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Alcohol Use in Elective Total Hip Arthroplasty

Risk or Benefit?

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Abstract

Background Excessive alcohol consumption has been associated with adverse health measures after elective surgery. The effects of low or moderate consumption remain unclear.

Question/purposes We determined differences among patients with different consumption levels in (1) preoperative and postoperative patient-perceived outcomes and hip scores, (2) changes in those scores from preoperatively to postoperatively, (3) demographics and comorbidities, and (4) length of stay (LOS) and hospitalization charges.

Methods We retrospectively reviewed 191 patients (218 primary hips). Based on a self-administered consumption questionnaire, patients were stratified into three groups: (1) nondrinkers (n = 52), (2) occasional drinkers (n = 56), and (3) moderate drinkers (n = 17). Demographics, BMI, Charlson Comorbidity Index, and American Society of Anesthesiologists grade; preoperative and postoperative Quality of Well-being Scale, SF-36, WOMAC, Harris hip, and Merle d'Aubigné-Postel hip scores; and LOS and hospital charges were obtained and compared among groups adjusting for patient characteristics. Minimum followup was 1 year (mean, 3.5 years; range, 1–6 years).

Results Most abstainers were older, female, and Hispanic. Preoperatively, moderate drinkers had better WOMAC function and total scores and Harris hip scores. There were no differences postoperatively among groups. However, nondrinkers had greater improvement (preoperative to postoperative) in the WOMAC function, pain, and total scores. Compared to nondrinkers, moderate drinkers had a higher contribution margin and net income.

Conclusions Alcohol consumption is more common among men and non-Hispanics. Moderate consumption was associated with better WOMAC and Harris hip scores. After surgery, abstainers achieved greater improvements in the WOMAC function, pain, and total scores.

Level of Evidence Level III, prognostic study. See the Instructions for Authors for a complete description of levels of evidence.

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Each author certifies that his or her institution approved the human protocol for this investigation, that all investigations were conducted in conformity with ethical principles of research, and that informed consent for participation in the study was obtained.
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Introduction

Excess alcohol intake has detrimental effects on overall health and has become a major cause of morbidity and mortality in the US population. The incidence of alcohol

abuse approaches 5% [15]. Among patients admitted to surgery, the estimated incidence of screen-positive alcohol dependence is approximately 23% [12]. In a meta-analysis of prospective studies, Di Castelnuovo et al. [6] found high-level alcohol consumption was associated with increased mortality. However, the association between total mortality and alcohol intake was a J-shaped relationship because alcohol consumption, up to four drinks/day in men and two drinks/day in women, was inversely associated with total mortality. The curve that depicts the relationship between alcohol consumption and mortality is influenced by a combination of beneficial and harmful effects [8]. To determine the effects of prior alcohol consumption on long-term mortality among early survivors of acute myocardial infarction, Mukamal et al. [13] performed a prospective cohort study with all-cause mortality as the main outcome measure and found, compared with abstainers, patients who consumed fewer than seven drinks/week had a lower all-cause mortality rate than those who consumed seven or more drinks/week. Williams et al. [18] made use of the Alcohol Use Disorders Identification Test-Consumption (AUDIT-C) questionnaire (higher scores signify greater and more frequent alcohol consumption) to evaluate the concurrent association between alcohol screening scores and patient perception of health among male veterans and also found, after adjustment, a quadratic (inverted U-shaped) relationship between AUDIT-C categories and all SF-36 scores such that patients with AUDIT-C scores of 4 to 5 and 6 to 7 reported the highest health status and patients with AUDIT-C scores of 0, 8 to 9, and 10 or more reported the lowest health status. As a consequence, strong interest exists today about the possibility that, at certain doses, the benefits of alcohol could overcome its harmful effects. In the current investigation, we determined whether low or moderate alcohol consumption could be associated with beneficial effects in THA.

We therefore determined differences among patients with three different consumption levels in (1) preoperative and postoperative patient-perceived outcomes and clinical-based hip scores; (2) changes in those scores from preoperatively to postoperatively; (3) age, sex, race, ethnicity, American Society of Anesthesiologists (ASA) grade, Charlson Comorbidity Index (CCI), and BMI preoperatively; and (4) hospital length of stay (LOS) and hospitalization charges.

Patients and Methods

We studied a total of 218 primary THAs in 191 patients. The selection criterion for this study was patients having primary THA. We excluded patients with (1) conversion of prior hip surgery to THA, (2) THA revision with or without allograft, and (3) THA revision of only the acetabular or femoral component. All patients provided informed consent for this institutional review board-approved study.

All 191 patients were provided with a preoperative self-administered questionnaire on the frequency of alcohol consumption that asked "Do you drink any alcoholic beverages (including beer, wine, rum, whiskey, etc)?" The patient indicated the frequency of alcohol consumption, both past and present, as never, occasionally, moderately, or heavily. Demographic data collected included age, sex (female/male), race (black/white), ethnicity (Hispanic/non-Hispanic), BMI, and comorbidities (ASA grade [1], CCI [4]) (Table 1). All surgeries were performed by the senior author (CJL). All cases were cementless THAs and were performed through a modified Hardinge direct lateral approach.

Table 1. Demographic data of the three self-reported levels of alcohol consumption

Dependent measure	Nondrinkers (n = 52)	p value*	Occasional drinkers (n = 56)	p value†	Moderate drinkers (n = 17)	p value‡
Mean age (years)	68	0.897	67	0.008	57	0.003
Sex (female/male) (number of patients)	37/15	0.02	27/29	0.41	6/11	0.01
Race (black/white) (number of patients)	8/44	0.006	0/56	0.11	2/15	1.0
Ethnicity (Hispanic/non-Hispanic) (number of patients)	39/13	0.03	31/25	0.14	7/10	0.02
BMI (kg/m^2)	28	0.557	29	0.987	30	0.694
Mean Charlson Comorbidity Index	1.12	0.432	1.50	0.131	0.65	0.538
ASA grade (number of patients)						
1	0		1		1	
2	17	0.073	18	0.073	10	0.073
3	13	0.073	9		0	

* Nondrinkers compared to occasional drinkers; †occasional drinkers compared to moderate drinkers; ‡nondrinkers compared to moderate drinkers; when comparing groups in which at least one group had an n = 0 or two groups had n = 1, we left a blank space in the table corresponding to the p value; ASA = American Society of Anesthesiologists.

Most patients were discharged to home within 3 to 4 days in the absence of complications. Patients were then seen by the senior author during the second and sixth postoperative week for staple removal and clinical evaluation. The Quality of Well-being Scale (QWB-7), SF-36, WOMAC, Harris hip, and Merle d'Aubigné-Postel hip scores were performed at 3 months, 6 months, 1 year, and annually thereafter.

Preoperative and postoperative patient-perceived outcomes, clinical hip scores, and LOS were prospectively recorded in our joint registry database and retrospectively studied. Patient-perceived outcomes included the QWB-7 total score [11]; the physical function, bodily pain, general health, social functioning, and physical component scores of the SF-36 [2]; and the physical function, pain, stiffness, and total scores of the WOMAC [3]. Clinical scores included the Harris hip score [10] and the Merle d'Aubigné-Postel hip score [5]. We also studied data on hospitalization charges (gross revenue, net revenue, direct cost, contribution margin, indirect cost, operating cost, net income) obtained from the hospital financial services.

Of the 191 patients, 65 patients did not complete the questionnaire, leaving a sample size of 126 individuals who responded to the questionnaire. One patient reported heavy consumption. This patient was identified as an outlier and was excluded from analysis. Based on present self-reported preoperative alcohol consumption, patients were stratified into three groups: (1) nondrinkers (n = 52; 42%), (2) occasional drinkers (n = 56; 45%), and (3) moderate drinkers (n = 17; 13%). We investigated the association of self-reported alcohol consumption with patient-perceived and clinical outcomes by comparing the scores preoperatively and postoperatively among the three consumption groups after statistically controlling for patient characteristics and by comparing the change in scores (from preoperative to postoperative) among the groups. We also studied the relationships between self-reported alcohol consumption with LOS and hospitalization charges.

For the statistical analyses, we used standard statistical tools. ANOVA and chi-square analysis were performed to determine whether there were differences in demographics and clinical variables among the groups. CCI comparisons were made after adjusting for age, sex, race, ethnicity, and BMI. We used analysis of covariance to compare the scores in the groups on multiple clinical and psychosocial functional measures preoperatively and at followup, controlling for age, sex, race, ethnicity, BMI, ASA grade, and CCI to isolate alcohol consumption as a risk factor. In addition, ANOVA was used to determine whether there were differences in change in scores on the same clinical and psychosocial functional measures among the groups. ANOVA was also used to evaluate whether there were differences in LOS and relevant cost variables among the groups. Analysis was performed on available data. All statistical analyses were performed using SPSS® software (Version 16.0; IBM Corp, Armonk, NY, USA).

Results

At the preoperative visit and compared to nondrinkers, individuals who reported being moderate drinkers had better scores for the WOMAC physical function score (p = 0.04) and the Harris hip score (p = 0.04) (Table 2).

Table 2. Comparison of the average preoperative patient-perceived and clinical outcomes after adjustments in the three levels of self-reported alcohol consumption

Dependent measure	Nondrinkers (n = 52)	Occasional drinkers (n = 56)	p value*	Moderate drinkers (n = 17)	p value†
QWB-7 total score (points)	0.52	0.52	1.0	0.583	0.81
SF-36 score (points)					
Physical functioning	13.93	16.30	1.0	36.25	0.09
Bodily pain	30.82	34.89	1.0	51.00	0.37
General health	68.75	69.48	1.0	86.75	0.77
Social functioning	45.14	39.44	0.47	61.00	1.0
Physical component summary	24.04	25.48	1.0	31.00	0.82
WOMAC score (points)					
Function	42.79	42.07	1.0	24.75	0.04
Pain	11.46	10.59	0.89	7.38	0.05
Stiffness	3.11	4.33	0.33	3.25	1.0
Total	57.36	57.00	1.0	35.38	0.06
Harris hip score (points)	46.21	50.33	0.86	65.25	0.04
Merle d'Aubigné-Postel hip score (points)	10.46	11.48	1.0	14.38	0.05

* Nondrinkers compared to occasional drinkers; †nondrinkers compared to moderate drinkers; QWB-7 = Quality of Well-being Scale.

Additionally, individuals who reported being moderate drinkers had better scores for the WOMAC physical function score ($p = 0.03$) and the WOMAC total score ($p = 0.04$) compared to those who reported being occasional drinkers. There were no differences in postoperative self-reported measures or clinical scores among the groups (Table 3).

Function improved in all three groups after surgery. Based on the change in scores from preoperative to postoperative, nondrinkers had greater improvement in the WOMAC physical function score ($p = 0.02$), WOMAC pain score ($p = 0.02$), and WOMAC total score ($p = 0.02$) (Table 4). In other words, not consuming alcohol was associated with greater improvement in perceived physical function and pain.

Those individuals who reported moderate alcohol consumption (mean, 57 years) were younger than those who reported being occasional drinkers (mean, 67 years) ($p = 0.008$) or those who reported being nondrinkers (mean, 68 years) ($p = 0.003$) (Table 1). A greater

Table 3. Comparison of the average postoperative patient-perceived and clinical outcomes after adjustments in the three levels of self-reported alcohol consumption

Dependent measure	Nondrinkers (n = 43)	Occasional drinkers (n = 42)	p value*	Moderate drinkers (n = 10)	p value†
QWB-7 total score (points)	0.60	0.63	0.61	0.69	0.17
SF-36 score (points)					
Physical functioning	48.33	58.04	0.15	63.33	0.31
Bodily pain	65.04	67.43	0.60	75.0	0.27
General health	71.96	74.83	0.22	76.83	0.51
Social functioning	76.13	77.87	0.61	75.17	0.66
Physical component summary	40.75	44.09	0.17	46.50	0.13
WOMAC score (points)					
Function	3.46	4.39	0.26	1.0	0.43
Pain	0.42	0.91	0.05	0.00	0.84
Stiffness	0.21	0.52	0.09	0.00	0.92
Total	4.08	5.83	0.14	1.0	0.54
Harris hip score (points)	82.21	89.13	0.05	87.83	0.55
Merle d'Aubigné-Postel hip score (points)	15.92	17.04	0.06	15.67	0.86

* Nondrinkers compared to occasional drinkers; †nondrinkers compared to moderate drinkers; QWB-7 = Quality of Well-being Scale.

Table 4. Comparison of average change (postoperative to preoperative) in scores for patient-perceived and clinical outcomes in the three levels of self-reported alcohol consumption.

Dependent measure	Nondrinkers (n = 43)	Occasional drinkers (n = 39)	p value*	Moderate drinkers (n = 10)	p value†
QWB-7 total score (points)	0.09	0.13	0.33	0.12	0.77
SF-36 score (points)					
Physical functioning	39.06	43.38	0.68	35.50	0.90
Bodily pain	32.23	39.62	0.37	26.5	0.79
General health	−2.14	4.77	0.28	−3.0	0.99
Social functioning	27.09	39.43	0.23	15.10	0.58
Physical component summary	16.51	20.67	0.13	18.10	0.89
WOMAC score (points)					
Function	−39.05	−36.90	0.70	−27.0	0.02
Pain	−10.86	−9.60	0.25	−7.22	0.02
Stiffness	−3.10	−3.35	0.87	−2.78	0.93
Total	−53.0	−49.85	0.64	−37.0	0.02
Harris hip score (points)	39.18	38.04	0.93	28.7	0.06
Merle d'Aubigné-Postel hip score (points)	5.41	4.88	0.22	3.14	0.08

* Nondrinkers compared to occasional drinkers; †nondrinkers compared to moderate drinkers; QWB-7 = Quality of Well-being Scale.

proportion of women (53%) were nondrinkers while approximately 72% of men were occasional or moderate drinkers ($p = 0.015$). Regarding ethnicity, 75% of Hispanics reported being nondrinkers while only 25% of non-Hispanics reported it ($p = 0.01$). We found no difference in mean ASA grade ($p = 0.073$) and CCI ($p = 0.131$) among groups. The drinkers were not different either in BMI ($p = 0.52$) or race ($p = 0.11$).

There was no association between the level of alcohol consumption represented by the three groups and LOS ($p = 0.63$). Pertaining to cost analyses, compared to nondrinkers, moderate drinkers had a higher contribution margin ($p = 0.02$) and greater net income ($p = 0.01$).

Discussion

Acute alcohol exposure has been reported to have antiinflammatory effects while chronic abuse has been associated with immunosuppression and an increased response to pathogenic bacterial products that exacerbate tissue injury in conditions such as hepatitis and pancreatitis. Chronic alcohol abuse negatively impacts the function of antigen-presenting cells and the activation of T cells [17]. Alcohol use independently predicts the occurrence of pneumonia, superficial surgical-site infection, wound disruption, and prolonged LOS after surgery [14]. Excessive alcohol consumption has been associated with complications after surgery [9, 16]. However, Espehaug et al. [7] in a matched case-control study reported the association of alcohol intake with revision risk to be J-shaped, where the lowest risk occurred among moderate drinkers and the highest risk among patients having a consumption of more than four units/week. This type of relationship has also been established with total mortality [6]. As a consequence, there is controversy about the possibility that at certain doses alcohol consumption could have a beneficial effect on THA. We therefore determined differences among patients with different consumption levels in (1) preoperative and postoperative patient-perceived outcomes and hip scores, (2) changes in those scores from preoperatively to postoperatively, (3) demographics and comorbidities, and (4) LOS and hospitalization charges.

Our results should be interpreted in light of several limitations. First, the groups were different in age and sex at baseline. In view of this, we statistically controlled for those differences and other patient characteristics in an attempt to isolate alcohol consumption as a factor. Second, the classification of patients as nondrinkers, occasional drinkers, and moderate drinkers was based on self-reported levels of alcohol consumption. It is possible some patients with high alcohol intake opted to not complete the questionnaire or to report lower levels. Analysis was based solely on the answers selected by patients; as a consequence, consumption classification could be biased. Third, the questionnaire has not been validated and exact quantitative intake levels were not provided. However, this questionnaire is similar to those of many validated instruments intended to determine pain, activity, and function level making use of the none, mild, moderate, and severe options. In most validated instruments, the same general categories are utilized for pain. Finally, this retrospective study cannot establish a causal link between alcohol consumption and negative outcomes even though comparisons were made between the groups after statistically controlling for many variables.

In our study, moderate drinkers had better preintervention scores than nondrinkers on the WOMAC function and total scores and the Harris hip score. Postoperatively, we did not find differences among the groups in self-reported measures or clinical scores. Our results regarding preintervention alcohol consumption and health status measures confirm previous investigations [6–8, 13, 18]. Williams et al. [18], using the AUDIT-C questionnaire, observed after adjustments an inverted U-shaped relationship between AUDIT-C categories and all SF-36 scores. Across all health status measures, patients with severe alcohol misuse had poorer statuses than those with mild or moderate levels of severity. Di Castelnuovo et al. [6], in a meta-analysis, found consumption of up to four drinks/day in men and two drinks/day in women was inversely associated with total mortality. Espehaug et al. [7], in a matched case-control study with 674 revised hips as cases and 1343 hips as controls (primary), reported the alcohol intake association with revision risk to be J-shaped; the lowest risk was among moderate drinkers and the highest risk was among patients who consumed more than four units/week. Gmel et al. [8] also found the curve depicting the consumption relationship with mortality was influenced by a combination of beneficial and harmful effects. Mukamal et al. [13], in a study on long-term mortality among early survivors of acute myocardial infarction, found, compared with abstainers, patients who consumed fewer than one drink/day had a lower all-cause mortality rate than those who consumed one or more drinks/day.

Regarding changes in scores (preoperative to postoperative), we found nondrinkers had greater mean changes in scores than moderate drinkers on the WOMAC function, pain, and total scores. In other words, after surgery, abstainers obtained greater function and pain improvement. We could not ascertain the actual reasons for this and found no previous description of this particular finding in the literature. We could only speculate that consumption through effects mediated on inflammation or host tissue responses could have hampered a greater pain and functional improvement. This particular finding warrants further investigation making use of longitudinal studies.

We found alcohol consumption was fairly common among younger patients, men, and non-Hispanics. Our results are in agreement with a previous report from The

National Institute of Alcohol Abuse and Alcoholism [15] on the 12-month incidence and population estimates of DSM-IV alcohol abuse by age, sex, and race-ethnicity in the United States. Overall incidence of abuse was 4.65%. The lowest incidence (1.21%) was among patients older than 65 years while the highest (6.95%) was for patients aged 18 to 29 years. Overall incidence was 2.55% among women and 6.93% among men. Hispanics (3.97%) had a lower incidence in comparison to whites (5.10%). Regarding comorbidities and alcohol consumption, we did not find differences among groups on overall health based on comorbidity scores. Our results are not in agreement with previous investigations [6, 13] that found beneficial health effects associated with moderate alcohol consumption, in particular, the findings of Di Castelnuovo et al. [6] regarding the inverse association of intake with total mortality. Mukamal et al. [13] also found self-reported moderate alcohol consumption in the year before acute myocardial infarction was associated with reduced mortality after infarction.

We found no association between the level of alcohol consumption represented by the three groups and LOS. However, moderate drinkers had a higher contribution margin and greater net income charges when compared to abstainers. Our results are not in agreement with a previous study by Nath et al. [14] that found alcohol exposure to be a risk factor for adverse outcomes in elective surgery. In a study of inpatients, the median LOS was 5 days in patients with active alcohol exposure versus only 3 days in those without it ($p < 0.0001$). In addition, the time from operation to discharge for inpatients was examined and active alcohol exposure was associated with a similarly increased median number of days from operation to discharge (4 versus 3 days). Active alcohol exposure was an important risk qualifier for analyzing hospital trends and cost analysis as active alcohol use alone can increase hospital costs by increasing LOS from surgery and can increase the risk of many possible life-threatening complications.

In conclusion, alcohol consumption was fairly common among men and non-Hispanics. Moderate consumption was associated with better clinical and patient-perceived outcomes along with higher hospital reimbursement. However, after surgery, abstainers achieved greater improvements in function and pain scores. These particular results warrant further investigation.

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