SURGERY FOR DENTISTS

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Formulating a diagnosis

Surgical diagnosis

- Correlating signs and symptoms
- Targeting investigations and interventions



Surgical diagnosis



Surgical diagnosis





Causes of surgical disorders

(NAÏVE MD DICT)

- Neoplasia
- Autoimmune
- Infection, Inflammatory
- Vascular
- Environment, toxin exposure
- Metabolic
- Drugs
- Degenerative
- Iatrogenic
- Congenital / developmental
- Trauma

Neoplasia

Benign neoplasia



Malignant neoplasia



Autoimmune

- Sjogren's syndrome



Inflammation

- Inflammatory processes often stem from *infection*
- Inflammation also result from *physical irritation* e.g. noxious chemicals





Infection

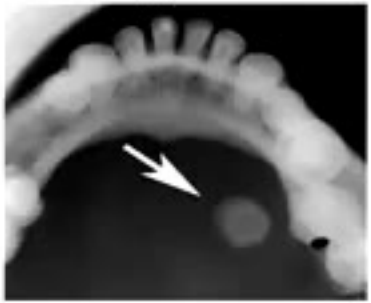
- Bacterial diffuse through the dentinal tubules toward the pulp and evoke inflammatory changes resulting in pulpitis and pulp necrosis
- Bacteria from the pulp spreads into periapical tissues and soft tissues and bones of the face and neck





Inflammatory conditions of salivary glands

- Aetiology – calculus, viral, bacteria infection









A-V malformation



Cutaneous SCC from sun damage





Oral cancer

- Oral SCC associated with smoking and alcohol excess



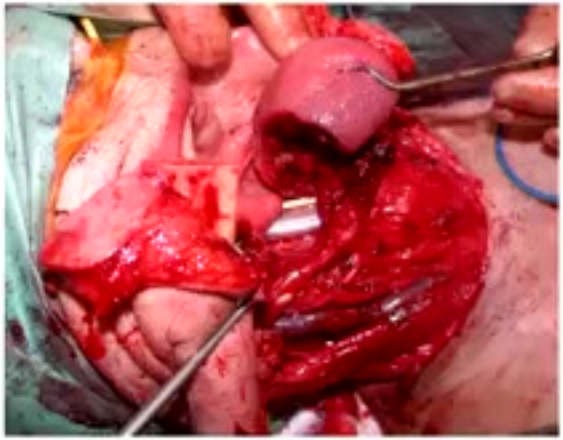
Oral cancer

- Betel nut habit and oral cancer





Surgery and reconstruction for oral SCC





Metabolic disease

- e.g. Diabetes

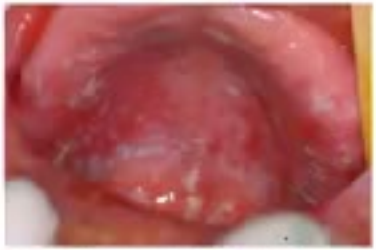




Endocrine disorders

e.g. Diabetes mellitus
- periodontal disease
- candidosis
- dry mouth and increased caries
- glossitis
- burning mouth syndrome
- orofacial dysaesthesia
- poor healing







Drugs

- Phenytoin induced gingival overgrowth



Medication related osteonecrosis



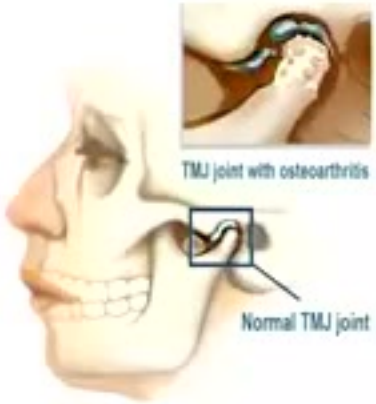
Degenerative disorders

- Osteoporosis



Degenerative disorders

- Osteoarthritis





Iatrogenic causes

- Damage or injury resulting from the action of a health care personnel





Subcutaneous emphysema



(a)



(b)



(c)

Trauma from chemical

- Sodium hypochlorite solution commonly used in root canal treatments
- Strongly alkaline with pH 11 to 13
- Complications of accidental spillage are damage to clothing, damage to eye, damage to skin and damage to oral mucosa
- Complications from hypochlorite extrusion into peri-radicular soft tissue include chemical burns and tissue necrosis and neurological complications like anaesthesia or paraesthesia
- Using sodium hypochlorite for root canal irrigation without adequate isolation of the tooth can lead to leakage of the solution into the oral cavity and ingestion or inhalation by the patient, resulting in throat irritation and in severe cases, upper airway compromise

Congenital

- Birth defects of the face or head
- Cleft lip and palate are among the most common of all birth defects. Others are very rare
- Mostly affect how a person's face or head looks. These conditions may also affect other parts of the body.
- Treatment depends on the type of problem
- Reconstructive surgery may help the person's appearance

Congenital

- Cleft lip occurs 1 in 750 live births, cleft palate 1 in every 2000
- Half the cleft lip also have a cleft palate
- 10% patients with cleft have other malformation



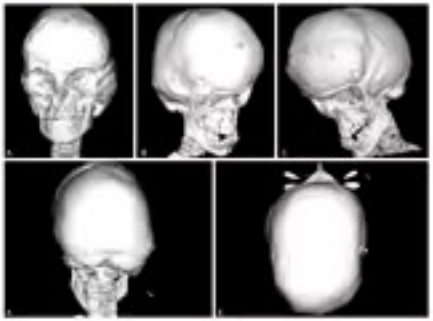


Craniofacial abnormalities



Craniofacial abnormalities







Craniofacial abnormalities







Craniofacial abnormalities



Craniofacial abnormalities



Orthognathic surgery







Anomalies of growth / Developmental

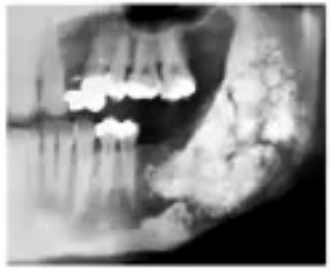
Supernumerary teeth





Complex and compound odontome





Pre-prosthetic surgery

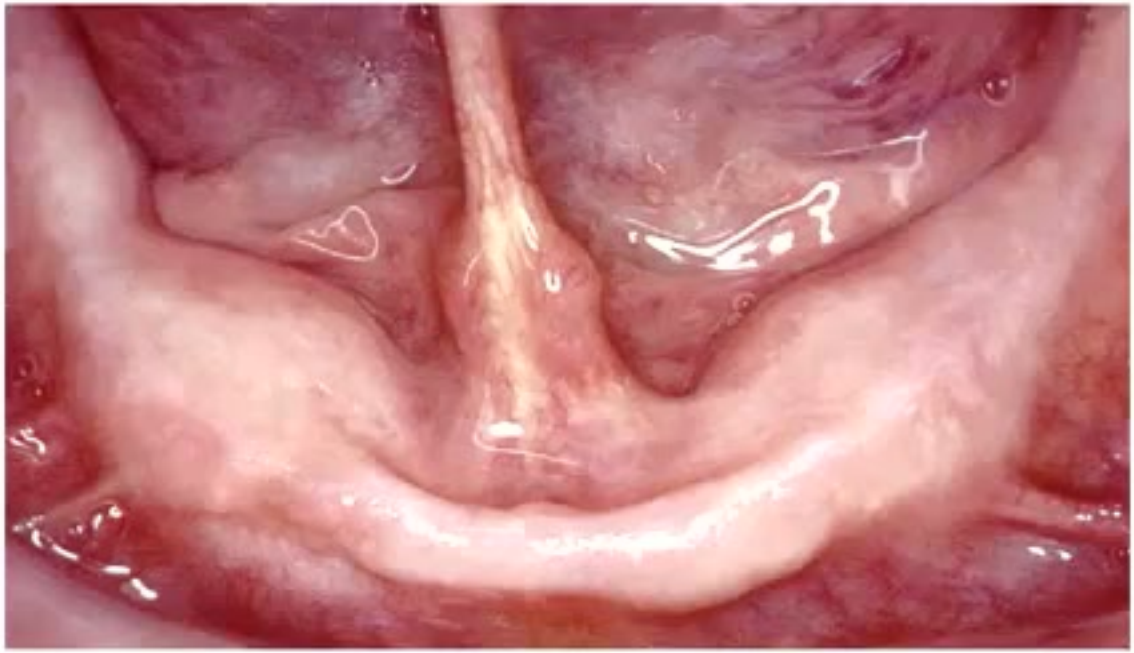


Figure 7 Top: mandibular arc on both sides in an edentulous patient without alterations in shape and volume

Pre-prosthetic surgery



Pre-prosthetic surgery



Trauma

Dentoalveolar trauma



Maxillofacial trauma



Pre-prosthetic surgery



Pre-prosthetic surgery



Pre-prosthetic surgery



Pre-prosthetic surgery

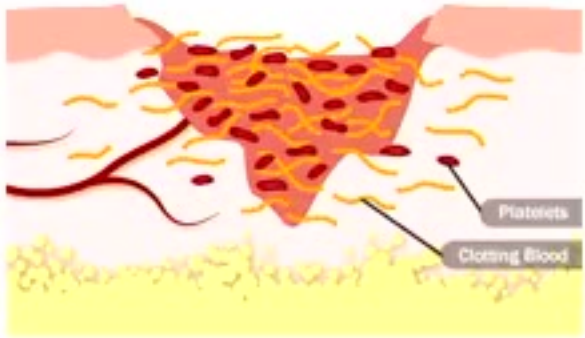


Pre-prosthetic surgery



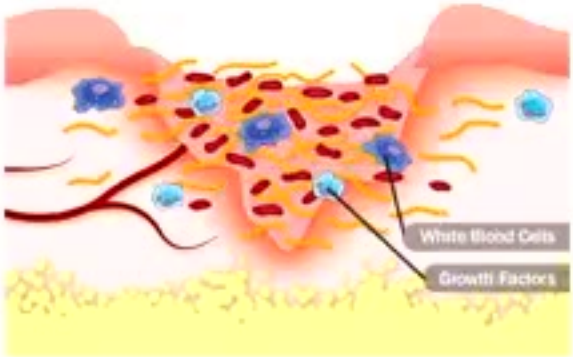
Stage 1: Bleeding stops

- Blood vessels contract
- Platelets migrate to wound
- Clot forms in seconds to minutes
- Clotting also helps close and heal the wound



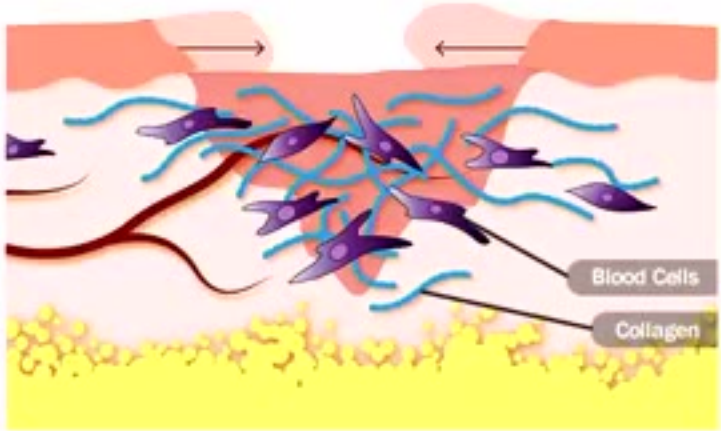
Stage 2 : Inflammation

- Kinins released
- White blood cells migrate to wound to remove bacteria
- Growth factors released to help repair



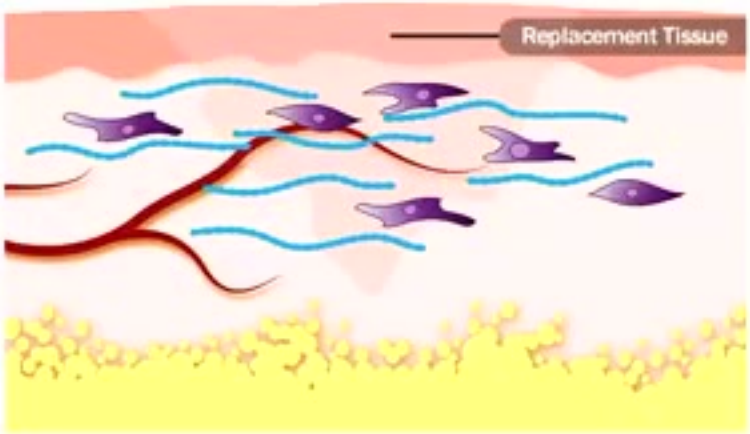
Stage 3: Rebuilding (growth and proliferation)

- Oxygen and nutrients carried to wound site to heal and grow new blood vessels
- Collagen laid down

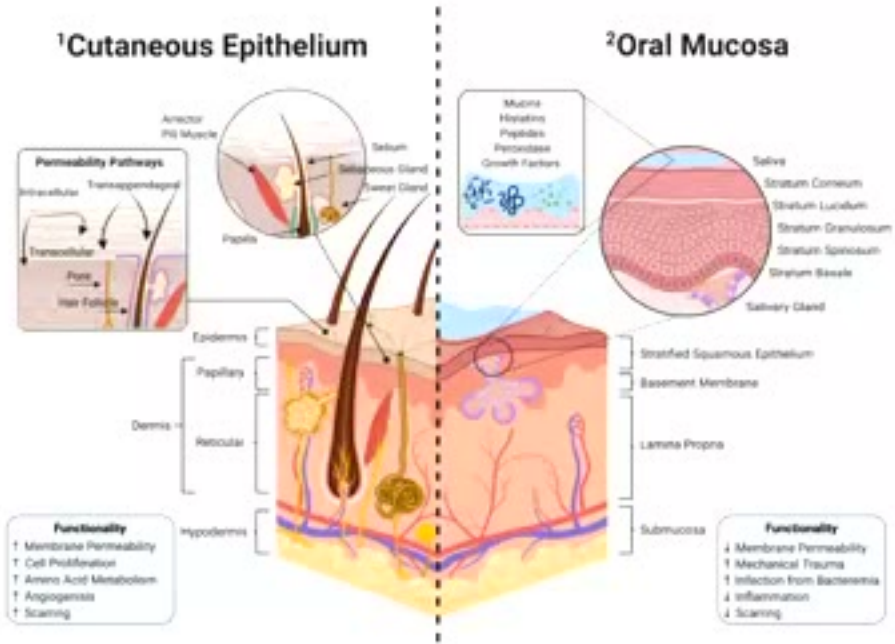


Stage 4: Maturation

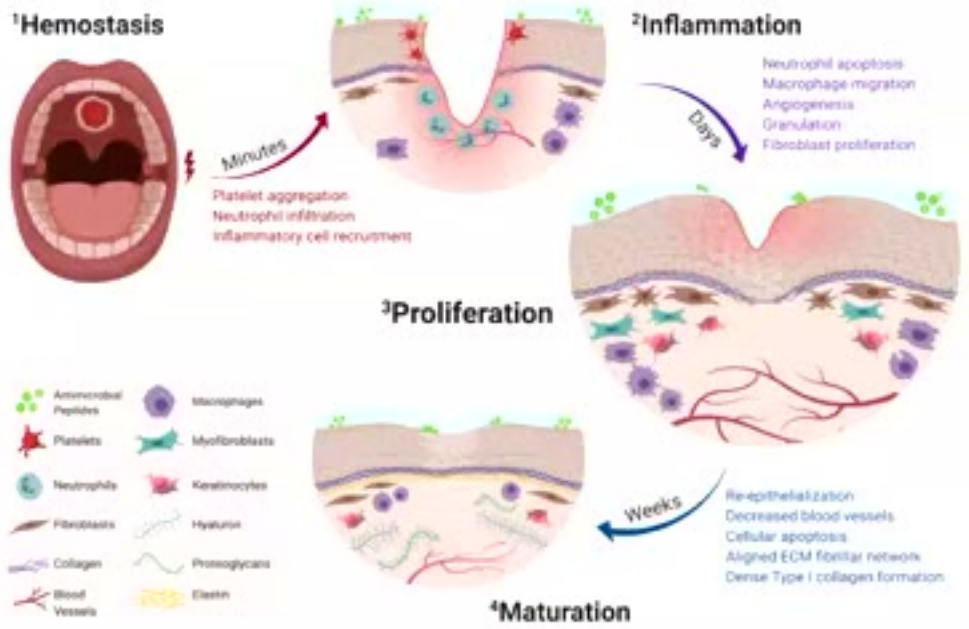
- Replacement tissue takes hold
- Healing can take days, months, even years



Cutaneous epithelium versus oral mucosa



Oral wound healing



Oral mucosa healing

- Mucosa re-epitheliazed within 2 weeks, but the regeneration of the lamina propria is incomplete

Metabolic response to injury

Injury →

Shock →

Catabolic phase (1 week) →

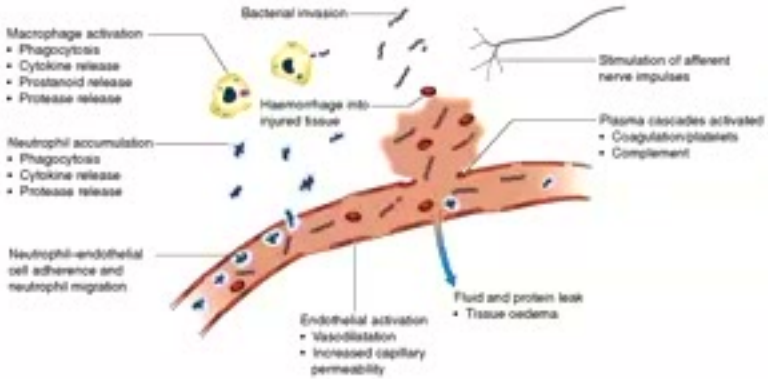
high metabolic rate, breakdown of proteins and fats, negative nitrogen balance and weight loss

Anabolic phase (2 - 4 weeks) →

protein and fat stores are restored and weight gain occurs (positive nitrogen balance)

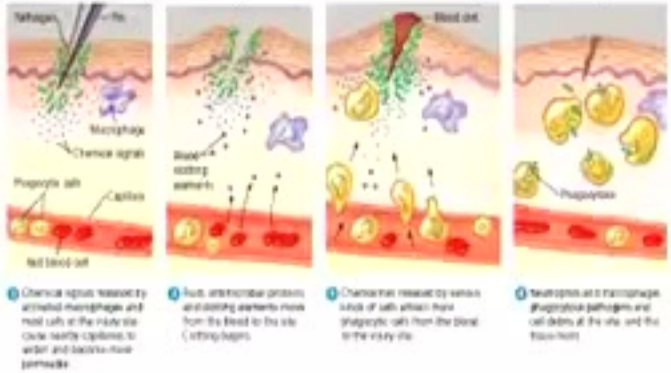
Factors mediating metabolic response to injury

- Acute inflammatory response
- Endothelium and blood vessels
- Neuroendocrine response
- Bacterial infection



Acute inflammatory response

- Injury results in local activation of e.g. macrophages which release cytokines, recruiting macrophages and neutrophils to the site to clear dead tissue and kill bacteria
- Release of cytokines into circulation initiates systemic features e.g. fever (IL-1) and acute phase protein (IL-6)



Acute inflammatory response

- Other pro-inflammatory e.g. prostaglandins, kinins, complement, proteases and free radicals
- Anti-inflammatory e.g. antioxidants, protease inhibitors and IL-10, also released
- Clinical condition of patient depends on extent to which inflammation remains localized and balance between pro- and anti-inflammatory processes

Endothelium and blood vessels

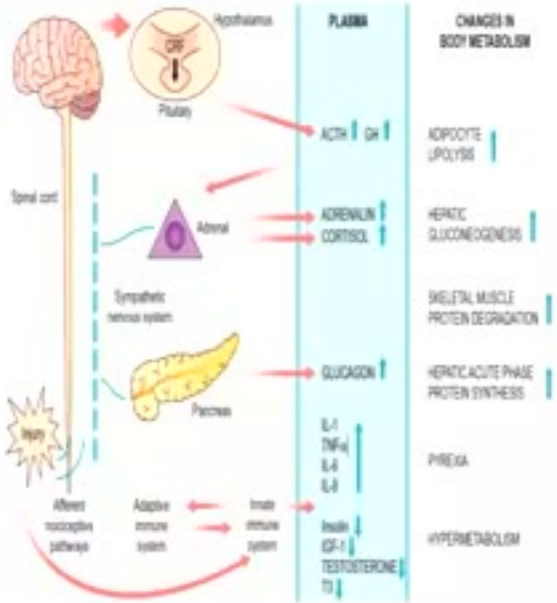
- Expression of adhesion molecules upon endothelium leads to leucocyte adhesion
- Release of kinins, prostaglandins and nitric oxide, leads to vasodilatation and increased local blood flow, and increased capillary permeability leads to delivery of inflammatory cells, oxygen and nutrient substrates which are important for healing
- Oedema results from colloid particles (albumin) leaked into injured tissues
- Exposure of tissue factor promotes coagulation and together with platelet activation, decreases haemorrhage

Afferent nerve impulses and sympathetic activation

- Tissue injury and inflammation leads to impulses in afferent pain fibres that reach the thalamus and mediate metabolic response
- Activation of sympathetic nervous system leads to release of noradrenaline from sympathetic nerve fibre endings and adrenaline from adrenal medulla.
- This results in tachycardia, increased cardiac output, and carbohydrate, fat and protein metabolism

Neuroendocrine response

- Changes in the circulating concentration of hormones following injury, either by direct gland stimulation or feedback mechanisms
- Increased secretion of stress hormones
- Decreased secretion of anabolic hormones



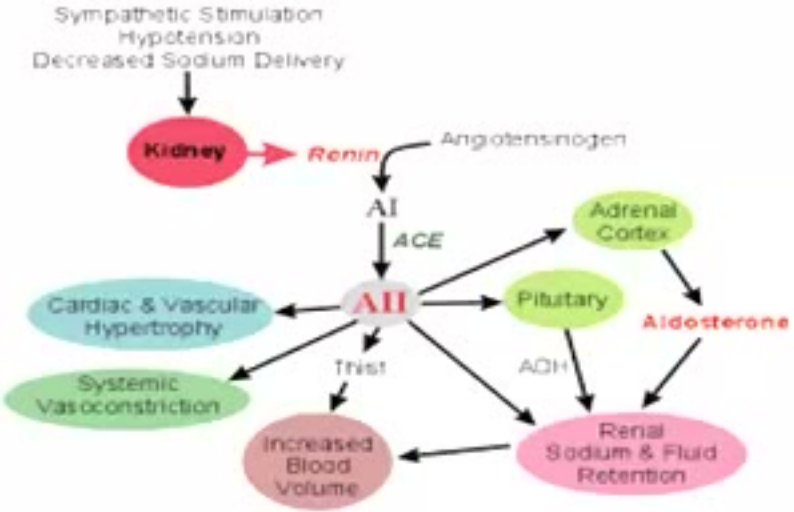
Consequences of metabolic response to injury

- Hypovolaemia
- Increased energy metabolism and substrate cycling
- Catabolism and starvation
- Changes in red blood cell synthesis and coagulation
- Anabolism

I. Hypovolaemia

- Loss of blood, fluid or water
- Sequestration of protein-rich fluid into interstitial space, due to increased vascular permeability
- Decreased circulating volume will reduce oxygen and nutrient delivery and increase healing and recovery time

Renin-angiotensin-aldosterone



II. Increased energy metabolism and substrate cycling

- Energy for physical work, generate heat, meet basal metabolic requirements
- Basal metabolic rate (BMR) = energy required for maintenance of membrane polarization, substrate absorption and utilization, mechanical work of heart and respiratory systems
- Following surgery, overall energy expenditure rise by 50% due to increased generation of heat, fever and BMR

III. Catabolism and starvation

Catabolism

- Breakdown of complex substances to glucose, amino acids and fatty acids
- Mediated by increase in catecholamines and cytokines and hormones
- Total energy expenditure increased in proportion to injury severity
- Reduction in fat and muscle mass until stimulus for catabolism ends

Starvation

- Occurs when intake less than metabolic demand
- Acute starvation
- Chronic starvation

Factors associated with magnitude of metabolic response to injury

Patient factors

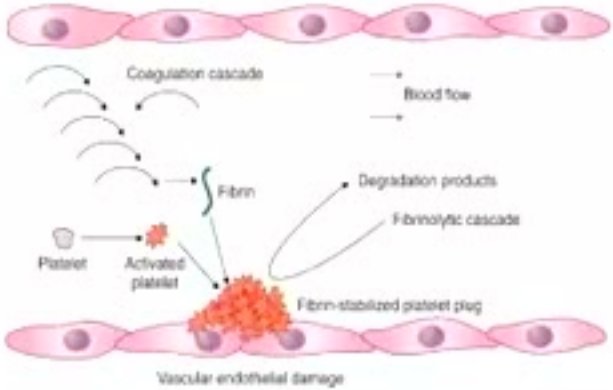
- Genetic predisposition
- Coexisting disease
- Drugs
- Nutritional status

Trauma factors

- Severity
- Nature
- Ischaemia-reperfusion
- Temperature
- Infection
- Anaesthetic techniques

IV. Changes in red blood cells synthesis and coagulation

- Anaemia common after major surgery or trauma
- Following tissue injury, blood hypercoagulable and increase risk of thromboembolism



V. Anabolism

- Anabolism
  - regaining weight
  - restoring skeletal muscle mass
  - replenishing fat stores
- Hormones include insulin, growth hormone, insulin-like growth factors and androgens

Effects of surgery

- Stress response to surgery – release of ADH and catecholamines and activation of renin-angiotensin system, resulting in oliguria and water retention
- Potassium released by damaged tissues. If renal perfusion is poor and urine output poor, potassium not excreted and accumulate. Resultant hyperkalaemia causes arrhythmias

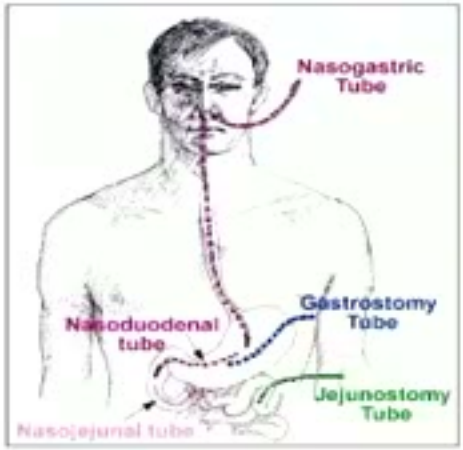
Effects of surgery

- Majority of patient require fluid replacement for brief period postoperatively until normal diet resumed
- In severely ill patients and those with impaired gastrointestinal function, long-term nutritional support necessary

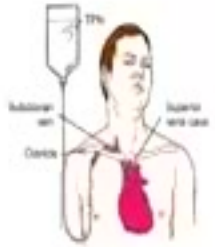


Nutritional support

Enteral feeding



Total parenteral nutrition





Infections and antibiotics

- When normal defences e.g. skin breached, commensals can cause infection
- Infection = proliferation of micro-organisms in body tissue with adverse physiological consequences
- Factors important in development of infection

1. Host defence system-physical barriers, antagonism by commensals, antibacterial substances, immune state, acquired immunity, innate immunity
2. Bacterial factors-virulence, inoculum, growth rate
3. Insults-foreign body, necrosis, ischemia, haematoma

Preventing infection

- Minimize risks to patients and staff from infections acquired during or after surgery

-Aseptic technique

-Hand decontamination

-Personal protective equipment (PPE)

-Skin preparation

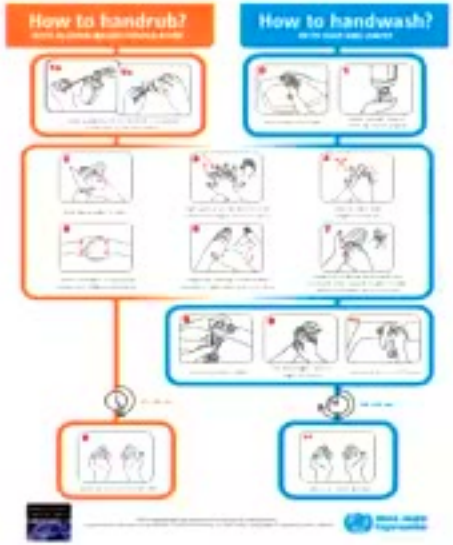
-Surgical instruments

Aseptic technique

- Specific practices immediately before and during surgery to reduce postoperative infection
  - Hand washing
  - Surgical scrub
  - Skin preparation of patient
  - Maintaining sterile field
  - Safe operating practices



Hand decontamination





Personal protective equipment

- Cap
- Face mask
- Eye protection
- Sterile gown and gloves



Skin preparation

- Antiseptics e.g. chlorhexidine or povidone-iodine applied to surgical site prior to incision reduce number of resident organisms and risks of wound infection



Surgical instruments

- Prevent cross-infection
- Surgical instruments are washed in washer disinfectors to remove organic matter and kill most micro-organisms except spores
- Instruments then packed and autoclaved to destroy any remaining micro-organisms and spores



Prophylactic use of antibiotics

- Timing and dose
- Choice of antibiotic
- Carriage of resistant organisms and prophylaxis
- Prophylaxis for immunosuppressed patients

Prophylactic antibiotics

- Antibiotic prophylaxis aims to prevent infection by achieving high concentrations of antibiotic during surgery
- Choice of antibiotic must cover likely pathogens
- Single dose of antibiotics usually adequate for prophylaxis
- In patients with multi-resistant bacteria (e.g. carriage of MRSA or ESBL-producing E. coli) or patients who are immunocompromised, the antibiotic choice may need to be modified and expert advice sought

Prophylactic use of antibiotics in dental surgery

- Low risk of wound infection balanced against risk of adverse effects and risk of developing resistant organisms
- Most dentoalveolar procedure in fit immunocompetent patients, antibiotic prophylaxis not required
- Consider antibiotic prophylaxis for
  - Maxillofacial surgery
  - Surgery in patient with recurrent infections
  - Dentoalveolar surgery in immunocompromised patients
- *There is limited evidence supporting the efficacy of commonly used antibiotics in preventing complications after lower third molar removal*

Principles of use of antibiotics

- **M**icrobiology guides therapy
- **I**ndications should be evidence-based
- **N**arrowest spectrum required
- **D**osage appropriate to site and type of infection
- **M**inimise duration of therapy
- **E**nsure monotherapy in most situations

Postoperative care

- Clinical assessment and monitoring - assess patient's colour, pulse, blood pressure, respiratory rate, oxygen saturation, level of consciousness
- Respiratory management – maintenance of airway and adequate ventilation
- Cardiovascular management – monitor for blood loss
- Fluid, electrolyte and renal management
- Control of sepsis
- Nutrition

Day surgery

- Surgical procedure performed on a day-case basis
- Well-defined and streamlined pathway
- Minimizes risk of hospital acquired infection
- Reduces risk of venous thromboembolism
- Economic benefit
- Maximize surgical throughput
- Criteria based pre-assessment reduce unnecessary investigations
- Protocol-based discharge with comprehensive patient information reduces unplanned hospital readmissions

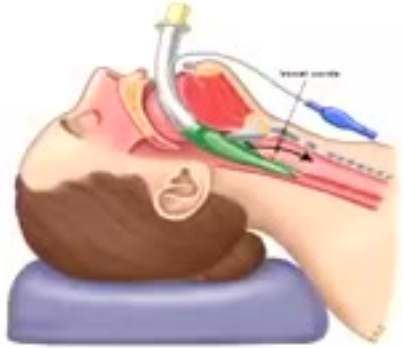
Day surgery

- Efficient and safe
- Only specified patients accepted for operation
- Body Mass Index (BMI) = kg/m2
- Obese if BMI > 30
- Risks of obesity include morbidities of diabetes and obstructive sleep apnoea
- Anaesthesiologists' Physical Status Classification System (ASA status). Day units accept ASA I (normal healthy) and ASA II (mild systemic disease e.g. well controlled non-insulin dependent diabetes, mild hypertension, epilepsy or asthma)

Day surgery

- Laryngeal mask airway





Day surgery

- Admission for surgery
- Anaesthesia
- Analgesia
- Recovery
- Discharge criteria

