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A. INFLAMMATION

- Inflammation is defined as the changes which take place in the living tissues and blood vessels as the result of any harmful stimulus **providing that** this stimulus does not cause sudden death to the cells.
- The degree of inflammation depends on the affected part and the causative agent. Therefore, it is noticed that inflammation caused by microorganisms is the most dangerous type of inflammation met with. This is due to the local damage of the bacteria and to the general effect of its toxins on the animal.

Causes: There are:

A- Exogenous

1- **Chemical:** Acids, caustic, and toxins.
2- **Physical:** Excessive heat and cold and ray burns.
3- **Mechanical:** Contusions, sprains, fractures, and dislocations.
4- **Malignant Tumours:** Causing intense reaction, in the surrounding tissues as sarcoma and carcinoma.
5- **Bacterial:** This is the most dangerous cause of inflammation owing to their local destructive effect on the tissues and the generalized effect of their toxins as previously mentioned.
6- **Parasitic:** External and internal parasites are causes of inflammation, e.g.,
   a. *Otodectes cynotis* causes otitis externa.
   b. *Onchocerca reticulata* induces a chronic form of tendonitis in equines.
   c. *Thelazia lacrimalis* is one of the causes of deep keratitis.
   d. *Gastrophilus larvae* induce intense inflammation of the mucous membrane of the rectum in equines and usually results in prolapse of the rectum in this species (Gastritis).

B- Endogenous

7- **Antigen-antibody interaction** (immune reaction).
8- Other factors such as tissue necrosis, thrombosis, infarction, massive hemorrhage, and deposition of salts.

Phenomena of inflammation:

Inflammation is characterized by three main, closely interconnected, and simultaneous phenomena: circulatory disorders (with exudation and migration … etc.), tissue alteration and proliferation of cells.

A- Vascular changes:

1- **Active hyperemia:** there is a generalized dilatation of arterioles, venules, and capillaries due to production of histamine-like substance after damage of tissue cells. There is increased blood flow to the area (hyperemia) after a short period of vasoconstriction.
2- **Stage of stagnation:** there is a gradual slowing down of the rate of blood flow, while the vessels remain widely dilated and engorged, finally stasis or stagnation occurs.
3- **Stage of exudation**: During this stage
   a. Capillary walls increased permeability.
   b. Exudation of plasma and escape of cellular constituents of blood takes place through the capillary walls. This exudate is called **Inflammatory Exudates**.
   c. The collection of inflammatory exudates causes swelling **(inflammatory oedema).**
   d. Along with the exudation of plasma is also emigration of leucocytes through the capillary walls. **Diapedesis of Leucocytes**
   e. A varying quantity of erythrocytes also escape into the inflammatory exudates (**Diapedesis of Erythrocytes**) especially when damage has been caused to the capillary walls.

B- Tissue changes:

- **Any irritant**, when
  - Very **Diluted** to be weak enough, acts as a **stimulant to the function and growth of cells**.
  - More **powerful**, it will cause changes varying from slight **degeneration up to complete necrosis and death** of the tissues.
  - **e.g.,** the **Endothelial Cells**, found on serous membranes become rounded, swollen, detached, lying free in the surrounding fluids and adopt the role of "phagocytes". **Connective Tissue Cells** behave similarly; enlarge by the addition to their protoplasmic contents and enter the fluids as "fibroblasts".
- All these detached cells retain the power to multiply by the process of "mitosis".

Clinical signs of inflammation:

A. Local symptoms:

1- **Redness of the affected area** is due to the dilatation of blood vessels and increased blood flow to the part and possibly also due to bleeding from small blood vessels which might have ruptured. The redness can, however, be observed only in the non-pigmented skin.
2- **Hotness:** is caused by the increased flow of warm arterial blood to the affected part as well as by chemical changes in tissues.
3- **Swelling:** is due to exudation of plasma and other blood constituents into the inflamed area and cellular proliferation. The swelling varies in size according to the vascularity of the area, the degree of injury, kind of tissue … etc. It is obviously less marked in avascular tissues and hard tissues, as compared to vascular tissues and loose areolar tissues.
4- **Pain:** is due to the increased pressure upon the sensory nerve endings in the area and may arise also from the irritating effect of toxins on the nerve causing local neuritis. The intensity of pain varies according to the nerve supply to the region, tenseness, and hardness of tissue …. Etc.
5- **Loss of function:** there may be either complete or partial loss of function of the area associated with inflammation. This may be due to: -
   a) Protective spasm of the muscles of the affected part to avoid pain during movement e.g., arthritis.
   b) Mechanical hindrance produced by the pressure of the inflammatory exudates.
   c) Paralysis of the nerve supply of the region due to the action of the produced toxins.

B. General symptoms:

Those are produced by the absorption of poisonous products from the site of inflammation into the general circulation resulting in:

1- Elevation of the body temperature.
2- Loss of appetite, imperfect digestion, constipation and dry skin and suppression of milk yield in lactating animals.
3- Acceleration of pulse and respiration.

Aim of inflammation:

The purposes of the inflammatory process are:

1- To maintain the nutrition of the tissues to the highest level.
2- To dilute and wash away the toxins in the affected part.
3- To destroy the bacteria and toxins through supplying more leucocytes and antitoxins.
4- To remove degenerated and dead cells through phagocytosis and increased blood and lymph.
5- To rest of the affected tissues as near as possible to normal.

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Terminations of inflammation:

1- **Delitescence** (disappearance of symptoms): In which the inflammation suddenly subsides. It usually takes place in very mild cases.
2- **Resolution**: Occurs in other favorable cases after the irritant has been removed or neutralized and the inflammatory process has been completed. The inflammatory exudates gets reabsorbed through lymphatics and the damages cellular matters are removed by phagocytosis. The tissue cells are either regenerated or are replaced by fibrous connective tissue. There is apparent resumption of function, although, there is alteration in the tissue.
3- **Induration**: resulting from chronic inflammation, where connective tissues are formed in large quantities with a new set of capillaries. The tissues in the area become thick and hard.
4- **Suppuration**: when the inflammation is produced by pyogenic organisms, there is pus formation leading to abscess formation.
5- **Gangrene**: when the cause of inflammation is so severe, the tissues are completely destroyed and there is massive death of tissues.

Classification of Inflammation:

Inflammation is classified according to several factors:

A- According to intensity of symptoms and duration of course:	B- According to the Nature of inflammatory exudates:	C- According to the tissue involved:
1- **Acute inflammation** (exudative inflammation): It is caused by a severe irritant. The symptoms are very pronounced. It is rapid in onset and has a short duration. 2- **Sub-acute inflammation:** The symptoms are less pronounced. 3- **Chronic inflammation:** Caused by mild and frequently repeated attack of an irritant. The exudative phenomena and other symptoms are not so marked as in acute inflammation. The characteristic feature of chronic inflammation is formation of fibrous tissue.	1- **Serous inflammation:** inflammation of serous membranes like peritoneum and pleura wherein an abundant serous exudate is produced. 2- **Haemorrhagic inflammation:** when large number of RBCs are present in the exudates. 3- **Fibrinous inflammation:** In which the exudates contain large quantities of fibrin. The fibrin coagulates and may cause adhesion between inflamed surfaces presenting a "bread and butter" appearance, e.g., fibrinous pericarditis. 4- **Purulent (suppurative) inflammation:** It is characterized by the formation of pus. 5- **Catarrhal inflammation:** inflammation principally affecting the mucous surface, and which is marked by a discharge of mucous and epithelial debris. 6- Mucopurulent, sero-fibrinous …… etc. 7- Specific inflammation, e.g., actinomycosis, botryomycosis, T.B. etc.	1- **Skin:** Dermatitis. 2- **Muscles:** Myositis. 3- **Nerves:** Neuritis. 4- **Periosteum:** Periostitis …. etc.

Treatment of inflammation:

A- Acute inflammation:

1- The exciting cause of inflammation should be removed.
2- Keep the inflamed part at complete rest.
3- Cold and astringent application are indicated to suppress inflammatory exudation. The application of cold water, ice, astringent lotion (lead subacetate) is commonly used. This method of treatment is indicated for early stages of slight inflammatory conditions, its action is to constrict the blood vessels, decrease the amount of blood in the inflamed area.
4- Warm applications (fomentations) are indicated in severe inflammations where tissues are threatened with gangrene. They induce proper circulation and thereby favor reabsorption of exudates. Fomentations are given in the form of either dry heat or moist heat. Heated bran, sand …. etc., covered in cloth bundle is used to provide dry heat. Cloth pieces dipped in hot water provides moist heat. Medicated poultices, antiphlogistic and similar preparations can be used in the form of a thick paste covered by a layer of cotton wool have an excellent effect.
5- Scarification: This method is used for removal of exudates and to decrease pain from the inflamed part, but its disadvantage is that it opens the way for infection. Therefore, it should be done under strict aseptic precautions.
6- Local analgesic preparation for superficial lesions can be applied to relieve pain, such as lignocaine gel or ointment.
7- Massage and compressions: Massage improve the blood circulation and compression produces warmth. Compression is performed by surrounding the inflamed area with cotton and a gauze bandage was applied.
8- Cortisone and its allied preparations are extensively used as anti-inflammatory agents. They are excellent for alleviating the symptoms but may have no remedial value.

B- Treatment of chronic inflammation:

Chronic inflammations are treated by counter irritant in the form of rubefacients, postulants, blisters, and firing.

1- **Rubefacients**: as turpentine oil camphor liniment or iodine oint. These are massaged thoroughly at the inflamed area.
2- **Blisters**: a biniodide mercury blister, where the hair is clipped, and the blister is massaged for 5 minutes. There are some precautions which must be undertaken before applying a blister. These precautions are:
   - **a)** The blister must be applied early in the morning so that the owner can notice his animal all day.
   - **b)** A bandage must be applied on the blistered area when possible so that the animal cannot lick the blister.
   - **c)** Blisters are never applied on the medial side of the thigh to avoid inflammation of the udder in females or scrotum and penis in the males.
   - **d)** Blistered animals must be put in stables with soft ground to avoid fracture of one of the bones especially the third phalanx.
   - **e)** The animal must be tied from both sides of the mouth, or a side stick or cradle can be used to prevent the animal from licking the blister.
   - **f)** Zinc oxide ointment or Vaseline is put under the seat of the blister to prevent dermatitis and skin cracks in this area.
3- **Pustulants**: These are in the form of setons where a piece of gauze soaked in turpentine oil is put in two or more than two openings one above the other. The setons are left in position for 14 days and then removed. The setons are made subcutaneously.
4- **Firing**: These are 3 types of firing:
   - **a)** **Line firing:** It is made in the form of lines by a firing machine heated until it becomes dull red. The lines should not penetrate the whole thickness of the skin. The lines may be transverse, oblique or in the form of a tree whose branches do not meet together at the same point. This type can be used at the region of the flexor tendons or on the medial aspect of the hock joint.
   - **b)** **Point firing:** There are two types:
     - **A)** Superficial point firing: This type do not penetrate the whole thickness of the skin.
     - **B)** Deep point firing: This type penetrates the whole thickness of the skin.
   - ***c)*** **Needle point firing:** This from is made by means of a firing machine whose end is pointed. It penetrates the whole thickness of the skin and in many cases reaches the cartilage, tendons, bones or the ligaments. It is not advisable to use this type of firing near joints or tendon sheaths in order to avoid infection to these structures.

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B. Septic Surgical Conditions

1 Abscesses

An abscess is a collection of pus that hollows out a cavity in the tissues by destroying and expanding them. In other words, it is **Circumscribed Cavity Containing Pus**.

Predilection Seats:

- Abscesses can be formed At any part in the body of animals.

Its predilection seats are

- **Equines, Sheep and Goats:** Parotid region, intermandibular space, hoof, back, neck and buttock.
- **Sheep and Goats:** Parotid region, intermandibular space skin, and SC lymph nodes.
- **Cattle:** The left chest region just behind the elbow joint, in front of the udder and at the umbilicus.
- **Camels:** The upper and lower parts of the neck.

Etiology:

The cause is usually due to the entrance of microorganisms through a break down in the skin or mucous membrane. These can be occurred through the followings:

1. Inflammatory reaction to
   a. An infectious process (bacteria or parasite) or,
   b. A foreign substance within the body (a needle or a splinter, nail wooden piece for example).
   c. A specific microorganism in some animal species is involved in particular types of abscesses.
2. The presence of foreign body as nail, needle, sharp piece of bone, wooden, or glass etc.
3. Injuries or accidents and skin wounds.
4. Wide bore needle which drives a piece of skin or hair into the muscle and the Improper sterile technique for injection.

Main features of an Abscess Formation:

1. Rapid and progressive emigration of polymorphonuclear leucocytes from the capillaries.
2. The **Neutrophils** migrate and emigrate through the blood vessels with phagocytic activity to destroy m.o.
3. The **Neutrophils** (Short lived) die and release the **lysosomal enzymes** into tissues in addition to the presence of the **bacterial proteolytic enzymes**, leading to structural protein breakdown.
4. Proteolytic enzymes that are manufactured by leucocytes are capable of digesting tissue damaged by bacterial action.
5. Lysis of tissue elements leaving a cavity.
6. Consequent liquification of the tissue and thick pus formation in the center of the lesion.

- Abscess forms after a period of 3- 5 days from the access of the pyogenic microorganism.
- The microorganism multiplies and produces its toxins in the tissue.

Classification:

Abscesses are classified according to the **Clinical Features** Into:

a) **Acute abscess "Hot"** when the evolution is rapid: **Superficial/Deep**

b) **Chronic abscess "Cold"** when the evolution is slow **Hard/Soft**

Each of the above types may be distinguished According to the Onset as:

1. Idiopathic.
2. Symptomatic.
3. **Embolic:** developed from septic emboli.
4. **Metastatic or Pyemic:** when there are multiple foci following a local collection of pus.
5. **Critical** when it Is the result of a grave disease or develops in connection with a vital organ.
6. **Wandering Abscess:** this abscess appeared any where and penetrates along vessels and nerves into inter-muscular tissue
7. **Gas Abscess:** it appear at the sites of accidental pricks or injection such as penetration of anaerobic infection, especially in cattle and pig.

Classification of Abscess

A- Acute or Hot Abscess

Formation and structure of an abscess:

1. An acute abscess is formed within a period of 3-5 days after the entrance of the pyogenic microorganisms.
2. The abscess Is composed of wall (pyogenic membrane) and its contents (Pus). The character of the pus varies according to tissue Involved and the causative agent.
3. The bacteria that have gained access to the tissues multiply and produce toxins which are diffused into the surrounding structures giving rise to an acute bacterial inflammation; the vessels dilated, the blood stream accelerated, followed by retardation and thrombosis formation and then emigration of leucocytes.
4. Microscopically, the lesion shows two well differentiated zones:
   a) **Central areas** of dead tissues that have lost their staining properties and contain causative pyogenic bacteria.
   b) **Peripheral zone** of acute inflammation which is highly infiltrated with leucocytes and fades gradually into the surrounding healthy tissues.
5. The enzymes which are secreted by bacteria and leucocytes digesting the tissue forming a cavity which is surrounded by granulation tissue (thick, bright pink colour, soft and velvety in appearance).
6. The wall is composed of many loops of newly formed blood vessels, leucocytes, and actively proliferating tissue cells.
7. Once the abscess has been opened the pyogenic membrane rapidly granulated and fills the cavity.

B- Chronic or Cold Abscess

These abscesses grow very slowly and show very slight inflammatory reactions, therefore pain in these cases is either very slight or absent.

Aetiology:

1. Repeated simple wounds as those Induced by the saddle.
2. Wounds of the long prominences as the ribs or the pelvic bones.

There are two types of these abscesses:

a) **Cold Soft Abscess:**

Where the abscess contains a large amount of pus and its surface is soft.

b) **Cold Hard Abscesses:**

In which case the abscess Is surrounded by fibrous tissues and the pus contents are small In quantity.

Fate of Pus/ Termination of The Abscess

1. The **Pus** normally **directed to** the **external surface of body**.
2. If pus cannot escape superficially owing to the presence of resistant tissue e.g., horn of the hoof, it extends in the **direction of the least resistance** until it finds a means of escape.

If Superficial Abscess

3. When the pus is most close to the surface and elevation (**Point**) is observed.
4. This point become necrosed with a pale-yellow colour, this process is called **'Pointing of the abscess"** that denoting the maturation of the abscess.
5. Eventually this point sloughs discharging pus "Rupture of the abscess" or "Burst".
6. Continuous flow of pus is discharging from the abscess "Draining".
7. Draining of the abscess may be followed by spontaneous healing or the abscess reform again due to the defective drainage.

If Abscess is Deep/Visceral/adjacent to cavities Abscess

8. Abscess in close vicinity to a joint or visceral cavity may open into it with serious consequences.
9. When an abscess is formed on ligament, tendon, or bone may be accompanied by necrosis of these structures, that remained in site after the burst of abscess preventing its healing.

Retained/Old/Chronic Abscess or Pus

1. **Retained Pus** in an abscess cavity for a long time before being evacuated becomes **inspissated**; its liquid portion is absorbed, while its solid portion becomes **caseated** (curd-like or cheesy like pus).
2. If retained for longer time it will be **calcified**.
3. This retained thick pus might get absorbed or encapsulated and calcified "**Encapsulated Abscess".**

Inspissated → Caseated → Calcified → "Encapsulated Abscess"

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Symptoms

Symptoms of an acute abscess vary according to its situation as if It Is superficial or deep.

a- Superficial Abscess

The signs appeared gradually in the following stages:

1. Signs of **Acute Inflammation** as swelling, redness, hotness, and local pain are the first visible symptoms.
2. **Circumscription:** The abscess appears as a more or less circumscribed inflammatory swelling that is very painful and firm on manipulation.
3. **The Center** of the swelling **gradually softens** while its periphery remains firm. The Center becomes **softer and thinner walled** and appears to be **fluctuated**.
4. **Pointing of the abscess:** It points at the skin surface, forming a shining and occasionally hairless patch at its center, that is found thin on palpation giving a sensation of softening combined with elasticity.
5. **Burst:** After wards it soon bursts, allowing escape of pus through the orifice.

b- Deep Abscess

1. As it usually develops under thick layers of tissues, it is first indicated by **febrile symptoms** (due to absorption of toxins).
2. **No local manifestations** could be noticed,
3. **Features of a superficial abscess** may be evident **only** when the pus has arrived near the surface.
4. **Oedema** may sometimes be detected in the vicinity of the deep abscess.
5. **Interference with function of the neighbouring organs** as pharynx, larynx, rectum ... etc.

Chronic Abscess

- Absence of inflammatory symptoms or the presence of mild Inflammation.
- The abscess appears as a fibroma in cold hard types arid as a cyst in cold soft one.

Symptoms of Chronic Hard-Abscess:

1. Presence of voluminous swelling without any clear signs of acute inflammation.
2. This swelling is surrounded by a hard fibrous tissue and fluctuation is rarely detected.
3. Later, it **assumes the features of a Tumour**.

Symptoms of Chronic Soft Abscess:

1. It has the **Appearance of a Cyst** except that it may reveal a little heat and sensibility.
2. It has a thin wall and contains a comparatively large.

N.B.: The cold abscess is a collection of pus. This is slowly produced without any signs of active inflammation

Diagnosis

1. Symptoms.

a. **Acute Superficial Abscess** is always easy by symptoms.

b. **Acute Deep**, **Chronic** Hard & Soft abscesses are hardly diagnosed and may be confused with Tumour, Haematoma, Hernia, bursitis, and cyst.

c. **Deep Abscess** *may* present serious difficulties as no local manifestation could be noticed. Oedema in the vicinity may be detected and febrile disturbances may be helpful.

2. Differential Diagnosis of Abscesses (Acute/Chronic)

A. Haematoma:

1. It is formed directly after severe trauma beneath the skin free from puncture (intact skin) and it is immediately fluctuating.
2. Some **inflammatory** reactions are only present just after its occurrence but **after few days these reactions disappear**.
3. It **becomes crepitant** when coagulation has taken place.
4. Pain is not severe as in abscess.
5. A haematoma **never points** as the abscess.

B. Cyst

1. A cyst takes a comparatively long time to be formed, sometimes it is congenital.
2. It is a cavity or space in a tissue, lined by epithelium or endothelium.
3. It is uniformly fluctuating.

C. Hernia:

1. **Hernial ring** is present.
2. The hernia is **usually free from inflammatory reaction** except when it is recent and due to trauma.
3. **Reduction** of its contents to the abdominal cavity **is possible** in case of reducible hernias.

D. Tumour:

1. It is an abnormal mass or overgrowth of tissue.
2. Benign tumours grow slowly.
3. It may be single or in clusters and remains localized, with **regular and well-defined borders without any sign of inflammation**.
4. It is **firm in palpation**.
5. In some instances, it may become subjected to friction leading to ulceration and infection.

E. Bursitis:

The inflammatory swelling of these bursae is known from their anatomical position.

3. Exploratory puncture

In all proceeding surgical conditions when it is impossible to reach a diagnosis, an exploratory puncture is made.

Exploratory puncture:

- This step is the last trial to confirm the diagnosis and differentiate between the different swelling (especially **Abscess**, **Hematoma** & **Cyst**) under strict aseptic preparation.

a. If the **pus** is aspirated through the needle, it is an **Abscess**.

b. In case of **Hematoma, blood** will be aspirated.

c. In case of **Cyst**, **serous fluid** will be aspirated.

Treatment

Principal Lines of treatment of an Abscess

A. Ripening: Measures to fasten the maturation of the abscess.

a. An abscess becomes "ripe" when
   a. It is close to the skin surface.
   b. The inflammation in the surrounding tissues has subsided.
   c. It is fluctuating and the pus lies within a smooth-walled cavity beneath a thin circle of skin.

b. **If it is unripe, apply Fomentation** and/or **Poultices** or **Antiphlogistic** preparations such as **Ichtyol** ointment 10-15% daily. In some cases, **Blister** (bin-iodide of mercury ointment, 1 in 32 to 1 in 8) is used.

B. Opening:

When the abscess content is ripe and the pus collects in a single cavity, it requires to be incised for evacuation and drainage.

- **The same as *in* hot abscesses by maturation and evacuation.**
- **Blister** may be applied to render the abscess acute and bring the pus near to the surface before opening it.

In some cases where pus is inspissated curetting of the abscess cavity is necessary then application of a drain immersed in tincture iodine.

N.B.

1. Opening of the abscess should be done only after it matures, otherwise cellulites may develop (cellulites is an Infection of subcutaneous tissue with pyogenic bacteria).
2. **In Critical/Dangerous parts**, open it by a guarded knife (cotton raped around the scalpel leaving only the point exposed) or puncture it by a closed artery forceps which is then withdrawn its jaws are apart from each other as in case of rectal or vaginal abscess.
3. It is not ordinarily advisable to open an abscess which is not fully ripe as secondary abscess may form afterwards. However, **abscesses situated close to a joint or peritoneum** may have to be opened before fully mature to avoid the chance of rupture into the joint or peritoneal cavity.

- **"Encapsulated" Abscess** that has a well-defined capsule it is preferable to be removed as a tumour under strict asepsis then the suturing the resultant wound.

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Technique of Abscess Incision and Evacuation:

1. After Pointing and Maturation of the abscess, open it at its lowest part by using the **Fixed Scalpel "Abscess Knife".**
2. An incision must be wide enough to prevent reaccumulating and placed at a suitable site for good drainage.
3. The site where it is proposed to open and the surrounding area should be cleaned and prepared as for a surgical operation: after shaving and washing the area with soap and water, drying, and applying a suitable antiseptic like Tr. iodine.
4. A sterilized **Abscess Knife (Lancet)** or scalpel is used to open the abscess. The opening should be at the site where it points into the Abscess Cavity, then cutting in a downward direction for a short distance (**Dependent Portion**) through which drainage by gravity in normal position of the patient is possible.

   After opening the abscess, the contents usually start draining.
5. The **abscess cavity** should be irrigated with **antiseptic solution**, to promote the complete evacuation and removal of the contents.
6. Directly after opening the abscess, take a pus sample, then apply pressure and squeeze on the periphery of the abscess cavity to evacuate it.
7. **The Depth of Abscess Cavity** should be thoroughly examined for the presence of a foreign body, necrotic debris, traversing blood vessel or nerve, as well as if it needs further drainage.

Counter-Opening

If the abscess is not pointing at a dependent portion, it is sometimes necessary to make another opening in the dependent portion to provide drainage. This is called a "**counter-opening**".

To Make a Counter-Opening,

a. **Artery forceps** may be passes through the first opening and inserted it into the bottom of the cavity.
b. **Bulging** the **overlying tissue and skin** by the tip of the forceps, then open its jaws.
c. **Incise the skin between the two jaws**, till reaching the abscess cavity **then thrusting the forceps** externally through the Counter-Opening.
d. Afterwards, a **"Seton"** (gauze dipped in antiseptic solution) is **lied between the jaws of forceps**, then close it to catch and carry the seton through the openings and the **Seton** ends has been tied each other, to keep the openings patent.
e. The seton is changed every day after cleaning the abscess cavity and irrigation with an antiseptic solution.

8. Flush the cavity with antiseptic solution. If the cavity is large, pack it with gauze painted with tr. Iodine for 24 hours).
9. While, if it is small, paint (swab) it with tr. Iodine after flushing it with the antiseptic solution.
10. After opening the abscess and irrigation of **its cavity**, it is **stuffed with gauze dipped in tr. iodine**. This is intended to destroy any infection remaining there in and to **exert a mild irritant** action **to stimulate the healing process**.
11. The **gauze packs are removed after 24 hours** (i.e. second day) arid then the abscess cavity is irrigated with a mild antiseptic lotion.

    The conventional method was to irrigate with a 1 in 500 solution of acriflavine sulphate as it is a solution which retains its antiseptic properties even in the presence of pus. Potassium permanganate, Dettol®, Savlon®, Iodine Povidone, H_2O_2 or another antiseptic solution can be used for irrigation.
12. **Topical application of antibiotics** or sulphonamides in the form of ointments or dusting powder is indicated if virulent infection Is suspected, and systemic use of antibiotics may also be necessary In some cases.
13. Continuous follow up by Daily dressings till the abscess cavity is filled with granulation tissue. This is in the form of antiseptic flushing then painting (swabbing) with tr. Iodine or changing the drain (seton).
14. The line of discharge should be protected by covering it with Emollient oint or Vaseline.
15. The **Normal Time** required for the **complete healing** of an opened-out abscess is usually **about three weeks**.

Deep Abscesses

In dealing with deep abscesses near to a serious area with great blood vessels, nerves or vital organs such as parotid region or subpharyngeal region (critical abscesses], the following steps may be employed:

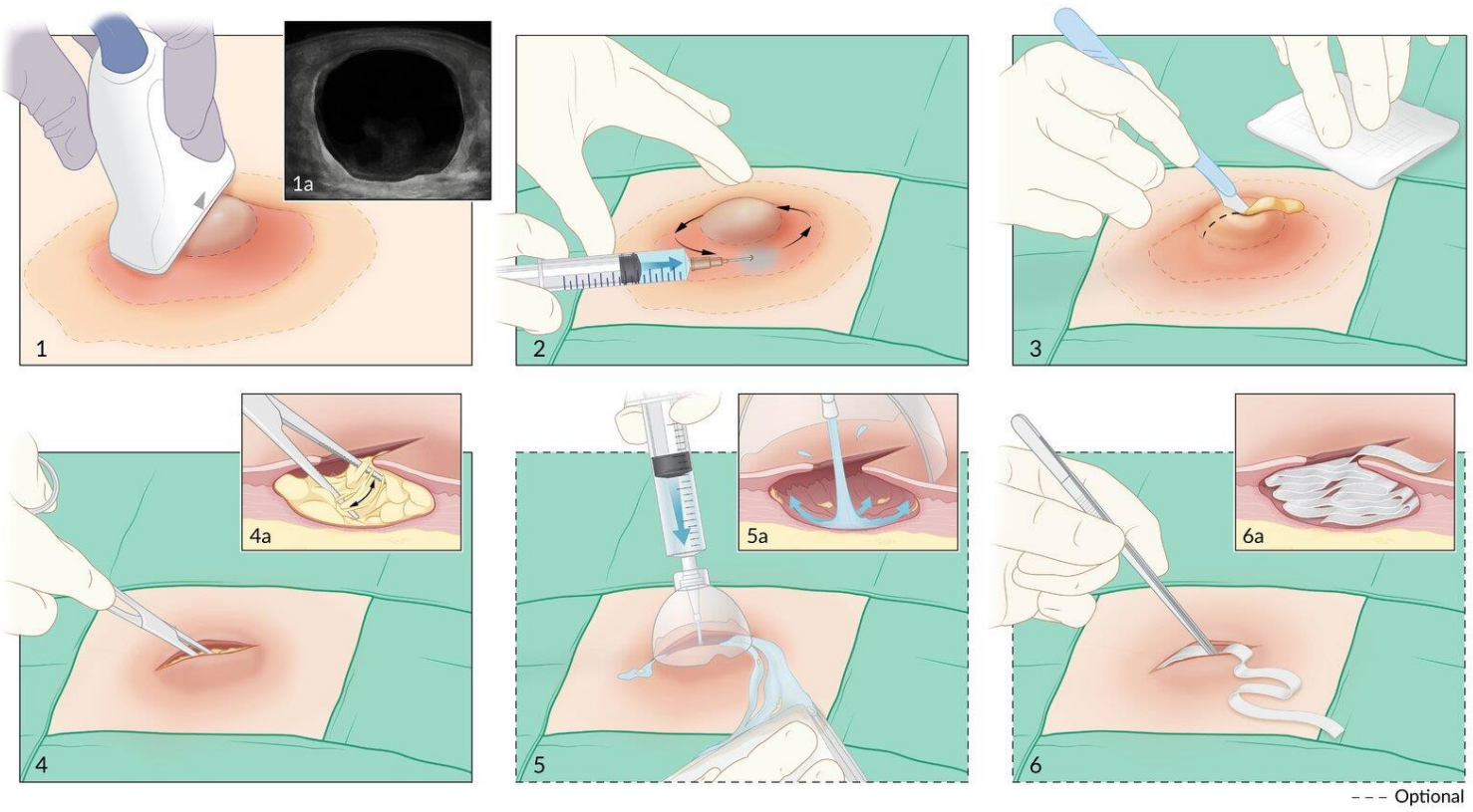
1. Incision of the skin without deep puncture.
2. Pushing a blunt instrument (artery forceps or blunt scissors) through the underlying tissues to reach the abscess cavity. Open the jaws of the instrument without sharp cutting.
3. Drain the content, then irrigate the cavity with mild antiseptic.
4. Explore the cavity with sterile gloved finger to ascertain a foreign body or necrotic tissues.
5. insert a drain dipped in Tr. iodine and daily dressing are advisable.

Abscess In Mucous Cavity:

An abscess in mucous cavity like pharynx, rectum or vagina may be opened by one of the following:

2. Thrusting the finger into its thin wall.
3. By using a concealed knife.
4. By means of a trocar and canula.
5. *By* an ordinary pointed scalpel guarded or enveloped in gauze or cotton wool Just up to its point to serve as a guard and control the use of the instrument.

N.B.: The persistent discharge from an opened out abscess usually Indicates inadequate drainage due to either small orifice or retention of dead tissue e.g. sequestrum *or foreign* body. Also, It is may be due to persistence of suppuration as a result of secondary infection or ineffective antiseptics used.

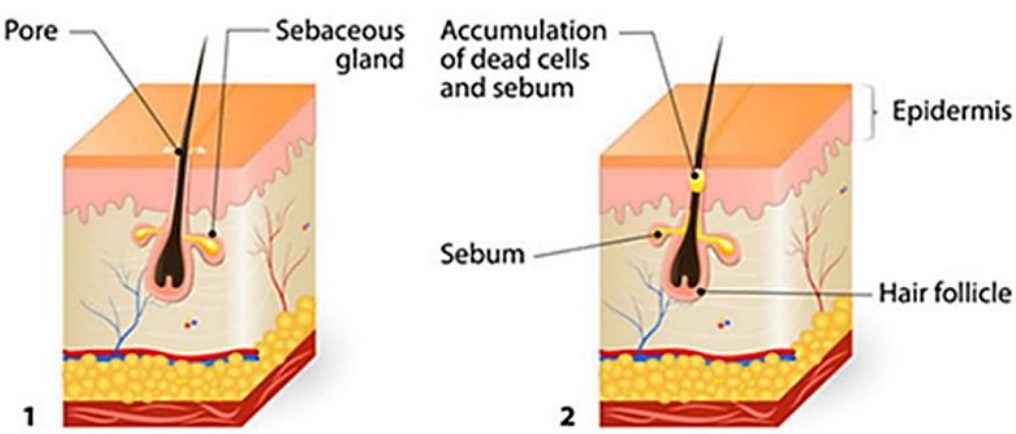


Abscess incision and drainage

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2 Acne "Furuncle" & Phlegmon

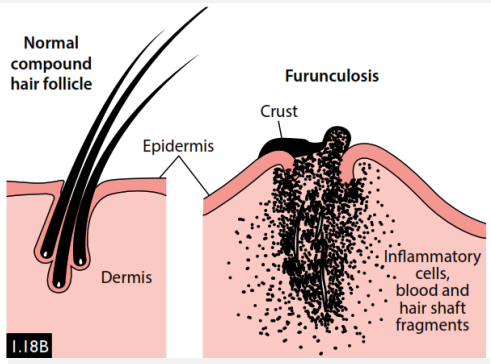
Acne "Furuncle"		Phlegmon
• **Acne, Furuncle or boil** is an abscess involving the sebaceous gland. • The disease occurs In all domestic animals but is common in the horse and dog. In the dog it is more common in short haired breeds. The region rich in sebaceous glands (like nose, lips ... etc) are often affected.		Diffuse inflammatory swelling which fades surrounding structures without any definite it may be:
Classification		
Furunculosis A group of boils in different parts of the body (Hair follicle).	**Carbuncle** It is inflammation of a several adjacent hair follicles and sebaceous glands. The condition produced by small boils rupturing SC and draining inadequately through many tiny openings on the skin	**A. According to the nature of cause into:** **1. Septic:** Caused either by bacterial invasion or by infiltration of the tissues by one of the body excretions as urine or feces. **2. Aseptic:** Caused by Infiltration of the subcutaneous tissues by an irritant material such as turpentine oil, chloral hydrate or concentrated saline solution. **B. According to the cause into:** **3. Primary ph.:** occurs in closed infected traumas and wounds, open fracture. **4. Secondary ph.:** As a complication of acute localized infection as furuncle, carbuncle, abscess and purulent infections.
Aetiology		
1. The infection is caused by staphylococci. **2.** Local irritation from any cause (e.g., Friction of saddle or collar) predisposes to the infection.		**1.** Trauma followed by infection of microorganisms. **2.** Infiltration of the tissues by body excretions or an irritant material. **3.** Secondary to local suppurative lesion as abscess, lymphadenitis or arthritis.
Symptoms		
1. The lesion may appear as a **single** pustule or as a **group of pustules**. **2.** The pustule **may be the size of a pea**. **3.** When it ruptures **grayish white pus** Is given out. **4.** A **grayish white core of necrotic tissue** comes out when the pustule Is compressed between fingers.		**1.** The presence of local diffuse swelling which fades gradually in the surrounding *structures.* **2.** Local tenderness and hotness. **3.** The lymphatic glands draining the area are usually inflamed. **4.** The body temperature rises and sharply fluctuates.
Treatment		
1. Wash thoroughly with soap and warm water. **2.** Apply an **Antiseptic** as Carbolized Vaseline 2-5% and salicylic acid ointment ... etc. **3.** In **chronic indurated** cases **bin-iodide of mercury** is effective. **4. Some** of the Pustules may require **to be Incised to remove the necrotic core.** They are after wards touched with tr. iodine. **5.** Topical and systemic antibiotics is very effective. (**Penicillin**)		**1.** Put the affected part in complete rest then apply. **2.** Hot antiseptic fomentation with compression or apply antiphlogistic poultices and bandage if practicable. for ripen the unripen phlegmon. **3.** If the phlegmon is so voluminous and threatens the circulation in the area, incise It several times (scarification) to provide free drainage then dress it as septic wound. **4.** Systemic sulphonamides or antibiotics are essential and If there Is a wound or incision. **5.** Antitetanic serum should be given.



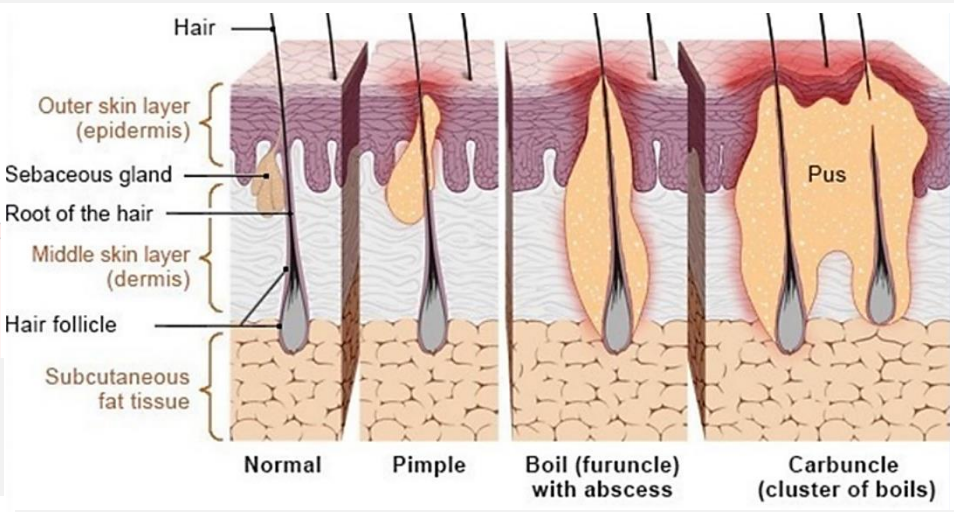
Acne Formation



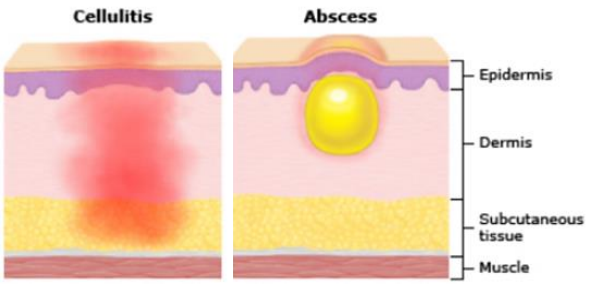
Shows **furunculosis** due to chin acne in a Mastiff.



Shows a normal hair follicle (left) and a hair follicle that has undergone furunculosis characterized by swelling and infiltration of neutrophils (right).



Carbuncle Formation



Phlegmon/Cellulitis Formation

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3 Fistula and Sinus

Fistula

A fistula is an abnormal tract joining between

- Two cavities as the recto-vaginal fistula
- A cavity and the outer surface as fistulous withers
- A canal and the exterior as milk and salivary fistulae.

Two surfaces covered by epithelium or at times mesothelium, discharging exudates.

If the end of the tract is closed (has one opening), it is called a **sinus**.

Sinus

- A Fistula Closed from one end. It is a tubular, inflammatory tract leading from a deeper inflammatory area, with one or more external openings upon a mucous or coetaneous surface.
- The interior of a sinus is lined by granulation tissue, there might be partial in growth of surface epithelium.
- In chronic cases there is thickening around the sinus tract due to fibro-connective tissue.

Classification

According to Cause

1. **Hereditary (congenital) fistula:**

As an example, the urachus where the umbilical cord is closed except the urachus where the urine is found to come out from it as well as from the natural orifices in the penis in males and in the vagina in females.

2. **Pathological (acquired) fistula:**

It is a fistula resulting from a pathological condition as a dental fistula, caused by a diseased tooth or quittor caused by necrosis of the lateral cartilage of the hoof.

According to Surface which opens

1. Skin → External fist.
2. Mucous memb. →Internal fist.

According to its Extent

1. Complete "perforated" whose canal connects two cavities "Recto-vaginal"
2. Incomplete "blind" when its closed at one end "Recto-perineal"

According to Character of discharge

1. Excretory → Urinary, Fecal.
2. Secretory → Salivary, lactating fis.
3. Purulent.

Fistula may be also classified into:

1. **Specific fistula:** A fistula caused by a specific infection as actinomycotic fistula and botryomycosis fistula.
2. **Purulent fistula:** A fistula discharging pus.
3. **Non-purulent fistula:** A fistula discharging any secretion rather than pus. These non-purulent fistulae are subdivided into:
   a. **Excretory fistula:** As the intestinal fistula, anal and urethral fistula
   b. **Secretory fistula:** As milk and salivary fistulae.

Aetiology

1. Congenital fistulas due to anomaly in embryo.
2. The presence of a foreign body or any necrotic tissue at the depth of the fistula.
3. Specific affections as actinomycosis and carcinomas.
4. Acquired fistulae – Wounds, Trauma as milk fistula, recto-vaginal. Neoplasms. Parasites as filarial
5. Abscesses of the parotid region and parotid duct may open to the inside destroying the gland or duet resulting in a fistula.
6. Opening an abscess in a wrong way as from its upper part or insufficiently draining it may result in the formation of a fistula or sinus.

- Presence of foreign body or substances or dead tissue e.g metal of glass pieces, infected suture material, necrotic bone, parasites.
- Infection like actinomycosis, actinobacillosis, botryomycosis, or specific lesions like carcinoma.
- A sinus persists when there is inadequate drainage especially when it has a tortuous course; constant movement of the walls of the sinus interferes with healing process. When it develops thick connective tissue walls and callus or epithelial lining, healing of the sinus is further delayed.

Pathogenesis

1. Presence of purulent focus or abscess rupturing leading to a canal connecting two cavities.
2. Walls of canal are lined by granulation tissue that grow and narrowing the canal, without complete obstruction due to continuous discharge or foreign bodies.
3. If external skin lesion is significant, massive granulation around fistula opening overgrow and frequently epithelialization occurs, 1-3cm from the opening due to longitudinal direction of canal, leading funnel-like depression at this site and when discharge collects, this will re-opened.
4. Encapsulation of foreign body can occur and sepsis production stops.
5. Healing of fistula is prevented by discharges as pus, urine, saliva, milk…. etc.

Symptoms

1. The presence of a small opening discharging pus of bad odour or discharging non-purulent exudates. This depends upon the type of fistula.
2. A probe can be introduced from the opening to detect the depth of the fistula and whether there are side canals or not.
3. The fistula opening is surrounded by an unhealthy granulation tissue.
4. In many cases more than one opening may be present.
5. Several scars around the fistula opening is an indication that the fistula Is old.
6. Some inflammatory reactions may accompany the fistula.
7. **A purulent fistula is composed of an opening, a canal and a depth.**

A. Fistulous opening:

A purulent fistulous opening is usually small in size denuded from hair. The skin around the opening epithelialize gradually until the opening is closed by a scar, but sooner or later pus accumulates in the depth forming a new abscess which bursts by a new opening beside the old one.

B. The fistulous canal:

It is a canal joining the fistulous opening with the depth. It may be straight and short as in eases of quittor or picked-up nail or it may be long and tortuous as in cases of fistulous withers and neck fistulae.

Therefore It is preferable to use an "S" shaped probe in cases of fistulae of long canals and a straight probe In eases of short fistulae.

C. The depth:

It contains usually the real cause of the fistula which may be a foreign body, as a nail, suture material, piece of gauze, a necrotic tendon or a necrotic piece of bone.

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Treatment

A. In fistulae with Short Canals

It is enough to curette the canal and its depth but when It Is impossible, an incision is made Including the whole tract, then irrigate the wound with antiseptic solution and the foreign body is extracted from the depth if present.

B. In fistulae with Long Canals:

1. Drainage should be enough by performing a counter opening.
2. **Sloughing of the interior necrotic tissue** and removal of the callous lining when present at the depth of the sinus. **To enhance sloughing** one of the following methods may be used:
   - **a.** Liquid or solid **caustics** can be used. (Silver nitrate or copper sulphate).
   - **b.** The use of **hot Iron** in the form of a **rod heated till** it becomes **red** and is Introduced inside the fistula tract to be directly withdrawn. This method helps in the separation of necrotic tissues.

     It should be rapidly inserted and rapidly withdrawn.

     Should be used with caution, to avoid excessive destruction of tissue.

     Surgical opening of the fistula through the whole length till its depth. Necrotic parts and foreign bodies should be removed by a curette.
3. If the fistula depth cannot be reach surgically, it is enough to curette and wash with antiseptics.

C. In case of excretory and Secretary Fistulae with a small opening:

The closure of the opening can be achieved through one of the following methods:

1. Blistering of mercuric iodide around the orifice
2. Point firing where a black scab is formed.
3. Purse string suture may be used after freshening the lips.
4. Drugs enhance the connective tissue formation. In these cases
   - **a.** Injection of 0.1 cc. is given at 6 places around the orifice, subcutaneously and
   - **b.** Another 2 injections 0.1 cc, also Inside the fistula orifice under the mucous membrane
4. **Cases of secretory fistula** which **do not respond to one of the previous treatments** as parotid fistula must be **treated by preventing** salivary **secretion**. This is done by **injecting tincture Iodine** or paraffin **heated up to 40°C** inside the parotid duct **3-4 times** every 5 to 7 days.

D. Operation to Opening out the Sinus, or Fistula:

1. It is better before opening a sinus to inject into it a colored antiseptic solution like 1 % methylene blue so that it will be easier to identify the tract.
2. Expose its depth, remove necrotic and callous tissue and provide for free drainage, followed by careful antiseptic to suppress the cause of the trouble.
3. Providing for drainages by incision of the tract in a downward direction or by making a counter opening and applying a setons.
4. Sloughing of the interior necrotic tissue and removal of the callous lining when present at the depth of the sinus.
5. In some cases where we cannot reach the depth of the fistula surgically, it is enough to perform curetting and washing with antiseptics.

E. Administration of antibiotics.

Prognosis

Depends upon depth, location, cause.

Diagnosis:

Symptoms, Probing and Injection of barium sulphate into the sinus or sergosine.

Treatment:

1. Remove the foreign body if it causing the condition.
2. The tract is cleaned with 5%- 10% Zinc chloride lotion or is swabbed with phenol followed by tr. iodine.
3. The solid or liquid caustics are indicated when there is thick callus lining, it also helps separation of necrotic tissue.
4. Opening out the sinus after its identification by injection of a colour solution of methylene blue (1%) so that it will be easier to the tract.
5. Injection of antibiotics.
6. Bier's hyperemia.

Bier's Hyperemia

1. The **Main Aim of Bier's Method** is to cause venous congestion in the affected part by application of a bandage on the proximal end of a limb or appendage sufficiently tightly to almost arrest the venous circulation without causing any obstacle to the arterial flow.
2. Serum and leucocytes are thrown out from the capillaries and exert an antitoxic, germicidal and anodyne effect on septic lesions.
3. The band should never be tight enough to cause pain to the patient and it should be pass the finger fairly easily between the band and the skin.
4. The duration of the compression varies from four to six hours/ day and may be continued for weeks. As the lesion improves, the duration of its application is gradually diminished.
5. In regions where a ligature cannot be applied, cupping may be adopted

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4 ULCERATION AND ULCERS

Definition

- **Ulceration** is the **molecular or cellular death of superficial tissues** leading to loss of substance, and is due to the action of a traumatic, Infective or neoplastic agency.
- An **Ulcer**, therefore, means the **loss of epithelial** and the **exposure of subepithelial** tissues In an area of skin or mucous membrane. **or**
- **Ulcer** is defined as a **superficial wound** of **skin or mucous membrane** involving **molecular destruction** of tissue and showing **no tendency to heal**.
- In popular language an **Ulcer** means a **wound showing no tendency to heal.**
- Ulceration differs from **Gangrene** in that the "gangrene" term is used to denote the simultaneous loss of vitality of a considerable portion of tissue. The two processes are however, closely associated.
- In fact, both signify tissue necrosis, in the **Ulcer** the **dead particles are not always visible to the naked eye**, whereas in the **Gangrene** the necrotic portions if superficial can always be seen.
- **Corrosion** is a process when the lesion involving the **superficial epithelium loss only**.

Classification

1. **Primary ulcers or simple ulcers**
   a. **Traumatic ulcer:**
      1- Contused ulcer at the tongue of cattle.
      2- Complication of wound on the ear conca, lip or tail of dogs.
      3- In the angle of flexion of the knee or back in the horse.
   b. **Infection:** Infection prevents healing of wounds, as well as the presence of a foreign body or necrotic tissue in the depth of the wound.
   c. **Decubitus ulcer:** may be pressure sores or **bed sore**.
   d. **Burns or irradiating ulcer.**
   e. **Malignant:** as rodent ulcer, epithelioma, and fungating ulcer due to *Streptococcus farciminosus*.
2. **Secondary ulcers or Specific ulcers**
   a. As a symptom of any other systemic disease/ specific affections such as Tuberculosis, Glanders, Corneal ulcer in case of Distemper in dog, FCV, Immune-mediated diseases, Malignant tumors (Carcinomatous ulcer).
3. **Creeping or healing ulcer**
   a. Healing occurs in one end of the ulcer, while more distraction occurs in the other end.
   b. **Exudate**: is very little and serous non-irritating in nature.
   c. **Edges**: Bluish-white peripheral layer of growing epithelium may be evident.
4. **Phagedenic and Spreading Ulcer.**
   a. It is an infected ulcer with a pathogenic organism.
   b. **Exudate:** There is usually a purulent and foul smelling.
   c. **Edges** of the spreading ulcer are inflamed and narcotized.
5. **Summer wound:** It usually occur in equine in the head and withers region caused by *Habronema*, while in cattle it caused by *Stephanofilaria*.
6. **Weak ulcer:** This type of ulcers has abounded soft granulation tissue, while the epithelization is delayed.
7. **Indolent ulcer:** It is a chronic ulcer, which is inactive, painless, and did not show any tendency to heal.
8. **Indurate (Callus) ulcer** These ulcers are characterized by an indurate and thickened edge [callus ulcer].

Aetiology

1. Loss of innervation of a part. Cutting of nerve trunk supplying an injured part.
2. Interference with blood supply and lymphatic obstruction of wounded parts.
3. Mechanical irritant e.g., tongue ulcer in cattle during prehension of food.
4. Repeat irritation of a wound (dog's ear, tip of the tail and angles of flexion)
5. Certain conditions associated with infection and prevented healing as Presence of foreign bodies and necrotic tissue in the wound.
6. Parasites as *Habronema* and *Filarial* infestation.
7. Burns and irradiation.

Symptoms

1. Ulcer has more or less rounded breaches of surface varying in depth in different cases.
2. The center of the lesion may be flat or concave - show necrotic spots.
3. Border may be on a level with the surrounding skin or raised above it, may be hard or soft.
4. In most cases there is discharge (serous, purulent, blood stained or grayish).
5. If the **ulcer is old**, it is surrounded by fibrous tissue and the edges are cut perpendicular and hard (**Callus ulcer**).
6. When **gangrene** occurs **at the level of the ulcer** and **extends rapidly in its depth due to bacterial destruction**, the ulcer is called **Phagedenic ulcer**.

Diagnosis

It's easy but care to say clinically whether its simple or specific.

Treatment

A. **Removal of the cause**, immobilize &protect the area from scratching or rubbing.
   Worm antiseptic fomentation (irrigation) indicated for painful septic inflammatory ulcer followed by dressing of iodoform powder application.
B. **Astringent** or caustic application indicated when there is infection, plenty of necrosed tissue, or excessive of granulation tissue.
   a. For example: septic ulcer may be touched with [carbolic acid]
   b. Removal of necrosed tissues is favored by repeated application of 0.5% HCl or urea.
   c. The excess granulation tissue can be suppressed by application of caustics like copper sulphate.
   d. Powder or potassium permanganate etc.
C. The use of **Thermo-Cautery**, which is an excellent agent for destroying unhealthy or callous tissue and promoting normal granulation and cicatrisation.
   a. Ultraviolet ray have bactericidal properties.
   b. Moderate pressure with cotton wool and bandage which promotes healing when the ulcer has been disinfected.
D. **Excision** of the ulcer by means of the knife. This is the best treat for a small ulcer in an operable region. After excision the wound is sutured and usually heals by first intension.
1. In case of ulcer on bone, curetting of the unhealthy surface is indicated (bone affections).
2. **Hyperemic treat. By Bier's method**

E. **Specific remedies for specific ulcers.**
1. **Treatment of weak ulcers**
   a. Suppression the excess granulation by caustics like copper sulphate, potassium permanganate, or zinc chloride etc.
   b. Clean the ulcer with turpentine oil followed by alcohol, then apply either powdered copper sulphate or potassium permanganate and put on a pressure bandage.
   c. Repeat this dressing daily or on alternate days until healthy granulation appears then a dry dressing powder may be applied, such as a mixture of equal parts of zinc oxide, boric acid, and Iodoform.
2. **Callous ulcer**
   a. The thick callous lining is scraped or excised [under local analgesia} and the necrotic tissue is cauterized with 10% solution of 5-10% silver nitrate, zinc chloride, or zinc sulphate.
   b. After removal of die callus the ulcer should be treated according to the general principles.
3. **Phagedenic ulcer:** Cauterizing may be with red-hot iron or chemicals as phenol followed by application of tr. Iodine or copper sulphate crystals.
4. **Treatment of septic ulcer**
   c. It is not advisable to treat tuberculosis ulcers in animals for fear of communication of the infection to humans.
   d. It should be treated as phagedenic ulcer in combination with systemic treatment for the primary disease.

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5 GANGRENE (NECROSIS)

Gangrene (Necrosis)	Sloughing	Sequestration	Necrobiosis
• It is the **simultaneous loss of vitality of hard and or soft tissues** of a functioning unit of the body due to arrested nutrition. e.g.: Death of the toe, foot or loop of intestine. • Death and putrefaction of a less extensive area of a hard or soft tissue due to arrest of nutrition while attached to the living body.	It is a process of **gangrene** which Is **limited to a soft tissue** and the dead mass is called a slough.	It is a process of **gangrene limited to the bone** and the resulted discharge is called sequestrum.	It Is a process of **gangrene limited to a tissue in the absence of Infection** (aseptic Infarction).

Etiology

A- Primary gangrene: Changes in the tissues due to direct causes.

Upon the tissues resulting in gangrene are:

1. **Mechanical/Traumatic Injuries** causing destruction of tissue or interfering with nerve and blood supply to a part. Bed sore (dry gangrene caused by constant pressure on bony prominence of body and "sit fast" also are included under this category. **Sit fast:** caused by pressure of the saddle on the skin for a long time.
2. **Physical;** burns and frost bites.
3. **Chemical**: caustic agents as strong acids and alkaline.
4. **Bacterial:** due to certain bacterial infection like black quarter, Malignant oedema, *Fusiform necrophorus* together with virulent Streptococci and Staphylococci.
5. Diminution of the focal resistance of tissue due to infiltration with urine may cause gangrene.

B- Secondary gangrene: Changes in the tissues due to indirect causes.

Leading to alterations of the tissues arising from the following:

- This type may arise from venous, arterial, cardiac or nervous affection or from alterations in the blood.
- As the result of these conditions the tissues involved are deprived of their nutrition and consequently lose their vitality.

1- Circulatory disturbances:

- **a)** Application of tourniquet for a long time causes gangrene lower to it.
- **b)** In some cases of fracture, a piece of bone exchanges its site pressing on some blood vessels leading to necrosis.
- **c)** Intestinal twist or invagination obstructs the mesenteric blood vessels causing necrosis of the intestinal loop.
- **d)** In case of adhesive hernia.

2- Bacterial causes: due to action of toxins of the causative organisms of various bacterial diseases.

Classification of Gangrene

Dry gangrene	Moist gangrene
Caused by **chronic arterial obstruction** with **adequate venous return** as In arteriosclerosis or calcification of the terminal arteries.	Occurs when a part rich in blood or liquid dies. Occurs in tissue rich in liquid fluid because of sudden **Arterial block or Venous obstruction**.
There is a line of demarcation between the dead and living tissues.	• There is **no definite line of demarcation**, a zone of inflammation surrounds the dead area and **later a line of demarcation is formed** between the dead and living structures.
Characterized by **mummification** of the tissues. The dead tissues become dry, wrinkled, of dark brown or black colour, and reduce in volume.	The dead tissues become **disintegrated and liquefied** by the action of putrefactive bacteria giving rise to a bloodstained, very fetid fluid. The process may extend to the adjacent structures.
Putrefaction is particularly absent.	The lesion contains **volatile odoriferous products and ferments** which elaborate soluble poisons, whose absorption into the system causes toxemia, with serious disturbance.
• The affected part of tissues **diminished in volume**, drained of their fluids before death. • The skin becomes shriveled, and its hair becomes dry and erect.	• The tissue becomes discolored with purple colour or any shade from black to yellow, green or white. • **Increased in volume**, and engorged with blood and serum. • Intense pain before death and after death has occurred the affected region become cold and insensitive. • Dark red fetid fluid discharges. • After a period the dead tissues cast off, provided that the toxaemia was not sufficient to kill the patient.

Symptoms

1- Local symptoms:

a) Period of <u>Death</u> In **<u>Dry Gangrene</u>**

1. The tissues become diminished in volume and shriveled up with dry erected hair.

2. A zone of inflammation surrounds the dead area then a line of demarcation appears between the dead and living structures.

a) Period of death In **<u>Moist Gangrene</u>**

1. The tissues become purple, greenish, or blackish in colour and increased in volume (engorged with blood and serum), pain is severe before death.

2. After death the part becomes cold and insensitive.

3. Epithelium can be scraped from the skin.

4. The discharge of the lesion is dark red and fetid.

5. If toxemia is not produced the dead part casts off.

b) Period of <u>Separation</u>: During this period complications may occur as **Secondary Haemorrhage** from sloughing of a blood vessel or **Septic synovitis** or **Septic arthritis**.

c) Period of <u>Cicatrisation</u>: Once the slough has separated, healing of the wound ensues rapidly except when a portion of hard necrotic tissue (bone, cartilage, or ligament) remains in the site.

2- General symptoms:

These result from Septic poisoning. There is

1. Fever
2. Rapid pulse
3. Accelerated respiration
4. Bad appetite
5. Painful or impossible movement
6. Later on the patient may be exhausted.

Diagnosis of gangrene:	Prognosis:	Termination:	Complications
The mentioned symptoms are characteristic.	The prognosis of the case is usually varied according to • The nature of the lesion • Volume of sloughing tissues • The virulence of the infecting organism. • It is dangerous if toxemia is present. Death may occur in case sever toxemia. • It may cause death within 24 hours as in some cases of gangrenous mastitis.	• In favorable cases the dead tissues are later cast off [sloughs] and the healing takes place. • Dead pieces of tissues like bone, cartilage, ligament and tendons are very slow to separate.	• Death resulting from toxemia or secondary bacterial infection. • Secondary hemorrhage if a vessel has been included in the slough. • If the sloughing opens tendon sheath or joint cavities, septic synovitis or arthritis may follow.

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Treatment:

Local:

1. **Removal of the cause,** The cause of gangrene should be removed and the spreading of the lesion to the surrounding tissues should be prevented. Sloughing of the dead tissues and granulation should be stimulated (Zinc oxide and cod liver oil).
2. **Application of an irritant** at the periphery of affected area to induce hyperemia and phagocytosis to accelerate the separation of the slough (hot antiseptic fomentation as Acriflavine) either in case of dry or moist gangrene.
3. **Scarification** in case of moist gangrene with a knife or puncture with the hot iron of the engorged gangrenous tissues. is sometimes advised to allow the discharges/ toxic liquid to escape from the dead tissue and to make possible introduction/penetration of antiseptics into the tissues to counteract the putrefaction.
4. Care should be taken to avoid wounding the Healthy tissues to avoid the spreading of infection and die occurrence of fatal septicemia. But it may provide chances for fresh bacterial invasion.
5. **Excision** of the dead tissue is comparatively safe in the case of dry gangrene but may at times give rise to septic complications.
6. **Spontaneous separation** of the dead tissue occurs after a period of time.
7. **Amputation of the affected part** in hopeless cases.

Systemic treatment:

Strength patient's healthy by plenty easily digestible food, stimulants, tonics and antibiotics.

Combat the pain by the suitable anodynes.

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C. SWELLINGS
6 TUMOR

- A neoplasm is a new tissue mass characterized by persistent, excessive, and disorganized cell growth of no useful function and is unresponsive to normal control mechanisms.
- A neoplasm can be benign or malignant originates from virtually any cell in the body.
- Most tumors end with the suffix"-**oma**" simply means neoplasms. When only"-**oma**" is coupled with a prefix denoting a particular cell type, such as fibroma or pattern of growth such as adenoma (gland) the term indicates a benign neoplasm.
- If the term **carcinoma** or **sarcoma** is added, it signifies a malignant neoplasm of epithelial cells as adenocarcinoma or a malignant neoplasm of mesenchymal cells as fibrosarcoma respectively.
- Two neoplasms; **lymphoma** and **melanoma are both malignant** despite the connotation of their names.

Neoplasm	Definition
Oncology	A science deal with diagnosis, prognosis and treatment of cancer.
Neoplasm	A disturbance of cell growth characterized by excessive uncontrolled proliferation of cells.
Cancer	Characterized by an abnormal and unregulated growth of cells which destroys surrounding body tissues and may spread to other parts of the body in a process that is known as metastasis.
Fibroma	A term applied to circumscribed tumors composed chiefly of connective tissue
Lipoma	A fatty tissue tumor occurs in the subcutaneous tissue
Osteoma	A connective tissue tumor formed from osteogenic tissue and originating usually in relation to bone, especially on the head and extremities.
Sarcoma	Is a bulky soft and vascular malignant type of tumor composed of cells of the connective tissue type
Undifferentiated neoplasm	Excessive growth of new tissue on the lateral aspect of the fetlock joint, this tissue seems to develop following an injury of the area. Due to the location of this vascular tissue it is frequently injured and becomes covered with blood (bloody wart).
Lymphoma	Is a local or regional circumscribed chronic enlargement of lymph nodes which are self-limiting and don not lead to systemic invasion.
Lymphocytoma	A true malignant neoplasm arising in lymphatic tissue from proliferation of atypical lymphoid cells.
Melanoblastomas	Is neoplasm composed principally of pigment producing cells called melanoblast.
Warts	May be a true papilloma or if multiple they may be due to a filterable virus.
Hemangioma	A neoplasm which is usually benign and consists of endothelium lined blood spaces filled with normal circulating blood.
Papilloma	Papilla indicates a small projection, and a papilloma is a tumor composed of a large number of these projections.
Carcinoma	Is a tumor process characterized by a typical and destructive proliferation of epithelium.

Causes:

- Cancer is caused by a number of factors, some of which we can control, and some we cannot.

A- Uncontrolled factors:	B- Controllable factors:
1. Presence of gene mutations. One type of gene that plays a role in normal cell growth (an oncogene) can be altered to contribute to the uncontrolled growth of a tumor. **2.** Mutations in tumor suppressor genes are another common cause of cancer. **3.** Chromosomal abnormalities **4.** Genetic predisposition: Heredity factors play a significant role in determining the susceptibility of individual animals to various carcinogens. **5.** Congenital factors: Ocular desmoids are the best examples of congenital tumors which tend to be very rare These growths are probably related to abnormalities in embryogenesis rather than to hereditary factors. **6.** There are also viruses associated with cancer (oncogenic viruses) e.g. bovine papilloma virus (BPV) produce cutaneous and alimentary papillomas and genital fibropapillomas in cattle. Equine papilloma, equine sarcoid and bovine leukemic viruses are other examples. The human papillomavirus (HPV) that causes genital warts is associated with carcinoma of the cervix. **7.** Excessive and prolonged exposure to ionizing radiation (X-rays) can increase the risk of certain cancers. **8.** Hormonal factors (fertility drugs as a risk factor for ovarian cancer, oestrogen). **9.** Immunological factors (Diseases or drugs that affect the immune system can also increase the risk of cancer, also, the disease AIDS is associated with a high risk of two types of cancer) e.g. interferon and immune system.	**1.** Fortunately, there are also factors under our control that can increase the risk of getting cancer and can therefore be avoided. There are substances called carcinogens (cancer-forming agents) that can increase the risk of getting cancer. Some common carcinogens include insecticides, fungicides, arsenic, asbestos, nickel, benzene, and formaldehyde, **2.** Radiation: Unprotected exposure to sunlight (ultraviolet radiation) and various forms of ionizing radiation is associated with skin cancer. Ultraviolet radiation induces squamous cell carcinoma in eye of white-faced Herford cattle. **3.** Nutritional factors (food additives, nitrate in drinking water) **4.** Environmental factors e.g., pollution **5.** Chronic irritation and inflammation: The incidence of squamous cell carcinoma was higher in scars resulting from severe burns, branding of cattle.

The Frequency of Neoplasm Depended on the:

1. **Species:** There was a relative risk of neoplasm for each breed within the species.
2. **Age of the animal:** There was an increasing tumor risk with age.
3. **Sex of the animal:** The estimated risk values of tumors for female and male were different.
4. **Colour (skin pigmentation):** Skin pigmentation and coat color were associated with an excessive frequency of certain cancers in animals.
5. **Site of neoplasm:** The leading sites of neoplasm in the bovine species were eye, hemic and lymphatic, skin and genital system. In equine tumors of the skin, eye and genital system were most frequent. Malignant tumors were 6% of skin tumors, 78% of eye tumors and 52% of genital tumors.
6. **Type of the cells:** Neoplasm of non-glandular epithelium and hematopoietic tissue were the most frequent types reported in bovine. The neoplasm of glandular epithelium, non-glandular epithelium and connective tissue were most frequent in equine.

Classification of Neoplasms:

1. **According to histogenesis**
    a. Neoplasm of connective tissue origin (e.g. fibroma, chondroma, osteoma, lipoma, melanoma, sarcoma)
    b. Neoplasm of epithelial origin (e.g. papilloma, adenoma, carcinoma)
2. **According to histological features:** Based on the size and shape of the tumor cells, their growth pattern, character of stroma and degree of cellular differentiation or maturity.
3. **According to tumor behavior:** Into benign and malignant tumor.
4. **According to the etiology**: Is not used because the exact causes of neoplasm are not known.
5. **According to the anatomy:** The neoplasm is classified after the anatomical site.
6. **According to synonyms:** Some tumors are known by the name of the person first describing the neoplasm.
7. **Systemic Classification of neoplasm**

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Organ	Neoplasm
Skin & Subcutaneous Tissues	Papillomas, Squamous Cell Carcinoma, Basal Cell Tumors, Sebaceous Gland Tumors, Sweat Gland Tumors Melanomas, Fibroma And Fibrosarcoma, Equine Sarcoid, Myxoma And Myxosarcoma, Lipoma And Liposarcoma, Mast Cell Tumors And Neoplasm Of Mammary Gland.
Cardiovascular Lymphoreticular System	Hemangioma and hernangiosarcoma, lymphangioma and lymphangiosarcoma, lymphoma and lymphosarcoma and neoplasm of spleen.
Musculoskeletal System	Osteoma, osteogenic sarcoma, chondroma and chondrosarcoma.
Digestive System	Non-odontogenic neoplasm of oropharyngeal region, odontogenic neoplasm, esophageal neoplasm, salivary gland neoplasm, stomach neoplasm, small and large intestine neoplasm, liver neoplasm and pancreas neoplasm.
Respiratory Tract	Nasal passage and paranasal sinuses neoplasm, laryngeal neoplasm, guttural pouch neoplasm and tracheal & lung neoplasm.
Genital System	Ovarian, uterine, cervical, vaginal, vulvar, testicular and penile neoplasm
Nervous System	Neurofibroma and glioma
Endocrine Glands	Thyroid, adrenal and pituitary neoplasm
Sense Organs	Ear and eye neoplasm
Hoof	Keratoma

Spread of Cancer:

Cancer may spread by one of the following routes:

1. Local spread or invasion.
2. Lymph spread.
3. Blood spread.
4. Spread by implantation (mechanical spread).

Diagnosis of Neoplasm:

Identification of superficially located tumors is relatively easy while great difficult arise in diagnosis of internal organs tumors.

1. **Case history.**
2. **Clinical manifestations:**
   - **a.** Swelling or enlargement, a sore which does not heal abnormal or bloody discharge.
   - **b.** Palpation is used to define consistency of the tumor, its boundaries, arc, and relationship with the surrounding tissues, sites and depth of location.
   - **c.** Solid or hard consistency, tuberous surface, and rather distinctive boundaries are characteristic of malignant neoplasm.
   - **d.** Tumors of the uterus ovaries and vagina can be found out in large animals with rectal examination.
   - **e.** The presence of the tumor in the abdominal cavity can be palpated in small animals only.
3. **Physical characteristics (external appearance):**
   - **a.** The external appearance of tumors presents extremely wide variations.
   - **b.** The color of neoplastic tissue is very distinctive, the blood content and hemorrhage may determine the color of most neoplasm.
   - **c. Consistency:** usually give significant indications of the nature of many neoplasm.
   - **d. Ulceration:** is frequently seen in neoplasm of the skin and mucous membrane.
4. **Gross feature:**

• **Gross feature of benign tumor characterized by:**	• **Feature of malignant tumor characterized by:**
1. Will not spread (metastasize) to distant parts of the body. **2.** Arising on or near surfaces. **3.** Tend to protrude above the surface with the formation of a polyp, which can be sessile with a broad base or pedunculated with a narrow base. **4.** The surface may be smooth or have papillary projections. **5.** Freely movable and not attached to adjacent structures. **6.** May be solid or cystic. **7.** Resembles the tissue from which it originates. **8.** Encapsulated. **9.** Of slow growth. **10.** Of little danger to the host. **11.** May lead to death when its size and location interfere with the vital functions of organs. **12.** When completely removed it had no tendency toward recurrence.	**1.** Usually irregular in shape. **2.** Have ill-defined borders owing to infiltration of surrounding structures. **3.** Often ulcerate and have central necrosis and hemorrhage. **4.** May be cystic or have papillary projections above a surface. **5.** Solid and fleshy and tend to merge more with the surrounding tissues. **6.** Rapid growth. **7.** Have tendency to invade the surrounding tissues. **8.** Have tendency toward metastasis and a fatal termination. **9.** High recurrence after surgery.

5. **Diagnostic imaging techniques**
   - **a.** Routine diagnostic radiology
   - **b.** Special diagnostic radiology
     - i. Lymphangiography: is used primarily in search of metastatic carcinoma
     - ii. Angiography: is useful in assessing preoperatively the respectability and curability of neoplastic lesions
     - iii. Interventional radiology: involves direct visualization of suspect areas by image intensification combined with more invasive techniques of percutaneous puncture.
     - iv. Mammography and xeromammographic: is low energy radiodiagnosis methods used in women for evaluation and diagnosis of breast disease.
   - **c.** Ultrasound.
   - **d.** Computed tomography (CT).
   - **e.** Magnetic resonance imaging (MRI)
   - **f.** Endoscopy guided magnetic resonance imaging for diagnosis of tumors of hollow organs.
6. **Pathological examination:**
   - **a. Biopsy** and microscopic examination of tissues are definitive steps in cancer diagnosis and classification.
   - **b. Incision biopsy:** Means partial removal of a lesion for sampling analysis. It was preferred when inadequate surrounding tissue was available for closure. The most common techniques of biopsy were (1) needle biopsy for deeper tissues.
   - **c. Biting biopsy** for ulcerated lesions and incision biopsy for larger diagnostic samples.
   - **d. Excision biopsy:** was preferred because the entire tumor was obtained to the pathologist and its intent of surgical cure (removal of all gross tumor and a margin of adjacent normal tissue).

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7. Hematology and Serum Proteins:

a. Increased total leukocytic count.
b. Increased erythrocytic sedimentation rate.
c. Elevated total serum protein.
d. Elevated alpha2-and gamma globulin.

8. Blood Chemistry:

a. Hypercalcemia, hyponatremia, hypokalemia.
b. Copper and zinc.
c. Enzymes (elevation of alkaline phosphatase, lactate dehydrogenase).
d. Hormones.
e. Immunodiagnostic (tumor -distinctive markers, tumor associated antigens).

Treatment:

Cancer treatment in animals was once largely limited to surgical intervention, although cryosurgery, radiotherapy, chemotherapy and immunotherapy are readily available today. Cancer is treated in a variety of ways depending on the size of the tumor, its location, the type of cancer, and a host of other factors.

Four common ways to treat cancer include:

a) Surgery.
b) Radiotherapy.
c) Chemotherapy (drug therapy).
d) Immunotherapy.

In many cases, these methods are combined to get the most effective results.

Surgery:

- Surgical treatment of tumors includes:

A- Prophylactic or preventive surgery which is indicated for:

- Excision of neoplasm prevented the eventual appearance of invasive malignancy (e.g., eye cancer).
- Removal of tissues or organs that contribute to the eventual occurrence of malignancy (e.g., cryptorchid).

B- Diagnostic surgery which include:

- Biopsy in superficial neoplasm
- Cavity exploration
- Endoscopic technique

C- Adjunctive surgery which observed in:

- Cytoreductive or de-bulking of the tumor volume so that another method of non-surgical therapy might be more effective.

D- Palliative surgery which was used to:

- Cure or prevent symptoms and prolong comfortable life e.g., squamous cell carcinoma of the eye, vagina, and oral cavity.

E- Curative surgery which was performed for:

- Removal or destruction of all gross abnormal tissues by one of the following:

1. Surgical excision:

a. Surgical excision is indicated as the sole treatment only when the tumor is locally excisable without significant morbidity and no systemic metastasis (in wide areas of the thorax, abdomen, neck and upper portions of limbs).
b. If the tumor is relatively localized, it can be surgically removed. Often, a border of healthy tissue surrounding the tumor is also taken (1 cm in benign tumors and 2-4 cm in malignant tumors) to ensure that all of the malignant cells have been removed.
c. Surgery is commonly used for cancer of the breast, colon, mouth, head and neck, kidney, testes and other parts of the body.
d. The resulted wounds were closed by reconstructive techniques or skin grafting.
e. Amputation is performed when the tumor involves one digit.
f. Surgery can also be used to remove tissue that may become cancerous if left untreated (precancerous) and also to relieve symptoms caused by the cancer.
g. Surgery is often combined with chemotherapy and/or radiation to improve results.

2. Electrocautery:

- -indicated to remove the tumors in areas of highly vascular and difficult to be closed after excision as in tumors of ear.

3. Cryosurgery:

- Is defined as the controlled use of substances that produce freezing temperatures cold enough to damage tissue severely.
- Cryosurgery should not take the place of successful conventional excisional techniques; however, in some situations conventional approaches are hazardous, and freezing may be the most effective method to destroy neoplastic tissue.

4. Laser surgery:

- New and promising approach in veterinary surgery.
- It offers veterinarians the potential to improve their surgical ability in respect to the handling of animals.
- It decreases complications and improving the results.

Radiation therapy (Radiotherapy)

- Is useful in fighting cancer because it destroys cancer cells more easily than normal cells.

Chemotherapy (Drug therapy)

- Is used to kill cancer cells, while attempting to limit the damage to normal cells.
- Chemotherapy is useful in fighting cancer that has spread to other parts of the body and cannot be easily detected or treated with surgery or radiation therapy.
- Anticancer drugs can be used alone, or in combination with others.

Immunotherapy

- Immunotherapy involved stimulation of the patient immune response to tumor cell membrane antigen, leading to rejection of the tumor.
- It is indicated in areas where surgical excision is undesirable, and the response of immunotherapy depend on the anatomical location, size, number and type of tumor.

Complications

- Local complications:

a. Circulatory disturbances.
b. Infiltration.
c. Obstruction of hollow organs.
d. Secondary infection.
e. Pressure on surrounding tissues and organs.
f. Bleeding.
g. Destruction of normal tissues.

- Systemic Complications (paraneoplastic syndrome):

a. Cachexia: characterized by weakness, anorexia, and depletion or redistribution of host components.
b. Anorexia.
c. Decreased resistance to infection.
d. Fever without the presence of infection (fever of undetermined origin).
e. Anemia: is the most common abnormal hematologic manifestation in patients with cancer.
f. Hemostatic abnormalities (disseminated intravascular coagulopathy).
g. Neuropathy results from damage of peripheral nerves by cancer (peripheral neuropathy). Also encephalopathy is frequently recognized in cancer patient.
h. Hormonal complications in neoplasm of endocrine glands.

Tumors can Cause Destruction in common Ways:

a. Tumors put pressure on nearby tissues and/or organs.
b. Tumors invade tissues and organs directly (direct extension),
c. Often damaging or disabling tissues and organs them in the process.

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7 CYSTS

Definitions

- Cysts occur in the form of hollow swelling containing fluid or semi-fluid material, occasionally solid structures, such as teeth and hair (dentigerous and dermoid cysts).
- They are either congenital or acquired.

1. Congenital cysts usually result from the displacement of certain embryonic buds in the early fetal time.

Classifications

Cysts may be classified into:

a. Epithelial cysts.
b. Retention cysts.
c. Exudation cysts.
d. Parasitic cysts.
e. Degenerative cysts.

1. Epithelial cysts:

- These types are mostly of embryonic origin (congenital cysts).
- It is an abnormal embryonic sac-like swelling lined by epithelium or endothelium.

They are classified into several types which are:

a) Dermoid Cysts:

They are mostly found subcutaneously and rarely found internally such as in ovaries, testicles or brain. They are also found in different forms:

1) Simple Form: which contain a mucoid fluid and its cavity lined by epithelium.

2) Compound form:

a. 'Teratoma-like swelling' in which the cyst wall is similar to the structure of the skin, with the presence of hair follicles and sebaceous material.

b. Corneal Cyst removed by **Superficial Lamellar Keratectomy**.

These cysts affect mainly cattle and occur in the neck, at the entrance of the larynx or in the posterior part of the lower maxilla.

3) Follicular cysts: present in the bony alveoli of foals especially those of first molar tooth.

These cysts increase in size at the age of one year.

b) Base Tongue Cysts:

- **Mucoid cysts**, found on the base of the tongue, pharynx or on the epiglottis.
- It is mostly affecting horses and cattle.
- These cysts may be pedunculated.
- When their **sizes** are **increased** up to the size of **hen's egg** or more, they **interfere with mastication** and may obstruct larynx causing **dyspnea** or even **asphyxia**.

c) Umbilical Cysts:

- Affecting mainly foals and calves in the umbilical region or the umbilical cord.
- **Size** varies from the **hen egg to the hand fist** and containing a **mucoid fluid**.
- Require **DDx**. Against Umbilical **hernia**, Umbilical **Abscess**...etc.

d) Traumatic Epithelial Cysts:

- Skin goes deeply due to trauma.
- These types are present in cases where fore**ign bodies are present in the depth of the wounds** such as a **piece of skin following the trauma** or in cases of **fire shooting,** where the wound healed externally.
- The cysts are usually filled with a **gray yellowish fluid** which is **mucoid** in nature.

2. Retention Cysts:

- It may develop from obstruction of a secretory duct of a gland. These cysts are of several types which are:

a) Atheroma:

- It is a sebaceous cyst due to obstruction of the ducts of sebaceous glands and may form in the false nostril in the horse causing local swelling and perhaps a nasal respiratory noise due to encroachment on the nasal passage.

b) Mucous Membrane Cysts:

Affecting cattle and horses due to obstruction of the ducts of mucoid glands.

- It is mostly found on the inner aspect of the lower lip and sublingual mucous membrane.
- It is spherical, or oval swellings filled with clear viscid fluid.
- This type of cysts may be present in the mucous membrane of rectum in horses or vagina of cattle.

c) Neck Cysts and Ranula:

- This is a cystic swelling, due apparently to obstruction of a mucous gland or one of the ducts of the mandibular or sublingual salivary glands.
- They are common in dogs.
- These cysts are either in the form of rounded or oval swellings beside the frenulum linguae or beside the tongue and are known as cysts of the mouth cavity or ranula, or they may be found as swellings under the larynx or in the upper part of the neck and in this case, they are known as the neck cysts.
- These cysts have usually a thin wall and are filled with a thick yellowish saliva like honey and so termed **'Honey cysts'.**

3. Exudation Cysts:

- It is usually occurring due to accumulation of inflammatory exudates in the tunica vaginalis following castration (Hydrocele] or cysts of the ovaries.

4. Parasitic Cysts:

- Such as
  - Cystic form of *Coenurus cerebralis* develops on the brain of sheep and cattle.
  - The cysts of the *Taenia* in cattle and pigs which mainly affect the muscles of the heart and masseters.
  - The cysts of *Echinococcus* which occur in spleen, kidneys, lungs, liver and bone.
- These cysts are produced by irritation caused by the growth of these parasites within the tissues.
- It is considered as pseudo-cysts which are enveloped by fibrous tissues.

5. Degenerative Cysts:

- Which are formed from intramuscular injection of irritant materials or chemicals which are difficult to be absorbed.
- They are also accompanying the tumors such as cysto-carcinoma, cysto-sarcoma and cysto-fibroma.

Symptoms of Cysts

2. A localized fluctuating swelling containing fluid.
3. Cysts are non-inflammatory and slow in development.
4. Skin covering cysts are normal and has no pathological lesion.
5. Cysts of the bone are diagnosed radiologically.

Symptoms are confirmed by exploratory puncture.

Treatment

1. Aspiration of contents by Puncture the cyst with trocar and canula to evacuate its contents, and then injected with an irritant liquid such as tincture iodine or 5% carbolic acid solution, to destroy its smooth lining.

This initiates the granulation tissue which will lead to obliteration of the cavity.

2. Incision at lowest point and swab with tincture iodine.
3. Seton may be a practical method in large animals as in case of hygroma in front of the cow's knee.
4. Excision of the cyst is the most satisfactory method. It is removed as if it were an ordinary tumor.
5. Pedunculated cysts present in the base of tongue, in vagina or in the abdominal cavity are excised using ecraseur.
6. Testicular or ovarian cysts are removed surgically by ovariectomy or castration.
7. In case of hydrocele, it must be first punctured and evacuated, then castration is adopted.

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8 HERNIA

Definition

- Protrusion of a content of a body cavity through a normal or pathological **opening in the wall** of that cavity.
- The protruded part may lie beneath the **intact skin** or occupy another adjacent body cavity.

Constituents of Hernia:

Constituents of Hernia a hernia consists of the hernial ring, sac, and content.

a. <u>The Hernial Ring</u>

- It is an opening through which the hernial contents are protruded.
- The hernial ring differs in its form and diameter; it may be rounded, oval or slit-like opening and its diameter may range from one fingerbreadth to more than one handbreadth.
- The Ring may be formed due to:

1) Rupture in the abdominal wall (Ventral hernia) due to trauma.

2) Rupture in limiting wall as diaphragm (Diaphragmatic hernia).

3) Persistent prenatal opening (Umbilical hernia).

4) Abnormal widening of a normal passage or opening (Inguinal/Scrotal hernia).

b. <u>The Hernial Sac</u>

1) Made of tissues (mostly skin) that enclose the hernial contents.

2) The wall of the sac usually formed from the skin, muscular fibers, fibrous tissue and parietal peritoneum.

3) Absent in case of diaphragmatic hernia.

c. <u>The Hernial Content</u>

- The contents of the hernia may include a part of an organ (a loop of bowel, liver, spleen, …etc.) or tissue (omentum) or both.

Classification

1. According to Etiological factor:

a. Congenital: A congenital hernia may occur due to anatomical defects or polygenic inheritance (Inguinal or Umbilical H.).

b. Acquired: The primary predisposing cause of at acquired hernia is mostly trauma.

- Other causes may act as exciting causes e.g., increased intra- abdominal pressure (pregnancy or tympany).
- In most cases abdominal contents herniated through the abdominal wall, diaphragm or perineum.

2. According to Topographical Anatomy:

a. External hernia:

- The external hernia consists of the hernial ring, hernial sac and the content of the sac.
- Known according to their position; Umbilical, Abdominal, Inguinal, Scrotal, and Perineal.

b. Internal hernia: The internal hernia lacks the hernial sac, such as Diaphragmatic hernia.

3. According to the contents of the sac:

The contents of the sac define the terminology' used for hernia suck as:

a. Enterocele (intestine).

b. Epiplocele (omentum).

c. Enteroepiplocele (intestine plus omentum).

d. Reticulocele (reticulum).

e. Hysterocele (uterus).

f. Vesicocele (urinary bladder).

4. According to the Functional alteration and Clinical signs:

a. Reducible hernia: In reducible hernia, **the contents of the hernial sac <u>can</u> be returned** to the original position through the hernial opening(ring).

b. Irreducible hernia: In irreducible hernia, **the contents of the hernial sac <u>cannot</u> be returned** to the normal original position through the hernial opening. It could be of three types:

1) Hermia with adhesion: In which the inflammatory process and adhesions between the sac and its contents prevent reduction.

2) Incarcerated hernia: In which the hernial contents become too voluminous to be returned through a narrow hernial ring.

3) Strangulated hernia: In which the blood vessel ls supplying the hernial contents are compressed which cause complications like necrosis, gangrene and extensive adhesion.

N.B.

Prolapse: Protrusion of an organ through a natural orifice. Mostly, the organ comes in contact with the exterior environment.

e.g., Uterine & Rectal prolapses.

Clinical Signs:

The clinical signs vary according to type and location of the hernia.

a. External hernia:

1. The presence of swelling that is varies in shape and size.

2. The ring can be easily palpated in case of reducible hernia; while it is not felt in case of incarcerated hernia as it's impossible to reduce the content.

3. In the case of strangulated hernia, symptoms like abdominal pain, fever and evidence of bowel obstruction may coincide with the swelling.

b. Internal hernia: Has a specific clinical sign such as respiratory signs in case of diaphragmatic hernia.

Diagnosis

a. Case history & Clinical signs (painless welling).

b. Plain and contrast radiography may be helpful to identify the contents of irreducible hernia in small animals, small ruminants, and calves.

c. Exploratory puncture; **Contraindicated.**

d. Specific diagnostic procedures for internal hernias; Ultrasonography, X-rays.

Treatment

A. Conservative treatment:

Mainly used in case of;

- Congenital hernia; small umbilical hernias within the first 6 months after birth.
- The hernial ring diameter not more than 2 fingers.

This treatment is in the form of:

1. Lay the animal down on its back.

2. Application of adhesive blaster or pressure bandage around the abdomen.

3. Application of metal or wooden clamp at the base of die hernial. *Belts to encircle the Abd, & cover the hernia.*

4. Skewers, that is in the form metal rods inserted at the neck of the hernial sac and fixed in position with figure-8 ligature after reduction of the hernial content.

5. Injection of counter irritants (saturated salt solution or turpentine oil) in four different points at the hernial ring. The resultant swelling and inflammation will cause closure of the hernial ring.

B. Surgical treatment

- Techniques for surgical treatment are different according to the type, location and signs of hernia and will be discussed in regional surgery.
- Broadly the surgical interferences will be in the form of open reduction after skin incision followed by closure of the hernial ring, suturing of the subcutaneous tissues and skin.
- **Herniotomy:** Surgical division of the constriction of hernia ring, or strangulation of a hernia, often followed by herniorrhaphy.
- **Herniorrhaphy:** Surgical repair of hernia, with sutures.
- **Hernioplasty:** The use of a variety of living tissues and non-living substances as grafts for closure of abnormally wide hernial opening.
  - **Hernioplasty** Applied when hernial ring size is more than 4x4 fingers. (Diameter ≥ 4 fingers – Length ≥ 4 fingers).

Materials used are:

1) Living tissues (fresh or preserved) such as full thickness skin, muscle.

2) Non-living substances, such as Nylon, Teflon, Meserelene, Dacron and Stainless meshes or Sheets.

Indications are:

1) Avoid recurrence of hernia due to a weak spot (scar) following herniorrhaphy.

2) Bridge the gap specially when the hernial ring is large, ring edges are distant and makes the approximation of tissue impossible.

3) Reinforce the absence/weakness of the tissues at the hernial ring.

Function of the graft:

1) These meshes initiate tissue response and simply act as a scaffold for the ingrowths of fibrous connective tissue.

2) The synthetic mesh is preferred to the sheet since it has flexibility and permits infiltrative fibrosis.

Steps of Hernia Surgical Treatment

1. Apply suitable Anesthesia protocol.

2. Lay animal down on its wall to allow the hernial content to return to its original place through the hernial ring.

- If the hernial ring is too narrow that content can return through it, a **Herniotomy** is required.

3. Make C-shape incision in the hernial sac to obtain a skin flap **(If the flap is too large, trim it to obtain suitable size).**

4. The inner hernial sac (layer directly beneath the hernial sac) is removed.

5. Hernia ring edges/lips is enclosed by suturing sing absorbable suture material as Vicryl size 5

- If the hernial ring is too wide, a **Hernioplasty** is required.

6. Suture/Close the skin wound.

If the hernial ring is too wide, a Hernioplasty is required.

a. Too wide hernial rings cannot be enclosed by sutures, they require a **Mesh** (material made of nonabsorbable network of wire or thread).

b. Mesh is placed on the hernial ring on the inner wall of the cavity to prevent organ exit/expulsion.

c. Mesh is sutured with the hernial ring edges, acts as abdominal wall instead of the distant muscle.

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9 Bursae & Bursitis

Definition of Bursa:

Bursa is a synovial sac lined with synovial/secretory membrane, covered with fibrous membrane and filled with synovial fluid.

Function of Bursa:

The function of bursa is to facilitate the passage of skin, muscle, tendon, fascia or ligament over a hard underlying structure.

Classification of Bursa

A. According to their situation:

1. **Subtendinous.** Navicular B - Bicipital B - Fetlock B.
2. **Subligamentous.** Supraspinous B (fistulous withers) - Atlantal B (poll evil).
3. **Subfascial.** Bursa under Gluteal fascia - B under fascia of the eye.
4. **Submuscular.** Bursa under Teres minor M - B under Flexor carpi radialis.
5. **Subcutaneous bursa.** Olecranon B - Precarpal B - Calcaneal B.

B. According to their nature:

1. **Typical, Congenital or deep bursa**
   - Present at birth.
   - Found subtendinous, subligamentous, subfascial and Submuscular.
2. **Atypical, Acquired or superficial bursa**
   - Formed during life due to due to irritation by movement of the skin causing tearing of the subcutaneous tissue and leading to gap formation, which becomes filled with fluid and acquired a bursal wall.
   - Present subcutaneously.

Bursitis	Aetiology Of Bursitis	
Inflammation of the wall of bursa. **Types of Bursitis:** 1. **Acute** (Dry form - Aseptic - Septic). 2. **Chronic** (Cystic - Haemorrhagic - Proliferative - Fibrous).	1. **Trauma** due to: **a.** Blow with hard object. **b.** Irritation by hard ground. **c.** Blow by the shoe as in olecranon bursa of a horse. **d.** Animal lays down for long periods on bursa on hard ground.	2. **Infection** by *Staph., St., E coli, Brucella, Salmonella* by the way of: **a.** Metastasis in the body. **b.** Open wound or intrabursal injection. **c.** Spreading through a neighbouring tissue. **d.** Toxins due to Strangles, Equine influenza, or Rheumatism. **e.** Parasite, as *Filaria*.

Types

Acute bursitis:

Symptoms:

1) **The Dry form** is transitory, present at the beginning of inflammation and so it is subclinical and soon followed by aseptic or septic form.
2) **Aseptic form:**
   Either serous as in horse and dogs or serofibrinous as in cattle.
   There is swelling of the bursa due to its distension with synovial fluid, with presence of hotness and pain.
3) **Septic form:** there is also swelling due to distension with synovial fluid, hotness and moderate to severe pain and there is change in the S.F. character.

Treatment:

1) Removal of the cause.
2) Rest to prevent further irritation.
3) Cold fomentation or hot fomentation depending on the time elapsed from the onset of inflammation.
4) Aspiration of S.F. and injection of corticosteroid as Hydrocortisone® or Kenacort ®or Depo-Medrol® combined with Crystalline Penicillin®. Repeat once or twice/ week for maximum 3 weeks.
5) Apply bandage if possible, to obliterate the cavity and prevent refilling with S.F.
6) Septic bursitis is treated as an abscess by incising the wall of the bursa in the lowest part, evacuation of the content and washing with antiseptic then putting of drain.
7) In case of subtendinous bursitis aspiration of the content and injection of antibiotic or surgical excision can also be applied.

Chronic bursitis:

This caused following acute bursitis or developed independently due to slight repeated irritation.

Symptoms:

1. Distention and enlargement of the bursa that constitute one of the following:
   - **a. Cystic Bursitis**
     - Characterized by enlarged bursa due to distention with S.F that fluctuates on palpation and thickening of the wall.
     - The bursa may be bi or multilocular.
   - **b. Haemorrhagic Bursitis**
     - Characterized by enlarged bursa due to distention with S.F and blood due to rupture of blood vessel in the bursal wall.
     - Palpation reveals either fluctuation or crepitation.
   - **c. Proliferating or Vegetating Bursitis**
     - Characterized by enlarged bursa with thickening of the wall as in the cystic form in addition to proliferation of the wall into the cavity dividing it into compartments.
   - **d. Fibrous Bursitis**
     - Characterized by enlargement of the bursa that filled with fibrous tissue forming fibroma like swelling.
     - It is developed from cystic bursitis that gets proliferation of the wall into the cavity.
2. The skin overlying the bursa may be deprived of hair, covered with horn or ulcerated due to repeated irritation.
3. Pain is very mild if present but lameness may occur due to impediment of movement.
4. Ankylosis of the adjacent joint may occur due to imperfect movement.

Treatment:

a. Haemorrhagic bursitis: Apply counter irritant and then open as in hematoma.

b. Cystic bursitis: Apply aspiration of S.F then apply counter irritant, or apply surgical excision.

c. Proliferating bursitis: Apply counter irritant or inject irritant substance as tincture of iodine in horse or copper sulfate 5% in cattle to strengthen the wall and then apply surgical excision.

d. Fibrous bursitis: Apply firing or surgical excision.

Surgical Removal of Bursa: Sometimes successful when the bursa is large and composed primarily of fibrous tissue as in capped elbow:

Technique of Surgical Excision of Bursitis:

1. Apply elliptical excision on the lateral portion of the bursa to reduce stress on the incision during flexion and extension on the joint.
2. Apply blunt dissection till the bursa become free from its attachment to the surrounding subcutaneous tissues.
3. Remove the bursa.
4. Suture the subcutaneous tissues.
5. Suture the skin with mattress sutures.
6. Cross-tying the horse for ten days post-surgically to prevent it from lying down aid healing.
7. Give antitetanic serum.
8. Give systemic antibiotic.
9. Daily swab the incision with betadine.
10. Removal of the stitches after 10 days.

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D. SURGICAL CONDITIONS OF THE SKIN

10 WOUNDS

Closed Wounds	Open Wounds	
Closed Wound is a wound in which there is no solution of the continuity of the skin or mucous membrane, but the deeper tissues are severed to a varying degree.	Open wound is that one in which there is solution of the skin and other tissues to a varying depth. (Open= external Exposed)	
1. Contusion. **2.** Abrasion.	**1.** Incised wound. **2.** Lacerated wound (contused). **3.** Stab and Punctured wound. **4.** Penetrating wound. **5.** Gunshot wound.	**6.** Perforating wound. **7.** Poisoned and envenomed wound. **8.** **Virulent Wound.** **9.** Ulcerating wound. **10.** Granulating wound.

10.1 CLOSED WOUNDS

Contusion (Bruise)

It is a lesion produced by applying violence by blunt object as result of it there is rupture of blood vessels and varying amount of damage of soft tissues without breaking of the skin but beneath it.

Contusion of the 1st degree:	Contusion of the 2nd degree	Contusion of the 3rd degree
This wound is characterized by rupture of capillary vessels of skin, subcutaneous tissues and formation of ecchymosis (extravasation of blood subcutaneously).	This wound is characterized by rupture of larger blood vessels and production of hematoma. (sCollection of blood in a cavity newly formed by bleeding into tissues).	Accompanied by extensive tissue damage (especially blood vessels) which undergoes gangrene.

Abrasion

Is produced by friction of the skin or mucous membrane upon some hard or rough surface

Symptoms

1. Slight inflammation. **2.** Pain. **3.** Change in the color (as black eye).	**1.** Presence of prominent swelling above the level of surrounding part **2.** Swelling on manipulation is found to be inflamed and there is crepitation (contain blood clots) **3.** Swelling is painful when recent.	**1.** There may be evidence of shock or injury or rupture of internal organs. **2.** If contusion inflected at level of a motor nerve often causes temporarily paralysis of muscle supplied by it.	**1.** Small areas of epithelia are removed → many superficial nerve endings exposed → lesion is **very painful** **2.** Grains (fine sand) or other matter like this are often ingrained at the surface so **Sepsis** of this wound occur in this route. **3.** The bacteria may be lodge under the scab (as mode of healing) and may be virulence enough to proliferate and induce **general disturbances without showing recognizable source of infection** (*Clostridium tetani*). **4.** If this abrasion is over a joint or other part where motion occurs, the **scab may be repeatedly cracked** or lost leading to **arthritis**.

Treatment

1. It is simple affection which undergo resolution **2.** At the moment of the accident apply cold fomentation of astringent. **3.** Apply ointment if there is pain (as anodyne oint. lignocaine).	**1.** When it is recent apply cold fomentation (irrigation) or cold astringent application. **2.** In subcutaneous form, rubbing by absorbent ointment as iodine oint. **3.** Then message and compression with cotton bag or bandage if practicable. **4.** When the case is of long standing the treatment consists of incision (opening) the swelling at dependent point (lowest point of swelling). ▪ This drains all hematoma contents. ▪ If severe heamorrhage occurs from too early opening of hematoma this bleeding must be arrested by bluging the cavity of the hematoma using gauze in a zigzag line. ▪ So, the hematoma must be opened at least after 8-10 days to give chance for B.V. to organize to avoid bleeding.	**1.** Moist warm applications are applied to increase blood supply. If gangrene appears must be treated as such **2.** If the patient suffers from shock the usual treatment should be applied.	**1.** Abrasion heals ideally under a scab, which act as dressing that keeps out bacteria. **2.** Wash carefully with water and antiseptics. **3.** Use penicillin or mercurial ointment as polydermine (act by precipitation of protein of the superficial cells). **4.** If infection is suspected under the scab it is necessary to remove the scab in order to allow the drain. However, removal of the scab if there is no infection, is bad treatment because the fibrin threads binding it to the beneath delicate tissues are so strong that when scab is removed, they tear away with some underlying tissues causing pain, further bleeding and **5.** If the abrasion is situated over joint or movable part may be necessary to splint the part or keep the scab from drying by moist dressing such as zinc oxide ointment after washing with antiseptic.

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10.2 Open Wounds

1. Incised Wound

It is a wound made by a sharp cutting instrument such as knife, surgical scalpel, and pieces of glass or rarely by blunt object upon tightly stretched skin as that of the forehead.

Symptoms

1. Wound tends to gap depending on the elasticity and tension of injured part.
2. Its length is greater than (>) its width.
3. Its **edges** are regular and these are only microscopic devitalization of the cells.
4. Painful because of the number of sensory nerves cut.
5. Its heamorrhage (**bleeding**) is free an
   ***** The freedom of heamorrhage is depending on blood vessel cleanly cut and size of blood vessel and vascularity of involved part.
6. It is accompanied by moderate degree of shock.
7. If the edges are opposed it **heals** by 1st intention within a week unless infection overcomes.

N.B: Septic incised wound heals in 5-7 days, if it is drained completely and sutures are removed after 8-10 days.

If there is no infection, the healing by 1st intention and the treatment will be as follows:

Treatment

1. Give suitable anaesthetic drug
2. Arrest the bleeding;
   - If there is general oozing, exposure to air is sufficient. *or*
   - Supplemented by pressure for few minutes by Aseptic tampon / Artery Forceps / Ligature for arteries and veins.
3. Sterilization of the wound and its vicinity.
4. Coaptation of the edges of the wound by means of sutures.
5. Provide with drainage to avoid retention of discharge and so guard against the irritation and tension caused by it.
6. Guard against infection by insufflations (dressing) of each layer of the wound by Sulphonamides or Penicillin powder.
7. Complete rest to injured part must be secured by splints, slings and bandages.
8. Attention should be paid to general health of the animal.

2. Lacerated & Contused W.

Theses wounds are caused by blunt instrument or by machinery as wheels of a vehicle.

Symptoms

1. The skin is less extensively injured than the underlying tissues but is commonly lifted off over wide area.
2. The **edges** are irregular and bruised.
3. **Bleeding less than** (<) **in incised wounds**; The blood vessels are teared → Retraction of tunica interna → Assist blood clotting (↑).
4. Usually, there is dirt and foreign bodies in the depth of wound.
5. Local insensitivity due to injury to nerve.
6. Primary shock is slight and secondary shock is more severe.
7. This wound **heals** by 2nd intention.
   - In **Septic** wound, inflammation overcome and results in granulating surface.
   - If the wound is aseptic, the healing may be by 1st intention but delayed. The edges must be coaptated to help healing (by sutures).

Treatment

1. **Render the wound aseptic, Remove**
   a. Foreign bodies.
   b. Blood clots.
   c. Dead/doubtful tissues if not important.
2. **If Aseptic;** no area of tissues lost and wound is free from infection, correct the edges and try to suture it partly, or completely.
3. **If Septic** (old - wound and surfaces are covered with sloughs), those are removed by antiseptic fomentation.
4. **Antibiotics:** Parenteral or Oral administration of **Penicillin** or other antibiotics which in reaching tissues will prevent multiplication of sensitive bacteria without damaging of leucocytes or tissue cells.
5. Apply the same principles as in incised wound. (step 5-8)

3. Punctured W.

This wound is made by sharp pointed object which is regular such as nail, needle, wood splinter, bayonets or fish hook.

Symptoms

1. It has a relatively small orifice.
2. It is deeper than longer.
3. **The sides of the wound "Margins";** Usually have a form of **contusion** which gives an idea of the causing agent.
4. **Bleeding**; **Little**.
5. **Not painful** except if infection is present.
   Pain varies with:
   a. Volume and regularity of the penetrating body.
   b. Sensitiveness of wounded area.
   c. Region affected.
6. **Infection or foreign body particles** can be carried into the depth of the wound and further damage may occur in the deep structures, which is difficult to be seen.
7. If a penetrating body is
   a. **Aseptic** and remains in the wound, → forms **Encysted Wound**.
   b. **Septic** body, reaction occurs and the lesion becomes swollen, hot, painful, edematous and fluctuating → **Pus** evacuating brings with it the foreign body present inside.

Treatment

1. With complete aseptic precautions, remove the present penetrating body from the depth of the wound.
2. Avoid putting any antiseptic or even antibiotics through the depth of the wound as this may introduce some bacteria and retain them inside.
3. The only treatment is to infiltrate the surrounding tissues around the wound with antibiotic injection. (As there is always difficulty for complete drainage and thus collection of bus readily forms and burrow in all the directions).

4. Penetrating Wound

This wound is made by sharp, blunt, or pointed objects, which penetrate the skin and underlying tissues. **Extend into Serous or Joint Cavity.**

Symptoms

1. The wound has a point of **only** entry **(inlet)** but has No exit (outlet).
2. The wound communicates a body cavity to the outside.
3. Unexpected damage may be inflected upon the deep structures.

Treatment

1. X-ray gives a real picture to the internal structure.
2. Treatment will be planned according to the present damage.

5. Perforating W.

It is a wound made by missile, which retains a high velocity.

Symptoms

1. Has **both** entry of **inlet** and an exit **(outlet)**.
2. The entry lips (inlet) are **invaginated/inverted** and the outlet **evaginated/averted** outside at the exit.
3. **No retention of foreign body inside it.**
4. Under certain conditions it is less dangerous than penetrating wound.

6. Gunshot W.

It is wound made by gunshot or bullet.

It is combination of Lacerated **+** Puncture **+** (Perforating / Penetrating) wounds.

Symptoms

1. Usually there are **two openings (inlet and outlet),**
   - **Or the shot maybe retained** inside the tissues so no outlet but **only inlet.**
2. The inlet has **invaginated** lips
   - The outlet, *if exists,* has evaginated lips.
3. **At the border** of the inlet there are **traces of gunshot powder** and **signs of burning**.
4. Certain special symptoms may be present if on an important organ is affected.

Treatment

► **If the shot comes out, treat as any wound.**

As in lacerated, contused, punctured, penetrating and perforating, So,

1. Arrest heamorrhage
2. Remove foreign body if present and all bruises and loose tissues.
3. Drainage followed by irrigation with antiseptic solution.
4. If the bullet retained in the tissues,
   a. It is removed by open operation. or
   b. The bullet can be left in situ without inducing trouble (suppuration), if no important structure involved.

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OPEN WOUNDS (CONTINUED)

7. Poisoned and Envenomed Wound

- It is a wound in which venom or poison is implanted in depth of the wound.
- Such wounds are situated usually at lower part of limbs, lips, or tongue and head.
- **Virulent Wound;** which contains dangerous organisms such as Anthrax, Rabies, and T.B.
- **Poisoned wounds** contain mineral or vegetable Poison.
- **Envenomed wounds** contain Venom of some reptiles.

Symptoms

1. Local symptoms: Rapid onset of swelling, pain and local discoloration.
2. General body reaction: local symptoms rapidly accompanied by Weak pulse, Vomiting, Dilation of pupil and Feeling of terror and fear.
3. In more virulent cases collapse soon follow and death occurs within one hour.

N.B:

- The Deposit in the depth (may be Poison, Venom, or Virus) result in local inflammation or general body reaction or the two.

If the envenom wound is due to Insect bite or wasps and bees' bites, there will be

1. Local acute inflammation.
2. Consequent excitement of patient.
3. Congestion and inflammation of internal organs.

Treatment

A- Local Treatment:

1. Arrest the circulation from the wound toward the heart by application of a ligature or tourniquet above the wound.
2. The wound is opened to provide free bleeding (for washing).
3. Washing the wound and compressing it from the periphery toward the center to flush out the poison.
4. Apply suction to the wound in order to aspirate the implanted venom.
5. Cauterization of the wound with one of the mineral acids or better by hot Irrigation of the wound with venom neutralizers as Chloride of lime ($Ca(ClO)_2$) 2%, Ammonia (NH_3) 2% or H_2O_2 solution.

B- General Treatment:

1. Respiratory stimulant at once.
2. Specific anti-venom should be given within one hour to reduce mortality to low figure.

1. Dispense the insects by sprinkling water on patient.
2. Apply
   a. **Alkaline** lotion, e.g., solution of **ammonia** in case of **Bees**
   b. Acid in case of Wasp's sting,
3. If **asphyxia** is threatened from the swelling of the nasal mucous membrane perform **tracheotomy**
4. In severe cases give respiratory and cardiac stimulant.

8. Granulation Wound

This is an old wound characterized by presence of unhealthy granulation tissue.

Symptoms

1. **The wound:** Dark red or purplish or greenish in coloration.
2. **Unhealthy Granulation Tissue:** characterized by dark colour, uneven surface, easily bleed and easily removed.
3. Wound after disintegration gives fetid door and blood - Stained discharge.
4. Wound may undergo caseation or even calcification in chronic cases, this associated with purulent fistulae of long standing.

Treatment

1. Destruction of the unhealthy granulation either by caustics or by excisions.
2. Application of the usual antiseptic wound dressing.

10.3 TREATMENT OF WOUNDS

Treatment of Recent Accidental Wounds

- Every wound except those inflected by the surgeon is patently infected.
- **Safe Period** lasts for at least 6 -12 hours in some cases.
- **Before elapse** of **Safe Period** the accidental wound can be considered to be **Recent**, and treated as follow:
  1. Full anaesthesia and aseptic techniques should be applied.
  2. The wounded area should be protected by laying sterile gauze, which maintained in position by hand. The surrounded skin over a wide area is vigorously cleaned by soap and warm water.
  3. Then the area should be shaved and painted with antiseptic liquid (alcohol).
  4. The field of operation is then covered with sterile towels as a clean operation.
  5. The gauze is then removed from the wound.
  6. Excise the wound edges using a fine knife and toothed forceps; the edges of both skin and subcutaneous tissue are removed in one piece.
  7. The wound must be explored in its whole extent.
  8. All dead and devitalized tissue especially fat and to lesser extent muscles and fibrous tissues must be cut away until healthy clean surface is revealed.
  9. **Obtain Haemostasis**. The large vessels must be ligated with any absorbable material and crushing or cautery could control small ones.
  10. Insufflations the wound layers with antibiotic powder.
  11. Suture the wound if this can be done without tension.
      - If there is loss of tissue that make apposition of skin edges is impossible without tension, the area should be left for healing by 2nd intension and latter skin grafted.
  12. Drain the wound when probability of collection of blood and serum is suspected.
  13. Immobilization of the wounded area and rest are very essential.
  14. **General treatment:** involves attention to the animal diet.
  15. The animal must be given systemic course of antibiotic for 3-5 days and prophylactic dose of anti-tetanic serum for equine patient.

Treatment of Old Septic Wounds (2013)

- The treatment must be prompt to check the infection.

The methods adopted after heamorrhage arresting are:

1. Clipping and shaving the hair at the area around the wound, washing by soap and water then painting with Tin. Iodine, betadine, iodophor solution occlusion
2. Flushing of the wound itself with an antiseptic solution, removal of foreign matter and excision of destroyed tissues.
3. Provide for drainage when there is a bucket in the wound in which septic material may lodge.
4. Initially, excite the proliferation of the granulation tissues in the wound by painting the interior of wound by antiseptic stimulant as tincture iodine.
5. Repeat this dressing every day after day till the wound cavity is built up to the surface by granulation tissue.
6. After every dressing, the suspected line of discharge should be protected by emollient ointment as Vaseline.
7. Initiate epithelization at the periphery of the wound to cover the granulation tissue by zinc oxide or cod liver oil.

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10.4 WOUND REPAIR

Wounds usually repair in process which vary according to character and condition of the wound.

- **A-** Healing by first intention (Primary union).
- **B-** Healing by secondary intention (Granulation).
- **C-** Healing by 3rd intention.
- **D-** Healing by mixed intention
- **E-** Healing under scab

A. Healing by 1ST intention

1. Approximation of edges of wounds with sutures reduces the size of the wound to be healed and swell spaces between the edges is sealed by clotting of blood and plasma.
2. **After 24-48 hours** from injury, the fibrocyte, which lay at the margin of the clean incision, begin to multiply
3. **Within 3-4 days** from time of injury, fibrocyte migrate into the clotted material along fibrin threads. Fibrocyte are accompanied by macrophages and capillary arches, while macrophages lysis the clot and remove it.
4. **Within 4-5 days,** the clot will have been replaced by vascular CT growing in an organized manner.
5. The process of organization joins the edges of the wound and replaces the previous fibrinous union by fibrous union.
6. The wound rapidly gains strength as the fibroblasts begin to assume the characteristic of fibroblasts and collagen is formed between them.
7. **Within the 10th day,** Level of the strength is attained.

B. Healing by 2ND intention or by Granulation:

The most common mode of healing in veterinary practice:

1. The blood flow in the superficial capillaries of the lesion which becomes arrested and adjacent vessels becomes dilated.
2. From Dilated Vessels an exudation of plasma and leucocytes released.
3. Then the plasma coagulates in the surface of the wound and form **Clot-Like Exudation** into which Fibroblasts and Capillaries Grow to form the **Advancing Surface of Organization**. This surface when inspected found to consist of red rich in vascular moist tissue with slight granular surface (granulation).

With minor degree of infection organization may still proceed. → The infected surface of the wound is gradually reduced, and the defects is filled with granulation tissue (within 4-7 days)

4. The Epithelium at the end of the wound proliferates to cover this formed granulation tissues that seems to grow.
5. The wound return to a level similar to adjacent tissues, it is **Cicatrisation** of the wound (**Cicatricial/Scar Tissue**)
6. Occasionally this doesn't occur and elevated mass of redundant (grow more than necessary) grow at the site of the wound; **Proud Flesh** (**Keloid**).

C. Healing under Scab

1. Occurs in superficial injuries of skin especially in abrasions and small wounds
2. This is practically **identical with healing by 2ND intention/granulation** except that **repair takes place beneath scab**.
3. **Scab:** formed from the blood and lymph which appears on surface then coagulate producing a dark brown crust.
4. Appearance of granulation tissue takes place under crust, at the same time marginal epithelium proliferate to cover the surface.
5. As healing progress there is **liquefaction** at the depth of the scab where it is attached to living tissue, forming thin cleft in which the advanced epithelium flows, this is most noticed at the margin of lesion where the scab becomes thin and curved upward as epithelium underline it also cicatrisation under the scab.
6. Finally, all row surfaces are covered with epithelium and crust become detached and drop off or easily, lifted off without bleeding and pain.

Necessary factors for healing

a) Recent or fresh of the lips.
b) Complete asepsis.
c) Absence of bleeding.
d) Clean cut edges brought into accurate opposition by sutures.
e) A good blood supplies.
f) Absence of dead tissue.
g) Protection from infection.

a) When lips not into opposition or not sutured.
b) When the surface of the wound is bruised or injured so that sloughing of portion of tissue occurs.
c) When microorganisms gaining entrance to the wound so 1st intention is prevented.

D. Healing by 3rd intention

It is the union of granulating surfaces under strict asepsis and with perfect contact of the wall of wound as in skin grafting.

E. Healing by mixed intention

Heal some part with 1st intention and others by 2nd intention.

10.5 FACTORS WHICH IMPAIR HEALING:

A. Local factors

1. **Devitalized and necrotic tissues:** these are irritant and also excellent media for growth of bacteria, which retard healing.
2. **Infection:** this may be
   a. **Primary** caused by the wounding agent
   b. **Secondary** from the skin of animal, its surrounding or during dressing.
3. **Foreign bodies:** these may be introduced from outside or deposited by the tissues as calcium deposition in area of old injuries.
4. **Inadequate blood supply locally:** the blood supply may interfere by the injury itself, laceration of regional vessels, presence of old scar or by unnecessary tension of sutures.
5. **Edema and lymphatic obstruction:** this result in reduction of oxygen tension in the tissues with building up CO_2 and fall in the pH (acid), which in turn results in further devitalization of tissue.
6. **Haemorrhage:** presence of bleeding in a wound result in increased tension in the tissue and produce pain, ischemia, necrosis and delay healing.

B. General factors

1. **Nutrition:** malnutrition may be the cause of lower resistance in the patient and may result in failure of the body to mobilize the defense mechanism, **Hypoproteinaemia inhibits fibroplasias** (formation of fibroblast) with granulation tissue, the edges of wound are soapy with oedema and they give evidence of fibroplasias as 8th day or 14th day after injury.
2. **Vitamins:** it well recognized that surgical procedure and injuries diminish hepatic function and that liver is concerned with metabolism and storage of most of the vitamins.
   a. **Vitamin C** is required for production and maintenance of the intercellular cement especially in capillary bed and collagen tissue.
   b. **Vitamin A** is essential for epithelization.
   c. **Vitamin K** has essential role in control of heamorrhage in relation to deficiency of prothrombin.
3. **Temperature:** ideal temperature for healing of the wound is the normal body temperature and every effort should be made to approximate it with the regard to dressing and condition of wound.
4. **Rest:** rest of the part is a considerable importance especially in relation to wound of extremities of the region of joint. Motion of the area disturbs the medium in which the cells are growing and initiate extravasations of blood.

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10.6 Complications of Wound Repair

Complications of Healing by 1st Intention

1. Opening of the wound lips:

a. Due to loss of the skin at the operation site, then tension is applied over the skin during suturing specially in cases of removal of large swelling.

b. Due to improper knots or using threads of bad quality.

c. Removal of sutures early and before healing of the wound.

2. Necrosis of the Wound Lips:

Due to narrowing the spaces between one stitch and another, and strong ligation of the sutures, leads to necrosis within 3-5 days.

3. Accumulation of Wound Secretions due to Septic Conditions

a. suturing the skin only without suturing of the underlying tissues, leads to formation of gap under the skin and wound secreta is collected.

b. Incomplete arrest of haemorrhage before suturing the wounds leads to formation of blood clot in the depth of the wound.

c. Secondary haemorrhage due to haemolysis of the blood clot in the region of wound.

Treatment:

Removal of the' sutures from the lower part of the wound and removal of wound contents by blunt instruments.

4. Small swelling:

Normally present around the wounds except if symptoms of sepsis are present.

5. Large swelling:

Usually, the cause is infection by pyogenic microorganisms.

Fever is noticed and local inflammation appears.

Treatment:

Removal of sutures and evacuation of pus and all measures for treatment of open wound are performed.

Complications of Healing by 2nd Intension

A) Hypergranulation tissue:

- Usually, granulation tissues begins from the depth of the wound until It reaches its surface then the skin is epithelized and cover the granulation.
- In abnormal healing, the granulation tissue is enlarged and protrudes over the skin forming granuloma.
- The granuloma is usually exposed to trauma and infection in which purulent secretions are noticed.

Causes:

1. Presence of wounds at the region of joints.
2. External irritation by licking or scratching or faulty bandages.
3. Faults during treatments by frequent using of caustics or curret or washing the wounds.

Treatment:

1. Removal of the cause.
2. Prevention of irritation by using local anaesthetic ointments and fly repellants as tar and applying a tail bandage and mouth mask.
3. The use of strong irritants over the granulation as copper sulphate or silver nitrate and application of pressure bandage over the wound.
4. Surgical removal of hypergranulation.
5. If the size of the wound is large, skin transplantation or implantation is indicated.

B) Hypoplasia of granulation tissues:

This case is diagnosed by slow formation of granulation tissue and eversion of the lips of the wound, then the wound is transformed to an ulcer.

Causes:

a. General causes:

1. Age factor (old, aged animals).
2. General debility and anaemia.

b. Local causes:

1. Wound infection.
2. Faulty in treatment by using unspecific drugs.
3. Paralysis of its nerve supply or venous thrombosis.
4. Specific infection as tuberculosis or glanders.

Treatment:

1. Good ration with addition of vitamins.
2. Use of ultraviolet therapy is of good result.
3. Touch the wound by tincture of iodine.
4. Use of cod liver oil.
5. Surgical excision of the wound and resuturing.
6. It is contraindicated to use penicillin or cortisone locally as it retards the healing process.

C) Imperfect epithelization:

Causes:

1. Presence of unhealthy granulation tissues.
2. Hypergranulation tissues.
3. Enlargement in the size of the wound.
4. Repeated severe irritation to the wound.
5. Leaving a bandage over the wound for long time leads to destruction of epithelium.

Treatment:

1. Removal of necrotic tissues.
2. Using zinc oxide ointment or cod liver oil ointment.

D) Ulcer:

Ulcers means a wound in the skin or mucous membranes which is unable to heal. Ulceration is usually accompanied by presence of pus. See ulceration and ulcer.

E) Fistula:

This item, was discussed before.

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A. Non-Infectious Complications.

	1. Syncope	2. Traumatic Shock	3. Traumatic Neuralgia (hyperesthesia)	4. Traumatic Emphysema	5. Traumatic Fever		6. Venous Thrombosis
					Simple Traumatic Fever	Symptomatic Fever	
Def	Form of unconsciousness due to sudden fall in blood pressure.	Shock produced by General decrease of vascular tone and Reflex inhibition of the heart through the vegi. **i.e.;** **a.** A fall in blood pressure follows and this leads to diminished venous return to the heart from the injured part. (**Decrease of vascular tone**) **+** **b.** Through peripheral sensory nerves to vital centers in the medulla then through the vegi. (**Reflex inhibition**) **=** Causing General Depressed Condition.	**Neuralgia**; intense, typically intermittent pain along the course of a nerve.	It is the escape of air into the subcutaneous tissue or escape of gas from the alimentary tract. Common complication of punctured and penetrating wounds.	This may occur after **1)** **Subcutaneous Injuries** e.g.; sprains, contusions or fractures. **2)** **Aseptic Operation** providing that there is no infection. **3)** The **absorption of some chemical substances from blood clot** or inflammatory exudates stimulates the neurogenic center. So, there is slight rise in temperature and acceleration of pulse and respiratory rate.	This occurs as Result of **Absorption of toxins from** the wound where initial **microorganisms** are present. Which also cause Putrefaction of: ○ Blood clots or ○ Dead tissue covering the wound.	**a.** It is Result of **Phlebitis** in a vein which has been opened or contused at the site of the wound during accident. **b.** The danger of this condition lies in the fact that thrombus may disintegrate forming emboli whose effect depend upon its size, site and degree of its sepsis. **c.** So, when it is large it may obstruct the pulmonary artery or auriculo-ventricular valve and cause sudden death (so it is in important site). **d.** Also, septic embolism produces a fatal septicaemia.
Cause	**a-** Severe heamorrhage. **b-** Reflex action (as in operation).		**Primary Neuralgia**: Manifested by continuance **during abnormal period of the pain** caused by the injury. **Secondary Neuralgia**: Appears **during the period of cicatrisation** (scar formation). Both may be confined to the region of the wound or extend along the nerves in the vicinity.				
Symptoms	**1.** Pale mucous mm. **2.** Dilation of pupil. **3.** Coldness of the body extremities.	**1.** Animal appear to be in prolonged fainting fate. **2.** Pale mucous membrane. **3.** Pulse rate is slow and its volume is poor. **4.** Respiration is slow and shallow. **5.** Extremities are usually warm owing to peripheral dilatation.		There is soft circumscribed, painless, crepitating swelling. It may become general causing discomfort and dyspnoea.			
Treatment	**1.** Place the head at lower level than that of the body. **2.** Flicking the body with towels or cloth. **3.** Performing artificial respiration. **4.** Injection of caffeine or ether subcutaneously. **5.** If due to loss of blood, give normal, saline, hypodermic I.V, rectal injection.	**1.** In mild cases. rest and simple stimulant is sufficient. **2.** In severe cases. eliminate all anxious stimuli and protect or splint every injured part and control hemorrhage. **3.** Sedative may be used in small doses, (never in large dose).	**1.** Treat antiseptically. **2.** Apply anodyne preparation. **3.** Worm moist compress often have analgesic effect. **4.** If due to compression of scar tissue the nerve must be exposed free from the contracting scar (2^{nd} neuralgia) tissue and displaced so that it can be no longer compressed.	**1.** Apply pressure from the periphery of swelling toward the wound to expel some of air or gas. **2.** Enlarging the wound so that the air may escape instead of infiltrating the tissues.	Counteract the infection of wound by antiseptic and antibiotics.		**1.** Apply antiseptic solution to clean the wound. **2.** Avoid rough handling of wound for fear of disturbing the clot and causing emboli. **3.** If general infection is suspected give course of antibiotics.

7. Hemorrhage: (mentioned at the concerned subject).

Infectious Complications

1. Specific Infection.
2. Generalized Infection.
3. Non-specific infections.
4. Granulomatous Infections.
5. Diffuse Supportive Inflammation (Phlegmon& Cellulites)

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B. Infectious Complications

1. Non-specific infections

a. Pyogenic Infection

Cause; *Staphylococci*, *Strept*, *E. coli, Bacillus pyogenes.*

1. When *Staph*. is pyogenic, there is rapid suppuration and formation of thick creamy pus.
2. When *Strept* becomes virulent, it spreads in extensive area and produce necrosis rather than abscess.
3. When pus is produced by E. coli, it has an offensive focal odour, thin and watery.
4. When *Bacillus pyogenes* present, pus has a musty odour with greenish or bluish coloration.

b. Cellulites (Phlegmon)

Cause; *Streptococcus pyogenes.*

1. It is spreading inflammation of subcutaneous or lose facial connective tissue.
2. At first, the site of infection shows signs of inflammation which rapidly show diffuse infiltration.
3. The area becomes slightly raised red and severely tender.
4. The edges of the inflam. are indifferent and fade off into the surrounding normal tissue.

2. Generalized Infection

a. Septicaemia

This result when the circulation is flooded with bacteria due to

a. Failure to local defense reaction at site of infection.
b. Delay or inadequate treatment.

In the blood stream, the microorganisms proliferate therein and can always been found in blood culture.

b. Bacteraemia

Organisms are present but not multiply in blood.

c. Pyaemia

Multiple abscesses develop in various parts of the body due to presence of Septic Emboli in the blood.

Some of the metastatic emboli maybe inaccessible and may lead to death of animal if it's present in vital structures.

d. Toxaemia (supraemia)

Blood is infiltrated either with

a. Poisonous naturally produced by organisms at the site of infection. or
b. By toxic by-product produced in the infected focus.

The blood culture is free from any bacteria.

Treatment

1. Careful attention to the wound.
2. Complete rest to affected part.
3. Increase blood supply to the part.
4. Systemic antibiotic must be administered.

1. Careful antiseptic dressing for the wound. Complete rest of the affected part and the patient.
2. I.V. daily injection of glucose saline. Systemic course of antibiotics or Sulphonamides.

3. Specific Infections

a. Tetanus

Cause; *Bacillus tetani,* anaerobic organisms.

1) Common complications in wounds of equine but comparatively rare in other animals.
2) *Bacillus tetani* multiply inside the wound and produces toxins which fixed in the nerve center provokes titanic convulsions.
3) Present mainly in deep dirt wounds.
4) The disease usually appears on 3rd - 5th day but if wound is healed it not appears till the 3th -4th week.

b. Rabies

Cause; *Rabies virus.*

It is viral line disease cause by filter-passing virus introduced into victim by bite of another animal especially dog.

c. Erysipelas

It is a contagious disease due to *Streptococcus erysipelatous.*

1) It causes marked swelling of the structures in the vicinity of the wound.
2) The discharge from the wound is amber-coloured in some cases and other there is suppuration of infected part of the skin.

d. Gas Gangrene

(Gangrene Septicaemia)

a. **Local symptoms:**

1. Painful, edematous swelling surrounding the wound.
2. The center of swelling; depressed, cold, insensitive and crepitating in advanced stage.
3. Lips of wound undergo purification becoming friable and infiltration of fetid gas.
4. Ordinary purulent discharge is replaced by greyish or reddish fetid liquid.

b. **General symptoms:**

1. Toxaemia and Fever followed by falling in temperature below normal.
2. Death may occur within 2-3 days.

4. Granulomatous Infections

a. Actinomycosis

1. The lesion present in the mandible and tongue.
2. This lesion is characterized by abscess formation with encapsulation.
3. As the case advances; CT is formed and lesion becomes dense and compact.
4. The affected part increase in size which has common name of disease such as wooden tongue and lumpy jaw.
5. The lymph node is not affected in case of actinomycosis is due to *Actinomyces bovis* is reported in equine, horse and sheep.

Causes:

1. By strain of anaerobic, gram positive fungus called *Actinomyces bovis* which in normal inhabitant of m. m. of upper respiratory tract and digestive tract.
2. The fungus becomes pathogenic when local injury causes devitality of m. m.

b. Actinobacillosis

1. *Actinobacillus lignieresii,* which is gram negative aerobic fungus it causes formation of abscess in the cervical region but commonly sub-maxillary lymph nodes.
2. Also, causes some of the case of wooden tongue.

c. Botryomycosis

(Granuloma Pyogenicum)

- It is a low grade of inflammation of oral m. m. due to invasion of an injury by *Staph, aureus*.
- The inflam. results in the proliferation of granulation tissue, which may be accompanied by variable degree of suppuration at early stage, it appears anywhere in mucous membrane of the mouth.

Treatment

The prevention of tetanus consists of injection of anti-tetanic serum as soon as possible.

1. It is mainly prophylactic.
2. The suspected wound should be treated as envenomed wound.
3. Hyperimmune serum in every case given.

1. Purgative should be given.
2. Anodyne to relief pain.
3. Provide drainage and through irrigation with antiseptics.
4. Polyvalent anti-streptococcus serum. S/C, repeated daily.
5. Antibiotic or Sulphonamides.

1. The same treatment as in septic traumatic lesions and for moist gangrene
2. Inoculate specific serum and injection of polyvalent antigangrenous serum
3. Systemic antibiotic,

1. Penicillin is considered the treatment of choice. Rather high dose should be given /day given at minimum for 6-8 weeks
2. Complete excision of the focus if possible.
3. Large doses of potassium iodide 5-20gms as 4% should be given/ daily with good result.

It is cured rapidly and completely by Potassium Iodide (KI).

- It is difficult due to the fact that process of treatment invades tissues below mucosa and special efforts must be made to remove all of the infected tissues.
- Radiotherapy may be done alone or to support surgery.

5. Diffuse Supportive Inflammation (Phlegmon& Cellulites)

Cause: usually *Streptococci.*

- In the infection there is tendency for spreading in the fascia involve veins and lymphatic and destruction.

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11 INFLAMMATION OF THE SKIN

Eczemas

Eczemas are primary, superficial skin inflammation that are confined mainly to the epidermis. They may also involve the upper layers of the cutis to some degree.

Etiology

- The precipitating causes are varied but every case involves a specific Inflammatory reaction of the sensitized skin.
- It is now generally agreed that eczemas represent an allergic skin reaction.
- The factors that predispose the animal to eczema are usually referred to exogenous or endogenous causes.

1- Exogenous:

1. Poor skin care: dirt particles, loose hairs and sweat and sebum decomposed on the skin (decomposition products lead to sensitization).
2. Frequent wetting of the skin.
3. The areas, that are constantly moist because of ocular or nasal discharge or chronic diarrhea.
4. Mechanical irritations by rubbing body parts.
5. Ectoparasites (flea, flies, lice. etc.) and their excretion products are important in the etiology of many eczemas.
6. Chemicals or topical medications can act as causative agents as well as plastics and rubber parts.
7. Bacteria, especially pyogenic types may cause eczema.

2- Endogenous:

- Eczema may relate to nutrition and metabolism.
- It can be caused by over feeding or deficiencies of some vitamins, proteins, fat, and minerals. The clinical manifestations of eczema are extremely diverse and various stages and degrees of inflammation may be present at any given time.
- Eczemas may take an acute or chronic course.
- They are classified according to predominant signs, nature, localization, or precipitating cause, if known.

Symptoms

The inflammatory process goes through various well-defined stages. The major stages of eczematous changes are:

1. **Erythematous stage:** Erythema with slight epidermal damage as a sign of hyperemia of the superficial skin layers with weak serous infiltration.
2. **Papular stage:** Nodules develop as an expression of circumscribed cellular proliferation.
3. **Vesicular stage:** Serous exudation increases, leading to the formation of vesicles filled with clear fluid.
4. **Weeping stage:** The vesicles rupture and, if they have coalesced, produce diffuse weeping.
5. **Pustular stage:** Usually pustule formation is due to secondary bacterial invasion.
6. **Crusting stage:** The exudates of the vesicles or pustules dries forming concretions. These crusts may overlie a layer of pus.
7. **Scaling stage:** The skin surface is covered with scales of varying size as a manifestation of hyper - or parakeratosis, begin with above stage.

Acute eczemas typically progression halts at one of the remaining stages and heal with scaling.

In **chronic eczemas** the early stages are less pronounced, and erythema is usually absent. The major signs are localized thickenings of cell proliferation and heavy keratinization scaling. The skin itself feels dry due to. and sweat secretion.

Diagnosis

Is established by the history and clinical findings.

Differential Diagnosis

It is especially Important that eczema be differentiated from infectious skin diseases of parasitic (mange) or mycotic origin. Their exclusion is based upon the course, the clinical picture, and by the presence or absence of organisms In skin scrapings. In acne: The skin shows nodular lesions.

- **In alopecia:** There Is hair loss without skin damage.
- **In dermatitis:** The Inflammation involves both the dermis and the epidermis, and the lesions are homogeneous.

In photosensitization: The skin changes are confined to unpigmented areas.

Prognosis:

Acute eczema usually has good prognosis. The prognosis is poor in chronic cases.

Treatment

Eczemas vary widely in their response to therapeutic measures. Eczema treatment is often expensive and time consuming. The initial goal is to identify the cause and eliminating it if possible.

1. Use of insecticides in case of insects.
2. Any suspected medication should discontinue.
3. Administration of glucocorticoids [topically, orally, or parenterally) which is not eliminate the cause but treat the symptoms.
4. Primary attention is given to the feed.
5. Antihistamines are important.
6. Treatment of any demonstrable organ dysfunction [liver, kidney).
7. Local treatment: Cleaning washing with neutral soap and warm, mild antiseptic solution (3% solution of H2o2 and application of emulsions or ointments (zinc oxide, cod-liver oil and vitamins) in acute cases in chronic acses irritant preparations (coal-tar derivatives, iodine ... etc) are used.
8. Sulphonamides and antibiotics are injected for secondary Infection.

Dermatitis

Dermatitis is an inflammation' of all skin layers and is usually caused by the direct action of noxious agents.

Etiology

1. Mechanical as scratching.
2. Chemical as blisters and concentrated antiseptics.
3. Thermal as in cases of bums and scalds.
4. Parasitic as ticks, mites, and lice.
5. X-rays.
6. Bacterial.
7. Excessive secretion of tears as in cases of obstruction of the nasolacrimal duct [Tear scald).

Predilection seats

1. Saddle area.
2. Neck.
3. Hock, pastern and fetlock in equines.
4. In front of the carpus.
5. Pectoral region.
6. Nasal bones.
7. Entrance of the ear canal.
8. Tip of the tail.

Types:

1. **Dermatitis Erythematosa:**
   - It is the simplest type of inflammation.
   - The skin is thick, tense and painful and there is local elevation of the temperature.
   - The red coloration can be distinguished in unpigmented skin.
2. **Vesicular Dermatitis:**
   - In these cases, the serous fluid accumu1ates in the form of small vesicles covered by thin skin.
   - The vesicles are easily opened and secretes clear yellowish serious fluid.
   - This type is observed in cases of bums of the second degree arid after the use of blisters.
3. **Pustular Dermatitis:**
   - This type is due to infection with pus forming microorganisms where we can observe small vesicles filled with pus.
4. **Chronic Dermatitis: (hyperplastic or vegetative dermatitis)**
   - In this case the skin is well thickened and may be covered with scales or horny tissues.
   - It is usually observed in front of the hock, fetlock, and pastern joints.
   - In more chronic cases vegetations may be noticed and in this case, it is known as hyperplastic or vegetative dermatitis.

Treatment

1. Remove the cause, e.g., the saddle is removed when it is too tight or too wide.
2. Scratching must be prevented by using the side stick or cradle in large animals or by using a muzzle in dogs.
3. The skin Is washed with warm water and soap or with hydrogen peroxide then dried.
4. Application of anaesthetic ointments as cocainized Vaseline 10% and a bandage to decrease pain and at the same time to give warmth to the part.
5. This procedure is repeated daily until improving is noticed.
6. **Dermatitis erythematosa** is treated by powdered antiseptics as zinc oxide, iodoform or talc powder.
7. **Vesicular dermatitis** is treated by surgical opening of the vesicles and applications of an antibiotic ointment.
8. **Pustular dermatitis** is treated by opening of the pustules, washing with mild antiseptics and touch with tincture lamine.
9. In **chronic and hyperplastic dermatitis** massage and pressure bandages are indicated.
10. Cortisone ointment is also beneficial in preventing excessive vegetations.
11. The best treatment in cases of **vegetative dermatitis** is the surgical removal of the vegetations after washing with hydrogen peroxide (H2o2)
12. Bleeding in these cases is stopped by firing and then a pressure bandage is performed.
13. After some days the operation seat Is swabbed with 5% alcoholic formalin and repeated every 4-6 days.

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12 Thermal Injuries

Burns and Scalds

Burn: Is an injury caused by hot solids, flame, corrosive substances, ... etc.

Scald: Is an Injury caused by the action of severely hot liquids or steam.

The degree of injury depends on the temperature of the object and its duration of contact with the body.

When the integument of the skin and the tissues beneath it are exposed to sudden increases in temperature, cell death occurs because of protein coagulation.

Severe burns can occur in anaesthetized animals on heating pads.

The animal is not moving, the tissue against the pad is compressed, there Is inadequate blood circulation in this tissue, and therefore any heat accumulates here.

Classification

Burns are classified into three degrees according to the thickness of tissue involved, (first-, second-, or third-degree burn). This Is both the clinical and histologic definition.

1. **A First-degree burn**
   - Involves the superficial layers of the epidermis, is clinically diagnosed by the presence of erythema alone, and is characteristic of a typical mild sunburn.
   - In these superficial buns the surface layer of the epidermis desquamates and is rapidly replaced from the deeper germinal layers.
2. **A Second-degree burn**
   - Results in partial thickness skin loss with destruction of the epidermal elements.
   - In man and in pigs this is accompanied by the formation of vesicles.
   - Loss of epidermis is complete, and healing occurs by proliferation of cells located in accessory skin structures of the dermis.
   - The capillaries and venules in the dermis are dilated and congested and permit the escape of plasma.
   - This results in massive oedema of subcutaneous tissues, and leukocytes migrate from damaged vessels into the surrounding tissues.
3. **In a full-thickness burn (a Third-degree burn),**
   - The entire skin is coagulated into a homogenous mass because of the action of heat on the contained proteins.
   - The superficial blood vessels of the subcutis are thrombosed and the deeper vessels become excessively permeable resulting in severe oedema of the subcutaneous tissues and gangrene of the damaged tissue.
   - The eschar that develops is dark brown and leathery.
   - The area is insensitive because cutaneous nerve endings have been destroyed.
   - Full- thickness bums heal slowly, if not grafted, because healing depends on epithelialization from wound edges and contraction of the wound.
4. **Fourth degree:** In which the muscles are also involved.
5. **Fifth degree:** The whole burnt part is charred.

The Effects on Abdominal Organs and Systemic Reactions

Many of the abdominal organs show pathological changes associated with burns. These changes have considerable influence on the treatment.

1. **Renal function** In the immediate postburn period, slightly affected. Renal tubular flow must be maintained with fluid therapy.
2. There is definite damage to organs such as the liver. This liver damage can be highly significant.
3. Other common findings at necropsy include vascular congestion and oedema of CNS, and petechiae in the myocardium, intestinal tract, and kidneys.
4. **Pulmonary difficulties** are encountered frequently in burned animals. The early problems are those associated with inhalation of irritating smoke, which manifested by bronchospasm, copious secretion, and oedema of the trachea-bronchial mucosa. With steam inhalation, actual burn can occur, which has much more serious consequences.
5. Alteration in the composition, volume and distribution of the body fluids occur, resulting in fluid loss, which is an important aspect of burn.
6. Disturbance of **electrolytes distribution** due to cell membrane dysfunction, can occur.
7. **Protein loss** occurs through the loss of protein-rich fluid from the bum surface, due to increase of capillary permeability.
8. **Red blood cells loss** and destruction occur because of burn.
9. The result of fluid loss and other disturbances is **hemoconcentration** which vary in degree according to the severity of hemolysis and fluid loss.
10. There is **intense pain** and thirst if the lesions are extensive,
11. A varying degree of **toxemia** is present.
12. **Shock** develops if the lesions are extensive, because of the severe pain and due to the reduction in blood volume.
13. **Septicemia** may develop due to secondary bacterial infection.
14. **Pneumonia** is a common cause of death in animals.

Prognosis

- Prognosis depends more on the extent of the injury (i.e., the area of body involved) rather than on the degree of burn in a limited area.
- **Shock** may result if more than **40%** of the skin surface is affected by bums.
- The prognosis is **unfavorable** if more than **50%** of the skin surface is involved.
- **In first degree burn**, healing may take place within 10 days.

Second- and **Third-Degree** burn may take **three to four weeks or more**.

Treatment

A. General treatment: Supportive treatments include.

B. Antibiotics.

C. Sulphonamides

D. Corticosteroids

E. Antihistaminic

F. Vitamins and Minerals, to treat dehydration and shock.

G. Local treatment

1. **First degree:** apply boric acid, alum, picric acid 24%, tannic acid 2% and mercurochrome 5% in the form of emollients and ointment containing vitamin A & D plus sulfonamide & antibiotic.
2. **Second and third degree:** do not rupture the vesicles, remove all dead tissues, and apply warm saline, followed by anticoagulants and cod liver oil.

Cold injury "Frost bite"

- Frost bite is a condition caused by exposure to extreme cold weather.

Freezing tissue is rare in animals and is usually restricted to the tips of the ears and tail, the scrotum, and mammary glands. The excessive cold causes freezing of the fluid and stasis of blood.

Symptoms

1. The degree of severity of frost bite varies from temporary chilling of tissues to freezing and necrosis of a portion of tissue.
2. In mild cases the skin at first becomes pale and bloodless followed by intense redness, heat, pain, and swelling.
3. The hair may fall out and the epidermis may peel off.
4. The inflammation subsides within a few days.
5. In severe cases the affected part becomes swollen and painful and later undergoes necrosis.
6. Patches of skin are destroyed in this manner and a clear line of demarcation develops between the affected and normal portions.
7. Sloughing of the dead skin leaves a raw surface.

Treatment

1. In the treatment of frost bite there are various opinions regarding the means of local resuscitation of frozen tissues.
2. Rapid rewarming of the involved area by means of warm liquids or exposure by contact to warm surfaces rather than exposure to warm air.
3. The ischemic necrosed area should be cleaned with soap and systemic antibiotic therapy is advised.
4. After definite mummified demarcation has occurred, surgical amputation of these portions of the tissue Is carried out without difficulty.

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E. EAMORRHAGE &HAEMOSTASIAS

Definition	Loss of blood from the vessels or from the natural blood channels.	
Causes	**A. Direct exciting causes, like**	**B. Indirect or predisposing causes, like**
	1. Trauma or injury to a blood vessel. **2.** **Constitutional Diseases**; some congenital diseases (hemophilia). **3.** **Acquired Diseases**; purpura haemorrhagica and Leukemia.	A **pathological lesion in the wall of the blood vessels** (aneurysm, arteriosclerosis, malignant tumors). These **lesion predispose to rupture of blood vessels** especially in cases of high blood pressure or any sprain.

Classification/Varieties of Hemorrhage

1. According to the Origin *< Main Types of Hemorrhage>*

Arterial Heamorrhage	Venous Heamorrhage	Capillary Heamorrhage
a. Bleeding from arteries. **b.** Bright red in coloration. **c.** Occurs in jets from the upper end (with the heart beat). **d.** It may be fatal or serious (according to the size, site, and importance of the ruptured arterial vessels).	**a.** Bleeding from veins. **b.** It is dark red or blue red. **c.** It flows continuously in steady stream. **d.** It comes from the distal end-of the injured blood vessel. **e.** Less serious if compared with the arterial one.	**a.** **Bleeding** from **capillaries** **b.** The color is in between bright to dark red. **c.** It occurs as a generalized oozing. **d.** It is seldom severe or serious.

2. According to Location

External Hemorrhage	Internal Hemorrhage
It occurs from the skin as a result of wounds, or from any one of the natural body orifices. This type can be classified into: **a.** **Epistaxis** - Bleeding from the nose. **b.** **Hemoptysis:** Bleeding from the lung (it occurs during cough in patients with some respiratory diseases). **c.** **Hematemesis** - Bleeding with vomit from the stomach. **d.** **Hematuria** - Bleeding occurs in the urine **e.** **Melaena** - Bleeding occurs in the feces.	• The diagnosis depends upon the signs of the severe blood loss. • This type can be classified into: **A. Concealed hemorrhage or internal hemorrhage into the body cavity** It is very serious/fatal type because it may be difficult to recognize its locality and quantity inside the body. **4.** **Haematocele** Bleeding into the tunica vaginalis. **5.** **Hemarthrosis** Bleeding into the joint. **6.** **Hematometra** Bleeding into uterus. **7.** **Hematomyelia** Bleeding into the intramedullary space. **8.** **Hematorrhachis** Bleeding into the extradural space. **9.** **Hemoperitoneum** Bleeding into abdominal cavity. **10.** **Hemosalpinx** Bleeding into the fallopian tube. **11.** **Hemothorax** Bleeding into the pleural cavity. **B. Tissue hemorrhage** Escaping of the blood into the intercellular spaces, in the subcutaneous, submucous and the subserosal tissues (the surface remaining intact). such as: **a-** **Petechial hemorrhage** Minute red spots under the skin or the mucous or serous membranes. **b-** **Hematoma** • Collection of blood underneath the skin mucous or serous membranes or into the muscles. • The size is somewhat large according to the poured-out blood.

3. According to The Time of its Occurrence (2013)

Primary Hemorrhage	Intermediate or Reactionary Hemorrhage	Secondary Hemorrhage	Spontaneous Hemorrhage
It occurs immediately after injury.	It occurs within the few hours after an injury and is resulted from: **1.** Failure of the temporary natural arrest. **2.** Faulty ligation. **3.** Rise of blood pressure after recovery.	**a.** It occurs after long time, usually more than 24 hours. **b.** Occurs as a result of **Toxemia/Infection/Sepsis** in the wound which lead to softening of the distal stump. **c.** The proteolytic enzyme of the bacteria leads to proteolysis and softening of the formed clot in the injured blood vessel.	Bleeding without any cause.

Clinical Picture/Signs/Symptoms of Hemorrhage

Local Symptoms:

*<**Write the symptoms** that were referred to in detail in the description **of the three main types of hemorrhage (Arterial, Venous, & Capillary hemorrhages**).>*

- The local signs of the internal hemorrhage are absent but the history, general symptoms and signs of fluid in the internal cavity may assist the diagnosis.

General Symptoms:

Depend mainly upon the **Amount of the escaped blood** and the **Rapidity of flow.**

1. Usually, the massive and sudden outpouring of blood lead to disturbing the equilibrium of the heart beats which ended with shock.
2. The shock is characterized by marked fall in the blood pressure and unconsciousness.
3. The heart beats become thready and very weak.
4. The respiration is shallow and unremarkable.
5. Symptoms assisting the diagnosis: Pale mucous membrane, Coldness of the extremities, and The pupil reflexes.

Complications of Hemorrhage

1. Abscess (due to infection to hematoma).
2. Anemia (due to loss of blood and low hemoglobin %).
3. Pain (due to pressure from the enlarged hematoma, this pressure may produce nerve or vascular damage).
4. Sepsis and septicemia (due to lowering the vitality).
5. Shock (due to depression of the blood pressure).
6. Thrombus formation (due to Injury to the wall of blood vessels).

1. ARRESTING & TREATMENT OF HEMORRHAGE

1. Natural/Spontaneous Arrest of Hemorrhage

Arrest of Hemorrhage: The body defense against hemorrhages is characterized by:

1. Local clot formation.
   - **a.** Liberation of thromboplastin from the damaged tissues and blood platelets.
   - **b.** The thromboplastin interacts with the plasma prothrombin in the presence of Calcium ions to form thrombin.
   - **c.** The formed thrombin interacts with the plasma fibrinogen to form fibrin.
   - **d.** The formed fibrin appears as a fine strand or scaffold for the blood contents.
2. Retraction and contraction of the tunica intima of the blood vessel.
3. Development of regional spasmodic tension in the surrounding tissues.

Stimulate Thrombus

Two mechanisms for the liberation of Thrombokinase:

- **a.** **Mechanical mechanism**: usually applied by force pressure either by pressure by gauze, tampon, or cotton wool on the bleeding surface.
- **b.** **Chemical mechanism:** by injection of hypertonic solution of NaCl 10 %, Glucose solution 25 % or $CaCL_2$ 10 %.

N.B: The injured blood vessel heals normally as any wound, by the formed tissue changed to fibrous tissue which contracts and seals the formed wound. The excess of granulation tissue is gradually absorbed by phagocytosis.

N.B.: Thromboplastin (TPL) is also known as Thrombokinase.

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2. Treatment of Hemorrhage

A. General treatment

1. **Complete rest** of the patient and the **head is kept in low position.**
2. **Warming of the patient** by wrapping it in a blanket in small animals like dog and cats or put it in a warm room with a thermo regulatory heater **(avoid the overheating).**
3. **Increasing the coagulability** of the blood by the injection of Calcium borogluconate, Haemoplastin or Coagulin or any synthetic material aid in the clot formation.
4. **Vitamin K**.
5. **Restore the blood volume by:**

a) Normal saline 0.9 %.
b) Blood trans fusion.
c) Albumin.
d) Plasma in fusion.
e) Glucose sol. 25 % I.V. or 5 % S/C.

Contraindication:

► It is contraindicated to give general vasoconstrictor as Adrenaline 1/1000, Pituitrin®, Strychnine.

B. External compression of the blood vessel. (*, 2017, 2015)

1. By **Thumb/Digital pressure** at the site of bleeding. This pressure can be exerted by pad firmly bandaged on. Particularly applicable in venous heamorrhage.
2. Application of Tourniquet over the level of the injured area. (should not exceed 2 hours.).
3. Application of forceps pressure, by the **U** of forceps, or Ecraseur.
4. Packing by Rolls of wide gauze.
5. Elevation of the injured part over the level of the body: usually applied in man and to some extent in small animals.
6. **Alteration of local temperature either by:**
   - **a)** Cold application such as natural ice, or cold water and its used to treat hematomas, epistaxis, oozing from mouth and pharynx.
   - **b)** Hot application, the use of Thermocautery and Diathermy usually give good result in the capillary heamorrhage.
   - **c)** (These methods are applicable to bleeding from large area).
7. **Crushing of the stump of the blood vessel by Application of**
   - **a.** Forceps.
   - **b.** Sand crusher
   - **c.** Ecraseur
   - **d.** Emasculator.
   - **e.** Clamps.
8. **Torsion and twisting of the blood vessel:**
   Lead to rupture of the tunica intima which retract and contract to occlude the vessel.
9. **Ligation of the blood vessel:**
   The most commonly used method for arresting heamorrhage. Catgut and Vicryl are the most common materials for ligation of the blood vessels.
10. **Chemical haemostasis:** These chemicals acting mainly upon the wall of the blood vessel and assist the clot formation:
    - **a)** The use of alum, tannic acid and gallic acid (cause direct coagulation of the blood).
    - **b)** The use of stringent like adrenaline (1/1000) and lead acetate (cause vasoconstriction of the blood vessel).

Diathermy: A medical and surgical technique involving the production of heat in a part of the body by high-frequency electric currents, to stimulate the circulation, relieve pain, destroy unhealthy tissue, or cause bleeding vessels to clot.

2. Threatened Hemorrhage, Acute Anemia, Fatal Hemorrhage

- Occurs mainly as a result of bleeding from large arteries and veins, as well as from relatively small arteries in decreased blood coagulation factors.
- Bleeding from large blood vessels results in death within a short span e,g; 15-20 minute as the carotids artery is cut, 30 minutes as the femoral artery is cut.

Symptoms

1. Gradual acceleration and weakening of pulse and respiration.
2. Pallor of mucous membranes and dilatation of eye pupils.
3. Cooling of peripheral areas of the body e.g.; ears, lips, tongue, and extremities.
4. Exhaustion and motor discoordination appears on the animal.
5. Finally, the pulse becomes very weak and difficult to palpate.
6. Then the animal falls, urinary and fecal incontinence appear.
7. Pre-mortal phenomena; Convulsive movements of the head, limbs.
8. Horse does not die even in a 40% blood loss. Cattle; only in a 60% blood loss.
9. Massive blood loss is relatively easy to tolerate by dogs.

Therapy/Fatal Haemorrhage Treatment (2016)

1. **Arrest of heamorrhage**.
2. **Cardiac tonics** as camphor, caffeine or cardiazol.
3. **Worming;** The animal should be covered by blankets, rage or exposed to sun heat.
4. Lowering of the head to maintain minimum blood supply to the brain.
5. Applying pressure bandages over the limbs to assist in elevation of lowered blood pressure.
6. Compensation of the blood losses by either **Fluid Therapy** or by **Blood Transfusion** from the same species.

Fluid Therapy

In order to replenish the blood channel with fluid, it is beneficial to inject intravenously one of the following solutions:

1. **Normal Saline [sterile solution of Sodium Chloride, NaCl]**
   - Normal saline, which raise the blood pressure within a relatively short time, but it is rapidly eliminated from the vascular system into dehydrated tissues.
   - Since even infusing of small amounts of physiological NaCl solution impairs the balance of the cellular endothelium of myocardial vessels, it is useful to add about 5% of glucose in it.
   - This makes the 50% of saline retain in the blood channel, enabling to reduce the amount of injected solution 1.5-2 times.
   - The dose is 3-7 litres /day for large animal and 50-500 cc/ day in small animals.
2. **Dextrose 5%**
   - The dose by intravenous route is 3,5 litres / day large animals and 100-500cc/ day small animals.
3. **Glucose 20%**
   - The dose by intravenous route is 1-2 litters/ large animal and 50-100 mal / small animals.
   - Ascorbic acid may add in a dose of 3-4 gm by intravenous route and subcutaneous insulin in a dose of 100 to 300 unit.

Blood Transfusion

- It is the ideal replenishment of the blood channel, when it is unavailable, it is good to use plasma substitutes [polyglycine and rheopolyglucine].
- Blood transfusion is indicated in case of acute anemia.

The transfused blood has the following properties:

a) Replacing effect which is ensured through prolonged functioning of its formed elements and serum protein in the vasculature.
b) Stimulation effect which is mainly achieved by the serum protein, and partly by erythrocyte function which induce and promote stimulating of the whole body, including immunogenesis and regenerative-reparative processes.

Types of blood transfusion

Note: Transfusion of blood of other animal [donor] is permissible only after thorough testing, ruling out infectious and parasitic blood disease in the donor.

a. Direct transfusion is performed rarely by directly connecting the donor's vein or artery to the recipient's vein through a rubber or polyethylene tube system.
b. Indirect transfusion is performed using a specially prepared blood, which may be compatible or incompatible, obtained from the donor.
c. The obtained blood is preliminary stabilized with 5% sodium citrate (1: 10), 1% calcium chloride (1: 10), and 10% sod. Salicylate (2: 10).

Dosage Calculation

► It is presumed that normally there is 90 ml blood/ 1 kg body weight.
► Desirable level of Haemoglobin; 75% at least
a. If Haemoglobin % is decreased by 38% due to blood loss, which means 37% of Hb need to administer with transfused blood in order to produce desirable level [75%].
b. **To calculate the Blood Volume**,
c. Body weight (100 kg) must be multiplied by 90 ml (90 ml blood/1 kg b. w.) and by 37%, (needed Hb) then must be divided by 100 %

$$\frac{100(\text{Kg}) \times 90\ (\text{mQ})\ \text{X}\ 37(\%)}{100\%} = 2.970\ \text{ml}$$

Generally large animal with relatively small blood loss is transfused 1-2 L up to 3 litres. In small animals 50-100 ml up to 400 ml.

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Wound colour	Wound type	Purpose of treatment	Exudate	Recommended dressing materials
Black	Necrotic wound	Remove necrotic tissue	**++**	Saline gauze † Alginate Honey dressing* Silver dressing*
			+	Alginate Saline gauze † Hydrogel Hydrocolloid Honey dressing Silver dressing
			-	In absence of signs of infection, the wound can heal under the scab
Yellow	Exudating wound	Wound cleaning and removal of debris	**++**	Alginate Hydrofibre Foam Saline gauze †
			+	Alginate Hydrofibre Foam Hydrogel* Hydrocolloid Saline gauze †
Green	Infected wound	Wound cleaning and clear infection	**++**	Antimicrobial gauze dressing † Silver dressing † Honey dressing †
			+	Antimicrobial gauze dressing † Silver dressing † Honey dressing †
			-	Antimicrobial gauze dressing † Silver dressing Honey dressing
Red or Pink	Granulating or epithelializing wound	Wound protection and providing a moist environment to stimulate healing	**++**	Hydrofibre Foam
			+	Hydrogel* Hydrocolloid* Hydrofibre Foam
			-	Hydrogel #

++ = wet; +=moist; −=dry.

† Cover with a secondary absorptive dressing.

***** Select one with good absorptive properties or use an absorptive secondary dressing to reduce the number of dressing changes.

For rehydration of the wound.

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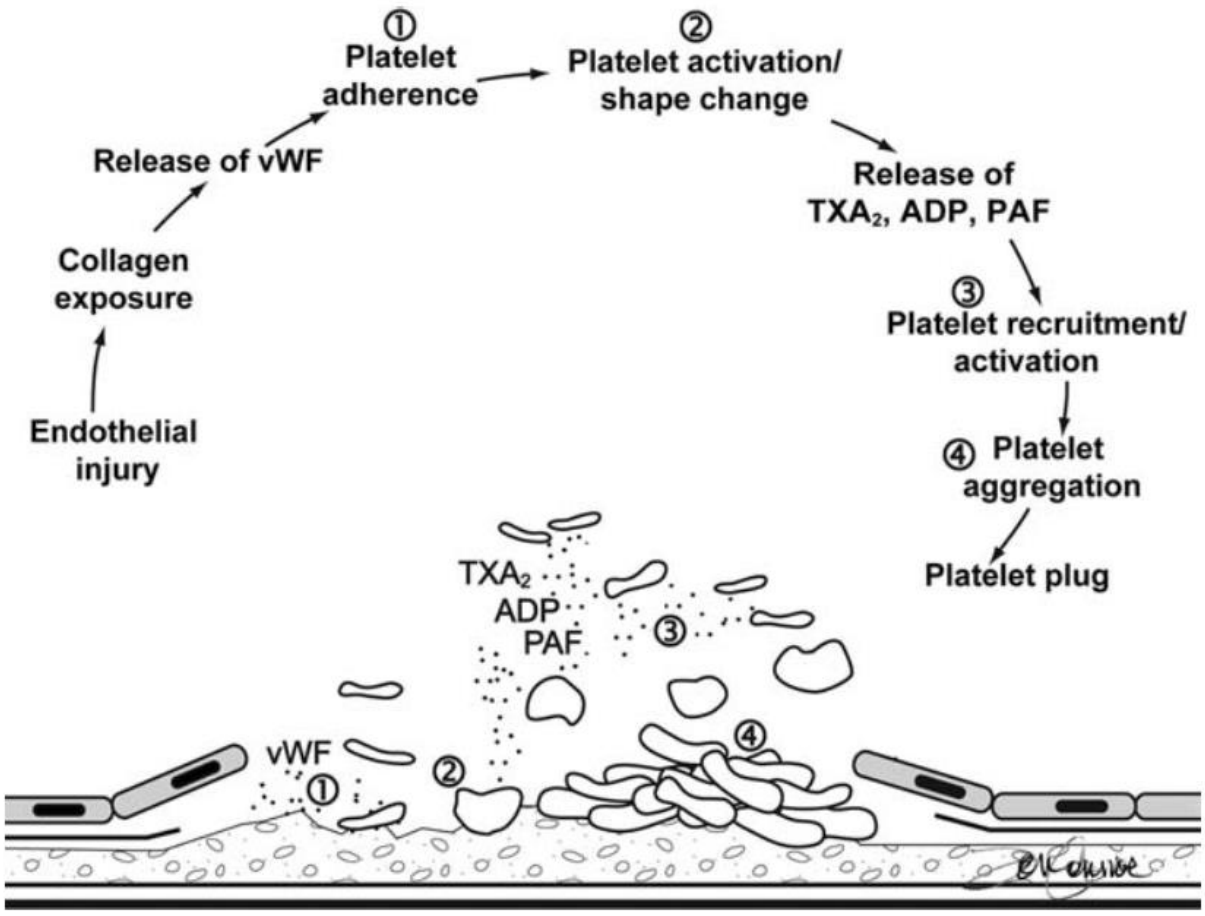


Figure 16.1 The primary hemostasis pathway. Damage to the endothelium exposes collagen which releases vWF and causes platelets to adhere to the damaged area (1). Once adhered, the platelets activate and change shape (2). The activated platelets release granules containing TXA_2, ADP, and PAF, which act to recruit and activate additional circulating platelets (3). The activated platelets aggregate (4) to form a platelet plug over the damaged vessel wall. *vWF*, von Willebrand's factor; *TXA_2*, Thromboxane A_2; *ADP*, Adenosine diphospate; *PAF*, Platelet activating factor

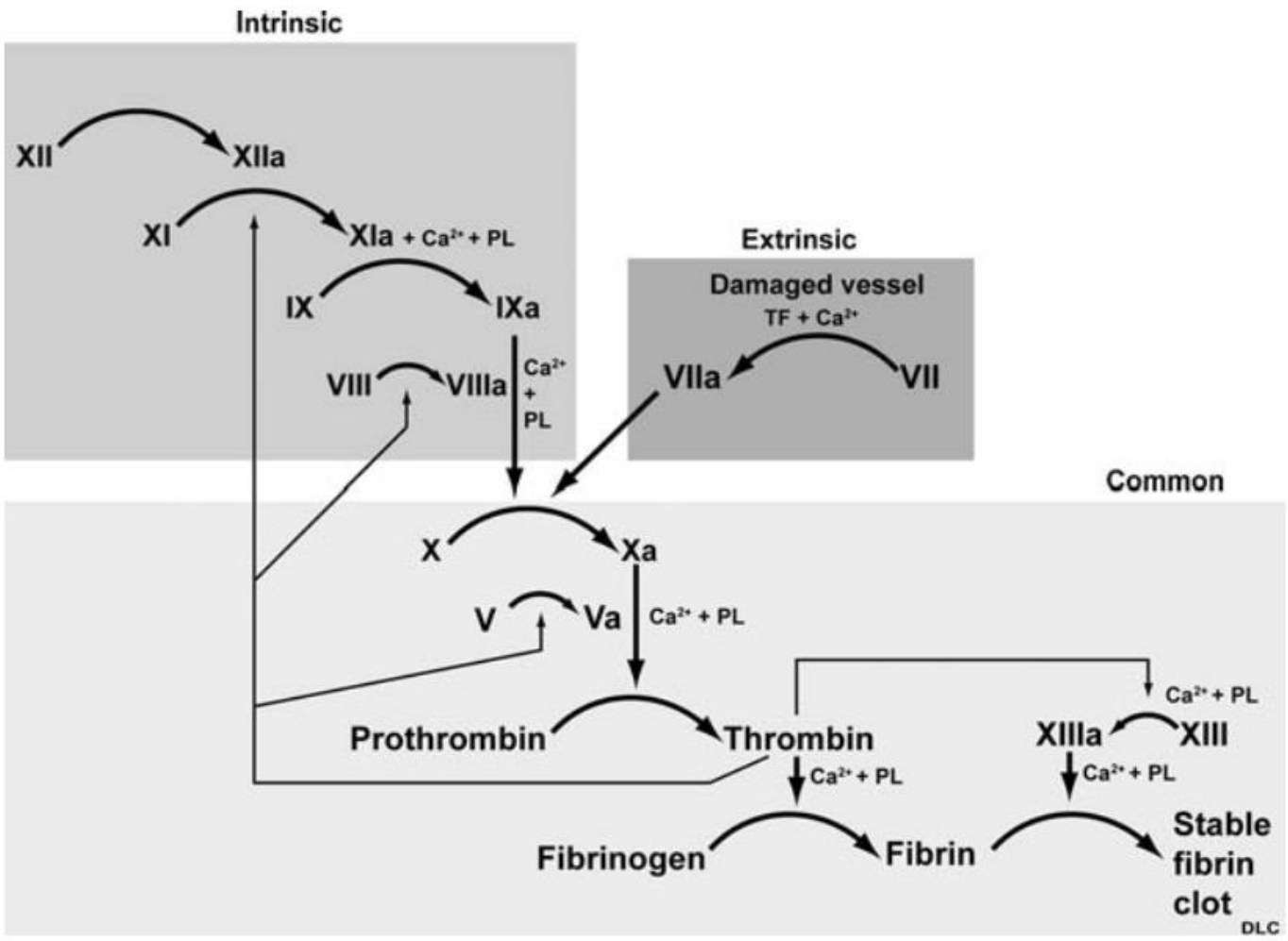


Figure 16.2 The secondary hemostasis pathway. The extrinsic pathway is initiated when tissue factor from damaged endothelium combines with calcium and activates factor VII. The intrinsic pathway is initiated when thrombin activates factor XI and, to a lesser extent, when blood contacts damaged endothelium, which activates factor XII. Both pathways intersect at the common pathway, and activate factor X which leads to the formation of a fibrin clot. Prothrombin is also known as factor II, and fibrinogen is also known as factor I. Factors are indicated as Roman numerals, activated factors are denoted by the letter *a*. *Ca^{2+}*, Calcium ion; *PL*, Phospholipid; *TF*, Tissue factor. Each branch of the pathway is shaded and labeled.

Fundamentals Of Small Animal Surgery

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F.JOINT AFFECTION

Joint Anatomy:

a. **Joint Capsule** is thick fibrous lined by synovial membranes. **b.** **Articular Cartilage** covered the articulated bone extremities. **c.** **Joint ligaments** may be **Periarticular** (collateral) ligaments or **Intra-Articular** ligaments (cruciate).	**d.** **Synovial Fluid** is ultra-filtrate of plasma contains leukocyte and hyaluronate. **e.** **Periarticular Structure** are muscles, tendons & ligaments.

Joints (& their inflammation terms):

Forelimb joints		Hindlimb joints	
Shoulder J.	Scapula ***with*** Humrus. → **Omarthritis**.	**Hip J.**	Pelvis ***with*** Femur. → **Coxitis**.
Elbow J.	Humrus ***with*** Radius.	**Stifle J.**	Femur ***with*** Tibia. → **Gonitis**.
Knee/Carpal J.	Radius ***with*** Cannon (metacarpal). → **Carpitis**.	**Hock J.**	Tibia ***with*** Cannon. → **Spavin**.
Fetlock J.	Cannon ***with*** Long pastern. → **Osselets**.	**Fetlock J.**	Cannon ***with*** 1st Phalanx. → **Osselets**.
Pastern J.	Long pastern (1st Phalanx) ***with*** short pastern.	**Pastern J.**	1st Phalanx ***with*** 2nd Phalanx.
Coffin J.	Short pastern (2nd P) ***with*** Pedal/coffin (3rd P).	**Coffin J.**	2nd Phalanx ***with*** Pedal/coffin bone.

Joint Affections

1. CONTUSION	2. SPRAIN	3. DISLOCATION	4. FRACTURE
Joint trauma	Slipping & falling & false step overexertion which cause Joint Rotation & Temporal luxation.	Trauma - Ms. paralysis - Congenital.	Trauma- Disease – Nutrition.
• Simple. • Compound with fracture / ligament sprain.		Complete/Incomplete **displacement** of **articular extremities.**	Complete/Incomplete **discontinuity of bone**.
Clinical Signs			
1. **Acute inflammation** at the joint region. **2.** **Swelling** (Variable degree of **Synovial Effusion**).	**3.** **Pain** (especially on passive movement of joint). **4.** **Lameness** (severe in sprain).	**1.** **Severe infl.** (severe swelling, pain). **2.** **Lameness** (non-weight bearing).	**3.** **Immobility** of affected joint. **4.** Limb **deformity** (shortened).
Treatment			
1. Resting (joint immobilization). **2.** Hydrotherapy (Cold followed by hot moist fomentation). **3.** Antiphlogistic applications	**4.** Massage. **5.** Bandage with cotton. **6.** Physiotherapy (Regular Exercise after inn. subsided to prevent adhesions stiffness).	**1.** **Reduction** (click heared when reduction take place). **2.** **Joint immobilized** for to prevent recurrence. **3.** **Medical treatment** (NSAID). **4.** **Physiotherapy** (gentle exercise after healing to avoid ankylosis).	

Inflammation of Joints = Arthritis

Arthritis; Inflammation of a joint Ch. By wear & tear damage, including joint capsule, articular bones, articular cartilage and ligaments.

- Major cause of lameness in equine (28-42%).

A. Classification of Arthritis acc. **Activity**					B. Classification of arthritis acc. To **Type**	
Acute arthritis				**Chronic arthritis (DID)**	**1.** Traumatic (Serous) arthritis. **2.** Septic arthritis. **3.** Osteoarthritis. **4.** Ankylosis arthritis.	**5.** Metabolic (rickets). **6.** Neoplastic arthritis. **7.** Degenerative arthritis. **8.** Rheumatic arthritis.
Aseptic arthritis		Septic arthritis				
Traumatic (mechanical) f.	Circulatory f.	Traumatic (mechanical) f.	Circulatory form.			

1. Rheumatic Arthritis	2. Metabolic Arthritis (Rickets)	3. Neoplastic Arthritis	4. Ankylotic arthritis (Ankylosis)		5. Traumatic Arthritis		
Frequent exposing to alternative cold and hot condition in bovine, carnivore.	Mineral imbalance	Chondrosarcoma.	Chronic form of arthritis ch' by physical impairment of j. movement due to		• Mechanical cause (Single or repetitive episodes of trauma). • Circulatory causes; standing for long time without work >> blood stagnation in the limb → oedema.		
			Complete Ankylosis	**Incomplete Ankylosis**	**Type 1**	**Type 2**	**Type 3**
			• Destruction of articular cartilage • New bone growth. • Fusion of two articular surfaces.	Adhesion & fibrous thickening & calcification of periarticular tissue.	Traumatic synovitis & capsulitis. No disturbance in artic. cart. Or Lig.	Including disturbance of articular cartilage Or Lig., meniscal tears and intra articular fracture.	Including osteoarthritis & ankylosis (DJD) due to severe trauma.
Signs							
Shifting of inflammation of joint from one to another.	Bone deformity. Enlarged epiphyses.	Bony bumps, limited mobility.	By artificial joint prothesis.	By Enhance complete ankylosis or Prevent it by physiotherapy, massage counter irritant.	• Synovial effusion pain, redness. • Lameness (light to moderate degree) semi flexed affected limb. • Radiological exam. reveal only distended joint capsule without cartilage or bone damage.		
Treatment							
a. Protection from cold and hot condition, **b.** Administration or salicylate. Local antiphlogistic. **c.** Massage with counter irritant.	Well- balanced diet, rich in Ca^{+2} & Vit. D.				Aimed to restore normal function to the joint quickly as possible. **1.** Rest (to stimulate healing process). **2.** Cold fomentation (prevent vasodilation allow vasoconst.). **3.** Systemic NSAID (phenylbutazone, flunixin, & diclofenac acid).	**4.** Intra-articular injection (hyaluronate, polysulpljated glucose aminoglycan or dimethyl sulfoxide). **5.** Synovectomy to remove the hypertrophied inflammatory synovial membrane. Pressure Bandage.	

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6. Degenerative Joint Disease DJD

Osteoarthritis OA, Chronic Deformed Arthritis, Osteochondrosis Dissecans OCD

Progressive degeneration (wear and tear) of articular cartilage, bone & soft tissue.

Pathogenesis

Primary DJD

Reduction in hyaluronic acid conc.

Reduction in peptidoglycan.

Increase intraarticular conc.

└► Cartilage Degeneration.

Secondary DJD

Follow other type of traumatic or septic arthritis.

- **Young foals:** Low Incidence & mostly affect j. (carpal, & fetlock).
- **Adult horse**: High Incidence, mostly affect joints are high loading, low motion j. (pastern coffin).

Clinical Symptoms

Varying acc. to degree of degeneration

Less Marked Swelling & Pain than in septic arthritis

A. Early stage; Swelling & Lameness (Temporary clear with heavy working only)

B. Late stage;

1. Swelling (permanent & firm).
2. Lameness (permanent).
3. Chronic incurable.
4. Progressively worsen.
5. Increase with joint flexion.
6. Stiff gait.
7. Muscle atrophy.
8. Apparent bony prominence of the joint.

Gross Pathology

1. **Cartilage Eburnation:** Cartilage softening, Severe erosion, & ulceration > exposure & grooving of subchondral bone with velvety appearance.
2. Bone (abnormal new bone growth) Inside & outside joint.

Diagnosis

A. Radiography

1. Soft tissue swelling.
2. **Joint space changes** (**narrowing** due to cartilage loss inside the joint then **widening** due to cartilage and subchondral bone destruction then **loss** of joint Space due to Ankylosis)
   - **a. Osteophytes** (bone spurs) (abnormal bone growth inside the j.).
   - **b. Osteoperiostitis** (abnormal bone around the j.)
     - At level of pastern, coffin j (Ring bone).
     - At level of in hock j (Bone spawn).
   - **c. Enthesophytes;** Abnormal bone at the attachment or tendon or lig. with joint.
   - **d. Joint mice** (loose fragment of cartilage inside synovia).

B. Ultrasonography:

Synovial fluid is less echogenic than septic arthritis & Less Joint effusion than in septic arthritis.

C. Arthroscopy.

D. Computed Tomography (CT).

E. Magnetic Resonance imaging (SIRI).

The Aims of Treatment

1. Remove the cause. **2.** Relieve pain. **3.** Stop degeneration. **4.** Repair damaged cartilage. **5.** Restore animal movement.

Treatment of DJD

A. Systemic (NSAID):
Flunixin, Phenylbutazone- Diclofenac acid.

B. Intraarticular medication:

1. **Corticosteroids.**
2. Sodium Hyaluronate (hyaluronic acid))
   Increase synthesis of endogenous hyaluronate.

- **Anti-inflammatory**; decrease degenerative process, Pain & Swelling.

3. Polysulfated Glycosaminoglycan (PSGAG).
   Lubricant > increase joint movement.
4. **Dimethyl Sulfoxide (DMSO) 40%:**
   - **a.** Alone or in combination with corticosteroids to promote the absorption of corticosteroids.
   - **b.** Bactericidal action.

Surgical interferences:

1. Surgical curettage of the cartilage; Surgical removal of large osteophyte.
2. Artificial joint prothesis
3. Arthrodesis (surgical fixation of the joint).

If Not Respond to Treatment: To avoid joint motion {Responsible for pain).

1. Few drill holes parallel to the joint surface with fixation
2. Using of multiple lag screws.
3. Using of bone plates
4. Intraarticular injection of irritant.

7. Septic Arthritis

Infectious arthritis, Joint ill, Septic apophysitis.

Inflammation of the joint due to infection.

Pathogenesis

Closed septic arthritis (Empyema)

Result of haematogenous or endogenous due to extension from adjacent cellulitis.

Open septic; arthritis:

Result of open joint (Penetrating injury. Arthrotomy. or Intra-articular injection).

Strept., Staph., Mycoplasma (Adult). - *Salmonella. E. coli, brucella* (Foal).

└► Suppuration (proteolytic enzymes as hyaluronidase enz., > rapid (within 8 hr) destruction of articular cart. & bone.

- **Young foals:** High Incidence, Closed SA (Hematogenous form infected navel).
- **Adult horse:** Low incidence, Open septic arthritis (Trauma with puncture).
- Most commonly affected joints (carpal, hock & stifle).
- Corticosteroids > lower joint resistance (cause infection).

Clinical Symptoms

A. Acute

1. Severe pain, heat & swelling (due to periarticular soft tissue swelling & synovial effusion).
2. Open joint due to injury or rapture of distended capsule (discharge suppurative exudates).
3. Crepitus (in severe erosion).
4. Polyarthritis (in new born animals).

B. Severe: Systemic illness, loss of weight, & laying down with decubitus ulcers.

C. Chronic

1. Severe swelling due to fibrosis and bony enlargement.
2. Ankylosis.

Gross Pathology

Corpora Libra (Cartilage erosions & ulceration).

Diagnosis

A. Radiography

(Radiographic abnormalities not detected before 21d.of inflammation)

1. Soft tissue swelling.
2. **Joint space** changes (**narrowing** due to cartilage loss inside the joint then **widening** due to cartilage and subchondral bone lysis)
3. **Subchondral bone** erosions & osteomyelitis (diffuse radiolucent or "ground-glass" appearance of articular bone)

B. Ultrasonography

Synovial fluid is more echogenic due to its high cellularity & tissue debris.

C. Synovial Fluid Analysis & Culture:

1. Synovial fluid becomes turbid, dark.
2. yellow to brown color and clots rapidly.

D. Arthroscopy.

Treatment of Septic Arthritis

1. **Antibiotic Therapy**
   - **a.** Intensive course of systemic antibiotic based on antibiotic sensitivity test.
   - **b.** Ampicillin + Gentamicin.
   - **c.** Ampicillin + Trimethoprim-sulfadiazine.
   - **d.** IM or IV each 6 hrs for 2-3 w.
2. **Joint drainage** (Joint Lavage).
3. **Synovectomy:** Arthrotomy > lavage > Synovectomy.
4. **Nonsteroidal anti-inflammatory drugs (NSAIDs)** For anti-inflammatory and analgesic effects-
5. **Chondroprotective drug** Hyaluronic acid, Polysulfated Glycosaminoglycan (PSGAG), Dimethyl Sulfoxide (DMSO).

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Joint Drainage (Joint Lavage)

Method for flushing of joint space to remove (m.o. enzymes, fibrin & debris).

A. Needle aspiration & Distension-irrigation; (Only in acute Stage of septic arthritis as there is no tissue debris)

B. Through and through lavage	C. Arthrotomy with lavage	D. Arthroscopy with lavage
Method		
1- Insertion of 2 needles into synovial cavity (one for Injection of flushing solution and the other for drainage). **2-** 1-3 letters of saline or Ringer lactate used as flushing sol. └►Repeated 2 d. later if clinical signs not improved. **3-** Addition of sodium hyaluronate to irrigating fluid is beneficial. **4-** Addition of antibacterial agents to irrigating fluid may causing chemical Synovitis.	Through Arthrotomy incision, then Penrose drain is inserted and sutured and the limb is bandaged.	Via arthroscopy.
Advantage		
	Allow extensive flushing, drainage of joint and complete removal of fibrin and debris.	**1.** The same as Arthrotomy without complication of incision healing. **2.** Provide complete visuali1_ation of the joint and synovial membrane than Arthrotomy. **3.** Allow removal of necrotic cartilage and bone.
Disadvantages		
1- Cannot perform joint debridement, remove fibrin clots or synovectomy so only performed in acute stage. **2-** Cannot obtain synovial membrane biopsy for culture or histology **3-** Cannot inspect the articular cartilage.	Arthrotomy wound left to heal with 2"" intention with incidence of infection or fistulation.	Expensive.

Intraarticular Corticosteroid

Indications	Traumatic arthritis, Osteoarthritis, Rheumatoid arthritis & gout.	
Benefits	Inhibit capillary dilatation & edema → Decrease joint effusion → Relief pain. Inhibit collagenase release → Decrease the incidence of articular cartilage erosion → Preserve joint movement.	
Contraindicated	**1-** Intraarticular Sepsis. **2-** Intraarticular fractures. **3-** Damaged articular cartilage.	**4-** Damaged of subchondral bone. **5-** Failure of previous injections.
Complications	**1.** Suppress immunity → Septic arthritis. **2.** Cartilaginous degeneration.	**3.** Steroid arthropathy. **4.** Soft tissue mineralization.

Open Joint

Def	Penetrating wound into joint cavity result in escaping synovia.	
Cause	Direct penetrating Trauma (nail, wire or falling down) or Indirect secondary to tissue sloughing.	
Types	**A. Recent Fresh Open Joint**	**B. Old Septic Open Joint**
Clinical Signs		
	1. Wound discharging clear straw yellow oily synovia increase with movement or flexion. **2.** No or mild degree of pain or lameness. **3.** Radiography for diagnosis & no probing. **4.** to avoid further destruction.	**1.** Wound discharging bad odor purulent discharge increase with movement or flexion. **2.** Painful Swelling with sever degree of lameness (non-weight bearing lameness (S"' degree). **3.** Radiography for diagnosis.
Treatment		
	1. intraarticular and periarticular inj. of cortisone - antibiotic mixture. **2.** Suturing, Rest, Joint fixation by splint and pressure bandage. **3.** Complete course of systemic broad-spectrum antibiotic.	As septic arthritis **1. Antibiotic Therapy** **2. Joint drainage** (Joint Lavage). **3. Synovectomy:** Arthrotomy > lavage > Synovectomy. **4. Nonsteroidal anti-inflammatory drugs (NSAIDs)** For anti-inflammatory and analgesic effects- **5. Chondroprotective drug** Hyaluronic acid, Polysulfated Glycosaminoglycan (PSGAG), Dimethyl Sulfoxide (DMSO).

Tendonitis

- **Tendon**: (dense fibrous band muscle to bone).
- Ligament (dense fibrous band connect bone to bone).
- Tendon is structured from thick closely packed parallel longitudinally collagen bundles interspersed with fibroblasts.
- Tendon has high Gliding-ability.
- Tendon receives blood supply from paratenon, endotenon, muscle, & periosteum.
- '**Tendon sheaths** (A layer covering the tendon at areas of articulation where there is high friction and gliding movement. It contains fluid like synovia the provide the tendon with lubrication and nutrition).

Tenosynovitis (Tenovaginitis): inflammation of tendon sheath.

Tendosynovitis (Tendovaginitis): inflammation or tendon sheath & its tendon.

Classification:

I. Acute (septic & aseptic).

2. Chronic (septic & aseptic)

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G. TENDON AFFECTIONS/ TENDONITIS

Tendonitis: Inflammation of Tendons. While **Desmitis** is inflammation of Ligament

Incidence

- SDF Tendinitis > common in race horses.
- DDF Tendinitis > common in draft horses.
- Achilles Tendinitis > common in bulls.

Pathogenesis

Tendon Overstretching > Rupture of tendon fibers → haemorrhagic Core Lesion > gradually filled with Granulation tissue > Thick, inelastic & weak Tendon (The tendon is susceptible to reinjury)

Aetiology of Tendinitis

A. Exciting causes

1. Trauma (direct or indirect overstretching or overloading).
2. Infection through wound.
3. Rheumatism.
4. Parasitic infestation (Filaria) nodular tendonitis

B. Predisposing causes:

1. Improper shoeing.
2. Abnormal conformation (sloppy pastern & thin tendon).
3. Uneven working conditions (Slippery; muddy or uneven roads).
4. Early working of young animals.

Classification of Tendinitis

A. According to Grade (Grading)

Grade I	Grade II	Grade III
• Ultrasonography (Minimal fiber disruption) • Edema & Swelling & pain - No heat on palpation & NO to Slight lameness	• Ultrasonography (50% fiber disruption (anechoic Haemorrhagic core)). • More obvious signs (Heat & Apparent lameness}	• Ultrasonography 500/0 fiber disruption (anechoic Haemorrhagic core) • Most intensive signs (Heat & Severe to chronic lameness}.

Grades II and III are complications or recurrence of Grade I lesions.

B. According to Time Elapsed

1. Acute (cardinal Signs of inflam.- (swelling, heat, pain)).
2. Chronic (fibrosis as hard swelling on palmar or planter aspect).

C. According to site of affection

1. High Bow (Just distal to carpus (upper MC third)
2. Middle Bow (Middle MC third)
3. Low Bow (Distal MC third)
4. Low-low Bow (Distal to fetlock)

Clinical signs

Acute tendinitis

1. Fiber rupture > intratendinous haemorrhage > Acute Tendinitis (Swelling. Pain. Heat & variable degree of Lameness severity **(I, II, III)**
2. Holding the limb in flexed position to relax the tendon

Chronic tendinitis.

1. Uneven treated acute tendinitis > scar tissue & peritendinous adhesion > Chronic Tendinitis (Tendons
2. Thickening (nodular or diffuse), Bow & Walking on toe, anterior side of hoof or fetlock (1st, 2nd, & 3rd degree of knuckling)).

Diagnosis of Tendinitis

1. Case History:
   a. Type Of work (draft or Athletic)
   b. Species Horses and donkeys are more susceptible than mules.
2. Clinical examination.
3. Physical Examination (Palpation and pressure).
4. Ultrasonography (the most specific and important).
5. Tendon Radiography (only in chronic cases with fibrosis).
6. Tenoscopy (Endoscopy): to examine tendon sheath cavity.
7. Thermography.

Diagnostic Ultrasonography of Flexor Tendons

1. Safe & Non-invasive method: to assess and follow up tendinitis tenosynovitis & desmitis in horses.
2. Ultrasound Machine: with Linear transducer (7.5-12 MHz),
3. Preparation of the Animal: clipping, shaving of the palmar aspect of metacarpal & applying copious amount of ultrasonic gel.
4. Examination must be performed in standing position: to ensure collagen bundles well tighteT1ed for easy examination.
5. Normal Ultrasonography Of Flexor Tendon: MC divided into 6 zones (Z1(A&B), Z 2 (A&B) Z 3 (A&B)) for accurate examination.
6. The phalangeal region divided into 3 zones (1A, 1B, & 1C).

Abnormal Ultrasonography of Flexor Tendon:

1. Diffused or localized swelling of the affected tendon (increase its cross-sectional area CSA). In sagittal and transverse planes.
2. Small to large anechoic core lesion in the tendon or ligament → indicate tendinitis. in sagittal and transverse planes.
3. Poor fiber alignment pattern in sagittal plane.

Treatment

Acute tendinitis

Aimed to (Minimizing the inflammation, restore tendons tensile, elastic and glide ability & Prevent formation of weak scar tissue and reinjuring).

1. Rest: 6-8 w.
2. Rehabilitation program (controlled exercise):
   a. Stimulation circulation.
   b. Decrease adhesion.
   c. Enhance collagen alignment & strength.
3. Hydrotherapy (Cold application): Continuous hosing or Ice bags (for the first 24 hrs: for not more than 20 min. & 4—6 hrs > control exudation & swelling.
4. Pressure bandaging: Decrease exudation & swelling
5. Massage: ↑ bl. Sup. Decrease swelling & improve healing & decreases adhesions.
6. Corrective shoeing: Shoe with raised Calkins > decrease the load on the flexor tendons.
7. Percutaneous tendon splitting: by tentom create vertical incision in core lesion > prevent hematoma enhance healing.

Pharmacologic Therapy

1. NSAIDs (Phenyl butazone or flunixin meglumine) Low rate (2.2mg/kg— 12hrs-5d) & High rate(4.4mg/kg-24hr-5d).
2. Dimethyl sulfoxide (DMSO).
3. Polysulfated Glycosaminoglycan.
4. Sodium hyaluronate.
5. BAPTEN (BAPNLF) (Scar-remodelling Agent).
6. Control collagen cross linking > allow proper collagen alignment.
7. 2 spots (1mg for each spot) injected by insulin syringe intratendinous in 3 rows.

Topical or intratendinous inj. Act as anti-inflammatory, reduces edema, enhances collagen formation & enhances gliding.

Regenerative Therapy

1. PRP (Platelets- rich Plasma), Stem Cells.
2. Both promote rapid healing with regenerative result by production of mature thick bundles of collagen I instead of Immature scar of collagen **III** after intratendinous injection under ultrasonographic guidance.

Chronic tendinitis

Aimed to Induce hyperaemia improve vascularization to be treated as acute tendinitis

1. Blistering. Hair shaving > blister is rubbed into the skin for minutes > Bandaging:
2. Firing: Anaesthesia > hair shaving > Line or point firing > bandaging
3. Corrective shoeing. Shoe with short toe raised Calkins decrease the load on the flexor tendons
4. Neurectomy; Desensitization of the affected area > prolong the animal working life
5. Tenectomy: Tranquillizer & local infiltration anaesthesia > cutting of tendon.
6. Carbon Fiber Transplantation. In cases of tendon rapture and massive loss of fibers
7. Surgical Treat.
8. Superior check Lig. & Annular lie, Desmotomy to keep the tendon free from adhesion and constrictions.