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Original Article

Si-Wa Hand Port for Hand-Assisted Laparoscopic Surgery: An Innovative Device

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Abstract ***Objective:*** **To demonstrate a newly invented inexpensive hand port device and to evaluate its performance in the Hand-Assisted Laparoscopic Surgery [HALS].**

Materials & Methods: **We invented a new reusable hand port named" Si-Wa (Sirinuch -Warisara)" Hand Port from used, impaired commercial hand port and inexpensive materials. The technique of assembly was described. The device was evaluated with the satisfactory questionnaire by five gastrointestinal surgeons in the Department of Surgery, Faculty of Medicine Siriraj Hospital after using this new device.**

Results: **From the satisfactory questionnaire acquiring from the surgeons who used this new device for Hand-Assisted Laparoscopic Colectomy in 40 patients, the statistic analysis indicated that the device was effective for maintaining the pneumoperitoneum condition, safety for the patients and saving cost. All of these answers were ranked in the "Very Good" level.**

Conclusion: **Si-Wa hand port is an effective and inexpensive device for using in Hand-Assisted Laparoscopic Surgery.**

Key words: **Laparoscopic Surgery, Hand Port, Laparoscopic Colectomy**

Background

Colon cancer is the fourth most common cancer in the world with the annual mortality rate of 655,000[1]. Currently the most popular treatment for colon cancer is laparoscopic colectomy due to the advantage of having small wounds and less pain compared to open surgery. The outcome can bring about shorter recovery time hence patients can go back to work sooner.

At present, advanced laparoscopic colectomy can be performed by two methods. The first one is total laparoscopic surgery. The second one is Hand-Assisted Laparoscopic Surgery [HALS]. In HALS, surgeons inserted one hand through a special device (hand port) for manipulating intra-abdominal organs while it could preserve pneumoperitoneum state resulting in shorten duration of the operation[2]. In the

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Department of Surgery, Faculty of Medicine Siriraj Hospital, we adopted both methods for the treatment of colorectal cancer patients. However, the hand port equipment is not yet popular because it is very expensive (approximately 20,000 Thai baht or 700 US Dollars) and a disposable device. The materials are delicate and easily torn. Moreover, it is difficult to be cleaned thoroughly which could cause infections if reuse in another patient. This could increase the costs for the patient and for the hospital.

The authors have invented a new hand port device named, "Si-Wa (Sirinuch-Warisara)" Hand Port, which is made from cheaper materials already existed in the operating room together with some parts from impaired and previously used, commercial hand port. Those materials can be adapted effectively to each patient's physical condition. It is also easily dissembled and cleaned thoroughly before the next use. As a result, it could save an extra budget for the hospital. The present study described experiences in invention of this new hand port for HALS and assessed the satisfactory outcome among surgeons using this device.

Materials & Methods

The following materials in operating theater were needed to prepare:

1. New rubber glove No. 8
2. Some parts from impaired Hand Port
3. Scissors & ruler
4. Rubber band

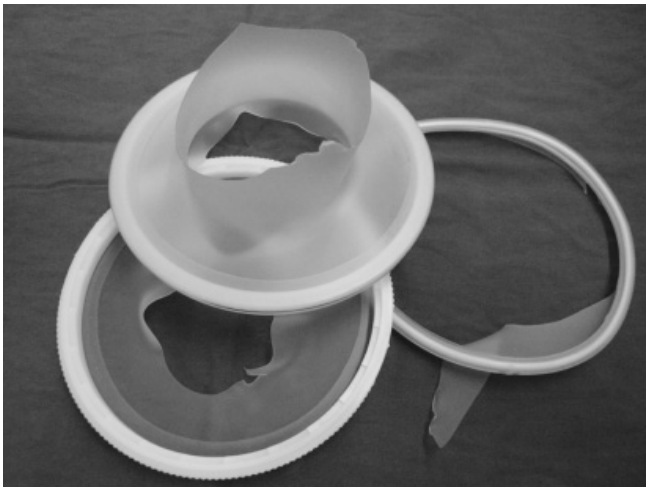

Figure 1 The impaired commercial Hand Port was unpeeled to three silicone rings.

First, the silicone part of the impaired Hand Port was unpeeled to get a big plastic ring, a small plastic ring and a silicone ring (Figure 1). The finger parts of the new glove were cut off by measuring 12 inches from the edges. The edge of the glove was tied with the small plastic ring. The glove's edge was inside of the ring and then tied with a rubber band (Figure 2). Another edge of the glove was inserted through the big plastic ring and tied tightly with rubber band by letting the band be inside the ring. The first ring was left 1.5 cm away from the second ring (Figure 3). Using another new glove, the side with no edge was tied to the big ring then tied

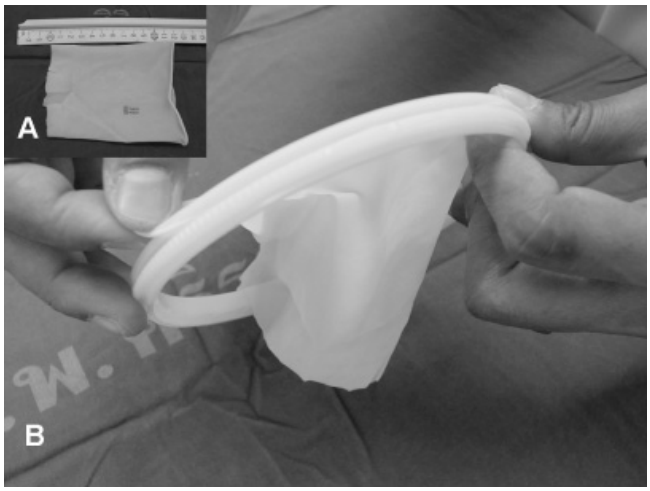

Figure 2 The glove was cut to be 12 inches (A) and use the edge of the glove to tie with the small plastic ring, fixed with a rubber band (B).

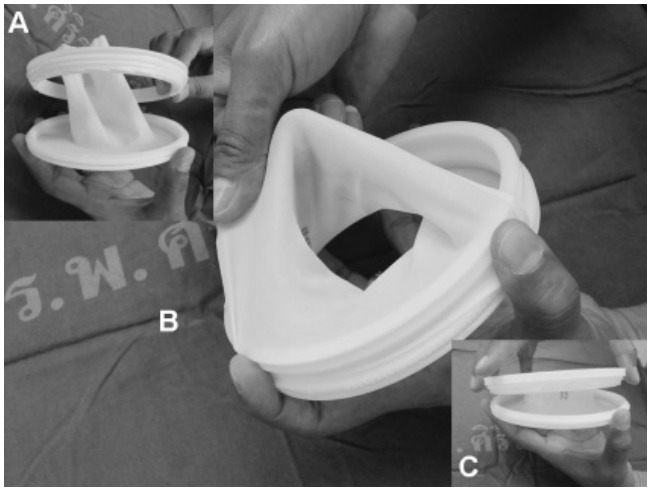

Figure 3 Another edge of the fixed glove was inserted through the big plastic ring (A), fixed with a rubber band (B) and left the first ring 1.5 cm away from the second ring (C).

Figure 4 Another cut glove was fixed with the second ring by the rubber band (A & B).

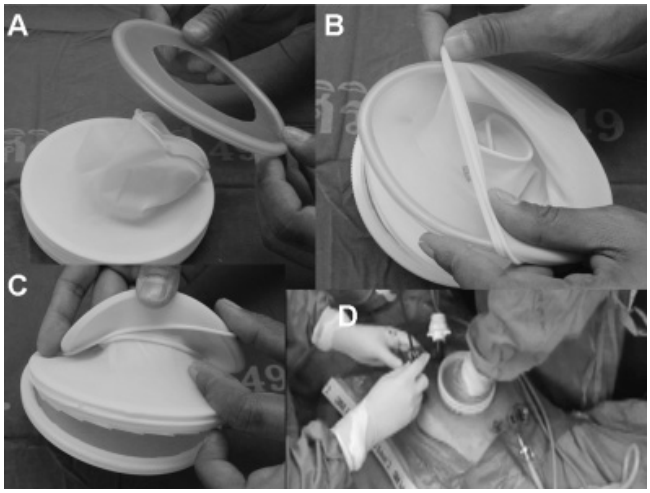

Figure 5 The edges of both gloves were inside the third silicone ring (A&B). Then, the edges of the gloves were reverse to cover the ring (C). Finally the "Si-Wa" hand port could be used in HALS (D).

Table 1 The questionnaire used for the satisfactory evaluation of Si-Wa hand port

Satisfaction criteria	Very good (4)	Good (3)	Fair (2)	Improvement needed (1)
1. Effectiveness to hold pneumoperitoneum status				
2. Patient safety				
3. Quality of the device				
3.1 Equipment flexibility				
3.2 No pressure on both of the surgeon's wrists				
3.3 Durability of the equipment to use until completing the surgery				
4. Saving cost				
5. Overall satisfaction towards the equipment				

tightly with the rubber band with the band inside the ring. The last glove was brought to top the finished one and then the same steps were done (Figure 4). Both gloves were inserted using the sides that had edges into the silicone ring. The edges of the gloves were reversed to cover the silicone (Figure 5). Finally the materials were sterilized with ethylene oxide gas before use.

Results

The newly invented hand port "Si-Wa" had been used in the Division of General Surgery, Department of Surgery, Faculty of Medicine Siriraj Hospital since 2007. Between October 2007 and February 2008, the data were prospectively collected from five surgeons who used this hand port in 40 cases of HALS colectomy. The results from the questionnaire for performance evaluation of the device were separated into four levels: Very Good (4), Good (3), Fair (2), and Improvement needed (1) (Table 1). Analyzing from the question-naire's statistics, the average value of performance was categorized into four levels: very good (3.5-4.0), good (2.5-3.49), fair (1.5-2.49), and improvement needed (≤ 1.49). After collecting and analyzing the data on the usage of Si-Wa hand port, the satisfaction level of all criteria was in very good level (Table 2).

Discussion

We have described the technique to produce the "Si-Wa" hand port. With "Si-Wa" hand port, the

Table 2 The results of the evaluation of Si-Wa hand port in 40 HALS operations

Satisfaction criteria	X ± S.D.	Level
1. Effectiveness to hold pneumoperitoneum status	3.6 ± 0.54	Very Good
2. Patient safety	4.0 ± 0.00	Very Good
3. Quality of the device	3.8 ± 0.39	Very Good
3.1 Equipment flexibility	3.8 ± 0.39	
3.2 No pressure on both of the surgeon's wrists	3.8 ± 0.39	
3.3 Durability of the equipment to use until completing the surgery	3.8 ± 0.39	
4. Saving cost	3.8 ± 0.39	Very Good
5. Overall satisfaction towards the equipment	3.8 ± 0.39	Very Good

technique of peritoneal insertion is slightly more difficult than the other hand port because of its elasticity. However, it is suitable for different size of surgeons' wrist and is more comfortable than the commercial one. For cleaning process, it is very easy and more effective than the other hand ports because all of its parts can be removed except three remaining plastic loops for disinfection process and reproducing a new "Si-Wa" hand port. In this study, there were few surgeons completed the questionnaires for the efficiency evaluation of "Si-Wa" hand port. Therefore the result may be not adequate to proof "Si-Wa" hand port's efficiency.

Conclusion

In summary, the satisfaction level of surgeon in operating room toward the "Si-Wa" hand port is in the "very good" level. This reveals that the new device is effective, safe and cost saving for use in case of HALS in advanced laparoscopic surgery.

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