

# Dental management in Chronic Renal Failure and Dialysis

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## ABSTRACT

The main purpose of this paper was to evaluate the dental status of a patient who is undergoing hemodialysis for chronic renal failure. Chronic renal failure is relatively common condition which can leads to systemic abnormalities like anemia, platelet disorders and hypertension as well as oral problems like xerostomia, stomatitis, periodontal diseases and radiographic alteration in maxilla and mandible.

**Key words:** Kidney, dialysis, dental management,

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## INTRODUCTION

The kidneys regulate fluid volume and acid-base balance of the plasma. Excrete nitrogenous waste, synthesize erythropoietin, 1, 25-dihydroxycholecalciferol and renin. Kidneys are also target organ for parathormone and aldosterone.

Progressive disease of kidney can result in decreased function and manifestations in several organ systems. Thus, practice of dentistry esp. oral surgery and periodontal disease can be influenced by resulting anemia, abnormal bleeding, electrolyte fluid and imbalance, hypertension, drug intolerance and skeletal abnormalities.

## DISCUSSION

End Stage Renal Disease (ESRD) is a chronic bilateral progressive disease which causes deterioration of nephrons which are functional unit of kidneys. This disease results in uremia and can lead to death. It manifests when 50-75% of the approximately 2 million nephrons lose function.

ESRD occur in three successive Steps:

First stage – diminished renal reserve which is asymptomatic and characterized by mildly elevated creatinine level and slight decline in GFR (10-20%).

Second stage – renal insufficiency – when GFR is mild to moderately diminished (20-50% of normal) and nitrogen products accumulate in blood.

Third stage – renal failure in which kidneys ability to perform, endocrine and metabolic function is deteriorated beyond compensatory mechanisms, which result in a clinical syndrome called uremia.

## Epidemiology

- Disease increasing by approximately 9% per year who have diabetes and hypertension
- More common in men
- Most commonly patient dies because of cardiovascular disease

**Etiology:** ESRD is caused by any condition that destroys nephrons. Three most common known causes of ESRD are

1. Diabetes mellitus (34%)
2. Hypertension (25%)
3. Chronic glomerulonephritis (16%)

### Pathophysiology

Deterioration and destruction of functioning nephrons is the underlying pathologic processes of renal failure. Various disease affect different segments of nephrones e.g. hypertension affect vasculature first, while glomerulonephritis affects glomeruli first.

Once the nephrons are lost, they are never replaced. But compensatory hypertrophy of remaining nephrons takes place and normal function is maintained.

Normal function is maintained until about 50-75% of nephrons are destroyed. But later compensatory mechanisms are decreased and signs and symptoms of uremia occur.

1. Patient with early renal failure remain asymptomatic but diseases progresses simultaneously which occur because of loss of nephrones. Sodium pump lose its effectiveness and causes mat excretion with excessive amount of urine i.e. osmotic diuresis. So, polyuria is a common finding.
2. In advanced renal disease patient develops uremia which is fatal if not treated. Failing kidneys are unable to concentrate and filtrate the intake of sodium which cause fluid overload, hypertension and risk of cardiac disease which results in 50% annual mortality of patient with ESRD.
3. Loss of GFR causes azotemia (collection of urea in blood) which is measured by BUN. It results in metabolic acidosis which causes retention of  $\text{NH}_3$ . Acidosis causes nausea, anorexia and fatigue. Hyperventilation occurs to cope the acidosis.
4. Severe electrolytic disturbance occur causing hyponatremia and hyperkalemia and as azotemia progresses, urine output falls and acid base balance deteriorates.
5. Anemia, leukocyte and platelet dysfunction and coagulo-pathy develop. Anemia associated with ESRD is due to erythropoietin deficiency, inhibition of RBC production, hemolysis, and shortening of RBC survival.
6. Host defense is compromised due to nutritional deficiencies and change in production and function of white blood cells.
7. Bleeding and bruising are common in patient with ESRD which occur due to abnormal platelet aggregation and adhesiveness, decreased platelet factor 3 (tissue thromboplastin) and impaired prothrombin consumption.
8. There occurs congestive heart failure and pulmonary edema. Most common complication is arterial hypertension caused by NaCl retention fluid overload and inappropriately high renin levels.
9. Bone disorders also occur in ESRD which are collectively called as renal osteodystrophy. Decreased GFR results in decreased 1, 25 dihydroxy vitamin D productions by kidney, and decreased calcium absorption by intestine and increased serum phosphate. Phosphate is driving force of bone mineralization. Excess phosphate causes serum calcium to be deposited in bone leads to decrease serum calcium level and weakening of bones.

Due to decreased serum calcium, parthormone secretion is stimulated result in secondary hyperparathyroidism. Renal osteodystrophy further leads to osteomalacia (increased unmineralized bone matrix), followed by osteitis fibrosa (bone resorption lytic lesion and marrow fibrosis) and finally osteosclerosis (enhanced bone density).

### Sign and Symptoms of chronic renal failure patients:

- Patient appears ill and develops nocturia and anemia produce pallor of skin and mucus membrane, leading symptoms like lethargy and dizziness.
- Hyper pigmentation of skin occurs due to retention of carotene like pigment which is normally excreted by kidney. These pigments produce profound pruritis.
- Whitish coating on the skin of trunk and arms is produced by residual urea crystals left when perspiration evaporates called as uremic frost.
- Patient complains of anorexia, nausea and vomiting, and generalized gastroenteritis.
- Uremic syndrome commonly causes malnutrition and diarrhea.
- Convulsion occurs due to azotemia.
- Stomatitis with oral ulceration and candidiasis occur.

- Parotitis may also present.
- Bleeding problem may accompany ESRD causing ecchymosis, petechiae, purpura and gingival or mucous membrane bleeding.
- Cardio Vascular system manifestations are hypertension, Congestive Heart Failure and Pericarditis.

#### Laboratory Finding:

1. Urinalysis (increase Na and polyuria)
2. BU (normal value 20-40 ml%) increased in CRF
3. Serum Creatinine (normal value 0.7 – 1.5 mg%) more than 8 indication for dialysis
4. Creatinine clearance directly proportional (normally 80-120 ml/m)
5. Electrolytic measurement
6. Protein electrophoresis (albuminuria)

#### Dental Management of Chronic Renal Failure and Dialysis patient can be divided into two types of according to line of their treatment:

##### A. Patient under Conservative Care:

1. Consultation with patient's physician should be done before providing dental care.
2. Dental treatment should be avoided if disease is unstable or poorly controlled.
3. Blood pressure should be monitored before and during the procedure.
4. Screening for bleeding disorder should be done before surgery in which BT, CT, platelet count, hematocrit and hemoglobin should be monitored. Hematocrit (male 47-54 and female 40-47) and Hb should be noted to know the status of anemia.
5. When surgical procedures are to be done, meticulous attention should be given towards good surgical technique to decrease the risk of excessive bleeding and infection.
6. Nephrotoxic drugs should be avoided like acetaminophen in high doses acyclovir, aspirin, NSAIDs, Tc and amino glycosides.
7. Frequency and dosage of dental drugs administration should be adjusted because of following changes in drug metabolism:
  - (i) low serum albumin value reduces number of binding sites for circulating drugs
  - (ii) uremia can modify hepatic metabolism of drugs
  - (iii) Antacids can affect acid base or electrolyte balance
  - (iv) NSAIDs and aspirin potentiate uremic platelet defects and hence antiplatelet drugs should be avoided.
8. Ant anxiety drugs like diazepam require preoperative hematocrit or Hb concentration before I.V. sedation to ensure adequate oxygenation.
9. Barbiturates and narcotics are avoided in presence of uremia because BBB may not be intact and excessive sedation can occur.
10. General anesthesia is not recommended for patient with ESRD when Hb concentration below 10 gm/100 ml.
11. If there is risk of bleeding surgeon should take local measure like topical thrombin, microfibrillar collagen, suture or systemic drugs like desmopressin 0.3 ug/kg over 30 min should be given.
12. Orofacial infection should be managed aggressively with culture and drug sensitivity test and appropriate antibiotics.
13. Hospitalization should be considered in case of severe infection or major procedures.

##### B. Patient Receiving Dialysis:

1. Peritoneal dialysis presents no problem in dental management. But in case of hemodialysis as surgically created arteriovenous fistulae are potentially susceptible bacteremia that cause infective endocarditis even when there is no preexisting cardiac defect. IE occur in 2-9% of patient with hemodialysis. Consultation should be taken for infective endocarditis.
2. Blood pressure cuff and IV medication in arm with shunt should be avoided, as inflated blood pressure cuff could collapse shunt and make it useless and IV medication cause phlebitis which produce clot.
3. Hemodialysis aggravates bleeding tendencies by physical destruction of platelets and use of heparin. So status of hemostasis should be determined before oral surgical procedure. Screening test like BT and platelet count should be evaluated. In high risk patient several modification should be noted like

- (i) Providing dental treatment usually the day after the hemodialysis since on the day of dialysis patients are generally fatigued and could have bleeding tendencies. Activity of heparin is 3-6 hours after infusion and delay of treatment is necessary until it is eliminated from blood stream.
  - (ii) Primary closure should be done and haemostatic agents such as thrombin, oxidized cellulose, desmopressin, and tranexamic acid can be used.
  - (iii) All the major surgical procedure should be done on the day after the end of the week of hemodialysis treatment to provide additional time for clot retention before dialysis is resumed.
  - (iv) Protamin sulphate can be used if immediate care is required.
4. Status of liver function and presence of opportunistic infection is noted because of increased risk for carrier state of hepatitis B, hepatitis C, urinary infections and HIV.

### **CONCLUSION**

We can conclude from above discussion that chronic renal failure or ESRD is a multisystem disorder involving almost every system of body. These are the manifestations in other organ systems which make its treatment a hilarious task. The treatment given (i.e. Dialysis) itself has its own complications. So while providing health facilities to a patient with renal failure we should always take into account the derangements in other systems of body.

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