Predictive Factors for Unanticipated Admissions After Ambulatory Laparoscopic Cholecystectomy

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Hypothesis: Analysis of the causes of unanticipated admission after ambulatory laparoscopic cholecystectomy may permit the identification of predictive clinical factors for postoperative admission.

Design: Univariate and multivariate analyses of clinical variables associated with unplanned admission in a retrospective case-control series of ambulatory laparoscopic cholecystectomies.

Setting: A major university-affiliated teaching hospital.

Patients: Seven hundred thirty-one consecutive patients who underwent ambulatory laparoscopic cholecystectomies between January 1, 1996, and December 31, 1999.

Intervention: Ambulatory laparoscopic cholecystectomy.

Main Outcome Measures: Unplanned postoperative admissions. Univariate and multivariate analyses of 19 clinicopathologic factors were performed to identify independent predictive factors for these admissions.

Results: Seven hundred six patients were discharged on the day of operation. The remaining 25 required admission because of pain (n=10), nausea and vomiting (n=6), retention of urine (n=5), patient preference (n=3), and medical observation (n=1), giving an unanticipated admission rate of 3.4%. Significant factors associated with unplanned admission included operative duration of longer than 60 minutes and thickened gallbladder wall on ultrasonographic and pathological findings. By means of logistic regression, length of operation was the only independent predictive factor. Operative time exceeding 60 minutes incurred a 4-fold increased risk for unanticipated admission.

Conclusions: Operative duration was the best predictive factor for unplanned admission after ambulatory laparoscopic cholecystectomy. During selection of patients for day surgery, ultrasonographic demonstration of a thickened gallbladder wall should be taken into consideration.

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PATIENTS AND METHODS

Between January 1, 1996, and December 31, 1999, 731 ambulatory laparoscopic cholecystectomies were performed at the Department of Surgery, Brigham and Women's Hospital, Harvard Medical School, Boston, Mass. Patients who were admitted after ambulatory laparoscopic cholecystectomies were identified retrospectively. For each case resulting in admission, 4 control patients who were discharged successfully on the day of operation were randomly selected during the study period. A review of the patients’ medical records was performed to document demographic features, results of preoperative biochemical and hematologic studies, ultrasonographic findings, details of the operation, and pathological findings.

SELECTION CRITERIA FOR PATIENTS

The selection criteria for patients undergoing ambulatory laparoscopic cholecystectomies included American Society of Anesthesiologists risk classification I or II, absence of adverse history with anesthesia, anticipated operation time of less than 90 minutes, informed consent to day surgery by the patient, and the availability of a competent adult to accompany the patient home and look after the patient for 24 hours.

DAY OF OPERATION

All patients were admitted on the day of operation after a midnight fast. The procedures were usually scheduled in the morning session of the operation list. All patients underwent laparoscopic cholecystectomies using a standard 4-port technique, with the patient under general anesthesia. Local infiltration of the wounds with 10 mL of 0.5% bupivacaine hydrochloride was routinely performed before skin incisions.

of the overall population was 41.0 ± 12.6 years. There were no hospital mortalities. Twenty-five patients required admission after operation, leading to an overall unplanned admission rate of 3.4%. The reasons for admission were pain (n = 10), nausea and vomiting (n = 6), pain with urinary retention (n = 3), patient preference (n = 3), urinary retention (n = 2), and medical observation (n = 1) (Figure).

By univariate analysis, length of operation, thickened gallbladder wall on ultrasonographic and pathological findings were significantly associated with unplanned admission (Table). Nineteen and 36 patients in the case and control groups, respectively, had operations exceeding 60 minutes (P = .001). The relative risks for unanticipated admission for the ultrasonographic finding of a thickened gallbladder wall and an operation exceeding 60 minutes were 3.63 and 4.03, respectively. By logistic regression analysis, length of operation was the only independent predictive factor for unplanned admission (P = .007; 95% confidence interval, 1.02-1.12).

In the case group (n = 25), 23 patients (92.0%) were discharged the next day, and 2 stayed for 2 nights. All but 1 patient had uneventful recoveries. That patient was readmitted on postoperative day 3 because of increasing abdominal pain. Results of contrast-enhanced computed tomography revealed a hepatic subcapsular hematoma. Expectant treatment was adopted after an exploratory laparoscopy confirming the diagnosis. The hepatic hematoma gradually resolved during follow-up. In the control group (n = 100), there were 2 readmissions to hospital because of bile leakage (n = 1) and retained common bile duct stone (n = 1).

Operative records of the case group were reviewed to search for reasons of prolonged operation. Concomitant procedures included intraoperative cholangiography (n = 2), umbilical hernia repair (n = 2), and attempted cholangiography (n = 1). Operative difficulties were recorded in 18 patients. These included 1 or more of the following reasons: adhesions (n = 13), thickened gallbladder wall with chronic inflammation (n = 4), gall-

POSTOPERATIVE MANAGEMENT

After assessment by the operating surgeon, the patients were discharged from the day surgery unit in the afternoon when their clinical conditions had satisfied the following discharge criteria: alert and oriented to time and place; stable vital signs for at least half an hour; pain controllable by oral analgesics; no emesis (mild nausea if any present); no bleeding from the operative site; able to void; able to retain oral fluids; able to walk without dizziness; discharge instructions from surgeon and anesthesiologist and prescriptions provided; and adult present to accompany patient home.

All patients were given a supply of compound tablets, a combination of acetaminophen, 325 mg, and oxycodone hydrochloride, 5 mg, for analgesia. Patients were scheduled to follow up at the general surgical clinic 2 to 3 weeks after operation.

STATISTICAL ANALYSIS

Statistical comparisons of 19 clinicopathologic factors between the case and control groups were performed by means of the t and χ² tests where appropriate. Clinical factors (n = 16) studied included age; sex; body weight; American Society of Anesthesiologists risk classification; employment status; preoperative white blood cell count; levels of hemoglobin, hematocrit, aspartate aminotransferase, alanine aminotransferase, alkaline phosphatase, and bilirubin; preoperative ultrasonographic findings of thickened gallbladder wall and contracted gallbladder; operative duration; and time of completion of surgery (before vs after 3 PM). Pathological variables (n = 3) evaluated included gallbladder wall thickness, cystic duct diameter, and maximum diameter of the gallstone. Significant variables associated with unplanned admission were then chosen for multivariate models by means of multiple logistic regression models using a stepwise approach to identify independent predictive factors for unanticipated admission. A P < .05 was regarded as significant. Statistical analysis was performed using a commercially available software program (Statistical Package for the Social Sciences; SPSS Inc, Chicago, Ill).
Our unplanned admission rate of 3.4% after ambulatory laparoscopic cholecystectomies compares favorably with the results of other centers, which ranged from 1% to 39%. A lower admission rate has been reported in freestanding ambulatory surgery centers, but this could be related to their strict patient selection criteria. Results should therefore be compared among similar health care settings.

More than half of our patients were admitted because of uncontrolled postoperative pain. Pain was the principal reason for admission in 2 large series of ambulatory surgery, which recruited more than 20,000 patients. Although adequate analgesia is the primary concern of postoperative care, adverse effects of narcotic use, such as nausea and retention of urine, cannot be neglected. Nausea and vomiting accounted for one quarter of our unplanned admissions. To achieve optimal analgesia and minimal adverse effects, a multimodal method using a combination of opioids, nonsteroidal anti-inflammatory drugs, and local anesthesia had been adopted since the inception of the ambulatory laparoscopic cholecystectomy service. Research on further improvement of pain and antiemetic treatment after ambulatory laparoscopic cholecystectomy is therefore essential.

Admission is usually a joint decision made by the surgeon and the patient. As patients have to participate in self-care after discharge, their comfort, preference, and safety need to be considered on the assessment for discharge. The aim of admission after ambulatory surgery is chiefly to allow management of short-term problems, namely pain, nausea, vomiting, and retention of urine. With appropriate selection of patients, few should be admitted for medical observation. More than 90% of our admitted patients were discharged the next day once their ailments resolved.

In the present study, patients with postoperative complications in the case and control groups were all re-admitted subsequently. Admission of the patient had no


Univariate Analyses of 19 Clinicopathologic Factors Associated With Unplanned Admissions

<table>
<thead>
<tr>
<th>Patient Group</th>
<th>Unplanned Admission (n = 25)</th>
<th>Uneventful Discharge (n = 100)</th>
<th>P Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age, y</td>
<td>40.0 ± 15.5</td>
<td>42.0 ± 11.9</td>
<td>NS†</td>
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<tr>
<td>Body weight, kg</td>
<td>74.7 ± 17.9</td>
<td>73.8 ± 16.3</td>
<td>NS‡</td>
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<tr>
<td>Sex, No. M/F</td>
<td>2/23</td>
<td>12/88</td>
<td>NS‡</td>
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<tr>
<td>ASA risk classification, No. of patients</td>
<td>I 17</td>
<td>74</td>
<td></td>
</tr>
<tr>
<td></td>
<td>II 7</td>
<td>26</td>
<td></td>
</tr>
<tr>
<td></td>
<td>III 1</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>Unemployed status, No. of patients</td>
<td>6</td>
<td>8</td>
<td>NS‡</td>
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<tr>
<td>Operative duration, min</td>
<td>80.0 ± 31.3</td>
<td>55.0 ± 13.6</td>
<td>&lt;.001†</td>
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<tr>
<td>Operation finished after 3 PM, No. of patients</td>
<td>4</td>
<td>9</td>
<td>NS‡</td>
</tr>
<tr>
<td>Laboratory results</td>
<td>Hemoglobin, g/dL</td>
<td>12.9 ± 1.6</td>
<td>13.2 ± 1.3</td>
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<td></td>
<td>White blood cell count, ×10³/µL</td>
<td>7.8 ± 3.1</td>
<td>7.4 ± 2.4</td>
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<td></td>
<td>Hematocrit, %</td>
<td>37.7 ± 8.2</td>
<td>39.8 ± 3.7</td>
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<td>Alkaline phosphatase, U/L</td>
<td>80.8 ± 35.8</td>
<td>74.6 ± 37.4</td>
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<td>Aspartate aminotransferase, U/L</td>
<td>34.4 ± 40.2</td>
<td>25.8 ± 29.4</td>
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<td>Alanine aminotransferase, U/L</td>
<td>28.2 ± 13.3</td>
<td>20.2 ± 12.7</td>
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<td>Bilirubin, mg/dL</td>
<td>0.56 ± 0.25</td>
<td>0.47 ± 0.28</td>
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<tr>
<td>Ultrasoundographic findings, No. of patients</td>
<td>Thickened gallbladder wall</td>
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<td>5</td>
</tr>
<tr>
<td></td>
<td>Contracted gallbladder</td>
<td>3</td>
<td>5</td>
</tr>
<tr>
<td>Pathological findings, cm</td>
<td>Wall thickness</td>
<td>0.28 ± 0.09</td>
<td>0.23 ± 0.13</td>
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<td></td>
<td>Cystic duct diameter</td>
<td>0.29 ± 0.09</td>
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<td></td>
<td>Gallstone maximal diameter</td>
<td>0.98 ± 15.1</td>
<td>0.90 ± 0.68</td>
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</table>

*ASA indicates American Society of Anesthesiologists. Unless otherwise indicated, data are given as mean ± SD.
†Indicates t test.
‡Indicates χ² test.
§To convert to micromoles per liter, multiply by 17.1.
Impact on the course of postoperative complication.16,17
As postoperative morbidity usually manifests after 24
hours, most complications will not be detected during a
1-day admission.16,18 However, Saunders et al17 have
attributed mortality to early discharge of patients after laparoscopic cholecystectomy.17 In their report, the patient, who was an elderly woman with mild dementia, died of bowel perforation at home on postoperative day 4. This report illustrated the importance of careful selection of patients for ambulatory laparoscopic cholecystectomy.
In selected healthy patients, concern for delay in instituting treatment of complications owing to early discharge does not seem to be justified.

Operative duration of 60 minutes or longer was the most important predictor of unanticipated admission.2,6,19 The length of operative procedure is a multifactorial function, including the number of concomitant procedures, occurrence of intraoperative complications, etc. In the setting of a major teaching hospital, training of surgical residents is mandatory, and most ambulatory laparoscopic cholecystectomies are performed by surgical residents under supervision. Performance of the whole procedure by an experienced surgeon will definitely reduce the length of operation. For the sake of the patient, it is therefore the responsibility of the attending surgeon to ensure that the operation is performed in a timely fashion. Prolonged operation could also be due to unexpected abnormalities or a more extensive disease process than originally expected.3,18 Adhesions and thickened gallbladder wall were the 2 most common technical difficulties encountered in the case group. Inadvertent perforation of gallbladder with leakage of gallstones will also inevitably prolong the procedure. Unfortunately, all these factors except the demonstration of gallbladder wall thickening are virtually unpredictable by means of ultrasonography before the operation. Factors influencing the operative duration of laparoscopic cholecystectomy can be identified only by future prospective studies.
The unanticipated admission rate may reflect deficiencies in patient selection criteria. Patients with a thickened gallbladder wall on preoperative ultrasonographic findings have a 3-fold increased risk for admission, compared with those with normal thickness of the gallbladder wall. Corr et al20 reported a significant association of gallbladder wall thickening and technical difficulty of operation. Ultrasonography is a valuable preoperative assessment tool, and the demonstration of a thickened gallbladder wall should be taken into consideration in scheduling an ambulatory laparoscopic cholecystectomy. All at-risk patients should be scheduled appropriately to optimally manage resources. An operation that goes beyond its scheduled time not only increases the risk for admission but also delays subsequent procedures. On the other hand, careful physical examination to exclude the presence of an inconspicuous paraumbilical hernia can help to avoid unexpected hernia repair. The success of day surgery relies on careful patient selection, skillful operative techniques, safe anesthesia, and adequate postoperative care.21

CONCLUSIONS

Length of operation was the only independent predictive factor for unplanned admission. An operation exceeding an hour incurred a 4-fold increased risk for admission. Ultrasonographic findings of gallbladder wall thickness should be incorporated into the selection criteria of patients for ambulatory laparoscopic cholecystectomy.

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REFERENCES