

LAPAROSCOPIC CHOLECYSTECTOMY IN SICKLE CELL DISEASE: IS IT A SAFE PROCEDURE?

Salim M Albassam*, **Mohammad M Mohammad[@]**, **Jassim H Salim[@]** & **Hashim S Alkhayat[@]**

*Department of surgery, Basrah Medical College, Iraq. [@]Department of surgery, Basrah General Hospital, Iraq.

Correspondence to: Dr. Salim M Albassam, e-mail: albassamsalim@yahoo.ca

Abbreviation: Hb= Hemoglobin. ACS = Acute Chest Syndrome. ASA = American Society of Anesthesiologists

Abstract

The aim of this trial is to determine the safety of laparoscopic cholecystectomy for treatment of gall bladder stones in patients with sickle cell anemia (a controversial issue). Sixty patients from both sexes, between 19-35 years old with sickle cell anemia, all of them having gall bladder stones were included in this study in Endosurgery Center in Basrah General Hospital. The patients were divided into three groups, group one (19 patients) were selected for laparoscopic cholecystectomy on random preoperative background, the same thing was applied in group two (21 patients) whose patients were subjected to open cholecystectomy while patients in group three (20 patients) were selected for laparoscopic cholecystectomy on conditioned selection. Three mortalities and two serious morbidities were encountered in the group one and one mild morbidity seen in group two and no mortalities or morbidities in group three. Laparoscopic cholecystectomy in sickle cell patients is a debatable issue, an increasing controversy about serious perioperative and postoperative morbidity were mentioned. The procedure itself was accused and an entirely opposed results were emerged from different studies all are debatable. In this study we noticed the big influence of the risk factors, preparation of patients for surgery and the adherence to the principle anesthetic rules on the outcome after laparoscopic cholecystectomy in patients with sickle cell disease. This influence was limited in open procedure. The controversy in the different trials lies on wither the problem is confined to the disease itself or to the surgical method used for cholecystectomy or both.

According to the results obtained from our study we believe that both the severity of the disease and the surgical procedure affecting the results, application of intra and post operative protocol (blood transfusion if Hb less than 9gm/dl, rehydration, oxygenation and respecting general anesthesia rules are mandatory for the safety of the patients.

Introduction

Sickle cell disease is due to the presence of an abnormal B-globine chain in HbA (Valine substituted for glutamic acid) resulting in reduced oxygen tension, increased blood viscosity, occlusion of small blood vessels and infarct in many organs. Pulmonary infarct can lead to acute chest syndrome, dehydration seems to predispose to sickle cell crisis and acute chest syndrome by increasing the viscosity of blood¹. Sickle cell anemia can only occur when two people who carry sickle cell trait have a child

together². Gallstones are frequent complication in patients with haemoglobinopathies because of the repeated bouts of RBC haemolysis leading to an increase in bilirubin excretion and gall stone formation of pigment type³. The incidence of gallstones with sickle cell disease increases due to the use of non invasive detection technique (ultrasound vs. cholecystogram) and the longer survival of these patients⁴. The development of pigment gallstones in patients with sickle cell disease is age dependant with a

reported prevalence of 50% by the age of twenty two⁵. Laparoscopic cholecystectomy in sickle cell patients is a debatable issue, an increasing controversy about serious perioperative and postoperative morbidities was mentioned, the procedure itself was accused and an entirely opposed results were emerged from different studies with no solid answers^{6,7}.

Methods

Sixty patients were included in the study, from both sexes, all of them having sickle cell disease and gall bladder stones. Age ranged between 19-35 years. The patients were divided into three groups, group one included nineteen patients, group two included twenty one patients, group three included twenty patients. The three groups were exposed to surgery for removal of their gallbladder (Table I): Patients in group one were selected for laparoscopic cholecystectomy on random preoperative bases, only blood transfusion was ordered when Hb level was less than 9 gram% and some anesthetic principles (increased oxygen concentration, increased tidal volume and decreased respiratory rate) were applied. The same things were applied for group two whose patients were subjected to open cholecystectomy, while patients in group three were selected for laparoscopic chole-cystectomy on conditioned back ground {appreciation of the risk factors (Table II), perioperative hydration, good per operative oxygenation, prophylactic antibiotics, blood transfusion was ordered only when HB level less than 8 gram% }.

Results

The patients in group one (treated by laparoscopic cholecystectomy after routine preoperative preparations) showed 3 mortalities and 2 morbidities, 15.789% mortality and 10.526% morbidity (total 26.315%). Average operation time was 46 minutes and

average hospital stay was between 6 -8 days.

In group two (treated by open cholecystectomy after routine preoperative preparation), only one case of mild vasoocclusive crisis in form of musculoskeletal pain was reported (4.761%). Treatment was ordered and patient recovered. Average, operation time was 65 minutes and all patients discharged from hospital after 4-6 days. The post operative period for patients in group three (treated by laparoscopic cholecystectomy after conditioned selection) was smooth, neither morbidity nor mortality was recorded, average operation time was 42 minutes and all patients left hospital after 2-3 days, and in the next 2-3 weeks they reported to the outpatient department for follow up.

Discussion

In this study we noticed the big influence of the risk factors, preparation of patients for surgery and the sticking to the principle anesthetic rules on the outcome after laparoscopic cholecystectomy in patients with sickle cell disease.

This influence was Limited in open method. The controversy in the different studies lies on whether the problem is confined to the disease itself or to the surgical procedure used for cholecystectomy or both⁸. According to the results obtained from our study we believe that both the severity of the disease and the surgical procedure affecting the results. The experience of many centers in the evaluation of the laparoscopic cholecystectomy in patients with sickle cell disease were elusive and opposing each other. Application of intra and post operative protocol (blood transfusion if Hb less than 9g/dl, rehydration, oxygenation and respecting general anesthesia rules) are mandatory for the safety of the procedure⁹. Pulmonary care and appropriate monitoring are also important^{10,11}.

Laparoscopy does not decrease the incidence of acute chest syndrome compared with open approach and predisposing factors were not significant in predicting postoperative acute chest syndrome¹². A study concluded that the procedure is safe in experienced hands with adequate preoperative preparation¹³. Another study emphasized that sickle cell anemia patients undergoing cholecystectomy have a high perioperative morbidity specially if patients not transfused before surgery^{8,14}. Portal vein thrombosis following prolonged laparoscopic intervention in a patient with sickle cell disease had been reported¹⁵. The mortality and morbidity increased in emergency and nonprepared patients¹⁶. The incidence of acute chest syndrome (ACS) is more in laparoscopy than open method¹⁷. In the absence of preoperative transfusion there is 50% chance of painful vasoocclusive crisis¹⁸. The effect of pneumoperitoneum and intraperitoneal pressure on the operation outcome was also controversial; one

study claimed the harmless effect of pneumoperitoneum even in patient with ASA 3,4¹⁹. Another one explained the deleterious effect of pneumoperitoneum by inducing hypoxia and local tissue acidosis and the adverse effect of high CO₂ pressure on the micro-circulation²⁰. The importance of blood transfusion in the prevention of serious postoperative complications was mentioned in different studies²¹⁻²⁴. The debate still existing about whether laparoscopy is safe or not for patients with sickle cell anemia²⁵⁻²⁷.

Conclusion

Although the safety of the laparoscopic cholecystectomy in patients with sickle cell anemia is still a debatable issue we believe that it is a reliable and convenient procedure provided that the requirements are fulfilled (blood transfusion before surgery, perioperative hydration, good preoperative tissue oxygenation, prevention of infection and minimizing the risk factors).

Table I: Three groups of patients with sickle cell disease exposed to cholecystectomy.

Group & No. patients	Procedure	Risk factors	Periop. Hydrat.	Per op. oxygen	Preop. blood transf.	Prophyl. anti biotics	Mort.	Morbid.	Hos. stay	Op. time
One 19 patients	Lap.chole. with routine preop. preparation risk factors not appreciated	No	No	Yes	When Hb level less than 9 grams	No	3 15.8% ACS	2 10.5% ACS & sever vaso Occlus. crises	6-8 days	46 min.
Two 21 patients	Open chole. with routine preop. preparation risk factors not appreciated	No	No	Yes	Same like group one	No	Nil	1 4.75% mild vaso Occlus. crises	4-7 days	65 min.
Three 20 patients	Lap.chole. with conditioned preop. preparation & minimum risk factors	Yes	Yes	Yes	Yes if Hb level less than 8 grams	Yes	Nil	Nil	2-3 days	42 min.

Table II: The Risk factors

Age	More than 30 years
ASA(American society of anesthesiologists) score	2,3,4
Past medical history	Systemic disease and smoking
Number of hospitalization and time of hospital stay in the past year	More than 5 admissions, more than 7 days
Transfusion history, reaction	More than 10
Preoperative hypoxia	O2 saturation less than 90%
Radiology	Abnormal chest radiology
Liver function test	SGPT more than 60U/L
Serum creatinine	More than 1.5 mg/dl
Anesthesia time	More than 2 Hours
Extended procedure	Incidental
Hospitalization time	More than 9 days(depend on ASA)

References

- Geller AK, O Connor MK. The sickle cell crises; a dilemma in pain relief. *Mayo Clin Proc* 2008; 83(3): 320-3.
- Lee MT, Pionelli S, Granger S. et al. Stroke prevention trial in sickle cell anemia. *Blood* 2006; 108(3) 847-52.
- Claster S, Vichinsky EP. Managing sickle cell disease. *BMJ* 2003 ; 327:1151-56.
- Curro G, Meo A, Ippolito D, Pushiol A, Cucinotta E. Asymptomatic cholelithiasis in children with sickle cell disease. (Early or delayed cholecystectomy?). *Ann Surg*, 2007; 245:126-29.
- Suell MN, Horton IT, Disilop MK, et al. Outcome for children with gall bladder abnormalities and sickle cell disease. *J Pediatr*, 2004; 145:617-21.
- Plummer JM, Duncan ND, Mitchell DI, McDonald AH, Reid M, Arthur M. Laparoscopic cholecystectomy for chronic cholecystitis in Jamaican patients with sickle cell disease: Preliminary experience. *West Indian Med J*; 2006; 55(1): 22-4.
- Leandros E, Kymionis GD, Konstadoulakis MM, Albanopoulos K, Dimrakakis K, Gomatos I, Androulakis G. Laparoscopic or open cholecystectomy in patients with sickle cell disease; Which approach is superior?. *Eur J Surg* 2000 ; 166(11): 859-61.
- Charles M Haberkern, Lynne D Neumayr, Eugen P Orringen, Miguel R Abboud, Ann N Earles, Shanda M Robertson, Dennis Black, Mabel Koshy, Olajire Idowu, Elliot P Vichinsky. Colecystectomy in sickle cell anaemia patients; outcome of 364 cases from the national preoperative transfusion study. *Blood* 1997, vol 89 no 5: 1533-42.
- Fall B, Sagna A, Diop PS, Faye EA, Diagne I, Dia A. Laparoscopic cholecystectomy in sickle cell disease. *Ann Chir* 2003; 128(10): 702-5.
- Sandoval C, Stringle G, Ozkaynak MF, Tugal O, Jayabose S. Perioperative management in children with sickle cell disease undergoing laparoscopic surgery. *JSLs (Journal of the society of laparoscopic surgeons)*, 2002; 6(1):29-33.
- Vecchio R, Cacciola E, Murabito P, Gambelunghe AV, Murabito R, Cacciola RR, Di Martino M. Laparoscopic cholecystectomy in adult patients with sickle cell disease. *G Chir* 2001; 22(1-2):45-8.
- Waies PW, Carver E, Crowford MW, Kim PC. Acute chest syndrome after abdominal surgery in children with sickle cell disease: Is a laparoscopic approach better?. *J Pediatr Surg* 2001; 36(5):718-21.
- Al-Mulhim AS, AL-Mulhim FM, AL-Suwalygh AA. The role of laparoscopic cholecystectomy in the management of acute cholecystitis in patient with sickle cell disease. *Am J Surg* 2002; 183(6): 668-72.
- Selleem MI, AL-Hashemy AM, Meshref SS. Mini-laparoscopic cholecystectomy in children under 10 years of age with sickle cell disease. *ANZ J Surg* 2005; 75(7):562-5.
- Portal vein thrombosis following laparoscopic surgery in a patient with sickle cell disease. *Surg Endosc* 2003; 17(5): 831.
- Curro G, Iapichino G, Lorenzini C, Palmeri C, Cuccinotta E. Laparoscopic cholecystectomy in children with chronic hemolytic anemia. Is the outcome related to the time of the procedure?. *Surg Endosc* 2006; 20(2): 252-5.
- Diarra B, Roudie J, Coulibaly A, Ehui Somian F, Kanga-miessan JB, Franco B. Cholecystectomy in sickle cell disease patients: Is there more acute chest syndrome after laparoscopy? *Int J Surg* 2008; 6(3):220-3.
- Dan D, Seetahal S, Harmanan D, Singh Y, Hariharan S, Naraynsingh V. Laparoscopic cholecystectomy in sickle cell disease patients: Dose operating time matter?. *Int J Surg* 2008; 6(4): 466.
- Koivusalo AM, Pere P, Valjus M, Scheinin T. Laparoscopic cholecystectomy with carbon dioxide pneumoperitoneum is safe even in high risk patients. *Surg Endosc* 2008; 22(1):61-7.
- Karlos R Molinas, Philippe R Koninckx. Hypoxia induced by CO2 or helium pneumoperitoneum is a co-factor in adhesion formation in rabbits. *Hum Reprod* 2000 Vol 15 No 8(1758-1763).
- AL-Samak ZM, AL-Falaki MM, Pasha AA. Assessment of perioperative transfusion therapy and complications in sickle cell disease patients undergoing surgery. *Middle East J Anesthesiol* 2008; 129(5): 983-95.
- al-Mulhim AS, AL-Mulhim AA. Laparoscopic cholecystectomy in 427 adult with sickle cell disease, a single centre experience. *Surg Endosc* 2009; 15(12):234-6.
- Ndoye MD, Bah MD, Pape IN, Diouf E, Kane O, Beye M, Fall B, Ka-Sall B. Perioperative management of laparoscopic cholecystectomy in children with homozygous sickle cell disease. *Arch Pediatr* 2008; 15(9):1393-7.
- left DR, Kaura T, Davies SC, Haward J, Chang AC. Anontransfusional perioperative management regime for patient with sickle cell disease undergoing laparoscopic cholecystectomy. *Surg Endosc* 2006 20(12): 810-13.
- AL-Salem AH, Oaisaruddin S, AL-Abkari H, Nourallah H, Yassin YM, Varma KK. Laparoscopic versus open cholecystectomy in children. *Pediatr Surg Int* 1997; 12(8):587-90.
- Ware RE, Kinney TR, Casey JR, Pappas TN, Meyers WC. Laparoscopic cholecystectomy in young patients with sickle haemoglobinopathies. *J Pediatr* 1992; 120(1):58-61.
- Goers T, Panepinto J, Debaun M, Blinder M, Foglia R, Oldham KT, Field JJ. Laparoscopic versus open abdominal surgery in children with sickle cell disease is associated with a shorter hospital stay. *Pediatr Blood cancer* 2007; 4(5):45-7.