

Perioperative Risk of Hip Arthroplasty in Patients with Cirrhotic Liver Disease

We retrospectively reviewed the complete medical records of 30 patients with a diagnosis of liver cirrhosis who had undergone hip arthroplasty at three academic institutions between October 1994 and May 2001. There were 26 males and 4 females with a mean age of 60 yr at index operation. Surgical procedures included 17 primary total hip arthroplasties (THA), 8 bipolar hemiarthroplasties, and 5 revision THAs. According to the Child-Pugh scoring system, 19 cirrhotic patients were categorized as class A, 9 as class B, and 2 as class C. Eight (26.7%) of the 30 patients had one or more perioperative complications. Of these, wound infection was the most common, with a rate of 10% (3 of 30 hips). Other perioperative complications included surgical site bleeding, coagulopathy, encephalopathy, gastrointestinal bleeding, pneumonia, and arrhythmia. Death occurred in 2 (6.7%) of the 30 patients; both were Child-Pugh's C cirrhotics. A higher Child-Pugh score ($p=0.0001$) and a high level of creatinine ($p=0.0499$) were associated with significantly increased perioperative complications or death. Our findings suggest that surgeons should be vigilant about perioperative complications in patients with advanced cirrhotic liver disease who undergo hip arthroplasty, albeit the mortality rates are relatively low in less severe cirrhotics.

Key Words : Hip Arthroplasty; Liver Cirrhosis; Perioperative Complications; Risk Factors

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Received : 2 February 2006
Accepted : 25 August 2006

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INTRODUCTION

Although previously published studies have documented a high perioperative risk in patients with liver failure undergoing general surgery, such as, elective abdominal surgery (1-4), thoracotomy (5), and trauma operations (6, 7), little information is available on clinical outcomes following orthopedic surgery in this group of patients. Ziser et al. (8), in their retrospective review of 733 cirrhotic patients undergoing any type of surgical procedure, reported that patients undergoing major orthopedic procedures including hip surgery, spine fusions, and operations for long bone fractures had a substantially higher perioperative complication rate than patients undergoing non-orthopedic surgery.

Whilst elective total hip arthroplasty (THA) is generally regarded as safe, with an associated perioperative mortality rate of less than 1% in the general population (9-11), data are extremely limited on the safety and outcome of hip arthroplasty in patients with advanced liver disease. Only two recent studies (12, 13), to the best of our knowledge, have evaluated the perioperative risks of hip arthroplasty in cirrhotic patients. The purpose of this study was to document perioperative morbidity and mortality in patients with liver cirrhosis undergoing hip arthroplasty.

MATERIALS AND METHODS

We retrospectively reviewed the complete medical records of 30 cirrhotic patients who had undergone hip arthroplasty at three participating academic institutions between October 1994 and May 2001. Cirrhosis was diagnosed primarily by biopsy, and when biopsy was not performed, abdominal ultrasonography or computed tomography was used for the diagnosis of cirrhosis, in conjunction with a history of liver disease and abnormal liver function test results. There were 26 males and 4 females with a mean age of 60 yr (range, 15-63 yr) at the time of index operation. The procedures included 17 primary THAs, 8 bipolar hemiarthroplasties, and 5 revision THAs. Of the 25 primary hip arthroplasties, the diagnoses leading to surgery were osteonecrosis of the femoral head in 13, hip fracture in 10, and osteoarthritis in 2.

Preoperative data included age, gender, levels of serum albumin, total bilirubin and creatinine, the presence of ascites, esophageal varices, or encephalopathy, and prothrombin time. A modification of the Child's classification by Pugh (14) was used as a measure of liver dysfunction. The severity of cirrhosis was graded as class A when the Child-Pugh score was 5 or 6 points, class B from 7 to 9, and class C from 10 to 15 (a higher score indicates more severe cirrhosis). Perioperative compli-

cations searched for were as follows: postoperative bleeding (gastrointestinal or surgical site), coagulopathy, wound (dehiscence or infection), encephalopathy, cardiovascular (congestive heart failure, myocardial infarction, or arrhythmia), pulmonary (pneumonia, pulmonary embolism, or ventilatory dependence), renal (acute tubular necrosis, hepatorenal syndrome, or ascites), and infection (bacteremia or fungemia). Postoperative bleeding was defined as hemorrhage requiring transfusion, and gastrointestinal and surgical site bleedings were distinguished from each other based on a review of the medical records. Coagulopathy (whether on the basis of reduced hepatic synthesis, disseminated intravascular coagulation, normal consumption, or dilutional mechanisms) was noted in those patients with a decreased platelet count, fibrinogen concentration, and increased activated partial thromboplastin time. New onset or worsening of ascites or encephalopathy was also registered as a postoperative complication within 30 days of hip arthroplasty. Mortality was defined as death within 30 days of index arthroplasty. We chose this 30-day perioperative time limit because a shorter period may have missed complications and deaths directly related to events that had begun during hip surgery or hospitalization.

Twelve variables were investigated to determine risk factors in liver cirrhosis patients who underwent hip arthroplasty; age, gender, the presence of ascites or varices, prothrombin time, the levels of albumin, bilirubin, and creatinine, the type of surgery (primary THA, bipolar hemiarthroplasty, or revision THA), the type of anesthesia (general or spinal), operation time, and estimated operative blood loss. As none had a preoperative encephalopathy, it was excluded from the investigation.

Statistical analysis was performed using the SAS statistical software package (SAS Institute, Cary, NC, U.S.A.). Multivariate logistic regression models were used to identify factors differentiating complicated and uncomplicated hip arthroplasties in cirrhotic patients. Generalized estimating equations were used to control for the clustering of complications

Table 1. Perioperative complications following hip arthroplasty in 30 patients with liver cirrhosis

	Child-Pugh classification		
	A	B	C
Total number of patients	19	9	2
Complications (no. of occurrences)*			
Wound infection	0	3	0
Operative site bleeding	0	1	1
Coagulopathy	1	0	1
Encephalopathy	1	0	1
GI bleeding	0	1	0
Pneumonia	0	0	1
Arrhythmia	0	1	0
Total number (%) of patients with any complications	1 (5.3)	5 (55.6)	2 (100)

*Some patients were associated with more than one complications.

within patients. Variables deemed significant by multivariate analysis at $p < 0.05$ were considered risk factors associated with perioperative morbidity and mortality in liver cirrhosis patients who underwent hip arthroplasty.

RESULTS

According to assessments of liver cirrhosis severity using the Child-Pugh scoring system, 19 patients (63.3%) were class A, 9 (30.0%) class B, and 2 (6.7%) were class C.

Eight (26.7%) of the 30 patients had one or more perioperative complications. Of these, a superficial wound infection was the most common, with a rate of 10% (3 of 30 hips). Other postoperative complications included 2 surgical site bleedings, 2 coagulopathies, 2 encephalopathies, 1 gastrointestinal bleeding, 1 pneumonia, and 1 arrhythmia. In the analysis of the cirrhotic patients by individual Child-Pugh's class, perioperative complications occurred in 1 (5.3%) of 19 class A cirrhotics, 5 (55.6%) of 9 class B, and 2 (100%) of 2 class C (Table 1). Two patients with class C died from aspiration pneumonia and disseminated intravascular coagulation, respectively, during the first postoperative month. Thus, the perioperative mortality rate was 6.7% (2 of 30 patients).

Of the twelve variables that were investigated to identify risk factors for complicated hip arthroplasty in patients with liver cirrhosis, a high level of creatinine was solely associated with increased perioperative mortality ($p = 0.0499$). No statistically significant associations were found in the other variables including age, gender, the presence of ascites or varices, prothrombin time, the levels of albumin and bilirubin, the type of surgery, the type of anesthesia, operation time, and

Table 2. Variables associated with perioperative complications and death following hip arthroplasty in cirrhotic patients

Variables	Complications (p value)	Death (p value)
Age	0.9932	0.82
Gender	0.0892	0.12
Child-Pugh class		
A:B	<0.0001	N/A
B:C	<0.0001	N/A
Presence of ascites	0.0513	0.0574
Presence of varices	0.6536	0.119
Prothrombin time	0.3564	0.0979
Albumin level	0.0921	0.0947
Bilirubin level	0.9736	0.095
Creatinine level	0.1313	0.0499
Type of surgery		
Primary THA vs. BHA	0.7723	0.5546
Primary THA vs. revision THA	0.8127	0.2823
Operation time	0.2734	0.5794
Estimated operative blood loss	0.7123	0.4
Type of anesthesia	0.9672	0.627

THA, total hip arthroplasty; BHA, bipolar hemiarthroplasty.

estimated operative blood loss. However, combining all of the categories included in the Child-Pugh scoring system, a significantly increased risk of perioperative complications was noted in cirrhotic patients who had a higher Child-Pugh score ($p=0.0001$) (Table 2).

DISCUSSION

Previous studies (1-7, 15-18) have well documented high rates of perioperative complications in patients with liver failure undergoing anesthesia and surgery, especially those undergoing major orthopedic procedures (8). However, data are extremely limited on the safety and outcome of hip or knee arthroplasty in patients with advanced liver disease (12, 13, 19). Ziser et al. (8) evaluated 733 patients with a diagnosis of liver cirrhosis who had undergone some type of surgical procedure, and reported a perioperative complication rate of 30.1% and a mortality rate of 11.6% within 30 days of surgery. Of these, 26 procedures were hip and pelvic surgery, arthroplasty, or fractures, and this subgroup showed a substantially increased perioperative complication rate of 53.8%. Recently, Hsieh et al. (13) reported on the outcomes of 45 hip arthroplasties that had been performed over a period of 20 yr in 38 patients with liver cirrhosis, with a perioperative 30-day complication rate of 26.7%. They found that advanced cirrhotics (Child-Pugh's B and C patients) had a higher risk of complications than Child-Pugh's A cirrhotics ($p=0.004$). Cohen et al. (12) also reported a 20.7% major complication rate for cirrhotic patients who received either total hip or knee arthroplasty. In accordance with these previous studies, we observed a high perioperative complication rate (26.7%, 8 of 30) in cirrhotic patients that had undergone hip arthroplasty. Of the twelve variables evaluated in our series, a high level of creatinine was found to be the only risk factor associated with perioperative mortality. However, combining all of the categories included in the Child-Pugh scoring system, a higher Child-Pugh score was another important risk factor of perioperative morbidity. Our findings were also consistent with the previous observations that there was a trend toward an increased perioperative risk for hip arthroplasty in cirrhotic patients with more advanced liver disease.

Rice et al. (16) reported a mortality rate within 30 days of surgery of 28% for patients with chronic liver failure who had undergone non-hepatic surgery, and that 2 of 5 patients who underwent unspecified orthopedic surgery died. Hsieh et al. (13) reported that 18 of 38 cirrhotic patients undergoing hip arthroplasty died during the protracted study period of 20 yr. Of these, 8 patients died from complications of liver cirrhosis. Cohen et al. (12) reported a 10.3% perioperative mortality rate for cirrhotic patients who received either total hip or knee arthroplasty, and this mortality rate increased to 15.8% (3 of 19) in cirrhotic THA patients. However, a relatively lower rate of perioperative mortality (6.7%, 2 of

30) was noted in the present study as compared with previous series that enrolled patients with liver cirrhosis undergoing orthopedic surgery over a long time span. Although it may be attributed to the small number of patients with severe liver cirrhosis (Child-Pugh's class C) in our series, we believe that the improvement of medical care of cirrhotic patients and refinement in surgical techniques that have occurred during past decade may contribute to the lower mortality rate. Cohen et al. (12) also suggested that less extensive operative procedures, such as bipolar hemiarthroplasty, would be associated with more favorable outcomes than those of primary or revision THAs, but our findings showed no statistically significant difference among the different surgical procedures, which we attribute to the small sample size.

In conclusion, we continue to perform hip arthroplasty in patients with cirrhotic liver disease, but we should warn patients with a higher Child-Pugh score and those with an increased creatinine level about their increased perioperative risk of complications or death. Cirrhotic patients should be aware that they are at increased risk for surgical complications because of their disease, albeit the mortality rates are relatively low in less severe cirrhotics.

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