Inflammation

Definition: **It is a protective-adaptive response of the body to various injuries occurring due to mechanical, chemical & biological traumas.**

Classification:

a- Aseptic inflammation: induced by mechanical, physical & chemical influences. Its course may be acute & chronic & its character serous, serofibrinous & fibrinous. When serous exudates contain a significant amount of erythrocytes, it is called hemorrhagic. Injections of turpentine & some irritant drugs may induce aseptic purulent inflammation.

b- Septic (Infectious) inflammation: caused by pathogenic agents & has primarily acute course which is more severe than aseptic & subacute & chronic course in some types of infection & mycotic lesions. In an aerobic infection due to streptococci, Pseudomonas aerugenosa & some other microorganisms, purulent inflammation is characteristic. Facultative anaerobes induce putrid inflammation

Symptoms (Cardinal signs) :

1- The redness is only seen in the non-pigmented skin & is due to hyperaemia & to extravasation of blood when b.vs is ruptured.

2- Increase in temperature (Hotness) is recognized by palpation, comparing it with the normal temperature of the region or with that of the corresponding place on the other side of the body.

3- The swelling which is more marked in vascular than in non vascular structures, & in loose areolar than in hard tissues. It may be due to acidified secretion produced by bacteria or parasites.

4- The pain varies with the acuteness of the inflammation, the nerve supply of the region, the tenseness & hardness of the overlying tissues. It is caused by compression of the nerve terminals & neuritis in the affected part.

5- Impairment of function of the inflamed part which accompanying some surgical affections as bone fractures, sprains & joint diseases.

Termination of inflammation:

1- Delitescence, in which the inflammation rapidly subsides owing to its having been very slight.

2- Resolution, occurs after the inflammatory process has been completed. The exudate becomes reabsorbed, the damaged tissue is repaired by the new formation of fibrous tissue & the affected part apparently resumes its normal condition.

3- Suppuration, due to invasion with pyogenic microorganisms sitting up an abscess or other form of suppuration.

4- Gangrene, usually seen in cases where the cause is so severe to produce damage of the affected tissues causing their destruction *in masse.*

5- Induration & fibrosis occurs in chronic inflammation.

Prognosis:

depends on its nature & the organ or part affected. Infectious inflammation is more serious than aseptic one, owing to the destructive local & serious general effects of the toxins of many varieties of bacteria.

***Treatment*: Acute inflammation**

1- Rest of the affected part.

2- Cold & astringent applications : These comprise cold compresses frequently renewed, cold water irrigation, cold baths or ice, then apply astringent lotions, As these cause vasoconstriction of the b.vs, thus diminishing the supply of blood to the region & prevent the exudation & diapedesis. Cold requires to be applied continuously for hours to produce its good effects.

3- Warm applications: are indicated in severe inflammatory affections in which the tissues are seriously injuried. They promote circulation in the damaged region, restoring the blood supply in parts where it has been almost arrested, & thus prevent death of the affected tissues. They also soften the inflammed structures, thus releasing tension & relieving pain. These applications may be in the form of fomentations, compresses, poultices or baths at a temperature of 104—112 F.

4- Anodyne preparations: such as cocainised vasline or iodoform ointment are indicated for very painful superfacial lesions.

5- Scarification of the inflammed tissues may be performed to relieve tension & pain.

6- Antiseptic applications for inflammatory lesions e.g. septic wounds & foot lesions.

7- Antibiotics are required to be used in some inflammatory conditions when they prone to infection.

8- Antirheumatic & Antihestaminic.

9- Massage & compression.

Subacute & chronic inflammation

Are treated either by moist heat (hot fomentation), massage, and compression or counter irritation. Counter irritation may be effective in the following forms:

1- Rubefacients, e.g. liniments which have also a blistering effect when frequently repeated & rubbed in. They are indicated for comparatively slight subacute inflammation.

2- Blisters, e.g. biniodide of mercury, iodine ointment 8—10 % & coaline poultices. Before applying the blister, the hair should be clipped & the skin brushed. It should be vigorously rubbed in with the fingers about 10---20 minutes. Avoid contact with the sound parts of the body as it will cause fissuring of the skin. After blistering, the horse must be prevented from scratching or rubbing the part, which he has inclined to do owing to the irritation of the blister.

3- Pustulants, e.g. seton which is a tape smeared with an irritant & passed under the skin over the affected part & left in situ for some weeks. It causes purulent inflammation in its track which has a counter-irritant effect on the deeper tissues. It is not much used nowadays, although it may be useful for an old-standing chronic inflammatory condition.

4- The actual cautery (Firing) : is the severest form of counter-irritation & indicated as the last solve in treatment of deep seated inflammatory condition, e.g. spavin, ringbone & chronic tendonitis by superfacial line firing, superfacial point firing, penetrating point firing & needle point firing.

Abscesses

Definition:

is a localized pathological cavity filled with pus. It is caused by a breach of skin or mucous membrane & the entrance of pyogenic microorganisms.

Classification :

1- Hot (Acute).

2- Cold (Chronic).

3- Superfacial & 4- Deep. According to the stage of development: forming or maturing & mature abscesses are distinguished.

Acute abscesses:

1-Wall (pyogenic membrane).

2-Contents (pus).

Character of the pus: m.o and tissue involve

Staphylococcal pus in all animals is thick, white-yellow, of skim milk- or sour cream-like consistency & sourish odour. The pus of rabbits is thick, white or white-yellow, like condensed sour cream; it is cheese- like & grey-white in birds.

Streptococcal pus is usually malodorous, of liquid consistency, greyish-yellow or greyish-brown & has admixture of small amount of necrotic tissues, streaks of blood & a few fibrin flaks. In the presence of hemolytic streptococcus the pus is liquid, yellowish, with bloody hue & blood streaks. In invasion of ***E.coli,*** the pus is liquid, malodorous, of brown color; With sewage odor.

Pseudomonas aeruginosa, it is thick, pale green or grey-green.

Symptoms:

The superfacial abscess:

is characterized by the symptoms of acute inflammation. It appears as a more or less circumscribed, firm, painful swelling. Later on, the center of the swelling becomes gradually softer & fluctuation can be detected by digital pressure. If left to itself its center soon becomes very thin & the abscess is said to be “pointing”. Eventually, bursts allowing escape of pus.

The deep abscess:

usually develops under thick layers of tissue & is first indicated by febrile symptoms. It may interfere with movement of the affected part. Later on, local symptoms become evident with some odema around it. Such abscesses in the region of important organs like, pharynx, larynx, rectum or the spinal cord cause serious interference with function.

Diagnosis:

Superfacial is easy but deep seated one is difficult to be diagnosed. However, acute deep abscesses are diagnosed by increase in general & local temperature, pulse & respiratory rate acceleration, depression of animal as well as loss of function of an organ or part of the body. In order to confirm diagnosis, a puncture is made with an injection needle in superficial abscess in an oblique direction at its center, while in deep abscess puncture is made perpendicularly at the most painful point with a needle of wide diameter.

Abscesses should be differentiated from the following:

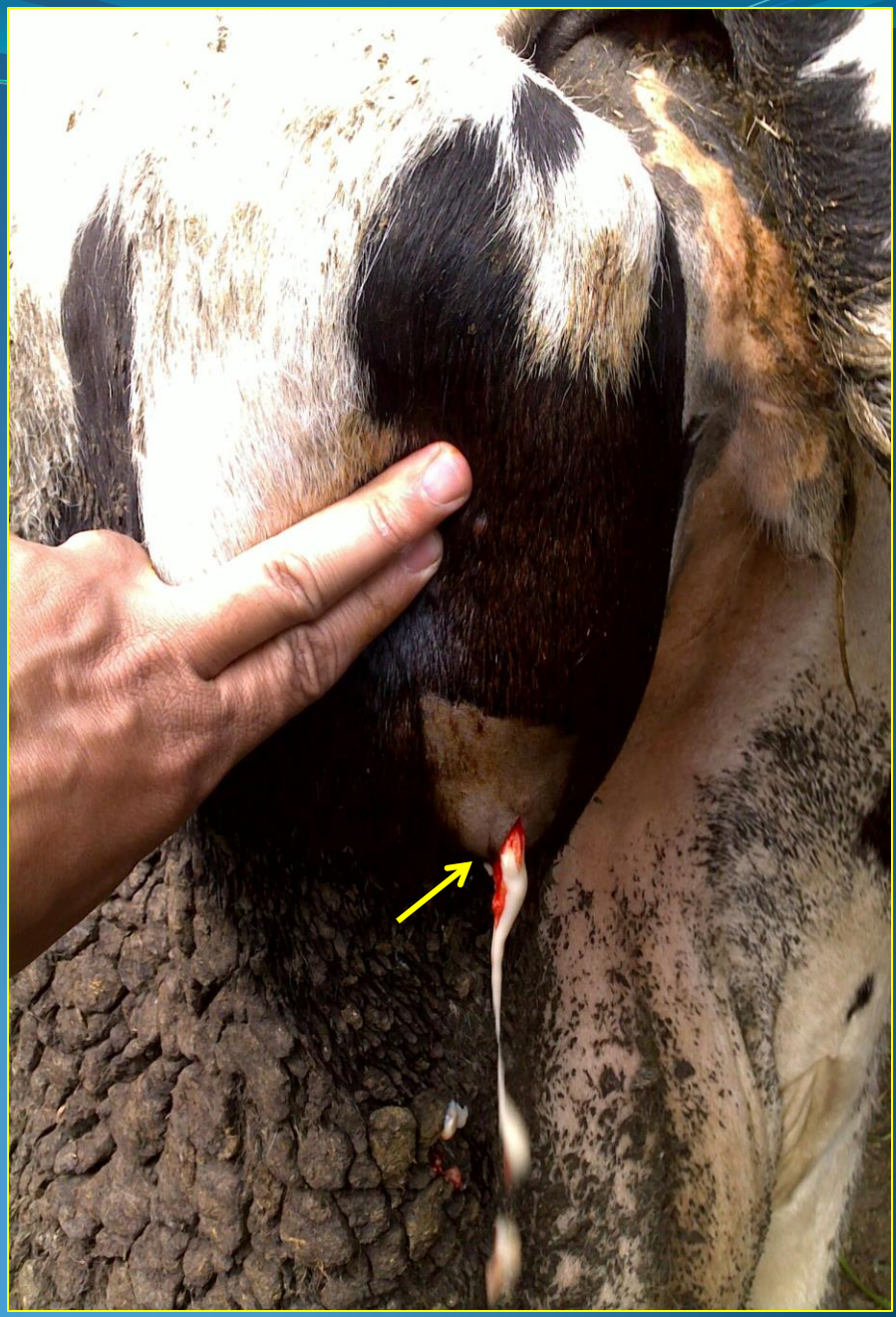
1- Hematoma, which is formed within several minutes or hours after trauma, feels doughy on palpation, may crepitate on pressure, composed of coagulated blood & serum. It is not so tense or painful. 2- Aneurism, is located along a great blood vs, elongated oval in shape, clearly pulsative at palpation, puncture yields fresh blood. 3- Cyst, slowly formed, without inflammatory signs, uniformly fluctuant & is not hard at its periphery.

4- Hernia, which is recognized by the presence of hernial ring. The contents of the hernial sac usually can be reduced into the cavity, but it can reappear; peristaltic murmur may be heard at auscultation. 5- An inflamed & distended bursa, which is recognized by its situation & by careful examination. 6- Neoplasms differ from abscesses by slow enlargement of the swelling & absence of inflammation & fluctuation.

Treatment:

1- Maturation of the abscess (hot fomentation, poultices or blisters).

2- Opening the abscess to evacuate its contents. If the abscess opened before all the pus is collected in one cavity, secondary abscesses may form in inflamed tissue. When the abscess is located near an important cavity or structure (peritoneum, joint, etc.), it should be opened once diagnosed to avoid extension of suppuration. Best results are obtained by opening abscesses under local anaesthesia, then the sharp pointed scalpel is thrust into the most bulging site of the abscess & it is incised downward as far as the granulation barrier to achieve good drainage. The cavity is irrigated with antiseptic solution or H_2O_2, dried up with sterile drapes & loosely filled with the drain containing antibiotic ointment.



Critical abscess : If the tissues are highly vascular, they may be divided layer by layer to avoid cutting the vessels & nerves. A blunt instrument such as artery forceps or curved scissors is pushed through the deeper layers into the abscess cavity to enlarge the opening & facilitate escape of pus. **Deep seated abscess:** A counter-opening may be performed if the cavity is deeply seated either by : (1) Insertion of a blunt sound (probe) into the bottom of the cavity to make it bulge the tissues there then cut down on it with the knife or (2) Insertion of a sharp pointed-seton needle into the bottom & thrust it through the skin at this point. It is desirable to insert a strip of gauze through the two openings & tie its ends for keeping the openings patent for two or three days to ensure free drainage.

Sinus & Fistula

Sinus: **Is a blind purulent tract showing no tendency to heal.**

Fistula: **Is an abnormal canal or passage between a cavity or duct & the surface of the body, or between two cavities or ducts.**

Fistula may be classified into :

1- Congenital fistula, e.g. pervious urachus.

2- Acquired fistula.

3- Internal fistula, if opens on the m. m. of hollow organ.

4- External fistula, if opens on the skin.

5- Incomplete or blind, when their canals originate from a closed purulent tissues.

6- Complete (perforated), e.g. recto-vaginal & recto-perineal fistula.

According to the character of discharge, fistulas are divided into: - purulent, secretory (salivary & lactic) & execratory (urinary & fecal), but purulent one is more common.

Treatment:

1- Radical incision under local or general anaesthesia. External fistulas are incised along the canal & foreign bodies are removed. If there is pus collection, a counter opening is made & drain is inserted into it.

2- Use of solid or liquid caustics to cause sloughing of the interior of the canal (cicatrical tissue).

3- Application of a hot iron has the same effect as in No. 2-. It should be rapidly inserted & rapidly withdrawn.

4- Bier's hyperemic treatment which may be employed with success for the lower parts of the limbs. This method causes venous congestion in the affected part by the 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. Serum & leucocytes are thrown out from the capillaries & exert an antitoxic, germicidal & anodyne effect on septic lesions.

Ulcers

It means a breach of integrity of mucous membranes, skin & underlying tissues & showing no tendency to heal.

Etiology:

1- Repeated irritation of the wound e.g. a wound in the dog's ear or on the tip of its tail, in the angle of flexion of the knee or hock in the horse.

2- Invasion of tissues by foreign bodies, deep necrosis of soft tissues & bones due to embolism or microbial metastasis.

3- Impairment of blood supply & metabolism.

4- Specific ulcers occur in the course of specific affections (malignant tumours, ulcerative lymphangitis, glanders, foot&mouth disease, avitaminosis, etc.).

***Symptoms*:**

they can vary in size & form; their surfaces are covered with pus crusts, removal of which reveals granulations. The borders may on a level with the surrounding skin or raised above it, & may be hard or soft. The centre of the lesion may be flat or concave & may show necrotic spots. In most cases there is a serous, purulent, blood-stained or greyish discharge. ***Rapidity of healing of an ulcer is determined by the combination & interaction between the processes of regeneration & degeneration of cell elements in the ulcer, thus the following forms of disease progress are possible:*** **1- Process of regeneration prevails over degeneration- in such cases, the ulcer is called simple. It heals up, although slowly. 2- Process of regeneration & degeneration are equal. Their size is neither decreased nor increased over a long time (months, years); they do not tend to heal. 3- Process of degeneration prevails over regeneration which is typical of progressive ulcers which show rapid or gradual increase in size due to necrobiotic degradation of cells of adjoining tissues**

Treatment :

1- Removal of the cause.

2- Stimulation of regenerative processes by adequate nutrition & improve the housing condition of the animal.

3- Warm antiseptic fomentations are indicated for painful septic ulcers followed by a dressing of iodoform powder.

4- Moderate pressure with cotton – wool & bandage.

5- Astringent or caustic applications, when the granulations are extensive or unhealthy.

6- The use of thermo-cautery for destroying unhealthy or callous tissues & promote normal granulation.

7- Excision of the ulcer by cutting edges & then sutured to promote healing by first intention. When the ulcer is situated on bone, curetting of the unhealthy surface is indicated.

8- Hypaeremic treatment by Bier's method.

9- Specific remedies for ulcers due to specific diseases.

Phlegmon

Is a diffuse spreading acute inflammation of loose connective tissue.

Classification:

According to the cause:--

1- Primary phlegmon: occurring in closed infected trauma & wounds, open fractures.

2- Secondary phlegmon: occurs as a complication of acute localized infection (abscess, purulent arthritis, osteomyelitis, etc.).

According to the nature of exudate:

-- purulent, purulent heamorrhagic & gas phlegmon.

According to their location:-

1- Subcutaneous phlegmon: occurs as serous or purulent s/c swelling at abscess formation stage, it felt fluctuated & then ruptured.

2- Subfacial phlegmon: e.g. antebrachium as the whole leg loses its function; being half-bent & acquires a pendulum-like state.

3- "Sheath " phlegmon: common in antebrachium, shin, withers & back.

4- Intermuscular phlegmon: occurs in deep stabbed, contused, accidental & gunshot splinter wounds, open fractures, osteomyelitis & purulent arthritis.

Gangrene

It means death & putrefaction of a more or less extensive area or volume of tissue. If death of tissue occurs in the absence of infection, the condition is called necrobiosis (aseptic infarct).

Etiology :

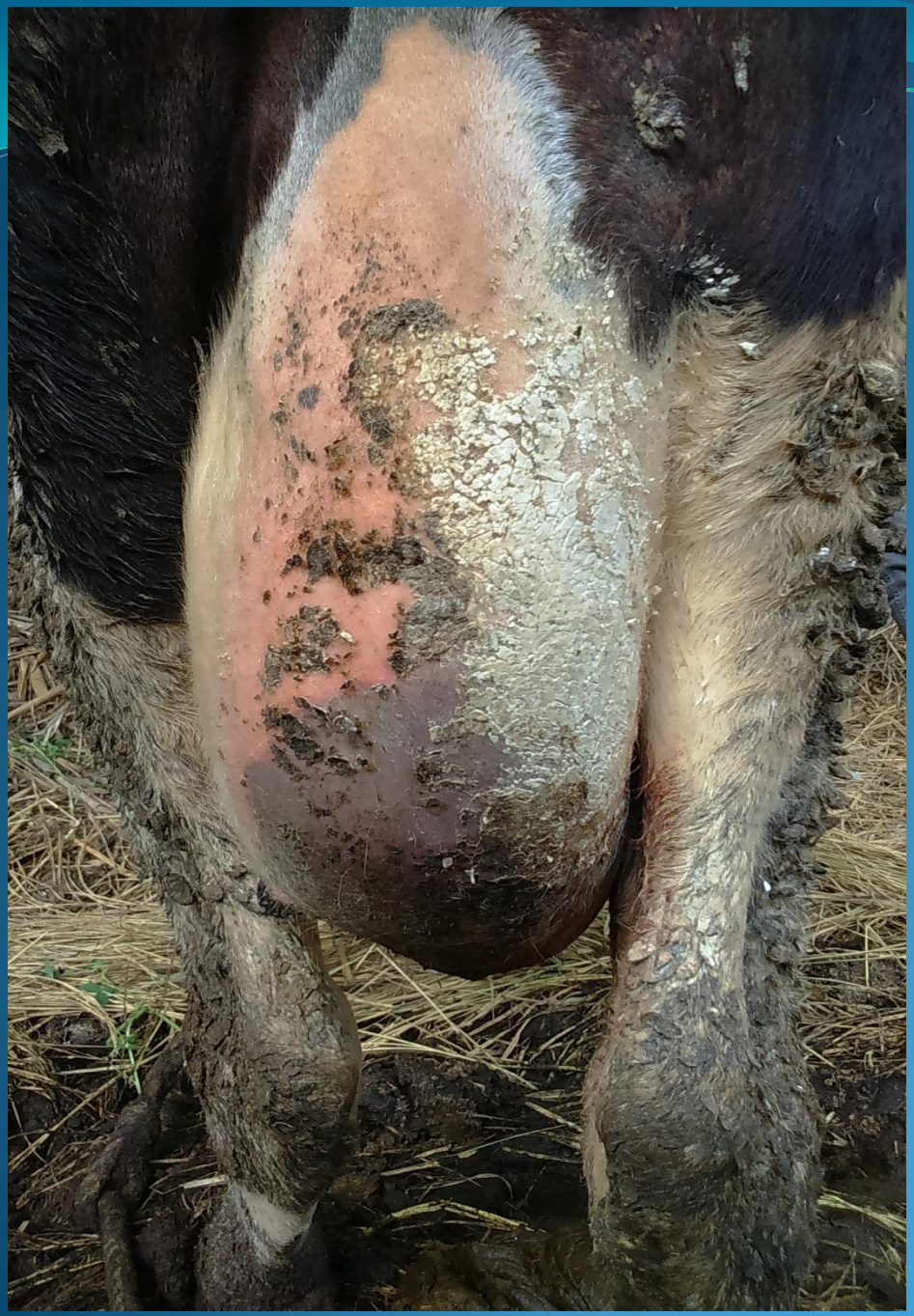
1- External causes : as contusion of grades 3 & 4 attended by crushing & laceration of tissues, prolonged compression of a part of a body or an organ while lying on a hard floor (decubiti), & by tight bandage or plaster dressing, tourniquet, rope; thermal burns & frostbites of grade 3 & 4, action of acids,alkali & other chemicals; impaction of the intestine in the hernial ring or by volvulus; infection with pathogenic microorganisms especially those of malignant oedema, necrosis, anthrax, black quarter & virulent streptococci & staphylococci.

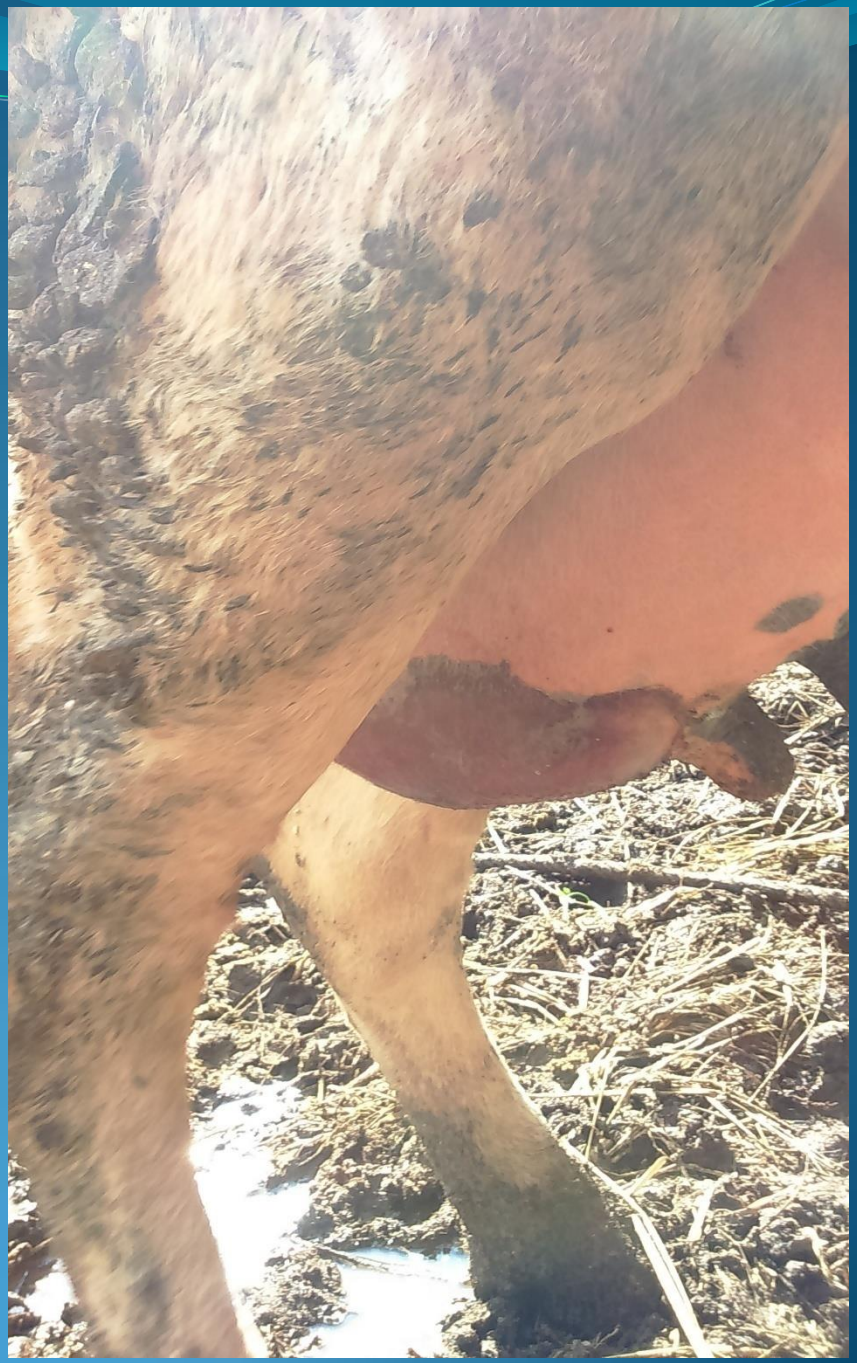
2- Internal causes : are occlusion of blood vs (thromboembolism) or rupture of them, especially when collaterals are absent ; disturbance of innervation & endocrine system function. Occurrence of gangrene is facilitated by cardiovascular insufficiency, metabolic disturbances, starvation & sustaining severe disease (e.g. diabetic.).

Clinically gangrene is classified as :

1- Dry gangrene. **2- Moist gangrene.**

In dry gangrene, the tissue becomes reduced in volume but retaining their structure & acquiring dark brown or black color (mummification). A zone of inflammation surrounds the dead area. Then, a line of demarcation forms between the dead & living structures. Complete rejection (sloughing) of the necrotic tissue mass occurs after 10 – 16 days. Under physiological condition, umbilical stump of the newborn undergoes similar alterations.





In moist gangrene, the tissues becomes purple, greenish or blackish in color

& increased in volume, being engorged with blood & serum. Pain is intense before death of the part but later on, the affected region becomes cold & insensitive, The discharge from the lesion is in the form of dark-red foetid liquid. There is no demarcation line & a threatened life toxaemia may occur.

Moist gangrene may developed in internal & superficially located organs (lungs, intestinal loops, uterus; udder, external genitalia & extremities). While, the dry one affects only the superfacial lying tissues & organs (ear conchae, comb, wattles, tail, toes & skin of different sites of body prominences).

Treatment :

is directed against extension of the gangrene, hastening separation of the slough & preventing general effects.

1- removal of the cause.

2- Scarification : using knife or hot iron, a deep incisions of necrotic tissues are made without touching healthy tissues, then apply antiseptic solutions to counteract putrefaction. These procedures lead to drying of necrotic tissues, speed up formation of the demarcation wall & sloughing.

3- Application of an irritant : e.g. 2 – 3% alcoholic iodine solution or iodine ointment is applied at the periphery of the dead part to produce hyperaemia & phagocytosis & thus accelerate the separation of the slough.

4- Amputation of the affected part or organ is performed in certain cases (in moist & dry gangrene of digits in cattle, extremities in small animals, of penis & uterus).

Myositis

***Traumatic myositis*:**

Causes: contusions of grade 2 & 3; sprains & lacerations.

Symptoms: painful, hot to touch swelling. Skin abrasions may be seen & a deep fluctuation (hematoma) is found out in cases of partial & complete lacerations. Prolonged loss of function is usually seen in all cases.

Treatment: is the same as that of contusions & hematoma:-

- Anti-inflammatory procedures are applied.

- Means that help resorption of hematoma as massage, paraffin application, hemoclar etc.

- Cautery combined with resorptive ointment & ultrasound procedures followed by exercise of the animal are effective in case of chronic proliferative myositis.

Purulent myositis:

Causes: Streptococci, Staphylococci, E. coli invaded muscle tissues through injuried skin or metastasis from septic foci in the body. Intramuscular injections in massive doses of irritant drugs & not following the asepsis rule.

Symptoms: increase in general body temperature; loss of muscle function. At the initial stage, the affected muscle is tense, enlarged, painful & hot, then, collateral odema appears.

In diffuse myositis, there is a diffuse, hot swelling showing symptoms of phlegmon. A deep fluctuation is seen at the stage of abscess formation.

In local myositis, local induration, thickening & pain exists in the centre of muscle swelling. Later on, the swelling becomes localized fluctuated & when punctured gives pus.

Prognosis: questionable in diffuse myositis & good in local myositis.

Treatment: must be comprehensive:-

- Use of local & systemic antibiotics in combination with sulphonamides drugs etc.
- Phlegmons & abscesses are broadly incised along the muscle as early as possible & treated as usual.

***Rheumatic myositis*:**

Cause: **cold attack (overcooling in the wind, air draughts, prolonged staying the animals in damp & cold housing etc.).**

Symptoms: **sudden onset of disease; elevation of general body temperature; stiff gait; tenderness in muscle; rheumatic pain. Animals prefer to lie; moan; stand up with difficulty & show muscular tremors. *Lameness appears during movement first in one, and then in another limb, the lameness disappears or is less after walking exercise*. Neck & back curvatures are sometimes observed. Local palpation reveals, pain, tension of muscles & their enlargement, odema of the adjacent loose fatty tissues. rheumatic myositis usually has an acute course & end in recovery of animals in 3 – 14 days.**

***Differential diagnosis*:** **is by injection of phenylbutasone, salicylates, analgin etc. as they cause diminution of systemic & local manifestation of rheumatism. Several rheumatic attacks cause indurations, tuberosities & sometimes joint contractures.**

Treatment:

1- Removal of the cause: improve housing conditions & avoid sudden exposure to cold.

2- Acid feeds (silage, grains) & concentrates are removed from animal's diet, replacing them with good hay & edible roots, with vitamin & mineral supplements included.

3- Give purgative or laxative.

4- Apply a liniment on the affected muscle, antiphlogestic, warm fomentations – massage.

5- Injection of anti-inflammatory drugs e.g. phenylbutazone, I/v injection of sod. Salicylates sol. 10% 1 – 2 times/ day for 2 – 3 days (100 – 200 ml to large animals, 20 – 50 ml to small animals).

6- Physiotherapy: Ultra-high frequency, light irradiations, diathermy etc.

Prognosis: **is poor in cases having a severe course of the disease.**

***Chronic fibrous myositis*:**

Usually follows the acute forms (traumatic, purulent & rheumatic myositis; Actinomyces; Trichinella & Onchocerca lesions of muscles). There is a prolifarative interstitial connective tissue & atrophy of muscular fibers with scar formation. A grinding sound is heared when the affected muscles incised due to the calcified tissues which are present in *diffuse* or *local* form. There is no tenderness & when the muscles of the limb are affected, lameness is observed.

***Treatment*:**

1- Vibration massage. 2- Turpentine liniment. 3- Cautery & ultrasound procedures are used.

Ossifying myositis:

This case is rarely seen, but may be common in horse than other animal species appears as sequel of trauma & various forms of myositis. Symptoms are nearly similar to that of fibrous myositis. It may be *circumscribed* or *diffuse*. Only in diffuse involvement, the muscle becomes hard, tuberous, little movable & painless. It is usually observed after healing of some hernia operations & laparotomy. It is said that the cause of calcification is the transformation of the connective tissue cells into bone cells.

***Treatment*:**

In early stage: needle point firing combined with massage & resorptive ointments, ultrasound.

In chronic cases; solitary bone formations are extirpated but when it is diffuse it is incurable.

Tendinitis

Tendons **: are fibrous bands of dense connective tissue that always have one end attached to the muscle & the other end blending with the fibrous connective tissue of the structure to which they attach (usually bone) .**

Synovial tendon sheath**: are tubular sacs wrapped around the tendons; they are similar to bursae in their fundamental structure & are filled with synovial fluid. They occur where tendons pass under ligaments & through osseofibrous tunnels, thus facilitating movements by reducing friction. They have lining like synovial membrane, that respond to infection by forming more fluid & by proliferating more cells, causing adhesions & thus restriction of movements of tendon .**

***Tendinitis*:**

i.e. inflammation of the tendon & tendon sheaths. It may be:-

A- Aseptic:

acute – chronic (fibrous, ossifying).

B- Purulent.

C- Parasitic.

***Aseptic tendinitis*: is widely spread in horses, mules & donkeys & relatively rare in other animals. The flexor tendons are more susceptible to tendinitis than the extensors.**

Causes:

1- Putting the animal to work in young age.

2- Malconformation of the limb: narrow or wide position of the limbs & increased sloping of the phalanges.

3- Improper shoeing.

4- Hard work for a long period.

5- Quality of tendon: soft gummy tendons are more subjected to tendinitis than hard fine ones.

6- Partial rupture of tendons as the result of trauma & kicks.

7- Parasitic infestation as Onchocerca reticulata.

8- Heavy drought results in overloading to the flexor tendons & causes its inflammation.

***Acute tendinitis*: the affection appears suddenly where the tendon becomes swollen, painful with high local temperature. There is lameness. Pain is milder in cattle compared to horses. In tendinitis of flexors, the animals reflexly hold the limb in contracted position to reduce tension & pain exerted upon the tendon.**

***Chronic tendinitis*: the condition appears gradually & is usually a continuation to the acute form. The tendons are thick & hard as a result of connective tissue formation around & between the tendon fibers. Lameness of moderate degree & appears clearly at the onset of exercise then decreases gradually.**

In advanced cases of chronic fibrous tendinitis of the deep flexor tendon, shortening which leads to knuckling over may be seen. In parasitic tendinitis; solid nodules are found on the surface of the tendon which can be palpated.

Treatment:

- Acute form:-

1- Complete rest. 2- Shoe with Calkins to rest the flexor tendons.

3- Tight bandaging within the first 24 hours. 4- Injection of NSAD.

5- Hot fomentations 4 times daily. 6- Iodine ointment after 4 – 7 days.

- Chronic form:-

1- Biniodide of mercury blister 1 – 8 & bandage. 2- Line firing.

3- Firing combined with blistering (objective firing): holding a red-hot iron close to (about 5cm) the tendon after rubbing in of a blister until it is emulsified.

4- Tenotomy of the superfacial or deep flexor tendons in cases of contracted tendon (knuckling).

Purulent tendinitis:

it may occur as a primary disease due to infection & as a secondary disease due to expansion of purulent process from surrounding tissues. There is pain, swelling & discoloration of the tendon due to pus infiltration. The tendon tissue is lysed & necrosed with degradation in separate bundles. Severe lameness in the affected limb & pronounced fever (40 – 41).

Treatment **must be done as quickly as possible.**

1- The operative area is surgically prepared.

2- Necrosed sites of tendon are dissected within the boundaries of healthy tissues.

3- The operative wound is irrigated with aqueous solution of antibiotics & apply bandage every 3 days.

4- A course of systemic antibiotic is done in the presence of fever.

Affections of the bursae

***Bursae*: are flattened sacs of synovial membrane that contain a viscid fluid that moistens the bursa wall to facilitate movement by minimizing friction. They found when tendon rubs against a bone, ligament or other tendon. They are prone to fill with fluid when infected or injuried.**

Types of bursae:

1- Subcutaneous bursae: e.g. olecranon bursa, precarpal bursa, presternal bursa.

2- Subligamentous bursae: e.g. atlantal bursa & withers bursa (cucularis bursa).

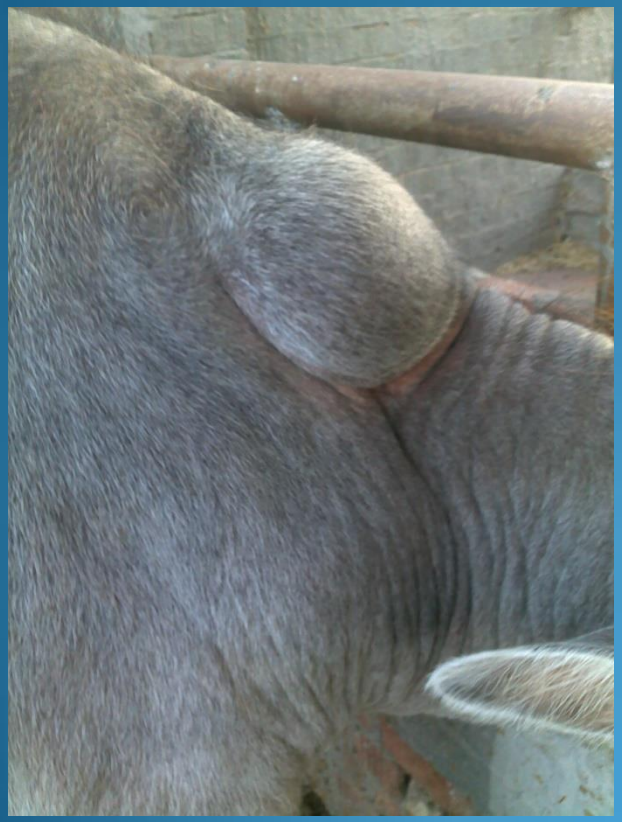
3- Subtendinous bursa: e.g. bursa intertubercularis, navicular bursa.

N. B. All the above mentioned types (1, 2 & 3) are called synovial.

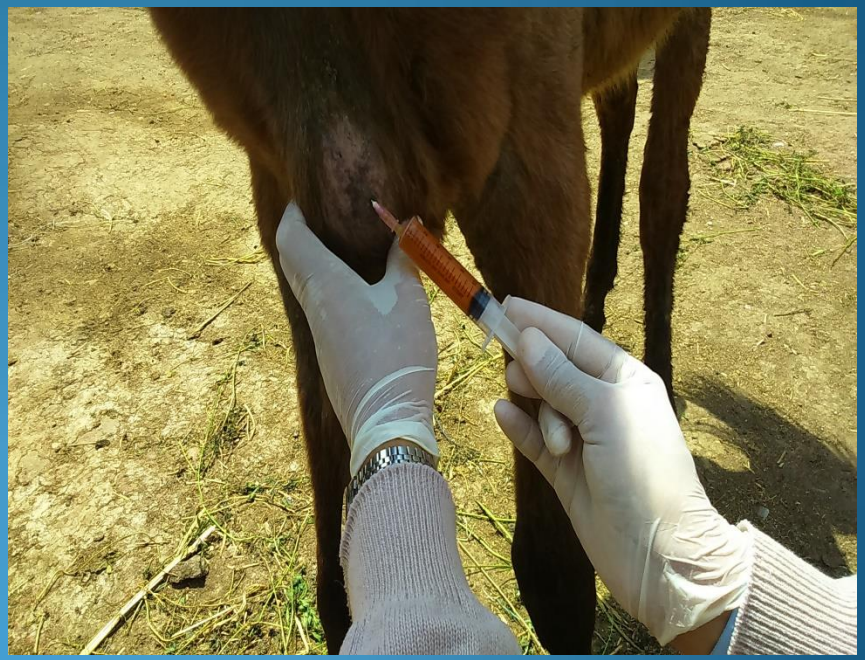
4- Subfascial & submucous bursae: these bursae are of no importance from the surgical point of view.

Bursitis

S/L WITHER BURSITIS



S/C PRESTERNAL BURSITIS



Bursitis:

inflammation of mucous & synovial bursae.

Etiology:

1- Closed & open mechanical injuries.

2- Spreading of purulent process from surrounding tissues or hematogenous infection (brucellosis, strangles sepsis etc.).

3- Repeated trauma: e.g. laying of animals on hard floor without litters & soft bedding. In horses, unfit harness & saddle predispose to the condition.

- According to clinical symptoms & course, bursitis is classified into: - Aseptic & purulent, acute & chronic.

***Aseptic bursitis*:**

According to exudates & pathomorphological changes, they are divided into: serous, serofibrinous, fibrinous, fibrous & ossifying. In acute cases, the bursa & its surrounding tissues showing the signs of acute inflammation. As the cause is eliminated & early treatment is done, inflammatory symptoms gradually disappear & the bursa returns to normal. In chronic serous or serofibrinous bursitis, connective tissue overgrowths appears which result in thickening in the bursal wall. The interior of the bursa shows, crests & intersections are formed on bursal mucosa, villi are thickened & young connective tissue is grown by bursal wall & parabursal tissues. The exudate becomes yellowish & so called *rice bodies or epithelioid cells* appear in it. In continuous injury of the bursa connective tissue proliferation reaches a great size, its wall is thickened & bursal cavity is compressed containing less quantity of exudate (serous or serofibrinous process converts in fibrinous) .Ossifying bursitis may occur when calcium salts are deposited in the wall of fibrinous bursitis.

***Clinical symptoms*:**

A- Acute aseptic s/c bursitis: swelling, pain & fluctuation. Lameness is mild or absent in cases of s/c bursitis in the limb.

B- Acute aseptic subtendinous bursitis : swelling is little manifested & fluctuation is absent ; pain is produced by pressing the bursa & stretching a respective tendon; there is a significant lameness .

C- Chronic serofibrinous bursitis : there is a painless outlined, hard elastic swelling, motile in s/c bursitis; fluctuation is greater as bursal wall is thinner & there is more exudates .

D- Chronic fibrinous bursitis: is characterized by appearance of painless, solid, little motile swelling & absence of fluctuation.

***Treatment*:**

1- Remove the cause.

2- Cold fomentation for 10 – 15 minutes (4 -5 times in 1st day).

3-Evacuation & intrabursal injections of aqueous penicillin & hydrocortisone & apply a pressure bandage if possible.

4- As pain resolves, massage with rubbing in resorptive ointment (iodine & compher oint.) & other procedures helping exudate & infiltrate resorption.

***Purulent bursitis*:**

- It may develop either due to primary infection or secondary from metastasis & expansion of purulent process of the surrounding tissues. The disease occurs in *acute* & *chronic* forms, local inflammatory symptoms appears at the bursal seat, severe lameness is seen in inflammation of subtendinous bursae of the limbs & increase in general body temperature. In chronic cases, parabursitis develops & purulent fistula is formed, communicating with bursal cavity & discharging mucous pus.

Treatment:

1) Puncture at its lower part.

2) Washing the cavity with antibiotic solution.

3) If a joint is involved, additional dose of aqueous antibiotic (1% Novocain with penicillin & streptomycin) injected into the joint to prevent infection, repeated every day.

4) Systemic antibiotic must be given.

Treatment of chronic bursitis:

- In subcutaneous bursitis; aspiration of the exudate & injection of 5% alcoholic iodine solution in the bursal cavity. The bursa is opened after 2 – 4 days & necrotic tissues are removed.

- In chronic aseptic inflammation of mucosa of subtendinous bursa; cautery is used combined with rubbing in of irritant oint. (or blistering using biniodide of mercury 1 – 8) .

- Fibrous, ossifying & purulent subcutaneous bursitis, with a well developed capsule is extirpated. Tranquilizers & local infiltration anaesthesia around the bursal capsule are enough for the operation. Enough skin must be left for coaptation of the wound lips.

Cysts

Cysts are swellings with a wall containing fluid, semifluid fluid materials & solid structures like, teeth & hair (detigerous & dermoid cysts).

 # Classification:

A- Congenital cysts or epithelial cysts: appear as a congenital abnormality on the region of the head & neck due to misdisplacement of the ectoderm during early embryonic development.

B- Acquired cysts: this is may be:-

1- *Retention cysts*: may develop due to obstruction of a secretory duct of a gland e.g. salivary gland, sebaceous gland. These cysts are of several types which are:

1-a) *Atheroma*: a sebaceous cyst may form in the false nostril in the horse, causing a local swelling & perhaps a nasal respiratory noise due to encroachment on the nasal passage.

1-b) *Mucous membrane cysts*: affecting cattle & horses due to obstruction of the ducts of mucoid glands. It is mostly found in the inner aspect of the lower lip & sublingual mucous membrane. It is spherical or oval swelling filled with clear viscid fluid. This type of cysts may be present in the mucous membrane of rectum in horses or vagina in cattle.

1-c) *Neck cysts & Ranula*: these cysts are apparently due to obstruction of a mucous gland or one of the ducts of the mandibular or sublingual salivary gland. They are common in dog but may be present in other animals. It presents as a rounded or oval swelling beside the fraenulum lingue or the tongue are known as cysts of the mouth cavity or ranula or they may found as swellings under the larynx or in the upper parts of the neck & in this case they are known as neck cysts. These cysts have usually a thin wall & filled with thick saliva like honey & so termed "Honey cyst

2- *Exudation (distention) cyst*: it is usually due to accumulation of inflammatory exudate in the tunica vaginalis following castration (Hydrocele) or cysts of the ovaries.

3- *Parasitic cysts* : associated with some parasitic infestation such as hydatid cyst of the echinococcus which occur in spleen, liver, kidney, lungs; Coenurus cerebralis develops on the brain of sheep & cattle & cysts of the taenia in cattle & pigs which mainly affect the muscles of the heart & masseters. In some cases, the cyst may be serious in its prognosis.

4- *Degenerative cysts*: which are formed from intramuscular injection of irritant materials or chemicals which are difficult to be absorbed. They are also accompanying the tumours e.g. myxoma; cystocarcinoma, cystosarcoma & cystofibroma. In this type the centre of the tumour may be liquefied leaving a cyst containing fluid.

Diagnosis:

- A localized fluctuating swelling containing fluid which can be confirmed by exploratory puncture.

Cysts are non-inflammatory & slow in development.

Cysts of the bone are diagnosed radiographically.

Treatment:

1- Puncturing to evacuate its content & then injection with an irritant liquid e.g. Tr. iodine or 5% carbolic acid solution to destroy its smooth lining. This initiates the granulation tissue which leads to obliteration of the cavity.

2- Incision & swab with Tr. iodine.

3- Radical excision of the cyst; its removal as if it is an ordinary tumour.

4- Radical excision of the organ or part from it (testicular or ovarian cyst by castration or ovariectomy).

5- Pedunculated cysts present in the base of the tongue; in vagina or in the abdominal cavity are excised using ecraseur.

Tumours

Tumours or neoplasms are pathological overgrowths of tissues which occur as a result of multiplication of cellular elements. They are characterized by atypical structure, unlimited & uncoordinated with the body growth, persisting even after elimination of the causes.

Etiology:

- Tumours are encountered in all the animal species but they are more common in cattle, horses, dogs than in sheep, pig & goat. The definite cause of tumours is not well known. According to current concepts, tumours caused by different factors: biological (viruses), chemical, physical. Some papillomata are contagious e.g. those affecting the mouth of the dog, contagious granulomata affecting the vagina of the bitch & the prepuce & surface of the penis in dog are transmitted from one animal to another by coitus. A multiple & variable external & internal factors are recognized; the number of carcinogenic substances of exogenous origin are continuously growing because of discovery & synthesis of new chemical compounds. Endogenous carcinogenic agents include substances produced by the animal body (e.g. sex hormones, steroid agents, etc.).

Classification of tumours: **clinically tumours are divided into: - benign, malignant, solitary & multiple.**

-Benign tumour, is limited, localized, they do not grow into tissues & usually encapsulated; they grow slowly; do not metastasize & do not relapse after operative removal.

-Malignant tumour, characterized by infiltrative growth, rapidity of it; intoxication of the body; some of them relapse & produce regional or distance metastases.

-Solitary: when it is only one present.

- Multiple: develops in groups in the same organ or region.

Diagnosis:

- Superfacial (visible) tumours is relatively easy e.g. papillomas or warts.

- The presence of tumour in the abdomen can be ascertained in small animals by palpation but in large animals it is impossible.

- When the relative lymphatic glands are involved, it is a reliable sign that the primary tumour is carcinoma.

- Using x – ray.

- Histopathology; microscopic examination of pieces of the tumour which are obtained operatively (biopsy) to define the type of the tumour & its malignancy.

Prognosis:

- Benign tumours are harmless, if they are not situated in a region where they interfere with function. They can be successfully excised if situated in a place where operation is possible. Malignant tumours, in the great majority of cases are incurable.

Treatment:

- Benign tumors:-

1- Pedunculated neoplasms are extirpated by ligation of the base of the tumour with an elastic ligature. The tumour will drop within 5 – 10 days. Antiseptics are necessary for the wound caused by ligature.

2- Hot iron is used when the tumour is more or less Pedunculated, & can be grasped by retention clamp. It has the advantage that prevents hemorrhage & its effect destroys any portion that is left & causes it to slough away. It is often employed for papilloma for their great vascularity.

3- Excision of the tumour mass within boundaries of healthy tissues.

4- Using caustics, e.g. glacial acetic acid; saturated solution of salicylic acid in colloidon especially for papillomas (warts).

N. B.

when papillomas (warts) are extensive & multiple which are mostly encountered in cattle, a combined therapy consisting of preliminary or later i/v injection of 1% novocain solution & operative removal of large papillomas. The novocain sol. is injected at interval of 4 – 5 days, repeated 3 – 5 times.

- S/C injection of tissue suspensions, prepared from autogenous papillomas, to large animals with skin papillomatosis yields good results: A few well formed papillomas weighing 2 – 3 gm are cut from the affected animal with scissors, washed in physiological saline & ground up in a porcelain mortar. The resultant homogenous mass is diluted with 15 – 20 ml physiological saline & antibiotics are added. The obtained tissue suspension is injected s/c in the area of the neck. Warts completely disappear after 15 – 20 days.

5- Pedunculated tumours in the mucous membrane & mucous cavities, pharynx or vagina can be removed with ecraseur.

Malignant tumours:-

1- Excision of the tumour within boundaries of normal tissues is most effective (e.g. cases of squamous cell carcinoma), the earlier the operation is undertaken, the greater therapeutic effect. When the nearest lymphatic glands are involved they must also be extirpated.

2- Radiotherapy; it is painless & acts only on the neoplastic cells of the tumour without damaging normal tissue. Curetting the lesion may associate with it, & increases its efficacy.

3- The use of caustics.

Burns & Scalds

The burn is an injury of integuments & underlying tissues according to the action of high temperature or chemical substances. Scalds are brought by the action of boiling water, superheated steam or other hot fluids or gases. A circumscribed deep burn is less serious than superfacial burn affecting a large area.

Degree of burns:-

***- The burn of grade 1:**

Characterized by injury of superfacial layers of the epidermis, erythema, moderate swelling, hotness & pain for a short time.

***- The burn of grade 2:**

Characterized by injury of the whole thickness of the epidermis & part of the papillary layer of the skin. Vesicles (blisters) filled with serous exudate. The burn vesicles when bursts leaving ulcers which may be bacterially contaminated leads to infection complications. If there is no vesicles the epidermis burnt is converted into a thin crust which is rejected as epithelial integument regenerates.

The burn of grade 3: destruction of all layers of epidermis & papillary layer of the skin & usually the grade 1 & 2 are involved. There is a severe pain & significant odema of s/c fat. The healing process occurs after rejection of necrosed epidermis & papillae. Shallow ulcers appear, they are covered with the epithelium owing to small islets of surviving cells of the malpighian layer & epithelium of hair sacs, sebaceous & sweat glands.

***- The burn of grade 4: characterized by complete charring of wall (hair), skin & s/c tissue & even superfacial layers of muscles. It is associated with massive odema of s/c & underlying loose fatty tissue.**

***- The burn of grade 5: accompanied by charring of all soft tissues & even bones. The burn of this grade is more common in a head region where soft tissue layer is directly situated on bones.**

General symptoms:

1- Shock; presents as a short-term, from several seconds to several minutes, violent excitation (erectile phase of shock), which is sometimes followed by depression (torpid phase of shock).

2- Loss of body heat; compensated by elevation in the body temperature.

3- Dehydration due to loss of body fluids leading to hemoconcentration with subsequent central circulatory stress.

4- Disturbances of blood circulation in parenchymatous organs e.g. liver, lungs & adrenals which may result in reduction in circulatory blood volume & considerable alterations in hemodynamics.

5- In extensive burnt area; infection may set in on 5^{th} or 6^{th} day which always result in death of the animal.

Prognosis:

burns of grade 1 usually result in recovery within a few days; burns of grade 2 & 3 & other grades which involve 50% of the body may result in death. Death of animals may also occur in burns of 1/20 of the body in cases when mucous membranes of the respiratory tract are injuried.

Treatment:

A- Local treatment: consists of:-

1- Tanning solutions, especially in burns of grade 1 & 2; e.g. tannic acid 2%, alum.

2- Local hypothermy in combination with vasoconstricting & bacteriostatic drugs.

- N. B. Local hypothermy should be immediately used after the burn, using clean water with a temperature 10 – 15 c poured on the burn area. The duration of irrigation is 5 – 10 minutes; interval is 1 – 2 minutes. The procedure is applied for 20 – 30 minutes in burns of grade 1; 60 minutes in grade 2; at least 90 – 120 minutes in grade 3 & 4 . In burns of extremities; cooling baths with about 0.5 – 1% pot. Permanganate added is used.

3- Apply antibiotic oint. on the burnt area after the vesicles has been ruptured for prophylaxis against infection .

4- After removal of dead tissues; apply warm normal saline, followed by anticoagulants. Just the healthy granulations appeared, put cod liver oil oint. with antibiotic.

5- S/C injection of hydrocortisone in a dose of 0.003/1kg of body weight is useful in the burn of grade 2.

B- General treatment:

1- Warm the animal with covering.

2- Abolishment of pain by i/v injection of sod. bromide with a dose of caffeine or 0.5% Novocain .

3- Fluid therapy; saline, glucose, blood or plasma & sod. bicarbonate for treatment of acidosis.

4- Prophylactic treatment: antitetanic serum with systemic antibiotic in large dose (5 – 6 days).

5- Antihistaminics; e.g. Avil inj.

6- Systemic inj. of cortisone or ACTH.

7- Vit. C & calcium inj. or (20% glucose & ascorbic acid in a dose of 300 – 500 ml i/v injection daily for nourishing the heart muscle & retaining glycogen in the liver).

8- Other vitamins, especially B group.

Dermatitis

- Inflammation of the skin without appearance of eruptions.

* *Etiology*:

1- Mechanical as scratching, contusions, harness friction & prolonged laying on a hard floor.

2- Chemical as blisters & concentrated antiseptics .

3- Thermal as in cases of burns & scalds .

4- parasitic as ticks, mites, lice & ringworm .

5- X- ray radiation .

6- Bacterial; e.g. staphylococcal dermatitis .

7- Excessive secretion of tears as in cases of obstruction of the naso-lacrimal duct .

Types :

1- Dermatitis erythematosa : it is the simplest type of inflammation. The skin is thick, tense & painful & there is local elevation of temperature. Initially, the skin acquires a red color, capillary bleeding appears & then bloody crusts are subsequently produced .

2- Vesicular dermatitis : in these cases, the serous fluid accumulates in the form of small vesicles. The vesicles are easily opened & secretes clear yellowish serous fluid. This type is observed in cases of burns of grade 2 & after the use of blisters .

3- Pastular dermatitis : this type is due to infection with pyogenic microorganisms where vesicles are seen filled with pus .

4- Chronic dermatitis : the skin is well thickened (sclerosis), significant odema appears, mild pain. The skin loses its elasticity & becomes dry. Folds appear & may covered with scales or horny tissues, it usually observed in flexor surfaces of joints especially, those of the pastern area, gradually deepen, becoming cracks which causes mild lameness. In more chronic cases, vegetations may be noticed, & in this case it is known as hyperplastic or vegetative dermatitis .

***Contusions*:**

Cause: trauma.

Symptoms: acute pain which may extend along the course of the nerve & more or less paralysis or loss of sensation in the muscles involved, depending on the nature of the injury.

Treatment:

1- Local application of warm fomentations, massage & counter irritants.

2- Administration of pot. Iodide internally.

3- Nerve tonics. **4- Local anaesthetics.** **5- Electrotherapy.**

Cutting of the nerve:

Symptoms: the special symptoms are acute pain at the time of cutting, paresis or paralysis in the distal part supplied by a motor nerve & loss of sensation in the part supplied by a sensory nerve. Muscular atrophy & sometimes hyperesthesia occur later.

Treatment: regeneration of cut nerve depends on:-

a) Diastasis of ends; must not exceed 5mm.

b) The nature of tissue & foreign bodies which separate the ends of the nerve cut.

c) The intensity of inflammatory reaction at the site of the injuried nerve.

d) The degree of tissue injury & infection.

1- Nerve anastomosis ; the only special treatment is immediate suture for completely divided nerves using a very fine atraumatic needle & thread, a forceps with a mouse teeth & a sharp scissors & scalpel. Having trimmed the ends of the nerve, they brought into contact & sutured by one of the following methods:-

a) Direct suture through the ends of the nerve.

b) Indirect or perineurotic suture passing through neurolemma only.

c) Paraneurotic suture, passing through the surrounding tissue only: when a significant diastasis is present, regeneration of the cut nerve trunk occurs by *neurotization* .

- neurotization via intermediate scar.

- neurotization via muscular fibers.

- neurotization via anastomosis of an adjacent nerve; a) central end; b) peripheral end; c) trunk of adjacent nerve .

2- Nerve tonics.

3- Physotherapy & electrotherapy.

Neuralgia :

- i.e. sudden evidence or appearance of severe pain lasting from several seconds or minutes & as suddenly disappearing (transient pain due to inflammation of a nerve trunk) .

Causes:

1- Common cold.

2- Strangulation (compression) of a sensitive nerve; e.g. trigeminus, in the bone canal or compression by a scar or tumour.

3- Intoxication & ascending infection.

Classification:

1- Facial neuralgia: characterized by ophthalmia, nasal discharge & ptyalism & evidence of pain in the head region. The horse holds the head to one side lowers the ears & may groan. The eyes are fixed & glaring.

2- Sciatica: characterized by hind limb lameness, pain on pressure on the hip over the course of the sciatic nerve or by pressure on it per rectum.

3- Dorso-costal neuralgia: indicated by manifestation of pain during respiration.

4- Lumbo-abdominal neuralgia: recognized by pain in the lumbar region.

5- Cervico-occipital neuralgia: causing hyperesthesia in the region of distribution of the occipital nerve.

Diagnosis: is not always easy & may be confused with acute rheumatism.

Treatment:

A- Local treatment:-

1- Moist heat in the form of hot fomentations; poultices & antiphlogistines.

2- Anodyne applications e.g. belladonna liniment.

3- Counter irritants including stimulating liniments, blisters & needle-point firing.

4- S/C injection of morphine or atropine locally.

5- Light massage which must be repeated daily.

6- Electrotherapy.

B- General treatment:-

1- Injection of sod. salicylates, asprin & other nerve sedative drugs.

2- Injection of nerve tonics.

Neuroma:

- i.e. Enlargement of stump of nerve trunk, the proximal end of the nerve cut grow in size & together with scar tissue form on the proximal end a flask-like swelling (neuroma) a source of severe pain .

Treatment:

Surgical removal of neuroma & medicinal as that of neuritis .

Paresis & Paralysis:

- **Paresis** means, weakening of voluntary movements.

- **Paralysis** is complete loss of motor function.

Types of paralysis:-

- **Monoplegia or local paralysis**: involvement of one limb.

- **Paraplegia**: paralysis of either fore or hind limbs.

- **Hemiplegia**: paralysis of lateral portion of the body (paralysis of limbs on one side).

- **Quadriplegia or tetraplegia**: paralysis of both sides of an organ or of the four limbs.

According to the type of the affected neuron, *central* & *peripheral* paralysis are distinguished: The central type occurs when the central motor neuron or its pyramidal tract is affected & characterized by hypertonia; tendon hyerflexia without atrophy . The peripheral paralysis occurs when the peripheral motor neuron or its axon is injuried, the spinal reflex arch is interrupted & nerve impulses cease to come in the muscle, resulting in atonic paralysis; the muscle becomes weak, flaccid & atrophied; tendon & cutaneous reflexes disappear (areflexia) .

Diagnosis:

- Is made on the basis of clinical symptoms . In paresis of peripheral nerves; weak, delayed muscle contraction during flexion or extension of a limb or complete loss of function by respective muscles, with tactile sensation preserved (deep paresis) are observed . In peripheral paralysis, contractile muscle function & all types off sensation are lost distally from the damaged site; paralyzed muscles are atonic, cutaneous & tendon reflexes are absent; atrophy develops later.

In central paralysis, exaggeration of tendon reflexes & elevation in the tone of the paralyzed muscle are characteristic of central paralysis (hyperreflexia & hypertonia).

Prognosis: recovery may obtained in cases with slight nerve injury within few hours – few days; delayed recovery (3 – 6 months) was seen in cases having strong & prolonged mechanical injuries; chronic paralysis & atrophy is more difficult to be treated.

Treatment:

1- Removal of the cause: callus, tumour or scar compressing a nerve etc.

2- Application of a counter- irritant & injection of pot. iodide, to promote absorption of inflammatory exudate pressing on nerve.

3- Administration of nerve stimulants: nux vomica internally or strychnine hypodermically & vitamins (B-complex).

4- Massage; counter-irritation by liniments, blisters or firing; & exercise to prevent muscular atrophy.

5- Passive movements of joints, to induce the commencement of activity of the paralyzed muscles.

6- S/C injection of common salt to prevent atrophy & promote the restoration of function in the nerves & muscles affected.

7- Electrotherapy.

Traumas of the brain :

Etiology : concussions & contusions commonly seen in falls of animals on the head or back . Sustaining severe blows.

Symptoms:

- The animal falls, unable to stand up.

- Pupil dilation, nystagmus, rapid pulse, snoring respiration, Pallor mucous membranes.

- Vomiting & loss of motor reflexes in severe cases.

- Head contusions & wounds destroying subcortical structures & medulla oblongata result in death in a few minutes or hours. In mild cases, paralysis develops after brain contusion at the site opposite to injury (monoplegia, hemiplegia).

Treatment:

1- Cold fomentations are applied to the head.

2- Cardiac & respiratory stimulant.

3- To reverse excitation, sod. bromide is used; Combelene is injected in horses; Rompun to cattle.

4- To prevent brain odema, 10% sod. chloride or 10% ca. chloride is injected i/v.

5- S/C injection hydrocortisone (0.003/ kg b.wt.) .

Concussion & contusion of the spinal cord :

Concussion :

- Symptoms of concussion are:- mild, transient paresis of hind limbs; disturbance of skin sensation of the respective area; transient micturation & defecation disorders occur in concussion of lumbosacral segment of the spinal cord .

Contusion : persistent motor disorders appear after trauma & caudal to it. In cases of fracture of the spine, complete tear of the spinal cord or compression of it by splinters may occur .

Symptoms :

1- Mild contusions without injury of the brain matter are accompanied by transient paresis .

2- Severe contusions with tears of brain matter, bleedings & injury of roots present as micturation & defecation disorders & paralysis of the body caudal from the contused site .

3- Animals take a position of a sitting dog when the lumbosacral segment is severely contused .

-Treatment : only adopted, if symptoms of spinal cord injury are absent, symptomatic treatment is performed in valuable animals . Animals are discarded in vertebral fractures with tearing of spinal cord .

Wounds

It is a breach in the continuity of the skin, mucosa, underlying tissues & organs which characterized by pain, gaping, bleeding and functional disturbance.

- *Abrasions or scratches* means, solution in the integrity of the epidermis

Types of wounds

1- Operative, aseptic & heals without symptoms of infection within the shortest period by first intention.

2- & 3- Accidental & gunshot, are always infected & contain significant amount of necrotic tissues. In cases when surgery is associated with the opening of infectious foci, e.g. abscesses. Phlegmons, the operative wound become infected like accidental & gunshot wounds. They heal by the second intention with more or less suppuration.

Classification of wounds

1- Stabbed wound inflicted with a sharp or blunt object & has a narrow opening & canal, sometimes very deep to penetrate into anatomical cavity, internal organ or major blood vessel.

2- Cut (Incised) wound, inflicted with sharp objects in the process of operation or accidentally.

3- Slashed wound, shows great destruction, up to injury of bone & even paring away of a part of the body.

4- Crushed wound, takes place under the action of bruising or pressing force e.g., moving caterpillar.

5- Lacerated wound

5- Lacerated wound appears with sharp objects such as claws of predatories, iron hooks or barbed wire. Their edges are irregular & rough, with variable depth, the walls & bottom are represented by necrosed tissues.

6- Bitten wound, or (viral) may having a virulent m.o. like rabies virus. Imprints of teeth are usually seen on the skin.

7- Gunshot wound, inflicted by firearms, has irregular, swollen edges, show bruises & marginal necrosis. If a shot was made from a short distance, burn marks & powder particles are detectable. Gunshot wounds may have two openings (perforated). Inlet opening has round irregular triangular or stellate form. Outlet opening which is usually greater than the former often has lacerated, inverted, festoon edges. The wound canal may change the direction, as the bullet or splinter flight get into contact with a bone or other dense tissue.

8- Poisoned and Envenomed wounds, containing chemicals, radioactive contaminants, venom of snakes & spiders & others.

9- Contused wounds, caused by blunt objects, laceration of skin, severe contusion of muscles, nerves & other tissues often with bone fractures occur at the site of application of the force. Contused tissues represent a good nutrient medium for microbs and facilitate onset of infection.

10- Combined wounds, have features of two or three types of wounds e.g. stabbed-contused, contused-lacerated.

According to the time elapsing from the onset of injury and response of the body: -

1- Recent (fresh) wounds, if no more than 24 – 36 hours.

2- Inflamed wounds, which show prominent clinical symptoms.

3- Infection-complicated wounds.

Symptoms

1- Pain: always present, but varies according to the innervations in the part. Skin, periosteum, abdomen & hoof derma have the highest pain sensitivity. Cattle are less than horses. Dogs, cats & pigs are highly sensitive & may die from shock. Adult animals are more responsive to pain than young ones. Pain is intensified by infection of the wound.

2- Gaping of the lips of the wound is marked in cut, slashed & lacerated wounds. It is more marked in skin wounds at joint areas & other movable sites than at little movable areas. Gaping can be increased by the onset of wound infection, thus retarding normal healing.

3- Functional impairment: injury of a common nerve or internal organ impairs their function.

4- Bleeding / Hemorrhage:

The amount of hemorrhage depends on the vascularity of the part and the size of the vessels injuried. It may external & internal; arterial, venous, capillary; parenchymatous & combined. In addition, erosive type may be found. *External bleeding* easily detectable. *Internal one* is characterized by effusion of blood into injuried tissue or anatomical cavity. Bleeding is defined according to the type of anatomical cavity: e.g. bleeding into a joint cavity is reffered to a hemarthrosis, into pleura— hemothorax, into the eye--- hemophthalmos, from the nose--- epistaxis, from the mouth--- hematemesis. *The characteristic symptoms of internal bleeding are: weak & rapid pulse, pale mucous membrane, general weakness & dyspnea.* If blood flows outside from external orifices & into any cavity, symptoms of external & internal bleeding are seen, such bleeding is called *combined.*

** ***Primary hemorrhage:***

Occurs immediately after injury or exact at the time of operation (induction of injury).

** ***Secondary or recurrent:***

Occurs several hours or days after arrest of the primary bleeding. Its onset is sudden or preceded by increase of body temperature.

** ***Intermediary hemorrhage:***

Takes place after some hours due to rising of blood pressure above its normal level.

Causes of secondary hemorrhage / bleeding:-

1- Inadequate arrest of primary bleeding.

2- Breaking away of thrombus by blood stream.

3- Repeated injury of tissues or granulations.

4- Rough replacement of dressing, tampon, drapes.

5- Laceration of the wall of contused vessels above the site of ligation.

6- Injury of vessels by bone splinters, foreign bodies.

7- Liquifaction or lysis of tissues & thrombi due to infection especially with pyogenic microorganisms.

8- Deficiency of vitamin K & C.

* Arrest of bleeding *

1- Spontaneous arrest of bleeding is possible in minor injuries.

2- Mechanical hemostasis is performed by tamponade, pressure bandage, crushing using artery forceps, sand crusher, emusculator & ecraseur.

3- Chemically: e.g. tannic acid, alum & ferric chloride.

4- Cautery: hot iron & electrothermocauterization.

5- Biologically: e.g. adrenaline used in epistaxis in horse & cattle, ergometrine (ergot) & methergine in cases of post-parturent hemorrhage.

6- Blood compensation by normal saline, dextrose & plasma in animals & blood transfusion in human.

7- Use of activators of coagulation system as protamines which suppress the action of anticoagulants e.g. epsilon-amino caproic acid (EACA), paraminomethylbenzoic acid (PAMBA), aminomethylcyclohexanecarbonic acid (AMCHCA); vtamin K, ca. porogluconate, hyaluronidase & hyaluronic acid.

Complications of wounds

1- *Acute anaemia (Traumatic anaemia):* occurs as a result of bleeding from large arteries & veins. It is characterized by gradual acceleration & weakening of pulse & respiration, pallor m. ms, dilation of eye pupils, cold extremities & motor incoordination. Then, the animal falls, urine & fecal incontinence, convulsive movements of the head, limbs. Death occurs only in a 60 % blood loss. Cattle are relatively tolerate massive bleeding than horses.

#Treatment:-

*** Blood transfusion.**

*** Cardiac & respiratory stimulants e.g. caffeine, coramine & lobeline.**

*** Fluid & electrolyte therapy.**

*** Warmth of the body.**

Syncope and Shock

2- *Syncope*

- **Sudden stoppage of the heart's action. The patient appears to be dead. The cause may be severe hemorrhage or reflex action.**

3- *Shock*

- **Acute peripheral circulatory failure. In this case, the movement of the heart and respiration still continuous, but the patient is unconscious**

 # Treatment :

*** Placing the head on a lower level than that of the body.**

*** Performing artificial respiration & injecting cardiac & respiratory stimulant.**

***Intravenous injection of normal saline.**

*** Warmth.**

4- *Venous thrombosis:* is the result of phlebitis, that a vein has been opened or contused at the site of a wound. Disintegration of the thrombus in the vein leading to the formation of emboli as the may obstruct the pulmonary artery or the auriculo-ventricular valve & cause sudden death. Septic embolism produces a fatal septicaemia.

 # Treatment:

*** Apply antiseptic solution to the wound.**

*** Avoid rough handling for fear of disturbing the clot & causing embolism.**

*** Injection of penicillin to guard against infection.**

5- ***Traumatic fever:*** **it is manifested by symptoms of febrile disturbance due to the absorption of toxins from the wound caused by the presence of bacteria.**

Treatment:

*** Local antiseptics & local & systemic antibiotic therapy.**

6- *Traumatic emphysema:* due to infiltration of the cellular tissue by air or by gas from the alimentary tract or respiratory tract. It is a common complication of punctured wounds at the axilla & groin. The opening & closure of these wounds during movement cause air to be aspirated into the wound & driven through the tissues. After puncturing the rumen or the caecum, gases may escape from the alimentary canal & infiltrate the tissues around the wounded area.

 # *Symptoms:* - Presence of a soft, circumscribed, painless, crepitating swelling, quite different from that caused by gas gangrene.

- It is usually harmless.

- Some local infection may occur, when the gas is come from digestive tract.

 # *Treatment:* * Apply pressure from the periphery of the swelling towards the wound to expel some of the air or gas.

*** Keeping the animal at rest after treatment when the wound present in the axilla or groin.**

*** Enlarging the wound in the case of punctured wound to do a free exit.**

7- Specific infections:

A- Gas gangrene: due to invasion of the wound by anaerobic bacilli (Cl. sps) e.g. Cl. perfringens (welchii), Cl. novyii (edematiens) & Cl. septicum.

 # Symptoms: *** Hot, painful, edematous swelling surrounding the wound which spread rapidly.**

*** As the disease advances, the centre of the swelling becomes depressed, cold, insensitive & crepitating.* Later on, the lips of the wound undergo putrifaction, becoming friable & infiltrated with foetid gas.* If there is an open wound a clear or slightly turbid brownish exudate drains from the wound & a very offensive odour characteristic of putrefying tissue is present. Also gas bubbles may be seen.**

 # Treatment: *** Application of ice pack which should be kept in contact with affected area until the swelling subsides.**

*** Application of antiseptic solutions.**

*** Repeated & massive administration of penicillin.**

*** Deep septic lesion is dressed with carbolic acid, pot. Permanganate or H2O2.**

B- Tetanus:

This disease is fairly common as a complication of wounds in the horse, but comparatively rare in other animals. Occurs mostly in puncture & deep dirty wounds having necrotic tissue & pyogenic m.os. It is caused by anaerobic bacilli (Cl. tetani) which multiplies in the wound, elaborating a toxin which becomes fixed in the nerve centres & provokes tetanic convulsions. Prevention of tetanus consists of thorough antiseptics of the wound & the injection of antitetanic serum as early as possible after the occurance of the wound.

C- Erysipelus:

Caused by specific stereptococci & manifested in three forms—

- **Cutaneous erysipelus** which characterized by a diffuse, hot, painful swelling affecting the skin & spreading rapidly, may be accompanied by lymphangitis and adenitis. When the horse's lips are affected, the whole head becomes swollen.

** **Phlegmonous & gangrenous form** are manifested by symptoms of diffuse suppurating lesions & those of moist gangrene. Severe febrile reaction with great depression. Death is a common termination in such cases.

Management of wounds

Basic principles of wound treatment:

1- Prevention of infection.

2- Careful debridement & trimming.

3- Irrigation of wound to remove debris & necrosed tissue.

4- Careful hemostasis.

5- Gentle handling of tissues.

6- Layer by layer closure & avoiding tissue tension.

7- Avoiding the use of irritant materials.

8- Prevent over-stimulation of nerve centres by pain impulses.

9- Promote systemic resistance by improving housing conditions & by adequate vitamin feeding of the animal. Various dressing materials are used to protect the wound from contamination, absorb the exudate, prevent further trauma & to provide comfort to the patient.

Management of clean or aseptic wounds

Aseptic preparation of the skin should be done to minimize or eliminate surface infection before any operation: - First, the skin is washed with detergent soap & then shaved & again washed with detergent several times. Before the operation, the operative area should be swabbed with an antiseptic solution & allowed to dry.

* The clean wound should pack with sterile gauze at the time of preparation of site around the wound to prevent contamination.

* The wound is flushed with a sterile normal saline or mild aqueous antibiotic solution; then the wound is dried & the area is surgically draped. * Blood clots are completely removed.* The sterile dressing should be done on alternate days as needed.

* In large wounds, placement of sutures should be done under aseptic precautions.

* Sutures should be removed after 10 days or when the healing is complete.

It is desirable to dress the wound for 3 – 4 days after removal of the skin sutures to prevent infection from stitch bites & the wound should be protected further from any trauma for 10 – 15 days to prevent dehiscence.

Management of contaminated wounds

Wounds of less than 6 – 8 hours duration are considered to be contaminated. It can be converted into a clean wound & closed safely, but infected wound can not be converted surgically into a clean wound & therefore should be treated as infected open wounds. Management of contaminated wound which can be converted into a clean wound is done as follows: -* The wound should be covered & protected by sterile gauze.

*** Aseptic preparation of the area around the wound.**

*** The wound should be irrigated gently with isotonic normal saline or non-irritant antiseptic lotion after removing the dressing.**

*** Removal of necrotic tissue & contaminants & irrigation with non-irritant antiseptic lotion should be repeated.**

*** The soiled drapes are replaced & proper drainage is provided.**

*** The wound may be closed after providing proper drainage.**

*** A course of antibiotic could be given for 4 – 5 days & antiseptic dressing applied till sutures are removed.**

Management of infected wounds

Wounds of more than 6 – 8 hours duration are considered infected wounds

*** The infected area should be washed with antiseptic solution followed by aqueous antimicrobial agents. * Parentral administration of antibiotics.**

*** Provide good drainage to evacuate pus, exudate, etc. In case of deep wounds, fenestrated rubber tube is kept in the wound to provide drainage & is removed after cessation of exudate. * The wound should be dressed with antiseptic/ antibiotic ointment or maggoticides or chemical debridement agents when is needed.**

*** The wound cavity should be filled with absorbent dressing materials & finally covered with gauze & bandaged.* The dressing should be changed daily for 5 – 7 days.**

*** Protective wound dressing with mild antiseptic & antibiotic should be done on formed healthy granulation tissue on alternate days or biweekly intervals.**

*** Warm applications are indicated in chronic infections & cold in acute infections. The warm promote drainage & local blood flow & promote healing; while, the cold cause vasoconstriction & provide relief from pain by decreasing blood flow, metabolic rate & bacterial growth .**

Treatment of wounds with the use of drains**: is indicated in deep, recent, inflamed & infection complicated wounds containing a significant amount of necrotic tissues & in obstructed drainage of wound exudate from pockets & niches.**

Two types of drains are recognized:-

1- Active drains (gauze drains): They soaked with antibiotics, hypertonic and antiseptic solutions or proteolytic enzymes.

2- Passive (tube) drains: which eliminate the exudate, afford periodical washing of wounds & administration of antiseptic drugs through them. Insertion & replacement of drains are done with regard to asepsis & antisepsis rules. The drain can be removed when fluids or exudate are lessened.

** ***Skin grafting*** **

A skin graft is a segment of epidermis & dermis that is completely removed from the body & transferred to a recipient site. Clinically, *autografts* (i.e. the recipient & donor sites on the same animal) are the most successful type of graft, because the graft & host are genetically identical.

Indication of skin grafting:

1- Extensive wounds with complete loss of skin in a large area.

2- Wounds in which insufficient skin is available for primary closure after removal of benign & malignant tumour.

3- Burns of second or third degree involving large extensive area.

4- Cosmetic purpose – blemish or scar of skin can be removed by skin grafting.

Contusions

Closed mechanical injuries of tissues and organs with preservation of anatomical continuity of the skin.

1- Contusion of the first degree, characterized by rupture of capillary vessels in the skin & s/c tissues & the formation of ecchymosis. The typical symptoms are only observed in non-pigmented skin & are represented by changes in color. Initially, red colored bruises become blue-purple in 1 – 2 days, brown in 3 days & yellow later on because of conversion of hematoidin in hemosiderin; yellownish of tissues disappears in 10 – 20 days.

2- Contusions of the second degree, with rupture of large blood vessels & the production of hematoma, lympho-extravasate; when the blood is extravasated, a symptom of hematoma will appear which later on subside if not complicated by infection. Contusion inflicted on the thigh, buttocks or forearm where a strong aponeurotic membrane is situated, an accumulation of serum & lymph forms quickly under the skin, due to separation of the skin from the aponeurosis &the consequent rupture of lymphatic vessels & capillary blood vessels . *The symptoms are characterized by* the formation of uniformly fluctuating enlargement. The liquid does not completely fill the space under the skin & can be displaced from one part to another (the swelling has a dimpled appearance at the space not occupied by the liquid).

3- Contusions of the third degree, in this case, a deep extensive volume of tissues is destroyed & undergoes gangrene. The lesion result from very strong blow or severe trauma & may show evidence of shock or of injury to internal organs.

**** Prognosis*: - Contusions of the first & second degree is good; of the third degree is poor**

**** Treatment*: Contusions of 1st degree: Cold & astringent applications & the affected skin is processed with 5% aqueous solution of pot. Permanganate, alcoholic sol. of iodine. Contusions of the 2nd degree: Cold water irrigation-astringent applications are used during the first 24 hours, then the rubbing in of absorbent ointments – massage – compressions with a pad & bandage. When the case is of longstanding, treatment consists in incising the swelling & evacuating its contents & treating its lining with an irritant antiseptic solution.**

***N.B.* collections of lymph may be opened early without fear from hemorrhage (early opening of hematoma is contraindicated before the ruptured vessels are thrombosed).**

Contusions of the 3rd degree: require moist warm antiseptic applications, compresses, antibiotics & counter-shock measures in cases of shock.

Wound healing [Repair]

In open wounds, healing occurs on two main stages:-

A- *Fibroblastic healing*: it is subdivided into:

1- Exudative phase or inflammatory phase.

2- Fibroblastic phase or collagen phase.

3- Maturation phase.

B- *Epithelial regeneration (Epithelization)*: it includes:

1- Contraction phase.

2- Remodeling phase.

A- 1- Exudative phase: it occurs as immediate response to the formation of the wound. There is vasoconstriction of small blood vessels in the area of the wound which helps in control of hemorrhage. This response lasts fore 5 – 10 minutes & is followed by active vasodilatation, therefore, fluid having the same composition as plasma & containing enzymes, proteins, antibodies & complements begins to leak from the venules. These fluids provide fibrinogen & other clotting elements which form **fibrin clots.** This fibrin is laid down in the wound & provides a good frame work for repair besides hemostasis. The resistance of the wound to bacterial invasion is accompanied by the vascular & cellular reaction. After dilatation of the vessels, there is an exudate poured into the tissues producing an edema. Phagocytosis & antibacterial substances slow the development of & destroy bacteria. The enzymes liberated by leucocytes liquefy dead tissue. Toxic products are carried away by blood stream. With the liquefaction of the tissue proteins the acidity of the tissue approaches neutrality & **new capillaries begin to develop** from the blood vessels in the surrounding healthy tissue. In a wound that is sutured & healing occurs by first intention, the exudative phase **lasts about 4 days.**

A- 2- Fibroblastic phase:

it begins at about 5-th day. The fibroblasts in the wound are derived from local mesenchymal cells. When chemical environment becomes favorable & there is adequate nutrition from the new capillaries, it stimulates fibroblast to migrate into a wound. The fibroblasts secrete protein polysaccharides & various glycoproteins which form ground substance. Collagen is synthesized by the fibroblasts which in the beginning are formed from small bundles but gradually enlarged to form dense collagen that binds the edges of the wound. The fibroblastic phase of wound healing lasts for 2 – 4 weeks. Collagen provides adequate strength for the wound by 15-th day.

A- 3- Maturation phase:

it starts once the collagen bed has been laid down. The collagen fibers become thicker & denser & the fibroblasts decrease, pale & somewhat tissue scar forms. The full maturation of scar may take months or year.

B- Epithelization:

It begins within hours of wounding and requires a suitable granulating surface. The cells adjacent to a wound initially show **mobilization** and prepare themselves for **migration.** Following mobilization, these cells enlarge and begin to migrate down & across the wound. Then, they show **mitotic activity** and are responsible for migration of the epithelial cells. Migration of epidermal cells appears to move by **rolling & sliding** over one another. Migration and then mitosis of epithelial cells cover the wound. Complete epithelization of an open wound requires **days or even weeks** depending upon size of wounds.

B- 1- Contraction phase:

Contraction is a powerful force in the closing of wounds & results from the inward movement of the surrounding healthy tissue. Contraction force can close a large wound if it is located in an area where the tissues are freely movable (e.g. large wounds in the trunk can be completely closed by contraction with minimal scar tissue). Whereas, a very little contraction occurs in wounds that are fixed to the underlying structures or are stretched across bony areas (e.g. tuber coxae & lower parts of the limbs).

B- 2- Remodeling phase:

May also referred to normalization phase as the wounded parts almost restore their normal shape & function.

** Types of healing **

1- Healing of wounds by first intention:

This occurs in:-

*** Recent, aseptic operative wounds, free from infection & foreign bodies.**

*** Arresting bleeding (through hemostasis).**

*** Wounds having regular & viable edges.**

*** Closure sutures are properly placed on them without tissue tension.**

*** No gaps. This is the best type of healing, since it is completed within a short period (5 – 7 days).**

2- Healing of wounds by second intention:

This type is observed in accidental, operative, infected & gunshot wounds.

The characteristic features of this healing are two-phase course:

*** *Suppuration*; then ** Filling of the wound with granulations & their coating with *Epithelization.* So, it is very important to keep on granulation tissue & avoid any destruction or infection. The wounds may take longer to heal: 3 – 4 minimally (average 1.5 -2 months).**

3- Healing by a scab:

Wounds heal by a scab occurs in rodents & birds. Only abrasions, scratches and superficial wounds do so in cattle, horses, dogs & other animals. The scab is produced by blood clots, fibrinous exudate & necrotic tissues.

Healthy (normal) granulation tissues

- **Regular and fine granularity (buds).**
- **They are solid, non-bleeding, rosy red in color and**
- **Produce little, transparent and clear exudate having a normal smell. Such granulations are formed only in normally occurring second intention of wound healing.**

Unhealthy (morbid) granulation tissues

They appear because of mechanical, chemical irritation & infection of the wound

- **Irregular macrogranularity, vivid red, bluish-green to yellowish color.**
- **They are soft, fragile, bleedy, showing necrosis & shreds &**
- **Produce slimy (mucous-watery) exudate, pussy & having offensive smell. Such granulations do not perform barrier & phagocytic functions & are not coated with epithelium.**