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Extra-hepatic biliary-system morphology, demographical characteristics and surgical outcome in patients who undergo laparoscopic cholecystectomy for symptomatic gallbladder disease.



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Abstract

Introduction: This study consists of descriptive-prospective cross sectional studies, which assessed the extra-hepatic biliary system morphology in human cadavers and patients, who underwent laparoscopic cholecystectomy for symptomatic gallstone disease, demographic characteristics of those patients, clinical manifestation in gallstone disease, pre and post symptomatic profile and surgical outcome of laparoscopic cholecystectomy. The outcome of endotherapy in iatrogenic bile duct injuries and microflora in human bile was assessed in separate studies.

Methods: A descriptive-prospective cross sectional study was performed in 60 fresh cadavers and 200 patients, who underwent LC for symptomatic gallstone disease with a view to observing variations in GB, cystic duct (CD), cystic artery (CA) and Calot's triangle. The patients were further evaluated for demographic characteristics, clinical symptoms, safety, efficacy, and morbidity of surgical procedure.

Micro-flora and antibiotic sensitivity were assessed by a descriptive analytical study of 70 bile samples (35 cholesterol and 35 pigment stones) of patients who underwent laparoscopic cholecystectomy for uncomplicated cholelithiasis, and 20 controls who underwent laparotomy and had normal gallbladder ultrasound scans and no demonstrable stones.

Another prospective descriptive study was done of 30 patients, who underwent therapeutic endoscopic procedures for iatrogenic injuries following laparoscopic cholecystectomy for symptomatic gallstone disease at the National Hospital of Sri Lanka to evaluate the endotherapeutic outcome.



Settings of study:

- Departments of Anatomy, Surgery, Microbiology, Pathology and Public Health, Faculty of Medicine, Ragama, University of Kelaniya.
- Departments of Anatomy, Surgery, Faculty of Medicine, University of Sri Jayawardenapura.
- Department of Surgery, Faculty of Medicine, University of Colombo.
- Department of Gastroenterology and Endoscopy, The National Hospital of Sri Lanka.
- Colombo North Teaching Hospital.
- Colombo South Teaching Hospital.
- Sri Jayawardenapura Teaching Hospital.

Statistical analysis: In descriptive studies, data were expressed as mean, Standard error of mean, median, range and frequencies. Data were analyzed using Statistical Package for Social Sciences 11(SPSS) (SPSS 11.0, Chicago, Illinois, USA). Significance was assigned to a p-value <0.05.

Ethical clearance: Ethical clearance committee, Faculty of Medicine, Ragama, University of Kelaniya. Ref: P13/05/2006. Title: Extra-hepatic biliary system morphology, demographical characteristics and surgical outcome in patients who undergo laparoscopic cholecystectomy for symptomatic gallbladder disease.

Conflict of interests: None

Self finance

Results: The descriptive cadaveric study revealed that there were no intra-hepatic gall bladders or left-lobe situated gallbladders. The mophometry showed that the mean length and the width of the gallbladder was 6.48cm (range: 4.5cm - 9cm) and 3cm (range, 2.5cm - 4.5cm) respectively. The mean length and the inner diameter of the cystic duct was 2.5cm and 2.6mm respectively. The angular mode (flat down) union of cystic duct and the common hepatic duct were found to be the commonest type (84%). The mean lengths of the right and left hepatic ducts were 1.33cm and 1.32cm respectively. The mean length and the inner diameter of the common hepatic duct were 2.4cm and 3.8mm respectively. The mean length and the inner diameter of the common bile duct was 6.26cm and 7.86mm respectively. Hepato-Cystic ducts were found in 3.3% of the specimens. The mean lengths of right and left hepatic arteries were 2.8cm and 2.3cm respectively. The mean length of the proper hepatic artery was 3.1 cm. The mean length of the cystic artery was 1.4cm (range, 0.9cm - 2.1 cm) before its division into anterior and posterior branches. Seventy-five percent of the cystic arteries originated as a single artery from the right branch of the hepatic artery, while, 43% of the specimens of the right hepatic artery was lying in the triangle of Calot's.

Among the patients who underwent LC, transversely septate, sessile and bipolar gall bladders were found in 1%. Agenesis of the gallbladder was not seen. Among the patients, 1% each had no cystic ducts or dual cystic ducts. The angular mode (flat down) of union of cystic duct and the common hepatic duct was found to be the commonest at 96%. Three percent had connective tissue ensheathing both the cystic duct and the common hepatic duct. The flat horizontal and parallel courses of cystic ducts were noted in 3% and 1% respectively. Eighty-nine percent of the cystic arteries originated as a single artery from the right branch of the hepatic artery. The origin of the cystic artery revealed that 5% had two cystic arteries originating separately from the right hepatic artery. The pathway of the cystic artery showed that 5 % had passed anterior to the common hepatic duct and 1% traversed over the cystic duct duct. Forty-one percent of the right hepatic artery lay in the triangle of Calot's, while, 2% had the right hepatic artery running over the common hepatic duct.



Two-hundred patients were recruited for the demography, i.e. 162 women and 38 men whose age averaged 39.1 years (range, 17 to 77 years). All patients had symptomatic gallstone disease. The socio-demographic data revealed that most of the patients were either in grade 1 or 2 with regard to their level of income. The level of education among the patients was satisfactory, most of them being in the grade 2 and 3 levels of education. With regard to the surgical outcome and safety of the technique and its efficacy, the mean operating time was 48.5 ± 20 minutes and the mean hospital stay was 37.6 hours. Post-operative pain relief requirements were limited to oral medications in more than 70% of the patients. A normal diet was tolerated by 83% of patients by the morning following the procedure. Median time of return to full activity was 10.8 ± 5.8 days after operation. In addition an analysis of the hospital-costs of these 200 cases demonstrates a modest cost advantage over standard open cholecystectomy (n = 38) (mean, Rs.3620.25 \pm 1005.00 versus Rs.4251.76 \pm 988.00). There were four cases of bile duct injury requiring laparotomy and t-tube insertion, three postoperative bile collections and one clinical diagnosis of a retained stone that passed out spontaneously. Four patients required conversion to open cholecystectomy because of technical difficulties with the dissection. No deaths were recorded.

With regard to the clinical manifestations and symptomatic outcome of laparoscopic cholecystectomy, the symptoms that were relieved by cholecystectomy were nausea, vomiting, colicky abdominal pain, and back-pain. Flatulence, fat intolerance, and nagging abdominal pain were unaffected as shown by a benefit ratio. Post-cholecystectomy diarrhoea occurred in 11% of patients. The type of surgical access did not influence the symptomatic outcome but had a significant bearing on the time to return to work or full activity after surgery (laparoscopic cholecystectomy two weeks, open cholecystectomy eight weeks, $P=0.001$). Patient appreciation of a satisfactory cosmetic result was 72% in the open group compared to 100% in the case of patients who were treated by laparoscopic cholecystectomy ($P=0.001$).

In the assessment of microbiology of gallbladder bile in patients with uncomplicated symptomatic cholelithiasis, thirty-eight (54%) of 70 patients with gallstones had bacterial isolates. Nine (26%) isolates were from cholesterol stone containing bile while 29 (82%)

isolates were from pigment stone containing bile (P=0.01). Twenty-eight of 38 (74%) bile samples showed positive cultures only after enrichment in brain heart infusion medium (BHI) (P=0.02). The overall bacterial isolates from bile samples revealed predominantly *Echerichia coli*, followed by *Pseudomonas aeruginosa*, *Enterococcus spp*, *Klebsiella spp.* and *Staphylococcus epidermidis*. There were no bacterial isolates in the bile of controls after either direct inoculation or enrichment in BHI.

During the endoscopic management of post-operative iatrogenic bile duct injuries, patients who underwent laparoscopic cholecystectomy, and had bile leaks, were diagnosed with persistent abdominal pain 30%, jaundice with cholangitis 6.6%, abdominal distension 16.6% and persistent bile flow to the skin surface through and around the existing drains, 46.6%. The median duration between initial surgery and detection of bile leak was 3 days (range 0-12 days). Twenty-three patients (76.6%) had high-grade bile leaks while 7(23.4%) had low-grade leaks. Iatrogenic bile duct injuries were: hepato-cystic junction injuries 10(33.3%) (3, high grade: 7 low grade bile leaks), common bile duct injuries 16(53.3%) and right hepatic duct injuries 4(13.3%). Endotherapy inclusive of sphincterotomy with stone extraction followed by biliary stenting (10 patients), sphincterotomy with biliary stenting (15) and sphincterotomy alone (5). Bile leaks stopped in all patients at a median of 4 days (range 2-14 days), the drains were removed at a median duration of time of 6 days (range 5-16 days) and the stents were removed at a 6-8 weeks interval after endoscopic procedures.