

Surgical Technique

**Marionette method for transumbilical single-incision, two-trocar
laparoscopic cholecystectomy: A new, simple technique**

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Running title: Marionette method in SILC.

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Abstract

Single-incision laparoscopic cholecystectomy (SILC) has recently become a topic of interest among types of minimally invasive surgery. We developed a novel “marionette method” technique for performing SILC. Two 5-mm trocars were placed through a 1.5-cm transumbilical incision. In addition, a nylon suture with a laparoscopic sliding knot was used to tighten the fundus of the gallbladder was thereafter suspended with this nylon suture. The neck of the gallbladder was tightened by means of a loop type retractor, and the gallbladder was to enable adequate visualization of the triangle of Calot. Dissection was performed as a conventional laparoscopic cholecystectomy using standard straight laparoscopic instruments. All 20 patients successfully underwent a single-incision, two-trocar laparoscopic cholecystectomy performed using the marionette method. The mean operative time was 119 min. There were no complications. The marionette method can provide good tension and an appropriate laparoscopic view with a suitable surgical field for safely performing a dissection at the triangle of Calot during SILC.

Key words: Single-incision laparoscopic cholecystectomy, marionette method, new technique.

Introduction

Laparoscopic cholecystectomy (LC) has become the gold standard for the treatment of symptomatic gallstones and gallbladder polyps. Traditional LC is performed with four trocars. The development of various laparoscopic instruments and techniques has made it possible to reduce the number of trocars used in LC to three or two [1, 2]. Single-incision laparoscopic cholecystectomy (SILC) represents a recent technical advancement in minimally invasive surgery [3-5]. In the SILC technique, the placement of multiple trocars via separate punctures through the same transumbilical incision can ensure suitable tension and a suitable surgical field and laparoscopic view for performing cholecystectomy [6]. On the other hand, new access devices for introducing laparoscopic instruments via the same access port at the umbilical incision, such as the SILS™ Port (Covidien, Inc., Norwalk, CT, USA), has been proposed as another approach to less invasive LC [7, 8]. Herein, we describe a new surgical technique in SILC, which we refer to as the "marionette method," for performing a safe, transumbilical single-incision, two-trocar LC without the use of an additional port or any new access devices.

Operative technique and patients

The patients were placed in the reverse Trendelenburg position and slightly rotated to the left. Under general anesthesia, a 1.5-cm vertical incision was made through the center of the umbilicus. After the fascia was exposed, the first 5-mm trocar (Ethicon, Brunswick, NJ, USA) for a laparoscope was inserted at the right side of the umbilicus using an open technique, and a pneumoperitoneum was set at 8 mm Hg. A 5-mm flexible scope (Olympus, Tokyo, Japan) was used for the intra-abdominal visualization. Another 5-mm trocar was inserted at the left side of the same umbilical incision, and a standard 5-mm laparoscopic instrument was used for the dissection. Two 5-mm trocars were placed through the same incision but at separate fascial sites. A 2-0 nylon suture with a laparoscopic sliding knot at the end was inserted on a straight needle through a 5-mm umbilical trocar. Thereafter the fundus of the gallbladder was tightened with the sliding knot in the nylon, and the straight needle was then passed extracorporeally through the abdominal wall in the right subcostal area. The gallbladder was suspended with this nylon suture. A 2-mm loop type retractor (Mini-loop retractor II; Covidien) was

inserted directly at the right upper quadrant below the nylon suture. The nylon suture and loop type retractor were important, as it allowed the triangle of Calot to be adequately visualized. Dissection was performed by conventional LC using standard straight laparoscopic instruments. The cystic duct and the cystic artery were exposed and clipped with a 5-mm clip applier (EndoClip; Covidien) and then divided with laparoscopic scissors. The gallbladder was dissected from the liver bed using a regular hook electrocautery device. To expose the optimal laparoscopic view, we used both a Mini-loop retractor II at the neck and a nylon suture at the fundus of the gallbladder in coordination. This coordinated movement looked like the movement of a marionette. We therefore called this method of retraction of the gallbladder during SILC the "marionette method." A 5-mm trocar was removed and an endoscopic retrieval bag (Endo Catch; Covidien) was inserted directly, and the gallbladder was then extracted. No intraperitoneal drainage was used. The defect in the fascia was repaired with a 0-Vicryl (Ethicon) suture, and the skin was closed with a subcuticular 4-0 PDS-II (Ethicon) suture.

20 patients underwent this new surgical procedure, the

"marionette method," between December 2009 and July 2010, in the course of SILC. The mean age of the patients was 63 years. The mean operative time was 119 minutes (range: 85-163).

Intraoperative blood loss was minimal in all cases. No conversions were performed. There were no postoperative complications. All patients had a history of cholecystitis.

Discussion

Conventional LC is performed with four trocars. Many surgeons have attempted to reduce the number and size of the trocars used in LC in order to reduce the postoperative pain and achieve a cosmetically satisfactory result [1, 2, 9]. The recent trend in LC is SILC [3-8]. In SILC, all of the laparoscopic devices are inserted through the same incision in the abdominal wall. Several new access devices for SILC have been developed, such as the SILS™ Port (Covidien), TriPort™ (Advanced Surgical Concepts, Wicklow, Ireland), and Uni-X™ (Pnavel systems, Morganville, NJ, USA). These new access devices make it possible to insert multiple instruments through one port at the umbilicus [7, 8, 10]. Another surgical procedure that is useful in SILC involves the insertion of multiple trocars via separate fascial punctures through the same incision at the umbilicus [6]. Our surgical procedure used only two trocars in the course of inserting the scope and the standard laparoscopic instruments. However, it was difficult to expose and dissect the triangle of Calot using just one laparoscopic instrument. Using the marionette method, it was possible to dissect the triangle of Calot under the appropriate

tension and with an appropriate laparoscopic surgical field. Several laparoscopic procedures for the retraction of the gallbladder use a Kirschner wire or involve the placement of a stay suture with a straight needle [11, 12]. However, such procedures can lead to the bile leakage from the damaged gallbladder wall. On the other hand, the incidence of occult gallbladder carcinoma after LC was reported to be 0.5% [13]. Sakata et al. [14] reported that a case of bile duct carcinoma was detected via a port-site metastasis after the patient underwent LC for cholecystolithiasis. Therefore, bile leakage should be prevented during laparoscopic cholecystectomy, even in the case of a diagnosis of cholecystolithiasis. Our technique using a nylon suture with a laparoscopic sliding knot and a loop type retractor allowed us to avoid injuring the gallbladder wall. In conclusion, the marionette method can ensure suitable tension and a suitable surgical field and laparoscopic view for the dissection of the triangle of Calot. Our technique is simple and easy and requires no special surgical instruments. A transumbilical single-incision, two-trocar LC using the marionette method can be performed with a combination of conventional laparoscopic

instruments. Also, we believe that this surgical procedure can reduce costs and is useful for facilitating a safe SILC.

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Figure legends

Fig. 1. Marionette method for transumbilical single-incision, two-trocar laparoscopic cholecystectomy. **A;** External positioning of two 5-mm trocars through the single transumbilical incision, a nylon suture, and a Mini-loop retractor for the marionette method. **B;** The fundus of the gallbladder was suspended by nylon suture with a laparoscopic sliding knot. The marionette method can provide good tension and an appropriate laparoscopic view at the triangle of Calot.

Fig.1A

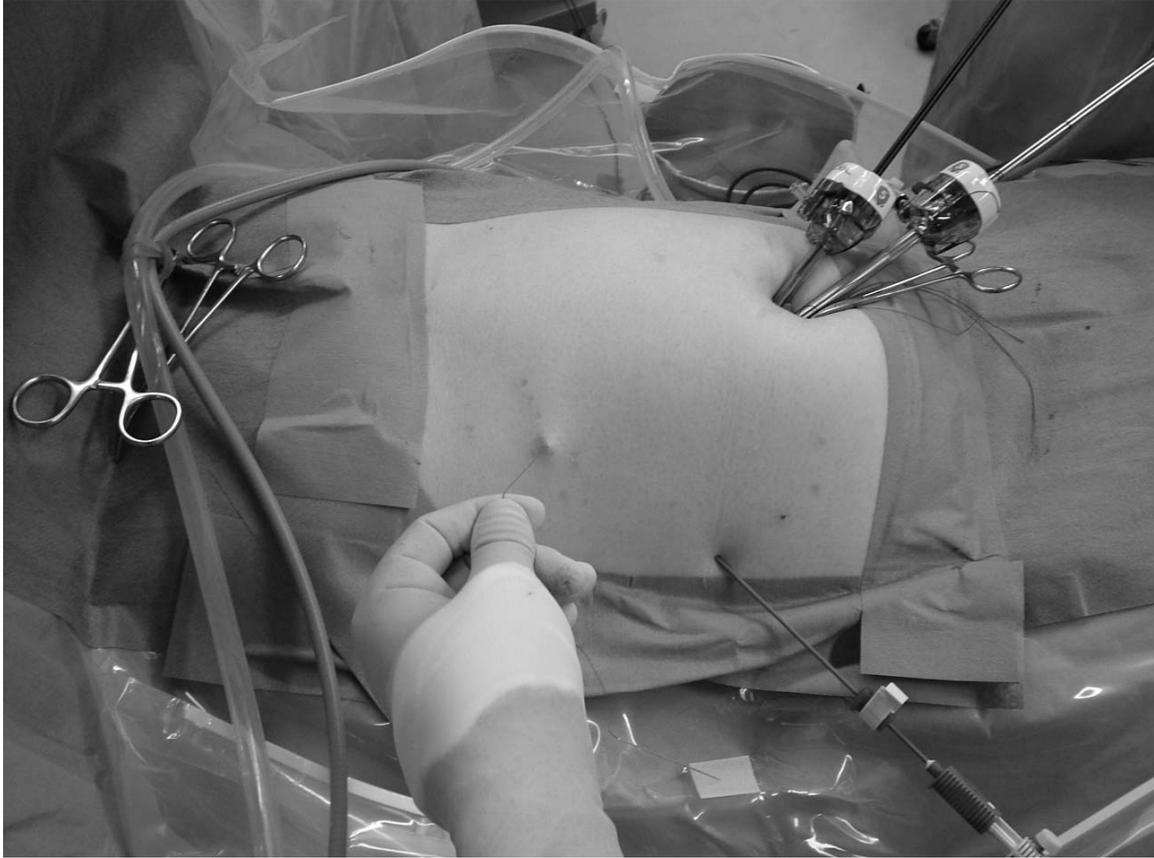


Fig. 1B

