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Preoperative symptom duration predicts success in relieving abdominal pain caused by biliary dyskinesia in a pediatric population

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Abstract

Purpose: The objective of this study was to identify factors associated with symptom relief in pediatric patients treated with laparoscopic cholecystectomy (LC) for biliary dyskinesia (BD).

Methods: This was a case–control study of pediatric patients diagnosed with BD between January 2004 and June 2011. Controls were patients with symptom resolution and cases were patients who did not experience symptom relief.

Results: Fifty patients met study eligibility, of whom 43 were controls and 7 were cases. Mean follow-up for the cohort was 26.5 months. Unadjusted comparisons suggested no significant differences ($p > 0.05$) between the two groups in the distribution of demographic and clinical variables with the exception of preoperative duration of symptoms and presence of comorbidity. After adjusting for comorbidities, the only significant predictor associated with the resolution of symptoms after surgery was preoperative duration of symptoms (OR, 0.37; 95% CI, 0.15–0.94); 96% of patients with symptoms < 12 months had symptom relief versus 70% with symptoms ≥ 12 months.

Conclusion: Symptoms associated with BD can be successfully relieved with LC. These data suggest patients with preoperative symptoms for less than 12 months are the most likely to have symptom relief after surgery.

First described in 1923, the diagnosis of biliary dyskinesia (BD) has evolved into the combination of colicky right upper quadrant pain and abnormal gallbladder ejection fraction (GBEF) (<35%) after cholecystokinin (CCK) stimulation as visualized on hepatobiliary nuclear imaging in the absence of gallstones [1]. BD has gained recognition as a common cause of chronic abdominal pain and nausea/vomiting in the pediatric population [2]. In fact, some studies suggest it is now the most common indication for laparoscopic cholecystectomy (LC) in this population, occurring in 58–64% of patients undergoing LC [3-5].

Laparoscopic cholecystectomy has been shown to successfully relieve abdominal symptoms in the majority of pediatric patients with BD [2-17]. Factors identified to independently predict success for pediatric patients treated

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with LC have ranged from extremely low GBEF, preoperative nausea, male gender, non-overweight patients, and shorter duration of preoperative symptoms [6-8,18]. However, other studies report finding no reliable preoperative predictors of response outcome [9,19]. We sought to review our experience of surgical treatment for BD and to identify any preoperative predictors of long-term symptom relief.

1. Materials and methods

This was a case–control study of pediatric patients (age ≤ 18 years) with a preoperative diagnosis of BD treated at the University of Oklahoma Children's Hospital between January 2004 and June 2011. Patients were treated with LC by four attending surgeons, with an equal distribution of patients among the surgeons. Controls were patients whose symptoms resolved and cases were patients whose symptoms did not resolve. Eligible patients were identified from a study base of all patients undergoing LC during the same time period.

Patients were diagnosed with BD if they met the following criteria: presence of abdominal symptom(s) (pain, nausea/vomiting, appetite disturbance) in the absence of gallstones with an abnormal gallbladder ejection fraction (GBEF) (<35%) after cholecystokinin (CCK) stimulation as visualized on hepatobiliary nuclear imaging or pain upon CCK administration. A retrospective chart review was performed to obtain patient demographic and clinical information. Demographic information included age, gender, height and weight. Clinical covariates of interest, obtained from pre and postoperative clinic visit information, imaging studies and operative reports, included GBEF, preoperative symptomatology, presence of comorbidity, preoperative symptom duration, presence of gallbladder pathology, resolution of preoperative symptoms, perioperative complications, and follow-up time. Preoperative symptom duration was measured in months as an ordinal variable with 3-month increments. Comorbidities considered in our study, defined by having a preoperative diagnosis listed in the medical record, included gastroesopahgeal reflux disease (GERD), cerebral palsy, trisomy 18, scoliosis, depression, hypertension, asthma, pediatric autoimmune neuropsychiatric disorders associated with streptococcal infections (PANDAS), bronchopulmonary dysplasia, type I diabetes, short gut syndrome, attention deficit hyperactivity disorder, bipolar disorder, cystic fibrosis, and Hirschsprung disease. In addition, a standardized, scripted telephone survey was conducted by two of the authors to supplement follow-up data and provide data for long-term symptom resolution. This survey was attempted for all 58 patients. However, eight patients were unable to be reached and were excluded based on missing outcome data. Statistical analyses were performed using the Student's *t* test for continuous variables and Fisher's Exact test for categorical variables. Logistic regression was used for multivariable analysis to identify independent predictors of symptom relief. All analyses were performed using SAS Version 9.3 (SAS 9.3, SAS Institute, Cary, NC). This study was approved by the University of Oklahoma Health Sciences Center Institutional Review Board.

2. Results

Of the 300 patients undergoing LC during the study period, 58 (19.3%) were diagnosed with BD. Eight of these patients had missing outcome data and were thus excluded from the study. Of the 50 patients, 86% (43) had symptom relief (controls) and 14% (7) did not (cases). The mean age was 12.5 years (range 4–18) with a mean weight of 57.6 kg (range, 13–148). Twenty-seven (54%) of the patients were female. Patients were followed up for a mean of 26.5 months, with a median of 19 months (range 0–90). The most common preoperative symptom for this cohort was abdominal pain (96%), followed by nausea/vomiting (62%) and appetite disturbance (44%). Forty-three (86%) patients reported complete resolution of their preoperative symptoms. All cholecystectomies were completed laparoscopically except one, which required conversion to an open procedure secondary to bleeding resultant from injury to a replaced right hepatic artery. One patient had a perioperative wound infection that was opened and packed; otherwise there were no perioperative complications. The mean GBEF was 18.6%. Four patients had a GBEF>35% but experienced pain with CCK administration. Chronic cholecystitis was the most common pathologic finding, present in 44 (88%) patients. None of these patient characteristics predicted symptom relief after surgery.

Table 1 summarizes patient demographic and clinical characteristics. Unadjusted comparisons suggested no significant differences ($p>0.05$) between the two groups in the distribution of age, gender, BMI, GBEF, pain with CCK administration, length of follow-up, preoperative symptoms and abnormal gallbladder pathology. However, patients with symptoms for less than 12 months were significantly ($p<0.05$) more likely to have symptom relief, while those whose symptoms did not resolve were significantly more likely to have comorbid conditions.

On multivariable analysis, preoperative duration of symptoms was the only significant independent predictor associated with the resolution of symptoms after surgery (OR, 0.37; 95% CI, 0.15–0.94) after adjusting for presence of comorbidity; 96% of patients with symptoms < 12 months had symptom relief versus 70% with symptoms ≥ 12 months. After controlling for preoperative duration of symptoms, absence of comorbidity remained marginally associated ($p=0.07$) with symptom relief status but its effect estimate lacked precision (OR, 0.17; 95% CI, 0.02–1.16).

Of the seven patients who did not have symptomatic relief with LC, six had persistent abdominal pain and in one, nausea was the remaining symptom. The patient with nausea