



# A case series of cholecystectomy in Jamaican sickle cell disease patients - The need for a new strategy

Pierre-Anthony Leake <sup>a,\*</sup>, Marvin Reid <sup>b</sup>, Joseph Plummer <sup>a</sup>

<sup>a</sup> Department of Surgery, Radiology, Anaesthetics & Intensive Care, University of the West Indies, Mona Campus, Jamaica

<sup>b</sup> Tropical Metabolic Research Institute, University of the West Indies, Mona Campus, Jamaica

## HIGHLIGHTS

- Morbidity rates for cholecystectomy in Jamaican sickle cell patients remain high.
- There is a trend to higher morbidity for laparoscopic over open cholecystectomy.
- Preoperative transfusion is rarely employed in this patient population.

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## ABSTRACT

High morbidity rates related to cholecystectomy in sickle cell disease (SCD) patients have been previously reported in the region. This study serves to assess the current outcomes related to cholecystectomy in a Jamaican SCD population. **METHODS:** A retrospective chart review of SCD patients undergoing elective cholecystectomy at the University Hospital of the West Indies over a 6-year period was performed providing relevant information for analysis. Patients were grouped on an intention-to-treat basis into an open and laparoscopic group. **RESULTS:** A total of 27 patients were included (18 laparoscopic and 9 open). Both groups were matched for age, gender and steady state hemoglobin. Only one patient (in the open group) received preoperative blood transfusion. The conversion rate for laparoscopy was 28%. Operative time was significantly longer in the open group ( $175.3 \pm 62.1$  vs.  $125.9 \pm 54.4$  min,  $p = 0.0355$ ). Bile duct exploration was undertaken in 66.7% of patients in the open group compared to 0% in the laparoscopic group. There was no significant difference between groups with respect to hospital stay, morbidity or mortality. The overall 30-day morbidity was 48.1% with acute chest syndrome being diagnosed in 6 patients and pneumonia in 7 patients. **CONCLUSION:** Morbidity rates related to cholecystectomy in the Jamaican SCD population remain high. Further studies to evaluate the factors contributing to such high morbidity in this population are warranted, with particular focus on laparoscopic cholecystectomy. Strategies such as preoperative transfusion and prophylactic cholecystectomy also need to be evaluated and considered in this patient group.

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## 1. Introduction

Sickle cell disease (SCD) is a prevalent inherited haemolytic disorder that affects 1 in 150 newborns in Jamaica [1]. Owing to red blood cell haemolysis, these patients are predisposed to the development of gallstones, with rates of up to 83% in the adult population [2]. The current standard of care for the treatment of symptomatic gallstones is laparoscopic cholecystectomy [3], with

some reports suggesting that asymptomatic gallstones should be managed similarly in the sickle cell population [4].

Sickle cell patients are prone to significant morbidity and mortality related to surgery and anesthesia. Changes in temperature, oxygen tension and fluid volume related to the surgical process predispose SCD patients to red cell sickling intra- and post-operatively with consequent vaso-occlusive crises [5]. The most notable SCD-related postoperative complications include acute chest syndrome, painful crises, stroke and priapism.

International reports suggest perioperative morbidity rates of 7%–14%, most of which are SCD-specific [6–8]. Rates of acute chest syndrome have been quoted as 0.4%–10% [9]. Mortality rates of less

\* Corresponding author.

E-mail address: [paeleake@yahoo.com](mailto:paeleake@yahoo.com) (P.-A. Leake).

than 1% have been reported from high-volume centers [10,11]. Significantly higher morbidity rates have been quoted in the Caribbean—37.5% by Plummer et al. [12] and 21% by Dan et al. [13]. No contributing factors have been elucidated to date.

With improvements in surgical and anesthetic care, greater awareness of the pathophysiology and predisposition to vaso-occlusive crises and improved perioperative patient management, we sought to assess the current outcomes for cholecystectomy in a Jamaican sickle cell disease population and to determine whether any differences in outcomes were noted based on the surgical approach.

## 2. Methods

This is a retrospective single-center case series of all sickle cell disease patients over 12 years of age consecutively undergoing elective cholecystectomy for confirmed gallstone disease between January 2009 and December 2014. The patients were managed at the University Hospital of the West Indies, a tertiary-level teaching hospital affiliated with the University of the West Indies. The study was conducted in accordance with the Declaration of Helsinki (research registry UIN: researchregistry2115), with ethics approval granted by the University of the West Indies/Faculty of Medical Sciences Ethics Committee (ECP 84, 15/16). The data collected through chart review were analyzed using SPSS version 18. Patients with sickle cell trait (hemoglobin AS) were excluded.

Data collection included patient demographics, phenotype, preoperative hemoglobin, surgical procedure, additional procedures, operative time, postoperative complications and hospital stay. Patients were separated into two groups – open and laparoscopic. The surgeon made the decision regarding surgical approach based on factors including need for cholangiography and common bile duct exploration.

Statistical analysis performed aimed to determine overall morbidity and mortality and the differences between groups with respect to operative time, complications and total hospital stay. Mann-Whitney U and Chi-squared tests were used for non-parametric scale and categorical variables, respectively. P value of <0.05 was considered significant. This study has been reported in line with the PROCESS Guidelines [14].

## 3. Results

During the 6-year study period, 27 patients were identified who met the inclusion criteria. All cases were conducted under direct supervision of a consultant surgeon. The consultant performed eight cases while the remaining 19 were performed by year 4 or 5 residents under supervision. Eighteen patients (66.7%) underwent laparoscopic cholecystectomy while an open approach was undertaken in 9 (33.3%) patients. The conversion rate for laparoscopic cholecystectomy was 27.8%. Reasons for conversion were difficult visualization due to hepatomegaly in one patient and significant scarring obscuring Calot's triangle in four patients. Symptomatic cholelithiasis and choledocholithiasis represented the main indications for cholecystectomy (Fig. 1). No patient in the cohort underwent prophylactic cholecystectomy.

The mean age of the cohort was 30.8 years, with all patients being homozygous HbSS in phenotype. The mean hemoglobin on presentation was 7.4 g/dl. Twenty-one (77.8%) patients had been admitted at least once previously with gallstone-related complications. The mean time from onset of symptoms to surgery in this cohort was 223.5 days (range: 22–1394 days).

Twenty-five of 27 (92.6%) patients had some form of duct evaluation. Fifteen (60%) patients had preoperative endoscopic or magnetic resonance cholangiopancreatography. The remainder,

including one patient who failed endoscopic retrograde cholangiopancreatography, underwent operative cholangiography ± common bile duct exploration. (Fig. 2). Fig. 3 demonstrates that all patients chosen to undergo open cholecystectomy had intraoperative duct evaluation performed compared to only one patient in the laparoscopic group. No common duct exploration was performed laparoscopically. Twenty-one (77.8%) patients had abnormal gallbladders at operation (fibrotic and contracted in 11 patients and distended with adhesions to surrounding structures in 10 patients).

There was no significant difference between groups related to baseline characteristics of age, gender, previous admissions or hemoglobin at presentation. Only one patient (3.7%) of the cohort had preoperative blood transfusion (Table 1). Operative time was significantly longer in the open group (175.3 vs. 125.9 min,  $p$  value = 0.0355). There was no statistical difference between groups with respect to hospital stay, perioperative morbidity or mortality (Table 2). The overall 30-day morbidity rate for the cohort was 48.1%. There were no intraoperative complications. Postoperative complications were predominantly medical, with acute chest syndrome and nosocomial pneumonia being the most common (Table 3). Two patients died, the causes being acute chest syndrome in one patient and cardiac failure, renal failure and sepsis in the other. The mortality rate was 7.4% (Table 2). Mean follow-up for this cohort was 6 weeks. Twenty-five percent of the cohort defaulted from follow-up prior to discharge from the surgical clinic.

## 4. Discussion

The present study demonstrates that laparoscopic cholecystectomy has become the predominant approach to management of gallstone disease in the Jamaican sickle cell disease population, with open cholecystectomy being reserved for patients requiring additional procedures. Although no difference in outcomes were noted between open and laparoscopic groups, the overall morbidity and mortality rates related to cholecystectomy in the Jamaican sickle cell disease population remain high at 44.4% and 7.4% respectively.

Perioperative morbidity and mortality rates higher than those noted in the general population are expected in sickle cell disease patients and are related to increased perioperative red cell sickling. Methods to reduce sickling and improve outcomes have been established over time and form an essential part of the perioperative management of a sickle cell patient. These measures include ensuring normothermia, intravenous fluid hydration, supplemental oxygen, analgesia, antibiotics and chest physiotherapy [15]. The role of perioperative blood transfusion, either simple or exchange transfusion, as well as the use of minimally invasive surgical approaches has been debated [7,16–18].

Laparoscopic cholecystectomy is the gold standard surgical approach in the general population [19]. Multiple international reports have demonstrated laparoscopic cholecystectomy to be safe and associated with low morbidity and mortality in the SCD population. Morbidity rates of 6.6%–14% [6–8] and mortality rates of 0%–1.4% have been quoted [10,11]. Early concerns related to physiologic changes and the potential for increased sickling associated with pneumoperitoneum have not been substantiated [20]. A single report has suggested an increased rate of acute chest syndrome associated with laparoscopic cholecystectomy [7]. However, the retrospective nature of the study introduced significant bias and such conclusions have also not been substantiated by other studies.

National and regional data show morbidity rates significantly higher than those reported internationally. Plummer and Dan reported morbidity rates of 35.2% and 21.1% respectively for laparoscopic cholecystectomy in SCD patients [12,13]. Admittedly, both

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