Urgent laparoscopic cholecystectomy as a result of acute calculous cholecystitis in Pediatrics

J. Jiménez Gómez, P. Jiménez Arribas, J. Betancourth Alvarenga, S. Santiago Martínez, B. San Vicente Vela, M. Gaspar Pérez, J. Roberto Güizzo, C. Esteva Miró, B. Sánchez Vázquez, N. Álvarez García, B. Núñez García

Pediatric Surgery Department. Hospital Universitari Parc Taulí. Sabadell (Spain).

ABSTRACT

Introduction. In spite of the increase in the prevalence of cholelithiasis in the last decades, no recommendations regarding the best treatment of acute calculous cholecystitis (AC) in Pediatrics have been developed.

Clinical case. 4-year-old, 20kg male patient with no significant history referred to our institution as a result of abdominal sepsis. The blood count showed leukocytosis, with normal hemoglobin and bilirubin levels, and a normal liver function. The abdominal ultrasonography revealed cholelithiasis, gallbladder hydrops, and an inflammatory process compatible with appendicular plastron. In the diagnostic laparoscopy, the appendix was macroscopically normal, and acute cholecystitis was observed. Given the patient's situation, and in cooperation with the General Surgery Department, laparoscopic cholecystectomy was carried out. The patient recovered uneventfully on hospitalization day 5 under piperacillin-tazobactam treatment.

Discussion. There are no recommendations regarding AC treatment in children. In septic patients, cooperation between general and pediatric surgeons allows urgent cholecystectomy to be considered as a safe option.

KEY WORDS: Acute cholecystitis; Laparoscopic cholecystectomy; Cholelithiasis; Children.

COLECISTECTOMÍA LAPAROSCÓPICA URGENTE POR COLECISTITIS AGUDA LITIÁSICA EN PEDIATRÍA

RESUMEN

Introducción. Pese al aumento en la prevalencia de colelitiasis durante las últimas décadas, no se han desarrollado recomendaciones sobre el mejor tratamiento de la colecistitis aguda litiásica (CA) en Pediatría.

Caso clínico. Paciente varón de 4 años y 20 kg de peso sin antecedentes de interés, que acude derivado por sepsis de origen abdominal. Analíticamente destaca leucocitosis con hemoglobina, función hepática y bilirrubina normales. La ecografía abdominal muestra colelitiasis, hidrops vesicular y proceso inflamatorio compatible con plastrón apendicular. En laparoscopia diagnóstica se observa apéndice macroscópicamente normal y colecistitis aguda. Ante la situación del paciente se realiza, conjuntamente con Cirugía General, colecistectomía laparoscópica. El paciente se recupera sin incidencias tras 5 días de ingreso bajo cobertura con piperacilina-tazobactam.

Comentarios. No existen recomendaciones sobre el tratamiento de la CA en niños. En los pacientes sépticos, la colaboración entre cirujanos pediátricos y cirujanos generales permite contemplar la colecistectomía urgente como una opción segura.

PALABRAS CLAVE: Colecistitis aguda; Colecistectomía laparoscópica; Colelitiasis; Niños.

INTRODUCTION

The prevalence of cholelithiasis in the pediatric population has increased in the last 30 years from <0.5% up to 2% according to the latest series[1-3] as a result of the overweight pandemics in children[4]. Such increase has been primarily caused by the rise in adolescent cases, with overweight teenagers currently being the stereotypical patients after replacing patients with hemolytic anemia.

Concomitantly, hospitalizations due to cholelithiasis-associated complications –biliary colic, choledocholithiasis, biliary pancreatitis, and acute cholecystitis– have also increased. However, no evidence-based clinical guidelines or recommendations have been described by scientific societies for the treatment of acute calculous cholecystitis in Pediatrics.

Today, there is no consensus as to which procedure –urgent or deferred cholecystectomy– is best for acute cholecystitis. As a result of this, treatment is heterogeneous and varies according to each institution's resources, experience, and protocols[5-8].

We present an acute calculous cholecystitis treated through urgent laparoscopic cholecystectomy.

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Corresponding author: Dr. Javier Jiménez Gómez. Pediatric Surgery Department. Hospital Universitari Parc Taulí. Parc de Taulí, 1. 08208 Sabadell (Spain).
E-mail address: j.jimenez.gomez.89@gmail.com

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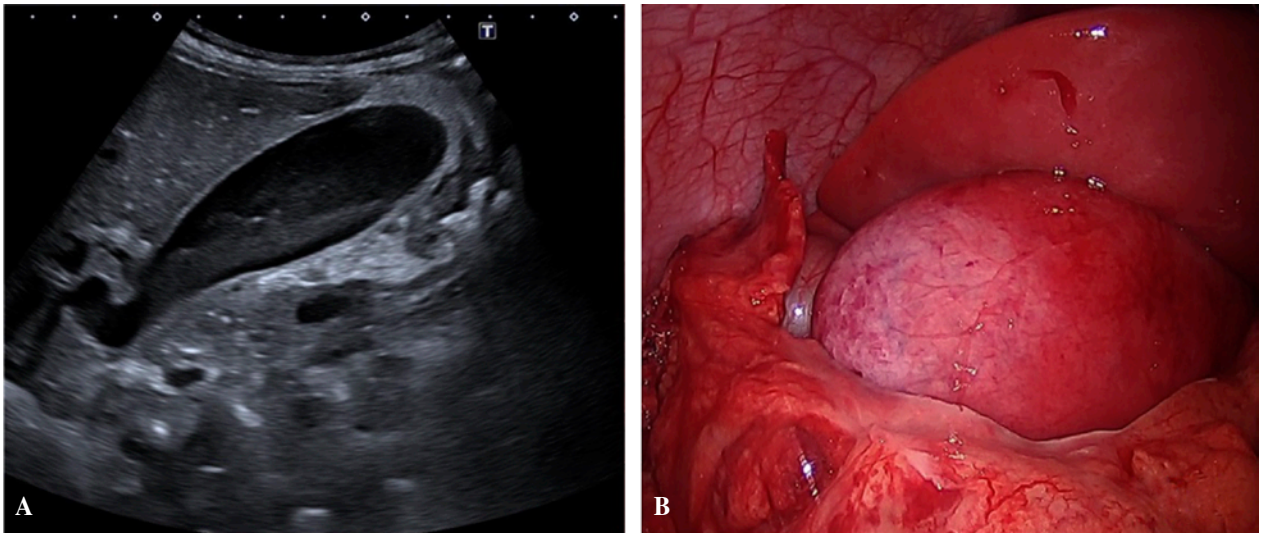

Figure 1. A) Ultrasound vision revealing a gallbladder hydrops with irregular wall thickening and presence of mud inside. B) Laparoscopic correlation of the ultrasound image.

CLINICAL CASE

4-year-old, 20 kg male patient referred to our institution as a result of abdominal sepsis. He had no known allergies or a significant clinical history. His parents reported he had been intermittently suffering from abdominal pain for 15 days, with pain worsening in the last 48 horas, fever, vomit, and loss of appetite.

Blood count levels were the following: Hemoglobin: 14.4 g/dl; Leucocytes: 28.1x10^3/microliter (84% neutrophils); Platelets: 339x10^3/microliter; CRP: 26.8 mg/dl; Prothrombin activity: 64%; Urea: 23 mg/dl; Creatinine: 0.32 mg/dl; AST: 25 IU/l; ALT: 15IU/l; Amylase: 21 IU/l; Direct bilirubin: 0,28 mg/dl.

In the referring institution, expansion with saline solution had been carried out, and piperacillin-tazobactam antibiotic therapy had been initiated prior to referral.

At admission, he showed a poor general condition, with lethargy and tachycardia, and without hemodynamic instability. At physical exploration, he had a distended abdomen with pain and abdominal guarding in the right hemiabdomen, and no signs of widespread peritoneal irritation were noted.

An abdominal ultrasonography was conducted. It revealed cholelithiasis and gallbladder hydrops, without dilatation of the bile duct, and with an inflammatory process in the ascending colon compatible with subhepatic appendicular plastron.

Given the patient's poor general condition, compatible with acute appendicitis, 3-port diagnostic laparoscopy was decided upon. It showed a macroscopically normal appendix, an inflammatory plastron above the transverse colon, and gallbladder inflammation compatible with acute cholecystitis. No further pathological findings following a thorough exploration of the rest of the abdominal cavity were noted.

The Emergency Trauma and Surgery Unit was contacted, which allowed the diagnosis of acute phlegmonous cholecystitis (Fig. 1) to be confirmed. Given the patient's clinical situation, urgent laparoscopic cholecystectomy was decided upon. In case no view of safety was achieved, laparoscopic cholecystostomy was proposed as a bailout maneuver.

After placing a fourth port in the epigastrium, the gallbladder was punctured for traction and manipulation purposes, with an outflow of mucoid material and abundant pus –which was sampled for culture. Using the hook and the aspirator, the hepatocystic triangle was dissected (Fig. 2), and after clearly identifying the structures, the artery was clipped using 5 mm clips, and the cystic duct was clipped using 10 mm clips (Fig. 3). Gallbladder dissection was completed, and the gallbladder was removed through an endoscopic bag while leaving a redon drainage in the surgical bed.

Following surgery, the patient was referred to the ICU, with piperacillin-tazobactam antibiotic treatment being administered for 5 days. After 24 hours, oral tolerance was initiated uneventfully, and the patient was referred to the standard hospitalization area. In the interoperative pus sample, Klebsiella pneumoniae –which was sensitive to the treatment administered– was identified. On postoperative day 4, the drainage was removed, and the patient was discharged on hospitalization day 5.

The pathological examination confirmed the presence of phlegmonous hemorrhagic acute cholecystitis, with multiple dark calculi measuring up to 0.7 cm in diameter. In the outpatient check-up carried out 15 days later, the patient had no symptoms, no surgical wound complications were noted, and the patient reported to lead a normal life.

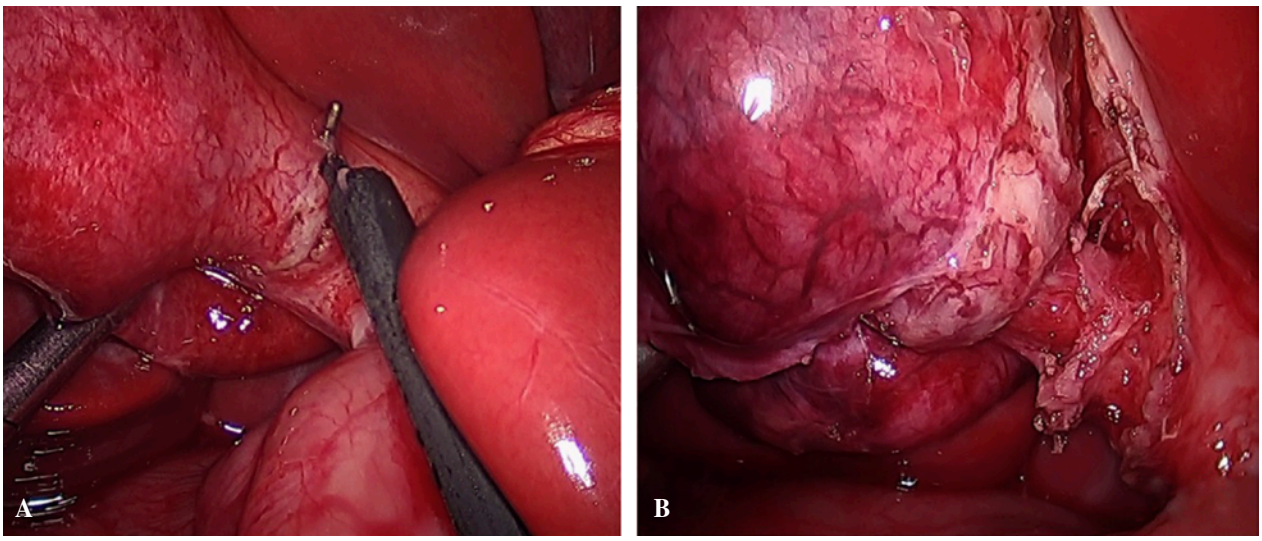

Figure 2. A) and B) Dissection of Calot's triangle using a hook and blunt dissection with aspirator.

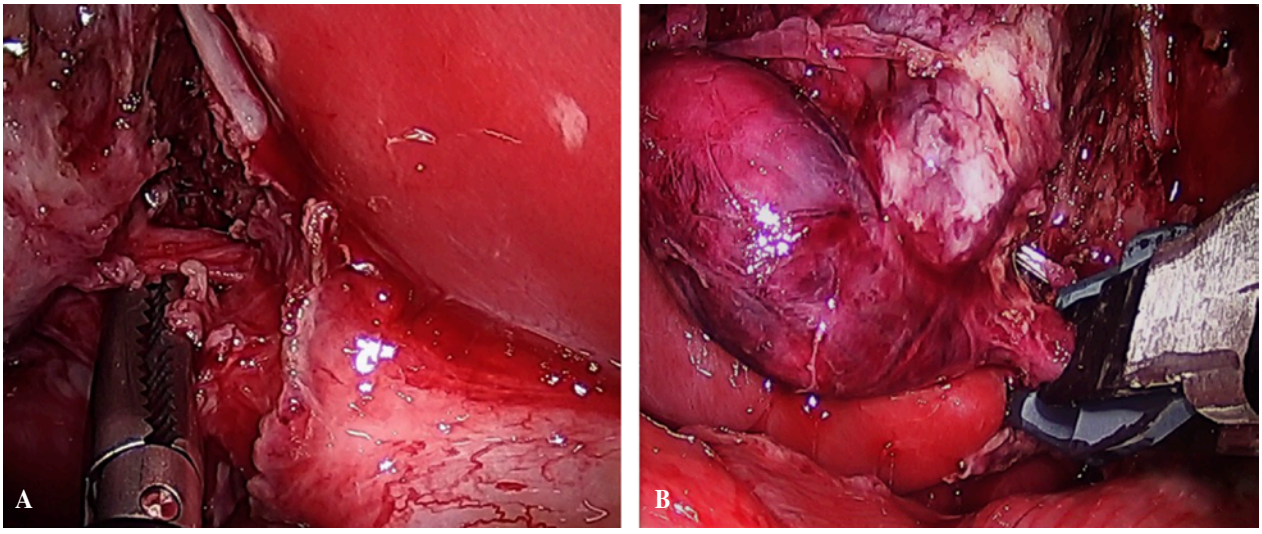

Figure 3. A) Individualization of the cystic artery running parallel to the cystic duct. B) Clipping of the cystic duct following clipping of the cystic artery.

DISCUSSION

In spite of being the treatment of choice in adult patients with acute calculous cholecystitis[9,10], urgent laparoscopic cholecystectomy is not so widespread in pediatric patients. In our case –a 4-year-old patient with no risk factors for cholelithiasis, and with sepsis secondary to acute calculous cholecystitis–, urgent laparoscopic cholecystectomy was conducted in cooperation with the Emergency Trauma and Surgery Unit. The patient recovered early and had no subsequent complications.

The treatment of acute cholecystitis in children is heterogeneous, with both urgent and deferred cholecystectomy being feasible[1,5-8] according to each institution's experience and resources.

Urgent laparoscopic cholecystectomy allows the infectious focus to be controlled at admission, thus shortening antibiotic treatment, and allowing for early resumption of day-to-day life. The deferred cholecystectomy approach in children has been based, among others, on a good response to medical treatment and a theoretically greater surgical complexity in the active infection stage that could lead to inadvertent damage of the bile duct.

However, the literature evidence in this respect is scarce, with bile duct injuries having been reported both in urgent and deferred surgeries[5-7,11,19]. Even though

cholecystitis is a risk factor for bile duct injuries both in adult and pediatric patients, randomized studies carried out in the adult population have shown no differences in the incidence of bile duct injuries between early cholecystectomy (< 72 h) and deferred cholecystectomy (6-8 weeks)[9,12,19]. Although these studies lack statistical power –given that bile duct injuries are infrequent (0.4-1.5% incidence)–, statistically significant differences have been found in terms of conversion rate to laparotomy, which is higher in deferred cholecystectomy. The indication for conversion in these cases was based on the need for bailout maneuvers, since no view of safety could be achieved or bile duct injuries were suspected during the procedure. This suggests the procedure should be carried out in the active infection stage rather than in the post-inflammatory fibrotic one[19].

Deferred treatment raises other questions in terms of antibiotic treatment duration, cholecystectomy's exact timing, or deciding which rescue maneuver would be the most adequate in case of conservative treatment failure, all of which remain unresolved in the literature[13].

Another risk factor for bile duct injuries, which has been described both in adult and pediatric patients, is the medical institution's experience and volume[1,14]. In this respect, Tokyo guidelines[9] recommend urgent cholecystectomy in stage II and III patients in institutions with experience in urgent surgeries and critical patient care. Similarly, Akhtar-Danesh GG et al.[1] identified a smaller number of pediatric patients with bile duct injuries, both in urgent and deferred cholecystectomy, in larger institutions, which were not specifically pediatric. In light of these results, some authors have wondered which surgeon is the most adequate[5,14,1] for this procedure, or even considered the need for cooperation between general and pediatric surgeons in the treatment of these patients.

The culture of safety in laparoscopic cholecystectomy is a fertile ground, with multiple publications in the literature, but mostly focused on adult patients[9,15-19]. Indeed, there are few pediatric studies available in this respect, and widely accepted tools such as the critical view of safety[8], the use of bailout maneuvers, or the adoption of established bile duct injury classifications have not been seemingly incorporated to pediatric surgery, thus impairing adequate characterization and comparison, as well as treatment assessment[6,7,11,18].

Finally, there is no recommendation, expert consensus, or evidence-based clinical guideline stating which treatment is the most adequate for acute calculous cholecystitis in Pediatrics.

In conclusion, in selected cases and with the cooperation of general surgeons specialized in emergency surgery or hepatobiliopancreatic surgery, urgent laparoscopic cholecystectomy can be considered as a safe treatment option that reduces comorbidity, hospital stay, and recovery time.

The treatment of acute calculous cholecystitis in Pediatrics in our environment is so variable that it prevents these patients from being uniformly managed. Even though acute cholecystitis cases are currently few, incidence may increase in the next years as a result of the rise in the prevalence of cholelithiasis. Further studies, recommendations, and guidelines by the various scientific societies are therefore required.

REFERENCES

1. Akhtar-Danesh GG, Doumouras AG, Bos C, Flageole H, Hong D. Factors associated with outcomes and costs after pediatric laparoscopic cholecystectomy. JAMA Surg. 2018; 153(6): 551-7.
2. Khoo AK, Cartwright R, Berry S, Davenport M. Cholecystectomy in English children: evidence of an epidemic (1997-2012). J Pediatr Surg. 2014; 49(2): 284-8; discussion 288.
3. Greer D, Heywood S, Croaker D, Gananadha S. Is 14 the new 40: trends in gallstone disease and cholecystectomy in Australian children. Pediatr Surg Int. 2018; 34(8): 845-9.
4. WHO European Childhood Obesity Surveillance Initiative (COSI): report on the fourth round of data collection, 2015–2017. Copenhagen: WHO Regional Office for Europe; 2021. Licence: CC BY-NC-SA 3.0 IGO.
5. Simal Badiolal I, Corona Bellostas C, Sagarra Cebolla E, Velasco Sánchez E, Zornoza Moreno M, Rojo Díez R, et al. Colecistectomía laparoscópica en niños y adultos: lo que podemos aprender. Cir Pediatr. 2014; 27(4): 165-8.
6. Cabrera Chamorro CC, Pabón Arteaga JS, Caicedo Paredes CA, Cabrera Bravo N, Villamil Giraldo CE, Chávez Betancourt G, et al. Cholelithiasis and associated complications in pediatric patients. Cir Pediatr. 2020; 33(4): 172-6.
7. Esposito C, Corcione F, Settimi A, Farina A, Centonze A, Esposito G, et al. Twenty-five year experience with laparoscopic cholecystectomy in the pediatric population-from 10 mm clips to indocyanine green fluorescence technology: Long-term results and technical considerations. J Laparoendosc Adv Surg Tech A. 2019; 29(9): 1185-91.
8. Kılıç SS, Özden Ö, Çolak ST. Comparative analysis of reliability and clinical effects of the critical view of safety approach used in laparoscopic cholecystectomy in the pediatric population. Pediatr Surg Int. 2021; 37(6): 737-43.
9. Okamoto K, Suzuki K, Takada T, Strasberg SM, Asbun HJ, Endo I, et al. Tokyo Guidelines 2018: flowchart for the management of acute cholecystitis. J Hepatobiliary Pancreat Sci. 2018; 25(1): 55-72.
10. Pisano M, Allievi N, Gurusamy K, Borzellino G, Cimbanassi S, Boerna D, et al. 2020 World Society of Emergency Surgery updated guidelines for the diagnosis and treatment of acute calculus cholecystitis. World J Emerg Surg. 2020; 15(1): 61.
11. Miura da Costa K, Saxena AK. Complications in pediatric laparoscopic cholecystectomy: systematic review. Updates Surg. 2021; 73(1): 69-74.
12. Borzellino G, Khuri S, Pisano M, Mansour S, Allievi N, Ansaloni L, et al. Timing of early laparoscopic cholecystectomy for acute calculous cholecystitis: a meta-analysis of randomized clinical trials. World J Emerg Surg. 2021; 16(1): 16.

13. Diez S, Müller H, Weiss C, Schellerer V, Besendörfer M. Cholelithiasis and cholecystitis in children and adolescents: Does this increasing diagnosis require a common guideline for pediatricians and pediatric surgeons? BMC Gastroenterol. 2021; 21(1): 186.
14. Chen K, Cheung K, Sosa JA. Surgeon volume trumps specialty: outcomes from 3596 pediatric cholecystectomies. J Pediatr Surg. 2012; 47(4): 673-80.
15. Brunt LM, Deziel DJ, Telem DA, Strasberg SM, Aggarwal R, Asbun H, et al. Safe cholecystectomy multi-society practice guideline and state of the art consensus conference on prevention of bile duct injury during cholecystectomy. Ann Surg. 2020; 272(1): 3-23.
16. Rosin D, Rogers PN, Schein M. The gallbladder and bile ducts. En: Schein M, Rogers PN, Leppäniemi A, Rosin D, editors. Schein's common sense. Prevention and management of surgical complications. Shrewsbury: tfm; 2013. p. 315-45.
17. Gupta V, Jain G. Safe laparoscopic cholecystectomy: Adoption of universal culture of safety in cholecystectomy. World J Gastrointest Surg. 2019; 11(2): 62-84.
18. de' Angelis N, Catena F, Memeo R, Coccolini F, Martínez-Pérez A, Romeo OM, et al. 2020 WSES guidelines for the detection and management of bile duct injury during cholecystectomy. World J Emerg Surg. 2021; 16(1): 30.
19. Wakabayashi G, Iwashita Y, Hibi T, Takada T, Strasberg SM, Asbun HJ, et al. Tokyo Guidelines 2018: surgical management of acute cholecystitis: safe steps in laparoscopic cholecystectomy for acute cholecystitis (with videos). J Hepatobiliary Pancreat Sci. 2018; 25(1): 73-86.