The Renal Diet and Oral Health: Special Considerations for Xerostomia in Patients Living with Chronic Kidney Disease

Introduction

• As the prevalence of Chronic Kidney Disease (CKD) has increased to an estimated 1 in 8 in the United States, the dental healthcare provider should become familiar with current medical treatment recommendations.

• Evidence based practice in the nephrology community confirms the importance of patient adherence to a renal friendly diet.

• Current dental recommendations for the treatment of xerostomia and other oral health issues may be contraindicated in these patients.

• Therefore, dental healthcare providers must become more familiar with medical and dietary contraindications in the renal population.

Course Objectives

• Basic comprehension of the disease process of Chronic Kidney Disease

• Knowledge of medical complications associated with Chronic Kidney Disease

• Understanding of medical, pharmaceutical, and dietary treatments used in the treatment of patients living with Chronic Kidney Disease

• Tips for treating xerostomia for patients who should be adhering to the Renal Diet

Chronic Kidney Disease

• According to The National Kidney Foundation’s Kidney Disease Outcomes Quality Initiative (KDOQI), Chronic Kidney Disease (CKD) is a major public health crisis. With early intervention and treatment, many adverse complications of CKD can be avoided or postponed.

What is Chronic Kidney Disease?

• Defined according to the level of kidney function

• Not based upon etiology of disease

• Evidence-based categorization of continuous levels of kidney function that facilitate application of medical clinical guidelines, clinical performance measures, and quality improvement efforts in the management of Chronic Kidney Disease (CKD)

What conditions put patients at high risk for Chronic Kidney Disease?

• Diabetes
• Hypertension
• Relative with kidney failure
• Cardiovascular disease
• Obesity
According to the National Kidney Foundation (NKF), “A recent study found that prevalence has increased from 1 in every 10 adults to about one in every 7 to 8—a figure likely to rise more due to high obesity rates (1/3 of all adults), the link between obesity, diabetes and high blood pressure (all risk factors) and the aging of the Baby Boom generation (another risk factor).”

**Understanding the 5 Different Stages of Chronic Kidney Disease**

**CKD Blood Test**

**Terminology and Definitions**

- **Serum Creatinine** (kree-AT-uh-nin)
  - Waste product that comes from the normal wear and tear on muscles of the body. A creatinine level of greater than 1.2 for women and greater than 1.4 for men may be an early sign that the kidneys are not working properly.

- **Glomerular Filtration Rate (GFR)**
  - Test to measure how well the kidneys are removing wastes and excess fluid from the blood. A GFR below 60 is a sign that the kidneys are not working properly. A GFR below 15 indicates that a treatment for kidney failure, such as dialysis or a kidney transplant, will be necessary.

- **Blood Urea Nitrogen (BUN)**
  - Blood Urea nitrogen (yoo-REE-uh NY-truh-jen) comes from the waste produce urea. Urea is made from the breakdown of protein in the body. A normal BUN level is between 7 and 20.

**The Five Stages of Kidney Disease**

- **Stage 1 with normal or high GFR**
  - GFR > 90 ml/min

- **Stage 2 Mild CKD**
  - GFR = 60-89 ml/min

- **Stage 3 Moderate CKD**
  - GFR = 30-59 ml/min

- **Stage 4 Severe CKD**
  - GFR = 15-29 ml/min

- **Stage 5 End Stage CKD**
  - GFR <15 ml/min

**Glomerular Filtration Rate (GFR)**

- Glomerular Filtration Rate (GFR) is a laboratory test that measures the filtration rate of the glomeruli, which is the filtration unit within the kidney.

- There are standard and excepted values according to KDOQI that measures renal function and the extent of disease.

- Although there can be slight fluctuations in these values it allows healthcare providers to track the progress of CKD over time.

- Dental healthcare providers should interpret this knowledge as that Chronic Kidney Disease is not a “black and white” issue. It is a gradual process that includes various symptoms and outcomes depending on what stage of kidney disease the patient is in.

- For instance, in Stage 1-3 the patient rarely exhibit obvious clinical signs; however, in Stage 5 the patient often exhibit clinical signs and it is at this point that dialysis is usually initiated to preserve essential life functions.

- The clinical symptoms seen within the stages may vary slightly due to variations in etiology, clinical stability, and adherence to prescribed treatment, medications, and diet.
Stage 1 CKD With Normal or High GFR

• Glomerular Filtration Rate at a normal or high level greater than 90 ml/min.

• Usually asymptomatic - because kidneys do a good job even when they’re not functioning at 100%, most people will not know they have Stage 1 Chronic Kidney Disease.

• Other ways a person may discover they are in Stage 1 Chronic Kidney Disease:
  – Higher than normal levels of creatinine or urea in the blood
  – Blood or protein in the urine
  – Evidence of kidney damage in an MRI, CT scan, ultrasound or contrast X-ray
  – A family history of polycystic kidney disease (or other congenital kidney disease)

Stage 2 Mild CKD

• Glomerular Filtration Rate of 60-89 ml/min
• Usually asymptomatic

• Other ways a person may discover they are in Stage 2 Chronic Kidney Disease:
  – Higher than normal levels of creatinine or urea in the blood
  – Blood or protein in the urine
  – Evidence of kidney damage in an MRI, CT scan, ultrasound or contrast X-ray
  – A family history of polycystic kidney disease (or other congenital kidney disease)

Stage 3 Moderate CKD

• Stage 3 Chronic Kidney Disease exhibits kidney damage with a moderate decrease in the Glomerular Filtration Rate of 30-59 ml/min.

• As renal function declines waste products begin to build up in the blood causing a condition known as “uremia.”

• Common complications seen in Stage 3 include: high blood pressure, anemia and/or early mineral and bone disease.

• Symptoms may start to present in Stage 3, such as:
  – Fatigue (due to anemia)
  – Too much fluid (due to edema)
  – Urination changes (Urine may become foamy, dark orange, brown, tea colored, or red)
  – Kidney pain (most asymptomatic; however, with polycystic kidney disease or certain infections, pain may occur)
  – Insomnia (trouble falling asleep or staying asleep, itching, muscle cramps and/or restless leg syndrome)

Stage 4 Severe CKD

Possible symptoms include:

• Fatigue
• Excess fluid in tissues (especially extremities)
• Urination changes
• Kidney pain
• Sleep disturbances
• Nausea/Vomiting/Loss of appetite
• Taste changes (Food may not taste normal or may have a metallic taste)
• Uremic breath
• Difficulty in concentrating
• Neurological problems (Numbness /tingling in fingers or toes)
Medical Treatment of Stages 1-5

Treatment may include:

- Medical treatment for primary etiology of renal disease and/or secondary comorbidities
- Dietary changes (that are initiated to correct protein, vitamin, mineral, and electrolyte complications caused by renal disease)

Stage 5/Also known as End Stage Renal Disease (ESRD)

Possible symptoms include:

- Nausea/vomiting/loss of appetite
- Headaches/fatigue
- Inability to concentrate
- Itching
- Making little or no urine
- Edema (especially around the eyes and ankles)
- Muscle cramps
- Tingling in hands or feet
- Changes in skin color/increased skin pigmentation

There is no “CURE” for End Stage Renal Disease

Renal transplantation is not a “cure” for ESRD, but rather one of several different treatment modalities available.

Treatment Options for ESRD

- Hemodialysis
- Peritoneal dialysis
- Renal transplantation
- No treatment - hospice

Common Systemic Complications of Chronic Kidney Disease

- Continual loss of Renal Function
- Anemia
  - Due to intervention in the formation of erythropoietin
- Mineral and Bone Disorder
  - Due to abnormalities in calcium and phosphorus levels
- Malnutrition
  - Due to lack of appetite from uremia and restrictions in diet
- Cardiovascular Disease
  - Where there is a higher rate of mortality due to a cardiovascular event rather than declining renal function

Oral complications

- Pallor of the oral mucosa secondary to anemia.
- Diminished salivary flow, resulting in xerostomia and parotid infections.
- Patients frequently complain of a metallic taste, and the saliva may have a characteristic ammonia-like odor due to a high urea content.
- In severe renal failure, a stomatitis may be present.
- Loss of lamina dura.
- Demineralized bone.
- Localized radiolucent jaw lesions.
- Dialysis – potential complications from heparin
**Effect on Oral and Systemic Health**

- A harmful cascade of events that may be evident during all stages of CKD that has the potential effect on oral and systemic health can include:
  - Xerostomia
  - Malnutrition (due to difficulty in chewing/swallowing)
  - Gingival Enlargement/Overgrowth
  - Mineral and Bone Disorder

**Xerostomia**

- Xerostomia may be evident in all stages of CKD (even after renal transplantation) due to medications prescribed to treat hypertension, etc.

- Fluid restrictions are commonplace in dialysis treatment modalities
  - Dialysis patients can survive for many years depending on medical stability
  - Even dialysis patients that are renal transplant candidates (which typically have fewer fluid restrictions) may be on the transplant waiting list for years before they receive a transplant

**Malnutrition**

- During all stages of CKD, patients may experience changes in their diet that may pose challenges toward good nutrition.

**Gingival Overgrowth/Enlargement**

- There are common adverse side effects due to some immunosuppressive medications commonly used in renal transplantation (most notably Cyclosporine)

- Can create a nidus for infection that can:
  1. Put the patient at risk for sepsis
  2. Create an immune response that might lead to rejection of the transplanted organ
  3. Create glycemic challenge for those living with diabetes
  4. Can put an immunocompromised patient at increased risk of bacterial pneumonia due to the inability to effectively remove biofilms from deep pocketing

**Mineral and Bone Disorder (MBD)**

- Formerly referred to as Secondary Hyperparathyroidism (HPT)
  - It is now known that Secondary HPT is only a small part of what is now understood about MBD

- When phosphorus reaches high levels, it can actually cause a chain reaction that can extract calcium from the bones.

- This elevates the risk for fracture AND can lead to calcium deposits within blood vessels, arteries, and soft tissue.

- Dialysis can help with the level of phosphorus to some degree, but with most patients it is critical that they follow the prescribed renal diet (based on their laboratory values) to keep all of their minerals within balance.

- Silent disease

- Can affect many parts of the body – heart, lungs, liver, etc.

- Symptoms may include – itching, bone pain, weakness, sexual dysfunction, or can be asymptomatic
What is Mineral and Bone Disorder?

• Excessive excretion of parathyroid hormone (PTH)

• Treatment includes:
  • Renal Diet
  • Phosphorus Binders
  • Vitamin D (Active – Calcitriol)
  • Calcimimetics (i.e. Sensipar™)

Renal Diet

• Adherence – One of the most important aspects of treatment (Includes following prescribed diet and meds, exercise, attending prescribed dialysis treatments and a good healthy dose of a positive attitude)

• So, what is the Renal Diet and why is it so important?

The CDK Diet and Dental Treatment

• Patients with Chronic Kidney Disease can vary greatly in their dietary needs. Dental healthcare providers should ALWAYS consult with the renal dietitian prior to recommending any product to be ingested by the patient.

• When providing dietary counseling to prevent decay in CKD patients, dental healthcare providers should familiarize themselves with the patients prescribed renal diet. This will vary slightly from patient to patient due to etiology, renal function, and co morbidities.

• Typically, until Stage 5 patients will be on a low protein diet to preserve renal function; however, after the initiation of dialysis patients will usually be placed on a high protein diet.

  (Due to variations in etiology and treatment of CKD treatment and diet may vary)

CKD Diet

• Carbohydrates – daily caloric intake needs to be enough to keep the body healthy and prevent the breakdown of body tissue.

• Sodium restrictions are typically initiated in Stages 1-5 to avoid edema, hypertension, and congestive heart failure.

• Potassium is restricted if it is not excreted effectively and levels in the blood are high. If potassium levels reach critically high levels it places the patient at high risk for a cardiovascular event.

• Phosphorus is usually is reduced: therefore, dairy products, bioavailable phosphorus dental products (i.e. MI Paste which is beneficial for the general population is likely contraindicated in many CKD patients).

• As you can see, the patients ability to adhere to the renal diet and follow the prescribed treatment (taking prescriptions as prescribed and attending dialysis treatments) is very important and has a high impact on clinical outcomes!

• Although renal transplant recipients may have dietary restrictions due to comorbidities and renal function (after the transplant) dietary restrictions are usually comparatively less when compared to patients in Stage 4-5 making it an attractive treatment modality for many people living with CKD.

• Typical recommended reductions with declining renal function:
  – Sodium
  – Phosphorus
  – Potassium
  – Fluids

• Dependent on Stage
  – Protein (low prior to Stage 5/dialysis – increased during Stage 5/dialysis)
  – Carbohydrates
  – Calcium
**Helpful Dietary Links**

- Sodium (Special dietary sodium recommendations)  
  http://www.kidney.org/atoz/atozitem.cfm?id=175

- Phosphorus (foods containing phosphorus)  
  http://www.kidney.org/atoz/atozitem.cfm?id=101

- Potassium (foods containing potassium)  
  http://www.kidney.org/ATOZ/atozItem.cfm?id=103

**Hypertension**

Hypertension is prevalent within the Chronic Kidney Disease population. As that hypertension is the number two cause of CKD and is a common commodity of CKD due to fluid retention. In a low sodium diet for patients living with CKD, salt substitutes are contraindicated because of the potassium in the ingredients.

A good alternative would be cooking with fresh spices, avoiding prepared meals, and communicating with the renal dietitian to develop a systemic and oral friendly meal plan and emphasizes the importance that the dental healthcare provider be familiar with dietary modifications for CKD.

**Secondary Hypertension**

Mineral and Bone Disorder may contribute to secondary hypertension if calcifications are present in the cardiovascular system.

As the body is unable to excrete adequate fluid due to inadequate renal function – secondary hypertension is also caused by fluid retention.

**Dietary Counseling**

Phosphorus has several important functions, one of these functions is:
- The formation of bone and tooth mineral

However, we now know how phosphorus can play a role in patients living with CKD

What foods/beverages contain phosphorus?

**High Phosphorus Beverages**

- Ale
- Beer
- Chocolate drinks cocoa
- Drinks made with milk
- Canned iced teas
- Dark colas

**High Phosphorus Foods**

- Cheese
- Cottage cheese
- Custard
- Ice cream
- Milk
- Pudding
- Cream
- Soups
- Yogurt
**High Phosphorus Proteins**
- Carp
- Crayfish
- Beef liver
- Chicken liver
- Fish roe
- Organ meats
- Oysters
- Sardines

**High Phosphorus Vegetables**
- Baked beans
- Black beans
- Chick peas
- Garbanzo beans
- Kidney beans
- Lentils

**Other High Phosphorus Foods**
- Carp
- Crayfish
- Beef liver
- Chicken liver
- Fish roe
- Organ meats
- Oysters
- Sardines

**Dangers of Excessive Phosphorus in CKD patients**
- Fractures
- Bone pain
- Deformities
- Vascular calcification
- Cardiovascular disease
- Ultimately, mortality

**Vitamins and Minerals**
The dental healthcare provider should always consult with the patient’s nephrologist and renal dietitian prior to recommending any vitamins or minerals, due to:
- Uremia can change the way the body metabolizes certain vitamins/minerals
- Certain prescribed medications may change the way the body metabolizes certain vitamins/minerals
- Certain vitamins and minerals may be affected by the loss of kidney function and/or during dialysis treatment
- Uremia may result in loss of appetite; therefore, patients may become malnourished
- Patients are frequently prescribed renal friendly vitamins and minerals to optimize their medical condition
- The balance of vitamins and minerals in the CKD diet is a delicate matter. Dental healthcare providers should research the various vitamins and minerals (and amounts) that are present in products we may recommend for xerostomia.
- For instance, fortified calcium, casein (phosphorus product), etc. would be contraindicated in the CKD patient.
**What foods are allowed?**
To prevent malnutrition, most diets are higher in carbohydrates and fats

**Common palliative tips for End Stage Renal Disease patients with fluid restrictions**

- Suck on a lemon wedge
- Suck on citrus candies (sugar-free if diabetes is present)
- Suck on frozen grapes

- These recommendations may seem unconventional in the oral health community, but malnutrition is a large challenge within the renal community.

- Fluid restrictions and uremia can be both physically and psychologically challenging.

- Today, the average patient waiting for a renal transplant candidate can wait an average of five years for a transplant.

- Dental healthcare providers should be patient, ask lots of questions of the patient and their healthcare providers, and be ready to brainstorm to find renal friendly methods that will provide palliative relief to their patients.

**Palliative Relief for Xerostomia**

Following palliative tips may result in:

- Increase Quality of Life
- Reduction in:
  - oral/systemic ramifications of excessive biofilms
  - Gingivitis and periodontal disease
  - Caries
  - Candidiasis
- Improved nutrition

- Restoring salivary flow or providing palliative care for patients who suffer from dry mouth can challenging. However, when the patient has Chronic Kidney Disease there are special contraindications that often interfere with tradition recommendations to relief xerostomia.

- Therefore, the dental healthcare provider needs an inside view of what Chronic Kidney Disease is and how it is medically treated to develop a practical approach to treating xerostomia.

- Since malnutrition is a challenge with patients living with CKD the dental healthcare provider must learn a comprehensive approach to dental related nutritional counseling

**Common tips for Xerostomia for patients without CKD dietary restrictions**

- Sips of water or sugarless drinks – may not be an option due to fluid restrictions
- Avoid caffeine (always a positive option)
- Chew sugarless gum (xylitol) or suck sugarless candies (citrus, cinnamon, or mint flavored are beneficial)
- Oral moisturizers (saliva substitutes)
- Avoid alcohol or tobacco products
- Spicy or salty foods may cause discomfort or exacerbate condition
- Sleep with a humidifier on the nightstand.

Remember, due to variations in etiology and treatment of CKD, the dental healthcare provider should ALWAYS consult with the nephrologist prior to recommending ANY ingested product
**What palliative treatment is available for xerostomia within CKD dietary guidelines?**

- Use of a power toothbrush
- Special Care in Dentistry 2006 Nov-Dec;26(6):241-6.
- *Stimulation of salivary flow with a powered toothbrush in a xerostomic population.*
- Papas A, Singh M, Harrington D, Rodríguez S, Ortblad K, de Jager M, Nunn M. Tufts University, Boston, Massachusetts, USA. Athena.Papas@Tufts.edu

**Benefits of the Power Toothbrush in Decay Reduction**
- Special Care in Dentistry  2007 Mar-Apr;27(2):46-51
- Reduction in caries rate among patients with xerostomia using a power toothbrush.
- Papas AS, Singh M, Harrington D, Ortblad K, de Jager M, Nunn M.

**Benefits of Oral Irrigation**
- Although drinking the water during oral irrigation, it may be a refreshing alternative to interdental floss for the fluid restricted patient (in addition to reducing oral biofilms)
- Comparison of Irrigation to Floss as an Adjunct to Tooth Brushing: Effect on Bleeding, Gingivitis, and Supragingival Plaque
  - Caren M. Barnes, RDH, MS
  - The Journal of Clinical Dentistry, Volum XVI, 2005, No.3

**Xerostomia Products that should be safe for patients living with CKD**
- Xerostomia suggestion sheet coauthored by Cheryl A. Thomas, RDH and Shirley Gutkowski, RDH, BSDH
- Remember, due to variations in etiology and treatment of CKD, the dental healthcare provider should ALWAYS consult with the nephrologist prior to recommending ANY ingested product

**What can dental healthcare providers do?**

- Recognize who is at risk!
- Always consult with the patient’s nephrologist prior to clinical treatment
- Always consult with the patient’s nephrologist and/or renal dietitian prior to prescribing prescription medications or over the counter medications
- Work with the patient and the nephrologist to create a daily oral health regimen that is effective and manageable

**Additional Information**
- National Institute of Dental and Craniofacial Research(NIDCR) printable reference sheet to help find financial resources for medically/dentally indigent patients
  - www.nidcr.nih.gov
- Oral Health and Chronic Kidney Disease: Building a Bridge Between the Dental and Renal Communities
  - http://www.kidney.org/atoz/atozItem.cfm?id=169
Cheryl Thomas, RDH

- 1999 Renal Transplant Recipient
- Renal Patient Advocate
- CE Provider for dental and renal healthcare providers

Cheryl Thomas, RDH is a graduate of Tarrant County College of Fort Worth Texas. Cher began her career in dentistry 25 years ago, and has worked as both a dental hygienist and dental assistant in general dentistry, pediatric dentistry, and public health settings. In 1997, she was diagnosed with end stage renal disease due to ANCA+ vasculitis and received a renal transplant in 1999. Her brother, Robert, was her donor.

Cher educates audiences by collaborating with medical healthcare providers and by using her personal experience with kidney disease. She’s not only researched kidney disease, she has lived it. Cher’s attitude toward kidney disease reminds us that, “Every adversity has within it the seeds of an equivalent benefit.”

Cher is an active member of ADHA, TDHA, and is President of the Bay Area Dental Hygienists’ Society. She is also a member of OSAP and the Speaking Consulting Network. She has been published in RDH Magazine, Contemporary Oral Hygiene, Access, Dentist’s Money Digest, Implant News & Views, Procter & Gamble’s Dental Resource Net, The National Kidney Foundations “The Transplant Chronicles”, iKidney.com and is an editorial advisor for the PennWell Publication Grand Rounds. She has presented at the National Kidney Foundation Clinical Session, the American Nephrology Nurses national and state meetings, and was a co-presenter at the CDC Diabetes Training Conference. In July 2005, she received the RDH - Sunstar Butler Award of Distinction.

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