Hip arthroplasty in patients with cirrhosis of the liver

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We retrospectively reviewed 45 hip arthroplasties which were performed over a period of 20 years in 38 patients with cirrhosis of the liver. There was a high perioperative 30-day complication rate (26.7%). Advanced cirrhosis was associated with a higher risk of complications (p = 0.004) as also was increased age, a high level of creatinine, a low level of albumin, a low platelet count, ascites, encephalopathy and an increased operative blood loss. The survival of the prosthesis at five years was 77.8% and infection was a major cause of failure.

In view of the high rate of early complications and the limited longevity of the prosthesis, surgeons who perform hip arthroplasty on such patients should counsel them appropriately preoperatively.

Received 20 February 2003; Accepted 11 April 2003

Cirrhosis is the end stage of many chronic liver diseases. It is characterised by an irreversible, diffuse fibrosis and formation of nodules after hepatocellular necrosis. Chronic viral infection, especially with the hepatitis B virus (HBV) and the hepatitis C virus (HCV), is among the leading causes of cirrhosis. Excessive consumption of alcohol, a major cause of osteonecrosis of the femoral head, also plays an important role in the development of cirrhosis. Malnutrition, impaired immunity, coagulopathy and metabolic bone disease often develop in patients with cirrhosis of the liver. Such changes may adversely affect the outcome if these patients require major orthopaedic surgery, such as total hip arthroplasty (THA).

There is little information in the English literature about the results of hip arthroplasty in patients with cirrhosis. The purpose of this retrospective study, therefore, is to report on the outcome of 45 hip arthroplasties in 38 patients with cirrhosis of the liver. In order to determine the surgical risk, we examined a series of preoperative clinical and laboratory variables in these patients and correlated these with perioperative complications.

Patients and Methods

We reviewed the medical records of all patients with cirrhosis of the liver who had undergone hip arthroplasty between 1979 and 1999. Forty-nine patients were identified. After reviewing their documentation, we excluded five whose diagnosis of cirrhosis had not been made by us, three who had undergone surgery because of deep infection of a previous hip prosthesis, two in whom hepatocellular carcinoma had been diagnosed before surgery and one who was lost to follow-up after surgery. This left 38 patients (45 hips) in the study group, all of whom were followed up in the orthopaedic clinic for their hip prosthesis and in the hepatology clinic for their liver disease. Failure was defined as removal, revision, or clinical failure of the hip implant. Some hips had undergone several surgical procedures during the study period. For these hips, data for the first operation only were analysed.

The causes of cirrhosis of the liver were chronic viral hepatitis in nine patients, alcoholism in six, a combined mechanism in 19, prolonged cholestasis due to intrahepatic stones in two, autoimmunity in one, and idiopathic (cryptogenic cirrhosis) in one. The diagnosis of cirrhosis was made primarily by biopsy. For patients in whom a liver biopsy had not been performed, the diagnosis was made from a history of liver disease and impaired liver function tests, and an additional abnormality on at least one of the following investigations: liver ultrasonography, CT or direct examination of the liver during previous abdominal surgery.

At the time of surgery, the hepatic functional reserve of the patients was recorded using the Child-Turcotte-Pugh scoring system (Table I). Fifteen other variables were also recorded: age, gender, haemoglobin, white blood cell count, platelet count, the level of creatinine, albumin, and bilirubin, the prothrombin time, documented ascites, the
presence of encephalopathy, the type of surgery (primary or revision hip arthroplasty), the type of anaesthesia (general or spinal), operating time and operative blood loss. A perioperative complication was defined as any event which caused death, reoperation, hospital stay of over two weeks, requirement for intensive care, or admission after discharge within 30 days of surgery.

In order to determine the risks of hip arthroplasty in patients with cirrhosis of the liver, we divided the 45 arthroplasty procedures into two groups, according to whether or not perioperative complications developed. We then compared the incidence of each preoperative variable within the two groups. Our sample size was too small to perform a multivariate analysis and therefore we only performed univariate analysis. For categorical data, a chi-squared analysis or a Fisher’s exact test was used when appropriate. For continuous data, recorded as mean ± standard deviation (SD), a two-tailed Student t-test was used for comparison between the two groups. Statistical significance was defined as p < 0.05.

In order to determine the survival rate of the prosthesis at five years, the Kaplan-Meier survival curve was used.

Results

For the 45 hip arthroplasties, the indications for surgery were avascular necrosis of the femoral head in 27, fracture of the femoral neck in eight, aseptic loosening of a hip prosthesis in five and osteoarthritis in five. The procedures involved 20 cementless primary THAs, nine primary hybrid THAs, seven cementless and four cemented hemiarthroplasties and four cementless and one cemented revision hip arthroplasty.

Of the 38 patients in the study, 29 were male and nine were female with a mean age of 55.2 ± 10.3 years (29 to 70) at the time of the THA. The minimum length of follow-up was two years or until the prosthesis failed, when the mean was 84 months (29 to 144). The duration between the diagnosis of cirrhosis and surgery was a mean of 3.5 ± 2.1 years (1 to 7).

The severity of cirrhosis using the Child-Turcotte-Pugh scoring system was: 28 hips (62.2%) were Child’s class A (5-6 points), 14 (31.1%) class B (7-9 points) and three (6.7%) class C (10-15 points). Twelve procedures (26.7%) were associated with one or more perioperative complication, three in class A, six in class B and three in class C patients. These complications are shown in Table II. We found that patients with Child’s class B or C cirrhosis had a significantly higher incidence of complications than those who had a better hepatic reserve (Child’s class A) (p = 0.004).

### Table III. Variables (mean, SD) for the arthroplasties with and without perioperative complications

<table>
<thead>
<tr>
<th>Variable</th>
<th>Complicated (n = 12)</th>
<th>Uncomplicated (n = 33)</th>
<th>p value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age (years)</td>
<td>59.4 ± 6.3</td>
<td>53.6 ± 11.1</td>
<td>0.03*</td>
</tr>
<tr>
<td>Gender (male/female)</td>
<td>10/2</td>
<td>22/11</td>
<td>0.46</td>
</tr>
<tr>
<td>Haemoglobin (g/dl)</td>
<td>9.8 ± 1.1</td>
<td>10.1 ± 1.8</td>
<td>0.48</td>
</tr>
<tr>
<td>White cell count (10^9/l)</td>
<td>9.3 ± 2.5</td>
<td>8.6 ± 2.5</td>
<td>0.43</td>
</tr>
<tr>
<td>Platelet count (10^9/l)</td>
<td>108 ± 45</td>
<td>154 ± 75</td>
<td>0.041*</td>
</tr>
<tr>
<td>Creatinine (mg/dl)</td>
<td>1.9 ± 0.6</td>
<td>1.4 ± 0.5</td>
<td>0.018*</td>
</tr>
<tr>
<td>Albumin (g/dl)</td>
<td>2.8 ± 0.3</td>
<td>3.2 ± 0.3</td>
<td>0.003*</td>
</tr>
<tr>
<td>Bilirubin (mg/dl)</td>
<td>2.1 ± 0.7</td>
<td>1.7 ± 0.5</td>
<td>0.12</td>
</tr>
<tr>
<td>Prothrombin time (seconds)</td>
<td>14.0 ± 1.9</td>
<td>12.9 ± 1.5</td>
<td>0.06</td>
</tr>
<tr>
<td>Type of surgery (primary/revision)</td>
<td>10/2</td>
<td>30/3</td>
<td>0.59</td>
</tr>
<tr>
<td>Type of anaesthesia (general/spinal)</td>
<td>8/4</td>
<td>16/17</td>
<td>0.28</td>
</tr>
<tr>
<td>Operative blood loss (ml)</td>
<td>984 ± 232</td>
<td>803 ± 328</td>
<td>0.041*</td>
</tr>
<tr>
<td>Operative time (minutes)</td>
<td>90.1 ± 20.6</td>
<td>104.5 ± 31.6</td>
<td>0.08</td>
</tr>
<tr>
<td>Ascites (number of cases/total)</td>
<td>8/12</td>
<td>5/33</td>
<td>0.001*</td>
</tr>
<tr>
<td>Encephalopathy (number of cases/total)</td>
<td>4/12</td>
<td>2/33</td>
<td>0.03*</td>
</tr>
</tbody>
</table>

*Statistically significant
Univariate analysis was performed on 15 variables in order to evaluate which factors might differentiate between complicated and uncomplicated hip arthroplasties in cirrhotic patients (Table III). Seven factors were identified. There was a statistically increased risk of complications in cirrhotic patients who were older, had a higher level of creatinine, lower level of albumin, lower level of platelet count, pre-existing asciitis or encephalopathy, or those with a greater operative blood loss. There was no significant difference in gender, haemoglobin, white cell count, prothrombin time, level of bilirubin, type of surgery or anaesthesia and operating time between the two groups.

Seventeen hips (37.8%) were considered to be failures and were removed or revised during the follow-up period. The survival rate of the hip prostheses at five years was 77.8% (95% CI 72% to 85%). Of the 38 patients, 18 (23 hips) died during the study period. The causes of death were complications of cirrhosis of the liver in eight patients, hepatocellular carcinoma in three, pneumonia in three, bacterial endocarditis in one, road traffic accident in one, a stroke in one and suicide in one.

In ten hips (22.2%), the prosthesis was removed at a mean of 38 months (5 to 72) postoperatively because of deep infection. Revision was performed in six hips after antibiotic treatment and four remained as excision arthroplasties. Of the six revision THAs, only three remained free from infection. The other three hips became reinfected and were subsequently treated by excision arthroplasty. Other indications for revision surgery included aseptic loosening of the components in five hips, wear of the polyethylene liner and osteolysis in one and periprosthetic femoral fracture in one.

Discussion

Cirrhosis is a well-known comorbidity which creates a high risk of perioperative complications in patients who need surgery. Several studies have reported a high mortality rate in elective abdominal surgery,10-13 thoracotomy,14 and operations for trauma.15 Little information is available about the risks and outcomes in cirrhotic patients who undergo orthopaedic operations. Rice et al16 evaluated 40 non-hepatic surgical procedures performed in patients with chronic liver failure and reported a mortality rate of 28% within 30 days of surgery. In their series, there were two deaths in five patients who had undergone unspecified orthopaedic procedures. Ziser et al17 reviewed the records of all patients with a diagnosis of cirrhosis who had undergone any surgical procedure under anaesthesia (except liver transplantation) at their institution. For 733 surgical procedures, the perioperative mortality rate was 11.6% and the perioperative complication rate was 30.5%. Twenty-six procedures were either arthroplasties or surgery for fractures of the hip and pelvis. Of these, perioperative complications developed in 14 (53.8%). Our retrospective study confirms that cirrhotic patients who undergo hip arthroplasty carry a high perioperative risk, with a complication rate of 26.7%.

The traditional use of the Child-Turcotte classification is a well established method of assessing hepatic functional reserve.18 The classification was modified by Pugh et al,9 who substituted the prothrombin time for assessment of the patient’s nutritional status and established a scoring system. The use of the Child-Turcotte-Pugh classification has been supported for various types of surgical procedures.16,17,19 Although its use is not a direct measure of hepatocellular function, and some investigators have noted uncertainties in the system,20 no other test has surpassed its ability to predict operative outcome.21 In our study, the incidence of perioperative complications in patients with advanced Child’s grading (B and C) was 52.9%, as compared with an incidence of 10.2% in patients with Child’s class A (p = 0.004). We consider that the Child-Turcotte-Pugh classification system is useful for predicting surgical risk in cirrhotic patients who undergo hip arthroplasty.

Previous reports attempted to identify parameters which were predictive of poorer surgical outcomes. Several factors have been described.10,15-17 These may vary because of the heterogeneity of surgical procedures and the patients’ profiles in the various studies. In our study, seven factors (advanced age, elevated creatinine, decreased albumin, decreased platelet count, increased operative blood loss, ascites and encephalopathy) were found to be associated with perioperative morbidity. Our small sample size, and the retrospective design of the study, prevented us from using multivariate methods in order to look for independent variables. Factors identified by the univariate analysis, such as platelet count and operative blood loss, may have a coefficient on the outcome. Elimination of one or more of these factors may not necessarily reduce complications.

A prolonged prothrombin time has been recognised as a poor prognostic factor.16,17 In our series, however, we did not find the preoperative prothrombin time predictive of perioperative complications. This may partially be because most of our patients received fresh frozen plasma or vitamin K during the operation. A firm conclusion could not therefore be drawn from our study. Nevertheless, since a prolonged prothrombin time is potentially correctable, we would recommend aggressive correction of this coagulation parameter before surgery in order to avoid excessive bleeding.

Patients with cirrhosis have an increased incidence of bacterial infection.22 The reason for this may be impaired phagocytic function.23 In our series, ten of the 17 perioperative complications were associated with infection, four patients with pneumonia, two with infection at the site of the hip arthroplasty, two with a urinary tract infection, one with peritonitis and one with septicemia of unknown origin. Ten of the 17 prosthetic failures were also due to infection. The outcome of treatment for infection of the hip prostheses was poor. Of the ten hips which became infected, only three ultimately had a successfully functioning prosthesis.
The survival rate at five years for the prosthesis was 77.8%. An accurate, longer-term survival rate could not be determined because of the limited number of surviving patients. It is clear, however, that this rate is less favourable than the published rates for prosthetic survival of up to 96.4% for a primary prosthesis and up to 94% for a revision prosthesis, ten to 14 years after surgery. 27,29 Patients with cirrhosis have a reduced life expectancy, and the reduced longevity of their hip implants may not be important. The improvement in the quality of life after hip arthroplasty may outweigh the risk of failure.

In summary, we found that patients with cirrhosis of the liver who undergo arthroplasty of the hip carry a high risk of perioperative complications and early prosthetic failure. Those with a higher Child-Turcotte-Pugh score are at higher risk. Infection is a common cause of failure and may be difficult to treat. With improvement in the medical care of cirrhotic patients, however, the number who require a hip replacement will undoubtedly increase. We have identified several factors which are associated with an increased surgical risk, and which warrant special attention in view of the high rate of complications. Whenever possible, orthopaedic surgeons should correct, or avoid, these factors when they undertake an arthroplasty of the hip on cirrhotic patients.

No benefits in any form have been received or will be received from a commercial party related directly or indirectly to the subject of this article.

References