SURGICAL COMPLICATIONS OF DIABETES MELLITUS

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DEFINITION

• Diabetes Mellitus is regarded as a syndrome characterized by chronic hyperglycemia due to relative deficiency of insulin or resistance or both.
# CLINICAL FEATURES OF DIABETES

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Type I</th>
<th>Type II</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age &lt; 30 yr</td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td>Ketosis</td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td>Obesity</td>
<td>No</td>
<td>Yes (90%)</td>
</tr>
<tr>
<td>Family history</td>
<td>Possible</td>
<td>Usual</td>
</tr>
<tr>
<td>Auto antibodies</td>
<td>90%</td>
<td>10%</td>
</tr>
<tr>
<td>Complications</td>
<td>Micro</td>
<td>Macro</td>
</tr>
<tr>
<td>Primary defects</td>
<td>↓ Insulin secretion</td>
<td>↑ Insulin resistance</td>
</tr>
<tr>
<td>Pathogenesis</td>
<td>Auto immune</td>
<td>Heterogenous</td>
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</table>
• Surgical complications of Diabetes are due to:
  • 1) Micro vascular changes involving the capillaries of retina, kidneys, and peripheral nerves
  • 2) Macro vascular changes characterized by atherosclerotic lesions of the coronary and peripheral arterial circulation
  • 3) Diabetic neuropathy
  • 4) Infection in glucose loaded tissue
Surgical complications of Diabetes

The following are the prominent surgical complications:-

• Bacterial infections like abscesses, carbuncles, chronic balanitis, and diabetic foot. Fungal infections like candidiasis, Mucormycosis.

• Emphysematous Cholecystitis, Emphysematous Pyelonephritis, Necrotising fasciitis and Fournier’s gangrene.

• Sexual dysfunctions
Diabetic carbuncle
Carbuncle

• Carbuncle is a group of multiple boils which occurs in diabetic patients over the back, nape of neck and hands. It is an infective gangrene caused by Staph. Aureus.
Carbuncle

An indurated and tender swelling appears which later on becomes suppurated. It may spontaneously breakdown discharging pus and leaving multiple sieve-like openings and ashy grey slough.

- Later the openings coalesce, leaving an excavated ulcer.

Considerable constitutional symptoms occur.
The diabetic foot

• Most feared and devastating complication of diabetes
• Most common cause for leg amputations
• The classic pathological triad of the diabetic foot is vascular disease, neuropathy and infection
The diabetic foot (Continued)

- Wagner’s classification
  - Grade 0: High risk foot. No ulceration
  - Grade 1: Superficial ulceration
  - Grade 2: Deep ulceration penetrating up to tendon, bone or joint
  - Grade 3: Osteomyelitis or deep abscess
  - Grade 4: Localized gangrene
  - Grade 5: Extensive gangrene requiring major amputation
DIABETIC FOOT WITH GANCRENE
DIABETIC FOOT WITH ULCER
DIABETIC FOOT WITH ULCER
DIABETIC FOOT WITH ULCER
The diabetic foot

(Continued)

• **Neuropathic foot**
  
  • Sensory, autonomic and motor neuropathy contribute to the pathogenesis of Neuropathic foot.
  
  • Motor weakness leads to atrophy of the small muscles of the foot with an imbalance between the flexors and extensors. This results in clawing of the toes and prominent metatarsal heads. High foot pressure develops under the metatarsal heads.
  
  • Dry, brittle skin (as a result of autonomic neuropathy) and high foot pressure lead to callus formation. The callus can cause tissue damage and ulceration.

(Continued)
Sural nerve biopsy showing demyelination
The diabetic foot

(Continued)

Classification

1. Neuropathic foot
2. Neuro-ischemic foot
The diabetic foot
Neuropathic foot

(Continued)

• Glycosylation of collagen leads to stiffness of the ligaments resulting in restriction of joint movement, aggravating foot pressure.
• Sensory neuropathy permits continued ambulation despite tissue inflammation or breakdown.
• Neuropathic foot is at risk of ulceration, digital necrosis, fissures, bullae, neuropathic joint and neuropathic edema.
The diabetic foot

Neuro-ischemic foot

- The ischemic foot has absent pulse and cold.
- The vascular problem can be divided into
  - Macrovascular disease associated with generalised atherosclerosis and thrombosis
  - Microvascular disease consisting of occlusion of small arteries and arterioles and thickening of the basement membrane of the capillaries
- The ischemic foot leads to pain at rest, ulceration on the margins of the foot, digital necrosis and gangrene.
The diabetic foot

Infected foot

- Foot has several compartments which intercommunicate. Lack of pain due to neuropathy allows the patient to continue ambulation, facilitating spread of infection from one compartment to another.
- Even a small thorn prick can lead to severe infection and gangrene.
- Presence of infection leads to pressure effects on the neuro-vascular bundle, causing necrosis of tissues.
Diagnosis and assessment of diabetic foot

- Thorough neurological examination to detect sensory, motor or autonomic nerve deficit.
- H/o rest pain, intermittent claudication. Examination of peripheral pulses, capillary filling. Doppler study. Magnetic resonance angiography (MRA). Digital subtraction angiography (DSA)
- Estimation of blood glucose, Hb., urea, creatinine and lipids.
- X-ray to detect osteomyelitis
Management of diabetic foot

- Remove callus. Wound drainage. Give rest to ulcer by immobilization, application of plaster cast.
- Give plantar metatarsal pads under pressure points to redistribute weight.
- New developments are use of Platelet Derived Growth Factor (PDGF) and human fibroblasts for wound coverage.
Management of diabetic foot

(Continued)

• Infections are treated by wound debridement, institution of proper antibiotic, multiple insulin injections to achieve good control of blood glucose.

• Exercise, cessation of smoking. Use drugs like pentoxyphylline, aspirin, and thrombolytic agents to improve blood supply.

• Angioplasty, bypass, stenting, atherectomy and laser ablation of atherosclerotic plaque.
Management of diabetic foot

(Continued)

• Attempt to convert wet gangrene to a dry one by repeated dressings and proper antibiotics.

• Once gangrene sets in, decide for amputation.
Management of diabetic foot

(Continued)

• Prevention
  • Proper foot care, wearing of correct footwear, regular foot inspection, avoid walking bare foot.
  • Avoid using worn out footwear.
  • Surveillance of high risk patients.
  • Ensure good cushioned footwear.
Special problems in diabetic patients

• Diabetic patients with ketoacidosis may present with acute abdominal pain
• Diabetic neuropathy can cause gastric paresis and aspiration. Urinary retention can occur necessitating catheterization.
• Cardiac autonomic neuropathy can cause arrhythmias and cardiac arrest.
Surgery in diabetic patients

- Diabetic patients are prone to develop sudden hyperglycemia or hypoglycemia during surgery. So, frequent monitoring of blood glucose is necessary.
- Short acting insulin is given I.V. during surgery and in the immediate postoperative period.
- They are admitted a few days ahead of surgery.
- Oral hypoglycemic drugs are stopped a few days before major surgery and insulin is started, to bring about better control of blood sugar. Insulin is continued for a few days in the postoperative period also.
- They are prone for cardiac arrest, thromboembolism and cerebrovascular accidents.
- Wound healing is likely to be poor and prolonged.
Arteriogram showing stenosis of right common iliac artery
Hallux Valgus

(b) Appearance of the feet with hallux valgus. A bunion is present.
X-ray of foot showing Hallux Valgus
Duplex scan showing a thrombus in the brachial artery
Neuropathic joints in a diabetic foot
Arteriogram showing block in the right superficial femoral artery
MRA showing segmental block in the right CI and a stenosis close to