Single-incision Robotic Cholecystectomy: Initial Experience and Results

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Although there have been many studies of the safety or feasibility of single-incision laparoscopic surgery (SILS) since it was first performed in 1997,¹ most surgeons agree that it has disadvantages such as difficulty conducting triangulation, instrument crowding, and collisions.²⁻⁴ To overcome these limitations of laparoscopy, the robotic platform was developed, providing advantages including three-dimensional view, magnification, and an articulated instrument.⁵ However, robotic surgery requires a longer set-up time and operation time than laparoscopy.⁶ For single-incision robotic cholecystectomy (SIRC), there are debates regarding operation time, with some authors reporting a longer operation time for SIRC than SILS (98 vs 68 min, $p < 0.001$).⁷ Conversely, a significant difference in operation time was reported for RSSC (62 min) and SILS (83 min).⁸ A recent multicenter study showed a short operative time of RSSC of 52 min with a decreasing trend after 55~85 cases.⁹ However, that study was limited in that it did not include a comparative analysis for SIRC. In the present study, the operation time was 97.2 min, the console time was 49 min, and the docking time was 10 min, which is similar to other reports.^{7,10} The authors also described a decreasing trend of console time with accumulation of experience, indicating the potential to overcome the long operation time of SIRC.

The first single-incision robotic cholecystectomy (SIRC) was successfully performed in humans in 2010,¹¹ and the safety and feasibility of SIRC have since been published in many reports. Moreover, there have been no severe complications, such as injury to the bile duct or conversion to laparoscopy or open surgery,^{11,12} although one case of postoperative hemorrhage associated with SIRC has been reported.¹³ Additionally, some authors have investigated cosmetic outcome and postoperative pain in comparative studies,^{14,15} with less pain and better cosmetic outcomes occurring in SILC.^{16,17} The results of the present study also showed good outcomes without any conversions or complications, even when no additional port was used during the procedure. In another recent study, the authors reported their experience of SIRC in a broadly inclusive patient population with six conversions to laparoscopy, one to open surgery, and one aborted case.¹⁸ Here, we focus on indications of SIRC. The surgical outcome in earlier studies was excellent because the initial inclusion criteria in most studies were limited in symptomatic gallstones or gallbladder polyps, and did not include high BMI or acute cholecystitis.^{6,8} To clarify the effectiveness of SIRC, operative indications should be extended in all cases of gallbladder diseases. However, gallbladder retraction is not easy in cases of edematous or dense

fibrotic tissue. Some authors have described several methods of gallbladder retraction using sutures, clips, and magnets.^{19,20} In fact, few instruments of robotic single-site platform are articulated, unlike multiport robotic systems. This is a strong point to explain the reason why the widening of indication is difficult. According to a previous report, there are limitations to this procedure, such as short-term follow up and selection bias.⁹ Specifically, they found that the follow up period was too short to show the incisional hernia rate. Accordingly, additional studies investigating long-term outcomes are needed to establish the incisional hernia rate.

Single-incision robotic cholecystectomy is a safe procedure for gallbladder diseases. However, several problems need to be solved to adapt the SIRC to all patients with gallbladder diseases, such as cost, indications, and incisional hernia. Therefore, further studies to clarify the benefits of SIRC are needed to investigate long-term outcome and provide a large comparative analysis of laparoscopic and multiport robotic procedures.

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