

Hand-Assist Laparoscopic Surgery for the Gynecologic Surgeon

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ABSTRACT

Background: Hand assist laparoscopy (HALS) is a minimally invasive technique which allows for the placement of the surgeon's non-dominant hand through a hand-port device while maintaining pneumoperitoneum. There is no standardization of this procedure and it is rarely used in gynecology.

Methods: The multidisciplinary team of authors, with experience in minimally invasive pelvic surgery, has developed a practical approach performing HALS over several years. Here we present our technique.

Conclusions: There are several roles for HALS in the world of gynecology and pelvic surgery. Further experience will help improve upon a standard technique.

Key Words: Hand assist laparoscopy, minimally invasive pelvic surgery, technique, gynecology.

INTRODUCTION

Hand-assist laparoscopic surgery (HALS) is a minimally invasive surgical modality unfamiliar to many gynecologists. Generally used by general surgeons when performing low anterior resections, HALS is not taught in the majority of residency programs, and by and large it is a modality unfamiliar to most gynecologists. After reviewing the literature, it became obvious that many benefits are associated with the HALS procedure. Our hope is to familiarize the gynecologic community with this technique. Furthermore, there has been no standardization or studies to look at the best technique for placing and positioning the hand-assist port for gynecologic/pelvic surgeries. Here, a multidisciplinary team consisting of a minimally invasive gynecologic specialist and 2 fellows, a urogynecologist, and minimally invasive general surgeon, hope to propose a technique for optimal port placement for HALS and to discuss some of the potential benefits to using HALS in gynecologic surgery. This technique has been developed over several years, and the surgeons have done a combined number of over 200 HALS procedures.

INDICATIONS, ANATOMY, AND PORT PLACEMENT

The majority of gynecologists may consider converting a laparoscopic procedure to HALS secondarily to distorted anatomy, particularly pelvic side-wall disease, rectovaginal endometriosis, and/or dense adhesions. Furthermore, HALS can be used when the surgeon is faced with the inability to continue laparoscopically for various other reasons, such as excessive bleeding, difficulty retracting bowel and mesentery, troublesome retrieval of large specimens, long operative times, surgeon skill, or difficulty suturing laparoscopically (**Table 1**). As with trocar placement during minimally invasive surgery procedures, when using the HALS approach, it is important to consider the patient's anatomy. Because gynecologic surgeries involve both midline and lateral structures, namely the uterus and adnexa, a lateral port placement may be optimal for surgeon ease and accessibility to the pelvis.

We suggest planning for port placement by tracing the hand-assist port device in the proposed location before

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Table 1.

Potential Benefits of Hand Assisted Laparoscopic Surgery

Maintains tactile sensation of an open procedure
Maintains superior visualization of a laparoscopic procedure
Allows the surgeon to see and feel in a deep pelvis
Potential better control of hemostasis, immediate digital hemostasis
Better cosmesis
Decreased risk of wound infection
Decreased blood loss
Decreased hospital stay
Decreased post operative pain
Less post operative narcotic use
Allows for removal of specimens though hand port that should not be morcellated
Distension from the pneumoperitoneum aids in dissection and visibility

the initiation of a case, if the surgeon anticipates the possible conversion to HALS (**Figure 1**). The circle traced on the patient's abdomen will facilitate the surgeon later in the case once the abdomen is insufflated. Because the majority of surgeons are right handed, we propose placing the hand-assist port in the left lower quadrant, lateral to



Figure 1. The Hand Assist (HA) port is marked prior to initiation of the case, in anticipation of conversion to HALS. The incision is placed in the left lower quadrant and should measure 0.5 cm less than the surgeon's glove size (approximately 5.5–7.5 cm). The left lower quadrant traditional trocar is placed through this marked line if the case is started laparoscopically. It can later be removed and extended to accommodate the HA port.

the rectus abdominus muscles, approximately 3 finger-breadths above the anterior superior iliac spine so that surgeons may place their nondominant hand comfortably though the incision. The primary surgeon should stand on the patient's left side and can then reach across the table to control the laparoscopic instruments (**Figure 2**).

The traced circle in the proposed area of placement allows the surgeon to avoid placing other trocars near the hand-assist port. Poor placement of the hand-assist port can result in obstruction of the view from the laparoscope by surgeon's intraabdominal hand. We suggest that the camera trocar be placed at least a palm's breadth away from the hand-assist port to avoid any interference. Because most camera ports are placed through or in the vicinity of the umbilicus in gynecologic surgery, depending on the size and body habitus of the patient, care should be taken to ensure adequate distance between the hand-assist port and the camera.

Furthermore, one should consider placing the right lower quadrant traditional trocar first. With the abdomen insufflated and the laparoscope in the umbilicus, the surgeon can then evaluate anatomy and decide whether the case should be attempted laparoscopically or proceed immediately to HALS. If the decision is made to proceed with HALS, the hand-assist port can be placed initially, without having to remove a previously placed left lower quadrant laparoscopic trocar. If the case is attempted laparoscopi-



Figure 2. HALS Set-Up. 5mm laparoscope placed just above (or into) umbilicus. Hand Assist port in left lower quadrant with surgeon's non dominant (left) hand placed in port with iris valve turned to maintain pneumoperitoneum. Right lower quadrant port with traditional 11 mm trocar is controlled by the surgeon's dominant (right) hand or an assistant.

cally, the traditional trocar should be placed through the marked HA incision site. Therefore, should the case be converted to HALS, the trocar incision is simply extended to accommodate the HA port. This ensures one incision site and provides improved cosmesis.

If the pneumoperitoneum is already established, the incision made in the left lower quadrant should measure approximately 5 cm to 9 cm in length. The size of the incision is based on the size of the surgeon's hand. In general, if pneumoperitoneum has already been established, the incision should be 0.5-cm smaller than the surgeon's glove size. Thus, a surgeon who wears a size 7 glove would make a 6.5-cm incision. The insufflated abdomen stretches the skin, and therefore a smaller incision is usually adequate. If the incision is made before insufflation of the abdomen, it should be made 1 cm to 2 cm smaller than the surgeon's glove size. This allows for the anticipation of the stretch in the skin once the abdomen is insufflated. The incision is made in an oblique to horizontal fashion.

Once the skin incision is made, the subcutaneous fat layer is dissected down to the fascia. The surgeon must be aware of the location of the superficial epigastric vessels when dissecting the subcutaneous fat layer. In thin patients, this can usually be accomplished by transillumination of the abdominal wall with the laparoscope. In those patients whose superficial epigastrics cannot be visualized by transillumination, the surgeon can anticipate these vessels approximately $5.6 \text{ cm} \pm 1 \text{ cm}$ from the midline.¹ Once the fascia is opened, the external and internal oblique muscles are split, and the peritoneum identified and entered with caution. At this point, the surgeon should be aware of the location of the inferior epigastric vessels that usually can be visualized directly as they lie medial to the obliterated umbilical artery that can be found on its initiation near the insertion of the round ligament in the pelvis. In most cases, pneumoperitoneum has already been established, so the laparoscope may be used to observe as the incision is being made to avoid injury to these vessels as well as the bowel or other underlying structures.

PORT INSERTION

Once the peritoneum is opened, either side of the incision should be tagged with suture from the peritoneum through to the fascia. Once tagged, the suture on each side should be held with a clamp. The surgeons should place their hand through the incision to ensure that it is

large enough to accommodate their hand prior to inserting the hand-port device.

Several hand-port devices are available on the market for HALS. Most are made of flexible silicon, which allows for easy placement. Each port comes with its own specific instructions for inserting and securing the device. In general, the suture that is tagged on one side of the incision is elevated up while one side of the device is placed into the incision. The round port is bent into an oval shape allowing the edge to slide into the incision. The second suture is then similarly tented up, and the remaining side of the port placed down into the incision on the opposite side. Inspection of the port should be done to ensure that the peritoneal side of the port is flush with the abdominal wall. It is important that no bowel or structures are caught in the underside of the port prior to proceeding. Since the HALS ports are flexible, they do not create the same tissue trauma of a traditional metal retractor. Once the port is securely placed, the surgeon's hand is introduced.

MAINTAINING PNEUMOPERITONEUM

Depending on the type of device used, several measures are available to maintain the pneumoperitoneum. LAPDISC (Ethicon Endosurgery, Inc., Cincinnati, OH) has a rotating adjustable iris valve made of flexible silicone that fits air tight around the surgeon's wrist. Once the surgeon's hand is placed through the port, the iris valve is twisted until the fit is air tight around the wrist, thus maintaining the pneumoperitoneum. The surgeons may also remove their hand and place a trocar through the LAPDISC port and continue the case laparoscopically at anytime should they choose. The iris valve ensures maintenance of the pneumoperitoneum.

Gel port (Applied Medical, Rancho Santa Margarita, CA) has a gel covering which permits for the placement of the surgeon's hand through a malleable gel shield. The malleable gel shield fits air tight around the surgeon's wrist for the maintenance of pneumoperitoneum. Regardless of the port device, surgeons should take measures to ensure that their hand is in a neutral position so that they can triangulate towards the surgical field and avoid discomfort and fatigue in the intraabdominal hand (**Table 2**).

INCISION CLOSURE

Once the procedure is complete, we suggest closing the peritoneum. Although further studies are needed, we feel closure of the peritoneum reduces the risk of adhesion formation and potentially herniation. Our practice is fur-

Table 2.

Potential Disadvantages of Hand Assisted Laparoscopic Surgery

Loss of working space taken up by intraabdominal hand
Potential loss of pneumoperitoneum secondary to leaky hand device (however this has been decreased with new improved devices)
Surgeon discomfort
Pain and morbidity associated with hand assist incision
Cost of the hand assist device
Risk of incisional hernia through hand assist port site

ther supported by extrapolating the results from studies like those of Lyell et al,² which suggest that closure of the peritoneum at the time of cesarean delivery reduces formation of adhesions.

The hand-port incision should then be closed in a traditional running fashion using a 0-Vicryl suture on the fascia. Patients with certain comorbidities, such as diabetes, may require delayed absorbable suture. The surgeon should also consider permanent suture in patients with cancer who will likely require chemotherapy or radiation.

As evident from a small study we conducted, our preliminary, unpublished, data suggest that postoperative hernias though a left lower quadrant port site may be a problem with our proposed placement site and/or closure technique (see companion paper on file with author). However, the small size of our study suggests future investigation is needed to define the optimal closure technique and port-placement site.

POTENTIAL GYNECOLOGICAL INDICATIONS FOR HALS

Gynecologic Oncology

The scant numbers of studies involving HALS in gynecologic surgery appear primarily in the oncologic literature.³⁻⁷ The majority of these studies suggest that HALS may be used as a minimally invasive alternative for evaluation of complex adnexal masses.³⁻⁵ The hand port allows for removal of large masses while lowering the risk of potential rupture and upstaging of a presumed ovarian cancer.⁶ Traditional laparoscopy does not account for easy removal of such complex adnexal masses. Indeed, Gal et al⁸ found an overall rate of rupture of 25% during laparoscopic management of adnexal masses, compared with 9.4% during laparotomy when they retrospectively

compared laparoscopy versus laparotomy for adnexal surgery.

In addition to surgical staging and debulking for ovarian cancer, HALS may also facilitate in difficult pelvic lymph node dissection. The use of the intraperitoneal hand may provide a minimally invasive alternative for gynecological oncologists not comfortable in laparoscopic lymph node dissection. Essentially, the HALS approach provides thorough evaluation of peritoneal and retroperitoneal structures as well as cytoreduction while maintaining the benefits of minimally invasive surgery.

Benign Gynecology

We suggest that HALS be considered in a difficult endometriosis case where there is obliteration of the cul de sac. The intraperitoneal hand allows for the invaluable digital dissection and tactile sensation of an open procedure. On the other hand, when working in the deep pelvis of an obese patient, the superior visualization of the laparoscope is highly advantageous. Because laparotomy incisions in obese patients can be prone to morbidities like an increased infection rate and because visualization is often poor when working in a deep pelvis, we suggest HALS as a viable alternative in these patients.⁹ The benefit of tactile sensation along with the improved visualization of the laparoscope essentially combines the best of both laparotomy and laparoscopy while the patient maintains the benefits of a minimally invasive procedure.

Additionally, from the surgeon's point of view, the use of HALS in the treatment of pelvic organ prolapse has great potential. Due to the complexity of the procedure, many surgeons are not able to complete sacral colpopexies laparoscopically. HALS may allow the surgeon the opportunity to offer a minimally invasive alternative to the traditional abdominal sacral colpopexy.

CONCLUSION

The HALS approach in pelvic surgery offers a little known, safe, viable alternative for gynecological cases that might otherwise require a larger laparotomy incision. Once gynecologists become more familiar with this modality, it may become a standard part of our armamentarium. Prospective studies and more experience are needed to further improve upon the technique for HALS in the world of gynecology.

References:

1. Hurd WW, Bude RO, DelLancey JO, Newman JS. The location of abdominal wall blood vessels in relationship to abdom-

inal landmarks apparent at laparoscopy. *Am J Obstet Gynecol.* 1994;171(3):642–646.

2. Lyell DJ, Caughey AB, Hu E, Daniels K. Peritoneal closure at primary cesarean delivery and adhesions. *Obstet Gynecol.* 2005; 106:275–280.

3. Spannuth WA, Rocconi RP, Huh WK, Straughn JM, Jr., Barnes MN 3rd. A comparison of hand-assist laparoscopy and conventional laparotomy for the surgical evaluation of pelvic masses. *Gynecol Oncol.* 2005;99:443–446.

4. Havrilesky LJ, Peterston BJ, Dryden DK, Soper JT, Clarke-Pearson DL, Berchuck A. Predictors of clinical outcomes in the laparoscopic management of adnexal masses. *Obstet Gynecol.* 2003;102:243.

5. Chi DS, Abu-Rustum NR, Sonada Y, et al. Laparoscopic and hand-assisted laparoscopic splenectomy for recurrent and persistent ovarian cancer. *Gynecol Oncol.* 2006;101:224–227.

6. Krivak TC, Elkas JC, Rose GS, et al. The utility of hand-assist laparoscopy in ovarian cancer. *Gynecol Oncol.* 2005;96:72–26.

7. Schlaerth AC, Abu-Rustum NR. Role of minimally invasive surgery in gynecologic cancers. *Oncologist.* 2006;11:895–901.

8. Gal D, Lind L, Lovecchio JL, Kohn N. Comparative study of laparoscopy vs. laparotomy for adnexal surgery: Efficacy, safety, and cyst rupture. *J Gynecol Surg.* 1995;11:153–158.

9. Montgomery JS, Johnston WK, Wolf S. Wound complications after hand assisted laparoscopic surgery. *J Urol.* 2005;174:2226–2230.