



# Complete percutaneous laparoscopic cholecystectomy by employing the Percuvance Percutaneous Surgical System

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**Background:** Laparoscopic cholecystectomy (LC) has been the gold standard in the treatment of gallbladder disease. More than 50 different techniques of LC have been developed and performed, which seem to offer much in postoperative outcome and cosmesis. However, each has its limitations in practice mainly due to the long learning curve, or lack of appropriate instruments. The current paper studies the application of percutaneous LC employing the Percuvance Percutaneous Surgical System and reports the first documented complete percutaneous LC in the literature.

**Methods:** Complete percutaneous LC was performed in fifteen patients diagnosed with cholelithiasis, the Percuvance Percutaneous Surgical System from Teleflex was used. All operations were performed with the use of a single 10 mm Hassan Trocar port and a 30° degree camera.

**Results:** Complete percutaneous LC with the use of percutaneous Instruments was applied in all cases. No conversions to open cholecystectomy were reported. Mean operating time was well within the standard for LC. Postoperatively, no complications were observed, while all patients were discharged the next day. Excellent cosmesis and satisfied patients were the long-term results.

**Conclusions:** Percutaneous LC with the use of a 10 mm Hassan trocar, bears the potential of being a favorable alternative in cholecystectomy.

**Keywords:** Laparoscopy; cholecystectomy; percutaneous; needlescopic

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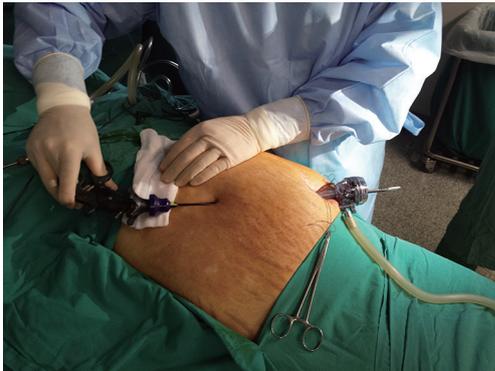
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## Introduction

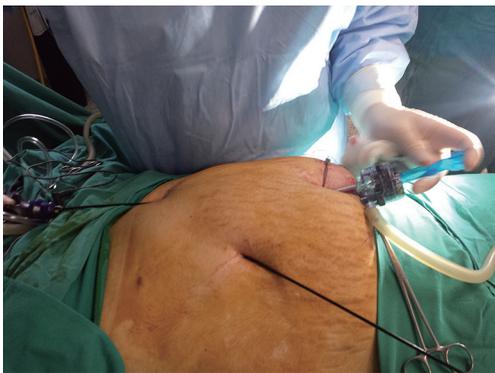
Laparoscopic cholecystectomy (LC) is currently, the gold standard in the treatment of gall bladder diseases. In the view of minimizing tissue trauma, wound complications, postoperative scarring, as well as improving cosmesis, minimally invasive surgery advances. Several novel

techniques have been described as modifications of the standard procedure (1). Natural orifice transluminal endoscopic cholecystectomy, single incision LC and needlescopic cholecystectomy are some aspects (2).

Needlescopic surgery or mini-laparoscopy refers to the procedure which employs instruments of 3 mm in diameter or less (3). The aim of this paper is to document the first



**Figure 1** Right; Percuance system with trandermal insertion and endoperitoneal debate.



**Figure 2** Right; Percuance system with trandermal insertion and endoperitoneal debate.



**Figure 3** Change of instrument.

cases of complete needlescopic cholecystectomy with the Percuance Percutaneous Surgical System (Teleflex, Wayne, PA, USA).

## Methods

The study was approved by the Investigational Review Board of Aristotle University of Thessaloniki (IRB approval 30/2018). The revised declaration of Helsinki was applied. The exclusion criteria included the contraindications of laparoscopy.

From December 2016 to March 2018, fifteen patients consented to undergo LC using the Percuance system. Patients were pre-operatively evaluated. Selection criteria included a normal body mass index (BMI) (18.5 to 24.9) or slight overweight (25 to 29.9), who reported no previous upper abdominal operations. The indications of cholecystectomy remain the same as the conventional. However, we choose patients that experienced mild gallbladder disease.

All procedures were performed by the same experienced surgeon. Entry into the abdomen was achieved under direct visualization. A 10 mm Hassontrocar was placed and pneumoperitoneum was created. The rest of the instruments of the Percuance system were positioned. A small incision of the skin was performed at the level of the midline just below the xiphoid and a 2.9-mm disposable shaft with reusable, interchangeable effectors and a reusable handle was inserted into the abdomen under direct visualization with a Veress needle tip. The end was extra-corporealized through the 10 mm umbilical camera port. The introducer tip was unlocked and a 5 mm dissector tool was inserted. The same procedure was followed for the second shaft that was placed in the lateral right abdomen position and changed with an atraumatic grasper tip. This was applied to the fundus of the gallbladder to create enough traction so as to enable the visualization of Callots triangle. The instrument tips were exchanged with other tips (e.g., scissors, dissector) during cholecystectomy as many times as necessary, repeating the step of extra corporatization. The next steps are the same as the conventional LC. The gallbladder was retrieved through the 10 mm umbilical port.

After procedures' completion, the fascia was closed with 0-polyglactin 910 (Vicryl<sup>TM</sup>), while the skin of the umbilicus was left to heal. The percutaneous access sites were closed with Steri-Strips<sup>TM</sup> only (Figures 1-7).

Patients were discharged after achieving adequate pain control management. All of them were followed-up 1 week and 3 months postoperatively (Figures 8-10). Data were collected prospectively.



**Figure 4** Change of instrument.



**Figure 5** Trocar.

## Results

Patients characteristics are summarized in *Table 1*. Ten females and 5 males, with mean age of 42.44 years were included. Mean BMI was 24.2 kg/m<sup>2</sup>. None of them reported a previous surgical history. ASA score was under 2. Mean operative time was 74.5±18.3 minutes and hospital stay was 1 day. No drainages were inserted and no additional trocars were introduced in the surgical field in 14 PLC. None of the PLC was converted to open cholecystectomy. However, a conversion to conventional laparoscopic cholecystectomy was recorded in order to control bleeding and to place a drainage. For the rest of the cases and when needed, a suction pipe was placed parallel to the umbilical trocar so as to avoid the insertion of another trocar. Postoperatively, no wound-related complications were observed while scarring was minimal.



**Figure 6** Percutance system.



**Figure 7** Gallbladder specimen.

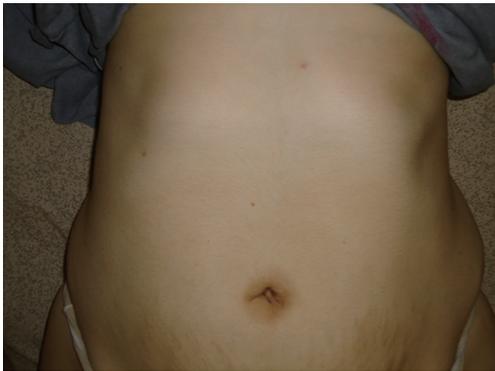
## Discussion

Recent trends tend to develop the most minimally invasive approach for cholecystectomy. Needleoscopic instruments and techniques seem to represent a promising candidate for several laparoscopic surgeries, including cholecystectomy, appendectomy, Nissen fundoplication, and video-assisted thoracoscopic surgery (2,4).

In general, the smaller the size of laparoscopic instruments the fewer the port-related injury occurs (4). As a consequence, activation of the sympathetic nervous system is decreased and so, less postoperative analgesic medication is required (5). Furthermore, wound infection rates are lower, decreasing the risk of future herniation and improving cosmesis (4,5). Kimura *et al.* (6) reported that the scars become significantly smaller as the size of the trocar decreases, not only



**Figure 8** After surgery.



**Figure 9** After 3 months.

immediately after the operation but also at 6-month follow-up. In this report, patients were evaluated postoperatively. On years interval scars seemed to be minimal.

However, flaws exist and may prolong the operation time (3), increase the risk of perioperative complications, or impose stress on surgeons (4). These results from the small size of the instruments and laparoscopes (7). Several of the available instruments reach the length of 2.9 cm or less, while instrument tips are smaller compared with 5-mm instruments, which can complicate dissection, especially in cases of inflammation. Such instruments bend easily and are prone to mishandling (2,5). As far as the 3-mm laparoscopes is concerned, they seem to have restricted visual field, poor resolution, and clarity (4). In our study, this was out reached by the placement of a 10-mm Hasson trocar, while



**Figure 10** After 1 year.

**Table 1** Patient's characteristics

Patients data	PLC (n=15)
Age (years), mean [SD]	42.44 [12.61]
Gender	
Male	5
Female	10
BMI (points) mean [SD]	24.2 [5.4]
ASA Score median (range)	1 [1–2]
Operation time (min) [SD]	74.5 [18.3]
Conversion to LC	1
Hospital stay (days) median (range)	1 [<1–1]

PLC, percutaneous laparoscopic cholecystectomy; LC, laparoscopic cholecystectomy; SD, standard deviation; BMI, body mass index.

extra-corporealizing the 2.9-mm shafts through a separate 10-mm trocar, without the loss of pneumoperitoneum, was technically simple. Fluency can, obviously, be achieved when completing the learning curve. Careful preoperative evaluation should be highlighted, while the choice of conversion remains the solution when the procedure is complicated.

Percutaneous LC with the Percuvance System seems to be a viable option in the era of minimally laparoscopic procedures.

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## Footnote

*Conflicts of Interest:* The authors have no conflicts of interest to declare.

*Ethical Statement:* The study was approved by the Investigational Review Board of Aristotle University of Thessaloniki (IRB approval 30/2018).

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