Atrial Fibrillation in Patients Undergoing Liver Transplantation—A Single-Center Experience

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ABSTRACT

Background. As the prevalence of atrial fibrillation rises with age and older patients increasingly receive transplants, the perioperative management of this common arrhythmia and its impact on outcomes in liver transplantation is of relevance.

Methods. Retrospective review of 757 recipients of liver transplantation from January 2002 through December 2011.

Results. Nineteen recipients (2.5%) had documented pre-transplantation atrial fibrillation. Sixteen patients underwent liver and 3 a combined liver-kidney transplantation. Three patients died within 30 days (84.2% 1-month survival) and another 3 within 1 year of transplantation (68.4% 1-year survival). Compared with patients without atrial fibrillation, the relative risk of death in the atrial fibrillation group was 5.29 at 1 month ($P = .0034$; 95% confidence interval [CI], 1.73–16.18) and 3.28 at 1 year ($P = .0008$; 95% CI, 1.63–6.59). Time to extubation and intensive care unit (ICU) and hospital readmissions were not different from the control cohort. Rapid ventricular response requiring treatment occurred in 4 patients during surgery and 7 after surgery, resulting in 3 ICU and 3 hospital readmissions.

Conclusions. The results suggest that patients with atrial fibrillation may be at increased risk of mortality after liver transplantation. Optimization of medical therapy may decrease ICU and hospital readmission due to rapid ventricular response.

PATIENTS ≥50 years are the fastest growing age group of liver transplant (LT) recipients [1]. More than 70% (4,473) of 6,341 patients who received LT in the United States in 2011 were ≥50 years old and almost 12% (745) were ≥65 years old—a 2-fold increase from 2001 (6.5%, 339 of 5,195 patients) [1]. Although elderly patients have good perioperative outcomes, this cohort also has an increased risk of cardiovascular comorbidities, primarily hypertension, coronary artery disease, and arrhythmias [2,3]. If these trends continue, more LT candidates will be at risk of atrial fibrillation (AF) [4–7].

AF is the most common sustained cardiac arrhythmia in Europe and the United States, with a prevalence of 1%–2% in the general population [4,8,9]. AF prevalence increases with age, ranging from 0.5% in the 6th decade to almost 9% in octogenarians [10]. Similar trends have been reported in other parts of the world [11].

AF has been reported as a complication of LT [12–16], and a recent retrospective study suggests that patients with preexisting AF may have worse patient and graft survivals after LT [17]. We report our institutional experience with 19 patients with a preoperative diagnosis of AF who received either liver or combined liver-kidney transplants.

METHODS

Selection and Description of Participants

This was a retrospective cohort study evaluating the outcomes of adult LT recipients with documented pre-transplantation AF. After Institutional Review Board approval, we reviewed the records of patients who underwent LT at our institution from January 1, 2002, to December 31, 2011. We included patients who presented with a documented preoperative diagnosis of AF.

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The classification of AF is based on the temporal pattern of occurrence, as summarized in the 2011 updated guidelines for management of patients with AF [4]. AF that self-terminates within 7 days is designated as paroxysmal, and when sustained beyond 7 days it is designated as persistent. Persistent AF that continues for >1 year, if cardioversion has failed or has been deemed to be unadvisable, is classified as permanent [4].

Patient Management

All LT candidates were evaluated and managed by a dedicated multidisciplinary team that included 4 LT surgeons and 6 anesthesiologists. In all cases surgery was performed with balanced general anesthesia and the use of the piggyback technique with a portacaval shunt. In combined liver-kidney transplantations, the LT was completed first. All organs were harvested from brain-dead donors. All patients were monitored with the use of an arterial line and a pulmonary artery catheter except for 1 in whom transesophageal echocardiography was used.

Data Collection and Analysis

Data were collected from electronic and paper medical records. Patient characteristics included age at the time of transplantation, sex, diagnosis, Model for End-Stage Liver Disease (MELD) score, and body mass index (BMI).

The $CHADS_2$ index [18] was calculated based on the data collected at presentation for transplantation. Risk factors for AF, including coronary artery disease, mitral regurgitation, mitral stenosis, left atrial enlargement, chronic obstructive pulmonary disease, and obstructive sleep apnea, were reviewed [19]. Pharmacologic and interventional treatments for AF were identified.

Intraoperative hemodynamic data, including the initial rate and rhythm, baseline cardiac index, maximum and minimum heart rate, intraoperative rhythm change and interventions, were obtained from the anesthetic record.

Serial blood tests obtained during transplant included arterial blood gas, complete blood cell count, prothrombin time, partial thromboplastin time, fibrinogen, thromboelastogram, and D-dimers.

Postoperative management data, including time to extubation, intensive care unit (ICU) and hospital length of stay, 30-day and 1-year patient and graft survivals, postoperative rhythm change, and 30-day readmission for AF, were collected.

Where indicated, parameters are represented as median or mean ± SD. Relative risk ratio was calculated to compare the risk of death in the AF versus non-AF groups.

RESULTS

Patients

Out of 757 patients who had liver or combined liver-kidney transplantation from 2002 to 2011, 19 (2.5%) had documented pre-transplantation AF. The mean age was 57.9 ± 6.8 years. Thirteen patients were male (68.4%), and 6 (31.6%) were female. Five patients (26.3%) were obese (BMI > 30 kg/m^2). The average MELD score was 23.5 ± 10.1. Indications for LT were alcoholic cirrhosis (31.6%), hepatitis C (10.5%), alcoholic cirrhosis in conjunction with hepatitis C (26.3%), cryptogenic cirrhosis (10.5%), nonalcoholic steatohepatitis (10.5%), amyloidosis (5.3%), and α-1 antitrypsin deficiency (5.3%). Four patients (21.1%) also had a diagnosis of hepatocellular carcinoma. Three patients underwent combined liver-kidney transplantation.

Patients with AF were not statistically different from other LT recipients at our institution regarding sex, BMI, MELD score, cold ischemia time, warm ischemia time, donor age, diabetes mellitus, creatinine >2 mg/dL, retransplantation, and donation after cardiac death. There was a small but statistically significant difference in age between the 2 groups ($P < .05$): Patients with AF were older (57.9 ± 6.8 y) than all LT recipients (53.4 ± 9.9 y).

Atrial Fibrillation Risk Factors and Treatment

Table 1 summarizes types, risk factors, and preoperative management of AF in the study group. Eight patients had a $CHADS_2$ score [18] of 2. Of those, 4 were on aspirin and/or warfarin. None of the nineteen patients had documented stroke or transient ischemic attack.

Five patients had a history of coronary artery disease. Coronary reserve was assessed in all patients with the use of either nuclear or dobutamine stress testing as part of the transplantation evaluation. Four patients had positive

Table 1. Atrial Fibrillation (AF) Preoperative Type, Risk Factors, and Treatment, n

AF type	
Paroxysmal	9
Persistent	3
Permanent	7
$CHADS_2$ score	
0	7
1	4
2	8
Preoperative management	
Antiarrhythmic	11*
Beta-blocker	8
Digoxin	4
Amiodarone	5
Anticoagulant	5†
Aspirin	3
Warfarin	3
Intervention	6
Cardioversion	3
Ablation	1
Pacemaker	3
Preoperative echocardiography	
Mitral regurgitation	13‡
Mitral stenosis	2
Left atrial enlargement	13
Diastolic dysfunction	9§
Stress test	
Negative	15
Positive	4

*Three patients on beta-blocker and amiodarone; 3 patients on beta-blocker and digoxin.
†One patient on aspirin and warfarin.
‡Twelve patients with mild mitral regurgitation; 1 patient with mild-moderate mitral regurgitation.
§Assessment of diastolic function unavailable in 5 patients.

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