

Oral Manifestations of Renal Diseases

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Abstract

Concerning dental therapy, we should bear in mind that patients with nephrotic syndrome are prone to infection and therefore, the endodontic treatment of deciduous teeth and multi-root teeth can show counter-indications. In any case, prophylactic antibiotics protection is a must before invasive dental treatment. Therefore, we should always bear in mind that dental intervention is not to be undertaken in patients with renal insufficiency unless in extreme cases, and this should be done only after consulting either the nephrologist or urologist. Oral cavity is considered as the mirror of systemic health. Chronic renal diseases present with a spectrum of oral manifestation, either due to diseases or its treatment.¹ Changes in bone architecture can be caused by either a high-bone turnover state or a low-bone turnover state.

Keywords: Chronic renal failure, Systemic features, Dental care, Oral manifestation

INTRODUCTION

A patient's renal reserve, or the capacity for structural and functional hypertrophy of surviving nephrons, can counteract to a point at which less than half of renal function remains. Once the destruction is past the point of compensation, patients will begin to experience the signs and symptoms of chronic renal insufficiency (CRI) and, if left untouched, will advance to a state of chronic renal failure (CRF). Eventually, such patients develop end-stage renal disease (ESRD), an irreversible and potentially fatal disorder unless patients go through dialysis or renal transplantation. The kidney counteracts for the damage of nephrons by hypertrophy of the left-over functioning units. This theory, often referred to as the intact nephron hypothesis, maintains that diseased nephrons are destroyed. Normal renal function can be maintained until approximately 50% of the nephrons per kidney are destroyed, at which point aberrant laboratory values and changes in the clinical course occur. This hypothesis is most useful in explaining the orderly pattern of functional adaptation in progressive renal failure.

SYSTEMIC MANIFESTATIONS

The progressive loss of kidney function ultimately results in a clinical syndrome known as uremia, in which failure to adequately perform essential functions leads to the buildup of retained toxins and the development of a numerous prospective problems affecting almost every organ system. Which blend of complications a patient with CRD will develop would depend on the underlying cause of the CRD, the remaining renal function, the success and compliance of treatment, and individual variation.

Two groups of symptoms are present in patients with renal syndrome:

symptoms related to altered regulatory and excretory functions (fluid volume, electrolyte abnormalities, acid-base imbalance, accumulation of nitrogenous waste, and anaemia) and a group of clinical symptoms affecting the cardiovascular, gastrointestinal, hematologic, and other systems.

Metabolic acidosis is a common biochemical disturbance experienced by patients with renal failure. As kidney function diminishes, excretion of hydrogen (H⁺) ions diminishes, leading to systemic acidosis that results in a lower plasma pH and bicarbonate (HCO₃⁻) concentration. Ammonium (NH₄⁺) excretion, decreased because of reduced nephron mass, is the most important factor in the kidney's ability to eliminate H⁺ and regenerate HCO₃⁻.

Kussmaul's breathing, a symptom is a deep sighing respiration aimed at increasing carbon dioxide excretion and reducing the metabolic acidosis. Disturbances in potassium balance are serious sequelae of renal dysfunction since only a limited plasma concentration (normal=3.5 to 5.5 mEq/L) is compatible with life.

CLINICAL SYSTEMIC MANIFESTATIONS

1. Gastrointestinal

Anorexia, nausea and vomiting are frequent and premature manifestations of uremia. 'Uremic fetor', a uriniferous odour to the breath, derives from the breakdown of urea in saliva to ammonia and was related with unpleasant taste sensation. Mucosal ulcerations leading to blood loss can occur at any level of GI tract in the very late stage of chronic renal failure-so-called 'uremic gastroenteritis'.

2. Neuromuscular:

Subtle disturbances of CNS function involving inability to concentrate, drowsiness and insomnia are among the earliest symptoms of uremia. Minor behavioural changes, memory loss and errors in judgment soon follows and are related with signs of neuromuscular irritability, including hiccups, cramps, and fasciculation, and twitching of large muscle groups. Asterixis, myoclonus and chorea are common in terminal uremia, as are stupor, seizures, and coma. Peripheral neuropathy might additionally be a frequent complication of advanced chronic renal failure.

3. Hematological

Normochromic–normocytic anaemia occurs regularly in chronic renal failure and contributes to fatigability and listlessness in these patients. Erythropoiesis may be depressed due to effects of retained toxins on bone marrow and reduced biosynthesis of erythropoietin by the diseased kidney. Hemolysis occurs because of hypertension, retention of waste products, altered body fluid pH and electrolytes composition which create an unsuitable environment for erythrocytes.

4. IMMUNOLOGICAL

Enhanced susceptibility to infection occurs in chronic renal failure due to defect in leukocyte formation and function. Uremic plasma suppresses lymphocyte reactions such as granulocyte dysfunction and suppressed cell-mediated immunity.

5. ENDOCRINE-METABOLIC

Number of hormonal abnormalities including loss of libido in both the sexes, are due to the associated hyperprolactinemia. Thyroid function was diminished. Amenorrhea was common in female.

6. CARDIOVASCULAR:

Hypertension develops in 80–90% of patients during the course of chronic renal failure. The hypertension contributes to the development of cardiomyopathy, atherosclerosis and progression of the renal failure itself. Pericarditis is usual in untreated end-stage renal failure.

7. DERMATOLOGICAL

The skin of the uremic patients may be dried up and there may be ecchymosis as a resultant from bleeding tendencies. In advanced uremia a white, uremic ‘frost’ may evaporate on the skin exterior with a fishy scale odour. The patient frequently complains of brittle nails.

RADIOGRAPHIC MANIFESTATIONS

• The phrase "CRF-associated mineral and bone disorders" involves defects with or with-

out extra skeletal calcification secondary to CRF pathophysiology in bone and mineral metabolism.

• Researchers report that up to 90% of renal patients have oral symptoms such as increased development of calculus, high saliva urea, ammonia-like odour, xerostomia, oral bleeding, and uremic stoma.^{2,3}

• A wide range of bony anomalies has also been reported accounting for 92% of patients with CRF.⁴

• The changes usually observed can be seen as partial or total loss of the lamina dura, calcification of the pulp and blurring of anatomical landmarks. Sometimes, it is possible to see clinically visible jaw enlargement or radiolucent brown tumours and pathological bone remodelling after extraction.^{5,6}

• Radiographic changes in CRF jaw bones are normal and are the product of renal osteodystrophy (ROD), the spectrum of histological changes that occur in CRF patients' bone architecture.

• Variations in bone architecture can be produced by either a high-bone turnover state or a low-bone turnover state.

• Four types of bone phenotypes (ROD) can be diagnosed in CRF patients: Osteitis fibrosa cystica (high-bone turnover with secondary HPT), osteomalacia (low-bone turnover and inadequate mineralization, primarily related to diminished Vitamin D synthesis), adynamic bone disorder (low-bone turnover due to extreme suppression of the parathyroid glands), and mixed osteodystrophy (with elements of both high- and low-bone turnovers).^{6,7}

Figure -1: Chronic renal failure patients with generalised alveolar bone loss and loss of lamina dura

• The clinical and laboratory changes in CRF are mainly related to the kidney's inability to excrete breakdown products of body metabolism leading to increase in serum urea and creatinine levels, and inability to fulfil their endocrine functions leading to defect in calcium metabolism, hyperphosphatemia, hypocalcemia and resultant secondary HPT. These changes also cause various oral manifestations and radiographic findings which

can be one of the diagnostic findings in renal failure patients. Early diagnosis and appropriate management of oral and radiographic manifestations can improve patients' quality of life contributing to their general health.

MANAGEMENT AND DENTAL CONSIDERATIONS OF RENAL DISEASE

Renal osteodystrophy or renal bone disease is one of the most important signs of CKD and may arise in one or several combined forms. Most common orofacial signs of renal osteodystrophy are bone demineralization, lower trabeculation, lowering of the density of the cortical bone, calcifications in soft tissues, radiolucent fibrocystic lesions, and complicated bone healing following extraction. Concerning the teeth and periodontal tissues we can see delayed eruption, enamel hypoplasia, loss of lamina dura, widening of the periodontal space, severe periodontal destruction, tooth mobility, denticles, obliteration of pulp chamber, and giant-cell lesions of the type "brown tumours".⁸

- The immune system of patients is grossly weakened, and consequently, there is greater tendency to infection. Candidiasis and ulcers are common in the oral cavity.
- As a result, excretion of saliva is reduced, XEROSTOMIA. food retention in the mouth is increased and halitosis is an outcome. In extreme cases, stomatitis uremia may develop.
- Forms of B and C hepatitis are frequent, and as a result, there is a bleeding tendency.
- Renal disorders almost invariably cause anaemia because of the kidneys' inability to produce erythropoietin. Fibrosis of marrow and the increased loss of erythrocytes are extra factors which increase the development of the disease. Anaemia leads to fatigue, loss of concentration, tissue hypoxia, and paleness of the oral mucosa.
- Tendency to bleeding is raised due to platelets dysfunction.
- There is also a tendency to hypotension and hypertension. Pre-operative as well as intra-operative tension is quite frequent in patients with chronic renal disease. This is attributed to fear, increased catecholamine secretion

and hypertension caused by renal dysfunction.

- Secondary hyperparathyroidism is also very common. In children with more serious chronic disease, delay in teeth development and jaw malformation may occur, but also changes in the tooth structure and porcelain abnormalities, precocious loss of teeth etc. .9• Acid-base disorders. Acidosis in patients with chronic renal disease may lessen the efficiency of local anesthetics.

PATIENTS WHO USE DIALYSIS

- Almost obligatory findings for each patient on hemodialysis are uremic breath and modified taste in the oral cavity. They occur as a result of the increased concentration of urea in saliva and its following transformation to ammonia.
- it is necessary to note that in the course of dialysis the patient is given heparin to prevent blood coagulation outside the body. This fact is important because of proper timing of dental intervention. Accordingly, since heparin prolongs the bleeding time, the tooth extraction should be done a day after dialysis when the anti-coagulant agent's presence is reduced to the minimum while the dialysis effect is maximal.
- APTT and INR should be checked before the surgical intervention.
- prevention and therapy against bleeding should include:
 1. Vit K IV.
 2. Etamsylatum amp. IV.
 3. Protamine sulphate (1:5)
- the patients who undergo dialysis are also very susceptible to infection. Because of possible bacterial infection, the prophylactic administration of antibiotics of broad spectre is strongly recommended. We can administer cephalosporins. Penicillin should be administered in the dosage of 2 mg after dialysis.

PATIENTS WITH KIDNEY TRANSPLANTS

- In general, kidney transplants contain the risk of transplanted organ rejection. To pre-

vent this, patients who have undergone an organ transplant operation, are given huge doses of immunosuppressants such as corticosteroids, azathioprine, cyclosporine A and anti-lymphocyte globulin.^{10,11}

- After tooth extraction the wound healing is significantly impaired.
- The side effects of immuno suppressants are hypertension, increased bleeding, diabetes.^{9,12}
- In patients who have undergone kidney transplant operations prophylactic antibiotics should be administered in consultation with the patient's physician. Due to potential adrenalin crisis risk, it is essential to modify steroid therapy.

ORAL MANIFESTATIONS

Impaired renal function causes changes within the oral cavity as body progress through an azotemic to uremic state¹³. Oral healthcare professionals should be able to recognise the oral symptoms. Studies of renal patients reveal that about 90% of these patients show oral symptoms of uremia.

UREMIC STOMATITIS

Uremic stomatitis can be seen due to the presence of markedly elevated levels of urea and other nitrogenous waste in the blood stream of these patients. It is clinically represented as white plaques distributed predominantly on buccal mucosa, floor of mouth and tongue¹⁷. Patients usually complain of pain, unpleasant taste and burning sensation with the lesion, clinician detects based on odour of ammonia in patients breath. The clinical appearance occasionally mimic oral hairy leukoplakia¹⁷. Uremic stomatitis can be of four types such as erythemopultaceous, ulcerative, haemorrhagic, hyperkeratotic. White plaques called 'Uremic frost', rarely found intraorally. This frost result from residual crystals left on the epithelial surfaces after perspiration evaporates or as a result of decreased salivary flow.¹³

URAEMIC STOMATITIS

Dry mouth (Xerostomia)

Xerostomia is a frequent and important complaint among dialysis patients¹⁸. The reduced

salivary flow could be due to direct uremic connection of salivary gland, chemical inflammation, dehydration, mouth breathing (Kussmaul's respiration), and also limited fluid intake. The other conditions that may cause dry mouth in uremic patients are retrograde parotitis, metabolic abnormalities and use of diuretics.¹⁵

TASTE CHANGES

The cause of metallic taste in uremic patients has been reported to be due to urea content in saliva and its subsequent breakdown to ammonia and carbon dioxide by bacterial urease. The change in taste can also be due to metabolic disturbances, use of medications, diminished number of taste buds and changes in salivary flow and composition.¹⁴

MUCOSAL PETECHIAE AND ECCHYMOSIS

This feature is due to bleeding tendency because of abnormal thrombocyte function and a decrease in platelet factor³. It may also relate to the anticoagulants used during hemodialysis.¹⁴

RENAL OSTEODYSTROPHY

It's a frequent long term complication of renal diseases. Renal osteodystrophy is a spectrum of bone metabolism disorders. These changes compromise bone demineralisation with trabeculation and cortical loss, giant cell radio transparencies or metastatic calcifications of soft tissues. These patients are at increased risk of fracture during dental treatments, such as extraction.¹⁹ There are several radiographic features exhibited in maxilla and mandible in this condition, like jaw enlargement and malocclusion, delayed eruption, enamel hypoplasia, loss of lamina dura, widening of pdl, severe periodontal destruction, tooth mobility, drifting, pulp calcifications etc.

CANDIDIASIS

Oral candidiasis will affect 20-30%, transplant patients. Candida infection may present as angular cheilitis, pseudomembranous or erythematous ulcerations or chronic atrophic

infection.²⁰ Prevention effective in early post-transplant period with antifungal lozenges and solutions. Treatment is based on the severity of diseases like lozenges in mild cases along with oral antifungals.

ORAL CANDIDIASIS

MUCOSAL LESIONS

Oral mucosal lesions mainly involves white patches and ulcerations. Lichenoid reaction and oral hairy leukoplakia can occur due to immunosuppressive drugs. EBV has also been detected with uremia. White patches of skin are called uremic frost which is presented in most patients.

PERIODONTAL DISEASES

Gingival hyperplasia, increased levels of plaque, calculus, gingival inflammation and increased prevalence and severity of destructive periodontal diseases can be seen in patients with renal diseases. Calcium channel blockers and calcineurin inhibitors, which are commonly used for the treatment of renal diseases, causes gingival hyperplasia. Gingival growth can also be caused by certain drugs. Gingival bleeding, petechiae, ecchymosis, results from platelet dysfunction and due to effects of anticoagulants used by these patients. Periodontal problems with loss of attachment, recession, deep pockets can also occur.²¹

ORAL MALIGNANCY

There is an increased risk of oral malignancies are seen in patients with renal diseases. There is increased susceptibility of epithelial dysplasia and carcinoma of lip. Increased risk may be due to iatrogenic immune suppression, which in turn increases mucosal susceptibility to virus-related tumours like Kaposi sarcoma or non-Hodgkin's lymphoma.¹⁴

ENAMEL HYPOPLASIA

In patients with renal diseases, enamel hypoplasia started at a young age. Site of hypoplastic enamel on permanent teeth relates to the age at the beginning of advanced

renal failure. Prolonged corticosteroid administration may also contribute to this.

CONCLUSION

A proper examination of the oral cavity is important in patients with renal diseases. These patients, if possible, must be routinely evaluated for oral lesions and treated accordingly. A proper dental management with proper protocol must be established so that no patients with diseases is left unnoticed.

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