

## Combating Chronic Renal Failure Patients in the Dental Chair: A Review

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### Abstract

Chronic renal failure is an alarming condition for health care professionals throughout the world. During the progression of renal damage, clinical manifestations are noted in practically all body organs and systems, and 90% of all affected patients experience oral symptoms. The existing management options range from simple measures based on changes in diet and life style, to different forms of dialysis (hemodialysis and peritoneal dialysis), and also kidney transplantation. Knowing that the multiple oral manifestations of chronic renal failure, and the different repercussions of its treatment upon the oral cavity- these patients require special considerations and during precautions of dental treatment. Consultation with the nephrologist is essential before any dental treatment is carried out, in order to determine the condition of the patient, define the best moment for dental treatment, introduce the necessary pharmacological adjustments, or to establish other important aspects for preventing complications in the dental clinic.

This article reviews the characteristics of the disease, the existing therapeutic options, and the considerations of relevance for the dental professional.

**Keywords:** Chronic renal failure; Glomerular filtration rate; Dialysis; Renal transplant; Immunosuppressive therapy; Oral lesions; Gingival hyperplasia; Dental management.

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### Introduction

From time immemorial, man has been a victim of lethal disease –one such crippling condition is chronic renal failure.[1] CRF is defined on the basis of a glomerular filtration rate (GFR) of less than 60 ml/min/1.73 m<sup>2</sup>, or by the evidence of renal damage (micro- or macroalbuminuria, persistent hematuria, radiological anomalies) during a period of more than three months.[2] The intraoral manifestations of renal insufficiency were first described by Frerichs[3] in 1851. Soon after in

1887, Lancereaus stated that the oral mucosa is sometimes thickened, and that occasionally “small superficial erosions” are noted in renal insufficiency.

### Pathophysiology

The kidneys play a vital role in maintenance of normal fluid volumes. There are more than 2 million functioning glomeruli that regulate total body water and solute concentrations. Chronic renal failure is the irreversible deterioration in renal function which results from a diminished mass of effective functioning renal tissues that is as renal failure progresses, there is a decrease in number of functioning nephrons. As the condition develops, the composition of body fluids becomes abnormal, particularly with regards to its water and salt content, its acid base equilibrium and the concentration of nitrogenous compounds resulting from normal metabolic processes. Early in the disease state, CRF is asymptomatic, but abnormal clinical laboratory test may be

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present. This stage is referred to as chronic renal insufficiency. Loss of renal function is usually first detected by increase in nitrogenous compounds. Azotemia is an elevation in Blood urea nitrogen (BUN) and serum creatinine levels subsequent to a decreased glomerular filtration rate (GFR). When azotemia is associated with adverse clinical signs and symptoms, it is called as uremia.[4]

#### *Classification of renal failure*

When a nephron is destroyed it is unable to regenerate, and the kidneys compensate the loss through hypertrophy of the remaining nephrons, so that normal kidney function can be maintained until approximately half of all the existing nephrons have been destroyed. Once this point has been reached, symptoms of renal functional impairment begin to appear:

Acute renal failure (ARF) is characterized by a sudden and important reduction in glomerular filtration rate (GFR) lasting for hours or days. The underlying causes are classified as pre-renal, intrinsically renal or

post-renal (Table 1). In general, renal function is restored once the underlying cause has been resolved[2,5], and it is not common for the dental professional to treat a patient with ARF.

Chronic renal failure (CRF) is characterized by a gradual reduction in the number of functional nephrons. There are many possible causes (Table 1)[2], and the natural course of CRF leads to terminal or end-stage renal failure (ESRF).[5,6] In ESRF, renal function has deteriorated to the point where the body suffers chronic systemic abnormalities. In this situation renal replacement therapy is required in the form of dialysis and/or kidney transplantation.[5,6,7]

#### *Clinical manifestations*

*General:* The clinical signs and symptoms are related to the type of underlying renal or systemic problem, and to the rate of impairment of renal functional.

1. Uremic patients
  - a) Generalized paleness as a result of anemia.[8,9]

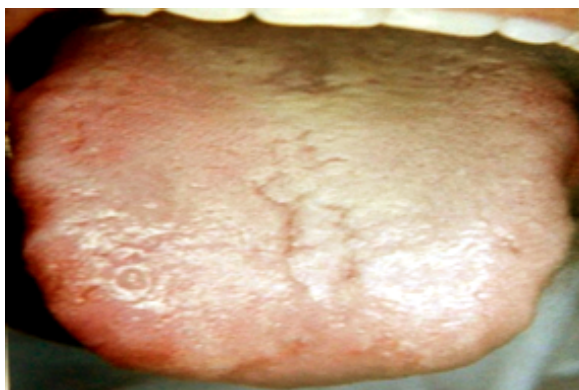
**Table 1: Causes of renal failure**

ACUTE RENAL FAILURE	CHRONIC RENAL FAILURE
<b>Pre-renal</b> Gastrointestinal losses Excessive perspiration Bleeding Burns with fluid sequestration Renal losses Cardiovascular failure Liver failure	Metabolic diseases (e.g., diabetes mellitus)
<b>Intrinsic renal causes</b> Acute tubular necrosis (vasomotor nephropathy) Severe cortical necrosis Severe acute glomerulonephritis Vasculitis Malignant hypertension Accelerated scleroderma Allergic interstitial nephritis	Congenital and hereditary renal processes (e.g., renal polycystic disease)
<b>Post-renal</b> Bilateral ureteral obstruction or ureteral obstruction in patients with a single kidney Bladder obstruction Bladder rupture Urethral obstruction	Chronic immune glomerulopathy Hypertensive nephrosclerosis Chronic tubulointerstitial diseases

- b) Brown hyperpigmentation of the nails and skin due to the retention of dietary pigments.
  - c) Skin excoriations or scratches produced by intense generalized itching secondary to the accumulation of calcium and phosphate microcrystal.[9]
2. Arterial hypertension
    - a) Attributed to the retention of sodium and water.
    - b) Activation of the rennin angiotensin-aldosterone system.[7,9,10] These patients also suffer dyspnea and gastrointestinal alterations such as anorexia, nausea and vomiting associated to the uremia[8,9], as well as an increased incidence of gastrointestinal bleeding episodes.[10]
  3. A frequent observation is anemia secondary to deficient erythropoiesis[6,8,10], and hemostasia is altered as a result of platelet dysfunction[8,10,11] and of the anticoagulants used in dialysis. The mechanical trauma to which the platelets are exposed during dialysis can reduce their counts. All these factors can lead to an increased risk of bleeding problems.[7]

*Oral:* A full 90% of all patients with CRF suffer oral signs and symptoms[7] affecting both the bone and soft tissue structures.[8]

**Figure 1: Dorsum of the tongue showing depapillation and crenations on lateral borders of the tongue**



### *Early symptoms*

Bad taste and odour on awakening. This uremic fetor, an ammonical color, is typical of any uremic patient and is caused by the high concentration urea in the saliva.

An acute rise in BUN may result in uremic stomatitis which may appear as *erythromopultaceous* form characterized by red mucosa covered by a thick exudates and a *pseudomembrane* or an ulcerative form, characterized by frank ulcerations with redness and a *pultaceous* coat.

Xerostomia—due to direct involvement of salivary glands, chemical inflammation, dehydration and mouth breathing.

### *End stage renal disease (ESRD)*

The classic sign of hyperparathyroidism—bone demineralization, loss of trabeculation, ground glass appearance, total or partial loss of lamina dura, giant cell lesions or brown tumors and metastatic calcifications.

These changes are most frequently seen in the posterior mandible superior to the mandibular canal. The generalized radiolucency throughout the jaws is the result of osteoporosis. Cortical bone loss or thinning also occurs and this may lead to spontaneous fractures.

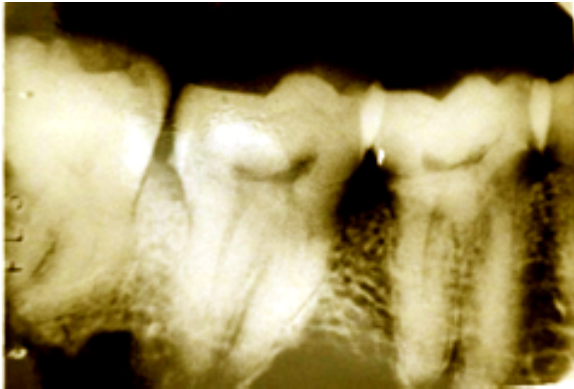
Other oral manifestation include tooth mobility, malocclusion and metastatic soft tissue calcifications. The teeth may be painful to percussion and mastication. Abnormal bone remodeling after extraction commonly occurs and is characterized by lack of lamina dura, resorption and deposition of sclerotic bone and is referred to as socket sclerosis began at a young age. Other findings are narrowing of pulp chambers pulp calcifications of teeth. [12,13,14,15,16,17]

### *Dental consideration and management of renal failure[18]*

#### *Before treatment*

Determine dialysis schedule and treat on day after dialysis.

**Figure 2: Shows Narrowing of Pulp chamber**



Consult with patient's nephrologist for recent laboratory tests and discussion of antibiotic prophylaxis.

Identify arm with vascular access and type; note in chart and avoid taking Blood pressure measurement/injection of medication on this arm.

Evaluate patient for hypertension/hypotension.

Institute preoperative haemostatic aids (DDAVP, conjugated estrogen) when appropriate.

Determine underlying cause of renal failure (underlying disease may affect provision of care).

Obtain routine annual dental radiographs to establish presence and follow manifestations of renal osteodystrophy.

Consider routine serology for HBV, HCV, and HIV antibody.

Consider antibiotic prophylaxis when appropriate.

Consider sedative premedication for patients with hypertension.

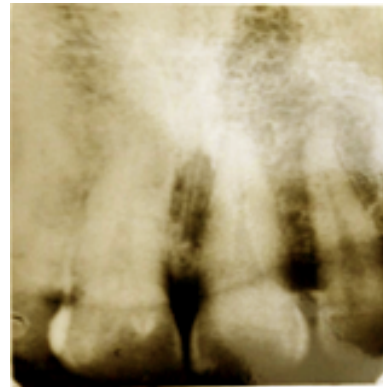
#### *During treatment*

Perform a thorough history and physical examination for presence of oral manifestations.

Aggressively eliminate potential sources of infection/bacteremia.

Use adjunctive hemostatic aids during oral/

**Figure 3: Lamina Dura Thinned out and missing in some areas**



periodontal surgical procedures.

Maintain patient in a comfortable uncramped position in the dental chair.

Allow patient to walk or stand intermittently during long procedures.

#### *After treatment*

Use postsurgical haemostatic agents.

Encourage meticulous home care.

Institute therapy for xerostomia when appropriate.

Consider use of postoperative antibiotics for traumatic procedures.

Avoid use of respiratory-depressant drugs in presence of severe anemia.

Adjust dosages of postoperative medications according to extent of renal failure.

Ensure routine recall maintenance.

(DDAVP= 1 - deamino - 8 - D-arginine vasopressin; HBV = hepatitis B virus; HCV = Hepatitis C virus; HIV = human immunodeficiency virus.)

Elective surgery is best performed in the day after dialysis (when the effects of heparinization have sufficiently worn off, and uremic metabolites of excess volume have been removed).

Medication -Dosage of drugs should be adjusted considering the severity of renal failure. Certain drugs such as aspirin; non steroidal anti inflammatory drugs (e.g.,

ibuprofen, zonepirac), phenacetin, antibiotics such as (tetracyclines, aminoglycosides and polypeptides) should be avoided.

NSAIDs may induce sodium retention, impair the action of diuretics, prevent aldosterone production, affect renal artery perfusion, and cause acidosis. Tetracyclines and steroids are antianabolic, increasing urea nitrogen to approximately twice the baseline levels. Other drugs, such as phenacetin, are nephrotoxic and put added strain on an already damaged kidney. The challenge for dentists in prescribing medications is to maintain a therapeutic regimen within a narrow range, avoiding subtherapeutic dosing and toxicity.

Preoperative antibiotic cover should be considered in susceptible individuals. Patients with renal transplant may require supplements of steroids.

## Discussion

Many a time dentists are called upon to treat patients whose physical status is less than ideal, and who require special management considerations for dental care.

Patient with chronic renal failure, on dialysis and those who have had successful renal transplants fall into this category and require special dental management strategies because of their complicated clinical status.

The kidney is involved in a number of specialized functions; diseases involving the kidney can therefore cause a variety of metabolic derangement which are exhibited both clinically and radiographically. Today kidney disease is reportedly the fourth leading health problem of the nation. Chronic renal insufficiency is one of the major debilitating illness, where the suffering endured is long and taxing. With the development of dialysis and transplant technique the prognosis has visibly improved the clinical picture of the disease entity varies depending on the progress of the pathosis the treatment modalities undertaken and changes secondary to the drug therapy.

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