

Case Report

A case of laparoscopic excision of choledochal cyst, hepaticojejunostomy, and Roux-en-Y anastomosis using Artisential®

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Choledochal cyst is a condition involving an abnormal dilation of the bile ducts, which can lead to various symptoms and comorbidities, including cancer. The treatment of choice for choledochal cyst is surgical correction including choledochal cyst excision and Roux-en-y hepaticoenterostomy. Minimal invasive methods like laparoscopic methods or robotic methods are used for surgical correction of choledochal cysts; however, it is still controversial which method is superior. A Korean company, LIVESMED, developed Artisential®, a laparoscopic surgical instrument that can overcome the drawbacks of laparoscopic methods. This article presents a case of the first Artisential®-performed surgical excision of a choledochal cyst and hepaticojejunostomy.

Key Words: Choledochal cyst; Laparoscopic surgery; Case reports

INTRODUCTION

Choledochal cyst is a rare congenital disorder that affects the bile ducts, which are responsible for transporting bile from the liver to the small intestine. While the exact cause of choledochal cyst is still unknown, genetic factors or abnormal pancreaticobiliary junctions, such as anomalous pancreaticobiliary duct union (APBDU), are reported to play a role in its development [1]. This condition is characterized by an abnormal dilation of the bile ducts, which can lead to a variety of symptoms and complications, including abdominal pain, jaundice, pancreatitis, and even cancer. Therefore, early diagnosis and prompt treatment, which involves surgical correction, are essential [2].


Due to advances in surgical techniques, it is now possible to perform minimally invasive hepatobiliary surgeries. Among them, the excision of choledochal cyst is efficiently performed by minimally invasive methods including laparoscopic or robotic methods.

Recently, an articulating laparoscopic instrument called Artisential® (LIVSMED) was developed. Artisential is a hand-help type instrument whose end effectors can move freely. Its multi-joint-end-effectors allow for articulation, which is essential for accessing narrow surgical sites and precision surgery (Fig. 1A). Despite the fulcrum effect in laparoscopic instruments, the movement of the surgeon's hand, wrist, and fingers are synchronized with the corresponding movements of the end-effector (Fig. 1B). Artisential® has two joints that move both horizontally and vertically, synchronized with the surgeon's hand movement (Fig. 2A). Also, its lock function enables the user to timely lock the end-effector, allowing the surgeon to effectively utilize the tool (Fig. 2B). Its multi-degree-of-freedom can show a similar range of movements with robotic surgery.

In this report, we present a case of laparoscopic Artisential®-assisted correction of a choledochal cyst and discuss the prospects of Artisential® in hepatobiliary surgery.

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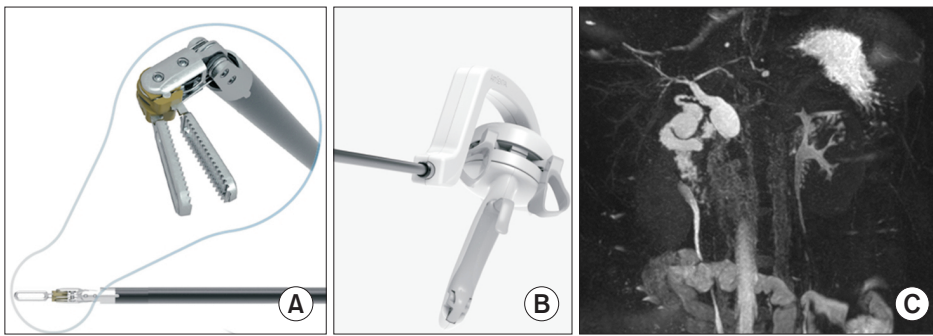


Fig. 1. (A) The Multi-joint-end-effector of Artisential®. (B) The handle part of Artisential®. Its movements are synchronized with the end effectors shown in (A). (C) Magnetic resonance cholangiopancreatography results show choledochal cyst and anomalous pancreaticobiliary duct union.

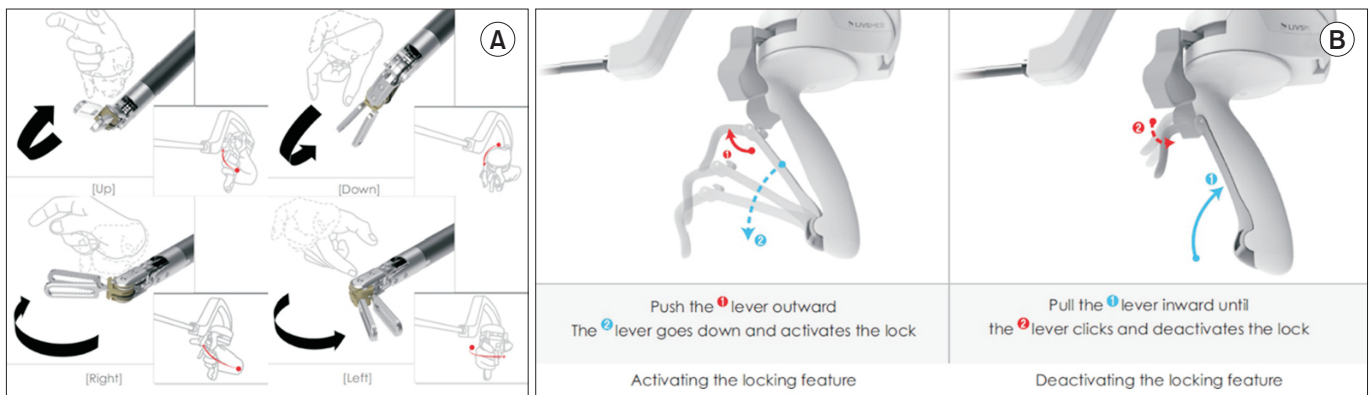


Fig. 2. (A) The Artisential® brochure demonstrates the synchronized movement of the end-effector. (B) The Artisential® brochure demonstrates the lock function.

CASE

Patient

A 30-year-old female patient visited our department after being diagnosed with choledochal cyst. She had no remarkable medicosurgical history. She had been experiencing indigestion for months. Fusiform dilatation of the common bile duct with APBDU was noted (Fig. 1C) in her magnetic resonance cholangiopancreatography (MRCP) results. She was planned for elective Artisential®-assisted laparoscopic choledochal cyst excision and Roux-en-Y hepaticojejunostomy with side-to-side jejunojejunostomy.

Operative techniques

The surgical techniques were similar to our previous reports [3]. Basically, our technique is a laparoscopic resection of a choledochal cyst, followed by laparoscopic or robotic reconstruction for bilioenteric anastomosis. In brief, the hepatoduodenal ligament near the choledochal cyst was dissected up to the intrapancreatic portion. The dilated common bile duct was excised by clamping the proximal part while performing division and ligation at the distal part via endo-GIA (Fig. 3A). After bleeding control, posterior continuous and anterior interrupted single-layer anastomosis was done utilizing the synchronized movement of Artisential® (Fig. 3B, Supplemen-

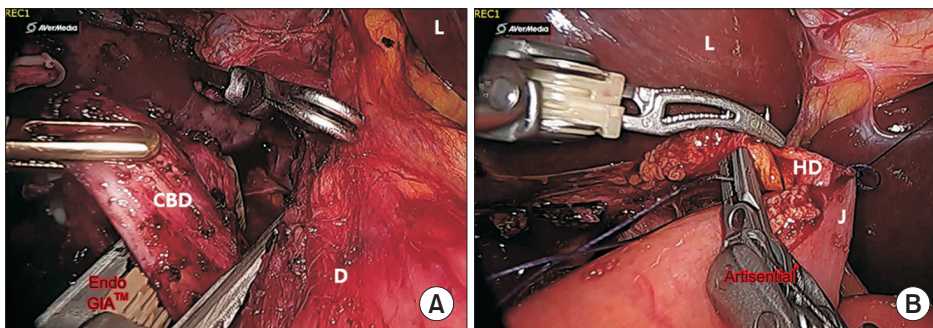


Fig. 3. The surgical process. (A) Excision of choledochal cyst. Endo GIA™ is used to clip CBD. (B) Hepaticojejunostomy is performed by Artisential®. CBD, common bile duct; L, liver; D, duodenum; HD, hepatic duct; J, jejunum.

tary Video 1). Subsequent jejunojunostomy is usually done by manual reconstruction through a small umbilical wound or intracorporeal anastomosis. In this case, after resection of the choledochal cyst, we performed hepaticojunostomy by using Artisiental[®] instead of a robotic surgical approach.

Perioperative outcome

Total operation time was 152 minutes. The patient experienced tolerable postoperative pain and minimal estimated blood loss. The patient started diet build-up starting with a level II soft diet on the third postoperative day. On the fifth postoperative day, an abdominal-pelvic computed tomography was performed and it showed no postoperative complications except for minimal amounts of intraperitoneal air. She was discharged on the sixth postoperative day with no other complications.

DISCUSSION

Total resection of choledochal cyst and Roux-en-Y hepaticojunostomy is generally accepted as the treatment of choice for choledochal cysts. However, the superiority of robotic methods compared to laparoscopic methods, for surgical correction of choledochal cysts, is still under debate [4-6]. Notably, laparoscopic methods have potentially higher risks for acute complications due to the well-known drawbacks including limited movement freedom and the fulcrum effect.

However, robotic methods are still not easily accessible due to their significantly higher costs compared to laparoscopic methods. In the case presented herein, hepaticojunostomy was safely, and precisely performed. The absence of surgical complications could be attributed to the use of Artisiental[®]. Compared to conventional laparoscopic methods, the articular motions of Artisiental[®] could minimize the damage to the surrounding tissues, especially when the angle of approach to surgical sites is not ideal. Also, Artisiental[®] is far more cost-effective than robotic methods and provides tactile feedback. Therefore, Artisiental[®] could overcome the disadvantages of laparoscopic methods and could be a better alternative to the expensive robotic methods in surgical correction of choledochal cyst and other hepatobiliary surgeries.

This is the first report of Artisiental[®]-assisted hepaticojunostomy in laparoscopic surgical correction of choledochal cyst. The results of the surgery were satisfying, showing the certainty and potential clinical application of the Artisiental[®], a Korean technique. However, Artisiental[®] has several drawbacks. Since it is a hand-held instrument, its rotational movement is limited to the range of supination and pronation of the surgeon's hand. Also, the use of Artisiental[®] requires incision of 8 mm rather than 5 mm (mostly used in laparoscopic methods), which contradicts the aim of minimally invasive surgery. Finally, its end-effector mimics the surgeon's hand, wrist, and fingers, while still having the fulcrum effect. Due to this "in-

compatibility," surgeons need a lot of practice on the use of this instrument, leading to a shallow learning curve. Still, our experience using the Artisiental[®] provided more a precise and delicate approach compared to conventional laparoscopic surgery. Further research regarding the benefits and cost-effectiveness of Artisiental[®]-assisted laparoscopic methods over conventional laparoscopic methods and robotic methods is required.

SUPPLEMENTARY DATA

Supplementary data related to this article can be found at <https://doi.org/10.14701/ahbps.23-114>.

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CONFLICT OF INTEREST

Some research allowance was provided to corresponding author.

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AUTHOR CONTRIBUTIONS

Conceptualization: CMK. Data curation: YS. Methodology: All authors. Visualization: All authors. Writing - original draft: YS. Writing - review & editing: CMK.

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