ACUTE ALCOHOL USE AMONG PATIENTS WITH ACUTE HIP FRACTURES:
A DESCRIPTIVE INCIDENCE STUDY IN SOUTHEASTERN FINLAND

J.-P. KAUKONEN1,*, I. NURMI-LÜTHJE2,3, P. LÜTHJE4, H. NABOULSI1, S. TANNINEN4,
M. KATAJA5, M.-L. KALLIO4 and M. LEPPILAMPI1

1Päijät-Häme Central Hospital, Lahti, Finland, 2Department of General Practice and Primary Health Care, University of Helsinki, Helsinki, Finland,
3Health Centre of Kouvola Region, Kouvola, Finland, 4Kuusankoski Regional Hospital, Kuusankoski, Finland and 5National Public Health Institute,
Helsinki, Finland

(Rceived 9 June 2005; first review notified 31 July 2005; in revised form 9 December 2005; accepted 10 December 2005;
advance access publication 1 March 2006)

Abstract — Aim: To assess the very recent use of alcohol among patients admitted to two Finnish hospitals due to an acute hip fracture.
Method: Very recent use of alcohol was recorded according to the patient’s or the relatives’ report. Ethanol was measured in blood samples taken at admission. Serum γ-glutamyltransferase, aspartate aminotransferase and alanine aminotransferase, and vitamin D concentration were measured. Reported use of medication, vitamin D, and/or calcium supplementation was recorded. Results: Complete data were obtained on 222 of 375 eligible patients; 71% of those enrolled were women. The mean age of women was 80.5 years (SD 10) and of men 73 years (SD 12) (P < 0.001). The fracture type was femoral neck in 50%, trochanteric in 41%, and subtrochanteric in 9%. The use of alcohol within 24 h before the accident leading to hip fracture was reported by 21.5% of men and 7% of women; positive serum alcohol levels were noted in 17% (19% of men and 16% of women) and 2.2% had a level of >1.0 mg/l. Recent alcohol use was more common among patients in the age group of 65–74 years than among older patients (P < 0.001). The use of alcohol was associated strongly with tobacco use (P = 0.00012) but had no association with vitamin D levels. Alcohol users used less medication than non-users (P < 0.01). Women seemed to conceal their use of alcohol more than men (P < 0.005). Conclusions: Alcohol consumption was common among patients with an acute hip fracture, being more common in younger than in older patients. Use of alcohol in the 24 h prior to the injury was reported by 21.5% of men and 7% of women. Alcohol concentration in blood was positive in 19% of men and 16% of women.

INTRODUCTION

Alcohol intoxication among trauma patients is well documented in many studies all over the world (O’Connell et al., 2003; Deutch et al., 2004). In a Danish study of Deutch et al. (2004), a quarter of all patients admitted to hospital because of severe trauma had an alcohol level higher than allowed for driving (0.5 mg/l). Among all injured patients admitted to Casualty Department of Helsinki, Finland, the proportion of alcohol intoxications varied from 11.4% in 1971 to 14.9% in 1981 (Antti-Poika, 1988) with a rising tendency through these years. Drinking habits of hip fracture patients have been described mainly on the basis of self-reports of the patients. Acute alcohol use among hip fracture patients has been documented less often, and not at all in Finland.

Studies on the risk of hip fractures associated with alcohol consumption seem to be contradictory. Some show that moderate alcohol consumption correlates with better bone quality and fewer fractures (Feskanich et al., 1999; Rapuri et al., 2000; Baron et al., 2001), but in most the use of alcohol seems to be an independent risk for osteoporotic fractures (Felson et al., 1988; Hernandez-Avila et al., 1991; Høidrup et al., 1999). All these studies depend on self-reported use and the acute (i.e. very recent) amount of blood alcohol remains unknown.

The aim of this study was to determine very recent alcohol use in patients with an acute hip fracture in Finland. This study is a part of a more comprehensive study where the serum vitamin D levels (Nurmi et al., 2005) and the use of benzo diazepines (Nurmi-Lüthje et al., 2005) among these patients were studied.

The intention was to enroll all patients with a fresh hip fracture admitted during the study period in Päijät-Häme Central Hospital, Lahti (hospital A) and Kuusankoski Regional Hospital, Kuusankoski (hospital B). In the regions concerned, hip fractures are not treated outside these two institutions. The study period was from 1 February 2003 to 31 January 2004 in Lahti and from 1 February 2003 to 30 April 2004 in Kuusankoski. Population of Lahti region is 208 000 and that of Kuusankoski region 100 000.

The Ethics Committees of Päijät-Häme and Kymenlaakso Health Care Districts approved the study. Written informed consent was obtained from all patients or their relatives.

Data gathering was performed by dedicated nurses trained for this work, using a questionnaire concerning the patient’s age, sex, place of residence, day and time of injury, day of admission, and history of previous fractures suffered at age ≥50 years. The type of hip fracture, listed as femoral neck, trochanteric, and subtrochanteric, were recorded by an orthopaedic surgeon (J.-P.K. and P.L.). The patient and/or relative were asked about the patient’s use of alcohol and medications during the last 24 h, which was also checked from the medical records, and categorized as follows: no medication, 1–3 different drugs, and >3 prescribed different drugs. The daily use of vitamin D and/or calcium supplementation was recorded separately. Smoking habits were recorded in hospital A, but not in hospital B.

Blood samples were taken in the emergency room (ER). Serum alcohol concentrations (S-EtOH) were measured by enzymatic methods with alcohol dehydrogenase. Serum GGT (γ-glutamyltransferase) was measured using the carboxysubstrate L-γ-glutamyl-3-carboxy-4-nitroanilide. GGT was defined as elevated when >50 nmol/l.

© The Author 2006. Published by Oxford University Press on behalf of the Medical Council on Alcohol. All rights reserved
Serum aspartate aminotransferase (AST) and alanine aminotransferase (ALT) were measured with pyridoxal-5-phosphate. Elevated concentrations were defined as >40 nmol/l. GGT, AST, and ALT were used as an aid to assessing the reliability of the reported alcohol consumption.

Serum vitamin D concentration, S-25(OH)D, was measured by radioimmunoassay-kits (IDS,Fountain Hills, AZ, USA). Hypovitaminosis D was defined as S-25(OH)D level under 37.5 nmol/l following previous reports in which the serum parathyroid hormone (PTH) concentration starts to increase in patients whose S-25(OH)D concentration is <37.5 nmol/l (Thomas et al., 1998).

Ethanol serum levels were classified as 0, <0.49, 0.5–1.0, and >1.0 mg/l. Associations between reported consumption and blood ethanol and sex, age, fracture type, history of previous fractures, use of medication, use of vitamin D and/or calcium supplementation, serum vitamin D concentrations, and use of tobacco were analyzed using Chi-squared test, Wilcoxon rank test, t-test (ANOVA), and Kruskall–Wallis test. Fisher’s exact test was used when appropriate.

RESULTS

Data were obtained on 223 (59%) of 375 patients admitted with an acute hip fracture [120/257 (47%) patients in hospital A and 103/118 (87%) patients in hospital B]. Many eligible patients were not included because staff was too busy. A closer look at those not enrolled in hospital A showed that there were no differences in the sex distribution between those who were enrolled in the study and those who were not (74% were females in both groups). No differences were found in the mean age between the enrolled women (79 years, SD 9) and woman not included (81 years, SD 10), either (t = 1.535, d.f. = 188, n.s.). However, men who did not enter the study were slightly younger (69.0 years, SD 9) than those who did (74 years, SD 10) (t = 2.282, d.f. = 65, P < 0.05).

Of the study population 71% (158/223) were women. The mean age of women was 80.5 years (SD 10 years) and of men 73 years (SD 12 years) (t = 4.897, d.f. = 221, P < 0.001). There were no differences in baseline characteristics between the two hospitals. Of the 223 fractures, 50% (112/223) were femoral neck, 41% (91/223) trochanteric, and 9% (19/223) subtrochanteric fractures. Sixty-six per cent (146/223) of all patients were admitted to hospital from their own home, 18% (41/223) from institutions, and 16% (36/223) from residential homes.

The alcohol analysis was omitted in one patient. Of the 222 patients, 17% had alcohol in serum, (15.8% of men and 15.9% of women), (χ² = 0.213, d.f. = 2, n.s.). An alcohol serum level <0.49 mg/l (n = 30) was found in 14%; 0.5–1.0 mg/l in 1.8%, and >1.0 mg/l in 2.2%.

Patients treated in hospital B were more often alcohol positive than patients in hospital A, 28.4% vs 6.7% (Kruskall–Wallis 2.642, d.f. = 3, P < 0.01).

When asked, 11.2% of patients reported the use of alcohol within 24 h before the accident, 21.5% of men (n = 14) and 7% (n = 11) of women (χ² = 8.597, d.f. =2, P < 0.05). In hospital A the percentage was 11% and in hospital B 12%.

The sex distribution of those who reported the use of alcohol was the same in both hospitals (Table 1).

Younger patients more often had used alcohol. In those aged 65–74 years, 29% of patients had used alcohol, compared to 5.9% in the 75–84 years age group, and 2.6% in those 85 years and over (Kruskall–Wallis 18.68, d.f. = 2, P < 0.0001).

A 24.6% (16/65) of men and 38% (59/157) of women had had a previous fracture. There were more previous fractures in the patients whose serum alcohol was positive (Kruskall–Wallis 6.154, d.f. = 2, P = 0.05).

Two-thirds (67%) of the patients used four or more different drugs daily, women more frequently than men: 119/158 (75%) vs 31/65 (48%), respectively (Wx = 3.58, P < 0.001). Among patients with positive alcohol levels, overall use of drugs was less common (Kruskall–Wallis 10.79, d.f. = 2, P < 0.01). Thirty percent of all patients reported the use of hypnotics or sedatives.

There were no significant differences in the subtypes of hip fractures among alcohol users and non-users (χ² = 1.416, d.f. = 2, n.s.).

The use of tobacco (hospital A) was more common among alcohol users (6/12, 50%) than among non-users (5/98, 5%) (Fisher exact, P = 0.00012).

Alcohol intake was not associated with the use of calcium substitutes or vitamin D (χ² = 0.570, d.f. =2, n.s.).

The results of the serum vitamin D concentrations, use of vitamin D, and/or calcium supplementation have been published in a recent paper (Nurmi-Lüthje et al., 2005). Concentrations <37 nmol/l were found in 40–60% of patients depending on the place of residence, sex, vitamin D intake, and season. Values over 74 nmol/l were found in only 0–10% of patients, the best concentrations emerging in summer. Vitamin D levels in serum were not changed by the use of alcohol (Wx = –0.178, n.s.).

Among patients whose serum alcohol was positive, the serum levels of liver enzymes were elevated (Kruskall–Wallis = 6.791–8.026, d.f. = 2, P < 0.05). Elevated GGT (>50 U/l) was found in 12.6% of all patients, 15.4% of men and in 11.4% of women. Elevated AST (>40 U/l) was noted in 6.2% of men and 7.6% of women, and elevated ALT (>40 U/l) in 9.2 and 6.7%, respectively.

Delay from injury to the laboratory tests varied from 0.42 to 382 h, the median delay being 4.3 h. There were 10 patients (5%) with a delay more than 5 days. The delay was <15 h in 75% and <6 h in 60% of all cases.

**Table 1.** Reported and found use of alcohol among hip fracture patients according to the hospital (upper part) and gender

<table>
<thead>
<tr>
<th>Hospital A</th>
<th>Hospital B</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Prefracture reported use of alcohol (n = 223)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Yes</td>
<td>13 (11%)</td>
<td>12 (12%)</td>
</tr>
<tr>
<td>No</td>
<td>104 (87%)</td>
<td>85 (82%)</td>
</tr>
<tr>
<td>Unknown</td>
<td>3 (2%)</td>
<td>6 (6%)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Alcohol found in serum (n = 222)</th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Men</td>
<td>21.5 (14%)</td>
<td>7.0 (11%)</td>
</tr>
<tr>
<td>Women</td>
<td>15.9 (25%)</td>
<td>13.7 (37%)</td>
</tr>
<tr>
<td>Total</td>
<td>18.5 (12%)</td>
<td>15.9 (25%)</td>
</tr>
</tbody>
</table>

n.s., not significant.

Younger patients more often had used alcohol. In those aged 65–74 years, 29% of patients had used alcohol, compared to 5.9% in the 75–84 years age group, and 2.6% in those 85 years and over (Kruskall–Wallis 18.68, d.f. = 2, P < 0.0001).
The approximated incidence of hip fractures was 124/100 000/year in the study regions.

DISCUSSION

Alcohol use at or just before an acute hip fracture is hard to determine. There is a variable delay from the time of accident to arrival at hospital. The patient may have consumed alcohol to cure pain after the fracture.

Most previous studies did not include blood samples (Antti-Poika, 1988; Felson et al., 1988; Baron et al., 2001); alcohol consumption was estimated by self-report alone which is known to be unreliable (Poikolainen, 1985). This was also noticed in our patients, especially in women.

Alcohol is, of course, only one of the many risk factors for falls and hip fractures. The alcohol concentration that increases the risk probably varies according to a patient’s age, medication, other illnesses, and many other factors. It would be an interesting task to examine actual BAC values at the moment of accident and evaluate more precisely the effect of alcohol intoxication on it.

This study was designed for incidence evaluation, which is why we had no control group. This, of course, limits possibilities, for example, risk evaluation.

According to a recent Finnish study, heavy drinking is associated with poorer functional ability (Sulander, 2005). In the study of Moore et al. (2003) already more than seven drinks per week or three drinks per occasion impaired the instrumented and advanced activities of daily living in elderly men and woman. On the other hand, it is also suggested that those drinking small or moderate amounts of alcohol are more likely to maintain mobility than non-drinkers (LaCroix et al., 1993). There is established evidence that 1 to 7 units of alcohol per week have some beneficial effects on health (Oslin, 2000; Klatsky, 2003). The amount of alcohol consumption that is harmful for health in general has been evaluated to be 280 g/week in men and 190 g/week in women according to Sulander (2005), who has studied elderly patients’ health in his case control and population studies. The threshold for rising risk for hip fractures was 330 g/week as evaluated by Hoidrup et al. (1999).

According to the guidelines of the American Geriatrics Society, for those aged 65 years or older low-risk drinking is no more than 13 g (1 drink) per day and a maximum of 26 g on any drinking occasion. Risk drinking means on average >13 g per day, or >91 g per week, or >36 g on heavier drinking occasions, where 1 US drink contains 13 g ethanol (The American Geriatrics Society, 2003).

The prevalence of excessive drinking in hip fracture populations varies from 4.4 to 15% depending on the definition of excessive drinking and on sex (Høidrup et al., 1999; Rapuri et al., 2000; Baron et al., 2001). The rate of all drinkers, when small amounts of consumption are also included, is much higher. The figure of all users of alcohol was 33% in Omaha, USA as well (Rapuri et al., 2000). There were fewer drinkers (33%) among hip fracture patients than controls (40%) in a Swedish study (Baron et al., 2001).

In the present study the incidence of alcohol use (17%) was almost the same as expected in these age groups from the studies referred to (Antti-Poika, 1988; Deutch et al., 2004; Sulander et al., 2004).

The rate of alcohol users seems to differ between the two hospitals, although the distance between the hospitals is only ~70 km. One reason may be that there is a historical background of heavy industry in the region of hospital B and this may affect the drinking habits of elderly. Higher consumption of alcohol among elderly people is associated with higher socioeconomic status (Moore et al., 1999; Ganry et al., 2001). However, no socioeconomic analysis was performed in this study. Recent unpublished data of STAKES, Finnish National Research and Development Centre for Welfare and Health, reveals consumption figures higher in the region of hospital B, than of hospital A.

In our study women seemed to conceal their alcohol use more often than men. This is probably due to social expectations of the Finnish culture. Women may be more ashamed of their alcohol use. The questions regarding alcohol use were asked in the ER. No extra privacy was afforded, and this may have some effect on the result. The method and circumstances were equal in both hospitals.

The poor recruiting rate in hospital A may have affected the results. According to enquiries among the hospital A staff responsible for recruiting all patients, the major reason for so many patients not being included was the rather tedious protocol and frequent rush in ER. In both hospitals some patients were not willing to commit in this study. In hospital B (regional hospital) there were some patients who were discharged from the ER to the university hospital for medical reasons and therefore could not be enrolled in the study. Non-inclusion was even across the genders, and across the study months. The mean age of men not included was somewhat lower than those included, while for women the mean age was the same. The possible influence of missing data on the results remains unclear. However, according to the information that was available from the missing data and the comparison between the hospitals regarding demographic and other variables there does not seem to be any systematic bias in our study.

In a Danish study (Høidrup et al., 1999) beer seemed to adversely affect the hip fracture risk more than other alcoholic beverages. This was not examined in the present study. A tendency for more trochanteric and subtrochanteric fractures among patients of alcohol users was found in Malmö, Sweden (Jonsson et al., 1993). This was not noticed in the present study.

Those who used alcohol used less medication. This may be explained by the more frequent drinking in younger patients (who need less medication). Also, polypharmacy should lead to more careful use of alcohol.

The rate of elevated serum GGT and other liver enzymes (AST and ALT) were similar to that found by Schnitzler et al. (1988) in South Africa.

Recovery after hip fracture was not examined in this study, although alcohol misuse may cause difficulties in rehabilitation.

CONCLUSION

The incidence of acute use of alcohol in patients having hip fractures proved difficult to examine in busy ER rooms. However, our data, and the trends in many countries, suggest...
alcohol is one factor in the aetiology of hip fractures. There is a need for further studies with more exact protocols to evaluate the field and real time association between blood alcohol concentration, other medication and accidents.

Acknowledgements — This study was supported by grants from the EVO foundations of Päijät-Hame and Kymenlaakso health care districts.

REFERENCES


Nurmi-Lüthje, I., Kaukonen, J.-P., Lüthje, P. et al. (2006) Use of Benzodiazepines (BZDs) and Benzodiazepine-related Drugs among 223 patients with an Acute hip fracture in Finland. Comparison of BZD findings in Medical Records and Laboratory Assays. Drugs and Aging 23 (in press).


