LEC. 36

SURGERY

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Lec. 1

Diabetic Foot & its Management

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DIABETIC FOOT

Objectives

- Definition
- Epidemiology
- Pathophysiology
- Classification

The complications of longstanding diabetes mellitus often appear in the foot, causing chronic disability.

Epidemiology

- More than 30% of patient attending diabetic clinics have evidence of peripheral neuropathy or vascular disease
- About 40% of non-trauma related amputations are for complications of diabetes.
- Nearly one in six patients die within 1 year of their infection

Pathophysiology

Factors predisposing diabetic patients to developing diabetic foot are:

1. Peripheral vascular disease
2. Damage to the peripheral nerves
3. Reduced resistance to infection
4. Osteoporosis

Peripheral vascular disease

Atheroeclerosis affects mainly the medium sized vessels below the knee
The patient may complain of claudication or ischemic changes and ulceration in the foot. The skin feels smooth and cold, the nails show trophic changes, and pulses are weak or absent. Superficial ulceration occurs on the toes, deep ulceration typically under the heel, these ulcers are painful and tender. Digital vessels occlusion may cause dry gangrene of one or more toes. Proximal vascular occlusion resulting in extensive wet gangrene.

**Peripheral neuropathy**

- Early on, the patient is usually unaware of the abnormality, but clinical tests will discover loss of vibration and position sense and diminish of temperature discrimination in the feet.
- Symptoms: mainly due to:
  1. Sensory impairment: symmetrical numbness and parasthesia, dryness and blistering of the skin, superficial burns and skin ulcers due to shoe scuffing or localized pressure.
  2. Motor loss: muscle weakness and intrinsic muscle imbalance usually manifests as claw toes with high arches and this may in turn predispose to plantar ulceration.

**Neuropathic joint disease (Charcot joints)**

- It is chronic, progressive, destructive process affecting bone architecture and joint alignment in people lacking protective sensation.
- The mid tarsal joints are most commonly affected followed by the MTP and ankle joints.
- There is usually provocative incident such as a twisting injury or a fracture following which joint collapses relatively painlessly.
- In late cases, there may be severe deformity and loss of function. A rocker-bottom deformity from collapse of mid foot is diagnostic.
Osteoporosis

- There is generalized loss of bone density in diabetes.
- In the foot the changes may be severe enough to result in insufficiency fractures around the ankles and or in the metatarsals.

Infections

- Diabetes, if not controlled is known to have adverse effect on the white cell function. This combined with the local ischemia, insensitivity to skin injury and localized pressure due to deformity, makes sepsis an ever recurring hazard.

Classification

Diabetic foot infection may be classified as:

- Superficial: often associated with ulceration.
- Deep infection: may involve soft tissues only with abscess formation or can involve bones (osteitis or osteomyelitis). This type of infection can also involve local joints (pyogenic arthritis).

Another classification system is Wagner’s classification which is one of the most widely used and universally accepted grading systems for DFU, consisting of six simplistic wound grades used to assess ulcer depth (grades 0-5)

Wagner classification system

- 0  Pre-ulcerative area without open lesion
- 1  Superficial ulcer (partial/full thickness)
- 2  Ulcer deep to tendon, capsule, bone
- 3 Stage 2 with abscess, osteomyelitis or joint sepsis
- 4 Localized gangrene
- 5 Global foot gangrene.

**Prevention & Management of Diabetic Foot**

**Prevention**

- The best way of preventing complications is to insist on regular attendance at a diabetic clinic.
Full compliance with medication

Examination for early signs of vascular or neurological abnormality.

Advice on foot care and footwear and a high level of skin hygiene.

Foot care for the at risk patients

To do list:

- Inspect the foot daily using a mirror to see the sole and don’t forget between the fingers.
- Wash feet daily
- Apply lotion to avoid skin cracks and if present skin cracks should be kept clean and covered
- Use a comfortable shoe wear and change it often
- Inspect shoes before wearing it from inside and outside. *Great care is needed with nail trimming

Not to do list:

- Smoking
- Step into bath tub without checking the temperature of the water.
- Use hot water bottles or heating pad.
- Use keratolytic agent to treat the calluses or corn. *Wearing a tight shoes or stocking.
- Walking with barefeet

Management of Diabetic Foot

For the management of diabetic foot there should be a multidisciplinary team comprising a physician (or endocrinologist), orthopaedic surgeon, surgeon, chiropodist and orthotist
Evaluation of Diabetic Foot patient

Peripheral neuropathy:

Sensory: Examination for early signs of neuropathy should include the use of:

- Semmes-Weinstein hairs (for testing skin sensibility)
- Biothesiometer (for testing vibration sense),
- Thermal discrimination test
- Joint position sense.

Motor: examine for wasting, weakness, absent or diminished tendon reflex, and deformities (claw toes, hammer toes, pes cavus). This can be enhanced by the EMG & N/C study.

Peripheral vascular damage: examine for

- The pulses,
- Skin temperature,
- Trophic changes in the skin and nails
- Peripheral vascular examination is enhanced by using
  - Doppler ultrasound probe,
  - Ankle brachial index measurement,
  - Absolute toe pressure,
  - Transcutaneous oxygen measurement,
  - Angiography.
Infection: examine for

- The local and systemic signs of infection.
- Ulcers must be swabbed for infecting organisms.
- Magnetic resonance imaging (MRI) is the most specific and sensitive non-invasive test to evaluate OM and is also useful for the evaluation of a probable abscess or sinus tract formation.
- Bone scans, such as the white blood cell labeled Indium-111, Technetium-99m HMPAO and Sulfur Colloid Marrow Scan, may prove beneficial between distinguishing acute and chronic infections, also it is useful for identifying OM from Charcot neuroarthropathy

Osteopathy: examine for

- Charcot deformities (flatening of the foot arches, rocker-bottom deformity, prominent metatarsal heads.
- X-ray examination may reveal periosteal reactions, osteoporosis, cortical defects near the articular margins and osteolysis - often collectively described as 'diabetic osteopathy

Laboratory investigations

- WBC elevated in 50% of patients.
Diabetic Foot

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Renal function
Electrolytes
Acidosis
Blood glucose level.
Hemoglobin A1C levels provide a barometer of glycemic control averaged over the previous 2-3 months.
Acute phase reactants ESR & CRP (baseline and post-treatment CRP, ESR and WBC were significantly elevated in patients who ultimately required amputation).
Total serum protein and albumin, well known as determinants of nutritional status.
Microbiological analysis permits the appropriate selection of antimicrobial therapy

TREATMENT

According to Wagner classification:

✓ **Grade 0 (skin intact)**:
  o Calluses should be trimmed so as not mask active ulcer, advise the patient how to do daily foot care and apply the preventive measures. (extra depth shoes and pressure relieving insole)

✓ **Grade 1&2 (superficial & deep ulcer but without infection)**:
  o The aim here is to heal the skin, after desloughing the ulcer and removing the hyper keratotic skin the ulcer can be dressed locally, the application of a skin-tight POP (total contact cast) changed weekly will allow most of the ulcers to heal. It also allows the patient to be mobile.

✓ **Grad 3 (grade 2 with infection)**:
  o Deep infection without abscess formation can be treated by strict rest, elevation, soft tissue support and AB.
  o Occasionally, septicemia calls for admission to hospital and treatment with intravenous antibiotics.
diabetic foot

- Any form of abscess formation needs to be drained urgently and the deeper tissues thoroughly debrided.
- Deep ulcers in certain sites are more problematic than elsewhere. Once an ulcer is healed the use of appropriate insoles and shoes can prevent further ulceration.

**Grade 4 (localized gangrene):**
- Ischaemic changes need the attention of a vascular surgeon who can advise on ways of improving the local blood supply. Arteriography may show that bypass surgery is feasible.
- Dry gangrene of the toe can be allowed to demarcate before local amputation.
- With diabetic gangrene septic arthritis is not uncommon, the entire ray (toe + metatarsal bone) should be amputated.
- In more extensive gangrene partial foot amputation done e.g. through the midtarsal joints (Chopart), through tarsometatarsal joints (Lisfranc), through metatarsal bone, Syme’s amputation

**Grade 5 (Global foot gangrene):**
- Severe occlusive disease with wet gangrene may call for immediate amputation.
- This should be undertaken at a level where there is a realistic chance of the wound healing.

**Treatment of special problems**

- **Ischaemic changes**: need the attention of a vascular surgeon who can advise on ways of improving the local blood supply. Arteriography may show that bypass surgery is feasible.
- **Insufficiency fractures**: should be treated, if possible, without immobilizing the limb; or, if a cast is essential, it should be retained for the shortest possible period.
- **Fixed foot deformities**: corrective surgery should be considered.
- **Neuropathic joint disease**: is a major challenge.
Arthrodesis is fraught with difficulty, not least a very poor union rate, and sometimes is simply not feasible. 'Containment' of the problem in a weight-relieving orthosis may be the best option.