Iatrogenic bile duct injury – a cost analysis

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Abstract

Introduction. Iatrogenic bile duct lesions following cholecystectomy represent a feared complication occurring in up to 0.9%. The aim of the present study was to estimate the total cost associated with both minor and major bile duct injuries. Material and methods. Detailed information on 24 consecutive patients, out of which 14 were considered to have minor and 10 patients considered as having major bile duct injury, provided the underlying information that rendered calculations on average individual costs for both groups of injuries. Results and discussion. Calculating individual costs for minor and major bile duct injuries with actual incidences of cholecystectomies performed and the incidence of iatrogenic bile duct injury demonstrated that the total costs, including in-hospital cost, sick leave and loss of production, were substantial. For the management of minor bile duct injuries costs were within the range of 136,787–159,585 EUR and for the management of major bile duct injuries from 336,903–449,204 EUR per million inhabitants and year. The total costs for the management of all types of bile duct injuries were thus within the range of 473,690–608,789 EUR per million inhabitants annually for the society.

Key Words: cholecystectomy; bile duct injury; follow-up; costs

Introduction

Iatrogenic bile duct lesions are feared complications reported to occur in approximately 0.2–0.3% in the open cholecystectomy era, but with incidence figures increasing following the introduction of laparoscopic cholecystectomy, with a mean figure of bile duct injuries when including both minor and major injuries up to 0.9% [1–6]. Both short- and long-term outcomes depend on the severity and grade of the bile duct injury. Several classification systems for severity of bile duct injuries have been described. Frequently used are the Academic Medical Center (AMC, Amsterdam) classification with four types of bile duct injuries, ranging from cystic duct leaks, major bile duct leaks, bile duct strictures, to complete transection of the bile duct [7]. Alternative classifications are the Strasberg classification grading from cystic duct or where gallbladder liver bed leaks to bile duct transection or hilar injury [8] or the Stewart-Way classification of laparoscopic bile duct injuries [9].

Additional classification systems are the Neuhaus [10], Siewert [11] and Hannover [12] classifications systems grading the magnitude of injury. Moreover, vascular involvement and location of the lesion above the hilar bifurcation has a major impact on the extent of the required surgical intervention and should also be emphasized in the classification and grading of bile duct injuries [12,13]. Omitting routine intraoperative cholangiography may leave up to 90% undiagnosed during surgery and delays diagnosis in median about one week postoperatively [7]. The cost for routine intraoperative cholangiography to diagnose and prevent a single bile duct injury has been reported and was calculated to be EUR 241,965 [14].

Independent of classification system, the proportion between minor injuries dealt with by drainage, endoscopic sphincterotomy/stenting and simple repair as compared to major injuries, requiring bile duct reconstruction with bilo-digestive anastomoses, is 60–70% being minor injuries and 30–40% representing major injuries, respectively [15–18].

Iatrogenic bile duct injuries are frequently associated with both short- and long-term problems, and thereby increased morbidity and mortality. This
means that this type of complication goes with the need of substantial resources. Despite this, limited studies have focused on the economical consequences of bile duct injuries. The aim of the present study was to analyze the economical resources required to manage both minor and major bile duct injuries caused during cholecystectomy.

Material and methods

Twenty-four consecutive patients with iatrogenic bile duct injury caused during cholecystectomy 1999–2005 were included, from whom detailed information was retrieved from their medical records. Of the 24 patients, 18 were women and six were men with a mean age of 41 years. Fourteen patients were considered to have minor injuries managed by primary repair with suture or endoscopic stenting. Of these, 10 were women and four were men and the median age was 41 years. Twelve out of the 14 patients sustained a bile duct injury during laparoscopic cholecystectomy, while two were injured during open cholecystectomy. Four of the 14 patients were referred from other hospitals. The median time from injury to repair was four days, and five out of the 14 injuries were discovered during the primary operation and sent for repair. Ten patients with a median age of 44 years were considered to have major injuries requiring Roux-en-Y hepaticojejunostomy to obtain repair of the bile duct injury. Among patients with major bile duct injuries, eight were women and two were men and the median age was 44 years. All patients sustained the bile duct injury during laparoscopic cholecystectomy at another hospital, referred to our hospital and the median time from laparoscopic cholecystectomy to definite and final repair of the bile duct injury was 79 days ranging up to 297 days. Short-term complications were defined as complications occurring within 30 days after treatment of the bile duct injury and long-term complications were defined as complications diagnosed 30 days or more after treatment of the bile duct injury.

The total cost per patient was calculated and included anesthetic and operation costs, expenses for normal, intermediary, and intensive care ward, radiological and outpatient costs. As far as possible, sick leave days were retrieved from the medical records. From the National Social Insurance Office [19] costs for sick leave were obtained (50 EUR/day) [19] and costs for loss of production during sick leave were calculated by data from health care economies (251 EUR/day) [20].

Results

In patients with minor bile duct injuries (n = 14), complications included wound infections in two patients, postoperative pancreatitis in two and multiple organ dysfunction in one patient. No mortality was encountered. Median hospital stay was six days. During a median follow-up of 86 months (range 18–127 months) one patient developed pancreatitis and one patient had small bowel obstruction and thus two patients (14%) had to be re-admitted to hospital. Median time for sick leave was 30 days (mean 50 days).

In patients with major bile duct injuries (n = 10), one patient developed wound infection and cholangitis, respectively, and two patients had anastomotic leaks. Median hospital stay was 10 (mean 12) days. Median sick leave was 132 (mean 359) days.

Costs

Cost estimations for minor and major bile duct injuries as expressed in EUR showed that in-hospital costs and loss of production dominated in patients with minor bile duct injuries. In patients with major bile duct injuries, loss of production is substantial and due to prolonged sick leave. Mean cost as expressed per patient was 21,837 for minor bile duct injuries, and 107,568 EUR for major bile duct injuries (Table I). Concerning sick leave days and loss of production, eight of the 10 patients with major bile duct injury and 13 out of 14 minor bile duct injury were eligible for sick leave (with age between 18 and 65 years).

Discussion

Iatrogenic bile duct injury during cholecystectomy is a feared complication with a frequently troublesome course, requiring substantial resources and hazarding the patients’ health and quality of life. Among identified hazards following repair of bile duct injury is high age, co-morbidity, and outcome is related to the experience of the surgeon performing the bile duct repair, implying the importance of referring patients with common bile duct injuries to surgeons or departments with documented experience in bile duct repair [21]. It has also been demonstrated that the rate of common bile duct injuries is significantly

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<th>Table I. Total cost for minor and major bile duct injuries, respectively.</th>
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lower when routine intraoperative cholangiography is used and thus systematic use of intraoperative cholangiography may reduce the rate of common bile duct injury [22]. Routine intraoperative cholangiography has been claimed cost effective, especially when used by less experienced surgeons and in high-risk operations [23].

The number of cholecystectomies performed in Sweden has increased during the 1990s, and during the period 1995–1999, 1126 cholecystectomies per 10^6 inhabitants and year were performed [24]. This increase has continued and for 2000–2003 1160 cholecystectomies per 10^6 inhabitants and year were performed, significantly more than before the introduction of the laparoscopic technique [25]. During this period, intraoperative cholangiography was performed in 72% of the patients [25]. When reviewing the Swedish in-patient registry, the need of surgical reconstruction of bile duct injuries following cholecystectomy was 0.47% during the latest period studied (1996–2001) [6]. With this information, i.e. a yearly incidence of 1160 cholecystectomies per 10^6 year with a majority (60–70%) being minor bile duct injuries and 30–40% being major injuries, and with information on individual patient costs as provided by the present study, estimations of the total costs associated with the management of bile duct injuries can be made. With these figures, the total cost for managing minor bile duct injuries would be within the range of 136,787–159,585 EUR and for the management of major bile duct injuries from 336,903–449,204 EUR, all expenses expressed as per million inhabitants and year. The overall costs for the society for the management of both mild and severe bile duct injuries would thus be between 473,690 and 608,789 EUR annually per million inhabitants with these estimations made on recent data obtained from a Scandinavian study population.

In conclusion, the present study estimates costs for management of both minor and major bile duct injuries with calculations on the total costs based on recent information on cholecystectomy, incidence and complications in Scandinavia. The amounts are substantial, within the range of 470,000–600,000 EUR per million inhabitants annually, and are probably underestimated as all types of economical compensation from, e.g. patient insurance policies or other sources have escaped identification. These data should renew the evaluation of performing routine intraoperative cholangiography, one of the critical factors in prevention and early detection of bile duct injury. Furthermore, consequences of bile duct injuries on long-term quality of life, not infrequently reported to be impaired, have not been analyzed.

References

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