

Lumps, Ulcers and Fistula/Sinus

CLINICAL EXAMINATION OF A LUMP OR SWELLING

This should be conducted in a systematic manner – history, local examination, state of local tissues, state of regional lymph nodes, and general examination of the patient.

• History

- Age, sex, ethnic group, occupation.
- Duration: *How long the lump is there?*
- Mode of onset: *How the lump has started?*
- Progress of the swelling: *Is the lump changing its size and surface?*
- Painful or painless?
- Family history.

• Local examination

- *Inspection*
 - Site
 - Number
 - Shape and size
 - Colour
 - Surface and edge
 - Skin over the swelling
 - Visible pulsation
 - Impulse on coughing
- *Palpation*
 - Local temperature
 - Tenderness

- Site, size and shape
- Surface and edge
- Consistence
- Fluctuation
- Translucency
- Fluid thrill
- Resonance
- Compressibility
- Pulsatility
- Indentation
- Impulse on coughing: Visible or palpable?
- Reducibility
- Mobility
- *Percussion*
- *Auscultation*
- **State of local tissues**
- **State of regional lymph nodes**
- **General examination of the patient**

Solid
or
Fluid
or
Gas

Vascular

LUMP

A lump or swelling may arise from the skin, subcutaneous tissue, muscle, tendon, bone, nerve, lymphatics and lymph nodes, blood vessels, gland, or lie within one of the body cavities.

A lump may also arise due to protrusion of a viscus from the body cavity through a weak spot of its wall, e.g. hernia.

Causes of a lump or swelling

A. Congenital

- Present since birth, e.g. meningocele, dermoid cyst, teratoma.
- Not evident at birth but appears years later, e.g. branchial cyst, thyroglossal cyst, cystic hygroma.

B. Acquired

- Traumatic: Swelling develops immediately after a trauma, e.g. haematoma, muscular lump caused by rupture, bony projections following fracture or dislocation.
- Inflammatory: Acute or chronic.
- Neoplastic: Benign or malignant.
- Otherwise, e.g. autoimmune disease.

DIAGNOSIS OF A LUMP OR SWELLING

History

- Age, sex, ethnic origin, occupation.
- Duration: *How long the lump is there?*
 - Congenital and present since birth, e.g. meningocele, dermoid cyst, teratoma.
 - Congenital but not evident at birth and appears years later, e.g. branchial cyst, thyroglossal cyst, cystic hygroma.
 - Acquired.
- Mode of onset: *How the lump has started?*
 - The swelling may appear after trauma or develop spontaneously. A swelling may arise on some pre-existing condition, e.g. a keloid may develop over a scar; malignant melanoma may develop over a mole or birth mark.
- Progress of the swelling: *Whether the lump is changing in size or surface.*
 - Rapid enlargement may imply inflammation particularly if it is painful, whereas progressive enlargement may signify neoplasia.
- Painful or painless?
 - Painful lumps are commonly due to trauma and inflammation. Pain is absent in benign growth and in early carcinoma.

Local examination

Inspection

1. *Site:* Location of the lump and its relation to

certain landmarks present in the vicinity of the lump.

Typical position of a swelling is almost diagnostic of some lesion, e.g.

- Postauricular dermoid behind the ear;
 - External angular dermoid at the lateral end of the eyebrow;
 - Meningocele over the back in the midline;
 - Thyroid swelling in front of the neck.
2. *Number:* Whether single, or multiple, e.g. neurofibromatosis, adiposis dolorosa, warts, naevi, secondary carcinomatous nodules, diaphyseal aclasia.
 3. *Shape and size:* Whether spherical, ovoid, kidney-shaped, pyriform or irregular. The lump may be pedunculated or sessile.
 4. *Surface:* Smooth (cyst), lobulated (lipoma), nodular (a mass of enlarged lymph nodes, multinodular goitre), rough and irregular (irregularity of a wart; carcinoma), red, shiny and oedematous (inflammatory lesion).

There may be presence of a *pit or punctum* (sebaceous cyst), *peau d'orange* (due to underlying carcinoma infiltrating towards the skin, e.g. carcinoma breast), *scar* (irregular scar from injury; broad, depressed and puckered scar from suppuration; linear scar with suture marks from previous operation – *this indicates that the lump appears after operation, e.g. incisional hernia; recurrence of lump, e.g. Paget's recurrent fibroid. Tense shiny skin with overlying prominent veins* (sarcoma).

There may be *ulcer over a swelling* (necrosis over a malignant nodule).

5. *Edge of the swelling:* Whether circumscribed or of the nature of a general bulge, i.e. without any definite margin. The edge may be sharp, rounded, regular or irregular.

Well-defined and regular (most of the benign swellings); *well-defined and irregular* (malignant swelling infiltrating the surrounding skin); *diffuse and ill-defined* (inflammatory swellings like cellulitis, abscess).

6. *Colour*: Red or purple (inflammation, haemangioma), blue (ranula, mucous cyst), black (melanoma).
7. *Visible pulsation*: Visible expansion synchronous with each pulse beat (aneurysm, vascular growth).
8. *Visible impulse on coughing* depending on the site of the lump. When the swelling is noticed over the groin, abdomen, chest, spine or cranium: *Note cough impulse*, e.g. hernia, meningocele.
9. *Movements of the swelling on deglutition* when the swelling is situated in front of the neck – *thyroid swelling moves up on deglutition*.
10. *Note any pressure effects* when the swelling is on the limb – inspect the distal part for any pressure effect like oedema, footdrop, wristdrop from nerve palsy.
4. *Consistence*: Depends on the contents of the lump which can be composed of cells, fluid or gas. So, consistence varies from soft to bony hard – *soft* (lipoma, haemangioma), *cystic* (cyst, aneurysm and abscess), *firm* (fibroma, papilloma, goitre), *hard but yielding* (chondroma), *stony hard* (metastatic lymph nodes), or *bony hard* (osteoma, osteochondroma).

Consistence may be uniform throughout or variable. *Variegated consistency*, i.e. some part is soft, some part firm, some part hard – suggests malignant growth.

A *cystic swelling* feels softer at the centre than at the periphery. A *solid swelling* feels firm at the centre than at the periphery.

Palpation

Before starting palpation of the lesion, the patient should be asked, whether the lesion is painful and/or tender.

1. *Temperature*: Examined by *dorsum of the fingers*. Raised in presence of acute inflammation, cellulitis or abscess. Some vascular tumours (e.g. sarcoma) may also show raised temperature. *For examination of other features of the swelling* – examine with the palmar surfaces of the fingers.
2. *Tenderness (pain on pressure)*: Present over a traumatic or inflammatory lump and is a feature of inflammation. Tenderness is also often noted over a rapidly expanding malignant lump. A swelling along the nerve is also tender, e.g. solitary neurofibroma. A swelling caused by bony fracture is also tender.
Benign growth is painless and non-tender.
3. *Confirm the site, size and shape, surface and edge*. Edge may be well-defined or ill-defined. *In lipoma, the edge is well-defined and when pressed upon, it slips away under the examining finger (slipping sign) – this is a characteristic of lipoma*.
Measure the size of the swelling with tape in three dimensions – length, breadth and height.
5. *Indentation or moulding*: Certain cysts like sebaceous cyst or dermoid cyst contain pultaceous or putty-like material and can be moulded. Such swelling when pressed upon with the tip of the finger, in contradistinction to the sign of emptying, *it stays indented*. Such sign of indentation can also be demonstrated over the palpable sigmoid colon loaded with solid faeces, in the left iliac fossa.
6. *Compressibility*: Some soft or cystic lumps are compressible. When they are squeezed, they diminish in size considerably or disappear, but reappear slowly on release of pressure. This is known as *the sign of emptying* and is a characteristic of blood-filled lesions such as haemangioma, aneurysm, arteriovenous fistula, but may also be seen in lymphangioma and narrow-necked meningocele.
The sign of emptying in haemangioma may be accompanied by blanching, i.e. the lesion becomes colourless or pale as the blood is expressed out of the lesion. The colour returns on release of pressure.
7. *Fluctuation*: This determines the presence of fluid (or gas) in a swelling – *cystic swelling*. This clinical sign can be elicited in a non-tense cystic swelling where an impulse transmitted to the finger or fingers of one hand on one side of the swelling by

sudden pressure exerted with the finger or fingers of the other hand on the other side of the swelling and vice versa. *Fluctuation implies transmitted impulse in two planes at right angles to each other. So, fluctuation should be elicited in both directions, at right angles to each other*, as fleshy muscle in the thigh can be fluctuant across but not in longitudinal direction.

Fluctuation is positive in cystic swellings like hydrocele, cystic hygroma, meningocele, bursa, etc.

For small swellings (<2 cm) do the Paget's test. Test for fluctuation in a small lump is elicited by watching two of the examining fingertips on the lump moving apart when a third finger is used to press on the lump.

Pseudo or false fluctuation is felt in a large soft swelling but without any fluid content, e.g. lipoma.

Cross fluctuation is the fluctuation between two separate swellings but communicating with each other, e.g. *compound palmar ganglion in the wrist* above and below the flexor retinaculum; *psoas abscess pointing to the thigh* above and below the inguinal ligament; *deep plunging ranula in the floor of the mouth* extending to submental region.

8. **Transillumination:** Once the swelling is found to be cystic, *test for translucency* in order to determine the nature of the fluid in the cyst – clear or otherwise. *Cystic swelling containing clear fluid* (e.g. hydrocele, meningocele, lymphangioma, cystic hygroma, ranula, bursa, etc.) *will transilluminate with pointed light provided the covering skin is thin.*

Hydrocele due to filaria, haematocele, though cystic, will not transilluminate.

Spermatocele, lipoma poorly transilluminate.

Note

Brilliantly transilluminable swellings

- Cystic hygroma
- Congenital hydrocele

- Epididymal cyst
- Ranula
- Meningocele with thin skin cover.

Note

For any scrotal swelling transillumination test is a must. Any scrotal swelling when felt hard and transillumination is negative: consider testicular tumour and proceed accordingly.

Spermatocele, filarial hydrocele and lipoma – very poorly transilluminate.

9. **Pulsatility:** A swelling may pulsate synchronous with each pulse beat of the patient.

The pulsation may be *expansile pulsation* where the swelling expands in all directions as well as it pulsates, e.g. *aneurysm, vascular malformation, arteriovenous fistula.*

This pulsation of the swelling may be *transmitted pulsation* where the swelling does not increase in size but is merely raised with each throb of the underlying artery, e.g. *a pancreatic mass* situated in front of the abdominal aorta, a *carotid body tumour* at the bifurcation of the common carotid artery.

A carotid body tumour may have rich blood supply and may exhibit expansile as well as transmitted pulsation. Some other tumour like telangiectatic type of osteogenic sarcoma have a rich blood supply to show expansile pulsation.

In case of an aneurysm, pressure over the main artery proximal to the swelling results in diminution in the size of the swelling as well as pulsation.

Note

- Carotid body tumour – hard and may show transmitted pulsation.
- Carotid aneurysm – soft and usually shows expansile and transmitted pulsation.

10. **Reducibility:** It indicates that a swelling can be emptied by squeezing, but the swelling does not return spontaneously on release of pressure (cf. compressibility) – reappearance of the swelling requires an additional force,

e.g. straining or coughing, or the effect of gravity. *A classic example is hernia.*

11. *Impulse on coughing:* This is present in those swellings which are soft or cystic and *are likely to be in continuity with the interior of one of the body cavities*, i.e. abdomen (external hernias, iliopsoas and lumbar abscesses), chest (e.g. empyema necessitatis), spine and cranium (e.g. meningocele). *The impulse on coughing is usually both visible and palpable and when present, say cough impulse is positive.*
12. *Thrill on palpation:* This is commonly found in an arteriovenous fistula. A thrill may also be present in toxic goitre.
13. *Mobility of the lump:* To know the depth, i.e. anatomical plane, the lump is situated and its relations to the surrounding structures, i.e. to skin, subcutaneous tissue, fascia, muscle, tendon, bone, vessels and nerves. *The mobility of a lump depends on its site of origin as well as on its tethering and fixation to the surrounding tissues.* A lump may be attached, adherent or fixed to the skin, subcutaneous tissue, deep fascia, muscle, tendon, bone, vessels or nerves.
 - (a) *Fixity to the skin:* A lesion arising from the skin, e.g. papilloma, wart, mole, sebaceous cyst, keloid, epithelioma etc., moves with the movement of the skin.

Swelling deeper to the skin: Try to pinch the skin over the swelling at various places or try to move the skin over the swelling by sliding movement after fixing the swelling.

 - Lipoma – skin can be pinched suggesting the swelling is not fixed to the skin.
 - Malignant breast lump – skin cannot be pinched or slid over the swelling as the swelling is fixed to the skin. *Even if skin can be pinched over the swelling, move the skin or the swelling* – the skin can be seen puckered as seen in early carcinoma of breast when the swelling is said to be tethered to the skin. *Tethering is indirect fixity to the skin and is due to fixity of fibrous septae*

due to infiltration, e.g. infiltration of Cooper's ligament in carcinoma breast.

- (b) *Subcutaneous lump* is free from the skin and moves freely over the contracted muscle. *Contraction of the underlying muscle and fascia makes a subcutaneous lump more prominent and easily palpable.*
- (c) *Fixity to the deep fascia only* is difficult to demonstrate. *A lump beneath the deep investing fascia of the neck becomes less palpable by pressing the chin on the opposite side of the swelling against the examiner's hand.*
- (d) *Fixity to the muscle:* A lump may be attached to a muscle, or incorporated in the muscle or situated underneath the muscle.

When the muscle is relaxed, the lump may be easily palpable and freely movable across the long axis of the muscle.

When the muscle is contracted, the swelling may change its character:

 - The swelling may become prominent, as when it lies above the muscle.
 - The swelling may remain unaltered, as when it is incorporated in the muscle.
 - The swelling may diminish in size or impalpable, as when it lies under the muscle.

Mobility of the lump over the relaxed and contracted muscle – a lump which is adherent to the muscle becomes immobile when the muscle contracts.
- (e) *Fixity to the tendon:* A swelling in connection with the tendon of a muscle *becomes fixed* when the concerned muscle is contracted against resistance. A swelling in connection with a tendon *also moves with the tendon* on movement of the concerned muscle.
- (f) *Fixity to the bone:* Swelling in connection with the bone cannot be moved apart from the bone, e.g. jaw tumour, exostosis.

- (g) *Fixity to the vessels and nerves:* A lump in connection with a vessel or nerve can be moved across (i.e. at right angles to their axes) but not along the direction of their axes.

Percussion

To differentiate *gaseous* swelling from *fluid* or *solid* swellings, *the first being resonant, the latter two are dull*. Tympanic or resonant in enterocele or pharyngocele. In a small swelling percussion is not done.

Auscultation

All pulsatile swellings should be auscultated with a stethoscope for any bruit or murmur. It may be systolic, diastolic or continuous murmur. A continuous buzzing sound, known as *machinery murmur* or *bruit* is audible over an arteriovenous fistula.

Bruit is also heard over a very vascular lesion, e.g. thyrotoxic goitre.

State of the local tissues

1. *Presence of induration:* Induration implies thickening and firmness of the surrounding tissues and is due to inflammatory oedema or infiltrating neoplasia. The indurated area may be indented or depressed on pressure, or hard. It may be tender.
2. There may be ecchymoses, pigmentation, metastatic nodules, prominent vessels.
3. If the swelling is overlying a bone – *feel for bony indentation or erosion deep to the margin of the swelling*, e.g. dermoid cyst, meningocele.
4. If the swelling is on the limb –
 - (i) Look for oedema, dilatation of veins due to pressure over the vein.
 - (ii) Palpate the distal pulse for any pressure over the artery.
 - (iii) Look for wasting of muscles, paresis or paraplegia, footdrop, wristdrop due to pressure over the nerve.
5. Examine the neighbouring joints, above and below the swelling to note whether there is impairment of joint movements.

State of the regional lymph nodes

- The draining lymph nodes must always be palpated for involvement in presence of inflammatory or malignant lesion.
- The head and neck drain to the cervical nodes.
- The skin, muscles and bones of the limbs and trunk drain to the axillary and inguinal nodes.
- The intra-abdominal structures and testes drain to the pre- and para-aortic nodes.
- The penis drains into the inguinal nodes.

General examination

Look for any systemic effects produced by infection, trauma or malignancy.

Is there similar swelling elsewhere, e.g. neurofibromatosis, diaphyseal aclasia?

In case of suspected malignant growth, a search should be made for secondary deposits elsewhere, e.g. *neck, axillae and groins* for enlarged lymph nodes; *abdomen* for enlarged, hard and nodular liver, mass due to enlarged nodes, ascites; *chest* for pleural effusion or consolidation.

DIAGNOSIS OF A CYSTIC SWELLING

1. **Site:** Most of the congenital cystic swellings have a typical location as follows:
 - *Branchial cyst* – anterior triangle of the neck, partly covered by upper one-third of sternomastoid.
 - *Dermoid cyst* – along the planes of fusion, such as midline of the body, e.g. at the root of the nose; on the scalp, e.g. pterion, asterion (postauricular dermoid), on the inner or outer angles of the eye (angular dermoid).
 - *Meningocele* – in the new born along the midline of the back, commonly at lumbosacral region.
 - *Ganglion* – on the dorsum of the hand.
2. **Shape:** Majority of cystic swellings are round and oval. Exceptions are:
 - *Subhyoid bursitis* – transverse oval cystic swelling in the midline of the neck.
 - *Thyroglossal cyst* – vertical oval cystic swelling in the midline of the neck.

- *Sebaceous cyst, dermoid cyst* – globular or hemispherical swelling.
- 3. **Surface:** Most cystic swellings in the skin and subcutaneous tissue have smooth surface.
- 4. **Consistence:** Cystic or firm to hard. *Fluctuation is positive in all cystic swellings. Fluctuation is to be elicited in two directions right angle to each other.*
 - *Soft cystic swelling* – meningocele, thyroglossal cyst, cystic hygroma, aneurysm.
 - *Tense cystic swelling* – hydrocele, ganglion. A tense ganglion may feel hard.
 - *Soft cystic at the centre with firm thickened periphery* – cold abscess.
 - *Putty or tooth paste* – sebaceous cyst, dermoid – the swelling is usually indented by a finger tip.
- 5. **Signs of compressibility:** The swelling may disappear completely or partially on application of pressure, but reappears on release of pressure, e.g. aneurysm, haemangioma, lymphangioma, meningocele.
- 6. **Pulsations:** Expansile or transmitted.
 - *Expansile pulsation* – aneurysm.
 - *Transmitted pulsation* –
 - (i) When a swelling lies over a vessel, e.g. pseudopancreatic cyst in front of abdominal aorta;
 - (ii) When an artery is pushed by a structure underneath, e.g. subclavian artery over the cervical rib.
- 7. **Transillumination:**
 - *Positive* with cysts containing clear fluid, e.g. hydrocele, meningocele, cystic hygroma.
 - *Negative* with cysts containing thick or opaque fluid, e.g. hydrocele due to filaria, haematocele.

Note

Causes of pulsatile bone tumour

1. Osteoclastoma
2. Angiocarcinoma
3. Angioendothelioma of bone
4. Aneurysmal bone cyst
5. Metastases from renal cell carcinoma and thyroid carcinoma

ULCERS

An ulcer is a persistent breach in continuity of the surface epithelium – the skin or mucous membrane – due to microscopic death of tissue. This is due to gradual necrosis of the surface tissue which results in the formation of **a sore or ulcer**. The dead tissue, which becomes separated from the living tissue during the process of necrosis, is termed as **slough** which covers the floor. *The base of the ulcer* may be necrotic, granulating or malignant.

Parts of an ulcer

Parts of an ulcer are:

1. Margin
2. Edge – various types of edges of the ulcer usually help to identify the definite ulcer type
3. Floor
4. Base – on which the ulcer rests

Examination of an ulcer

For quick examination of an ulcer, the following points must be noted:

- Note the site, size, edge, margin, floor, base and surrounding tissues.
- Note for pigmentation (venous ulcer), dark, thin and shiny surface (ischaemic), adjacent oedematous area (spreading ulcer), adjacent scar (Marjolin's ulcer), adjacent bony thickening.
- Look for fixity of the ulcer to the underlying structures – check the movements of the ulcer
- Probing of the adjacent ulcer margins for depth and any associated sinus.
- Examine the arterial pulses – arterial ulcer
- Examine for varicose veins – venous ulcer
- Examine for sensation – neuropathic ulcer
- Examine for nerve thickening – Hansen's disease
- Examine the regional lymph nodes –
 - (a) Enlarged due to infection – firm in feel and may be tender
 - (b) Enlarged due to malignancy (secondary) – hard in feel and non-tender
- Movements of the adjacent joints
- Note the following predisposing causes: diabetes, atherosclerosis/hypertension, venous

insufficiency, neuropathy – both sensory and motor supply, syphilis, tuberculosis and history of trauma.

Pathological classification of ulcer

On pathological basis ulcers are classified as:

- Non-specific
- Specific
- Malignant

Non-specific ulcers

1. *Mechanical*
 - Traumatic – due to mechanical, physical or chemical injury, e.g. dental ulcer (caused by sharp tooth or ill-fitting dentures), pressure sores (caused by prolonged pressure, e.g. by splints or plasters, or prolonged bed rest).
 - Physical – burns and scalds, electric burn, X-ray burn.
 - Chemical – caused by acids or alkalis.
2. *Infective*: Due to secondary infection of wounds by non-specific pyogenic organisms like *Staphylococcus* or *Streptococcus* (pyogenic ulcer, Bairnsdale ulcer).
3. *Trophic or nutritional* (Greek *Trophe* = nutrition) – *due to an impairment of the nutrition of tissues* which depends upon adequate blood supply and nerve supply, e.g. diabetic ulcer (atherosclerosis and/or neuropathy).
 - Vascular insufficiency: *Usually causes painful ulcers.*
 - *Poor arterial supply*: Burger's disease, Raynaud's disease, arteriosclerosis.
 - *Venous stasis*: Varicose ulcer over medial gaiter area proximal to the medial malleolus; venous ulcer in post-phlebitic limb.
 - Neuropathic: *Usually causes painless ulcer.* Ulceration is due to sensory impairment or anaesthesia, e.g. tabes dorsalis, syringomyelia, leprosy, diabetes, spina bifida, peripheral nerve injury. *Neuropathic ulcers are often called perforating ulcers.*
4. *Tropical ulcer*: Develops in the legs and feet of the people living in tropical countries by

Vincent's organism (bacteroides fusiformis) in a small abrasion. Ulcers are common in poor people with malnutrition, anaemia and avitaminosis.

5. *Bazin ulcer* (associated with erythrocyanoid frigida): Tender erythema with induration of subcutaneous tissue usually over the calves followed by ulceration in neglected cases – *due to cutaneous tuberculosis*. Common in women.
6. *Leprosy ulcer*: Chronic, non-healing, *painless skin patch or ulcer due to loss of sensation. Common in tuberculoid leprosy.* Common on the hands and feet – more common at the metatarsal heads. May be associated with footdrop or claw hands. *There may be painless thickening of ulnar nerve palpable behind the medial epicondyle or common peroneal nerve palpable over the fibular neck (due to subcutaneous position).*

In lepromatous leprosy – sensation is present.
7. *Cryopathic ulcer*: Due to chilblains and frostbite.
8. *Martorell's ulcer*: Hypertensive ulcer seen in calf region – *punched out ulcer*.

Note

Decubitus ulcer/pressure sore/bedsore is an example of trophic ulcers which are painless and punched out ulcers.

Specific ulcers

Due to specific infections.

1. *Tubercular ulcer* – undermined edge; a probe can be easily insinuated between the edge and the floor of the ulcer.
2. *Syphilitic ulcer* – punched out deep edge with wash leather slough in the floor and with deep indurated base.
3. *Soft chancres* – painless genital ulcer formed during the primary stage of syphilis – at this stage syphilis is highly contagious.
4. *Leprosy* – caused by *Mycobacterium leprae* – in addition to ulcer there will be *nerve thickening*.

5. *Actinomycotic ulcer*
6. *Meleney's ulcer* – postoperative, progressive bacterial gangrene, common in immuno-compromised individuals – *rapidly spreading ulcer involving a large area.*
7. *Bairnsdale or Buruli ulcer* caused by *Mycobacterium ulcerans* – *a painless ulcer on the skin.*

Malignant ulcers

1. Rodent ulcer or basal cell carcinoma – raised and beaded edge
2. Epithelioma or carcinomatous ulcer – raised and everted edge
3. Malignant melanoma
4. Any malignant growth fungating through skin.
5. Marjolin ulcer – squamous cell carcinoma which arises on chronic benign ulcer or scar.

CLINICAL EXAMINATION OF AN ULCER

This should be conducted in a systematic manner – history, local examination, examination of regional nodes, general examination.

History

The following points to be enquired.

1. Age, sex, ethnic origin and occupation
2. Mode of onset
 - How has the ulcer developed?*
 - Following trauma – traumatic ulcer.
 - OR
 - Spontaneously:
 - Over a nodule or lump, e.g. tuberculous lymphadenitis or abscess, gumma, or rapidly growing malignant growth;
 - Over unhealthy skin, e.g. a varicose ulcer, an irritable patch of dermatitis;
 - Over a corn or callus, e.g. perforating or trophic ulcer;
 - Over a scar, e.g. Marjolin's ulcer.
 - *Has the ulcer developed after sexual contact, e.g. chancre or chancroid?*
 - *Chancre* – painless genital ulcer commonly found during primary stage of syphilis.
 - *Chancroid* – a venereal infection causing painless ulceration of the lymph nodes in the groin.

3. Duration

How long is the ulcer present there?

- Short in acute ulcer; long in chronic ulcer.
- Chronic burrowing ulcer caused by micro-aerophilic streptococci.
- Incubation period in venereal ulcer: *3 to 4 weeks* in case of Hunterian chancre (syphilis) and *3 to 4 days* in case of chancroid (soft sore).

4. Painful or painless

Is the ulcer painful?

- Inflammatory ulcers are painful.
- Tuberculous ulcers are mildly painful.
- Malignant ulcers are absolutely painless unless they, in late stage, infiltrate the adjacent structures supplied by the nerve endings.
- Syphilitic ulcers and trophic ulcers resulting from nerve diseases (tabes dorsalis, syringomyelia, transverse myelitis, peripheral neuritis) are painless.

5. Progress of the ulcer

Is it changing in size or surface?

- Healing or non-healing.

6. Nature of discharge

- Serum, pus, or blood.

7. Past history

- *Note the following predisposing causes:* diabetes, atherosclerosis, venous insufficiency, neuropathy – both sensory and/or motor supply, history of trauma, tuberculosis, syphilis and history of exposure.

Local examination

Inspection followed by palpation:

- Site
- Number, size and shape
- Different parts of the ulcer–
 - Margin
 - Edge
 - Floor
- Base
- Discharge
- Tenderness, friability or bleeding
- Movements of the ulcer – fixity of the ulcer to the underlying structures

Site

This is often typical, e.g. *rodent ulcer* on the upper part of the face; *tuberculous ulcer* on the

neck; *trophic ulcer* over the weight-bearing area, e.g. over the heel, over the sacrum or other bony point in a bed-ridden patient; *ischaemic ulcer* over the dorsum of the foot and toes; *varicose ulcer* on the medial side of the lower half of the leg.

The three common types of lower limb ulcer – *venous*, *arterial* and *neuropathic* ulcers have specific site predilection.

Number, shape and size

- **Number:** Single or multiple, i.e. similar ulcers elsewhere in the body, e.g. pressure sores.
- **Shape:** The ulcer may be round, oval, irregular, or serpiginous.
- **Size:** Measure the size in cm in two directions.

Different parts of an ulcer

(Figs 1.1 and 1.2)

Margin

Margin of the ulcer is the border or 'transitional zone' of skin around the ulcer, i.e. *it is the line demarcating the ulcer from the intact skin*. Three types of margins are encountered:

1. **Healing ulcer margin:** Shows typical bluish line of growing epithelium which is squamous without cornification.
Margin of a healing ulcer shows three zones:
 - (i) Outer – white
 - (ii) Intermediate – blue
 - (iii) Inner – red
2. **Spreading ulcer:**
 - (i) Irregular in malignant ulcer, e.g. basal cell carcinoma
 - (ii) Red, inflamed and irregular margin with inflamed surrounding tissue in infective ulcer.

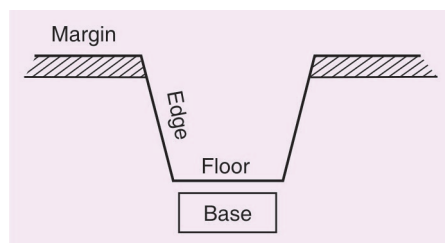


Fig. 1.1: Parts of an ulcer. Edge of the ulcer connects the floor of the ulcer to the margin.

3. **Chronic non-healing ulcer:** Shows marked fibrosis with thick white skin margin without the blue line of growing epithelium.

Edge

Edge of the ulcer is the mode of union between the floor and the margin of the ulcer, and it has thickness in three dimensions. It can be inspected as well as palpated.

Edge is often characteristic of the underlying pathology:

1. **Slopping edge:** A healing non-specific ulcer, venous ulcer.
2. **Punched out edge:** *Trophic ulcer*. The tissue destruction is equal in all planes from skin to bone, so the ulcer becomes deep *with a vertical edge* as if the tissues have been punched out.
3. **Undermined edge:** In a *tubercular ulcer*, the tissue destruction is more in the sub-cutaneous plane than in the skin, so that the skin overhangs at the edge – flask-shaped ulcer. *This can be well demonstrated by passing a probe under the margin. This is termed as undermined edge.*

Undermined edge is also noted in ulcer due to *pressure necrosis* particularly over the buttocks and in carbuncles.

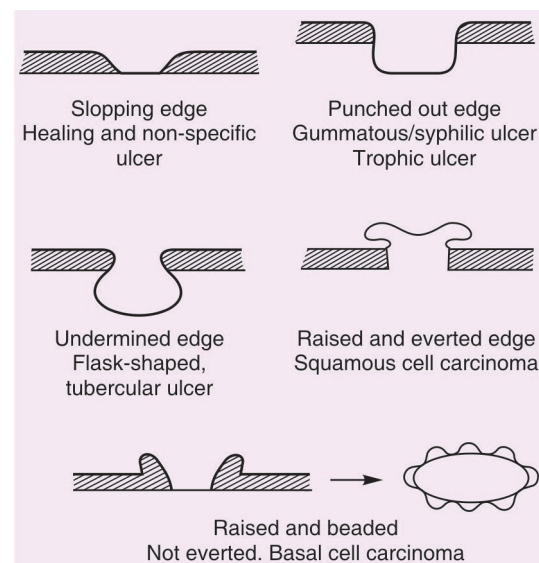


Fig. 1.2: Various types of edges of the ulcer.

Undermined burrowing ulcer may be associated with the formation of burrowing cutaneous fissures and sinus tracks that open at the distant sites (*Maloney's burrowing ulcer*) and is caused by microaerophilic non-haemolytic streptococci and aerobic haemolytic streptococci.

4. *Raised edge: Rodent ulcer.* The ulcer edge is raised and rolled but not everted. This is a slow growing malignancy. There may be nodules on the raised edge of the ulcer – *beaded appearance*.
5. *Raised and everted edge: Epithelioma.* In a malignant ulcer, the malignant tissue grows very fast and overhangs the skin margin. The ulcer itself is raised above the skin margin. The ulcer edge is raised and also overhangs the margin of the ulcer towards the surrounding skin – *raised and everted margin*.

Floor

This is exposed surface of the ulcer, i.e. *the part which can be seen within the edge of the ulcer*. This may show:

- *Pink or red and granular granulation tissue.* No slough is present. There may be small amount of serous discharge, e.g. healing ulcer.
- *Pale, flat and smooth granulation tissue* which does not bleed easily on touch, e.g. chronic or slowly non-healing ulcer.
- *Areas of unhealthy granulation tissue and areas of slough,* e.g. spreading or infective ulcer. *Slough is the necrotic soft tissue which has not yet separated from the living tissue,* e.g. infected bedsores.
- *Hypertrophic granulation tissue* where epithelialisation is not completed in time and thus shows hypertrophic granulation tissue. The exuberant granulation tissue rises above the skin surface. This is termed as *sprouting flesh* and is accompanied by excessive sero-sanguineous discharge. *Sprouting granulation tissue also delays wound healing,* e.g. a larger sized ulcer of some duration.
- *Watery or apple jelly granulation tissue,* e.g. tuberculous ulcer.

- *Wash leather slough,* e.g. a gummatous ulcer.
- Malignant tissue.
- *Relationship of the floor to the surface.*
 - (i) Floor below the surface level – non-malignant ulcer.
 - (ii) Floor above the surface level, i.e. raised from the surface – malignant ulcer.
- *Look for fixity of the ulcer to the underlying structures* – check the movements of the ulcer over the base.

Discharge

This may be small or profuse. The type of discharge may be typical, e.g.

- *Purulent discharge* – indicates active infection.
- *Bloody opalescent discharge* – typical of *Streptococcus* infection.
- *Yellowish and creamy discharge* – *Staphylococcus* infection.
- *Greenish discharge* suggests infection with *Pseudomonas pyocyanea*. *Pseudomonas* infection is commonly hospital acquired.
- *Watery discharge* – typical of tuberculosis.
- *Sulphur granules* – typical of actinomycotic ulcer.
- *Bloody discharge* – from healthy granulation tissue in a healing ulcer or a malignant ulcer.
- *Serous discharge* – from healing or malignant ulcer.

Base

This signifies the area on which the ulcer rests. *The base is to be palpated through the floor of the ulcer* for:

- Mild induration due to fibrosis may be felt in any chronic ulcer.
- Marked induration is almost diagnostic of malignant ulcer. Hunterian chancre also shows marked induration at the base.
- Mobility of the ulcer over the underlying structures – *reduced mobility implies* fixity to the underlying structures, muscle or bone. Malignant ulcer has reduced mobility. Varicose ulcer is also usually attached to the tibia. If the ulcer is small, try to pinch it up and palpate the base between two fingers.

Tenderness

Arterial ulcers, tuberculous ulcer, soft chancres – usually painful and tender.

Friability

Too much friability is often diagnostic of malignancy.

Bleeding on touch

Suggestive of malignancy. May also be noted in presence of healthy granulation tissue.

Examination of the surrounding area

This may show important features.

- (i) If the ulcer is infected and spreading due to cellulitis, surrounding skin appears shiny, red and oedematous with tenderness.
- (ii) Dark pigmentation and eczema in a varicose ulcer.
- (iii) Multiple scars and puckering of the skin, sinuses surrounding the ulcer: Suggestive of tubercular ulcer.
- (iv) Matted nodes surrounding the tubercular ulcer.
- (v) Melanotic halo in malignant melanoma.
- (vi) Satellite nodules within 5 cm proximal to malignant melanoma.
- (vii) A chronic ulcer within a large scar suggests Marjolin's ulcer.

Examination of the regional lymph nodes

The absence or presence and the consistence of the nodes may often indicate the type of the ulcer, e.g.

- Nodes are soft and tender in case of infective ulcer.
- Nodes are firm and matted and non-tender in Koch's ulcer.
- Nodes are enlarged, hard and even fixed in case of carcinomatous ulcer.
- Nodes are not enlarged in case of rodent ulcer unless secondarily infected.
- Inguinal nodes draining a syphilitic chancre of the penis are firm and 'shotty'.

When the regional nodes are palpable, then palpate the next higher groups of lymph nodes in a malignant ulcer.

General examination

1. Examination for debility and malnutrition – anaemia, diabetes, cardiac failure, etc., which delays ulcer healing. *Ulcer refuses to granulate or heal if Hb% is less than 10 gm% and serum albumin is less than 3 gm%.*
2. Examination for impairment of circulation:
 - Look for arterial pulsation: Arterial ulcer. Absence of arterial pulsation – arteriosclerosis, Burger's disease, Raynaud's disease, diabetes – since poor blood supply may result in ischaemic ulcers and delayed healing.
 - Look for varicose veins: Venous ulcer. Varicosity of veins in presence of varicose ulcer. Also test for deep vein thrombosis and calf muscle tenderness.
3. Neuropathic ulcer. Examination for neurological deficits – both sensory and motor supply, e.g. diabetes, tabes dorsalis, spina bifida, peripheral neuritis, leprosy may give rise to ulceration because of anaesthesia of the part – neuropathic ulcer. Look for nerve thickening – Hansen's disease.
4. Examine the joint movements active and passive, close to the ulcer. Restriction of joint movements and presence of deformity indicate a painful inflammation and tendon/muscle involvement. *Varicose ulcer may cause equinus deformity of foot.*
5. Examine abdomen for splenomegaly in haemolytic anaemia – leg ulcers.

Pathological examination

1. Examination of blood
 - Hb% – anaemia; RBC – sickle cell anaemia; WBC – infection.
 - ESR: Tuberculosis, malignancy, chronic infection.
 - Sugar: Diabetes.
 - W.R., Kahn and VDRL tests: Syphilis.
2. Examination of the discharge from the ulcer: Bacteriological examination of the discharge – smear test and culture and sensitivity test – are often required to determine the nature of bacterial infection.

AFB study for tuberculosis.

Spirochetes are found in the discharge or scraping of a primary chancre.

3. *Biopsy for cell cytology*

- *Wedge biopsy:* Removing a wedge from the margin of the ulcer. The central part of the ulcer is not chosen as it contains mainly necrotic material.
- *Excision biopsy:* The whole of the ulcer including the base may be excised and examined.

4. *X-ray*

- Of the underlying bone for periostitis and/or osteomyelitis.
- Chest, in tubercular or malignant ulcer spread.

5. *FNAC of lymph node* – if malignancy is suspected.

LIFE HISTORY OF AN ULCER

This consists of three stages:

1. *Stage of extension*, i.e. spreading or sloughing.
2. *Stage of transition*, i.e. preparation for healing.
3. *Stage of repair*.

Different characters of ulcers are evident in different stages.

Stage of extension

- *Floor:* Covered with exudates and sloughs. No granulation tissue.
- *Discharge:* Often purulent and even blood-stained.
- *Edge:* Sharply defined, thickened and inflamed.
- *Surrounding area:* Inflamed and oedematous.
- *Base:* Indurated and fixed.
- *Slough and small amounts of discharge* may dry to become a *scab*. A layer of dead tissue may become dehydrated and *form a dark brown or black eschar such as after a burn or ischaemic necrosis*.

Stage of transition

- *Floor:* Becomes cleaner with sloughs separating. Small, reddish areas of granulation

tissue appear which link up ultimately to cover the whole surface.

- *Discharge:* Becomes serous.
- *Base:* Induration diminishing.

Stage of repair

Follows the transition stage and may either show signs of healing or characters of a callous ulcer.

(a) *Signs of healing*

- *Floor:* Contains smooth and even red granulation tissue covered by a single layer of epithelium. The granulation tissue is transformed into fibrous tissue which gradually contracts to form a scar.
- *Edge:* Becomes more shelving with the bluish epithelium gradually extending from the margin onto the floor of the ulcer to cover it up (at a rate of 1 mm per day).
- *Discharge:* It is merely serous, if the surface is kept at rest.
- *Surrounding skin:* It is soft, flexible and free from congestion.
- *Base:* It is free from fixity.

(b) *Change to indolent or callous ulcer (chronic non-healing ulcer)*

This means that the ulcer refuses to heal by itself.

- *Floor:* Covered with unhealthy pale granulation tissue with or without serous discharge.
- *Edge:* Thickened, oedematous, indurated and often discoloured. The edge may be fixed to the base or inverted which delays healing. *It requires to be freed to allow healing.*

It does not show any tendency to heal because of callous attitude of the patient.

- *Surrounding area:* Oedematous and indurated.
- *Base:* Indurated and hard.

Note

In a malignant ulcer, the base is formed of malignant tissue. There is no formation of granulation tissue and skin ingrowth.

Clinical classification of an ulcer

1. **Spreading ulcer:** Edge of the ulcer is inflamed and oedematous. Floor is covered

with unhealthy slough without granulation tissue; purulent or offensive discharge with surrounding cellulitis around the ulcer margin. No sign of epithelialisation. Its size gradually increases due to loss of more and more epithelium.

2. **Healing ulcer:** Edge is sloping with healthy red/pink granulation tissue with thin layer of serous discharge on the floor. *On rubbing* – blood oozes out.
3. **Callous ulcer:** Floor contains pale unhealthy granulation tissue with or without serous discharge. The edge and base are also indurated and hard. The edge may be fixed to the base or inverted which delays healing. *Callous means hard and indurated.* Ulcer does not show any tendency to heal because of the callous attitude of the patient who refuses care and treatment. It continues for many months to years. *The edge fixation requires to be freed to allow healing.*

Causes of delayed healing of ulcer

1. Old age.
2. *Malnutrition:* Hypoproteinaemia, avitaminosis, anaemia.
3. Secondary infection.
4. *Diabetes mellitus* – leading to both atherosclerosis and neuropathy.
5. Neurological defects, e.g. sensory loss (leprosy) and/or motor loss.
6. Poor blood supply or arterial insufficiency, atherosclerosis.
7. Ulcer situated over bony prominences mainly due to prolonged pressure – pressure sores.
8. Excessive movements of ulcer-bearing area.
9. Callous ulcer (callous means hard or indurated).
10. Malignancy.
11. *Marjolin's ulcer:* SCC developing over a long-standing ulcer.

Note

Chronic burrowing ulcer is caused by micro-aerophilic streptococci.

Typical features of some common ulcers

Epithelioma (Syn. Carcinomatous ulcer; Squamous cell carcinoma of skin)

1. May occur anywhere but commonly found in lips, cheeks, tongue, breast, penis and anus.
2. Usually painless.
3. *Irregular shape with rolled out and everted edges are typical.*
4. *Regional lymph nodes enlarged and hard.*

Rodent ulcer (Syn. Basal cell carcinoma of skin)

1. Commonly found in the upper face above a line joining the angle of the mouth with the lobule of the ear.
2. Usually painless.
3. Usually circular in shape *with raised and beaded edges are typical.*
4. *Minute venules in the edge of the ulcer are characteristic.*
5. *Regional nodes are not enlarged.*
6. Spread by direct spread.

Tuberculous ulcer (Figs 1.3 A and B)

1. Usually results from bursting of caseous lymph nodes, so commonly seen on the neck.
2. Usually painful.
3. *The edge of the ulcer is thin and undermined and frequently bluish in colour.*
4. There is *pale granulation tissue at the floor with watery discharge.* The base is mildly indurated.
5. *Presence of matted lymph nodes adjacent to the ulcer.*

Syphilitic ulcer (Syn. Gummatous ulcer)

1. *Usually seen over the subcutaneous bone (e.g. tibia, ulna, sternum and skull).*
2. *Painless ulcer.*
3. *Most characteristic features are the punched out edge of the ulcer and the presence of wet wash leather (yellowish grey) slough in the floor.*
4. Lymph nodes are seldom involved unless secondarily infected.

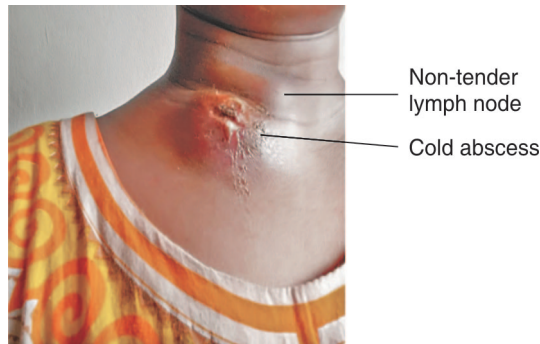


Fig. 1.3A: Tubercular lymphadenitis with two swellings—**solid** and **soft** cystic (cold abscess).

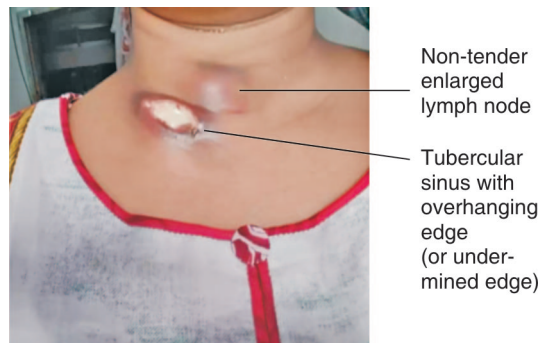


Fig. 1.3B: Tubercular sinus in the neck—right side. Same patient as in Fig. 1.3A reviewed after 3 weeks, when cold abscess turned into non-tender sinus.

Hunterian chancre (primary syphilitic sore)

1. Usually seen over the penis, lips and tongue.
2. Usually appears 3 weeks after the infection from sexual exposure.
3. The ulcer is painless.
4. It is usually oval in shape with a slopping edge and exudes a blood-stained discharge. The base of the ulcer is characteristically indurated that feels like a button.
5. *T. pallidum* can be demonstrated in the serous discharge.
6. The lymph nodes in the groin are enlarged, and 'shotty', i.e. hard and small and painless with no tendency to soften or suppurate.
7. Extragenital chancres (lips and tongue) are frequently not indurated, and the involved lymph nodes are often considerably enlarged.

Soft chancres (Ducrey ulcer)

1. Usually seen on the genitalia.
2. Usually appear within 3 days after infection following sexual exposure due to Gram -ve coccobacillus.
3. Painful ulcers.
4. Present as multiple acute painful ulcers with oedematous edge and yellowish slough, discharging copious purulent secretion, often bleeding.
5. Involved lymph nodes show the picture of acute lymphadenitis with tendency towards suppuration.

Varicose ulcer

1. Typically situated on the medial side of the lower half of the leg.
2. It is painless callous ulcer.
3. The ulcer is vertically oval in shape with slopping or stepping edge. It never penetrates the deep fascia.
4. Presence of pigmentation or eczema in the skin around the ulcer.
5. Presence of varicose veins in the upper part of the leg or thigh clinches the diagnosis.
6. Ask the patient to stand and examine both long and short saphenous veins for varicosity. Also note for scattered and irregular varicosities, blowouts.
7. Varicose ulcer may cause equinus deformity of the foot.

Marjolin's ulcer

- It is an aggressive ulcerating squamous cell carcinoma developing on an area of previously traumatised, chronically inflamed or scarred skin, e.g. following burn or chronic venous ulcer.
- Involvement of lymph nodes is not a feature of Marjolin's ulcer because it develops within the scar tissue which does not have lymphatics.

Post-thrombotic ulcer

1. It follows deep vein thrombosis following parturition or operation.
2. A painful ulcer, situated on the lower leg. The ulcer always penetrates the deep fascia.

3. *Do the test for deep vein thrombosis: Calf muscle tenderness, Homan's sign and Moses' sign.*
 - *Homan's sign:* With the leg extended, forcible dorsiflexion of the foot causes pain in the calf muscle.
 - *Moses' sign:* With the knee flexed, squeezing the calf muscles from side to side causes pain in the calf muscles.
4. CT/MRI may be helpful to detect deep vein thrombosis.

Trophic ulcer

A trophic ulcer is due to an impairment of nutrition to the tissues – either an impairment in blood supply, i.e. *ischaemia* or an absence of properly functioning nerve supply, i.e. *anaesthesia*. So there are two types:

1. Arterial ulcer – *ischaemic*
2. Neurogenic ulcer – *neurotrophic*

Arterial ulcer (ischaemic ulcer)

1. *The ulcer is caused by inadequate blood supply to the tissues or skin*, mostly due to peripheral arterial disease resulting in poor peripheral circulation leading to ischaemic necrosis. So, mostly found in presence of atherosclerosis (commonest), Burger's disease, Raynaud's disease, diabetes.
2. Commonly seen in old people.
3. Commonly occur in those parts of the limbs which are subjected to repeated pressure and trauma. Repeated trauma and superadded infection cause destruction of the poorly vascularised skin which fails to heal because of poor arterial blood supply.
4. *Usually occur on the anterior and lateral aspects of the leg, on the toes, dorsum and sole of the foot, or the heel* (these are the parts exposed to repeated pressure or trauma). *May also occur on the finger tips and dorsum of the hand.*
5. *Painful ulcer. Moreover, a history of intermittent claudication with or without discoloration of the toes is mostly present and characteristic.*
6. Ulcers may have *punched out edges* with slough in the floor. *Very often the deep fascia*

is involved exposing the tendons in the floor of the ulcer (cf. venous ulcer).

7. *Patches of dry gangrene* may also be present along with the arterial ulcer.
8. *Peripheral arterial pulses – diminished or absent. Palpate all the related arteries of both sides to rule out arterial insufficiency.*
9. *The ischaemic limb feels cold.*
10. *Elevation of the affected limb above the heart's level causes a marked pallor of the limb within 2–3 minutes and the patient will complain of pain in this position. Lowering of the limb below the horizontal leads to cyanotic congestion.*
11. Angiography may be necessary to detect the arterial disease. *Duplex color ultrasound or MRI angio are helpful and non-invasive.*

Neurogenic ulcer (neurotrophic)

1. The mechanism of formation of such an ulcer is repeated trauma or pressure *in an area which has absent sensation, i.e. anaesthesia due to impaired nerve supply.*
2. Such ulcers are found in presence of diabetic neuritis, peripheral nerve injury, spina bifida, leprosy, tabes dorsalis, syringomyelia.
Bedsore and perforating ulcers are also examples.
3. These ulcers are *commonly seen on the buttock and on the back of the heel when the patient is non-ambulatory; on the heel and ball of the foot when the patient is ambulatory.*
4. Ulcers may have *punched out edges* with slough in the floor. Very often the deep fascia is involved exposing the tendons and bones in the floor of the ulcer.
5. *Painless ulcer because of anaesthesia.*
6. The ulcer starts as a callosity under which suppuration takes place. The pus comes out from a small central hole and thus an ulcer is formed which gradually burrows silently through the deep fascia, muscles and the tendons to bones and joints. *That is why this ulcer is also called perforating ulcer.* The resultant cavity becomes filled with offensive matter. Finally, the track becomes lined with unhealthy granulation tissue or skin thus healing becomes impossible.

7. Peripheral arterial pulsations are well palpable.
8. Neurological examination will reveal diminished or absent sensation. *Test the sensation of the skin surrounding the ulcer using a sharp pin.*

Note

Commonest type of trophic ulcer – pressure/bedsore.

Diabetic ulcer

Three aetiological components are responsible for a diabetic ulcer:

1. *Impairment of peripheral circulation* leading to local ischaemia:
 - Atherosclerosis – as diabetic patients are more prone to it at an earlier age;
 - Microvascular disease.
2. *Impairment of sensation* due to peripheral neuropathy leading to trophic changes.
3. *Poor resistance of the tissues* to trauma and infection owing to the presence of sugar in the tissues.

Characteristics of ulcer are same as that of trophic ulcer.

Leprosy ulcer (Hansen's disease)

- Caused by infection with *Mycobacterium leprae*.
- Note the following.
 1. *Hypopigmented anaesthetic patches* over the limbs, back, face – due to peripheral neuropathy.
 2. Features of leonine face.
 3. *Palpate for nerve thickening:*
 - Common peroneal nerve over the lateral surface of fibular neck.
 - Tibial nerve – posteromedial to medial malleolus.
 - Ulnar nerve – posterior to medial epicondyle.
 - Greater auricular nerve – over the mastoid process behind the ear lobule.

Examine the deformity and the joint movements active and passive, close to the ulcer. Restriction of joint movements and presence of

deformity indicates a painless inflammation and tendon/muscle involvement.

Note

Leprosy can be cured with 6–12 months of multidrug therapy. *Early treatment avoids disability.*

Ulcer due to chilblains

- Due to exposure to intense cold causing first blisters which then rupture to form superficial ulcer in the foot.
- This is also called perniosis.
- Due to excessive cutaneous arteriolar constriction.

Ulcer due to frostbite

- Due to exposure of a part to a wet cold below the freezing point – cold wind.
- There is arteriolar spasm, denaturation of proteins and cell destruction.
- This leads to local gangrene of the part leading to deep ulcers.

Both these conditions are painful and common in soldiers stationed at high altitudes (areas located in or near glaciers).

Meleney's ulcer (postoperative synergistic gangrene) (Fig. 1.4)

- It is commonly seen in postoperative wounds on the abdomen after surgery for septic peritonitis and on the chest wall following empyema drainage.
- It is due to symbiotic or synergistic haemolytic streptococci and *Staphylococcus aureus* and anaerobes leading to severe infection and often with end arteritis of the skin leading to spreading ulcer and destruction.
- It is an acute rapidly spreading ulcer with destruction of skin and subcutaneous tissue and burrowing deeper with a resultant undermined edge. The ulcer is painful and tender with a tendency to spread. There will be a central purplish zone surrounded by red inflammation initially. The purplish zone becomes gangrenous producing ulcer.
- Management:
 - Urgent blood sugar examination – if diabetes, it has to be controlled.



Fig. 1.4: An infected ulcer in a patient with necrotising fasciitis—Meleney's ulcer.

- Antibiotics and metrogyl infusion.
- Adequate excision of dead or necrotic tissues until it bleeds.
- Blood transfusion.
- Once healthy tissue is formed – skin grafting is considered.

Tropical ulcer

- Commonly observed in Africa, India, South America and Australia.
- It is an acute ulcerative lesion of the skin, commonly of the leg, due to infection with Vincent's organism (*Bacteroides fusiformis*) and *Borrelia vincenti*, secondary to trauma or insect bites.
- Commonly occurs in people with lower socio-economic status suffering from anaemia, vitamin deficiency and malnutrition.
- Initially abrasion, redness, papule and pustule formed with severe pain.
- This is accompanied by acute, tender lymphadenitis.
- Eventually, pustule bursts with serosanguinous discharge with vile odour and unremitting local pain. But constitutional symptoms are minimal.
- Because of extreme tenacity of slough, the healing is delayed and ultimately a circular parchment-like, faintly pigmented scar develops.

Note

Ulcers due to extreme cold (chilblains and frostbite)

- Develop due to extreme cold – dry or wet, below the freezing point causes arteriolar spasms leading to superficial painful ulcers of the skin specially hands and feet and eventually gangrene of these areas. *These ulcers or gangrene are very painful and tender.*
- Common in soldiers stationed at high altitude – particularly in or near the glaciers.

Note

Painful ulcers

1. Arterial ulcer
2. Post-thrombotic ulcer
3. Chilblains and frostbite

Painless ulcers

1. Neuropathic ulcer
2. Venous ulcer
3. Leprosy ulcer

PRESSURE SORES (Bedsore, decubitus ulcer) (Figs 1.5 to 1.7)

- Pressure sores are *trophic ulcers* with bone at the base. These ulcers form when the soft tissues are compressed for a *prolonged period* between a bony prominence with overlying thin subcutaneous tissue and a supporting structure such as bed or wheelchair due to immobility.



Fig. 1.5: Pressure sores over sacrum and adjacent buttocks: Skin breakdown *limited to dermis*—stage II.

- *Sites of bed sore* are occiput, heel, sacrum, ischial tuberosity and scapula.
- *Formed due to loss of sensation and diminished blood supply* following chronic persistent pressure with or without shear particularly in a debilitated patient due to poor and neglected nursing care.
- *It is a type of traumatic gangrene due to persistent pressure leading to ischaemia of the skin and subcutaneous tissue as a result of prolonged and persistent pressure against bony prominences* – in debilitated, neglected, bed-ridden or comatose patients who are unable to move on their own.

Causes of pressure sores

Following predisposing factors are responsible (mnemonics PAIM).

- P** Pressure
A Anaemia
 Anaesthesia
I Injury
 Immobility
 Insufficiency of local blood supply
 Insensitivity of the wound
 Infection
M Moisture

Common sites

Typically develops over the areas *subjected to constant pressure due to immobility* like sacral area, ischial tuberosity, heel, occiput, scapula,



Fig. 1.6A: Bedsore with black eschar over the sacrum—stage III.



Fig. 1.6B: Same patient as in Fig. 1.6A. Bedsore over the sacrum after excision of the black eschar.



Fig. 1.7: Pressure sore stage III over the greater trochanter—left side.

elbow in a *prolonged bed-ridden patient* where the underlying bone is covered by skin and thin subcutaneous tissue only.

Predisposing factors

1. Abrasive local injury.
2. *Prolonged and persistent pressure due to immobility:* Due to poor nursing care, patient

remains immobilised in the same position for a prolonged period leading to poor blood supply to the tissues while under pressure and results in compromised oxygenation, ischaemia, and eventual tissue necrosis leading to sores.

3. Soakage of bed sheets with loose stool, urinary leak, hot moisture causing persistent wetting of the skin.
4. Persistent folding or crease or wrinkles of bed sheets are *also responsible for local pressure in an immobile and insensitive patient causing poor blood supply to the local tissues under pressure.*
5. Other factors which accentuate the process are anaemia, malnutrition, atherosclerosis and neuropathy – *atherosclerosis leads to poor blood supply; neuropathy leads to insensitivity and motor weakness leading to lack of protective reflexes.*

Clinical stages of the disease

The disease may be divided into four stages with following findings:

- **Stage I:** Early non-blanchable erythema which does not change colour on pressure (*a warning sign*), induration *without a breach in the epidermis.*
- **Stage II:** Blistering, *skin breakdown limited to dermis.* Initially a callosity may develop with or without tenderness due to constant pressure.
- **Stage III:** *Full thickness skin loss leading to ulcer/crater formation into subcutaneous tissues with overlying slough or eschar – typical bedsore.* The slough is dead tissue and appears as greyish or greyish-black in colour.
- **Stage IV:** Necrosis extending beyond the fascia, into ligaments and bones leading to osteomyelitis.

Note

Predisposing factors responsible for bedsores/pressure sores

- P Pressure:** Prolonged and persistent pressure in a bed-ridden and paraplegic patient
- A Anaemia:** Leading to poor blood supply and poor nutrition to local tissues

Anaesthesia: Leading to insensitivity of the wound due to sensory neuropathy

I Injury: Due to sustained or prolonged pressure

Immobility: Continuing prolonged pressure

Insufficiency of local blood supply

Insensitivity of the wound: Poor sensation of the wound

Infection

M Moisture: Leading to wet wound and maceration.

Avoidance and treatment of pressure sores

1. Skilled nursing care both by the nursing attendants and relatives from the beginning.
2. *Change of posture by turning the patient every 2 hours* to avoid constant pressure on one site particularly over bony points – **most important.**
3. Soft, dry and clean bed sheets to be laid in a manner that *there will be no wrinkle or folding of sheets underneath skin of the patient to avoid local erythema and induration of the skin* which is the starting point of the sore. *Avoid moisture.*
4. Specialised bed like air or water cushioned bed may be used which periodically redistributes the pressure points.
5. The skin should be kept clean and dry.
6. Finger tips pressure massage over the indurated area surrounding the ulcer is helpful.
7. Use of adhesive films over the pressure sore or wound may be helpful *to prevent soakage and maceration.*
8. Assist and encourage the patient to remain in sitting positions on the edge of the bed as many hours as possible during waking hours.
9. *Encourage for both active and passive movements and exercise of the limbs*, both in sitting and lying down positions to improve circulation and to control oedema.
10. Use of excess soft cotton or foam rubber padding over the pressure points.
11. Care of the perineum and genitalia to avoid soakage from stool, urine and sweat.
12. When the patient is able to move out of the bed even with the help of nursing staff – hot

- sitz water bath with Betadine solution is helpful.
13. *Dressing of the wound*
 - (a) Hot sitz bath with Betadine solution when the patient is mobile; otherwise hot fomentation of the wound before each dressing.
 - (b) Cleaning of the wound with EUSOL (Edinburgh University Solution) and/or H_2O_2 to remove the slough followed by dressing of the wound with metrogyl ointment (acts on anaerobic organisms also) and sofratulle.
 - (c) *If slough is excessive, desloughing and debridement are carried out.* Manual removal of slough by scissors dissection may be tried *as the slough is insensitive.*
 - (d) Once slough is removed, dressing with EUSOL followed by local application of H_2O_2 (on surface application provides nascent oxygen) is tried to enhance granulation tissue formation.
 - (e) Local application of metrogyl ointment is also helpful against anaerobic organism.
 14. *Antibiotics:* Oral/parenteral after culture sensitivity test of pus or wound discharge should be given. Oral metrogyl tab also to be supplemented against anaerobic organism.
 15. *If patient is diabetic,* insulin therapy for control of diabetes following blood sugar monitoring. Use short-acting or intermediate-acting insulin with modified regimen. Stop metformin and long-acting sulphonylureas and replace with insulin injections.
 16. *Continuous bladder drainage may be required* to avoid spillage of urine over the bed and hence soakage of the wound. C&S of the urine may be required for antibiotic choice.
 17. *Enema at regular intervals* to clean the bowel to avoid spillage of stool under the buttock.
 18. *Local infrared therapy* improves local blood supply and enhances wound healing.
 19. Optimise nutrition to maintain serum albumin above 2.0 g/dl.
 20. *Correction of anaemia, strict control of diabetes.* Oral vasodilators to improve local blood supply may be required.
 21. *Suitable reconstruction procedures after excision of the ulcer by musculocutaneous flap closure with local advancement flap* when the wound is clean and dry with healthy granulation tissue can be tried.

Note

Flap closure for pressure sores

When patient is reasonably fit, debridement of wound (removal of necrotic and scarred tissue, bursa and osteotomy) followed by flap cover are preferred.

Surgical reconstruction of pressure sores

Done preferably by myocutaneous flaps.

Sacral sore

- 1st choice: Gluteus maximus myocutaneous flap
- 2nd choice: Lumbosacral flap
- 3rd choice: Bilateral gluteus maximus flap

Trochanteric sore

- 1st choice: Tensor fascia lata flap
- 2nd choice: Tensor fascia lata and vastus lateralis flap
- 3rd choice: Random thigh flap

Ischial sore

- 1st choice: Gluteus maximus myocutaneous flap
- 2nd choice: Posterior thigh myocutaneous hamstring (V-Y) advancement flap

Combined ischial and trochanteric sore

- Tensor fascia lata and vastus lateralis flap

Note

Following dressing materials enhance wound healing:

1. **EUSOL** (Edinburgh University Solution): An aqueous solution of lime – a cleaning agent. Composition 12.5 gm of *bleaching powder* [$Ca(ClO)_2$] and 12.5 gm of *boric acid* in distilled water to make 1 litre of

solution. It helps to destroy the dead tissue or slough and thus inhibits bacterial and fungal growth.

2. **H₂O₂:** Another cleaning agent. In addition to destroy the slough, it also kills anaerobic organisms. It prevents capillary oozing and helps in haemostasis. It also provides nascent oxygen on exposure to the dirty or unhealthy wound to help in separation of the slough and enhance earlier coverage of the wound with healthy granulation tissue and thus early healing.
3. **Normal saline:** Cleaning agent.
4. **Metrogyl:** Local tissue application of ointment helps to destroy local anaerobic organisms.

Note

Agents used to promote growth of granulation tissue and epithelialisation

- **PDGF:** Platelet derived growth factor. Delivered to wounds by platelets derived from the injured capillary vessels and also produced by local fibroblasts.
- **EGF:** Epithelial growth factor. Stimulates proliferation of different types of cells especially fibroblasts and epithelial cells. EGF is found in skin fibroblasts.

Note

VAC therapy: Vacuum-assisted closure (negative pressure wound therapy) is being used in some centres for treatment of chronic or delayed wound healing, such as pressure sores, with good results.

DIABETIC FOOT ULCER

Diabetic patients are more prone to develop ulcers of the foot due to following reasons: *ischaemia, neuropathy and infection.*

1. **Ischaemia**
 - (a) *Microangiopathy* – producing small vessels disease in the form of non-specific thickening of the basement membrane leading to slowing of circulation and tissue hypoxia.
 - (b) *Macroangiopathy* – involving major vessels resulting in atherosclerosis. Both

these conditions (micro- and macroangiopathy) result in ischaemia of the toes and foot.

- Increased glycosylated haemoglobin decreases oxygen dissociation in the local tissue.
- Increased glycosylated tissue protein also decreases the utilization of oxygen.

2. **Neuropathy:** *Dampens pain of inflammation.* Neuropathy can be distal and diffuse with a stocking-and-glove type of distribution. Loss of vibration sense and deep tendon reflexes occur early. This is followed by loss of touch, pain and temperature sensations. As a result of this, *trophic ulcers* develop which can progress and penetrate deeper layers because of insensitivity.

Autonomic neuropathy reduces sweating causing increased dryness of the skin and thereby predisposes to infection.

3. **Resistance to infection:** Because of altered immune system, uncontrolled diabetic patients are more susceptible to infection because of diminished phagocytic activity of the leukocytes. Granulocyte mobilisation is also impaired in ketoacidosis leading to reduced chemotaxis. *Thus, the patients are susceptible to polymicrobial and fungal infections.* Infection can spread proximally to the subfascial planes.

Thus, micro- and macroangiopathy and/or neuropathy in combination with secondary infection favours the development of diabetic foot ulcers.

Ulcers may develop following a minor trauma such as thorn prick over the sole of the foot or callosity, trimming of the nail or due to shoe bite.

Presentation of diabetic foot ulcer

- *Trophic ulcers* in a diabetic patient without overt infection.
- Trophic ulcers, infection and deformities.
- Diabetic ulcers are usually found on the plantar surface of the foot over the heads or neck of the first and second metatarsals.
- Oedema is usually mild with no change in surrounding pigmentation.

Management of diabetic foot ulcer

1. Nursing care more or less the same as described under bedsore treatment.
2. Avoidance of pressure over the ulcer: Change of posture every 2 hours.
3. Early mobility with the help of attendant's support, with walker or stick.
4. *Control of oedema* by active and passive exercises of the foot and leg while on bed and active movements while mobile.
5. Lying on the bed with foot end of the bed raised by 6 inches helps to reduce oedema till the wound heals.
6. Oral diuretics also help to reduce oedema.
7. *Insulin therapy for control of diabetes.* Ensure good glycaemic control – FBS & PPBS, Hb1Ac.
8. *Antibiotics as per antibiogram* after C&S of wound discharge. In addition, metrogyl may be helpful – both orally and locally.
9. Antifungal drugs and/or ointments, if required.
10. Oral vasodilators and neurotrophic drugs may be helpful.
11. *Regular wound dressing with EUSOL and/or H₂O₂ after warm sitz bath* followed by local betadine or metrogyl ointment application.
12. *Necrotic tissue should be judiciously debrided* and topical antimicrobials needed to control local infection. *May require repeated debridement.*
13. Removal of callus skin under aseptic control.
14. Often, resection of the underlying slough and bony prominences may improve wound healing.
15. *Improvement of circulation* – after angiogram to assess feasibility of vascular reconstruction, if required.
16. 'Custom made' microcellular rubber (MCR) shoes with moulded insoles for trophic foot ulcer without overt infection and foot deformities.
17. Often, in neglected case or delayed healing, patient may require below knee amputation – if X-ray shows periostitis or osteomyelitis of the underlying bone. MRI may be helpful

to detect the level of bone involvement and the proximal neurovascular status. *Patient will be able to move around with crutches to earn his livelihood.* If patient can afford, after amputation patient can use custom-made below knee prosthesis after below knee amputation.

Note

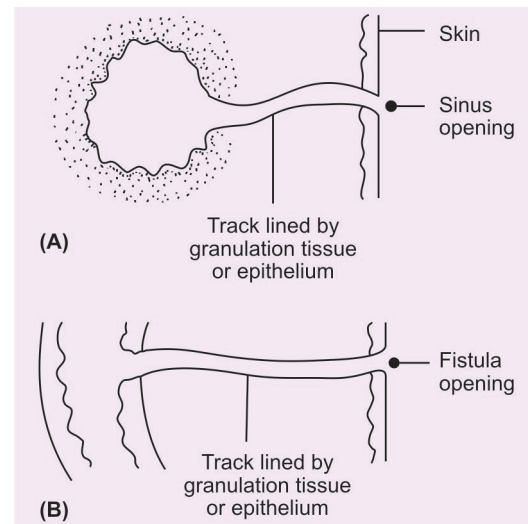
Recent advancement for wound therapy:

- Electrical stimulation (pulsed electromagnetic field therapy)
- Ultrasound therapy (low frequency ultrasound in the kHz region)
- Use of growth factors – PDGF, FGF, VEGF
- Stem cell therapy

SINUSES AND FISTULAE

SINUS

A sinus (Fig. 1.8A) is an abnormal *blind tract* leading from an epithelial surface into the surrounding tissue, *so it has one opening*. The sinus is lined by either unhealthy granulation tissue or epithelium.



Figs 1.8 A and B: (A) Sinus; (B) Fistula.

Examples of sinus

- Congenital sinus – preauricular sinus (Fig. 1.9).
- Acquired sinus – pilonidal sinus.



Fig. 1.9: Preauricular sinus at the base of the tragus.

- Osteomyelitic sinus discharging pus with or without bony spicules.

FISTULA

A fistula (Fig. 1.8B) is an abnormal tract between two epithelial surfaces. *So, it has two openings.*

The communication may be between a hollow viscus and the skin, termed as *external fistula*; or between two hollow viscera, termed as *internal fistula*.

The tract is lined by either granulation tissue or epithelium.

- *Examples of external fistula* are anal fistula, umbilical fistula, parotid fistula, branchial fistula and thyroglossal fistula.
- *Examples of internal fistula* are vesicovaginal fistula, gastrocolic fistula, cholecystoduodenal fistula, tracheo-oesophageal fistula and recto/colovesical fistula.
- *The communications may be between two vessels* – arteriovenous fistula.

Classification

Sinuses and fistulae may be congenital or acquired.

- *Congenital forms:* Preauricular sinus, branchial fistula, tracheo-oesophageal fistula, umbilical sinus, urachal sinus.
- *Acquired forms:* Often follow inadequate drainage of an abscess. Examples are perianal abscess bursting on the surface leading to external fistula, or opens both into the anal canal and onto the surface resulting in fistula-

in-ano. Other examples are pilonidal sinus, osteomyelitic sinus, hidradenitis suppurativa, tubercular sinus.

- Gastrojejunostomy and choledochoduodenostomy are caused by operation (iatrogenic forms).
- Acquired arteriovenous fistulas are caused by trauma or by operation (iatrogenic arteriovenous fistula for haemodialysis).

Causes of persistence of a sinus or fistula

1. Presence of a foreign body or necrotic tissue (e.g. a suture, sequestrum, a faecolith or even a worm in the depth of the wound).
2. Inadequate or non-dependent drainage.
3. Prolonged discharge of irritating materials such as urine, faeces or bile causing persisting inflammation.
4. When the tract wall becomes epithelialised.
5. Presence of dense fibrosis around the tract prevents contraction and healing.
6. Unrelieved obstruction of the lumen of the viscus or tube distal to the fistula.
7. Presence of malignant disease.
8. High output discharge (>750 ml in 24 hours).
9. Radiation induced, e.g. enteritis.
10. Distal obstruction of intestine.
11. Local infection and inflammation and sepsis.
12. Associated with specific type of chronic inflammation, e.g. tuberculosis, actinomycosis, Crohn's disease, leprosy, or carcinoma.

EXAMINATION OF A SINUS OR FISTULA

History

Duration:

- Congenital
- Acquired

Past history of:

- Tuberculosis: Tuberculous lymphadenitis followed by caseation of a lymph node, or abscess formation which had burst and discharge cheesy material.
- History of increasing swelling of the limb near a joint and then formation of an abscess which on bursting (or after operation) leaves a discharging sinus (suggestive of osteomyelitis).

- Previous anal abscess or ischiorectal abscess after inadequate drainage may lead to perianal fistula.

Local examination

1. **Number:** *Fistula-in-ano* may have more than one external opening particularly in presence of Crohn's disease affecting rectum and anal canal.

Goodsall's rule for fistula-in-ano: Anal fistula with an external opening in the anterior half of anus (an imaginary transverse line dividing the anus into anterior half and posterior half) has a direct radial course to open inside the anal canal, whereas external opening in relation to posterior half of anus has a curved course to open in the midline posteriorly (Fig. 1.10).

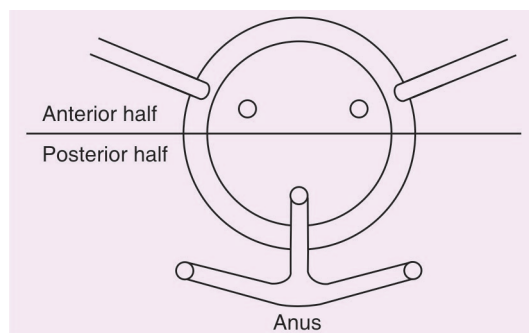


Fig. 1.10: Goodsall's rule for fistula-in-ano.

'*Watering can*' perineum with multiple openings can be seen in presence of urethral stricture especially after gonococcal infection.

Sinuses due to actinomycosis or madura mycosis are always multiple.

2. **Positions:** Specific positions are often diagnostic of specific conditions, e.g. branchial fistula, preauricular sinus, pilonidal sinus, tuberculous sinus in the neck, etc.
3. **Visible opening of a sinus or fistula:** Sprouting granulation tissue at the opening of a sinus suggests a foreign body in the depth, e.g. a sequestrum, drainage tube or bullet. The opening of a tuberculous sinus is

often wide resembling an ulcer with a thin, blue and undermined edge.

4. **Character of discharge:** It may be mucus, pus, blood, sulphur granules (actinomycosis), urine, faeces, bile, etc.
5. **Surrounding skin:** Presence of a scar may indicate chronic osteomyelitis or a previously healed tuberculous lesion. There may be presence of dermatitis, pigmentation.
6. **Palpation of a sinus or fistula for following.**
 - Tenderness
 - Thickening of the wall of a sinus – thickened in a chronic sinus.
 - Mobility of the sinus or fistula over the deeper structures – osteomyelitis sinuses are often fixed to the underlying bone.
 - Nature of discharge on pressure.
7. **Examination of the draining lymph nodes** – matted lymph nodes may be found in case of tuberculous sinus.
8. **Examination with a probe:** Probing should be done cautiously without using any force. The following points are noted:
 - The direction and depth of the sinus.
 - The presence of any foreign body or a movable sequestrum in the depth of the wound.
 - Whether the probe enters a hollow viscus or a bony cavity.
 - Whether any fresh discharge comes out on withdrawal of the probe.

Note

Overzealous probing can create a false passage.

General examination

1. Examination for debility and malnutrition, anaemia, diabetes – all may cause delayed healing.
2. Examination of particular system depending on the site and cause of sinus should be performed, e.g.
 - Chest in presence of chronic empyema.
 - Rectum and anal canal in presence of perianal fistula.
 - Urethra and lower urinary tract in presence of 'watering can' perineum.
 - Bone in presence of osteomyelitis.

Special investigations

1. Examination of the discharge: *Physically* (e.g. pus, or cheesy material in tuberculosis), *chemically* (e.g. presence of urea suggests the diagnosis of a fistula of renal origin), *microscopically* (e.g. sulphur granules in actinomycosis), and *bacteriologically* (e.g. Gram stain, culture and sensitivity).
2. *X-ray examination*
 - Straight X-ray to show a foreign body or a sequestrum and bony changes in osteomyelitis.
 - *Sinogram or fistulogram*: Injection of a radio-opaque dye (lipiodol or hypaque) into a sinus or fistula will determine the course and disposition of the sinus, its relation with the hollow cavities or viscus.
3. Often methylene blue dye is injected into the fistula or sinus to stain the tract – it helps in tracing the direction or disposition of the tract and its ramifications during operation and enables total excision.
4. Biopsy from the edge of the sinus/fistula may reveal tubercular or malignant aetiology.
5. Blood sugar to rule out diabetes.
6. MRI fistulogram is the most preferred investigation to delineate complex anal fistulae to ensure total elimination of the disease.

Management of a sinus or fistula

- Correction of malnutrition, anaemia and diabetes.
- *Control of infection with antibiotics*: Specific antibiotics may require Gram stain and culture sensitivity, Leishman stain.

- Anti-Koch's therapy for tuberculosis.
- Adequate drainage and/or excision – may require radiological investigations. Methylene blue dye injection prior to operation helps in tracing the tracks.
- Sequestrectomy followed by saucerisation of the bone cavity for chronic discharging osteomyelitis.
- Removal of any foreign body.
- Adequate rest.

Note

Beware during anal fistula operation – minimal or no division of the internal sphincter muscle to prevent anal incontinence.

Note

Pilonidal sinus (*pilo* – hair; *nidus* – nest) is a small tunnel in the skin. It occurs in the cleft at the top of the buttocks. A pilonidal sinus usually contains hair, dirt and debris.

It may develop in the web space – common in barbers (the hair is from customers).

Note

Causes of pulsatile bone tumour

- Osteoclastoma.
- Angiosarcoma – angioendothelioma of bone.
- Aneurysmal bone cyst.
- Metastases from renal cell carcinoma/thyroid carcinoma.

Note

Be kind and grateful to our brave soldiers who are protecting our country and lives from the enemy at the border at high altitudes, particularly in or near the glaciers. Be proud of them also.