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Original Article

Costs of management of bile duct injuries

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ABSTRACT

Background: Only a few studies address the financial impact of the management of bile duct injuries (BDI). This study was aimed to assess the cost of BDI sustained during cholecystectomy.

Methods: Patients who underwent surgical repair for post cholecystectomy BDI and due for routine follow up between August 2006 and September 2007 were called for an interview.

Results: 47 patients were interviewed. There were 39 (83%) women and 8 (17%) men. The median direct cost was US$ 1626 (451-11,009); ₹ 73,983 (20,521-500,910). The median indirect cost was US$ 312 (26-2,708); ₹ 14,196 (1,183-123,214). Total median cost was US$ 2,045 (488-12,369); ₹ 93,046 (22,204-562,790). The median total costs of management of BDI was 9.98 times the costs of a cholecystectomy at our centre (US$ 205); (₹ 9,328) and was 8.41 times the median monthly income of the patients (US$ 243); (₹ 11,057).

Conclusions: Our results will help the hospital administrators and the insurance agencies to calculate and revise the packages and premium for cholecystectomy so that the extra cost of a possible BDI is evenly distributed.

KEYWORDS: Bile duct injuries, cholecystectomy, insurance agencies, premium

Introduction

Gall stone disease (GSD) is common in north India. Cholecystectomy is the treatment of choice for symptomatic GSD. Bile duct injury (BDI) is not an uncommon complication of cholecystectomy. More and more cholecystectomies are now being performed laparoscopically. Laparoscopic cholecystectomy is associated with a 2-3 times higher risk of BDI than open cholecystectomy. BDI is associated with significant morbidity and may even cause mortality. Patients who sustain a BDI at cholecystectomy require prolonged and repeated hospitalizations, investigations and interventions for its management. Acute BDI may lead to a benign biliary stricture (BBS). Repair of BBS may require a major operation – hepatico-jejunostomy (HJ).[1] Patients who undergo HJ for BBS require long-term follow up including hospital visits and investigations. BDI, thus, puts an additional financial burden on the patient/ family/ society. A BDI has been described as a 'financial disaster',[2] as the cost to the patient who sustains a BDI during cholecystectomy are enormous.[3] In one study, the costs were calculated as US$ 160,000; (₹ 7,280,000).[4] We performed this study to calculate the costs of management of BDI sustained during cholecystectomy.

Methods

The study was conducted between August 2006 and September 2007 in the department of Surgical Gastroenterology

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at a tertiary level referral hospital in north India. The study group included patients who had suffered BDI during cholecystectomy performed elsewhere and who were managed by us for the BDI/ BBS between 1994 and 2007. Patients who were due for a routine follow up visit to our out patient department (OPD) were called for the interview about the costs incurred by them in the management of the BDI. All these patients had major bile duct injury during cholecystectomy and all underwent a Roux-en-Y hepaticojejunostomy as the definitive procedure. The project assistants directly interviewed all the patients in the presence of their relatives/ attendants. The respondents were made to feel at ease, and it was explained to them that the objective of this exercise was to obtain an account of the money spent by them on their healthcare pertaining to the BDI for which they were admitted to our center. Although a structured questionnaire was developed to take down the responses, the respondents were gently guided through an informal dialogue on their medical histories so as to facilitate the recollection of instances which led to the expenses. The original bills of the expenditure were verified, if available.

Direct costs of management included expenses incurred for pre-admission OPD visits, hospitalization for operation (HJ for BBS), post-operative follow up visits, investigations, procedures and medicines.

Indirect costs of management included expenses incurred on travel and transportation (for patient and attendants) from their home to the hospital for consultation at our centre, accommodation, food for attendants accompanying the patient, communication (telephone), entertainment of relatives/ friends who came to visit the patient in hospital/ home and miscellaneous expenses. Miscellaneous expenses included costs of any equipment such as wheelchairs, cost of changes that had to be made e.g. change in the toilet or any other facility to assist daily activities of the patient, loss of wages/ salary of the patient as well as the attendants, interest paid on the loan if taken for the treatment, expenses incurred on tips if given to any one in the hospital, expenses on religious trips or rituals performed or money spent on any other efforts made for the betterment of the patient.

The social costs e.g. loss of school-days for children, etc. could not be accounted for but were written out as short case studies of individual patients. The cost was calculated in Indian rupees (₹) and converted to Unites States Dollars (US$) at an exchange rate of 0.022 US$ per one ₹. The effect of inflation over the study period was not taken into account.

Pre-testing was done to ensure the effectiveness of the questionnaire. Seven patients were subjected to pre-testing. During the pre-testing, it was noticed that the respondents began answering the survey thinking that some monetary aid may be provided to them. This had the potential of leading to bias from the point of view of the respondents. It was, therefore, clarified and explained that the objective of this survey was not to provide them with any kind of monetary help. Pre-testing, thus resulted in changes in the layout and sequencing of the questionnaire proforma. The revised questionnaire proforma was administered to fresh 48 patients. The seven patients included in the pre-testing were not included in the final analysis of the data.

Results

Forty eight patients were called for the interview; one patient refused to participate. The data obtained from the remaining 47 patients were analyzed. There were 39 (83%) women and 8 (17%) men; age ranged from 22-70 (median 43) years. This gender and age distribution was similar to that of all BDI patients operated in our institution (72% women and 28% men; age 12-71 (median 40) years). Six were professionals, 33 were non-professionals and eight were illiterate. Forty one (87%) patients were non-earning dependents and only six (13%) were bread-earners for the family. Nine patients were from the same city where our centre is located; 23 were from other cities in the same state and 15 were from other states. The family income ranged from US$ 103-728 (median $ 243); ₹ 4,687-33,124 (median ₹ 11,057) per month.

After cholecystectomy and before referral to our centre, the patients had to make 1-50 (median 8) OPD visits and required hospitalization 1-4 (median 2) times for 15-51 (median 10) days elsewhere. After referral to our centre and before admission for operation, the patients made 1-8 (median 1) OPD visits and required hospitalization 1-3 (median 1) times for 7-25 (median 12) days. After repair of the BDI, the patients made 1-11 (median 5) OPD visits and required hospitalization 1-3 (median 1) times for 7-30 (median 10) days.

The details of the costs of management of BDI are shown in **Table 1**. The median total costs of management of BDI was 9.98 times the costs of a cholecystectomy (US$ 205); (₹ 9,328) at our centre and was 8.41 times the median monthly income (US$ 243); (₹ 11,057) of the patients.

None of the patients was insured for medical treatment; only seven out of 47 patients were reimbursed for their expenses

by their/ their spouses' employers. Only four patients said that they were financially sound and the expenses incurred in the management of BDI did not affect them significantly. Nine patients used their savings (made for future of their children) for management of BDI. Other methods by which patients arranged finances for management of BDI were withdrawal form provident fund, loans from relatives/ friends, support from relatives/ friends, mortgage of farming land, sale of land, sale of jewelry, etc. Two patients lost their jobs because of the loss of working days they spent in the management of BDI. The incurred cost difference between patients from the same city (n=9) and from out station (n=38) was not statistically significant.

Table 1: Costs of the management of bile duct injury sustained during cholecystectomy.

Type of expenditure	Cost (median and range in US$)	Cost (median and range in ₹)
Direct expenditure	1,626 (451-11,009)	73,983 (20,521-500,910)
• Out patient clinic	142 (32-1,101)	6,461 (1,456-50,096)
• Investigations	236 (41-2,092)	10,738 (1,866-95,186)
• Procedures including operations	821 (212-3,413)	37,356 (9,646-155,292)
• Drugs and consumables	404 (31-4,403)	18,382 (1,411-200,337)
Indirect expenditure	312 (26-2,708)	14,196 (1,183-123,214)
• Travel	105 (11-443)	6,825 (501-20,157)
• Accommodation	49 (4-320)	22,210 (182-14,560)
• Food	51 (4-276)	2,321 (182-27,646)
• Communication	7 (2-309)	319 (91-140,510)
• Entertainment	2 (1-109)	91 (46-49,510)
• Miscellaneous	45 (2-22,154)	2,048 (91-1,008,007)
• Total expenditure	2,045 (488-12,369)	93,048 (22,204-5,627,810)

Discussion

Our study shows that patients who sustained BDI during cholecystectomy had to spend an amount equivalent to more than eight months of their monthly family income on the management of the BDI. These expenses were approximately 10 times the costs incurred by them on cholecystectomy. In a report from the All India Institute of Medical Sciences, New Delhi, Srivastava et al[5] reported the average direct cost (including cost of investigations, disposables, drugs, hospital stay and operation including anesthesia) of a laparoscopic cholecystectomy to be US$134 (₹ 6,097) and that of open (mini laparotomy) cholecystectomy to be US$ 103 (₹ 4,687). The total costs of management of BDI in our patients were about 15-20 times this cost of cholecystectomy.

A national survey on cholecystectomy related BDI from Belgium reported on costs of 11,628 cholecystectomies performed in 1997 and costs of management of BDI sustained during these cholecystectomies.[6] Average costs were Belgian Franc (BF) 1,721 for uneventful laparoscopic cholecystectomy and BF 2,924 for uneventful open cholecystectomy. The cost increased four folds to BF 7,250 when a BDI occurred but was detected intra-operatively and treated immediately. If the treatment of BDI was delayed, the costs increased nine folds to BF 9,258. The authors concluded that BDI should be avoided by all means during cholecystectomy.

Similar results have been reported form the USA. If a BDI is sustained during cholecystectomy, the patient needs repeated visits to the hospital. Savader et al[2] reported average of 10 outpatient care days and 32 days of inpatient hospitalization in patients with BDI. Mean cost of management of CBD transection/ excision was US$ 9,061 versus US$ 2,689 for uncomplicated laparoscopic cholecystectomy.[7] The costs of repair of cholecystectomy related BDI can be 4.5 to 26.0 times the cost of uncomplicated cholecystectomy - a BDI is thus not only a health-related but a financial disaster also.[2] The hospital charges for HJ which is required for the management of a BDI were US$ 20,240.[8] Savader et al[2] reported the mean costs of repair at the Johns Hopkins Hospital (JHH) of a bile duct stricture following a BDI sustained during laparoscopic cholecystectomy performed elsewhere to be US$ 39,725. The mean cost of immediate repair at the JHH of a CBD injury sustained during LC at the JHH itself was US$ 22,565. Savader et al[2] also reported that the cost of management of BDI in patients in whom BDI was recognized immediately at the time of cholecystectomy was 43% to 83% less than the cost in those patients in whom recognition of the injury was delayed. The authors concluded that intra-operative recognition with immediate conversion to an open procedure for definitive repair can result in significant cost savings. This, however, applies to only those institutions which have adequate experience in

the management of BDI. If repair of BDI is attempted by inexperienced hands, the resultant failure and costs of further management required may add to the total costs.

Patients who have undergone repair of BDI with HJ require long-term (preferably life long) follow up including investigations such as liver function tests, ultrasonography, hepato-biliary isotope scan, magnetic resonance cholangiography, etc; costs of management of BDI will increase with increasing period of follow up. Even in the best hands, some repairs may fail and re-stricture needing further investigations, hospitalization and intervention.[9,10] Costs of unsuccessful management of BDI may, therefore, be even higher.

Between 1989 and 2006, we managed 195 patients with acute BDI referred to us following cholecystectomy elsewhere; 8 of these patients died (unpublished data). Since this was a retrospective study, we could not calculate the costs of management in patients who died because of bile peritonitis and sepsis following an acute BDI. Savader et al[2] reported that the costs of management of these more sick patients were much higher – US$ 130,345. Patients who sustain a BDI during cholecystectomy have a higher risk (hazard ratio 2.8) of dying during follow up as compared to those who have an uncomplicated cholecystectomy.[11] This would put an extra burden on the family, more so if the patient was a bread earner for the family.

The hospital charges are not the reflection of the hospital costs. Charges are what the hospital bills the patient for and what the patient pays to the hospital. The hospital costs are what the hospital actually spends on the treatment of patient. Moreover, our centre is a state government funded hospital where costs of treatment are highly subsidized; the hospital costs only partly cover the costs of consumables, drugs and utilities; manpower services are not charged and are free. Patients getting their BDI treated at corporate hospitals will have to spend more than what our results indicate.

The cost of management of a BDI may be more than that calculated by us as some components of indirect costs viz. loss of wages (of the patient, spouse or other attendants), etc. could not be ascertained.

In addition to measurable costs, BDI is associated with several non-measurable, non-monetary, intangible soft costs such as mental agony, pain, loss of studies of children, missed social commitments, non-celebration and non-enjoyment of festivals, etc.

Interestingly, a BDI during cholecystectomy is expensive not only to the patient but to the surgeon also. Mean payment for a litigation settlement for a BDI occurred during laparoscopic cholecystectomy (LC) was US$ 507,000.[12]

Surgeons who perform cholecystectomy should be aware of the expenses that a patient may have to incur if (s)he sustains a BDI during cholecystectomy. All surgeons should get properly trained for performing a safe cholecystectomy, especially laparoscopic cholecystectomy. They should take all precautions to avoid a BDI during cholecystectomy. If at all a BDI occurs, as it is bound to happen in some cases with all/most surgeons, the patient should be referred in time to a center with the infrastructure and experience for managing BDI including interventional radiology and therapeutic endoscopy.

Several corporate hospitals offer packages for particular surgical procedures including cholecystectomy. Our results will help hospital administration to calculate and decide packages for cholecystectomy. The extra cost of management of BDI could be distributed amongst all the patients undergoing cholecystectomy so that a BDI does not put extra burden on the hospital. Our findings will also be useful to hospitals/surgeons who want to create a fund to offer financial support to patients who sustain a BDI during cholecystectomy. Insurance agencies may use these costs to decide premium for policies covering cholecystectomy. Consumer forums may also use these costs to award damages to patients who sustain BDI during cholecystectomy.

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