End Stage Renal Disease with Nonalcoholic Steatohepatitis

Introduction
When the garbage disposal service of a city stops picking up garbage, the city becomes disordered. The longer the service delay the worse the effect on the city. The kidney acts like a garbage disposal of a person’s body, which is responsible for purifying blood and filtrating metabolic wastes. When the kidney fails, the entire body would be affected. End stage renal disease (ESRD) is the most severe stage of chronic kidney disease that needs dialysis treatment or a kidney transplant. Patients with ESRD usually suffer with other complications, which negatively affect their quality of life and dietary adherence. The purpose of this paper is to review the disease background and nutrition care process on an ESRD patient with nonalcoholic steatohepatitis.

Patient Background
The patient was a 63 year-old white female with ESRD secondary to diabetes mellitus, admitted to the hospital on February 4th with elevated liver function tests. Left quadrant abdominal pain and weakness was reported. Patient has medical history of hypertension (HTN), gastroenteritis, peripheral vascular disease, and acholic cholecystitis. She recently had a cholecystectomy about one month prior to the admission. She was 65-inch tall, and her admission weight was 58 kilogram (kg). The patient was married and lived with her husband. She admitted to different hospitals frequently for care of her diabetic ulcer on her left toe. About eight months ago, she had a left-toe amputation. Upon admission, the patient was alert and oriented. Several skin lesions was observed on patient’s arm, which learned later to be Prurigo Nodularis (PN), a complication with her kidney failure condition (1,2). The patient has been diagnosed with ESRD
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for six years and had hemodialysis (HD) three times per week at the local dialysis center.

Additional finding from physical examination was soft abdomen (possible ascites). There was no sign of incontinence.

**Disease Background**

*End stage renal disease*

ESRD occurs when there is less than 10% nephron function remaining, with glomerular filtration rate (GFR; ml/minute/1.73²) less than 15. It usually occurs when chronic kidney disease (CKD) has worsened to the point at which kidney function is less than 10% of normal (1,3). ESRD almost always follows CKD. A person may have gradual worsening of kidney function for 10-20 year or more before progressing to ESRD (4). As renal function declines, the end products of protein metabolism accumulate in the blood. Uremia develops and adversely affects every system in the body. The greater the buildup of waste products, the more severe the symptoms (1,4). All of the normal regulatory, excretory, and hormonal functions of the kidney are severely impaired. The rate of decline in renal function and progression of chronic renal failure is related to the underlying disorder, the urinary excretion of protein, and the presence of hypertension (1). The disease tends to progress more rapidly in patients who excrete significant amounts of protein or have elevated blood pressure than in those without these conditions. Diabetes and high blood pressure are the two leading causes of ESRD, accounting for more than 60 percent of new cases (3,5). ESRD can also develop from infection, inflammation of blood vessels in the kidneys, kidney stones and cysts (1). Other possible causes include prolonged use of pain relievers and use of alcohol or other drugs (including prescription medications). People over the age of 50 and certain minority populations, including African Americans, Native Americans, Hispanics, Asians
and Pacific Islanders are disproportionately affected by ESRD (1,5). According to the National Kidney Foundation, the incidence of chronic renal failure is rising fast, with more than 526,000 Americans currently receiving treatment for ESRD. This includes more than 367,000 dialysis patients and 158,000 people with functioning kidney transplants (5). Each year, more than 87,000 Americans die from causes related to kidney failure. Many ESRD patients benefit greatly from a kidney transplant. After successful transplantation, patients no longer require dialysis (2). Today there are approximately 87,820 Americans on waiting lists to receive a kidney transplant (5). To avoid rejection, the best possible source of kidney donation is a close relative whose blood and tissue type match the patient's. ESRD patients need adequate calories and protein to maintain lean body mass (LBM) and prevent malnutrition (3,6). It is suggested that ESRD patients daily energy intake to be 30-35kcal per ideal body weight (IBW; in kilograms), and protein intake to be at least 1.2grams/ IBW. The allowed protein must be of high biologic value (dairy products, eggs, meats). Recommended sodium intake should be 1-2g per day. Potassium and phosphorus intake should correlate to patient’s lab values (1,3). In general, the suggested phosphorus intake is 800-1000mg per day. The patients on peritoneal dialysis can be more liberal with potassium intake ( 2-3g/day), while patients on HD should have no more than 2 grams per day. Usually, the fluid allowance is 500 to 700ml more than the previous day’s 24-hour urine output (1). Vitamin supplementation is necessary because a protein-restricted diet does not provide the necessary complement of vitamins. Additionally, the patient may lose water-soluble vitamins from the blood during dialysis (3,4). There are two types of dialysis: hemodialysis and peritoneal dialysis. Hemodialysis (HD) involves removing blood from the body and filtering it in a machine. The patient is connected by a tube to the dialysis machine, which continuously draws blood out, cleanses it and removes excess fluid and then returns the blood back to the patient.
HD must be performed for 3 to 4 hours at least three times a week. It is usually performed at a dialysis center, though home dialysis is also possible (1). Peritoneal Dialysis is internal or in-body dialysis. Peritoneal dialysis entails use of a blood-cleansing solution called "dialysate" that is injected into the peritoneal cavity, the region of the abdomen that is lined by the peritoneum. While in the peritoneal cavity, the dialysate works to extract toxins and excess fluid from the blood. After a period of time, the solution is then drained from the body cavity. Peritoneal dialysis may be done during the day or at night. Continuous ambulatory peritoneal dialysis (CAPD) is the name given to this procedure when it is performed at five-hour intervals four times a day during waking hours (1). The goal for clinical dietitians on treating ESRD patients are maintaining adequate nutritional intake. The dietitians (RDs) may assess nutritional status by focusing on weight changes, serum electrolyte, BUN, creatinine, protein, and iron levels. BUN is the indicator of glomerular filtration rate and is affected by the breakdown of protein. Serum creatinine is also an indicator of kidney function by measuring waste product of skeletal muscle breakdown. The RDs should also assess patient’s nutritional dietary patterns, such as diet history, food preferences, and calorie counts (1,3). Some factors contributing to altered nutritional intake are anorexia, nausea, vomiting, depression, or lack of understanding of dietary restriction. The management of ESRD requires significant lifestyle adjustments that may be associated with nonadherence, which contributes to poorer health outcomes (6). Patients with ESRD are required to follow a complicated treatment protocol that includes frequent HD sessions, severe dietary restrictions, a complex medication regimen, and an exercise prescription. The rigorous nature of ESRD management is stressful and may increase the prevalence of depressive symptoms and negatively influence health-related quality of life (6). From an observational, pilot study conducted in South Korea, it was found that the use of acupuncture may benefit patient
undergoing HD for ESRD symptoms management (7). Twenty-four eligible patients were recruited and received acupuncture treatment twice per week, for six consecutive weeks. Self-reported symptoms, limitations in daily life by those symptoms, and general well-being were filled out in the patient’s own words and scored on a 0–6 scale (0=best condition; 6=worst condition) at baseline, the 7th weeks, and 11th weeks. The result showed that patients experienced a significant improvement of symptoms considered the most bothersome, reporting a decrease of 1.87 and 2.08 points on a 0–6 symptom scale at 7 weeks and 11 weeks, respectively (both p<0.0001). In addition, their quality of life showed significant improvement (p<0.0437) at 7 weeks (effects of kidney disease, burden of kidney disease, role-limitations physical, emotional well-being, and energy/fatigue) and 11 weeks (physical functioning and energy/fatigue). No serious adverse events related to acupuncture occurred. Major limitations in this study include lack of a control group and heterogeneity of treated symptoms. Because the main purpose was not to show net efficacy of acupuncture treatment for specific symptoms but to identify whether acupuncture treatment was feasible and acceptable for management of various symptoms in the HD population, those shortcomings should be addressed by a further controlled trial called for by the preliminary results.

Nonalcoholic Steatohepatitis

Nonalcoholic steatohepatitis (NASH) is a common, often “silent” liver disease. It resembles alcoholic liver disease, but occurs in people who drink little or no alcohol. The major feature in NASH is fat in the liver, along with inflammation and damage (8). Most people with NASH feel well and are not aware that they have a liver problem. Nevertheless, NASH can be severe and can lead to cirrhosis, in which the liver is permanently damaged and scarred and no longer able to work properly (8). Many patients with NASH have elevated blood lipids, such as cholesterol
and triglycerides, and many have diabetes or prediabetes. Other factors contributing NASH may include insulin resistance, release of toxic inflammatory proteins by fat cells (cytokines) and oxidative stress (deterioration of cells) inside liver cells. NASH is usually first suspected in a person who is found to have elevations in liver tests that are included in routine blood test panels, such as alanine aminotransferase (ALT) or aspartate aminotransferase (AST) (8). A liver biopsy can provide more accurate diagnosis. NASH is diagnosed when examination of the tissue with a microscope shows fat along with inflammation and damage to liver cells. If the tissue shows fat without inflammation and damage, simple fatty liver or nonalcoholic fatty liver disease (NAFLD) is diagnosed (8). For NASH treatment, a major attempt should be made to lower body weight into the healthy range. Weight loss can improve liver tests in patients with NASH and may reverse the disease to some extent (8,9). Research at present is focusing on how much weight loss improves the liver in patients with NASH and whether this improvement lasts over a period of time. Besides weight reduction, some other suggestions are avoid alcohol, increase physical activity, avoid unnecessary medications, and follow a balanced and healthy diet. The nutrition component of NASH usually resembles renal diet, with emphasis on low fat, high protein, and sodium and fluid restriction (8). One of the experimental approaches to treating NASH is the use of newer anti-diabetic medications—even in persons without diabetes. Most patients with NASH have insulin resistance and are less effective in controlling blood glucose and fatty acids in the blood than it is for people who do not have NASH (8,9). One pilot study tested Metformin, an anti-diabetic medication that is significant of lowering hepatic glucose production, for NASH treatment (10). After complete medical evaluation and liver biopsy, 28 eligible patients took 2000mg metformin daily for consecutive 48 weeks. NASH activity index, insulin resistance, body compositions, and liver histology were then measured every four weeks and were evaluated.
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after completion of metformin treatment. The result showed that 30% patients had significant improvements in liver histology (p<0.03), insulin resistance (p<0.04), and reduction of visceral fat and subcutaneous fat (p<0.001). In addition, there was a marked association between weigh loss and improvements in NASH activity index and ALT level (both, p<0.01). Limitation of this study included lack of control group, small study population, and lack of indication on metformin’s side effect and contraindications. It was concluded that metformin leads to improvements in liver histology and insulin resistance in 30% of patients with NASH, probably by its effects in causing weight loss. Further studies are needed to support the beneficial effects of metformin on NASH and weight-loss.

Current Admission

After undergoing the Magnetic resonance cholangiopancreatography (MRCP) for biliary evaluation, the initial diagnosis was ESRD and advanced cirrhosis with portal hypertension. The assigned diet was Renal Diabetic 1800kcal diet.

Nutrition Care Process

(for patient’s biochemical lab values and medications, please refer to p.12-13)

February 6th: Initial Assessment

A dietary consult was received to evaluate patient. Patient’s diagnosis and medical history were reviewed. According to the husband, the patient was having poor appetite, finishing approximately 50-60% of foods on the meal tray. The patient felt nauseated sometimes. Last bowel movement was two days ago, on the date of admission. The hydration status of patient was considered edema, with the condition of ascites. According to the admission weight (58kg), the patient was within normal Body mass index (BMI). Calculated daily nutritional needs were
based on hemodialysis-standard, with higher calories and protein per patient’s ideal body weight (IBW) and limited fluids: 1704-1988kcal (30-35kcal/IBW kg), 45-85g protein (0.8-1.5g/ IBW kg) 1000-1500ml fluid (or per MD). The patient’s nutrition status was moderately compromised, with a PES statement of: *Patient with altered nutrition related lab values related to current condition as evidenced by increased liver function tests, glucose, BUN, Creatinine, and phosphorus.* The main nutritional intervention was to add sodium restriction (2 grams of sodium) onto the diet order due to cirrhosis condition. Eating six-small meals per day was also recommended for lower the risk of fluid retention. The patient agreed to try the nutrition supplementation Nepro for adequate nutrition consumption; the Nepro would be provided twice per day (BID) and between meals. The follow-up (F/U) date was set to be within the next 7 days, on February 13th.

**February 9th: Diabetic Diet Education**

A consult was received for Diabetic education. At the time, the patient’s blood glucose was consistently high despite the insulin intervention. The patient had paracentesis and took out large amount of fluids (7.2 liters) from her abdominal area, and she felt fatigue and weakness most of the time. When visiting, the patient was at dialysis unit, so the education was given to the husband. The husband stated that patient have had poor food and beverage (PO) intake since she started on HD about six years ago. They were aware of the foods high in carbohydrates and have tried to eat what the doctor/dietitian from dialysis center have instructed, but patient still experienced uncontrolled blood glucose (BG). While educating the subject on carbohydrate’s effect to BG, the concern is drawn to controlling BG while patient having poor PO intake. With patient’s current medical condition, a poor-fair outcome was expected.
February 13th, Follow-up #1

Patient’s condition became more unstable since the initial assessment. She had a transjugular liver biopsy to examine further on her liver condition and was currently waiting for the result. Patient continued to have poor PO intake, drinking minimal amount of Nepro. Patient also suffered constipation, and stool softener had to be assigned as needed (PRN). Without discontinuing the PO diet, the physician has ordered a customized Total parenteral nutrition (TPN) for her. The component of TPN was 500g of dextrose, 70g of amino acid (AA), 25 units of insulin, and other electrolytes and minerals. TPN’s rate was 52ml per hour. The patient’s BG was very high (>700mg/dL) and had to transfer to the intensive care unit (ICU). The current weight was 75.1kg (BMI: 27.5, overweight), which was a +30% weight change from the admission weight (58kg). Whether there was an error of weight-recording was unknown. Without including the PO diet, the TPN regimen has met patient’s nutritional needs. However, the glucose infusion rate (GIR) was 4.6mg/kg/day, which was too high for a patient who had history of diabetes. The goal was to reduce the GIR to <4.0mg/kg/day. After reviewing the lab values and medication (refer to page 12), patient’s nutritional status was considered severely compromised, with the PES statement of: patient with increased nutrient needs related to liver/renal complications as evidenced by TPN administration and multiple altered nutrition related lab values. The recommendation was to reduce TPN’s dextrose from 500g to 400g per day to have the desired GIR. The next follow up date is within five days, February 17th.

February 17th, Follow-up #2

During her stay in ICU, patient’s hemoglobin (HGB) was very low to the point that blood transfusion was required. Following the recommendation, the TPN’s dextrose has changed to 400g per day, and the patient’s BG level has been in better control. TPN’s rate has been
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decreased to 46ml per hour, with less insulin dose (18 units). The physician was able to decrease the dosage of Zoloft and Cynbalta, and Ativan was discontinued. The result of liver biopsy showed that patient developed NASH. Patient was back to Medical Surgery unit with gradual improved PO intake, but still not meeting 50% of nutritional needs. The frequency of bowel movement had improved. The PO diet (2gm sodium and Renal Diabetic 1800kcal) remained unchanged. The new additional medication was Vitamin E, an anti-inflammatory medication which may decrease both symptoms of ESRD and NASH. The current weight (72.9kg) was consistent with previous assessed weight. Without including the PO diet, the current TPN have met 75-100% of patient’s nutritional needs. The GIR (3.8mg/kg/day) was within desirable range. After reviewing patient’s medication and lab values, her nutritional status still remain severely compromised with a PES statement of: inadequate food and beverage intake related to current condition as evidenced by pt/family food recall. The recommendations were 1) hold onto Nepro to control BG, 2) encourage PO intake, and 3) offer breakfast foods for lunch and dinner to provide more food choices. In addition, the recommendation was made to consider discontinuing TPN when patient’s PO intake met more than 75% nutritional needs.

February 18th—Discharge

The TPN had discontinued on February 18th, followed by a Calorie count request. Instead of Nepro, another protein supplement was provided. The patient showed slow improvement. After evaluation, the patient was discharged on February 22nd to a skilled nursing facility (SNF).

Conclusion

Patient was a 63 year-old female with significant medical history of ESRD, diabetes and hypertension admitted to hospital with elevated liver function tests. Ascites was observed. Liver biopsy was ordered. She was on HD. The recommended PO diet was 2gm sodium, Renal
Diabetic 1800kcal with Nepro BID. Diabetic education was given. The patient suffered from fatigue and discomfort and have had poor PO intake during the hospital stay, and her BG was difficult to control. Her nutritional status was mostly severely compromised. After reviewing the initial TPN, recommendation was made to lower the GIR to desired range (<4.0mg/kg/day). Liver biopsy result showed NASH. Patient showed slow improvement. After TPN discontinued, a Calorie count was order by the physician. Patient was discharged to SNF after 18 days of hospital stay.

**Personal Impression**

This was a very complicated case study. The patient had many other medical conditions (uncontrolled BG, poor PO intake, TPN administration…etc.) besides the ESRD itself, so it was quite difficult for me to decide what I wanted to focus on. Since I am still learning as an intern, I did not know well enough of what were the areas that I should or should not interfere with the physician’s order. Although I might have few questions of their decisions, my first impression would always be that their interventions were correct. I could have asked the doctors about why the physicians’ decision on using TPN for my patient. The patient did not benefit from TPN.
References