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Gout and Diet

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Title Gout and diet
Department Nursing
Degree Master of Science

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Abstract

The prevalence of gout continues to rise in the United States and all over the world. There are 8.3 million people in the United States that have gout. The prevalence of gout has risen 1.2 percent in the past two decades. Gout is a condition that happens due to deposition of monosodium urate crystals in the joint or soft tissue. These crystals are created by high levels of uric acid in the body called hyperuricemia. There are many different factors that contribute to gout including: advanced age, male gender, family history, obesity, medication increased alcohol consumption diet, lead toxicity, organ transplant, thyroid problems, serious illness, and other diseases such as diabetes and cardiovascular disease. The case report presented is a 46 year old male with a diagnosis of gout. He presents with many of the risk factors listed above for gout. He has cardiovascular disease, diabetes, obesity, he is currently on a diuretic, and his diet consists of many high risk foods such as oatmeal, sausage, steak, and beer. He was treated with Indomethacin, taken off his diuretic, and given instruction on diet. Food rich in purines, alcohol, sugar-sweetened beverages, and obesity are all discussed in this research. All of the studies reviewed found a correlation between gout and these four risk factors listed above. They also found the higher the intake of purines, alcohol, and sugar-sweetened beverages the higher the incidence of gout. The studies done on obesity showed as obesity increased, the incidence of gout increased. It has been known for years that consumption of purines, alcohol, and sugar increase one likelihood of developing gout. But now with the increase in prevalence and obesity, this may further prove that food and alcohol intake are the reasons for the increase in prevalence. Further studies need to be conducted on whether the gout correlation is only due to calorie intake from high risk gout food causing obesity, or if fat has some effect on the uric acid metabolism.

Background

Gout is a condition that happens due to deposition of monosodium urate crystals in the joint or soft tissue. These crystals are created by high levels of uric acid in the body called hyperuricemia. Over production or under secretion of the uric acid creates for increased serum blood levels. Gout causes red, inflamed, painful joints. The most common joint that is affected is the first metatarsal joint. The patient can have fever without chills, and the first episode usually occurs in the middle of the night with patient awaking to painful symptoms. As many as 8.3 million people in the United States have gout. Increased in age, obesity, heart disease, and kidney disease are all contributors to the increased prevalence of gout. The current prevalence of gout in men is 5.9% (6.1 million), and increase of 1.2% over the past 20 years (Center for Disease Control and Prevention, 2016). The average age that gout first occurs is between 30 and 50 years old. The occurrence in those under the age of 30 is often due to obesity, alcohol, and diet. When gout occurs in the elderly, it is more associated with kidney disease and the use of diuretics. Many different factors including: advanced age, male gender, family history, obesity, medicines, binge drinking, diet, lead toxicity, organ transplant, thyroid problems, serious illness, and other diseases can all put a person at higher risk for gout.

The patient in this case presented with many of the factors that put him at increased risk for gout. First, he is male which it is known that men have increased risk over women of developing gout. According to the CDC (2016), the ratio of men to women is 3.3 to 1 of developing gout. He currently is taking hydrochlorothiazide, which has shown to increase both the new cases of gout and flare ups in patients who already have gout. Singh, Reddy, and Kundukulam (2011) conducted a systematic review and found 13 studies that demonstrated a

positive correlation between the use of diuretics and increased prevalence of gout. According to Singh, Reddy, and Kundukulam (2001) patients with heart disease, diabetes, hypertension, hyperuricemia, obesity, renal disease including renal insufficiency, elevated triglycerides and cholesterol levels, menopause, undergoing surgery, and elevated creatinine levels are at increased risk for developing gout. The focus of this case report will be to evaluate how a person's diet and alcohol consumption relates to an increased risk of gout. The literature focuses on diet specifically high in purine, seafood, and sugar, along with higher levels of alcohol being the probable cause of this increase.

Case Report

A 46 year old male presents to the clinic today with complaints of pain and swelling to his right great toe. He woke up this morning with the above symptoms. His toe is painful to touch and when he steps down on his foot this causes him a great deal of pain. He did not have any pain or swelling when he went to bed last evening. He denies any recent or past injury to his toe or foot. He has not ever had this happen in the past, nor has he ever had pain or swelling to any other joints. He denies a history of gout.

He has not taken anything to treat the pain. He took his daily aspirin this am but this did not provide any relief. He reports his diet usually consists of oatmeal and banana for breakfast, he often skips lunch, and for supper he has some sort of meat such as sausage or steak with potatoes or pasta. He is wondering if it is ok to drink a beer or two every night.

His past medical history consists of: hypertension, dyslipidemia, diabetes mellitus Type II (diagnosed at age 45), and kidney stones. He currently is taking the following medications: hydrochlorothiazide, Lisinopril, Metformin, Simvastatin, and Aspirin. He has no known allergies and has had Lithotripsy done. His family history consists of his mother having diabetes, stroke

and hypertension and his father having hypertension, kidney stones and a heart stent. His sister is in good health.

The physical exam reveals the patient is alert and oriented, in no acute distress. He has a low grade temp of 99.3, his BMI is 29, and all other vitals are within normal limits. Lung sounds are clear to auscultation. Heart has regular rate and rhythm, S1 and S2 heard without murmurs. His right toe is red, swollen, and warm to touch. Swelling is most predominant over the 1st metatarsal joint. Patient has pain to very light palpation. Range of motion to right great toe is limited due to pain in the MTP joint. No other joints are noted to be inflamed or red. No lesions or deformities are noted to toes or foot.

Labs were obtained including a CBC, Chem 14, Serum uric acid, and a Sed rate. The labs that were obtained were to rule in and out differential diagnosis. CBC and Sed rate would show signs of infection and inflammation to rule out septic arthritis, cellulitis, or would further prompt more testing for Rheumatoid arthritis. Serum Uric Acid would rule in or out gout. All labs within normal limits except Serum Uric Acid 10.9, BUN 23, Glucose 139 (non-fasting), and WBC was elevated at 9.0, but not out of range.

The writer diagnosed him with gout, and a prescription of Indomethacin 50mg by mouth three times a day for 10 days was ordered. I explained to the patient that we will treat his acute flare of gout, but if he continues to have flare ups of gout we will have to look at chronic treatment. Hydrochlorothiazide was discontinued due to its contraindication with the diagnosis of gout. He was instructed to avoid all alcoholic beverages. Limit red meat and seafood to a 1-2 servings a week and limit sugar intake. Add chicken, vegetables, some fruit and dairy products to his diet. Follow up in one week for recheck of blood pressure; we may need to increase his lisinopril and also to recheck the gout response to medication, and discussion on weight loss.

Literature Review

The cause of gout continues to be widely studied. There are many known risk factors for the development of gout in one's lifetime. Many of these factors have shown to create a rise in serum uric acid or decrease the excretion, but no one factor seems to be the cause. This literature review focuses on specific foods in ones diet as well as the consumption of alcohol and how it relates to gout. Certain foods and alcohol are associated with the risk of gout, but many studies do not separate specific foods or amounts of the food and alcohol. Since the prevalence of gout continues to rise, we need to figure out what is contributed to the gout increase.

One of the most commonly documented foods to cause a rise in uric acid are those rich in purines. When purine is ingested, it is then broken down into uric acid. Foods that are high in purines are foods such as: organ meats (liver and kidneys), meats (bacon, beef, pork and lamb), and any other meats in large amounts, game meat, seafood and beef. Choi, Atkinson, Karlson,, Willett, and Curhan, (2004) studied diets in 730 case and actually broke down the different types of protein. They found that meat, specifically beef, pork, and lamb showed an increase in association with gout. Seafood intake including, all individual seafood items, also showed an increase in association. They found for "each additional daily serving of meat was associated with a 21 percent increase in the risk of gout, and each additional weekly serving of seafood was associated with a 7 percent increase in risk" (p.1101). Vegetables that are high in purine did not show an increase in association with gout. The intake of dairy products actually showed a decrease in gout. The way that meats or seafood is cooked could affect the purines in these different foods.

Chuang, Lee, Hsieh, and Pan (2011), studied many different foods that could increase or decrease uric acid levels. The study was conducted in Taiwan comparing their Nutritional and

Health Survey between the years of 1993-1996 and 2005-2008. It was noted that the prevalence of gout increased from 4.74% to 8.21%. They also broke down their study in different regions to compare if diets were different, and if uric acid levels correlated with those diets. They found, “the dietary pattern associated with lower uric acid levels included frequent intake of vegetables, eggs, lean meat, soy products, seaweed, and coffee and less bamboo shoots, organ meats and soft drinks” (Chuang, Lee, Hsieh & Pan, 2011, p. 304). The study also revealed that the different geographic ranges showed different levels of uric acid. Chuang, Lee, Hsieh, and Pan, (2011) noted the indigenous people had a higher uric acid levels, and they are known to have a higher prevalence in alcohol intake. Fishing is a big part of the Penghu Island, so they likely consume a larger amount of seafood. These people were found also to have a higher uric acid level.

A study done by Zhang et al., (2016) further supports the previous studies noted above regarding diet and alcohol. This group studied the clinical features of gout, and what is the cause for recurrent gout flares. Gout can be an ongoing problem, when gout resolves, the person can continue to have high uric acid levels and later have a gouty flare. Zhang et al., (2016) split their study into two groups, early onset and late onset of gout. It was found that the early onset group was more likely to have flares of gout with 69.6% reporting high purine intake, and 60.3% reporting alcohol intake prior to the flare. The late onset group reported diuretic and aspirin intake before their flares. This supports the idea that younger age men have higher incidence from diet and alcohol, compared to older men having higher incidence from medication.

Zykova et al., (2015) went as far as to study diets that compared macro and micronutrients; meaning carbohydrates, fats and proteins, compared to vitamins, minerals, trace elements, and antioxidants. Their study consisted of an Australian cohort and Norwegian cohort. They found that consumption of higher carbohydrates, calcium, and vitamin B12 showed lower

serum uric acid levels. Higher fat intake showed higher serum uric acid. The specific foods were: dairy products, high fiber bread, cereals, and fruits which showed lower effects, and meat, eggs and beer that showed higher effects or serum acid level. Interestingly the higher fat intake, but not protein, was associated with the higher uric acid. They note meat that shows association with high uric acid could be due to the way it is cooked, or the saturation in the amount of fat, not just only due to the amount consumed.

A cross-sectional study by Ryu et al., (2014) was conducted on 28,589 Korean men and women, to their knowledge no one had studied Korean subjects and hyperuricemia. Although they only studied hyperuricemia, and not specifically subjects with gout, this study is worth noting due to the diet and high number of subjects in the study. It was noted in the study, the Korean dietary habits are becoming more westernized. The studied showed the group that had hyperuricemia consumed: lower amounts of carbohydrates, fiber, calcium, phosphorus, iron, sodium, potassium, vitamin A, vitamin B2 Vitamin C, and folate. They found alcohol intake was significantly higher in the hyperuricemia group. But this is one study that did not show significance with consumption of meat, eggs, fish or shellfish.

Alcohol is another known risk factor for increasing the risk for gout, but specifically how much alcohol it takes to causes gout and flares are not well studied. A study done by Neogi et al., (2014) on 724 people with gout was done to compare the quantity and type of alcohol consumed to cause gout flares. The participants were studied over a 12 month period, had a mean age of 54, and were from all 49 states and the District of Columbia. Wine, beer, and liquor were the three types of alcohol compared. The total amount consumed in a 24hr period was the measurement for amount of alcohol. The results showed that having greater than 1-2 drinks in a 24 hour period, increased the risk of an attack by 36%. Breaking down the different types of alcohol

showed, greater than 1-2 servings of wine showed 2.36 times higher risk, greater than 2-4 beers showed 75% higher risk, and greater than 2-4 liquor beverages showed 1.67 times higher risk of having a gout attack (Neogi et al., 2014). They stated, “While alcohol has long been thought to trigger gout attacks anecdotally, the results from our study confirm that alcohol intake, potentially even moderate amounts, increases the risk of recurrent gout attacks in a short time following consumption” (Neogi et al., p. 315).

Another known risk factor for gout that was not as prevalent in the literature is increased sugar consumption. A large study of 46,393 men was done by Choi and Curhan (2008) to study the relation of a sugar sweetened soft drink and fructose intake with the incidence of gout. Choi and Curhan (2008) noted, “soft drink consumption in the US increased by 61% in adults from 1977 to 1997” (p. 310). This is alarming, but sugar sweetened soft drinks are the biggest single calorie source in the US. Choi and Curhan (2008) found with the increase in consumption of soft drinks, the increase in risk for gout went up. The study showed with two or more servings of sugar sweetened soft drinks daily, the risk of gout rose by 85%. As compared to diet soft drinks, there is was no association noted. They also found fructose and fructose rich food showed a substantial association to risk for gout. The fructose has similar mechanisms of ethanol, and possibly could affect uric acid levels by increasing insulin resistance, which is beyond the discussion of this paper. Another alarming statistic noted by Bray (2013) is that the gallons of soft drinks consumed, compared between 1950 and 2000 went from 10 gallons a year to 50 gallons a year.

Diet and alcohol have all shown to increase the risk of gout in the studies previously discussed above. This does not explain whether the prevalence of gout is on the rise due to diet and alcohol consumption. When looking further into the diet changes in the world and the

growing prevalence of obesity, this may explain the correlation. More than one third of the U. S. adults are obese. Obesity is higher among middle age and older adults compared to younger adults age less than 39 (CDC, 2016). In North Dakota alone obesity has went from 27.8% in 2011 to 32.2% in 2014 (CDC, 2016).

Juraschek, Miller and Gelber (2013) specifically studied the association with obesity and the prevalence of the gout in the U.S. Their study compared 16,521 subjects from the National Health and Nutrition Examination Survey from the years 1988-1994 and 2007-2010 looking at subjects with gout and their BMI. Their study showed the higher the BMI the higher the prevalence of gout.

For example, while approximately 1-2 % of the participants with a normal BMI value reported a diagnosis of gout, the proportion was 3% among the overweight participants, 4-5% among those with class I obesity, and 5-7% among individuals with class II and class III obesity (Juraschek, Miller & Gelber, 2013, p. 131).

The study broke down specific increases in height to weight ratio associated with gout. An average adult with a height of five foot nine inches will have a 5% increase prevalence of gout for every 6.8 pounds of extra weight. A BMI equal or greater to 30 has twice the prevalence of gout compared to non-obese person. Juraschek, Miller, and Gelber (2013) also broke down prevalence of gout by race, and found overweight and obese non- Hispanic whites, non-Hispanic African Americans and Mexican Americas all have higher rates of gout.

Bray (2013) noted currently 35% of Americans are obese and 65% are over-weight compared to 14% in 1972. He looked at several studies that compared obesity to soft drink consumption, and all had a positive relationship with obesity. He also reviewed studies that showed diseases such as diabetes mellitus, metabolic syndrome and heart disease had an

association with soft drinks and weight gain. Bray (2013) additionally compared three randomized clinical trial that were conducted with subjects consuming a set amount of sugar sweetened drinks in a certain timeframe. The amounts were all different in each study, but the results were somewhat similar. In two of the studies the subjects gained weight. Two studies showed an increase in blood pressure, the other study didn't comment on blood pressure. One showed an increase in inflammatory markers, the other two did not comment on labs studied. One mentions the total cholesterol increasing.

Williams (2008) studied the opposite end of unhealthy people, and instead studied people that were physically active with lower BMI. Even with a lower BMI there were still some incidence of gout, and again a difference in BMI and waist circumference made a difference. A person with a BMI of less than 20 had an 85% less risk of gout, than a BMI of greater than 27.5.

In summary, there is no specific study that states that diet or alcohol alone is the reason for the increase in prevalence of gout. With the literature review above, it could be said that gout is on the rise due to the consumption of purines, seafood, sugar and alcohol, specifically beer, around the world. Obesity continues to rise and this is caused from increase calorie intake from both food and soft drink consumption. It is also know that the intake of healthier foods such as fruits, vegetables and many vitamins and minerals does not cause substantial weight gain or affect uric acid levels. Many studies looked at for this case report found a direct correlation between obesity and gout. Further studies need to be conducted on whether the gout correlation is only due to calorie intake from high risk gout foods causing obesity, or if fat has some effect on the uric acid metabolism.

It is also worth noting that obesity puts people at risk for diabetes and cardiovascular disease, both of which can lead to kidney disease. All of these diseases also have a correlation

with the risk of gout. As our population becomes older and more obese, the prevalence of gout is likely to increase. Providers need to be aware of patient's diseases, weight, food, and alcohol intake when treating a patient with gout. Lifestyle changes alone may help prevent new or recurrent gout attacks by, limiting or avoiding the purines, sugars, and alcohol, and encouraging diet and exercise to lower weight.

Learning Points

- 1.** Foods high in purine such as meat (organ meat, beef, bacon, pork, lamb and game meat) and seafood increase the risk of gout
- 2.** Beer increases the risk for gout. The higher the intake the higher the risk.
- 3.** Sugar sweetened drinks increase the risk for gout
- 4.** Obesity and other disease, such as diabetes, cardiovascular and kidney disease, all increase the risk for gout.
- 5.** Decreasing the intake of the products listed above may help control new cases and recurrent attacks of gout.

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