

Liver transplantation for alcoholic liver disease : a retrospective analysis of recidivism, survival and risk factors predisposing to alcohol relapse

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Abstract

Background and study aims : Alcoholic liver disease (ALD) is the second most common indication for liver transplantation. The aim of this study was to evaluate the alcohol relapse rate and long-term survival after liver transplantation for ALD and to identify risk factors predisposing to alcohol relapse.

Patients and methods : Between 2000 and 2007, 108 patients transplanted for ALD in the Ghent University Hospital were included in this retrospective analysis. Relapse was defined as any drinking after transplantation, problem drinking as more than 2 units/day for women and 3 units/day for men. A wide range of variables was obtained from a questionnaire and medical records.

Results : The mean follow-up was 55 months. Relapse was observed in 29%, 16% in problem drinking. The one- and five-year survival was 87% and 74% respectively. No significant difference in survival was found between non-relapsers, occasional drinkers and problem drinkers. The following risk factors were found to be significantly associated with relapse into problem drinking in an univariate analysis : a shorter pre-transplant abstinence period, the presence of a first degree relative with alcohol abuse and a higher number of prior attempts to quit. In multivariable analysis, the presence of a first degree relative with alcohol abuse was found associated with relapse into problem drinking.

Conclusions : The presence of a first degree relative with alcohol abuse is a valuable pre-transplant variable evaluating an ALD patient's eligibility for liver transplantation. Other variables are also helpful to outline the broader context of the drinking behavior of the patient. (*Acta gastroenterol. belg.*, 2013, 76, 282-290).

Key words : alcoholic liver disease, liver transplantation, relapse.

Abbreviations

ALD : Alcoholic Liver Disease, LT : Liver transplantation.

Introduction

The diagnosis of alcoholic liver disease (ALD) is based on the combination of a history of excessive alcohol intake, clinical evidence of liver disease and supporting laboratory values. The exploration of an alcohol problem is not always easy because the patient often denies or minimizes the alcohol abuse, or the physician underestimates the problem. Given the serious implications of alcohol abuse and dependence on morbidity and mortality, it is extremely important that the problem is recognized in time and treated with the necessary advice and guidance. The cornerstone of the treatment of ALD is abstinence, but when complications develop and liver failure and/or hepatocellular carcinoma occurs, a liver

transplantation (LT) is often the only effective treatment option in order to prolong life and improve the quality of life.

According to the European Liver Transplant Registry (ELTR), ALD is the second most frequent indication for LT due to cirrhosis in Europe accounting for 33% of the cases. Only virus related causes are more frequent (39% of the cases). The 1-year survival for LT for ALD is 84%, the 5-year survival is 73%, and these results are comparable with the survival rates for other indications, and even slightly better than for virus related cirrhosis. Still, there is some reluctance because of fear for relapse and its implications on the donor organ function, mortality and compliance to medication and medical follow-up. Little is known about the impact of alcohol relapse on survival after LT. A fascinating but complex debate can be held on which patients should have priority in the allocation of scarce donor organs.

The aim of this single-center study was to evaluate the alcohol relapse rate and long-term survival after LT for ALD and to identify risk factors predisposing to alcohol recidivism.

Patients and methods

This study was approved by the Commission for Medical Ethics of the Ghent University Hospital and was conducted according to the guidelines for Good Clinical Practice and the Declaration of Helsinki (1). Each patient gave a written informed consent.

Enrollment

All patients transplanted for alcoholic liver disease (ALD) at the Ghent University Hospital from January 2000 to December 2007 were included in this retrospective analysis, excluding 4 patients who were lost to follow-up for various reasons (e.g. stay abroad). The 108 patients were diagnosed with ALD by a hepatologist

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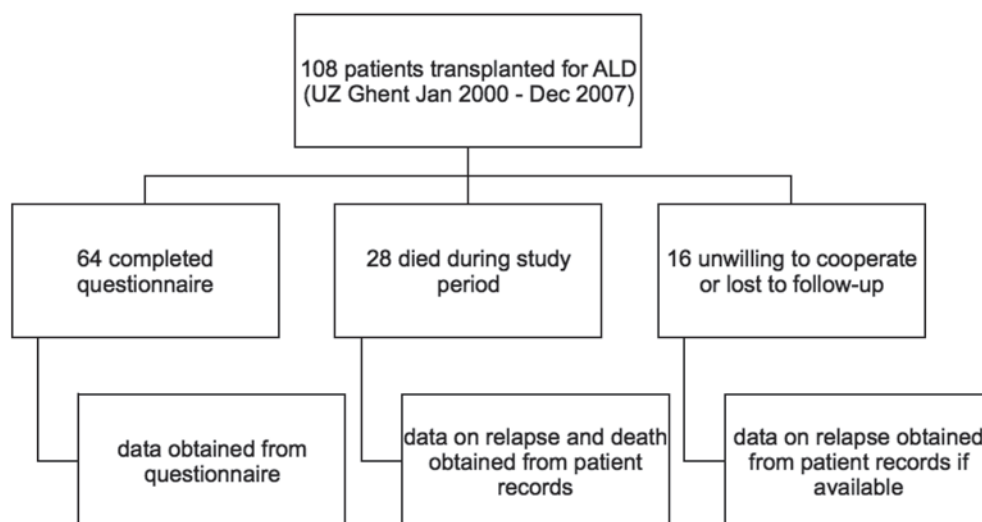
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based on a history of harmful drinking behavior, in combination with compatible clinical and laboratory findings. They were selected for liver transplantation (LT) after a total assessment whereby the multidisciplinary transplantation conference estimated that the risk of relapse was low, and six months of abstinence was achieved (except for three patients). The patients were followed after transplantation by the hepatologists at the Ghent University Hospital or in other affiliated hospitals, from the time of transplantation to the last consultation in October 2009, or until death.

Questionnaire

The patients were asked to fill in a questionnaire in which alcohol use before and after transplantation was

surveyed. Also factors identified in literature as predictive for relapse were questioned. A member of the transplant team did not process the information from the questionnaire, the contents were not included in the medical record and not passed on to the hepatologist to avoid socially desirable answers and to preserve the anonymity. Patients who did not consult in time or who were followed in other hospitals, were contacted by telephone and informed. If they were willing to participate, the questionnaire was answered by mail. A database was constructed using the questionnaire replies, containing demographic and psychosocial variables potentially related to relapse. Missing data on relapse was either due to death or non-participation in the questionnaire. If so, still the patient records were consulted to complete the database.



Graph 1. — Survival by post-transplant drinking status

Definitions

Any alcohol consumption after LT was considered as relapse, because this definition is most commonly used in transplant studies (2-4). Since not every use of alcohol is clinically relevant, patients were classified also according to the severity of relapse. *Problem drinking* was defined as prolonged, potentially harmful alcohol consumption, set as more than 2 units (10 g per unit) per day for women and more than 3 units per day for men. If the use of alcohol was not problematic, it was classified as a *slip*: an isolated use of a small amount of alcohol, for example on certain occasions.

Earlier identified and novel possible pre-transplant predictors of recidivism were analyzed to see whether they contributed to the prediction of recidivism (into any alcohol use or into problem drinking). These variables included age at transplantation, gender, marital status, employment status, presence of hobbies, presence of children, presence of a partner with an alcohol problem, presence of first-degree relatives with an alcohol problem

(parent, brother, sister), nicotine use, other substance abuse, number of alcohol units per day before LT, duration of pre-transplant sobriety, number of prior quit attempts, alcohol dependence (DSM-IV), alcohol abuse (DSM-IV), number of admissions to a rehabilitation center, psychiatric advice and psychiatric comorbidities.

Statistical analysis

An univariate analysis was performed to study factors potentially associated with both relapse in any or problem drinking. Categorical variables were studied using the 2-sided Fisher exact test, whereas quantitative variables were analyzed using the Student t-test or non-parametric Mann-Whitney U test when appropriate. Then, a multivariable logistic regression was conducted. Only variables with a p-value below 0.05 from the univariate analysis were included in the model. Variables compromising the strength of the test because of too many missing values were excluded from the multivariable analysis. The Hosmer-Lemeshow test was used to verify

goodness of fit of the model to the data (a non-significant result was indicative of satisfactory calibration). Odds ratios (OR) were calculated together with their 95% confidence interval (CI). Survival rates were calculated, adjusted for the time to drinking, using Kaplan-Meier Survival analysis. Log-Rank tests were performed to compare survival rates between non-relapsed patients, occasional drinkers and problem drinkers. In all analyses, a p-value below 0.05 was considered statistically significant.

Results

Patients characteristics

Of the 108 patients included in this retrospective analysis, 64 (59.26%) completed the questionnaire. Amongst the others who did not, 28 (25.93%) died and 16 (14.81%) were unwilling to co-operate or had disappeared from the follow-up. The age at the time of transplantation ranged from 36 to 70 years, with a mean age of 56 years. The patient population consisted of 81 (75%) men and 27 (25%) women.

Alcoholic recidivism : incidence and timing

In our study population, 31 patients (29%) relapsed into any alcohol use, of which 17 (15.9%) into problem drinking. Fourteen patients (13.1%) did use alcohol after their transplantation, but only occasionally i.e. slips.

Analyzing the moment of relapse (see table 1), it can be stated that 58.8% of the patients who relapsed into problem drinking used their first alcohol within the two years following transplantation, while all occasional drinkers (except 1) made their first slip more than two years after transplantation. In five of the 31 patients, the exact moment of relapse was unknown (four problem drinkers and one occasional drinker).

Survival analysis and causes of death

The 1-year, 3-year and 5-year patient survival after LT for ALD were respectively 87.0%, 81.6% and 74.4%. During the follow-up period of this study, a total of 28 patients (25.9%) died. Amongst these deaths, six (22.2%) had an alcohol relapse, of which three (11.1%) in problem drinking. The mean age at the time of death

was 58 years, ranging between 39 and 75 years. The causes of death are listed in table 2. One patient (0.92%) died due to relapse into problem drinking.

Graph 1 shows the Kaplan-Meier survival curves according to drinking after transplantation (non-drinkers, occasional drinkers and problem drinkers). The Log-Rank analysis showed no significant difference in survival (p-value 0.474). In other words, in this study population no difference in survival was found between non-relapsers, occasional drinkers and problem drinkers.

Risk factors for relapse

Abstinence period

In the Ghent University Hospital, the 6-month abstinence rule was always applied (except in three patients, who all relapsed). The mean abstinence period was 22.02 months at the time of transplantation. A significant association was found between the length of the abstinence period before transplantation and relapse (p-value 0.02). Also relapse into problem drinking was significantly associated with a shorter mean abstinence period before transplantation (p-value 0.01). Relapsers in problem drinking had reached a mean of 10.62 months abstinence compared with a mean of 23.45 months for non-relapsed patients.

Number of prior attempts to quit drinking

A significant relationship was found between relapse into problem drinking and the number of cessation attempts before the actual stop at the time of listing (p-value 0.02). Patients relapsed in problem drinking (n = 4), had a mean of 1.50 attempts to stop before the actual stop before transplantation, while people who did not relapse into problem drinking (n = 36) had a mean of 0.69 attempts. Patients who relapsed in any alcohol use had on average more stop attempts than those who did not relapse (mean of 1.20 and 0.62 respectively), but this result was not significant.

First-degree relatives with an alcohol problem

Of the 73 persons from whom this information was available, 35 patients were reported to have one or more relatives with an alcohol problem. Eight of these patients (22.9%) relapsed into problem drinking, in contrast to two patients (5.3%) in the group without relatives with an

Table 1. — **Timing of the first alcohol use after transplantation**

Time to alcohol use	Relapse into any alcohol use (n = 31)	Relapse into problem drinking (n = 17)	Relapse into slips (n = 14)
< 6 months	6.4%	5.9%	7.1%
6 months-1 year	9.7%	17.6%	0.0%
1-2 years	19.4%	35.3%	0.0%
> 2 years	48.4%	17.6%	85.8%
Unknown	16.1%	23.5%	7.1%

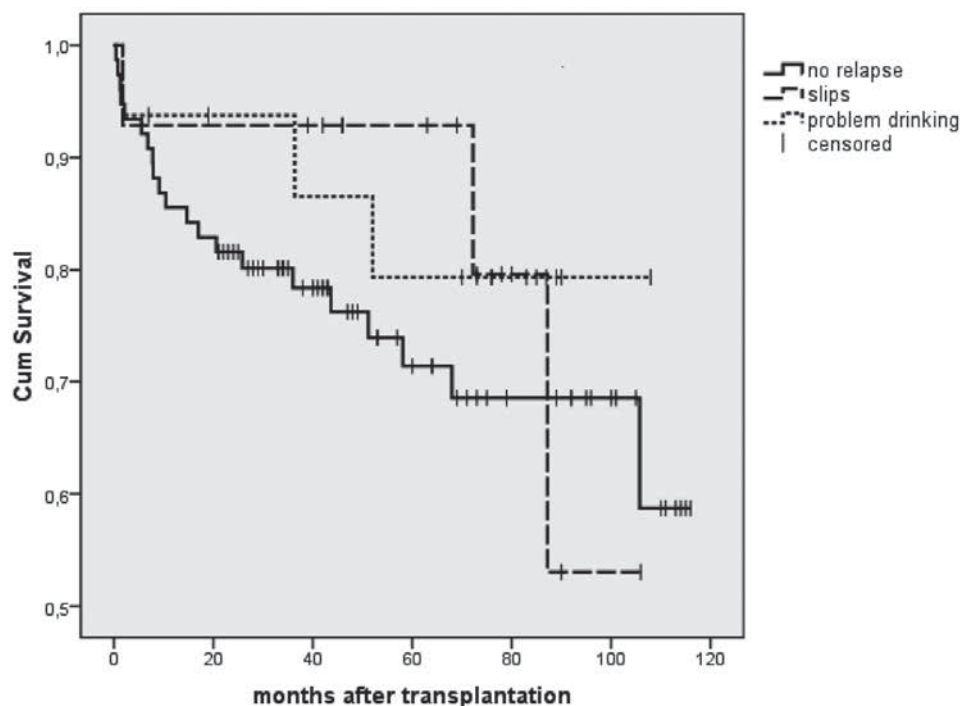


Table 2. — Mortality according to cause of death (%) (n = 28)

infection	32%
cancer	29%
cardiovascular causes	21%
liver failure due to recidivism	4%
variceal bleeding	4%
suicide	3%
other	7%

alcohol problem. A significant correlation was found between the presence of a family member with an alcohol problem and relapse into problem drinking (p-value 0.041). Categorized by the specific family member with alcohol abuse (parent, brother or sister), no association with relapse or relapse into problem drinking could be revealed.

Table 3 gives an overview of the most important categorical pre-transplantation variables and their association with relapse into any alcohol use and relapse into problem drinking.

Multivariable analysis

The variables found significantly associated with relapse into problem drinking in the univariate analysis (i.e. presence of first-degree relatives with an alcohol problem and the duration of the pre-transplant sobriety) were combined in a multivariable logistic regression. The number of prior quit attempts was not included in the multivariable analysis because of the limited results for this variable. The presence of a first-degree relative with

an alcohol problem remained independently associated with relapse into problem drinking (p = 0.034, OR 5.893, CI = [1.138-30.505]). The Hosmer-Lemeshow test was not significant (p = 0.808) suggesting good calibration.

Discussion

We conducted a retrospective single center analysis at the Ghent University Hospital in patients receiving a donor organ for alcoholic liver disease (ALD). This study wants to emphasize the importance of relapse into problem drinking, given the important differences in long-term clinical implications between occasional use of small quantities of alcohol and severe abuse. This is a strength, since most studies in current literature do not address this difference (2-4). The assessment of alcohol relapse after transplantation was heterogeneous, since not all included patients completed the questionnaire. This hiatus in the data was filled by consulting the treating hepatologist and the patient records. Because of the strict follow-up policy, these data were considered robust and therefore this approach is expected to have no negative impact on the reliability on the results of this study. The lack of an unambiguous definition makes it difficult to compare our problem drinking relapse rate of 15.9% with the widely different relapse rates reported in literature, ranging from 7% to 95% (5). Also different methods used for recording recidivism, different study designs and different population characteristics may be partially responsible for these divergent results. There is an urgent need for a standardized definition generally applied, in order to compare the relapse frequencies in different transplant centers in a correct way.

Table 3. — Categorical pre-transplantation variables and their association with relapse into any alcohol use and relapse into problem drinking in univariate analysis

category	n	Relapse into any drinking			Relapse into problem drinking		
		n	%	p-value	n	%	p-value
age at transplantation	108			0.999			0.305
< 50 year	20	6	30		5	25	
> 50 year	88	25	28.7		12	13.8	
gender	108			0.808			0.762
male	81	24	29.6		12	14.8	
female	27	7	25.9		5	18.5	
employment status	78			0.089			0.054
permanent employment	54	13	24.1		6	11.1	
retired	6	4	66.7		3	50	
no permanent employment	18	4	22.2		2	11.1	
hobbies	64			0.091			0.463
yes	39	15	38.5		7	17.9	
no	25	4	16		2	8	
marital status	108			0.427			0.311
married/cohabiting	81	21	26.3		11	13.8	
divorced	16	7	43.8		3	18.8	
widowed	5	2	40		2	40	
single	6	2	28.6		2	28.6	
children	70			0.999			0.320
yes	60	16	26.7		6	10	
no	10	2	20		2	20	
partner with alcohol problem	82			0.417			0.312
yes	7	3	42.9		2	28.6	
no	75	21	28.4		11	14.9	
first-degree relatives with alcohol problem	73			0.114			0.041
yes	35	13	37.1		8	22.9	
no	38	7	18.4		2	5.3	
nicotine use	99			0.999			0.256
ever	57	16	28.1		6	10.5	
never	42	12	28.6		8	19	
alcohol dependence (DSM-IV)	67			0.280			0.280
yes	38	13	34.2		7	18.4	
no	29	6	20.7		2	6.9	
alcohol abuse (DSM-IV)	67			0.768			0.999
yes	48	13	27.1		7	14.6	
no	19	6	31.6		2	10.5	
psychiatric advice	87			0.257			0.569
positive	60	16	26.7		9	15	
doubtful	23	9	39.1		5	21.7	
negative	4	0	0		0	0	
psychiatric comorbidities	108			0.224			0.231
yes	14	6	42.9		4	28.6	
no	94	25	26.9		13	14	

In our study population only two patients relapsed during the first six months following transplantation, probably due to the intensive medical monitoring in this period and the recovery of major surgery. The relapse into problem drinking took place within the two years after transplantation in 76.9% of the cases. All people who only drank a glass occasionally, did this for the first time after more than two years (except one). These results on the timing of relapse are not consistent with the findings in literature. Anantharaju and Van Thiel suggested that 95% of relapse took place in the first two years, with the highest proportion of relapse during the

first six months after transplantation (6). In the Tandon study, 18% of the problem drinkers relapsed during the first six months and 53% of the mild drinkers relapsed in the first months (6,7). Although no consensus can be found between the various studies on the exact time of relapse or relapse into problem drinking, we propose proper follow-up with attention for relapse prevention (especially) during the first 2 years after transplantation which may decrease the number of relapsers.

After LT for ALD in the Ghent University Hospital, the 1-year patient survival was 87% and the 5-year patient survival 74%. These results are slightly better than

the 1-year and 5-year patient survival in Europe (according to the European Liver Transplant Registry, ELTR), respectively 84% and 73%, and in the United States (according to the United Network for Organ Sharing, UNOS) 82% and 68% (5). Comparing the patient survival between LT for ALD and other indications, yielded similar results (without making a distinction between relapsers and non-relapsers). The survival rates in ALD are higher than those for chronic viral hepatitis (8). The causes of death appear to be very similar, with the exception of trauma and malignancies (laryngeal carcinoma), which are more common in patients transplanted for ALD (9). Little is known about the survival for patients transplanted for ALD for a period longer than 5 years.

The effect of relapse (into problem drinking) on mortality is controversial. This study found similar mortality rates between non-relapsers and relapsers, and so did several other studies (2,7,10). However, two recent European studies with prolonged follow-up periods show that the 10-year survival for relapsers is much shorter than for non-relapsers (11,12). Though this higher mortality is only visible if one considers only serious relapse and if the follow-up of these patients is long enough. The past AASLD practice guidelines 2010 do not take these recent studies into account and further results are needed to confirm these findings looking into more detail (13). In the patient population of Cuadrado *et al.* the increased mortality in relapsers was caused mainly by de novo malignancies (e.g. of the liver and digestive tract) and cardiovascular problems. Exposure to excessive alcohol (and often tobacco) together with the effect of the immunosuppressive medication contributed to the development of malignancies (11). Within the patient population of Pfitzmann *et al.*, the problem drinkers died in 87.5% of the cases of recurrent liver disease and esophageal carcinomas (12). Also cardiomyopathy, muscle atrophy, pancreas dysfunction and alcohol neurotoxicity attributed to an increased mortality (13).

Liver failure due to relapse is seen in one patient in this study. It is generally accepted that relapse causes the same histological changes in the donor liver, however the evolution to cirrhosis can be faster than before due to the immunosuppressive medication. Usually, only mild fatty changes occur, which are not significantly different from those in non-relapsers (11,14). The number of acute rejections of a donor organ is similar and, according to some studies, even lower in relapsers (but not statistically significant) by the inhibitory effect of alcohol on various aspects of the immune response (9,11).

Another possible consequence of relapse is non-compliance. The studies of Pageaux *et al.* suggest that relapsed patients would no longer be compliant with follow-up consultations and immunosuppressive medication (2,9). This is however counteracted in some recent publications (11,13-15), so the influence of relapse on compliance remains unclear.

Since relapse into problem drinking may implicate liver failure, increase mortality in 10 years, non-

compliance and loss of public confidence, it could be meaningful to identify these patients who will relapse into problem drinking. Recognizing predictors for relapse can help the clinician to make an informed decision in the selection of candidates for transplantation, and to provide additional follow-up and relapse prevention for those patients at risk for relapse. Several other papers have already extensively analyzed risk factors present prior to transplantation, which ought to be reliable, objectively determinable, and precisely predicting the relapse occurrence. However, with every study published there are new variables found, and moreover the obtained results often cannot be repeated. In this context, due to missing data and the available sample size, it has to be mentioned that also the multivariate analysis of the Ghent population cannot include all potentially important variables for alcohol relapse after LT, limiting the reliability of predicting relapse.

As a consequence, we included a confrontation between the studied factors in our population with these found in current literature (Table 4). However, one must keep in mind that the data are obtained with different study designs and different definitions.

In the Ghent population, a longer abstinence period before transplantation resulted in fewer relapses in any alcohol use and fewer relapses into problem drinking, although the optimal duration of abstinence could not be determined. In literature there is no consensus about this parameter. Although it is clearly demonstrated in different reports that the relapse rate is higher in patients with a shorter pre-transplant sobriety (4,7,12), no hard evidence is available to support the 6-month rule, used by many transplant centers as a selection criterion for enrollment on the transplant waiting list (16,17). Moreover, different studies showed that the relapse rates with and without the 6-month rule are comparable (3,17). Transplantation centers are facing a dilemma; waiting for a long period of abstinence before LT in order to limit the risk of relapse after LT and the risk of waiting too long. The shortage of donor organs and the public opinion makes the decisions even more complex. The abstinence period for transplantation can be determined with relative certainty, but the context of the abstinence (compulsory admission vs. motivated choice) is even more important. Patients with a period of sobriety less than 18 months may benefit from more intensive follow-up and rehabilitation after transplantation, especially within the first 2 years (7).

In a recent study of Mathurin *et al.*, patients with acute alcoholic hepatitis are transplanted without adherence to the 6-month rule with promising results (18). Unlike the Ghent population, where all three patients who were exceptionally transplanted with less than six months abstinence relapsed. Although no conclusions can be drawn from these three cases, a greater follow-up of patients transplanted without six months abstinence will be required.

Another variable found associated with relapse into problem drinking was the average number of quit

Table 4. — Pre-transplant variables and their association with relapse according to literature

	Association with relapse was found	No association with relapse was found
Younger age	Foster <i>et al.</i> 1997 (19) Pageaux <i>et al.</i> 1999 (9)	Björnsson <i>et al.</i> 2005 (21) Pfitzmann <i>et al.</i> 2007 (12) Ghent 2010
Older age	De Gottardi <i>et al.</i> 2007 (10) Tandon <i>et al.</i> 2009 (7)	Björnsson <i>et al.</i> 2005 (21) Pfitzmann <i>et al.</i> 2007 (12) Ghent 2010
Gender		Björnsson <i>et al.</i> 2005 (21) Pfitzmann <i>et al.</i> 2007 (12) Ghent 2010
Employment status		Jauhar <i>et al.</i> 2004 (17) Björnsson <i>et al.</i> 2005 (21) Ghent 2010
Hobbies	Anantharaju and Van Thiel, 2003 (6)	Ghent 2010
Marital status	Foster <i>et al.</i> 1997 (19) Jauhar <i>et al.</i> 2004 (17) Kelly <i>et al.</i> 2006 (23) Pfitzmann <i>et al.</i> 2007 (12) De Gottardi <i>et al.</i> 2007 (10)	Björnsson <i>et al.</i> 2005 (21) Burra <i>et al.</i> 2000 (22) Ghent 2010
Presence of children	Pfitzmann <i>et al.</i> 2007 (12)	Ghent 2010
Partner with alcohol problem		Foster <i>et al.</i> 1997 (19) Ghent 2010
First-degree relatives with alcohol problem	Foster <i>et al.</i> 1997 (19) DiMartini <i>et al.</i> 2001 (3) Jauhar <i>et al.</i> 2004 (17) Ghent 2010	
Nicotine use	Kelly <i>et al.</i> 2006 (23)	Ghent 2010
Other substance abuse	Foster <i>et al.</i> 1997 (19) DiMartini <i>et al.</i> 2001 (3) Anantharaju and Van Thiel 2003 (6)	Jauhar <i>et al.</i> 2004 (17) Björnsson <i>et al.</i> 2005 (21) Ghent 2010
Number of alcohol units per day	Kelly <i>et al.</i> 2006 (23)	Burra <i>et al.</i> 2000 (22) Ghent 2010
Abstinence period	Foster <i>et al.</i> 1997 (19) Yates <i>et al.</i> 1998 (24) Pageaux <i>et al.</i> 1999 (9) DiMartini <i>et al.</i> 2006 (25) De Gottardi <i>et al.</i> 2007 (10) Pfitzmann <i>et al.</i> 2007 (12) Tandon <i>et al.</i> 2009 (7) Ghent 2010	DiMartini <i>et al.</i> 2001 (3) Gish <i>et al.</i> 2001 (4) Burra <i>et al.</i> 2000 (22) Jauhar <i>et al.</i> 2004 (17) Kelly <i>et al.</i> 2006 (23)
Prior cessation attempts	DiMartini <i>et al.</i> 2001 (3) Anantharaju and Van Thiel, 2003 (6) Ghent 2010	
DSM-IV criteria		Lucey <i>et al.</i> 1997 Ghent 2010
Psychiatric advice	Burra <i>et al.</i> 2000 (22) Björnsson <i>et al.</i> 2005 (21) Kelly <i>et al.</i> 2006 (23) Pfitzmann <i>et al.</i> 2007 (12)	Foster <i>et al.</i> 1997 (19) Lucey <i>et al.</i> 1997 (26) Pageaux <i>et al.</i> 1999 (9) Ghent 2010
Psychiatric comorbidities	Gish <i>et al.</i> 2001 (4) Beresford 2000 (27) Anantharaju and Van Thiel 2003 (6) Kelly <i>et al.</i> 2006 (23) De Gottardi <i>et al.</i> 2007 (10) Tandon <i>et al.</i> 2009 (7)	DiMartini <i>et al.</i> 2001 (3) Jauhar <i>et al.</i> 2004 (17) Ghent 2010
Admissions to a rehabilitation center	DiMartini <i>et al.</i> 2001 (3)	Jauhar <i>et al.</i> 2004 (17) Ghent 2010

attempts prior to transplantation. Surprisingly few researchers have studied this variable, which is an indication of the severity of addiction. More frequently, studies address the correlation between the number of admissions into a rehabilitation center and relapse (2,17). As expected, we did not find an association between this variable and relapse, since this does not take into account the patients who stopped (and possibly relapsed) without hospitalization. Implementing the number of cessation attempts into practical guidelines requires a reliable threshold and therefore research on larger numbers of patients is needed.

Having one or more first degree relatives with an alcohol problem was also linked to a significantly increased risk of relapse into problem drinking in the Ghent population in uni- and multivariable analysis. Also DiMartini *et al.* and Jauhar *et al.* found a significant association between a family history of alcoholism and relapse (3,17). Foster *et al.* found a correlation between having siblings with alcoholism and recidivism (19). This finding is supported by twin- and adoption studies showing that alcoholism may have a genetic basis and that a close follow up is necessary in these patients (20).

Conclusion

All pre-transplant variables are valuable evaluating an ALD patient's eligibility for LT, since they help to outline the broader context of the patient and his drinking pattern. But particular attention should be given to patients with first-degree relatives with an alcohol problem, a higher number of previous cessation attempts or a shorter period of abstinence (respecting the 6-month abstinence rule at our center), since a significant increased relapse risk into problem drinking was seen in these patients. Careful follow-up is mandatory in the first 2 years after transplantation since a higher relapse in problem drinking is present within that time frame in our population.

In our study a strict difference was made between occasional drinking and problem drinking, enabling selection of the clinical relevant relapses. The limitations of this study include the relatively small sample size and the retrospective design. It is not possible to transform the observations into strict guidelines to be used in practice as the results do not express exact limits, no studies were performed on larger scale, and each report represents a geographically dependent condition. Larger, prospective studies are required to support these observations.

Ideally, the discussion of selecting a patient for liver transplantation is made by a panel of experts and all people involved in the transplant team. The decision is made, taking the risk factors into account whilst maintaining a flexible attitude towards a patient's individual context.

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