

Laparoscopic cholecystectomy by harmonic dissection

Laparoscopic cholecystectomy currently is accepted as the gold standard treatment of gallstones. The advantages of such a surgical approach have been reported by a number of authors, showing both the positive impact of this method on the postoperative quality of the patient's life and its optimal short- and long-term results.

Standard laparoscopic cholecystectomy commonly is accomplished by means of specialized instruments (electrosurgical hook or spatula, scissors, clip applicator) and high-frequency monopolar dissection technology.

Laparoscopic cholecystectomy is a safe technique. Nevertheless, there still are some pitfalls due to the limits of current technology and technique and the relevant risk of injuries and postoperative complications. These risks may be summarised as deep tissue damage with possible distant tissue damage by high-frequency electrosurgery. This may be unnoticed, involving vascular and biliary structures in the vicinity of the cystic duct and artery [4] visceral and solid organ injuries because of frequent instrument exchange, sometimes performed without optic guidance; bile leakage due to the slippage of clips [3]; and common bile duct stone formation due to the migration of ligature material, which may be a potential nidus for mineral and bacterial deposits [2].

Ultrasound dissection technology involves the application of ultrasound within the harmonic range of frequency (i.e., 55,500 Hz) to the tissues, allowing three effects, which act synergistically: cavitation, coaptation/coagulation, and cutting. The lateral energy spread is minimal and the risk of distant tissue damage lower than that of high-frequency electrosurgery [1]. Because of these two main characteristics—different functions gathered in one instrument (dissection, coagulation, cutting) and safety of use—and after extensive *in vivo* tests, we started performing laparoscopic cholecystectomy using the Harmonic Shears (Ultracision, Ethicon Endo-Surgery Cincinnati, OH, USA) for both dissection and closure/division of the cystic duct and artery. Therefore, besides the optic and the traction instruments, only one instrument was used during the whole procedure.

In 50 patients (35 women, 15 men) ages 29 to 76 years (average, 54.6 years) a laparoscopic cholecystectomy was performed totally by harmonic dissection. The operating time ranged from 10 to 180 min (average 57 min). The conversion rate was 0. In seven patients, an associated procedure was performed (4 Nissen-Rossetti procedures, 2 bile duct examinations, 1 annex surgery). Also in these cases,

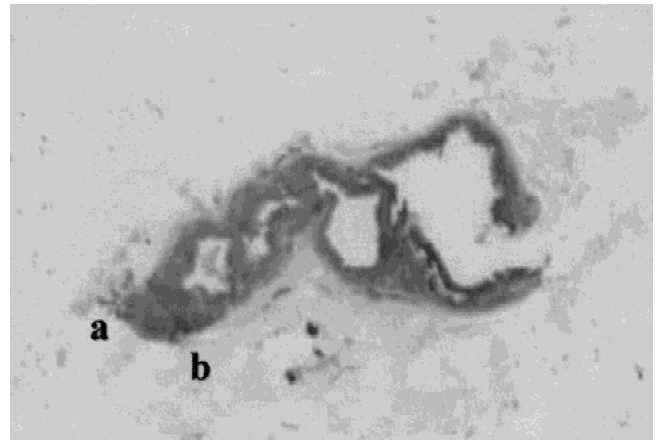


Fig. 1. Sagittal section of the cystic duct closed and divided by the ultrasonically activated shears: **a** Cutting edge with the sealed lumen due to the coaptation/coagulation effect and consequent collagen homogenization. The sealed tract of the lumen is 1.5 mm long. **b** No morphologic changes at 2 mm from the cutting edges with preservation of the Heister valves.

the procedure was performed using only the Harmonic Shears. The reported operating time was calculated including the time required for associated procedures. The morbidity rate was 2%, involving 1 case of bile leakage that lasted 36 hours and was treated conservatively. Mortality was nil. Postoperative hospital stay ranged from 1 to 15 days (average, 4 days).

Histologic examination of the cystic duct (Fig. 1) showed sealing of the lumen caused by collagen homogenization, with resulting distortion of glands profile, epithelial detachment, cell welding, nuclear lengthening, nuclear chromatin homogenization, fissures, and cavitation effects on the cutting edge. All morphologic changes were found within 1.5 mm of the cutting edge. In all cases, the airtight pressure of the sealed cystic duct was calculated to be higher than 320 mmHg.

As compared with standard laparoscopic cholecystectomy, the costs for disposable instruments are lower (346.03 Euro for one Harmonic Shears vs 397.67 Euro for one scissors and one clip applicator).

Still, by maintaining all the benefits of laparoscopic cholecystectomy, harmonic cholecystectomy has further advantages in terms of safety, consisting mainly of low-risk dissection in the proximity of vulnerable structures and no need for instrument changing during the whole operation.

References

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Operative manual of endoscopic surgery. Springer Verlag, Berlin, Heidelberg, New York pp 44–60

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