally with normal saline
10. For esophagostomy; (i.e when a fistula is to be created as indicated for feeding), suture the oesophageal mucosa to the skin. And the fistula created should be large enough to allow easy passage of a large –bore stomach tube.
11. Close the oesophagus with 2 continuous row of suture using chronic catgut in a simple pattern.

**POST –OPERATIVE CARE**

1. Allow only water for the first 24 hours after surgery
2. Soft bran and chopped grass and green food can be fed for a week
3. Do not allow hay to be fed until the skin sutures are removed.

**POSSIBLE COMPLICATION AND MANAGEMENT**

1. Post operative local oedema; apply cold pack.
2. Wound dehiscence; pain and fever after the first 2 days (i.e. on the 3rd or 4th day). Drain the surgical site and clean it daily until granulation takes place.

**SURGICAL CONDITIONS OF THE TRACHEA**

**INTRODUCTION**

 **REVIEW OF SURGICAL ANATOMY AND PHYSIOLOGY OF THE TRACHEA**

1. The larynx, trachea and lungs have a common embryonal origin in a ventral outgrowth from the foregut.
2. The trachea is a flexible, ciliated, cartilaginous, and columna epithelia membranous tube that extends from the outlet of the larynx at the level of the second cervical (C2) to the bifurcation into the two principal bronchi at the level of the 4th to 6th intercostals space.
3. It can be divided into cervical and thoracic segments.
4. Blood supply to the trachea is segmented and arises from a number of major vessels in the cervical region and mediastrium.
5. The structures that comprise the carotid sheath (i.e. common carotid artery, internal jugular vein, vagosympathetic trunk and recurrent laryngeal nerve) lies alongside the trachea on the dorsolateral aspect in the cranial half of the neck and lateral aspect in the caudal half.
6. Exercise great care when mobilizing the cervical region so as to avoid damage to the carotid sheath structures.

**I. TRACHEAL COLLAPSE (T.C)**

 **DEFINITION**

1. A disorder of the trachealis muscle or rings that result in a functional tracheal stenosis
2. It is mostly observed in toy and miniature (e.g Toy poodle, Yorkshire Terriers, Chihuahua and Pomeranian)
3. The actual cause is unknown (although trauma may be indicative)
4. The tracheal muscle, the annular ligaments becomes weakened and flaccid and this allows flattening and narrowing of the lumen in a dorsoventral direction due to the elastic nature of the rings.

 **HISTORY, CLINICAL SIGNS AND DIAGNOSIS**

1. History of chronic cough and respiratory distress exacerbated by stress is the major complaint by the client.
2. Physical examination; (palpation of the tracheal) initiates coughing and respiratory embarrassment.
3. Radiograph and fluoroscopy can be used to confirm the condition.
4. Plash lateral cervical and thoracic radiograph often reveals that the most frequent sites of collapse are the caudal cervical and cranial thoracic areas of the trachea.

**MANAGEMENT**

1. Patient with less severe disease and collapse of minimal anatomic extent are managed by a combination of tracheal ring chondrotomy and plication of the tracheal muscle.
2. More severe cases with extensive lesions (collapse) are better managed using an extraluminal prosthetic device.

**II. TRACHEAL FOREIGN BODIES**

1. Rare in dog and cats
2. Usually aspirated while animal is playing or running or as regurgitus.
3. Clinical signs include choking, coughing, retching and vomiting depending on the degree of obstruction.
4. Diagnosis is through radiography and endoscopy.
5. Management is through endoscopy and long retrieval forceps or tracheotomy.

**III. TRAUMA**

1. Cervical bite wound are the most common cause of trauma to the trachea.
2. Blunt trauma or penetrating injuries may also results into laceration or tracheal avulsion
3. Clinical signs include: non-productive cough, hemotysis, dyspnea and cyanosis.
4. Rupture of the thoracic trachea or bronchi causes progressive tension pneumothorax, resulting in severe dyspnea and cyanosis.

**DIAGNOSIS**: based on history, clinical sings and physical examination Radiography and endoscopy can be used to localize and determine the severity of the lesion.

**MANAGEMENT**

1. May involve emergency administration of oxygen and treatment for shock (when present)
2. Tracheostomy may be indicated for endotracheal intubation if dyspnea and cyanosis are severe.
3. Tension pneumothorax can be managed by inserting a chest tube continuous suction system.
4. Correct laceration, small wounds and defects surgically.

**SURGICAL CONDITIONS OF THE RUMINANT STOMACH**

**INTRODUCTION**

1. Surgical conditions of the ruminant stomach usually manifest as distended abdomen which result into pain and general discomfort to the animal
2. There could be reduced or absence of ruminal movement and rumination
3. In **ruminal tympany**, there is distention of the rumen with gas of fermentation (bloat) and the abdomen assumes a drum/barrel-like condition
4. Mechanical obstruction of the esophagus or intestine and constipation could also result into this.
5. **Abomasal displacement** could be to the left i.e Left displacement of abomasums (LDA) or right i.e Right dilatation and displacement (RDA)

**AETIOLOGY**

1. **Ruminant tympany** could be acute or chronic:

a) Acute ruminal tympany could result from:

 i. Mechanical esophageal obstruction (choke) by foreign bodies e.g potatoes,

 mango, apple fruits

 ii. Sudden access to grains or very lush pasture

 b) Chronic ruminal tympany could result from:

 i Chronic reticulitis, commonly with adhension formation, with signs

 reflecting poor ruminal movement subsequent to vagal nerve injury.

 ii. Esophageal cancer (e.g alimentary lymphosarcoma)

 iii. Mediastinal lymph node enlargement; nodes resting dorsal to esophagus and

 effectively preventing eructation due to chronic systemic lymphadenopathy

 e.g pneumonia or actinobacillosis.

1. **Displacement of abomasum** could result from:
2. Abomasal hypomotility and hypotonicity resulting in delay emptying due to:

 i Diet: high concentrate intake, often with high fat and or protein with

 relatively low fibre

 ii. Overeating or sudden change in feed

 iii. Re-arrangement of viscera associated with stress/force of parturition

1. **Abomasal tortion** in which the mechanical movements involved are not well understood.

**HISTORY, CLINICAL SIGNS AND DIAGNOSIS**

1. History may reveal sudden onset of partial or complete anorexia, dullness and slightly apprehensive appearance.
2. There could be severe drop in milk yields in dairy cattle
3. The back is hunched and the abdomen assume a barrel-like condition with stiff gait
4. Salivation becomes excessive while the head and neck are extended, raised and lowered frequently.
5. There may be frequent coughing due to excessive salivation in the pharyngeal region
6. There may also be mild constipation initially and later some diarrhea (especially in LDA)
7. Diagnosis is based on presenting history and clinical signs.
8. Auscultation of left flank gives pathognomonic high piched metallic tinkling sounds (over middle area bounded by ribs 10-13) in LDA
9. Corresponding area of resonance is detected by applying stethoscope and by flicking fore finger against rib cage; echo-like sound heard in LDA is quite different from dull noise heard with rumen closely applied to left body wall.

**MANAGEMENT**

1. Rumenotomy (e.g with trocar and cannular) can easily relieve a case of acute ruminal tympany
2. Iodides and or antibiotics may be indicated in chronic systemic lymphadenopathy due to actinobacillosis or pneumonia.
3. Abomasal replacement by rolling from right side to left
4. Rumenotomy to correct ruminal impaction and abomasopexy as adjunct to abomasal replacement in LDA/RDA
5. Increase exercise by turning animal to graze or yard
6. Maintain access to bulk folder as high priority.

**II. TRAUMATIC RETICULITIS (HARDWARE DISEASE)**

1. The incidence is higher in dairy cattle and animals grazing in areas near construction sites.
2. Most foreign bodies ingested by cattle such as nails, rusting fencing wire, brooms, bristles e.t.c are pushed forwards by ruminal contractions into the honey comb reticulum which contract and the foreign body may penetrate into the mucosa while some such as small stones may fail to penetrate the rumino-reticular wall and remain in the rumen.
3. The common site for entrapment is the cranial and ventral reticular wall.
4. Penetration of 5-7mm depth results in perforation of visceral peritoneum and traumatizing of opposing parietal peritoneum, diaphragm and occasionally the abdominal wall and liver.

**CLINICAL SIGNS AND DIAGNOSIS**

1. In the acute stage; there is sudden onset of anorexia, dullness, severe drop in milk yield, stiff gait, slightly hunched back and mild ruminal tympany.
2. Some pneumoperitoneum, slight expiratory grunt, hard feaces with reduced volume and little or no rumino-reticular activity
3. Rectal temperature is initially elevated 39.7 – 41.1oC which later falls to 39.2 – 39.4 oC
4. Urination may be initially suspended due to pain in adoption of appropriate stance, followed later by passage of large volume of urine.
5. Ballotment/percussion of cranioventral abdomen may be markedly resented and pinching of withers may elicit a grunt and reluctance to depress the spine
6. In the chronic stage, which starts in about 1 week after the acute phase, there are no striking or characteristic signs
7. Appetite improves but not normal animal often prefers concentrates to roughages
8. Stance is normal though animal show some stiffness
9. Ruminant movement id present but with reduced intensity
10. Diagnosis: is easy in early stages of acute cases based on clinical signs but more difficult in chronic cases
11. In chronic cases, there is persistent moderate pyrexia with sporadic flare-ups, abdominal pain, anorexia and lowered milk yield.
12. Such recurrent attacks justify exploratory laparotomy and rumenotomy
13. Haematology shows luecocytosis with shift to the left which may be due to other causes
14. Radiography requires powerful equipments and interpretation is difficult
15. About 60% of reticular punctures completely recover spontaneously, 30% remain as localized area of chronic peritonitis while 10% develop serious squeal
16. Squeal includes:
17. Intra-thoracic penetration
18. Intra- abdominal penetration
19. Chronic reticular adhesions and abscesses

**MANAGEMENT**

1. Conservative medical treatment should be instituted as signs are assessed over a few days
2. Systemic antibiotics therapy for 3 days
3. Many cases respond temporarily to conservative therapy, thus surgical intervention (rumenotomy) is the preferred treatment for traumatic reticuloperitonitis

**SURGERY OF THE RUMINANT STOMACH**

I.  **RUMENOTOMY/RUMENOSTOMY**

 **INDICATION**

1. Removal of foreign body in traumatic reticulitis or traumatic reticuloperitonitis
2. Gross severe rumen overload (grain overload) involving acidosis following sudden ingestion of large volume of concentrates (e.g corn, barly, wheat e.t.c)
3. Exploratory purpose e.g in chronic intermittent ruminal tympany
4. Experimental fistulation for study/research purpose.
5. Ruminal impaction

 **ANAESTHESIA REQUIREMENT**

1. Local infilteration in inverted “L” or paravertebral analgesia [T13-L2] with 2% lignocaine having premedicated (sedated) with Xylazine HCL

  **SURGICAL TECHNIQUE**

 Make a left flank laparotomy incision as follows:

 Clip/shave generously and scrub a wide area of left flank

1. Drape with sterile green clothes or rubber drape with appropriate window
2. Make a full skin incision in single scalpel movement to exposed abdominal wall musculature (the paracostal incision should be about 15cm long, about 5cm behind the last rib and starting 10cm below lumbar transverse processes.
3. Using a myoscissors, bluntly dissect the abdominal muscles and expose the underlying transverse facia which is transect to reveal the parietal peritoneum
4. Pick up the parietal peritoneum with rat-tooth forceps and make a small vertical incision with scissors and extend it to correspond with length and direction of skin incision (air rushes audibly into the abdominal cavity at this point creating pneumoperitoneum, and contact surface of ruminal wall drops away as abdominal wall moves laterally).
5. To make an incision on the rumen (i.e rumenotomy) or create a “hole or window” on the rumen ( i.e rumenostomy)
6. Exteriorize the rumen using a Weingart frame or stay stuture and place sterile cloth or rubber drapes completely around the exteriorized rumen between the frame and abdominal wall to minimize or prevent contamination
7. Make a stab ruminal incision with scalpel tip and extend it to the desired length.
8. Siphon off any excessive fluid and remove any solid material causing obstruction.
9. Pass arm cranially and vertically over U- shaped ruminoreticular pillar and explore reticulum methodically (evidence of adhesions already palpated during intra-abdominal exploration may lead hand to a particular area).
10. Identify and examine the cardia and esophageal groove areas as well as the medial wall and examine the reticular floor and the cranial wall.
11. Remove loose reticular foreign bodies and search for pointed longitudinal foreign bodies lodged in secondary reticular cells.
12. If penetrating foreign body is found, note the depth and direction of penetration to consider the likely structures damaged at this time to aid prognosis.
13. To close the ruminal incision, remove the small ruminal clips of the Weingart frame or stay suture and clean the peritoneal surface before and after placing the two suture layers (a continuous Cushing inversion suture of 4.0 chromic catgut and continuous Lembert inversion suture of similar material).
14. Clean the rumen again with sterile saline and release the large forceps to permit the rumen to drop back into the abdominal cavity.
15. Close the laparotomy incision routinely

**POST OPERATIVE CARE**

1. Give systemic antibiotics for 3-5 days
2. Put animal in clean pen with fresh bedding
3. Feed little quantity of forage for few days
4. Apply antibiotic wound spray on the incision wound
5. Remove skin suture after 8-10days post operation.

**POSSIBLE COMPLICATION AND MANAGEMENT**

1. Wound dehiscence (control infection with antibiotics and ensure that sutures are appropriately placed).
2. Peritonitis (treat systematically with antibiotics and minimize spillage or contamination during surgery).

**II. ABOMASOPEXY**

 **INTRODUCTION**

1. Fixation of a replaced abomasums, after correction of a displacement by suturing the abomasal wall or it attached omentum to the abdominal wall.
2. The abomasums normally lies on the abdominal floor slightly to the right of the midline and it greater curvature gives attachment to the superficial part of the great omentum which arises from the left groove of the rumen.
3. In LDA, the abomasums becomes trapped between the left side of the rumen and the left abdominal wall; this in turn leads to a change in position of the omasum and a downward displacement of the duodenum mediated through the omental attachment between the lesser curvature of the abomasums and the duodenum.

 **INDICATION**

1. As adjunct to correction of LDA, RDA and abomasal tortion.

 **SURGICAL TECHNIQUE**

1. Left flank approach (Utrecht Method of fixation) shall be discussed because its more simpler and effective than other methods.
2. Make left paracostal incision as for exploratory laparotomy
3. Evacuate gas from abomasum and push it down to midline.
4. Suture the wall of abomasums through the greater omentum to the abdominal midline, midway between xiphisternum and umbilicus with 2cm apart using non-absorbable suture material (polyamide polymer).
5. Ensure that there is no interposition of jejunal loops while suturing.
6. Close abdominal flank incision routinely.

  **POST OPERATIVE, COMPLICATION & MANAGEMENT**

1. As for rumenotomy/rumenostomy.

**SURGICAL CONDITION OF THE INTESTINE**

**[FOREIGN BODY, MECHANICAL & ANATOMICAL/FUNCTION OBSTRUCTION]**

**INTRODUCTION**

1. Intestinal obstruction (IO) is a blockage of the flow of intestinal contents (chyme)
2. Obstruction can be complete or partial; mechanical or functional.
3. Complete obstruction causes significant and early clinical signs while partial

 obstruction causes few or no signs (and signs may arise later).

1. The most important initial physiologic effect (clinical signs) of complete acute

 bowed obstruction is fluid and electrolyte imbalance due to vomiting and

 progressive dehydration

1. Vomiting and dehydration leads to hypovolemia, poor tissue perfusion and eventual circulatory collapse
2. A mechanical obstruction can be due to an extensive intramural or intraluminal causes e.g a foreign body (bone, ball or toy) or tumor
3. Functional/anatomical obstruction is often due to hypo-dynamic state such as illus and strangulation of the blood supply to the loop of bowel
4. Also Vagotonia (disruption of vagus nerve) can lead to vagal indigestion which is a type of functional obstruction.
5. Some conditions that could lead to IO (i.e differential diagnosis) include:
6. Foreign bodies
7. Tumors (e.g Adenocarcinomas, Leiomyomas & Lymphosarcomas)
8. Intussusception (entrapment into inguinal, diaphragmatic, umbilical or

 peritoneal hernias OR through a rent in the intestinal mesentery).

1. Volvulus
2. Strangulation
3. Vagotonia

**HISTORY, CLINICAL SIGNS AND DIAGNOSIS**

1. Animals with intestinal obstruction are often presented with a history of vomition, and general malaise.
2. Vomiting is often first noticed post pradial but eventually becomes independent of food intake.
3. Anorexia ensures and the general physical status may worsen rapidly. Diarrhea may also be noticed if the obstruction is due to intussusception.
4. The most obvious clinical signs are general discomfort, vomition, and diarrhea which may sometimes be bloody especially if the cause is due to intussusception
5. Foreign bodies with sharp edges such as bone rarely cause complete bowel obstruction but tend to perforate the intestinal wall. This results into retching and vomition, dehydration and depression.
6. Obstructions caused by tumours are usually malignant and it affects middle-aged to older animals. Chronic weight loss, progressive worsening diarrhea and abdominal effusion are suggestive of neoplasia. A palpable abdominal mass may or may not be felt.
7. In obstruction due to intussusceptions and volvulus, affected patient have diarrhea usually fetid and bloody and abdominal pain, while vomition may be an inconsistent clinical and signs.
8. **DIAGNOSIS**: of intestinal obstruction are based on the combination of history, clinical signs and physical examination
9. Survey radiography, which is perhaps the most useful aid in diagnosing bowel obstruction often reveals presence of segmented dilated loops of bowel
10. Gas filled loops of bowel in the thorax indicate diaphragmatic hernia; in the groin (inguinal hernia): in the ventral abdominal subcutaneous tissues (umbilical hernia) are diagnostic.
11. Peritonitis resulting from rupture or impending rupture of the bowel is represented by loss of regional detail.
12. The actual foreign body may or may not be identifiable on the plain radiograph, in which case, contrast medium like barium sulphate (if perforation is not anticipated) or a water soluble media like diatrizoate meglumine is introduced
13. Loss of abdominal detail coupled with dilated loops of bowel and free gas in the peritoneum is associated with peritonitis.

**MANAGEMENT**

1. Since most animals presented with surgical disorders of the intestine are often physiologically compromised to some extent, correcting fluid and electrolyte imbalances before surgery is often desirable whenever feasible.
2. Enterotomy
3. Resection and anastomosis

**SURGERY OF THE INTESTINE**

**[ENTEROTOMY, RESECTION AND ANASTOMOSIS]**

**I. ENTEROTOMY**

1. Definition: incision into the intestine.

 **INDICATION**

1. Intraluminal intestine foreign body obstruction
2. Exploratory examination of intestinal lumen for evidence of mucosal ulceration, stricture or neoplasia

 **ANAESTHETIC REQUIREMENT**

1. General anaesthesia with Xylazine/ketamine or O2 / halothane

 **SURGICAL TECHIQUE**

1. Make a ventral midline laparotomy incision from the xiphoid to the pubis.
2. Applied an abdominal retractor (preferably self retaining) with moistened laparotomy sponges to the incision wound edges.
3. Isolate the affected bowel segment from the other visceral with saline soaked with sponges (the intestine proximal to the obstruction is often distended with fluid and has a congested or cyanotic appearance).
4. Locate the obstruction, milk the ingesta away from the foreign body and apply bowel the site of obstruction in order to avoid the spillage of the intestinal content when the bowel wall is opened.
5. With a No 15 scalpel blade, make a full thickness longitudinal incision on the anti-mesenteric border of the intestine in the viable tissue immediately distal to the foreign body (the length of the enterotomy should approximates the diameter of the foreign body).
6. Gently manipulate the foreign body through the enterotomy taking care not to tear the incision margin.
7. Aspirate any intestinal content and close the incision with an inverted suture (mattress) which penetrates the full thickness of the intestinal wall using an a-traumatic needle on 3-0 chromic catgut, poly-glycolic acid, poly-dioxanone or polyglyctin.
8. In chronically ill/debilitated patient that is hypoproteineamic, where enterotomy leakage is more likely to occur, a continuous inverting Cushing pattern gives good serosa-serosa apposition and luminal bursting strength that exceed those of the interrupted pattern.
9. Test for leakage by putting normal saline in 5ml syringe and inject into the intestine. Correct leakage by placing more sutures
10. Close abdominal wall routinely

**POST OPERATIVE CARE**

1. Continue replacement intravenous fluid and electrolyte therapy until dehydration, acid-base imbalances and electrolyte abnormalities are resolved.
2. Parenteral prophylactic antibiotics therapy
3. Provide bland diet 24-48 hours after surgery in the absence of vomition.

**POSSIBLE COMPLICATION AND MANAGEMENT**

1. Peritonitis is usually due to leakage from enterotomy

 Abdominal paracentesis or diagnostic lavage should be perform; if septic

 exudate is present, early exploration of the abdomen is indicated in which

 case resection and anastomosis may be carried out.

1. Haemoperitoneum
2. Haemorrhage
3. Adhension
4. Herniation
5. Ileus

**II. RESECTION AND ANASTOMOSIS**

 **DEFINITION**

 Excision of an unhealthy portion/segment of the intestine and repositioning of viable

 tissues/segments.

 **INDICATION**

1. Ischemic necrosis
2. Neoplasm
3. Irreducible intussusception

 **ANESTHETIC REQUIREMENT**

 As for enterotomy

  **SURGICAL CONSIDERATION**

1. Make a standard ventral midline laparotomy incision from the Xiphoid to the pubis and shield the incision with moistened laparotomy sponges
2. Exteriorize the segment to be removed and isolate it between the fingers of an assistant or clamped with intestinal forceps.
3. Isolate and ligate the mesenteric blood supply to the devitalized area
4. Severe the damaged section of bowel using a scalpel or very sharp scissors angled so that the mesenteric border is left longer than the anti-mesenteric border (this allows adequate blood supply to the mesenteric border)
5. After resection, there is often a marked difference in the lumen size of the two ends of the intestine. And the smaller piece can be trimmed off at an angle to reduce the disparity
6. Hold the open ends of the intestine side by side by bowel clamps and place stay sutures to minimize trauma. Anastomose (i.e suture/close) together by a single mattress stitches which are placed 3-5mm apart; tie the knots within the lumen of the intestine.
7. Closure is carried out with a non traumatic needle on 3-0 chromic catgut, poly glactin 910 or polyglycolic acid
8. Test for the integrity of the anastomosis by filling the occluded segment with saline
9. Close the mesenteric incision with 3-0 chromic catgut
10. Close abdominal wall routinely

**POST OPERATIVE CARE, COMMPLICATION AND MANAGEMENT**

1. As for enterotomy.

**SURGERY OF THE REPRODUCTIVE SYSTEM**

**Components of the male reproductive system**

1. Testis
2. Epididymis
3. Ductus deferens
4. Accessory sex glands
5. Penis

**Surgical diseases of the male reproductive system**

1. Cryptorchidism
2. Testicular torsion
3. Testicular neoplasia

Sertoli cell tumor

 Seminoma

Leydig (interstitial) cell tumor

Orchidectomy (castration): indications

1. Elective for population or breed control
2. Improve carcass quality (only in food animal).
3. Cryptorchidism
4. Testicular tumor
5. Testicular torsion
6. Benign prostatic hyperplasia
7. Perineal Hernia

**Approaches to castration**

1. Depends on the location of the testis and the species
2. Abdominal/ laparotomy approach
3. Inguinal/paramedian approach
4. Scrotal approach
	* 1. Pre-scrotal
		2. Scrotal
		3. Post-scrotal

**Methods of castration**

1. Burdizzo method
2. Elastrator method
3. Scalpel method

**Complications of castration**

1. Hemorrhage
2. Scirrhous cord
3. Scrotal swelling
4. Obesity
5. Scrotal abscess
6. Intra-abdominal hemorrhage

**Vasectomy**

1. Surgical transection of the ductus deferens in other to convert a male to a teaser for estrus recognition in the herd
2. An incision is made on the scrotum to expose the testis
3. The testis is milked out and the tunica albuginea and vaginalis incised
4. The spermatid cord is freed and the vas deferens separated from the vascular components.
5. The vas deferens is the resected longitudinally
6. The scrotal incision is then closed in two layers.

**Prostatic diseases**

1. Benign prostatic hyperplasia
2. Cystic prostatic disease
3. Paraprostatic cyst
4. Bacterial prostatitis
5. Prostatic abscessation
6. Squamous metaplasia
7. Prostatic neoplasia
	* 1. Adenocarcinoma
		2. Transitional cell carcinoma
		3. leiomyosarcoma
		4. Hemangiosarcoma

**Signs of prostatic diseases**

1. Urethral discharge
2. Tenesmus
3. Haematuria or dysuria
4. Intra -abdominal mass
5. Hind limb paresis
6. Abdominal distension

**Diagnosis of prostatic diseases**

1. Rectal examination
2. Radiography
3. Retrograde urethro-cystography
4. Ultrasonography
5. Cytology of prostatic washings
6. Prostatic markers
7. Biopsy
8. Lumbar spine radiography

**Surgical management of prostatic diseases**

1. Marsupialization
2. Omentalization
3. Partial prostatectomy
4. Total prostatectomy

**Complications of prostatic surgery**

1. Urinary incontinency
2. Urethral stricture
3. Fistula formation
4. Devascularization of the neck of bladder
5. Haemorrhage
6. Urinary tract infection
7. Recurring or relapsing prostatic disease.

**Female reproductive tract**

1. Ovaries
2. Uterus
3. Cervix
4. Vagina
5. Vulva

**Surgical diseases of the ovary**

1. Ovarian Cyst
	* 1. Follicular cyst
		2. Luteal Cyst
		3. Para-ovarian cyst
2. Ovarian Neoplasia
	* 1. Adenocarcinoma/cystadenocarcinoma
		2. Adenoma/ cystadenoma
		3. Granulosa cell tumor
		4. Dysgerminoma
		5. Teratocarcinoma

**Clinical signs of ovarian disorders**

1. Persistent estrus and mammary hyperplasia in follicular cyst
2. Anestrus or cystic endometrial hyperplasia in luteal cyst
3. Ovarian tumors may be associated with CEH, persistent estrus, abdominal distension or ascites.

**Diagnosis of ovarian diseases**

1. History
2. Physical examination
3. Vaginal cytology
4. Abdominal and thoracic radiography
5. Abdominal ultrasound
6. Laparotomy.

**Surgical diseases of the uterus**

1. Pyometra
2. Uterine torsion
3. Uterine rupture
4. Uterine prolapse
5. Uterine neoplasia
	* 1. Leiyomyoma
		2. Adenocarcinoma

**Signs of uterine disease**

1. Vaginal discharges: Blood, mucus or pus
2. Abdominal distention
3. Palpable abdominal mass
4. Non -specific signs: lethargy, anorexia, dehydration

**Diagnosis of uterine diseases**

1. History
2. Physical examination
3. Vaginal cytology
4. Abdominal and thoracic radiography
5. Abdominal ultrasound
6. Laparotomy.

**Indications of ovariohysterectomy**

1. Elective OVH to control population, prevent inherited anomalies and prevent the problems associated with estrus
2. Ovarian disorders such follicular cyst, ovarian tumors
3. Uterine neoplasia
4. Diseases of the uterus : CEH, metritis, Uterine rupture
5. Vaginal hyperplasia or vagina fold edema
6. Diseases related to hormone production: mammary tumors, perineal hernia.

**Technique of ovariohysterectomy**

1. Fast patient for 6-12 hours
2. Aseptic preparation of site
3. General anaesthesia preferred but epidural anaesthesia can be used along with sedation in high risk patient
4. Ventral midline incision through the linea alba in the dogs
5. Paracoastal or flank approach in the cats

**Complications of ovariohysterectomy**

1. Hemorrhage
2. Peritonitis
3. Stump pyometra/ granuloma
4. Recurrent estrus
5. Urinary incontinence / continence
6. Vulvovaginitis
7. Increased weight gain

**Indications for hysterotomy (caesarian section)**

1. Primary uterine inertia
2. Secondary uterine inertia
3. Relative or absolute fetal oversize
4. Fetal mal-presentation
5. Anatomic abnormalities of the pelvic canal
6. Fetal death Pregnancy toxemia

**Surgical technique of hysterotomy**

1. The gravid uterus is identified and an incision made at the inter-cornua junction.
2. The incision is extended with a scissors.
3. The fetuses are then grasped and pulled out through the uterine incision
4. The hysterotomy incision is closed with a double row of Lembert suture using an absorbable suture
5. The uterus is the rinsed with saline, returned to the abdominal cavity
6. Abdominal incision is then closed routinely

**Complications of hysterotomy**

1. Hemorrhage
2. Incisional dehiscence
3. Peritonitis
4. Retained placenta
5. Uterine adhesion or scarring
6. Eclampsia
7. Agalactia/mastitis
8. Pyometra or metritis

**Surgical diseases of the vagina and vulva**

1. Recto-vaginal/ recto-vestibular fistula
2. Vagina fold edema vagina prolapse
3. Vagina neoplasia

Transmissible venereal tumor

Leiomyoma/ leiomyosarcoma

**Episiotomy:**

Surgical incision of the floor of the vagina in order to widen the birth canal

**Indications**

1. Persistent Hymen
2. Vaginal tumor
3. Vaginal prolapse
4. Extraction of fetus

**Surgical technique**

1. An incision is made from the dorsal vulva commissure towards the anus along the median raphe.
2. Vulva fascia, muscle and mucosa are then incised.
3. The incision is then closed in three layers

**SURGICAL CONDITIONS OF THE KIDNEY AND URETERS**

**INTRODUCTION**

1. The Urinary system has metabolic, humoral and excretory functions
2. Most abnormalities of the system can be diagnosed by physical examination, urinalysis, bacterial culture and interpretation of serum chemistry. Although diagnosis of some surgical conditions may require additional and specific tests and good knowledge of renal pathophysiology.
3. The kidney and ureters are major organs/ structures of the urinary system
4. The kidney is a bean-shaped organ in dogs, cats, sheep and laboratory animals and lobed shaped in cattle and horses. It is located in the lumbar region.
5. The kidney filters blood, excrete the end products of body metabolism in the form of urine and regulates the concentrations of ions like hydrogen, sodium, potassium, phosphate and other ions in extracellular fluids.
6. The ureter is the fibromuscular tube through which the urine passes form the kidney to the bladder.

**SURGICAL ABNORMALITIES**

1. **Ectopic Ureter:** an abnormally placed opening of the ureter, either into the urinary bladder or at other site in the lower urinary or genital tract. This condition usually causes constant dribbling of urine and commonly associated with pyuria (pus in the urine. It may be obvious or microscopic – usually accompanied by bacteria).
2. **Horseshoe–shaped kidney**: an anomalous organ resulting from fusion of the corresponding poles of the renal anlagen (primordium; first beginnings of an organ or part of a developing embryo).
3. **Pelvic Kidney**:a kidney that failed to ascend from its primodial site to the roof of the abdomen.
4. **Enlarged kidney**: may be due to polycystic kidney disease, hydronephrosis, pyelonephritis or congenital absence of one kidney resulting in hypertrophy of the other
5. **Ureter hypoplasia**: segmental underdevelopment of the ureter causing stenosis and hydronephrosis.
6. **Unilateral Renal agenesis**: This is always accompanied by ureteral aplasia. The condition is typically an incidental finding so long as the other kidney is functioning normally
7. **Hydronephrosis**: results from outflow obstruction of the ureter, bladder or urethra. Obstruction eventually destroys renal functions due to elevated ureteral pressure and decreased renal blood flow leading to cellular atrophy and necrosis. Causes include intra-abdominal mass compressing the ureter, ureteral neoplasia, calculi, accidental ligation during OVH, torsion of renal pedicle, ureteral stenosis, stricture, ectopic ureter and pyelonephritis.

**II. NEPHROTOMY/NEPHRECTOMY**

1. Nephrotomy: is an incision of kidney (indication – Renal calculi)
2. Nephrostomy: creation of a permanent opening into the renal pelvis
3. **Nephrectomy**: surgical removal (excision) of a kidney

**INDICATION**

1. Chronic renal disease or severe injury that produces irreparable damage to the renal cells
2. Renal neoplasia if metastasis has not occurred
3. Solitary renal cysts causing serious dysfunctions
4. Severe renal trauma resulting in destructution of majority of renal parenchymal with uncontrollable haemorrhage and/or urine leakages
5. Hydronephrosis
6. Avulsion of renal pedicle
7. Congenital abnormal kidney drained by an ectopic ureter
8. Renal transplant
9. Infestation by Dioctophyma renale (renal worms) with severe degenerative changes
10. Polycystic renal disease complicated by pyelonephritis refractive to medical treatment.

 \*NB: Nephrectomy is seldom perform when the architecture and

 vascular supply of the kidney are normal.

**SURGICAL TECHNIQUE**

1. Anaesthesized and place the patient in dorsal recumbence having prepared the ventral abdomen aseptically for surgery.
2. Make a ventral midline abdominal incision from the xyphoid process through the umbilicus. Protect the incision edges with moistened laparotomy packs and insert a Balfour retractor (self retaining).
3. The right kidney is exposed by lifting the descending portion of the duodenum and positioning the other loops of intestine to the left of the mesoduodeum while the left kidney can be exposed by using the mesentery of the descending colon as a retractor to displace bowel loops to the right.
4. The exposed viscera should be covered with moist laparotomy sponges.
5. **Nephrotomy**:
6. Immobilize the affected kidney between the thumb and forefinger and incise the renal capsule on the midline sharply with a scalpel for about 2/3rd the length of the kidney having severe the cranial peritoneal attachment.
7. Bluntly separate the renal parenchyma with a scalpel handle or osteotome while the cut edges are retracted with forceps
8. Ligate and severe interlobar vessels within the incision
9. Carefully remove large calculi without fragmenting them with appropriate forceps
10. Explore each diverticulum systematically with a small mosquito forceps and flush with warm saline to ensure that all existing calculi are removed.
11. Appose the two sides of the nephrotomy incision with digital pressure from thumb and forefinger while a simple continuous synthetic absorbable suture is placed through the renal capsule.
12. Remove the vascular clamp or tourniquet placed on the renal artery to restore reperfusion.

 **NB:** i. The duration of ischemia to the normothermic canine

kidney should not exceed 20 minutes.

 ii. Occluding only the renal artery allows verous drainage

 of the kidney and increases the pliability of the kidney.

II. **Nephrectomy**

1. Grasp with tissue forceps the peritoneum over the caudal pole of the affected kidney to be removed and incise it with scissors.
2. Insert a finger into the peritoneum and gently peels it off from the kidney
3. Free the kidney from all attachment from perirenal fat and retroperitoneum by blunt dissection.
4. Ligate the renal artery, vein and ureter separately with 2-0 absorbable ligatures and transect distal to each ligature and remove the kidney.
5. Return the intestine back to normal position and close the abdomen routinely.

**POST OPERATIVE CARE**

1. Continue intravenous fluid therapy after surgery until animal can maintain hydration.
2. A catheter can be place to measure urine output
3. Antibacterial therapy based on bacteria culture and sensitivity test is maintained for about 4 weeks
4. Post operative radiographs should be taken to compare with pre-operative ones and to document removal of all calculi

**POSSIBLE COMPLICATION**

1. Urine leakage
2. Stricture formation

**III. URETEROTOMY**

**INTRODUCTION**

1. This is an incision into the ureter
2. Indications for ureterotomy include
3. Removal of obstructive ureteral calculi
4. Ureteral neophasia e.g. papillomas, papillary carcinomas, transitional cell carcinomas and mesenchymal tumors.

**SURGICAL TECHIQUES**

1. Place a tourniquet around the ureter proximal and distal to the calculus or lesion
2. Make a transverse incision through the dilated ureter over the calculus
3. Gently manipulate and remove the obstruction
4. Remove the tourniquet and flush the distal ureter into the bladder using a soft catheter (e.g. 3.5 French gauge)
5. Close the incision with 2-4 simple interrupted sutures using 5-0 synthetic absorbable

Post operative care and possible complication are similar to nephrotomy