

**Surgical Technique**

**Rib-lifting method for retraction of the low-lying costal arch  
in laparoscopic cholecystectomy of gallbladder torsion with  
kyphoscoliosis**

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**Running title:** Rib-lifting method for retraction of the low-lying  
costal arch

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**SUMMARY**

Gallbladder torsion is a rare entity. Recently, laparoscopic cholecystectomy has become accepted as a standard operation for gallbladder torsion. Unfortunately, kyphoscoliosis is a risk factor of gallbladder torsion, and kyphoscoliosis results in a low-lying costal arch and disturbs the laparoscopic view. We report herein a new surgical procedure, a "rib-lifting method" for retracting the low-lying costal arch at laparoscopic cholecystectomy of gallbladder torsion with kyphoscoliosis.

**Key words:** rib-lifting method; gallbladder torsion; kyphoscoliosis; laparoscopic cholecystectomy; low-lying costal arch

## **INTRODUCTION**

Gallbladder torsion is a relatively rare cause of acute cholecystitis and is defined as rotation of the gallbladder with subsequent occlusion of bile and/or blood flow.<sup>1, 2</sup> Gallbladder torsion is generally caused by anatomic anomalies in peritoneal attachment of the gallbladder, allowing greater mobility. This condition is commonly known as a "floating gallbladder."<sup>1, 2</sup> Laparoscopic cholecystectomy is now recommended as the first choice for treating gallbladder torsion.<sup>3, 4</sup> Unfortunately, kyphoscoliosis is one of the precipitating factors of gallbladder torsion,<sup>5, 6</sup> and kyphoscoliosis often causes low-lying costal arch and disturbs the laparoscopic visualization.<sup>7</sup> We introduce herein our rib-lifting method for retraction of the low-lying costal arch at laparoscopic cholecystectomy of gallbladder torsion with kyphoscoliosis.

## **PATIENTS AND TECHNIQUE**

An 84-year-old woman was admitted with upper abdominal pain of 5-day duration. Significant past medical history included osteoporosis. Her height and weight were 141 cm and 34 kg, respectively. A marked kyphoscoliosis was present. On admission, the patient's blood pressure was 146/82 mm Hg, her pulse rate was 78/min, and her body temperature was 37.4 °C. Physical examination showed right upper abdominal pain and Murphy's sign. Laboratory values were all within the normal limits except for an elevated C-reactive protein of 14.42 mg/dl (normal < 0.17). Abdominal ultrasonography demonstrated an enlarged gallbladder with a septum-like structure in the lumen of the gallbladder. There were no gallstones. An abdominal multidetector computed tomography (CT) scan revealed a whirl sign of the gallbladder. These findings were consistent with a diagnosis of torsion of the gallbladder. We scheduled laparoscopic cholecystectomy as an emergency operation. The procedure was performed under general anesthesia, with the patient placed with her right side up in the reverse Trendelenburg position. The first 10-mm port for the 30° angled laparoscope was introduced at the umbilicus by open

technique. Under a condition of pneumoperitoneum, three additional standard ports for laparoscopic cholecystectomy were made. The intra-abdominal pressure was maintained within 8 mm Hg. The surgical view by the pneumoperitoneum method was poor with a small working space because of a right low-lying costal arch entirely covering the liver and gallbladder (Fig. 1). The solution is as follows. The costal arch was lifted by the two sutures placed across both the 9<sup>th</sup> and 10<sup>th</sup> ribs with the abdominal wall (Fig. 2). We therefore call this method for retraction of the low-lying costal arch the "rib-lifting method." This rib-lifting method provided us with a good surgical field as required for the performance of cholecystectomy (Fig. 3). At laparoscopy following the rib-lifting method, the gallbladder was found to be markedly distended, gangrenous, and "floating" away from the liver bed. A close examination showed that the gallbladder was rotated around its pedicle in a 180° clockwise direction. The gallbladder was returned to its natural position, and a simple laparoscopic cholecystectomy was performed in a routine manner. The patient's postoperative course was uneventful.

## **DISCUSSION**

Gallbladder torsion is an uncommon clinical entity and is treated by emergent surgery as acute cholecystitis.<sup>1, 2</sup> Recently, the preoperative diagnosis of gallbladder torsion has been facilitated with the use of ultrasound, CT scan, or magnetic resonance imaging techniques.<sup>8, 9</sup> Treatment of gallbladder torsion includes surgical derotation and removal of the gallbladder. Laparoscopic cholecystectomy is now accepted as a standard operation for the gallbladder torsion.<sup>3, 4</sup> Cholecystectomy is minimally invasive and may be performed easily because of the lack of fixation of the gallbladder to the liver bed. One of the pathophysiologic factors precipitating torsion of the gallbladder is kyphoscoliosis.<sup>5, 6</sup> Kyphoscoliosis presents as a low-lying costal arch, resulting in less working space and disturbance of the surgical view via the laparoscope. Therefore, the costal arch must be retracted to ensure a suitable surgical field for laparoscopic cholecystectomy. The most important point of our "rib-lifting method" is the lifting of both the 9<sup>th</sup> and 10<sup>th</sup> ribs with the abdominal wall. Our technique is simple and safe, and requires no additional surgical instrument or laparoscopic

port. We believe that this surgical procedure is useful for facilitating a safe laparoscopic cholecystectomy for patients with kyphoscoliosis.

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**Figure legends**

Figure 1. Laparoscopic view of a low-lying costal arch. The surgical view by the pneumoperitoneum method was poor with a small working space.

Figure 2. Situation with the rib-lifting method. The costal arch was lifted by two no.1 absorbable sutures placed across both the 9<sup>th</sup> and 10<sup>th</sup> ribs with the abdominal wall.

Figure 3. Laparoscopic view of the gallbladder after a retraction of the costal arch using the rib-lifting method. This rib-lifting method provided us with a good surgical field as required for performance of the cholecystectomy.

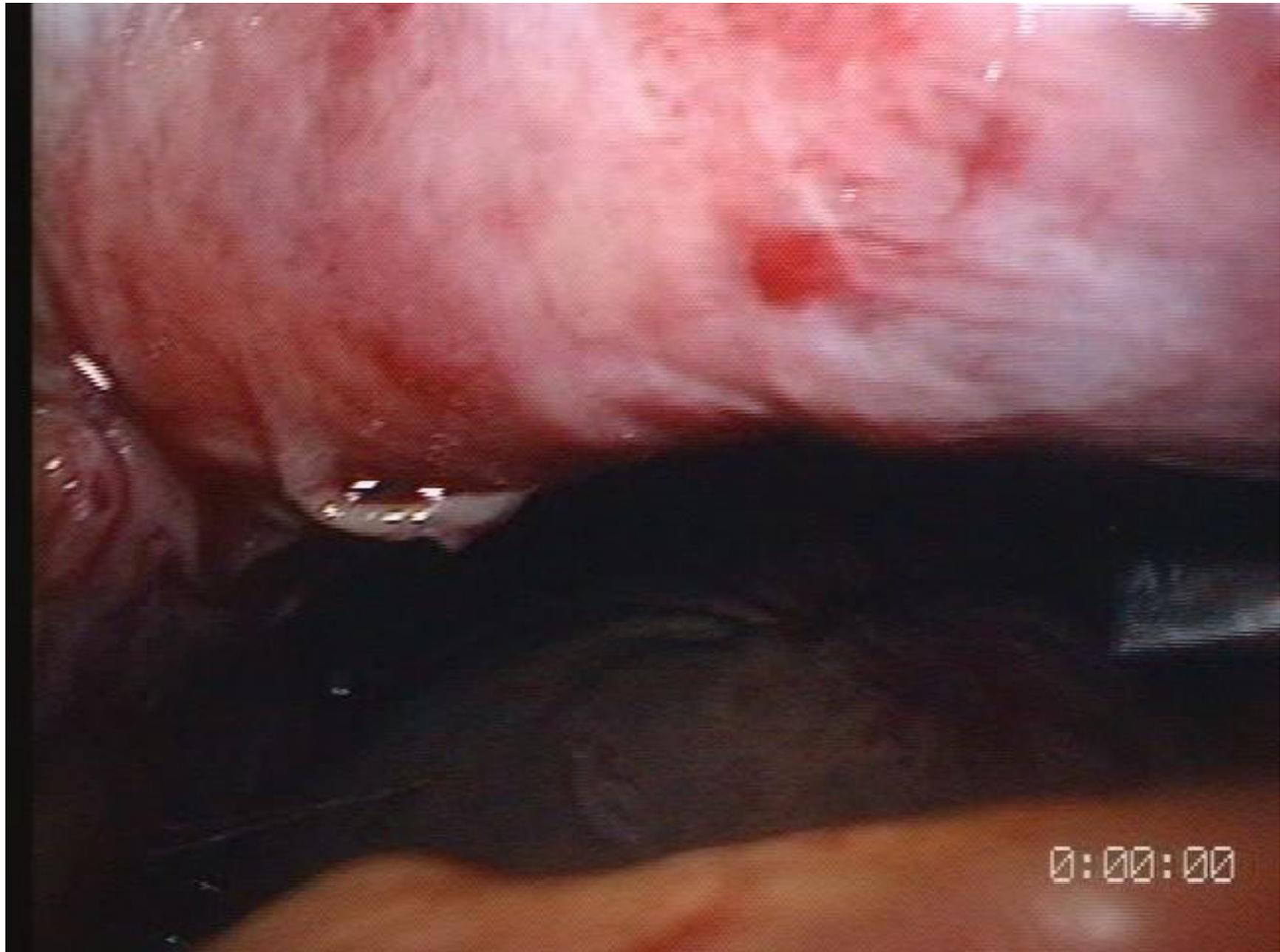


Figure 1

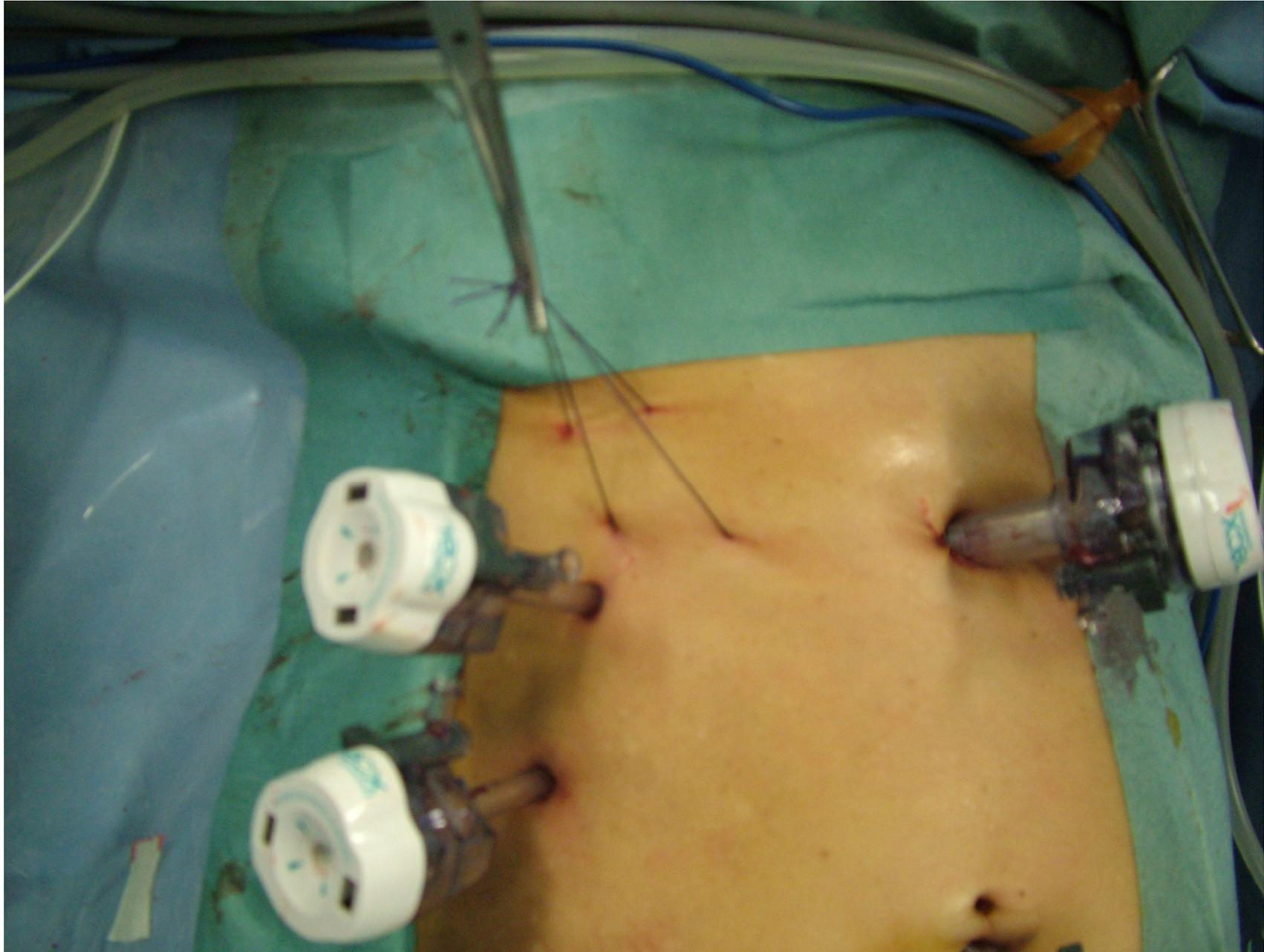


Figure 2

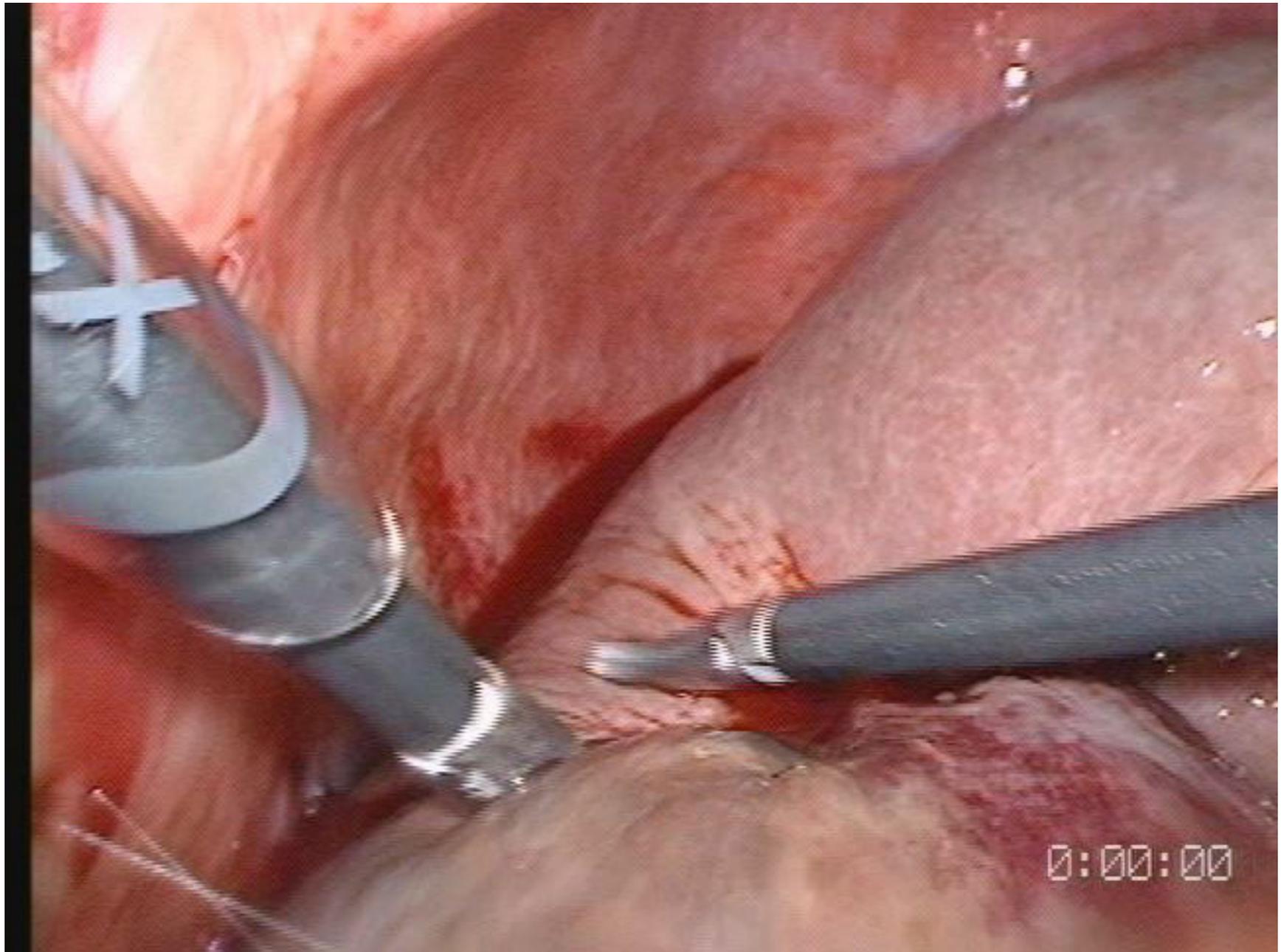


Figure 3