HandPort Laparoscopic Surgery—Review and Current Status

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Abstract HandPort laparoscopic surgery is a hybrid operation that allows the surgeon to introduce his nondominant hand into abdominal cavity through the port while maintaining pneumoperitoneum. It also helps to gain experience and expertise to learn advanced laparoscopic procedures. The common surgeries where HandPort is useful are laparoscopic splenectomy, colectomies, and donor nephrectomies. HandPort facilitates dissection and extraction of specimens. Hand in abdomen restores tactile sensation which is lacking in laparoscopic procedures. It reduces operative time, increases technical expertise of surgeon, and decreases blood loss. This article reviews the current status of HandPort laparoscopic surgery, the various HandPort devices, and their use.

Keywords HALS · HandPort · Nephrectomy · Colectomy

Introduction

HandPort laparoscopic surgery was introduced in 1990. The first device which was used for hand-assisted laparoscopic surgery (HALS) was extraperitoneum access bubble [1]. HALS has incisions larger than those used for laparoscopic surgery by putting HandPorts for performing advanced laparoscopic surgery. This hybrid surgery allows the surgeon to introduce nondominant hand into abdominal cavity through port while maintaining pneumoperitoneum. Hand-through HandPort replaces laparoscopic instruments for tactile and manual dexterity. HALS is a direct-access technique for advanced laparoscopic surgery. This article enumerates the

various HALS devices and their application in laparoscopic surgery.

Discussion

Devices used for HALS developed numerous innovations that allowed maintenance of intra-abdominal pressure. The six common devices available for HALS are:

1. HandPort (Smith and Nephew Endoscopy, Andover MA, USA)
2. GelPort (Applied Medical, Rancho Santa Margarita, CA, USA)
3. Lapdisc (Ethicon Endosurgery, Cincinnati, OH, USA)
4. Omniport (Advanced Surgical Concepts, Dublin Ireland)
5. Intromit (Applied Medical)
6. Pneumosleeve (Dextrity Inc., Roswell, GA, USA)

Each device has specific properties that are advantageous for a particular procedure. Hand-assisted devices could be used for those cases that required larger incisions for specimen extraction. HALS device is useful when surgeons used it for laparoscopic port for direction. Surgeons should adhere to the concept of port site triangulation, and HandPort devices should not be placed directly over target organ. The fascial incision should be measured and made to approximate the surgeon's glove size. The incision should be placed where it would be convenient to be enlarged for open conversion if necessary and for extracting large specimens. The surgeon usually uses a hand-through device for retraction and dissection. Fascial incision required for HALS made during and after surgery for performing anastomosis and removing large specimens should be similar to that needed for placement of HALS device. There are various HandPort devices

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available. HandPort is a bulky, lap disk and is efficient and neat, but the valve is difficult to rotate when the hand is inside. GelPort works well, but is bulky. Intromit and Dexterity devices have adhesive flanges. A study comprising the various HandPort devices compared 39 surgeons using HandPorts, 47 using Intromit, and 47 using Pneumosleeve. The three devices are effective, each having specific advantages and disadvantages. Intromit devices had the highest rating for instructions, maintenance of pneumoperitoneum, retrieval of specimens, and sturdiness [2]. HandPort is a device through which surgeons could insert the hand for surgery and it could be insufflated to maintain pneumoperitoneum, allowing an accessory trocar and instrument to be inserted through the device (Fig. 1). HandPort device consists of wrist cuff with a spiral inflatable tubular valve between the outer and inner rings.

A systemic search was done in MedLine for various studies using HandPort. Targorana et al. randomized patients for HALS and conventional laparoscopic surgery and found that return of bowel sounds, length of hospital stay, and analgesic requirement were similar. They were able to prove oncological equivalence with cytology, lymph node status, and specimen length [3]. Nakajuna et al. showed similar recovery, duration of anesthesia, bowel sounds, diet, and hospital stay between laparoscopic surgery and HALS.[4].

Laparoscopic splenectomy has become a routine procedure for removal of normal-sized spleen. Laparoscopic splenectomy using HandPort improves the maneuverability and helps the surgeon in dissection. These devices are equal to the glove size of the surgeon (Fig. 2). Targorana et al. compared hand-assisted splenectomies with laparoscopic splenectomies and found that HALS technique was associated with lesser morbidity and shorter hospital stay [5]. Rosen et al. compared hand-assisted with laparoscopic splenectomies and found that length of hospital stay was (5.4 vs 4.2 days) and complication rate (36 vs 16 %) was lesser for the HALS group than the laparoscopic group [6]. Borrazzo et al. reviewed 49 patients undergoing laparoscopic splenectomy for larger spleens (spleen length,

Fig. 2 Photograph showing HandPort (Ethicon) used for splenic surgery

17 cm; weight, 600 g). Laparoscopic splenectomy has become the gold standard procedure because of its superior outcome. HALS is a well-accepted option for cases of severe splenomegaly because of the difficulties in manipulating the spleen [7].

Hand-assisted technique shortens the learning curve for difficult laparoscopic procedures. Hand-assisted laparoscopic surgery is useful for extracting large specimens like the spleen and colon [8, 9]. The presence of surgeons' hand through HandPort inside the abdomen improves visual–spatial orientation and performance of laparoscopic tasks [10].

Prospective randomized study of hand-assisted donor nephrectomy was able to demonstrate 47 % reduction in analgesic use and 73 % reduction in pain at 6 weeks follow up in the hand-assisted group [11]. Bemelemen et al. compared HALS nephrectomy with laparoscopic nephrectomy, and concluded that operative time was reduced for HALS group [12]. HALS-assisted laparoscopic donor nephrectomy are easier to learn and provide confidence to surgeon without significant laparoscopic experience because hand is able to utilize tactile sensation and apply pressure to control bleeding. Warm ischaemic time is shorter in the hand-assisted laparoscopic technique. Hand-assisted surgery is indicated for donor nephrectomy

Fig. 1 Photograph showing HandPort device (Ethicon)

Fig. 3 Photograph showing HandPort device (Ethicon) used for colon surgery

and colectomies because of speed and safety. Conversion rates are lower in hand-assisted surgery for colonic surgery [13]. Nakajima et al. studied 100 patients between February 2001 to July 2003. In their study, the estimated blood loss was 33–40.3 ml and time taken was 168 ± 47.6 min. They concluded that hand-assisted donor nephrectomies are technically feasible, cause lesser blood loss, lesser postoperative pain, and would make laparoscopic donor nephrectomy widely available [14]. Lahhas et al. reviewed 230 donor nephrectomies and found that operative time was 107 min, blood loss was 112.4 ml, complication was 12.6 %, and conversion to open surgery was 1.3 %. The HandPort decreases extraction time for nephrectomy and allows safer method for extraction and decreases error [15] (Fig. 3).

Retrospective analysis of 25 cases of hand-assisted colorectal resections showed that they are easier to learn and are initial learning curve for laparoscopic colorectal surgery [16].

Dai et al. studied 26 patients who underwent resections for liver segments, splenectomy, hemicolectomy, ileocelectomy, and subtotal gastrectomy. Duration of surgery was around 2 h, blood loss was 80–120 ml, and conversion was 3.8 %. Patients had uneventful postoperative period with lesser pain and faster recovery compared with conventional surgery. HandPort combines the advantage of open and laparoscopic techniques achieving better hemostasis, shortening operative time, and is beneficial to patients [17]. The HALS Study Group Multicentric Trial randomized and prospectively compared studies for colorectal diseases. They were able to demonstrate the equivalence in the length of hospital stay, postoperative pain, and recovery [18].

HandPort decreases the learning curve between open and laparoscopic surgery. There is, however, a risk of developing incisional hernia. A retrospective review of the HALS procedure performed between July 2006 and June 2011 on 405 patients showed that there was incidence of 10.6 % incisional hernia [19].

Sundbom et al. applied HandPort devices for lap Roux-en-Y gastric bypass which was placed in the right subcostal region. Operative time was 205 min and hospital stay was 5 days. HandPort lap Roux-en-Y gastric bypass makes surgery faster and safer without losing essential benefits of total laparoscopy [20].

Majority of surgeons are right handed, thus the authors preferred placing HandPort device from the left lower quadrant, lateral to rectus abdominis especially in pelvic and gynecological surgeries. HALS could be used for pelvic lymph node dissections and evaluation of peritoneal and retroperitoneal structures. Hand-assisted gynecological surgery has been used for pelvic diseases and endometriosis. There is decreased bleeding, retraction of bowel, and mesentery is easier; retrieval of large specimens is facilitated by using HandPort. Lateral HandPorts are placed for surgeon's ease and accessibility. Authors analyzed 29 cases and concluded that blood loss

and shorter hospitalization was seen for the HALS group for gynecological procedures [21].

Conclusion

Hand-assisted laparoscopic surgery have reduced the learning process for the laparoscopic surgeon. HandPort laparoscopic surgery allows surgeon, skilled at open surgical procedures, to transfer skills to laparoscopic procedures. HandPort surgery is easier to learn and provides confidence to surgeon for advanced laparoscopic surgery. For surgeons starting advanced laparoscopic surgery, HandPort provides tactile sensation of hand inside peritoneum. HandPort helps surgeon to gain experience and expertise for learning advanced laparoscopic surgery and reduces operative time and blood loss. Effort should be made to learn this promising technique before starting advanced laparoscopic surgery.

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