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Effects of Alcohol Use Upon Bone Health

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University of North Dakota

PERMISSION

Title: Effects of Alcohol Use Upon Bone Health

Department: Nursing

Degree: Master of Science

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Jamila M. A. Unah

March 22, 2018

Abstract

Alcohol continues to be a commonly used substance in the United States and abroad as a coping mechanism and/or a means of achieving social acceptance. Approximately ninety percent of individuals have consumed alcohol within their lifetime, warranting the need for assessment and education related to healthy alcohol consumption, as well as possible interventions. The purpose of this case report is to examine the literature on the effects of alcohol consumption upon bone health to help understand the presented case of a 62 year old female. During this semester's objective structured clinical examination (OSCE), the patient, who presented for a post-operative exam for her left knee replacement, disclosed that she consumes one to two glasses of wine most evenings weekly. The following literature review was motivated by this OSCE.

Research studies related to the effects of alcohol use on bone health show that moderate alcohol use is beneficial for bone health especially for peri- and postmenopausal women. In contrast, excessive alcohol use is detrimental. However, daily alcohol use for at least eight weeks shows significant arthritic changes of the knees and shoulders. Excessive alcohol consumption may lead to an inadequate balance of essential minerals, further compromising bone health. Research also concluded that at least seven glasses of wine and eight or more standard spirit drinks have a protective benefit whereas beer consumption is associated with increased risk of developing osteoarthritis. Though the main dependent focus of this study is alcohol consumption, maintenance of bone health is affected by many factors.

Background

A legal substance for many decades, alcohol continues to be a commonly consumed beverage in the nation as well as abroad. Though recommended national guidelines exist to drink in moderation, this substance continues to be intentionally or unintentionally consumed excessively for reasons such as a coping mechanism or a culture norm in society. According to a survey conducted in 2015, almost 9 of 10 individuals ages 18 and older reported to drinking at least one alcoholic beverage sometime in their lifetime (NIH, 2017). Based on this statistic, it is necessary for providers to assess every patient especially those at risk for heavy alcohol use and to educate about the healthy and unhealthy consequences of alcohol consumption. Furthermore, it is the responsibility of the healthcare provider to help patients who participate in risky alcohol consumption see the problem and to progress into healthier choices in relation to this substance.

During this spring's objective structured clinical examination (OSCE), the discussion of alcohol use was briefly addressed. During the exam, the client discussed that she drinks one to two glasses of wine "most days of the week" which triggered a concern as well as a moment of education especially prior to her surgery. According to the 2015-2020 U.S. Dietary Guidelines for Americans, recommendations state that moderate alcohol use is up to one standard drink for women and two for men daily (CDC, 2017). Based on this guideline, the client does not fall into the category of moderate drinker and may be prone to unhealthy consequences due to excessive alcohol consumption.

The objective of this case report is to explore the possible effects of alcohol use upon bone health, especially the development of or those with osteoarthritis. The effects of alcohol consumption after a knee operation will also be addressed.

Discussion of Search Strategies

With the access of University of North Dakota Harley E. French Library of Health Sciences, an online search was conducted in relation to the following PICO question: among the adult population, what effect(s) does alcohol drinking have upon bone health? Starting with search engine PubMed, "alcohol drinking" [MESH] AND osteoarthritis resulted a total of thirty-eight articles. Under "publications date" on the upper left portion of the webpage, the "5 years" option was selected, narrowing results to thirteen articles. Of these thirteen results, five of them were relevant to the research topic.

The second search engine utilized was CINAHL. Initial search keywords were "alcohol drinking" AND "arthritis". A total of 108 results appeared. After limiting results to the past 5 years, peer reviewed, and to "all adult" age group, the results decreased to thirty-two. Unfortunately, none of these were relevant for this case report, and search keyword "bone health" was added. Nineteen results appeared after limiting selections to peer reviewed, to past 5 years, and to "all adult" age group with only a minute number of articles being relevant. Thirdly, UpToDate was also utilized keywords "alcohol intake" or "alcohol drinking" and "bone health" which revealed two relevant articles.

Case Report

History of Presenting Illness

Sixty-two year old Caucasian female presents to the clinic for pre-operative exam for left knee replacement. Patient reports she has dealt with knee pain for more than two years. Patient has declined steroidal or other local injections to relieve knee pain. In relation to medical conditions, patient states that she takes medications as ordered. She also reports her last A1C was less than 7.0 and blood pressure has been within appropriate range.

Personal Medical History

Patient has history of hypertension, diabetes mellitus type 2, hyperlipidemia, and osteoarthritis. Medical conditions are appropriately managed with Lisinopril, Metformin, and Simvastatin and she denies ever receiving blood products. She reports her vaccinations are up to date but denies receiving pneumococcal or zoster vaccine yet. She states that she does complete an annual eye exam and there have not been any visual concerns.

Family Medical History

Patient reports colon cancer of maternal grandfather and hyperlipidemia and diabetes mellitus type 2 of mother and father. Due to the family history of colon cancer, patient does undergo a colonoscopy every five years and states that her colonoscopies have always been free of polyps, malignancies, or other abnormalities.

Social History

Patient reports that she has smoked one pack of cigarettes daily for the past fifteen years. At this time, she has not considered cessation of tobacco use but is interested in discussion cessation options. She also reports that she drinks one to two glasses of wine “most evenings” and is not ready to decrease intake right now. Patient denies use of illicit drugs.

Review of Systems

Patient denies the following: fevers, chills, fatigue, syncope, lightheadedness, dizziness, unintentional weight changes, headaches, visual changes, sinus congestion, recent illnesses, sore throat, chest pain, palpitations, shortness of breath or dyspnea, indigestion, abdominal pain, nausea, vomiting, diarrhea, constipation, hematochezia, abnormal bleeding or bruising, swelling or pain in extremities, claudication, weakness, falls or injuries, or restrictions to range of motion. Patient reports pain to left knee.

Physical Exam

HEENT: Head is normocephalic and atraumatic. Conjunctiva and sclera are clear bilaterally and pupils are reactive to light. Tympanic membrane is pearly gray and free of perforation or bulge; cone of light is present. There is no sign of drainage or erythema with examination of external ear. Nasal septum is midline and turbinates are deep pink bilaterally. Adequate dentition is seen and gingiva is intact without edema or bleeding. No presence of mucosal lesions or exudate is observed. Uvula is midline and tonsils are free of erythema, exudate, and swelling. There are no palpable cervical nodes or tenderness. Thyroid is midline and no masses are palpated.

Cardiac and Respiratory: No bruit or murmur is heard over bilateral carotid arteries; there is no presence of JVD distension. S1 and S2 sounds heard over all heart landmarks without murmurs or other abnormal sounds. Lung sounds are clear throughout all lung fields without adventitious sounds. Chest rises and falls symmetrically and respirations are regular, easy, and unlabored. Pulses are palpable and strong in all four extremities; radial pulses are synchronized with apical pulse. No edema is noted to extremities.

Abdomen: Bowel sounds are present and normoactive in all four quadrants. Patient denies pain with light, medium, and deep palpation of abdomen. No splenomegaly or hepatomegaly is noted.

Musculoskeletal: No swelling or erythema is observed to bilateral knees. Patient is able to perform full flexion and extension with bilateral knees. Pain is expressed with palpation to right patella; crepitus is noted to bilateral knees. No instability is noted with anterior and posterior drawer tests. No sign of meniscal tear with McMurray test.

Neurological: Monofilament test is performed and no sign of diminished sensation to dorsal points of feet bilaterally.

Assessment and Plan

Obtain following lab orders and tests: complete blood count (CBC), comprehensive metabolic panel (CMB), lipid panel, and echocardiogram (ECG). All lab values are within appropriate ranges and ECG displayed normal sinus rhythm with heart rate of seventy-three beats per minute.

Per professional judgment, patient is cleared for surgery in two weeks. There are no concerns for patient's chronic medical conditions as they are controlled at this time. Patient is interested in smoking cessation and patient is agreeable to start oral medication such as Chantix or nicotine patches at this time. Her alcohol intake is a concern and patient was educated to stop drinking at least one week prior to her procedure to prevent possible complications.

Literature Review

After conducting this OSCE, it felt necessary to educate the patient to abstain from alcohol use prior to a procedure involving bone and joint space. However, this exam provoked a need for research regarding how alcohol affects the bone health especially in the situation of osteoarthritis, as well as orthopedic procedures. Research was conducted to analyze studies which specifically dealt with alcohol consumption and bone health.

Changes of Bone Health with Alcohol Consumption

While reviewing literature, there has been a common theme about changes in which bone health transforms after consuming alcohol. With use, the bone may deteriorate over time. Kc et al. (2015) completed a study to analyze chronic alcohol use of 4.5 percent in rats over a duration of eight weeks. Results for this study showed significant arthritic changes in the experimental group with alcohol exposure especially in the knees and shoulders. Though Kc et al. (2015) saw changes they briefly recommended that more research is necessary about chronic alcohol use and

its association with osteoarthritis development. That being said, Mutijima, De Maertelaer, Deprez, Malaise, and Hauzeur (2014) also agreed with Kc et al.'s findings after receiving results in which alcohol use may be provoking apoptosis of osteocysts and osteoblasts, resulting in either osteoarthritis or osteonecrosis. Mutijima et al. (2014) also used subjects with corticosteroid use or who had no pre-existing conditions, which may imply that bone health may be affected by multi-factorial aspects. Furthermore, Gaddini, Turner, Grant, and Iwaniec (2016) agreed with the previously discussed articles, discussing an inadequate balance of minerals due to excessive alcohol use especially calcium and vitamin D, ultimately resulting in impaired bone health. Interestingly, Gaddini et al. (2016) discussed that abstinence of alcohol among those suffering with alcoholism dramatically improved bone health, increasing bone mineral density and biochemical markers of bone turnover. With this information, it is vital to educate as well as refer to progress into a recovery phase.

Beneficial Aspects of Alcohol Use

Research concluded that people may have adequate bone health if no alcohol is consumed. Muthuri, Zhang, Maciewicz, Muir, and Doherty (2015) determined that there is no connection between the development of osteoarthritis and non-alcoholic consumption. However, some researchers have proposed that moderate alcohol consumption is actually helpful to bone health. McLernon, Powell, Jugdaohsingh, and Macdonald (2012) specifically focused on perimenopausal women and concluded that moderate alcohol use was independently positive for the bone mineral density of the greater femoral neck as well as the lower spine in comparison to those who did not drink alcohol. Lavernia, Villa, and Contreras (2013) also agree with the beneficial aspects particularly in relation to function, pain, and stiffness of joints prior to total hip arthroplasty. Marrone et al. (2012) agrees that moderate consumption is beneficial, focusing

primarily on older women who experience osteoporosis after menopause. Marrone et al. (2012) also concludes that moderate use of alcohol decreases bone loss in post-menopausal women.

Level of Alcohol Consumption

The amount of alcohol consumed, if any, may cause varying effects upon bone health. Gaddini et al. (2016) summarized that light to moderate use of alcohol is positive because it decreases age-related bone loss, as well as promotes higher bone mineral density. In contrast, the authors concluded heavy alcohol use is detrimental, increasing fracture risk, deteriorating bone quality, and reducing bone mineral density. After conducting a study on rats with surgically altered medial menisci, Butler et al. (2017) noted that there may be a correlation between amount of alcohol consumed and the severity of osteoarthritis.

A study has also been completed to determine the effects of alcohol consumption after a total hip arthroplasty. Lavernia, et al. (2013) determined that moderate drinkers, in comparison to nondrinkers and occasional drinkers, rated better scores for function, pain, and stiffness prior to their operation. The article discusses that this may be due to the anti-inflammatory component of alcohol. The writers also determined that many adverse effects have occurred after surgery due to excessive alcohol use. Though, Lavernia et al. (2013) revealed that function of movement and joints were better after surgery in all abstainers and alcohol users, improvement of subjective function and pain of bone and joints improved better in those who abstained. Tetrault and O'Connor (2017) discuss adverse effects include but are not limited to the following: hypertension; impairment of cardiac, nervous, and gastrointestinal systems; and inadequate blood cells and/or platelets due to bone marrow suppression.

Variable Effects based on Type of Alcohol

Research has shown that the type of alcohol may manifest different effects within the body. Muthuri et al. (2015) conducted a study to analyze the association of alcohol consumption between ages of 21 and 50 and osteoarthritis, which concluded beer, wine, and spirit consumption affect the body differently. The authors determined that beer intake during the above specified age range puts individuals at risk for osteoarthritis. Whereas those who consume wine and/or spirits such as gin, brandy, and/or vodka, had a negative association of osteoarthritis development, suggesting a protective barrier against this condition. This topic was also addressed by Tufts University (2015) in which consumption of wine, specifically with a minimum of seven glasses weekly, decreased an individual's chances of knee osteoarthritis by fifty percent. While there was no benefit of spirit use for knee osteoarthritis, however there was a reduction of developing hip osteoarthritis by almost fifty percent with the consumption of eight or more spirit drinks.

Multi-factorial Components to Bone Health

Though this case report discusses the single factor of alcohol consumption affecting bone health, there may be multifactorial aspects. Specifically osteoarthritis, Kc et al. (2015) note that it usually occurs from a combination of inherited and lifestyle elements, such as overuse or traumatic events to localized areas of the body. Muthuri et al. (2015) agree with this statement, while including nutrition and weight as significant modifiable factors. Though Marrone et al. (2012) state that moderate consumption is beneficial to bone health, they discuss that the quality of mineral bone density in post-menopausal women cannot solely be determined by alcohol intake as there are several variables which play a part in bone health maintenance.

Learning Points

The literature review revealed multiple learning points. Chronic alcohol use as well as heavy drinking has a negative impact on bone health. However, moderate alcohol use has been proven to be beneficial for the skeletal system. Evidence has also shown that alcohol has a positive effect for individuals prior to orthopedic procedures, particularly related to function, pain, and stiffness of joints. Though the effects were better prior to surgery for those with impaired bones, there was no change of symptom improvement based on level of alcohol consumption. Research did prove that those who abstained from alcohol use recovered better post-operatively.

The level of alcohol consumption is also critical. Though it has been proven that light to moderate alcohol intake may be beneficial, excessive use may lead to insufficient minerals including calcium and vitamin D needed for bone health. Excessive alcohol use may also result to increase risk of fractures and reduced bone mineral density. Furthermore, heavy alcohol intake can potentially lead to adverse effect post-operatively which can prolong the recovery and healing process.

Surprisingly, alcohol types affect bones differently. There is a positive correlation between beer use and osteoarthritis development, making those individuals who drink beer more at risk. In contrast, moderate use of wine and spirits actually protects bones.

In summary, the use of or abstinence from alcohol definitely influences the bones. It is important to remember that multi-factorial aspects contribute to maintenance of bone. The example of the patient in this case report shows it may be necessary to expand the conversation about alcohol consumption. It would be appropriate to educate patients about the size of a standard drink and recommended daily intake to help them stay within the category of a

moderate alcohol drinker. Educating patients about the protective effects of wine for bone health may also be useful. Furthermore, it is crucial to discuss with patients that excessive alcohol use can cause adverse reactions to many bodily systems. Taken together, the example of the patient in this case report and the literature show the importance of education about alcohol use and how it affects bone health.

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