

Orthodontics & Chronic Renal Disease

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Abstract

Chronic renal disease is defined as a progressive and reversible decline in the renal function associated with a reduced glomerular filtration rate (GFR). In addition to their associated morbidity, such disorders are important due to the number of affected individuals and the many patients subjected to treatment because of them. An inadequately controlled CRD patient constitutes a risk case in Orthodontic practice due to greater bleeding tendency, hypertension, anaemia, drug intolerance, increased susceptibility to infections. Orthodontic practitioners therefore must take a series of aspects into account before treating such patients, in order to avoid complications.

This paper is a review of the general aspects of renal diseases, oral manifestations, dose adjustments of drugs, orthodontic considerations and their management.

Key words Chronic renal disease, hypertension, anemia, orthodontic considerations

Introduction

The human kidney functions in preservation of the electrolytic composition and the volume of the extracellular liquid and filtering waste metabolic products along with regulation of the acid-base balance and endocrine function of the body. ¹Chronic renal disease (CRD) is a progressive and irreversible decline in renal function and as the disease progresses, the number of nephrons diminishes and glomerular filtration rate falls, while serum levels of urea rise, until approaching the stage of renal failure if untreated. The signs and symptoms present in patients with renal failure are known as "uremic syndrome".¹

The symptoms and signs vary with different patients.

The most important etiologic factors of CRD are diabetes mellitus, arterial hypertension and glomerulonephritis.² The most common cause of death in patients with end stage renal failure is cardiac arrest, followed by infection and malignancy.³

Treatment modalities of the chronic renal insufficiency include dietary changes, correction of systemic complications, and dialysis or a renal graft.

The fall in GFR is measured by the creatinine clearance (CC), indirectly measures the function of kidneys. Normal values of serum creatinine are 0.5-1.4 mg/dl. Serum creatinine level will be increased to more than 1.5 mg/dl, in patients with renal diseases.

Due to the improvement in the medical care (results in the reduced mortality and morbidity), many patients with renal disorders are frequently presenting for

orthodontic treatment.⁴

The objective of this paper is to summarize about chronic renal disease and the orthodontic consideration management of such patients.

Oral manifestations in CRD patients

Oral signs and symptoms in the hard and soft tissue are seen in 90% of patient with renal diseases either due to the cause of the disease or due to the treatment of the disease. Oral manifestation in CRD include:

- Halitosis (Uremic fetor) due to increase in the blood urea level, which will turn to ammonia.
- Perception of metallic taste in the mouth.
- Sensitive disturbances in the form of altered taste sensations, burning sensations of tongue and lips or sensation of enlarged tongue.⁵
- Xerostomia due to liquid intake restrictions, or due to secondary effects of medication eg. Antihypertensive drugs, possible glandular involvement such as minor salivary gland atrophy and mouth breathing.⁶
- Paleness of oral mucosa and skin due decrease in the synthesis of erythropoietin.
- In patients with an end stage or untreated renal disease, uremic stomatitis is usually seen
- Presence of erythematous lesions in the oral cavity which are localized or generalized.⁶
- Delayed eruption, enamel hypoplasia due to alterations in calcium and phosphorus.⁷
- There is a greater incidence of periodontal disease, bone loss, recessions

and periodontal pockets.

- Renal osteodystrophy, is a late sign of CRD, usually due to alterations in calcium and phosphorus metabolism. It is characterized by:
 - Bone demineralization,
 - Decreased trabeculation,
 - Decreased thickness of cortical bone,
 - Abnormal bone healing after extraction, and
 - Sometimes, dental mobility as a consequence of loss of bone.
 - Presence of ecchymosis, petechiae and hemorrhage in the oral mucosa due to alterations in the platelet aggregation and anemia.⁸
 - Presence of infections especially in Kidney transplanted patients due to immunosuppressive therapy. Cytomegalovirus and herpes simplex virus are frequently associated with CRD patients.^{9,10}
 - Gingival overgrowth is most frequently seen in CRD patients due to the immunosuppression. If the patients are medicated with a combination of cyclosporine and nifedipine, the prevalence of gingival overgrowth increases by 50%.¹¹
Gingival overgrowth is generally confined to attached gingiva. If it extends coronally it could interfere with occlusion, mastication and speech.¹²
- General management of CRD Patients**
In high prevalence of arterial hypertension- Monitoring the blood pressure pre and postoperatively.
In case of platelet dysfunction and anemia (bleeding tendency)- Request



hemostatic study should be planned before the surgery or any invasive procedures (time of bleeding, platelet count, hemoglobin percentage) and local hemostatic measures considered.

Patient undergoing heparin anticoagulation- Dental treatment should be performed on the days patient isn't receiving dialysis, to be sure that there is no heparin in the blood (mean life of 4 hours).

Vascular access for hemodialysis- Avoid compression on the arm with the vascular access and never use it to measure blood pressure nor administer drugs intravenously.

Disturbances in the metabolism and removal of drugs- it may be required to adjust the dose of some drugs or avoid prescription of certain drugs. Request the CC to estimate the GFR.

Renal osteodystrophy due to secondary hyperparathyroidism (late sign of chronic renal insufficiency)- Bone more susceptible to fractures, careful dental extraction technique to avoid fractures.

Orthodontic considerations and management of CRD patients.

Four types of patients with renal problems may be referred for orthodontic treatment:

1) Patient with renal disease in conservative medical treatment: The orthodontist should have communication with the nephrologist, in order to be aware of the stage of the pathology suffered and the treatment prescribed. Before any invasive dental procedure, possible hematologic problem in the patient should be studied. Due to the frequent hypertension, blood pressure should be monitored during the procedures. Drugs those that are nephrotoxic such as tetracyclines and aminoglycosides must be avoided. Orthodontic treatment is not contraindicated in well controlled renal disease. Orthodontic treatment should be deferred if renal failure is advanced.

2) Patient with renal disease in peritoneal dialysis: In cases of peritoneal dialysis, a

Catheter placed in the abdominal wall and inserted in the peritoneum achieves access to the body, in order to remove nitrogen and other metabolic toxic products; through this, a hypertonic glucosated solution is introduced. Again the orthodontist should have communication with the nephrologist. It is better to start the orthodontic treatment prior to kidney transplantation before immunosuppressive drugs cause gingival enlargement.

3) Patient with renal disease in hemodialysis: In hemodialysis, the filtering process is

carried out by a dialyzer, outside the patient's body. Most of these patients receive this treatment 3 times a week.¹³

If an emergency dental treatment must be performed, administration of protamine sulphate (heparin antagonist) is advocated

to block the anticoagulant effect.¹³ However, bleeding tendency would be still present due to platelet dysfunction and anemia, so usual hemostatic measures must be carried out.¹³

4) Renal transplant patient. These patients are immunosuppressed by medication therefore maintenance of a proper oral health is important as oral infections in transplant patients can contribute to its morbidity or even rejection.¹⁴ To minimize the risk of suffering an adrenal crisis in patients taking high doses of corticosteroids who are undergoing an invasive dental procedure, they should take a double dose of corticosteroids the day of the procedure.

Orthodontic appliances, especially fixed appliances, can produce a dramatic response in the gingival tissue even when no gingival overgrowth is present before orthodontic treatment. The following treatment approach is recommended.¹⁵

- Examine the extent of drug induced gingival overgrowth
- Oral hygiene should be well maintained before starting orthodontic treatment. 0.2 % Chlor-hexidine mouth-wash is advisable.
- Orthodontic treatment should be delayed until the excessive gingival tissue has been removed.
- Treatment time with fixed appliance should be kept to a minimum.
- Regular check up should be done with the hygienist.
- Appointments should be scheduled on non-dialysis days.
- Optimum time for surgical procedures or orthodontic banding is day after dialysis as platelet function will be optimal and the effect of heparin will have worn off.¹⁶
- It is best to carry out the surgical procedures under local anesthetics, cardiac arrhythmias can occur due to anemia and electrolyte disturbances when procedures are carried out under general anaesthesia.¹⁶
- A more recent review by Lockhart et al.¹⁷ (2007), pointed out the lack of scientific evidence to prescribe antibiotic prophylaxis to these patients.

Valvulopathies, particularly cardiac valvular calcification secondary to hyperparathyroidism, are frequent in this population. This condition, in itself, suggests antibiotic prophylaxis, as recommended by the AHA (American Heart Association)^{17,18} Drugs especially antibiotics are actively removed by the kidney, so an adjustment of the dosage by amount or by frequency is required.¹⁹

Drug of choice in CRD patients

Antibiotics - Penicillin, clindamycin and cephalosporins.

Paracetamol is the drug of choice among Non-narcotic analgesics.

Benzodiazepines can be prescribed without dose adjustment.

Narcotic analgesics which can be used are codeine, morphine, phenthanile.

According to Shirazi M, based on his study in rats shown that orthodontic tooth movement is accelerated in rats with renal insufficiency.²⁰ This is due to the increase in circulating parathyroid hormone. So orthodontic treatment force should be reduced and the forces re-adjusted at shorter intervals.²⁰

Conclusions

As orthodontists we are increasingly treating medically compromised patients. Compared to more invasive dental procedures, orthodontic therapy is viewed as a low risk procedure. Some orthodontic manipulation associated with fixed appliance therapy, are potentially harmful to these medically compromised patients. Orthodontists must therefore be able to identify these patients at risk and treat them accordingly.

Up to 90% of patients with CRD show oral signs and symptoms, such as bleeding tendency, greater susceptibility to infections and drug induced gingival overgrowth. As for Orthodontic considerations and management strategies for these patients, treatment is not contraindicated in patients if the disease is well controlled. Before invasive procedures, a blood test must be requested (including hemostasia and blood recount).

References

References are available on request at editor@healtalkht.com

