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Edited by
Nilay Mandal

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CHAPTER

2

Ulcer, Sinus, and Fistula (Including Pilonidal Sinus)

CHAPTER OUTLINE

ULCER

An *ulcer* is a break in the continuity of the covering epithelium—skin or mucous membrane. It may either follow molecular death of the surface epithelium or its traumatic removal.

CLASSIFICATIONS OF ULCERS

Two types of classification of ulcers are possible:

1. **CLINICALLY:** An ulcer may be either of the following three types.
   a. *Spreading:* When the surrounding skin of the ulcer is inflamed and the floor is covered with slough without any evidence of granulation tissue.
   b. *Healing:* When there is granulation tissue in the floor of the ulcer, the surrounding skin is not inflamed and the edge shows bluish outline of growing epithelium, moreover, there is slight serous discharge **(Fig. 2.1)**.
   c. *Callous:* When there is pale granulation tissue in the floor, there is considerable induration at the base, edge and surrounding skin. This ulcer shows no tendency towards healing.

Fig. 2.1: Foot ulcer in healing stage (note the sloping edge of ulcer).

2. **PATHOLOGICALLY:** The ulcers are classified into three main headings.
   A. *Nonspecific ulcers:* There are various causes of such ulcers. According to the cause these ulcers are classified as below:

- *Traumatic ulcer*—can be either:
  - Mechanical, e.g., dental ulcer of the tongue from jagged tooth, from pressure of a splint, etc. or
  - Physical—from electrical or X-ray burn or
  - Chemical—from application of caustics.
- *Arterial ulcer*—as occurs in atherosclerosis, Buerger's disease and Raynaud's disease (primary and secondary).
- *Venous ulcer*—venous ulcer in post-phlebitic limb.
- *Neurogenic ulcer.*
- *Infective ulcer:* Pyogenic ulcer and Bairnsdale ulcer are included in this group.
- *Tropical ulcer:* These ulcers occur in the legs and feet of the people in the tropical countries. Infection by Vincent's organisms in a small abrasion may cause such ulcer. Ulcers associated with malnutrition, anemia, avitaminosis and rheumatoid arthritis are also included in this group.
- *Cryopathic ulcer:* Ulcers due to chilblains and cold injury are included in this group.
- *Martorell's ulcer* (hypertensive ulcer).
- *Bazin's ulcer* (erythrocyanoid ulcer).
- *Diabetic ulcer.*
- *Miscellaneous ulcers.* Ulcers may be associated with (i) polycythemia, (ii) leukemia, (iii) systemic sclerosis, (iv) ulcerative colitis, (v) poliomyelitis, (vi) arteriovenous fistula, (vii) Acholuric jaundice, (viii) various collagen disorders and (ix) chronic lymphedema. Cortisone ulcers are also included in this group.

B. *Specific ulcers* are seen in tuberculosis **(Fig. 2.2)**, syphilis, soft sore and actinomycosis. Meleney's ulcer is included in this group.

C. *Malignant ulcers,* e.g., epithelioma **(Fig. 2.3)**, rodent ulcer **(Fig. 2.4)** and malignant melanoma.

Differential Diagnosis

Traumatic ulcer: According to the cause of the trauma, the ulcer is situated anywhere in the body. But these ulcers occur more commonly where the skin is closely applied to bony prominences, e.g., shin, malleoli **(Fig. 2.5)** and back of the heel. Plaster sores and dental ulcer of the tongue are included in this group.

These are small, painful and circular ulcers. Occasionally, particularly in older people, a single ulcer confined to the lower leg is due to chronic

Fig. 2.2: Tubercular ulcer in neck.

Fig. 2.3: Squamous cell carcinoma (note the everted edge).

Fig. 2.4: Basal cell carcinoma (note the rolled edge).

Fig. 2.5: Traumatic foot ulcer.

staphylococcal infection. 'Footballer's ulcer' on the shin is due to staphylococcal infection in an area of repetitive trauma. These ulcers heal quickly and do not become chronic unless supervened by infection or ischemia, which may turn this ulcer to chronicity. The typical example of such chronic ulcer is the 'footballer's ulcer'.

Arterial ulcer: These ulcers are caused by inadequate skin circulation. These occur in those parts of the limbs which are subjected to repeated pressure and trauma. Prolonged pressure on one part of the foot causes ischemic damage to the tissues and if the circulation is inadequate then the tissues cannot repair by themselves and ischemic ulcer develops.

These ulcers are mostly due to peripheral arterial disease and poor peripheral circulation. Atherosclerosis of the peripheral arteries is the most common cause of this condition. This condition is more often seen in old people. It is due to episodes of trauma and infection that destroy the skin which fails to heal because of poor arterial supply. These ulcers tend to occur on the anterior and lateral aspects of the leg, on the toes, dorsum of the foot or the heel (the parts exposed to trauma).

Buerger's disease (thromboangiitis obliterans), a disease of men between 20 and 40 years of age, may also present with such ulcer. Patches of dry gangrene are present along with the arterial ulcer.

Pain is the main complaint. These ulcers tend to be punched out and destroy the whole skin and the deep fascia (unlike the venous ulcer) and may expose the tendons in the floor of the ulcer. When these ulcers occur on the inner side of the ankle, the diagnosis may be confused with the venous ulcers, but a history of intermittent claudication with discoloration of one or more toes becomes the differentiating feature. Moreover if the leg is kept elevated above the heart's level, the ulcer shows no sign of healing and the patient will complain of pain in this position.

Arteriography is important to detect the arterial disease.

Venous ulcer (Fig. 2.6): This is the most common ulcer of the leg. The basic cause of venous ulcer is abnormal venous hypertension in the lower-third of the leg, ankle and dorsum of the foot. Various terms have been used, e.g., varicose ulcer, post-thrombotic ulcer, gravitational ulcer, etc.

Neurogenic ulcer: The mechanism of formation of such ulcer is repeated injury or pressure in an area which has lost appreciation of pain. The neurological conditions which predispose to formation of such ulcer include diabetes, alcoholic peripheral neuritis, tabes dorsalis, spina bifida, leprosy, peripheral nerve injury, paraplegia and syringomyelia.

These ulcers are commonly seen on the heel and ball of the foot when the patient is ambulatory; on the buttock and on the back of the heel when the patient is nonambulatory. This ulcer starts with callosity under which suppuration takes place. The pus comes out and the central hole forms the ulcer which gradually burrows through the muscles and the tendons to the bone. That is why this ulcer is also called *perforating ulcer.* These ulcers are painless **(Fig. 2.7)**.

Trophic ulcers are included in this group which are caused by various factors such as impairment of

Fig. 2.6: Typical location of venous ulcer.

Fig. 2.7: Neuropathic ulcer.

Fig. 2.8: Decubitus ulcer at the sacral prominence.

nutrition of the tissues, inadequate blood supply and neurological deficit. Bed sore is included in the group of trophic ulcers **(Fig. 2.8)**.

These ulcers have punched out edge with slough in the floor thus resembling a gummatous ulcer. These ulcers develop as the result of repeated trauma to insensitive part of the body.

Infective ulcer: Syphilitic ulcers are classified under the heading of specific group of ulcers and are not included here.

Tropical ulcer: The most characteristic feature of this ulcer is its callousness towards healing. Its edge is slightly raised and exudes copious serosanguineous discharge. This ulcer practically retains the same size for months and years. In some cases, it destroys the surrounding tissue and thus spreads widely. Every effort should be made to detect the cause behind the ulcer and to treat accordingly. Otherwise it may retain its existence or even spread rapidly.

The ulcer, which develops due to infection by Vincent's organisms in a small abrasion or breach of continuity of the skin due to trauma or insect bite, commences as a papule with a zone of surrounding inflammation and induration. Pain is an important symptom and this is often accompanied with acute lymphadenitis. Gradually pustules develop and burst in two or three days forming ulcers whose edges are undermined and raised. Copious serosanguineous discharge with considerable pain is the most important feature. The ulcer becomes indolent and refuses to heal for months or even years. In others, it heals after a long period leaving a parchment-like pigmented scar.

Cryopathic ulcers: Cryopathy means a condition resulting from intense cold and chilly weather.

- **CHILBLAINS:** When the lower extremity is exposed to intense cold, blisters and ulceration may occur particularly in the feet. This is also called perniosis. The lesion starts as red tender spot, which becomes a pruritic swelling later on. Blisters form in such swelling. These blisters burst to form ulcers. These ulcers are superficial. Such lesion results from excessive vasoconstriction of the skin arterioles of the affected area.
- **COLD INJURY:** This is also known as *frostbite*. When any part of the body is exposed to wet cold below freezing point, ischemic changes occur in the skin and subcutaneous tissues. Such ischemic changes are due to arteriolar spasm followed by stasis of blood in the capillaries. This along with exposure of the tissue below freezing point will lead to freezing of tissues and denaturation of intracellular protein with destruction of enzyme systems. All of these will cause gangrene of the full thickness of the skin. This is known as *frostbite*.

Martorell's ulcer: This was first described by Martorell in 1945. These ulcers occur in patients over 50 years of age who are usually hypertensive or atherosclerotic. A local patch of skin on the back or outer side of the calf suddenly necroses and sloughs away leaving a punched-out ulcer extending down to the deep fascia. *Pain* is quite severe and may prevent the patient from sleeping. This condition may be bilateral.

Pathology is sudden obliteration of the end arterioles of the skin of this region which is already having a sparse arterial supply from atherosclerosis. It is noteworthy that all peripheral foot pulses are usually present. Since this is an ischemic lesion, it has a long painful course and may take months to heal.

Bazin's ulcer: These ulcers are associated with 'erythrocyanosis frigida', which is an exclusive disease of young women. These patients have thick ankles with abnormal amount of subcutaneous fat, combined with an abnormally poor arterial supply to the ankle skin. The blood supply of the lower-third of the leg and the ankle are derived from a number of fine perforating arteries arising from the posterior tibial and peroneal arteries. In erythrocyanoid cases these arteries may be abnormally small or even absent causing low-grade ischemia of the whole ankle region. The patient finds that the ankle skin is abnormally sensitive to temperature changes. When the weather is cold, 'the ankle is blue, cold and often tender. In hot weather chronic reactive hyperemia becomes evident with the ankle becomes hot, edematous, swollen and painful. Palpation of the leg will reveal small, superficial and painful nodules which breakdown to form ulcers. These ulcers are small and multiple.

Anything liable to cause an ulcer (incompetent perforating vein, trauma or infection) produces its effect much more quickly and in a more severe degree in the relatively ischemic fat ankle. It is therefore necessary to recognize this condition and to treat such condition as venous ulcers, traumatic or infective ulcers more vigorously in erythrocyanoid limb.

Acute fat necrosis sometimes occurs on the back and outer side of the ankle, particularly with chronic exposure to cold environment. This may ultimately lead to very chronic painful ulcers. Sympathectomy may be necessary to manage such ulcer.

These patients are much troubled by chilblains. This again may be an indication for sympathectomy particularly if the patient lives in a cold climate.

Diabetic ulcer: In diabetes slight injury to the glucose laden tissue may cause chronic infection and ulcer formation. Ulceration in diabetes may be precipitated by ischemia due to associated atherosclerosis, infection or diabetic peripheral neuropathy and autonomic neuropathy or a combination of all these factors.

The toes and feet are commonly affected **(Fig. 2.9)**. As there are multiple factors which play in the formation of diabetic ulcer, it should not be included in any group in the classification.

Fig. 2.9: Diabetic foot ulcer.

Miscellaneous ulcers: Ulceration of the leg may be associated with (i) gross anemia, (ii) polycythemia, (iii) leukemia, (iv) systemic sclerosis, (v) rheumatoid arthritis, (vi) ulcerative colitis, (vii) poliomyelitis, (viii) arteriovenous fistula, (ix) acholuric jaundice, (x) various collagen disorders and (xi) chronic lymphoedema.

Cortisone ulcers are recently not uncommon finding. Cortisone ointments are often applied to minor abrasions, eczemas and other lesions of the ankle. These local cortisone creams, if applied, continuously for a prolonged period, may cause large callous ulcer with no inflammatory response. These ulcers are difficult to treat and may require excision and skin grafting.

- **Sloping edge:** Healing ulcers
- **Punched-out edge:** Deep trophic ulcer, gummatous ulcer
- **Undermined edge:** Tuberculous ulcer
- **Rolled edge:** Basal cell carcinoma
- **Everted edge:** Squamous cell carcinoma

Features that should be examined during clinical examination of an ulcer:

- Edge
- Floor
- Base
- Discharge

Different types of edges of ulcer:

- Sloping edge
- Punched-out edge
- Undermined edge
- Rolled edge
- Everted edge

Contd...

Contd...

'Footballer's ulcer is ulcer over the shin due to repetitive trauma.

Neurogenic ulcer is also called ***'perforating ulcer'*** because the ulcer gradually burrows through the muscles and tendons to the bones.

Bed sore is a type of trophic ulcer.

Common Sites of Different Ulcers

- **Traumatic ulcer:** Shin, malleoli, back of the heel
- **Arterial ulcer:** Tip of the toes and fingers, anterior and lateral aspects of the leg, dorsum of the foot, heel
- **Venous ulcer:** 'Gaiter' area of the lower leg (lower third) on the medial side
- **Neurogenic ulcer:** Heel, base of 5th metatarsal, head of 1st metatarsal (in ambulatory patients); buttock, back of the heel (in nonambulatory patients)
- **Martorell's ulcer:** Back or outer side of the calf
- **Bazin's ulcer:** Lower-third of leg, ankle. Diabetic ulcer—toes, foot
- **Actinomycotic ulcer:** Facio-cervical region

Principles of Ulcer Dressing

- Excess exudate to be removed.
- All dead and necrotic tissues should be excised.
- Dressing must be permeable to O_2, CO_2, moisture and impermeable to microorganisms.

Examples of painful ulcer:

- Traumatic ulcer
- Arterial ulcer
- Tropical ulcer
- Cryopathic ulcer
- Martorell's ulcer
- Bazin's ulcer
- Tuberculous ulcer

Examples of painless ulcer:

- Venous ulcer
- Neurogenic ulcer
- Trophic ulcer
- Diabetic ulcer

SINUS AND FISTULA

SINUS

A **sinus** is a blind track leading from the surface down to the tissues. There may be a cavity in the tissues which is connected to the surface through a sinus. The sinus is lined by granulation tissue which may be epithelialized.

FISTULA

A fistula is a communicating track between two epithelial surfaces, commonly between a hollow viscus and the skin (external fistula) or between two hollow viscera (internal fistula). The track is lined with granulation tissue which is subsequently epithelialized. A fistula may be an abnormal communication between vessels (arteriovenous fistula).

Sinuses and fistulae may be congenital or acquired.

Congenital sinuses and fistulae are: (i) branchial fistula, (ii) tracheoesophageal fistula, (iii) arteriovenous fistula, (iv) preauricular sinus, etc.

Acquired sinuses and fistulae usually follow inadequate drainage of abscesses: (i) The perianal abscess may burst on to the surface and lead to the formation of fistula-in-ano; (ii) Acquired arteriovenous fistula—is caused by trauma or operation (for renal dialysis); (iii) Thyroglossal fistula and (iv) Pilonidal sinus are other examples of acquired variety.

Causes of persistence of a sinus or fistula are: (1) presence of foreign body or necrotic tissue (e.g., sequestrum or a suture material) in the depth; (2) non-dependent drainage or inadequate drainage of an abscess; (3) when a specific chronic infection (e.g., tuberculosis, actinomycosis, etc.) is the cause; (4) when the track becomes epithelialized; (5) sometimes there may be a dense fibrosis around the wall of the track and the cavity preventing their collapse, as occurs in chronic empyema; (6) presence of malignant disease; (7) presence of obstruction distal to the sinus or fistula track; (8) history of radiation therapy.

One thing should always be remembered that if the natural passage is made patent, all abnormal offshoots or fistulae heal spontaneously.

HISTORY

Certain sinuses and fistulae are present since birth, e.g., *preauricular sinus.* When a *sinus is due to osteomyelitis,* the patient will give a history of high fever followed by swelling and pain in the bone concerned. An abscess will develop, subsequently this will gradually move towards the surface and will burst resulting a discharging sinus. Sometimes a history of discharge of bone chips may be elicited. The sinus will persist so long as there will be necrotic bone (sequestrum) at the depth of the wound. In case of *tuberculous sinus,* a previous history of lymph nodes enlargement or tuberculous affection of the bone or joint may be elicited. Subsequently a cold abscess will

Fig. 2.10: Perianal fistula (communicating track between perianal skin and anal canal).

develop which will burst (or be incised) leading to a sinus. In case of a sinus or fistula in the perianal region a previous history of perianal or ischiorectal abscess may be given by the patient **(Fig. 2.10)**. Intermittent contraction of the anal sphincter will prevent proper rest to the part and thus interfere with healing of the sinus or the fistula.

LOCAL EXAMINATION

A. INSPECTION

The following points are carefully noted:

1. **Number:** Though majority of the fistulae which occur in the body are single, yet a few are notoriously known for their multiplicity. These are 'Watering Can' perineum, Crohn's disease affecting the rectum and anal canal which produces multiple anal fistulae, actinomycosis always produces multiple sinuses and sometimes ulcerative colitis may produce multiple fistulae.
2. **Position:** Diagnosis of many sinuses and fistulae can be made only looking at the position of these sinuses and fistulae. *PREAURICULAR SINUS (*due to failure of fusion of the ear tubercles) is situated at the root of the helix or on the tragus of the pinna, the direction of sinus being upwards and backwards. The *BRANCHIAL FISTULA (*due to failure of fusion of the second branchial arch with the fifth) is almost always situated at the lower-third of the neck just in front of the sternomastoid muscle. The *PILONIDAL SINUS* is mostly seen in the midline behind the anus at the level of the first piece of coccyx. Multiple indurated sinuses in the upper part of the neck suggest the diagnosis of *ACTINOMYCOSIS. TUBERCULOUS SINUS* often takes a peculiar position which by itself speaks about the diagnosis. A single sinus over the irregular lower jaw is mostly due to *osteomyelitis.*
3. **Opening of the sinus:** Sprouting granulation tissue at the opening of the sinus suggests presence of foreign body at the depth, e.g., sequestrum, nonabsorbable suture material, a drainage tube, bullet, etc.
   The opening of a tuberculous sinus is often wide and the margin is thin blue and undermined.
4. **Discharge:** It is always advisable to look for the character of the discharge. In osteomyelitis it is often pus. In tuberculous ulcer it is often serosanguineous and most important is the presence of sulphur granules in the discharge of actinomycotic sinuses. In case of fistulae, urine, faeces, bile, etc., may be seen coming out.
5. **Surrounding skin:** There may be a scar in the surrounding tissue which may indicate chronic osteomyelitis or previously healed tuberculous sinus. There may be surrounding dermatitis and pigmentation which are characteristic features of Crohn's disease and actinomycosis.

B. PALPATION

While palpating a sinus or a fistula the following points should be noted:

1. **Tenderness:** Is the sinus tender ? The sinus from inflammatory source will be tender (e.g., osteomyelitis).
2. **Wall of the sinus:** It is palpated to note any *thickening* there. Chronic sinuses will have thick wall due to presence of fibrosis surrounding the wall of the sinus.
3. **Mobility:** Is the sinus mobile over the deep structures? Sinus resulting from osteomyelitis is fixed to the bone, which becomes irregular, thickened and tender.
4. **Lump:** Presence of lump in the neighborhood of a sinus often indicates tuberculous lymphadenitis.

C. EXAMINATION WITH A PROBE

This is important but should be performed with due precaution. This examination will inform the clinician about (i) the direction and the depth of the sinus, (ii) presence of any foreign body such as sequestrum, which will be moveable, at the depth of the wound, (iii) whether the fistula is communicated with a hollow

viscus or not and (iv) whether fresh discharge comes out on withdrawal of the probe or not.

D. EXAMINATION OF DRAINING LYMPH NODES

This examination is always essential and should not be missed under any circumstances.

General Examination

Depending on the site and cause of the sinus, examination of the particular system should be performed. In case of a sinus in the loin, the spine, ribs and the kidneys should be examined to know the exact cause of the lesion (tuberculous sinus following cold abscess). In case of a sinus due to chronic empyema, the chest should be thoroughly examined. In case of a sinus due to osteomyelitis, the bone should be examined carefully. In case of fistula around the anus a thorough examination not only of the anal canal and rectum both manually and proctoscopically should be called for but also sigmoidoscopic examination and examination of the whole abdomen should be performed. In case of multiple fistulae in the perineum and scrotum, the lower urinary tract should be thoroughly examined.

SPECIAL INVESTIGATIONS

- **Examination of the discharge**—is of utmost importance to come to a diagnosis. It should be examined macroscopically, physically, chemically, microscopically (e.g., for sulphur granules in case of actinomycosis) and bacteriologically. Express a little discharge into a test-tube half filled with water. The tube is corked and shaken vigorously. Sulphur granules will be seen sinking to the bottom of the test-tube. This is characteristic of actinomycosis.
- **X-ray examination:**
  - Straight X-ray may show a sequestrum, osteomyelitic change of the bone concerned or presence of opaque foreign body.
  - Injection of radio-opaque fluid (lipiodol or hypaque) into a sinus or a fistula will indicate the cause of the sinus by delineating its course.

PILONIDAL SINUS

In 1880 Hodges introduced the term 'Pilonidal'. It is a Latin word; *Pilus* means hair and *nidus* means nest. Basically, pilonidal sinus is a subcutaneous track lined with granulation tissue containing hairs or their small fragments. A pilonidal sinus is not lined by skin and there are no hairs growing within it. But the hairs in the sinus are short and broken pieces of hair that either get sucked into a pre-existing dimple in the skin or actually pierce the normal skin in the gluteal cleft, which act as foreign bodies to develop the sinus and also causes its persistence by chronic infection. This may lead to a chronic abscess which at frequent intervals flare up into an acute abscess.

Sites

Most commonly, pilonidal sinus occurs in the natal cleft **(Fig. 2.11)**. But this sinus may however occur in other regions:

- Interdigital cleft of barber's (hair dresser's) fingers.
- The umbilicus.
- The axilla.
- The clitoris.
- Interdigital web of the foot of a worker in a hair mattress factory.
- Face.
- The anal canal.

Etiology

Previously this sinus was considered to be of congenital origin.

However, in 1946 Patey opened the debate concerning the etiology of this condition and he favored the *acquired nature* of this condition.

Fig. 2.11: Pilonidal sinus in natal cleft.

ACQUIRED THEORY

It is believed that the sinus is nothing but a *foreign body granuloma,* the foreign body being hairs which penetrate the skin through sweat glands, hair follicles or abrasions. Hairs can be drawn into a sinus with root-end-first, so that the free ends are seen through the opening of the sinus.

Palmar reported that stretching of the skin at puberty can produce sufficient opening of the orifices of the skin to allow insinuation of foreign substances. These holes or pits represent distorted hair follicles. It is also probable that the condition starts as a mild infection of a hair follicle which sheds its hair and leaves a small epithelial-lined pit. Friction and suction are probably the main mechanisms by which occasional hairs are drawn root-first into these pits. The subsequent clinical course is that of a poorly draining *foreign body granuloma with the development of spreading inflammation, abscess formation and secondary sinus formation.*

- **Bascom's theory:** Movement of gluteal crease creates suction, hair enters in the abscess cavity due to suction.
- **Karydaki's theory:** Shafts of loose hair inserts into the depth of the natal cleft, resulting in foreign body reaction.

Pathology

The sinus extends into the subcutaneous tissue from the surface of the skin. The sinus passes upwards and forwards towards the sacrum. It ends blindly and does not reach the bone: It may possess branching side channels. It may have as many as six openings strictly in the midline between the level of the sacrococcygeal joint and the tip of the coccyx. It is an infected track.

- **Lining of the track—**is usually granulation tissue. Towards the mouth of the sinus there may be stratified squamous epithelium lining.
- **Contents:** These are mainly—(i) Hairs, (ii) Granulation tissue, (iii) Epithelial scales and debris.

The hairs are usually dead and are found (a) lying loose in the sinus, (b) embedded in the granulation tissue or (c) buried deep in the mature scar tissue at the depth.

MICROSCOPICALLY

One will find foreign body giant cells.

Clinical Features

Pilonidal sinus presents clinically as a recurrent pilonidal abscess, which discharges spontaneously or which is incised and drained, thus forming a recurrent discharging sinus in the midline of the sacrococcygeal region through which tuft of hairs can be seen projecting.

History

- **Age:** Symptoms usually commence during the third decade. Pilonidal sinus is rare in people over 40 years of age. The average age of presentation is 21 years. The affected individuals are usually over weight.
- **Sex:** It is more common in males than females. The ratio varies from 3:1 to 7:1. Typically the robust, fat, plethoric type of male with a narrow pelvis, a deep sulcus between prominent thick buttocks, and excessive glandular activity is the usual victim.
- **Ethnic group:** Pilonidal sinus is more common in dark-haired hirsute men. The condition rarely occurs in blondes.
- **Occupation:**
  - Pilonidal sinus was often referred to as ***'Jeep disease'.*** Shearing action of the buttocks, which is increased by sitting on a hard sit and especially by vibration of a vehicle, loose hairs travel down the intergluteal furrow to penetrate the skin or the open mouths of sudoriferous glands, which are more active during late puberty. So jeep drivers are often affected by this disease.
  - Mens' hair dressers sometimes get pilonidal sinuses in the webs between their fingers.
  - It is also seen in the interdigital web of the foot of a worker in a hair mattress factory.

Symptoms

The usual complaint is discharge, pain and tender swelling at the bottom of the spine. The pain may be dull ache or an acute throbbing pain when there is abscess formation. The pain is often relieved with the bursting of the abscess or incision on the abscess. If the sinus becomes chronically inflamed, a dull ache pain continues and the sinus discharges continually.

Local Examinations

Site: Pilonidal sinus has a typical position. It is always situated in the midline and usually at the level of the first piece of the *coccyx.* When there are multiple openings,

these are also situated in the midline stretching between the level of the sacrococcygeal joint and the tip of the coccyx. It rarely involves tissues between the tip of the coccyx and the anus.

INSPECTION

Shows either a smooth epithelialized edge of the sinus or a puckered scarred edge with pouting granulation tissue.

The discharge will vary from a little serum to a gush of pus.

PALPATION

- **Temperature and tenderness:** Unless the sinus is infected, when it becomes red and tender, the skin around a pilonidal sinus is usually normal.
- **The sinus:** The sinus if gently pressed will discharge a small quantity of serous fluid and reveal the tips of free hairs.
  Palpation of the skin and subcutaneous tissues around the sinus reveal indurated areas. These indurated areas correspond to the ramifications of the sinus.
- **Regional lymph nodes:** Inguinal lymph nodes are usually not enlarged, as the infection is mostly mild and chronic.

RECTAL EXAMINATION

It does not reveal any abnormality.

Complications

- Abscess formation.
- Recurrent inflammation.
- **Recurrence of sinus formation:** This is mostly due to inadequate excision of the sinus or entry of hair to the scar of the skin. Selection of inappropriate operation and inadequate postoperative care are the main causes of recurrence. Hairs growing into the healing wounds is probably the most common cause of recurrence of pilonidal disease.
- Very rarely malignant degeneration may occur in this lesion.

Differential Diagnosis

Two conditions should be differentiated from pilonidal sinus. These are:

- **Sinus connected with a post-anal dermoid:** The opening of such sinus will lie in front of the tip of the coccyx and behind the anus. Rectal examination will always reveal a cystic swelling in front of the sacrum.
- **Fistula-in-ano:** While in this condition there is always an internal opening in the anal canal, pilonidal *sinus* does never open into the anal canal, instead it passes upwards and forwards towards the sacrum, where it ends blindly near the bone but does not reach the bone. The external opening in fistula-in-ano will be anywhere around the anus and posteriorly between the tip of the coccyx and the anus.

Treatment

Acute Pilonidal Abscess

- Conservative treatments should be tried first, e.g., rest, local antiseptic dressings and systemic administration of broad spectrum antibiotic.
- If these fail to relieve the patient, *immediate incision and drainage of the abscess* should be carried out.

A cruciate incision is made on the most prominent and dependent part of the swelling as near the orifice of the sinus as possible. The corners should be excised to prevent rapid bridging of the wound. All loculi should be broken and all tufts of hairs must be extracted, as this may act as a foreign body to perpituate the infection. The pus should be sent for culture and sensitivity. The patient should be instructed to take rest in bed and to take warm sitz baths.

When the wound will heal, definitive treatment should be planned. A few cases are on record that a second surgical procedure was not needed. But this is questioned.

Chronic Pilonidal Sinus

Surgical treatment should usually be advised when there have been two or more infective episodes or when the discharge shows no sign of clearing up. The operation should be performed at a time when the infection is quiescent.

The most effective treatment is complete excision of the sinus tracks together will all their ramifications followed by off-midline primary closure or lay open for allowing healing by secondary intention or marsupialization.

Other treatment options are flap-based procedures, Video-assisted ablation of pilonidal sinus (VAAPS), Endoscopic pilonidal sinus treatment (EPSiT).

The flap-based procedures are particularly indicated for complex chronic pilonidal disease, recurrent pilonidal disease. Flap-based procedures include: (a) Rhomboid or Limberg flap; (b) Modified Limberg flap; (c) Karydakis flap; (d)Z-plasty; (e) V-Y advancement flap. Limberg flap is the most common flap-based procedure for pilonidal sinus. This procedure involves excision of diseased tissue in rhomboid shape followed by coverage of the defect by rhomboid flap.

Video-assisted ablation of pilonial sinus (VAAPS) and endoscopic pilonidal sinus treatment (EPSiT) are recently emerging treatment options for pilonidal disease. The principles of both these treatment approaches are almost same. These procedures include: (a) Insertion of fistuloscope through the external opening of sinus; (b) Identification of the anatomy of sinus tract, any secondary tracts or abscess cavity; (c) Removal of hair, infected tissue, any debris from the sinus tract using forceps; (d) Ablation of main sinus tract, secondary sinus tract or abscess cavity using monopolar electrosurgery; (e) Necrotic material is removed using endobrush and cleaning of sinus tract using irrigant solution. The advantages of these procedures include less postoperative pain, shorter length of hospital stay, and quicker healing. The initial results are promising but the long-term result is still unclear.

KEY POINTS

- **The classic site of pilonidal sinus** is natal cleft.
- Pilonidal sinus is also termed as ***'Jeep disease'.***
- The sinus tract characteristically contain **hair debris.**
- Pilonidal sinus is one of the components of **follicular occlusion tetrad**. Other components are hidradenitis suppurativa, acne conglobata, and dissecting cellulitis of the scalp.
- **Limberg flap** is the most common flap-based procedure for pilonidal sinus.

CASE DISCUSSION

Short Case Discussion

Case 1

A 35-year-old male patient presented with an ulcer in his right sole for last 2 months. Patient consulted with local physician and treated with antibiotics but no improvement. The ulcer was gradually increasing in size and depth. For the last 3 months, patient was complaining of numbness in his both foot for which he consulted with neuromedicine specialist. Patient didn't complain any pain in the lesion. No history of significant trauma in his right foot. Patient is chronic alcoholic for last 15 years. No history of diabetes mellitus or hypertension. On examination, a 2.5 cm × 2.5 cm ulcer is present in the sole of right foot at the level of head of 1st metatarsal. The ulcer has punched-out edge and floor is covered by slough. Mild amount of serosanguinous discharge is evident. There is no blackish discoloration of any toes or skin of dorsum of foot. The pain, vibration and thermo-proprioception of both feet are diminished. Motor functions of both lower limbs are normal except mild degree of restriction of movements of right ankle.

1. **What is the provisional diagnosis?**
   The provisional diagnosis is neuropathic ulcer in the sole of right foot likely due alcoholic neuropathy.
2. **What are the points in favor of diagnosis?**
   In history, chronic alcoholism for last 15 years, numbness in both feet for last 3 months, painless ulcer. On examination, ulcer at the head of 1st metatarsal, punched-out edge, sensory impairment of both feet are all in favor of neuropathic ulcer due to alcoholic neuropathy.
3. **What are the predisposing conditions?**
   - **Peripheral nerve lesions:** Alcoholic neuropathy, diabetes mellitus, leprosy, peripheral nerve injury.
   - **Spinal cord lesions:** Spina bifida, paraplegia, tabes dorsalis.

4. **What are the common sites of neuropathic ulcer?**
   Heel, base of the 5th metatarsal, head of the 1st metatarsal in ambulatory patients and buttock and back of the heel in nonambulatory patients.
5. **What is the treatment plan in this patient?**
   Advice for absolute abstinence from alcohol, treatment of neuropathy, care of the ulcer and use of off-loading footwear.
6. **What are the features that should be examined in an ulcer?**
   Edge, floor, base and discharge.
7. **What are the different types of edge in an ulcer and give example of each.**
   - Sloping edge (ulcers in healing phase)
   - Punched-out edge (trophic ulcer)
   - Undermined edge (tuberculous ulcer)
   - Rolled edge (basal cell carcinoma)
   - Everted edge (squamous cell carcinoma).

Case 2

A 50-year-old male, normotensive, diabetic patient presented with a ulcer in his right foot for last 5 months. Patient could not remember any history of trauma 5 months back. He consulted with a local doctor for this ulcer but no obvious improvement. No history of pain in leg or calf on walking. History of irregular intake of oral antidiabetics. He is chronic smoker, taking average 15 bidi per day for last 15 years. On examination, a 5 cm × 4.8 cm ulcer on the lateral aspect of dorsum of right foot with punched-out edge and floor is covered with slough. There is profuse foul-smelling serosanguineous discharge from the ulcer. The ulcer is tender. No blackish discoloration in both feet and toes. On neurological examination, no obvious neurological impairment.

1. **What is the provisional diagnosis?**
   The provisional diagnosis is diabetic ulcer in right foot.
2. **What are the points in history and clinical findings in favor of diagnosis?**
   In history, ulcer in right foot for last 5 months, history of irregular taking of oral antidiabetics. On examination, ulcer with punched-out edge with profuse serosanguineous discharge and no evidences of pre-gangrenous or gangrenous changes. All these points are in favor of diagnosis of diabetic foot ulcer.
3. **What are the etiologies of diabetic foot ulcer?**
   Neuropathic (sensory, motor, autonomic), ischemic (diabetic microangiopathy, associated peripheral occlusive arterial disease) and neuroischemic causes.
4. **What are the characteristic features of neuropathic diabetic foot ulcer?**
   Presence of callous, sensory loss, pink and granulating ulcer bed, present in the weight-bearing areas of foot.
5. **How to assess diabetic foot ulcer?**
   Assessment of diabetic foot ulcer includes: (a) Clinical assessment (site, size, depth and edge of ulcer, any malodor, any pain, any gangrenous changes, any discharge, any exposed bone); (b) Tests used for peripheral neuropathy (e.g., the 10 g monofilament test, etc.); (c) Assessment of vascular status—by duplex Doppler USG of arterial system; (d) Presence of infection—culture and sensitivity of wound exudates; (e) Assessment of foot deformities—Charcot foot, etc.
6. **What are the common classification systems for diabetic foot ulcer?**
   Meggit-Wagner classification, The University of Texas wound classification.
7. **What are the grades in Meggit-Wagner classification?**
   Grade 0: Preulcerative or postulcerative site.
   Grade 1: Superficial ulcer.
   Grade 2: Ulcer penetrating to tendon or joint capsule.
   Grade 3: Lesion involving deeper tissues.
   Grade 4: Forefoot gangrene.
   Grade 5: Whole foot gangrene involving more than two-third of foot.

8. **What is the management plan?**
   Optimal control of diabetes mellitus, treatment of peripheral arterial disease, hypertension and hyperlipidemia (if present), avoidance of smoking, local wound care, pressure offloading, patient education on foot care.
9. **What is patient education on foot care in diabetic foot ulcer patients?**
   There are some advices that should be followed by diabetic patient with at-risk for foot ulceration—(a) Avoid walking barefoot in home and outside; (b) Shoes must not be too tight and must not have rough edges; (c) Wash feet daily with water temperature below 37°C and dry them carefully; (d) Use emollients for lubrication of dry skin of foot, but not between the toes; (e) Cut toe nails straight across; (f) Regular examination of foot by a healthcare professional.

Case 3

A 58-year-old male patient admitted in medicine department with CVA for 15 days and discharged 1 week back, now attended the surgical OPD with a nonhealing ulcer on his back. Patient's relative noticed the ulcer during his illness when he was bedridden. Patient is hypertensive, diabetic for last 10 years. No history of smoking or alcoholism. On examination, a 5 cm × 4 cm ulcer with partial-thickness skin loss over the sacral prominence. The wound bed is red pink and no slough. There is no sensory loss and muscle power on right side is grade 4 and left side is grade 5. Mild slurring of speech is still present.

1. **What is the diagnosis?**
   The diagnosis is stage II pressure ulcer (pressure injury) over the sacral prominence.
2. **What are the points in favor of the diagnosis?**
   History of bedridden illness, ulcer over the sacral prominence.
3. **What is pressure ulcer or pressure injury?**
   Pressure ulcer (pressure injury) is localized injury to the skin and/or underlying tissue usually over a bony prominence, as a result of pressure, or pressure in combination with shear.
4. **What are the factors responsible for pressure ulcer formation?**
   Factors responsible are immobility, extremes of age, reduced sensation, friction and shear, pressure on skin and soft tissues, increased skin moisture.
5. **What are the common sites of pressure injuries?**
   Ischial tuberosity, sacrum, greater trochanter, heel, occiput.
6. **What is the staging system of pressure injuries by US National Pressure Injury Advisory panel?**
   Stage 1: Non-blanchable erythema of intact skin usually over a bony prominence
   Stage 2: Partial thickness loss of dermis presenting as shallow open ulcer
   Stage 3: Full thickness skin loss
   Stage 4: Full thickness skin loss with exposed bone, tendon or muscle.
   Unstageable full-thickness pressure injury: Obscured full-thickness skin and tissue loss.
   Deep tissue pressure injury: Persistent nonblanchable, deep-red, maroon or purple discoloration.
7. **Name two scales for assessment of risk for pressure ulcer.**
   Braden scale, Waterlow score.
8. **What are the preventive measures?**
   Skin assessment, repositioning every 2–4 hours, use of pressure-redistributing device, patient education on self-care.
9. **What is the treatment plan in pressure ulcer?**
   Optimization of medical conditions, improvement of nutrition, regular dressing of the ulcer, repositioning of the patient in every 2–4 hours, use of pressure-redistributing devices, and surgery if all other measures fail.
10. **Which surgical option is preferred in pressure ulcer?**
    Reconstruction of the ulcer using a fasciocutaneous or musculocutaneous defect.
11. **Which medical devices may cause Medical device-related pressure ulcer (MDRPU)?**
    Tracheostomy tube, ventilation mask, cervical collar, immobilization splint.

Case 4

A 29-year-old male patient, by profession driver, presented with openings in his gluteal cleft for last 5 months. Initially he noticed occasional discharge from the midline opening. About 3 months back, he developed a painful swelling besides that opening followed by spontaneous discharge of purulent material. In the last 2 months, patient was asymptomatic. No history of diabetes mellitus. He is addicted to tobacco chewing for last 5 years. No significant family history. On examination, two openings are seen at the natal cleft, one is at the level of first coccygeal segment and another is just below and lateral to that opening. No active discharge is present. Palpation of the skin and soft tissues around these openings revealed presence of induration. No rise of local temperature. Gluteal region is covered with coarse body hair.

1. **What is the diagnosis?**
   The diagnosis is pilonidal sinus at natal cleft.
2. **What is pilonidal sinus?**
   Pilonidal sinus is the chronic form of pilonidal disease characterized by single or multiple subcutaneous branching sinus tracts with characteristic midline pit. Pilonidal disease is an acquired condition related to presence of hair.
3. **What are the uncommon sites of pilonidal sinus?**
   Interdigital web (Barber's pilonidal sinus), umbilicus, breast (women engaged in sheep shearing, dog beauticians).
4. **What are the risk factors?**
   Risk factors for pilonidal sinus in natal cleft are obesity, hirsute body habitus, repeated trauma to the gluteal cleft skin, family history of pilonidal disease.
5. **What is the pathophysiology?**
   Two theories explain the pathogenesis of pilonidal sinus. In Bascom's theory, following folliculitis and development of abscess, hair enters in the abscess cavity due to movement of gluteal crease. In Karydakis's theory, due to shearing action of the buttocks, the loose hair inserts into the depth of the intergluteal furrow to penetrate the skin. Secondary openings develop due to self-propelling ability of the hair or spontaneous rupture of abscess.
6. **What are the characteristic clinical presentations of pilonidal sinus of natal cleft?**
   Midline sinus opening, presence of secondary opening or pits, tuft of hairs may seen projecting through sinus opening.
7. **What are the differential diagnosis?**
   Hidradenitis suppurativa, sacral osteomyelitis, actinomycosis, perianal fistula in Crohn's disease.
8. **Which investigation is indicated for confirmation of diagnosis?**
   If history and clinical findings are suggestive of pilonidal sinus, no need of any investigations for confirmation of diagnosis.
9. **What are the complications of pilonidal sinus?**
   Recurrent pilonidal abscess, malignant transformation (rare).
10. **What is the treatment of acute pilonidal abscess?**
    Incision (off-midline) and drainage of abscess, removal of hair in the gluteal cleft and surrounding area (surgeon-performed shaving or laser epilation), hair removal every 1–2 weeks until acute infection subsides.
11. **What are the treatment options for chronic pilonidal disease?**
    Phenol application, off-midline excisional procedure, flap-based procedures, video-assisted ablation of pilonidal sinus (VAAPS), endoscopic pilonidal sinus treatment (EPSit).
12. **Name some off-midline excisional procedures.**
    Midline follicle excision and lateral drainage (Bascom's technique), Karydakis technique.
13. **What are the different flap-based procedures?**
    Limberg or rhomboid flap, modified Limberg flap, Bascom's cleft-lip technique, Z-plasty, V-Y advancement flap.
14. **What is the indication of flap-based procedures?**
    In complex and recurrent pilonidal sinus.
15. **What are the basic principles of VAAPS and EPSit?**
    Insertion of a fistuloscope through the sinus opening, identification of the anatomy of the sinus tract and associated secondary tracts, removal of hair, infected tissues from the tract using forceps, ablation of main sinus tract and associated tracts using monopolar electrosurgery, removal of necrotic material using endobrush and irrigation solution.

MULTIPLE CHOICE QUESTIONS (MCQs)

1. Example of traumatic ulcer:
a. Footballer's ulcer
b. Dental ulcer of the tongue
c. Plaster sore
d. All of the above
Ans. (d)

Explanations: Footballer's ulcer is a traumatic ulcer found on the shin due to repetitive trauma. Tongue ulcer may also develop due to sharp teeth.

2. Arterial ulcer commonly develops on:
a. On the toes and dorsum of foot
b. On the shin
c. Gaiter region
d. On the heel
Ans. (a)

Explanations: Venous ulcer commonly develops in the 'gaiter' area, the area between the calf and the ankle. 'Footballer's ulcer', a type of traumatic ulcer, develops in the shin. Neurogenic ulcer commonly develops on the heel and ball of foot when the patient is ambulatory, on the buttock and back of the heel when patient is non-ambulatory.

3. Perniosis is:
a. Ulceration in the feet due to chilblains
b. Frostbite in the feet
c. Deep ulcers due to frostbite
d. Deep ulcers in the feet due to atherosclerosis
Ans. (a)

Explanations: When the lower extremity is exposed to intense cold, blisters and ulceration may occur particularly in the feet. This is called chilblains, also termed as perniosis. Frostbite is cold injury due to wet cold below the freezing point. In chilblain, ulcers particularly develop in the foot and they are superficial ulcers. In chilblain, the lesion develops due to vasoconstriction of skin arterioles. In frostbite, the ulcers are deep and develop due to arteriolar spasm along with denaturation of intracellular proteins and enzyme systems.

4. All these informations are true, *except*:
a. Martorell's ulcer is a painful ulcer
b. Bazin's ulcer is an exclusive disease of young men
c. Neuropathy and microangiopathy are responsible for development of diabetic foot ulcer
d. Cortisone ulcers are difficult to treat
Ans. (b)

Explanations: Martorell's ulcer develops in elderly patients with hypertension or atherosclerosis. Pain is quit severe. Bazin's ulcer is an exclusive disease of young women, associated with 'erythrocyanosis frigida'. Both peripheral and autonomic neuropathy and microangiopathy are primarily responsible for development of diabetic foot ulcer. Cortisone ulcers may develop if cortisone creams are applied regularly for prolonged period. These ulcers are large callous ulcer with no inflammatory response and difficult to treat. Often excision and skin grafting is indicated.

5. Which option is correct:
a. Undermined edge-tuberculous ulcer
b. Rolled edge-squamous cell carcinoma
c. Everted edge-basal cell carcinoma
d. Punched out edge-Venous ulcer
Ans. (a)

Explanations: Rolled edge is found in basal cell carcinoma, everted edge is found in squamous cell carcinoma and punched out edge is found in deep trophic ulcer.

6. Which statement is true:
a. Bed sore is a type of trophic ulcer
b. Neurogenic ulcer is also called 'perforating ulcer'
c. Actinomycotic ulcer most commonly found in faciocervical region
d. All of the above
Ans. (d)

Explanations: The neurogenic ulcer gradually burrows through the muscles and the tendons to the bone, that is why it is also called 'perforating ulcer'.

7. All these ulcers are painless ulcers, *except*:
a. Venous ulcer
b. Neurogenic ulcer
c. Diabetic ulcer
d. Martorell's ulcer
Ans. (d)

Explanations: Martorell's ulcer develop in elderly hypertensive patients or patients with atherosclerosis. Punched-out ulcer is developed which is quite painful.

8. Regarding sinus and fistula, which statement is correct:
a. Sinus is a blind track from the surface down to the tissue
b. Fistula is a communicating track between two epithelial surfaces
c. Sinus and fistula may be congenital or acquired
d. All of the above
Ans. (d)

Explanations: A sinus is a blind track leading from the surface down to the tissues and lined by granulation tissue which may be epithelialized. A fistula is a communicating track between two epithelial surfaces, commonly between a hollow viscus and the skin (external fistula) or between two hollow viscera (internal fistula).

9. Which one is congenital sinus or fistula:
a. Pilonidal sinus
b. Fistula-in-ano
c. Thyroglossal fistula
d. Preauricular sinus
Ans. (d)

Explanations: Congenital sinuses and fistula are branchial fistula, tracheoesophageal fistula, preauricular sinus. Acquired sinus and fistula are fistula-in-ano, thyroglossal fistula, pilonidal sinus.

10. Which one is the cause of persistence of sinus or fistula?
a. Presence of foreign body
b. Presence of distal obstruction
c. History of radiation
d. All of the above
Ans. (d)

Explanations: Causes of persistence of sinus or fistula are: (1) presence of foreign body or necrotic tissue (e.g., sequestrum or a suture material) in the depth; (2) absence of rest; (3) non-dependent drainage or inadequate drainage of an abscess; (4) when a specific chronic infection (e.g., tuberculosis, actinomycosis, etc.) is the cause; (5) when the track becomes epithelialized; (6) sometimes there may be a dense fibrosis around the wall of the track and the cavity preventing their collapse, as occurs in chronic empyema; (7) presence of malignant disease; (8) presence of obstruction distal to the sinus or fistula track; (9) history of radiation therapy.

11. Multiple fistula is commonly found in:
a. Actinomycosis
b. Preauricular sinus
c. Pilonidal sinus
d. Branchial fistula.
Ans. (a)

Explanations: Actinomycosis is a bacterial infection caused by *Actinomyces israelii* (gram-positive anaerobic organism), characterized by formation of multiple sinuses and abscesses.

12. Which statement is correct:
a. Pilonidal sinus most commonly found in gluteal cleft
b. Branchial fistula most commonly found in the upper third of neck
c. Sulphur granules are found in Crohn's disease related sinuses
d. Tuberculous sinuses in the neck often fixed to the underlying bone
Ans. (a)

Explanations: Branchial fistula almost always situated at the lower third of neck just in front of sternocleidomastoid muscle. Sulphur granules are found in the discharge of actinomycotic sinuses. Tuberculous sinuses in the neck are often multiple but not fixed to the bone, a single sinus fixed to the lower jaw often due to osteomyelitis.

13. Which statement is correct:
a. Sprouting granulation tissue at the opening of sinus suggest presence of foreign body, e.g., sequestrum, nonabsorbable suture material
b. Pigmentation and dermatitis in the surrounding skin of sinus suggestive of tuberculous sinus
c. Tuberculous sinus often fixed to the bone
d. All of the above
Ans. (a)

Explanations: Pigmentation and dermatitis in the surrounding skin of sinus are characteristic features of Crohn's disease and actinomycosis. Osteomyelitic sinus usually fixed to the bone.

14. Pilonidal sinus may develop in following sites, *except*:

a. Gluteal cleft
b. Interdigital web of fingers
c. Neck
d. Intermammary region

Ans. (c)

Explanations: Gluteal cleft is the classical site of pilonidal sinus. Pilonidal sinus may also develop in the barber's interdigital webs. Pilonidal sinus in intermammary region rarely found in dog beauticians.

15. All are true about pilonidal sinus, *except*:

a. Pilonidal sinus is also known as 'Jeep disease'
b. Common presentation is recurrent discharging sinus in the gluteal cleft
c. Fragmented hair may found in the sinus track
d. Complete excision of all sinus tracts followed by midline closure is one of the treatment choices

Ans. (d)

Explanations: Pilonidal sinus is also called 'Jeep disease' because shearing action of the buttocks, which is increased by sitting on a hard sit and especially by vibration of a vehicle, loose hairs travel down the intergluteal furrow to penetrate the skin or the open mouths of sudoriferous glands, that lead to more incidence of pilonidal sinus in jeep drivers during the second world war. The sinus tract usually contain fragmented hairs, granulation tissue, epithelial debris. Complete excision of all the sinus tracts followed by off-midline closure is one of the treatment options. If midline closure is attempted, the risk of recurrence is more.

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Nilay Mandal MS (General Surgery) is a Professor in the Department of General Surgery, Calcutta National Medical College and Hospital, Kolkata, West Bengal, India. He has a teaching experience of 14 years and both undergraduate and postgraduate examiners for the last few years. He has published articles in various national and international journals. He is the author of "Illustrated Surgery—A Basic Roadmap for the Postgraduates" and the Chief Editor of "'Postgraduate Surgery", published by Jaypee Brothers Medical Publishers (P) Ltd, New Delhi, India. He is also the Chief Editor of "Surgery MS: Suturing Your Clinical Gaps", an online course in "DigiNerve" app.

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