



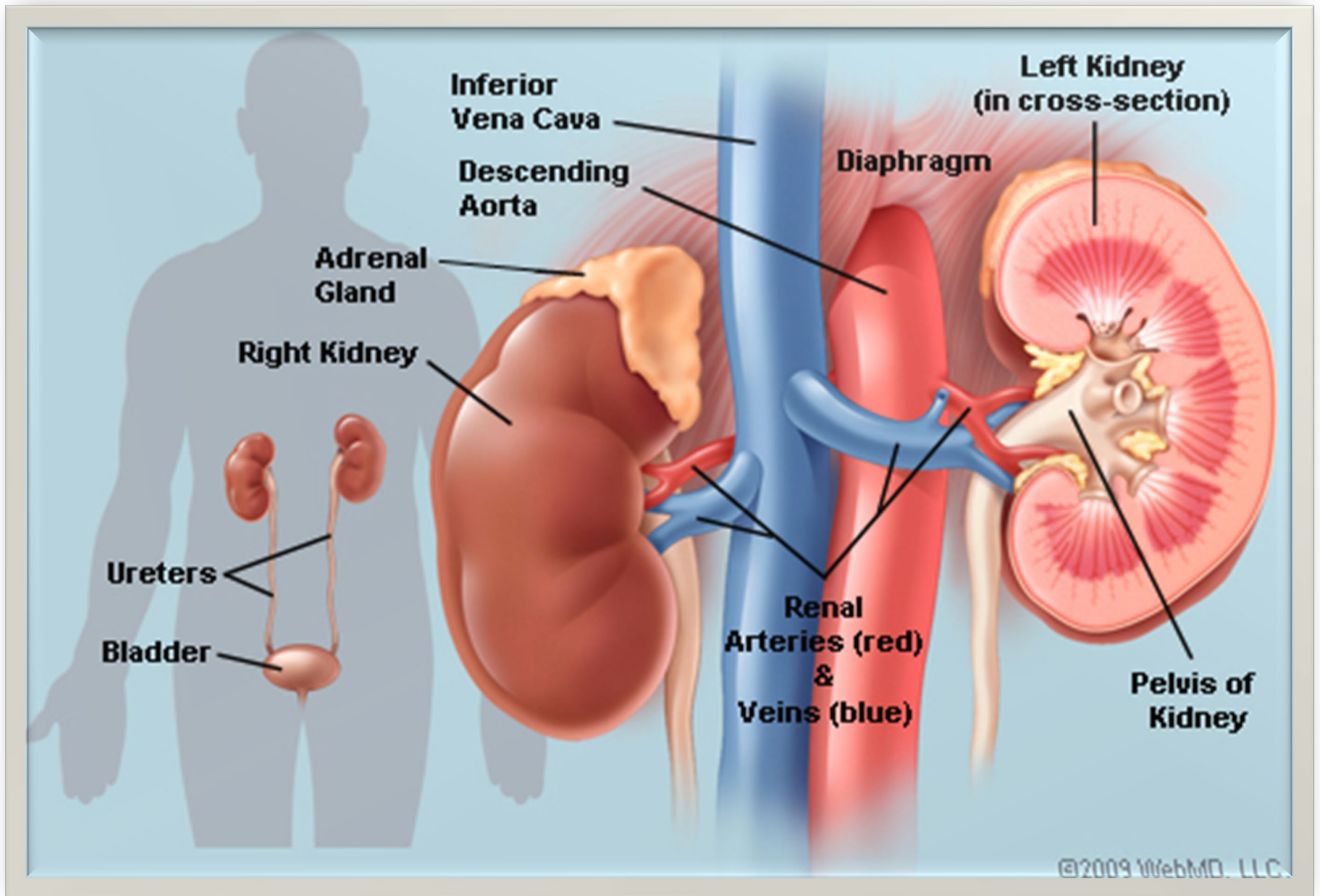
Oral Health Centre
of Western Australia

Renal disease and nutritional deficiencies

Bobby Joseph
Associate Professor
2026

Learning objectives

- To be familiar with the oral manifestations of chronic renal failure
- To understand the dental management of renal patients undergoing dialysis
- To know the oral complications of renal transplant
- To understand the significance of nutrition in maintaining oral health and the integrity of the oral mucous membrane



Functions of kidney

- Elimination of waste products, particularly urea
- Excretion of metabolites and drugs
- Regulation of blood volume and electrolyte concentration
- Regulation of RBC production in the bone marrow by secreting erythropoietin
- Participation in calcium homeostasis and synthesize vitamin D, renin and prostaglandins

Renal disease

- Renal disease is of great significance in general dental practice
- Dental management needs to be modified to prevent complications
- Oral changes occur
 - Chronic renal failure
 - Result of medical management

Renal disorders

- Patients with kidney disorders are seen in dental practice due to improvements in medical care leading to prolonged life expectancy
- Essential to have a working knowledge on renal disorders to provide appropriate and safe dental care
- Oral changes as a result of chronic renal failure
- Dental management modified to prevent complications

Dental aspects of renal diseases

- Renal function
- Chronic renal failure: oral manifestations
- Renal patient undergoing dialysis: dental management
- Renal transplant patients: oral complications

Points of relevance in the history of a patient with a renal disorder

- History of diabetes mellitus
- Chronic renal failure (CRF)
- Related bony disorders
- Anaemia
- Dialysis
 - type
 - how often
 - presence of A-V fistula
- Transplant
 - when
 - associated medication including steroids
- Susceptibility to infections/recent history of repeated infection (dental or generalised)

Chronic renal failure (CRF)

- Progressive kidney damage
- **Early CRF:** patient notice a need to urinate frequently at night (nocturia)
- Notice uncharacteristically poor appetite
- **Adult CRF** leads to hypertension and uraemia
- CRF can affect diverse body systems

Chronic renal failure

- Irreversible deterioration in renal function
- Plasma creatinine persistently exceeds
300 $\mu\text{mol/l}$ (*normal range 80-120 $\mu\text{mol/l}$*)
- Low glomerular filtration rate persisting over 3
months (normal 120ml/min)

Clinical features of chronic renal failure: a systemic approach

■ **Cardiovascular**

- Hypertension
- Congestive cardiac failure
- Atheroma

■ **Gastrointestinal**

- Anorexia, nausea, vomiting
- Peptic ulcer

■ **Neurological**

- Lassitude
- Headaches
- Tremor
- Sensory disturbances

■ **Dermatological**

Itching

Hyperpigmentation

■ **Haematological/Immunological**

Bleeding tendency

Anaemia

Susceptibility to infection

■ **Metabolic “Uraemia”**

Thirst

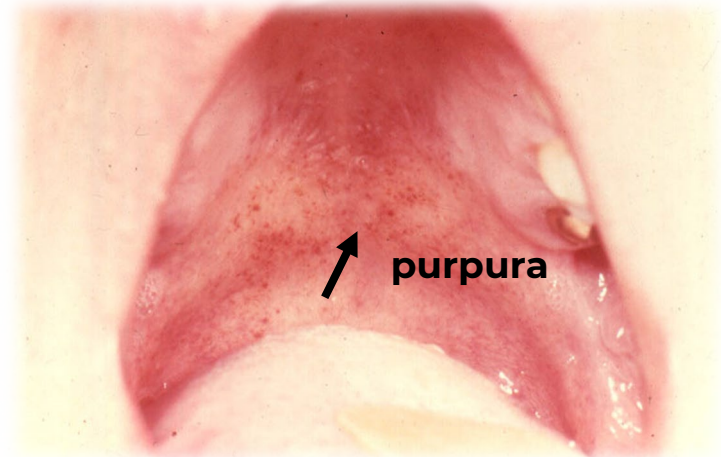
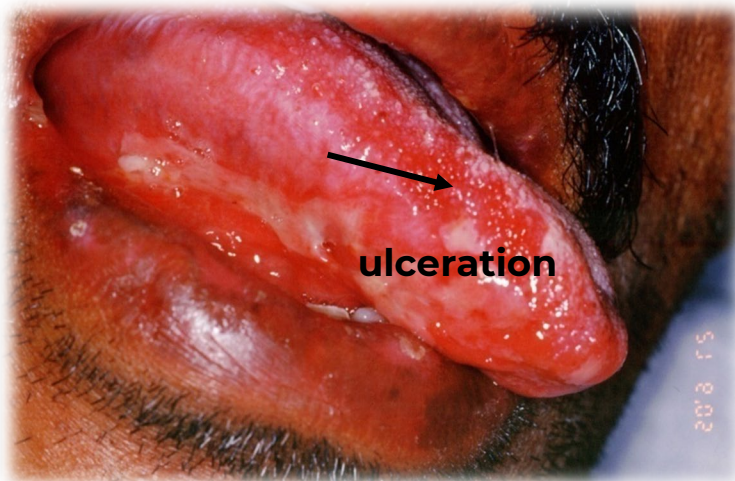
Nocturia/polyuria

Electrolyte disturbances

Secondary hyperparathyroidism

Oral manifestations of CRF

- Dry mouth
- Mucosal ulceration
- Bacterial & fungal plaques
- Pallour of the mucosa
- Oral purpura
- Giant cell lesions (osteolytic lesions in jaws)
- White plaques (uraemic stomatitis)



Uraemia

- Presence of excessive amounts of urea, nitrogenous waste compounds in the blood
- Causes kidney failure
- Results in nausea, vomiting, lethargy, drowsiness
- Treatment may require haemodialysis

Uraemic stomatitis

- Due to markedly elevated levels of urea and other nitrogenous wastes in the blood stream
- Clinically seen as white plaques on the buccal mucosa, floor of mouth and tongue
- Pain and unpleasant taste and burning sensation in the mouth
- Odour of ammonia or urine in the patient's breath
- Clinical appearance can mimic oral hairy leukoplakia

Types of uraemic stomatitis

1. Ulcerative

2. Haemorrhagic

3. Non-ulcerative, pseudomembranous

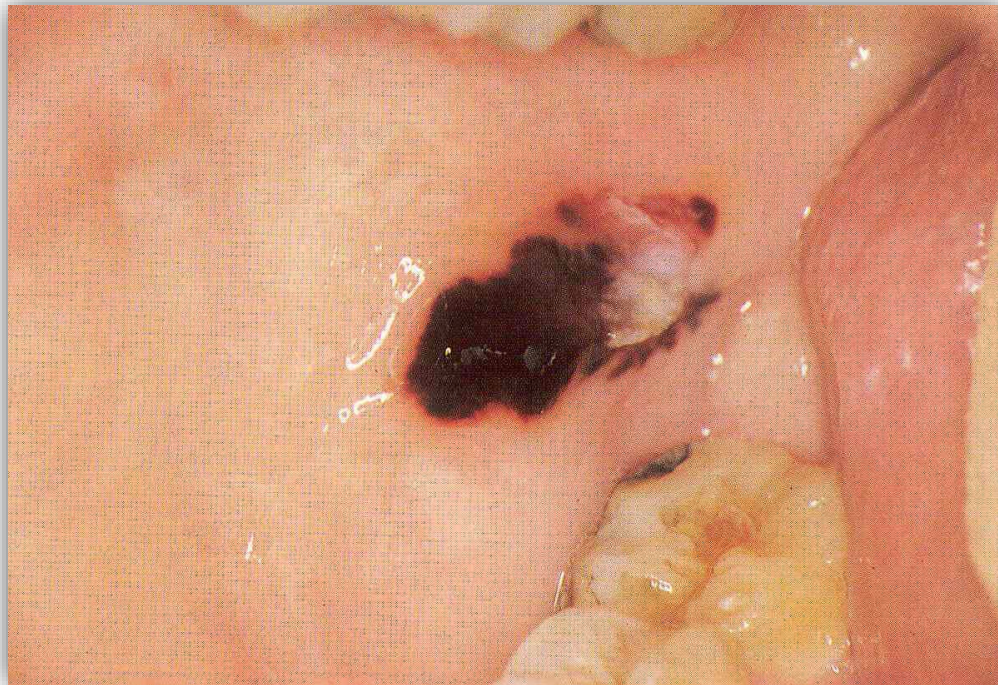
4. Hyperkeratotic

} White lesions

Uraemic stomatitis

Ulcerative

Painful superficial ulcers covered by a pseudomembrane



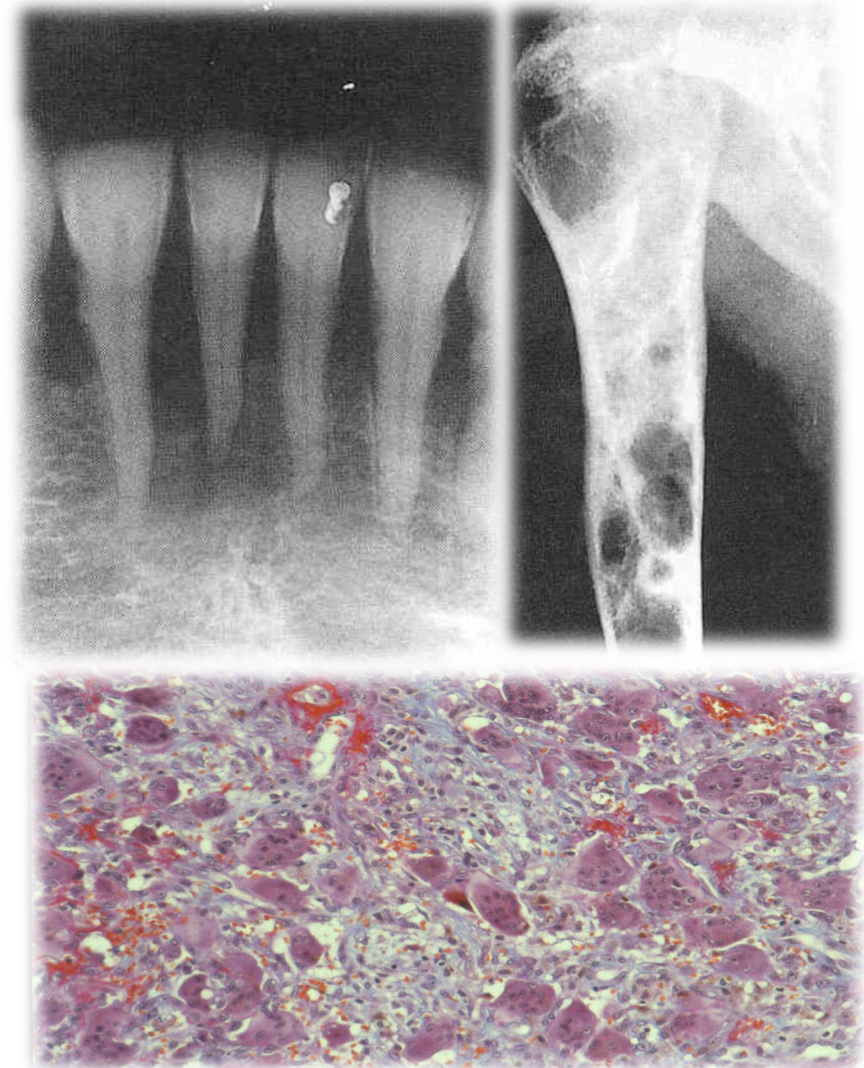
Non-ulcerative

Painful diffuse oedematous erythema and thick greyish pseudomembrane



Osseous lesions

- Loss of lamina dura
- Osteoporosis
- Osteolytic areas (renal osteodystrophy)
- Secondary hyperparathyroidism
- Abnormal bone repair after extractions
- Renal disease patients screened for bone disease before implant placement



Orofacial features of renal osteodystrophy: tooth and periodontium

- Delayed eruption
- Enamel hypoplasia
- Loss of lamina dura
- Widening of the periodontal ligament
- Severe periodontal destruction
- Tooth mobility
- Drifting
- Pulp calcifications
- Pulp narrowing

Dialysis

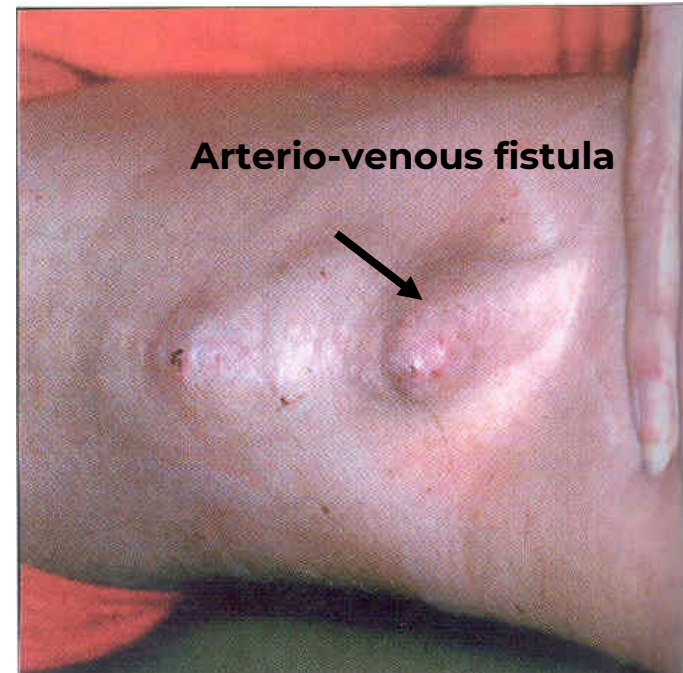
- Remove metabolites by exposing the patient's blood across a semi-permeable membrane to a hypotonic solution
- Essential if renal function worsens to end-stage renal disease (ESRD)

Dialysis

- Haemodialysis >arteriovenous shunt necessary
- Continuous ambulatory peritoneal dialysis (CAPD) >no hospitalization required
- Continuous cyclic peritoneal dialysis(CCPD) >machine does the exchanges at night

Dental management of haemodialysed patients: some important considerations

- ❑ Impaired excretion of drugs by kidney
- ❑ Bleeding tendency
- ❑ Heparinization prior to dialysis
- ❑ A-V shunts susceptible to infection
- ❑ Anaemia
- ❑ Increased carriage of Hepatitis B & C
- ❑ Hypertension





The optimum time for renal patients to undergo dental procedures is 12-24 hours post-haemodialysis

Renal transplant patients

- Side-effects of immunosuppressive regimes
- Pose a no: of dental & management problems
- Cyclosporin : A nephrotoxic drug!!!
- Nifedipine :hypertension in renal patients

Oral complications of renal transplantation

- Drug induced gingival overgrowth
- Bacterial & fungal plaques
- Increased incidence of oral malignancy (cyclosporin) reported
- Oral candidosis
- Herpes simplex infections (secondary)



Gingival overgrowth



Carcinoma of gingiva



Herpes simplex



Oral candidosis

Immunosuppressive therapy

1. Cyclosporin
2. Combined cyclosporin and nifedipine
3. Tacrolimus-less gingival enlargement?
4. Corticosteroids

Disorders related to immunosuppression

- Lymphoma
- Skin cancers
- Hairy leukoplakia
- Leukoplakia
- Kaposi's sarcoma



Prescribing for patients with renal disease

- Many drugs prescribed by dentists are excreted by kidneys
- Failure to excrete drug or metabolites lead to toxicity
- Nephrotoxic drugs should be avoided *e.g.* gentamycin
- Drugs may require dose reduction

Drug

Caution

Antibiotics

Amoxicillin, ampicillin

Reduce dose, rash more common

Erythromycin

Contraindicated in patients who had kidney transplant

Tetracyclines

Avoid; use of doxycycline or minocycline if necessary (avoid excessive doses)

Doxycycline increases plasma-cyclosporin concentration

Antifungals

Amphotericin
Fluconazole
Miconazole

Increases plasma-cyclosporin concentration

Antiviral

Acyclovir

Reduce dose

Drug

Caution

Analgesics

Aspirin

Avoid (sodium, water retention; deterioration in renal function; risk of gastric hemorrhage)

Ibuprofen, diflunisal

Avoid if possible/use lowest effective dose, monitor renal function

Dihydrocodeine, pethidine

Reduce dose/ avoid (increased and prolonged effect, increased cerebral sensitivity)

Other Drugs

Carbamazepine

Reduces plasma-cyclosporin concentration

Nitrazepam, temazepam

Start with small doses (increased cerebral sensitivity)

Povidone-iodine

Avoid regular application to inflamed or broken mucosa

Ephedrine

Avoid (CNS toxicity)

Autosomal dominant polycystic kidney disease (ADPKD)

- Common genetic disease- 1 in every 800 people
- Mostly teenagers & young adults affected
- Kidneys enlarge, fill up the abdomen
- Lumbar pain, haematuria, hypertension
- High levels of circulating ammonia
- Breath smells of urine
- Treatment: dialysis or renal transplantation



Kidney tumours



Wilms' tumour

- Common in children
- Age 1-4 years
- 6-7% of all childhood cancers
- Mutation of WT 1 gene

Renal cell carcinoma

- 85% of all malignancies
- Incidental mass
- No symptoms
- Haematuria
- Abdominal pain
- Smokers increased risk

Case-study

A 45-year-old male patient with a history of chronic renal failure presents with severe toothache. He undergoes regular haemodialysis. He looks very tired and has come directly from the renal dialysis unit. O/E there is a grossly carious maxillary first molar that requires extraction. There is no associated soft tissue swelling but you notice white plaques on the tongue and buccal mucosa. These do not wipe off and the patient reports that 'they come and go'.

1. How would you manage the dental extraction of this patient?
2. What is the most likely diagnosis of the white plaques on the patient's oral mucosa?

Answers

Q1. Extraction carried out at least 12 hrs post haemodialysis

Recent FBC to exclude thrombocytopenia

Established protocol for preoperative antibiotic prophylaxis? If there is none consult renal unit

Routine LA must be employed

Suture the wound, insert haemostatic gauze and check there is no postoperative bleeding

Patient may have tendency to bleed after extraction

Q2. White plaques likely to be uraemic stomatitis

No treatment required

If the plaques rub off –candida > Antifungal agent: fluconazole

Culture and sensitivity of microorganisms indicate the therapy of choice

1. Renal patients may have impaired drug excretion. Drugs used in dental sedation and GA should be used with caution and in consultation with a physician
2. Renal disease influences the use of NSAIDs and some antimicrobials in dentistry
3. Bleeding tendency due to platelet dysfunction
4. Dental treatment should be carried out on the day after dialysis
5. The surgically created arterio-venous fistula **should not** be used for venepuncture by the dentist
6. Kidney transplant patients may need corticosteroid cover
7. Bleeding tendency if anticoagulated
8. Gingival hyperplasia if taking cyclosporin
9. Prone to infection due to immunosuppression



Summary

Nutritional deficiencies

- Nutrition is defined by the W.H.O as “intake of food considered in relation to the body’s dietary needs”
- Malnutrition can significantly affect oral health
- Poor oral health in turn can result in malnutrition
- Dietary recommendation for intake both macro and micronutrients differ for the population sub-type
- Nutritional deficiencies can lead to
 - Disease progression through altered tissue homeostasis
 - Reduced resistance to microbial biofilm
 - Decrease in tissue healing

The effects of vitamin deficiencies

Vitamin deficiencies	Systemic effects	Oral effects
Vitamin A	Night blindness Xerophthalmia	Decreases epithelial tissue development; may contribute to leukoplakia/cancer
Vitamin B1 (Thiamine)	Neuritis, cardiac failure	Cracked lips?
Vitamin B2 (Riboflavin)	Dermatitis	Angular stomatitis, glossitis
Vitamin B3 (Niacin)	Dermatitis, CNS disease	Glossitis, stomatitis and gingivitis
Vitamin B12	Pernicious anaemia	Glossitis, aphthae
Folic acid	Macrocytic anaemia	Glossitis, aphthae
Vitamin C	Scurvy (purpura, delayed wound healing, bone lesions in children)	Gingival swelling and bleeding
Vitamin D	Rickets	Hypocalcification of teeth

Vitamin A

- Nutrient important for vision, growth, cell division, reproduction and immunity
- Has antioxidant properties
- Found in many foods such as, spinach, dairy products, liver
- Other sources of food rich in beta-carotene (green leafy vegetables, carrots)
- What the research says:
 - Acne (large doses no effect)
 - Macular degeneration (reduce risk by 25%)
 - Cancer (lung, prostate unclear)
 - Measles(reduce death)

Vitamin A deficiency

- Severe effects on secretory epithelium (rats)
- Columnar cells become squamous and keratinised
- Dental development is severely affected
- No evidence in humans for such changes
- Treatment of keratotic plaques (leukoplakia) with retinoids (Vitamin A derivatives)
- Drugs have toxic side effects
- Epidemiological studies suggested low Vitamin A intake is associated with oral and other cancers

Riboflavin deficiency

- Result from malabsorption syndrome
- In severe cases: angular stomatitis, painful red fissures at the angles of mouth
- Glossitis (tongue becomes magenta in colour and granular)
- Resolution follows after administering riboflavin (5 mg 1 tds)

Nicotinamide deficiency (pellagra)

- Affects the skin, GI tract, nervous system
- Weakness, loss of appetite, changes in mood
- Glossitis
- Tip and lateral margins of tongue, red , swollen
- Dorsum of tongue coated with thick, greyish fir
- Gingival margins are red, swollen, ulcerated

Aetiology of Vit B12 deficiency

- Autoimmune: Pernicious anemia is an autoimmune condition in which antibodies to intrinsic factor are produced
- Malabsorption: Parietal cells in the stomach produce intrinsic factor; therefore, any patient with a history of gastric bypass surgery may be at risk for developing a B12 deficiency
- Dietary Insufficiency: vegans

Folic acid deficiency

- Result from malnutrition, anticonvulsant therapy, pregnancy, alcoholism
- Women advised to take folic acid supplements for reducing risk of neural tube defects
- Also, may reduce risk of orofacial clefts

□ Vitamin B12 and folic acid deficiency

- Glossitis
- Raw beefy tongue



Vitamin D deficiency

- Vitamin D obtained mainly from exposure to sunlight and diet
- Rich source of Vitamin D is fish liver oils
- Causes rickets during skeletal development
- In severe cases induce defective tooth mineralization
- Associated with higher prevalence of periodontitis and gingival inflammation
- Also, may be linked osteonecrosis of jaws
- Linked to oral cancer development?

Vitamin C deficiency

- Scurvy, once common among crews of sailing ships
- Rarely seen today
- Cases still occur in elderly, neglected and younger patients with markedly restricted diet
- Skin manifestations include capillary fragility, spontaneous bruising
- Oral manifestations
 - Friable, swollen, bleeding gingiva
 - Marked false pocketing
 - Mobility of teeth

Iron deficiency

■ Symptoms

- Fatigued, listless and weak
- Short of breath, dizzy and light-headed
- Struggling to concentrate
- Getting infections
- Decreased libido

● Oral findings

- Depapillated atrophic tongue
- Glossodynia (burning sensation)
- Candidiasis/ angular cheilitis
- Aphthous-like ulcers



□ Iron deficiency

- Glossitis
- Smooth, depapillated tongue



Anorexia nervosa

□ Anorexia nervosa

- Food avoidance
- Underweight
- Distorted body image
- Fear of obesity
- Medical conditions: renal failure, liver dysfunction, dehydration, depression
- Patients come to the clinic due to general nutritional deficiencies (stomatitis)
- Parotid gland swelling
- Acid erosion of dental hard tissues

Bulimia

- Affect roughly 2% of young adult women
- Binge eating alternating with self-induced vomiting or purging
- Associated with psychiatric or psychological problems
- Normal body weight
- Frequent vomiting and misuse of laxatives cause potassium depletion
- Hypokalaemia predisposes to myocardial instability
- Oesophageal and dental hard tissue erosions common