Hand-assisted laparoscopic colorectal surgery

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Basic principles
Hand as operating port, triangulation towards operative field
Non-dominant hand, neutral position
Distant/forward access
Potential conversion incision

Applications of HALS
When tactile feedback is essential
Intact organ removal is required
Utility incision required
Pure laparoscopic approach fails to progress before open conversion
Extremely complex operations where introduction of the hand will significantly increase speed and safety
Fig. 1. Dexterity pneumosleeve and protractor retractor (Dexterity, Roswell, GA, USA).

Fig. 2. Intromit hand-access port (Medtech, Dublin, Ireland).

Fig. 3. Handport (Smith & Nephew, London, UK England).

Fig. 4. Lapdisc (Hakko-Medical, Tokyo, Japan).

Fig. 5. Omniport (Advanced Surgical Concepts, Dublin, Ireland).
<table>
<thead>
<tr>
<th></th>
<th>Abdominal Attachment</th>
<th>Wound wall space</th>
<th>Wound Components</th>
<th>Wound Retraction</th>
<th>Protection</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dexterity</td>
<td>Adhesive</td>
<td>Y</td>
<td>Multi</td>
<td>Y</td>
<td>Y</td>
</tr>
<tr>
<td>Intromit</td>
<td>Adhesive</td>
<td>Y</td>
<td>Single</td>
<td>N</td>
<td>+/-</td>
</tr>
<tr>
<td>Handport</td>
<td>Kissing balloon</td>
<td>Y</td>
<td>Multi</td>
<td>Y</td>
<td>Y</td>
</tr>
<tr>
<td>LapDisc</td>
<td>Iris valve</td>
<td>N</td>
<td>Single</td>
<td>Y</td>
<td>Y</td>
</tr>
<tr>
<td>Omniport</td>
<td>Pneumohelix</td>
<td>N</td>
<td>Single</td>
<td>Y</td>
<td>Y</td>
</tr>
<tr>
<td>GelPort</td>
<td>Gel-filled sleeve</td>
<td>Y</td>
<td>Multi</td>
<td>Y</td>
<td>Y</td>
</tr>
</tbody>
</table>
Video Demonstration
A 10-min video presentation will demonstrate the following important steps in the safe conduct of a hand-assisted laparoscopic total abdominal colectomy for a benign colonic pathology of pancolonic diverticular disease with recurrent bleeding:

Patient selection and preparation
Positioning and port-sites
Insertion of hand-assist device
Ligation of vascular pedicles
Flexures mobilisation
Omental takedown
Specimen retrieval
Anastomosis
Hand-assisted laparoscopic total colectomy for pancolonic diverticular disease

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Tan Tock Seng Hospital, Singapore
## Diagnoses and Procedures

<table>
<thead>
<tr>
<th>Diagnosis</th>
<th>Handport n=22</th>
<th>Laparoscopic n=18</th>
</tr>
</thead>
<tbody>
<tr>
<td>Diverticular Disease</td>
<td>10</td>
<td>8</td>
</tr>
<tr>
<td>Adenoma/polyp</td>
<td>4</td>
<td>4</td>
</tr>
<tr>
<td>Inflammatory Bowel</td>
<td>4</td>
<td>1</td>
</tr>
<tr>
<td>Rectal prolapse</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>Incurable malignancy</td>
<td>0</td>
<td>2</td>
</tr>
<tr>
<td>Sigmoid volvulus</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td>Colonic inertia</td>
<td>1</td>
<td>1</td>
</tr>
</tbody>
</table>

## Diagnoses and Procedures

<table>
<thead>
<tr>
<th>Procedure</th>
<th>Handport n=22</th>
<th>Laparoscopic n=18</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sigmoid resection</td>
<td>9</td>
<td>7</td>
</tr>
<tr>
<td>Right hemicolecetomy</td>
<td>5</td>
<td>5</td>
</tr>
<tr>
<td>Subtotal colectomy</td>
<td>3</td>
<td>1</td>
</tr>
<tr>
<td>Resection rectopexy</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>Low anterior resection</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Hartmann reversal</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Ileocolectomy</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td>Abdominoperineal resection</td>
<td>0</td>
<td>1</td>
</tr>
</tbody>
</table>

## HALS Study Group

### Operative Parameters

<table>
<thead>
<tr>
<th>Variable</th>
<th>Handport ( n=22 )</th>
<th>Laparoscopic ( n=18 )</th>
</tr>
</thead>
<tbody>
<tr>
<td>Operative time</td>
<td></td>
<td></td>
</tr>
<tr>
<td>ITT</td>
<td>152 (60-307)</td>
<td>141 (55-250)</td>
</tr>
<tr>
<td>Per protocol</td>
<td>144 (60-270)</td>
<td>152 (65-250)</td>
</tr>
<tr>
<td>Incision length</td>
<td>7.4 (5-9)</td>
<td>7.0 (4-20)</td>
</tr>
<tr>
<td>Anastomosis</td>
<td>21</td>
<td>18</td>
</tr>
<tr>
<td>Intracorporeal</td>
<td>8 (38%)</td>
<td>8 (44%)</td>
</tr>
<tr>
<td>Extracorporeal</td>
<td>13 (62%)</td>
<td>10 (56%)</td>
</tr>
<tr>
<td>EBL</td>
<td>147 (0-500)</td>
<td>126 (0-500)</td>
</tr>
<tr>
<td>Conversion</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>Trocars</td>
<td>2.4</td>
<td>3.3</td>
</tr>
</tbody>
</table>

*Surg. Endosc 2000; 14:896-901*
<table>
<thead>
<tr>
<th>Procedure</th>
<th>Reason for Problem</th>
</tr>
</thead>
<tbody>
<tr>
<td>Right hemicolecotomy</td>
<td>Obesity (inadequate base ring seal)</td>
</tr>
<tr>
<td>Sigmoid colectomy</td>
<td>Obesity (base retractor came out)</td>
</tr>
<tr>
<td>Low anterior resection</td>
<td>Obesity (base retractor came out) [required conversion]</td>
</tr>
<tr>
<td>Subtotal colectomy</td>
<td>Abdominal wall contour - four previous operations (poor seal)</td>
</tr>
<tr>
<td>Sigmoid colectomy</td>
<td>Leakage of air from base retractor</td>
</tr>
<tr>
<td>Right hemicolecotomy</td>
<td>Leakage of air from base retractor</td>
</tr>
<tr>
<td>Right hemicolecotomy</td>
<td>Bulb attachment seal</td>
</tr>
<tr>
<td>Sigmoid colectomy</td>
<td>HandPort incision too close to pubis (poor seal)</td>
</tr>
<tr>
<td>Sigmoid colectomy</td>
<td>Unclear</td>
</tr>
</tbody>
</table>

### HALS Study Group

### Postoperative Pain

<table>
<thead>
<tr>
<th>Variable</th>
<th>Handport n=22</th>
<th>Laparoscopic n=18</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>POD #1:</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>none-mild</td>
<td>12 (57%)</td>
<td>10 (55%)</td>
</tr>
<tr>
<td>moderate-severe</td>
<td>9 (43%)</td>
<td>8 (45%)</td>
</tr>
<tr>
<td><strong>POD #3:</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>none-mild</td>
<td>16 (73%)</td>
<td>14 (78%)</td>
</tr>
<tr>
<td>moderate-severe</td>
<td>6 (27%)</td>
<td>4 (22%)</td>
</tr>
<tr>
<td><strong>POD #14:</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>oral analgesics</td>
<td>7 (32%)</td>
<td>8 (45%)</td>
</tr>
<tr>
<td>no pain med.</td>
<td>15 (68%)</td>
<td>10 (55%)</td>
</tr>
</tbody>
</table>

*Source: Surg. Endosc 2000; 14:896-901*
## HALS Study Group

### Postoperative Outcome Measures

<table>
<thead>
<tr>
<th>Variable</th>
<th>Handport n=22</th>
<th>Laparoscopic n=18</th>
</tr>
</thead>
<tbody>
<tr>
<td>Return of bowel Function</td>
<td></td>
<td></td>
</tr>
<tr>
<td>POD #1</td>
<td>3 (14%)</td>
<td>2 (11%)</td>
</tr>
<tr>
<td>POD #3</td>
<td>17 (77%)</td>
<td>14 (78%)</td>
</tr>
<tr>
<td>Liquid diet</td>
<td></td>
<td></td>
</tr>
<tr>
<td>POD #1</td>
<td>8 (36%)</td>
<td>8 (44%)</td>
</tr>
<tr>
<td>POD #3</td>
<td>20 (91%)</td>
<td>18 (100%)</td>
</tr>
</tbody>
</table>

HALS Study Group

Functional Recovery

<table>
<thead>
<tr>
<th>Quality of Life (SF-36)</th>
<th>Handport n=22</th>
<th>Laparoscopic n=18</th>
</tr>
</thead>
<tbody>
<tr>
<td>Physical Functioning:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>preoperative score</td>
<td>80</td>
<td>78</td>
</tr>
<tr>
<td>30-day follow-up</td>
<td>75</td>
<td>75</td>
</tr>
<tr>
<td>General Health:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>preoperative score</td>
<td>62</td>
<td>64</td>
</tr>
<tr>
<td>30-day follow-up</td>
<td>74</td>
<td>71</td>
</tr>
</tbody>
</table>

Hand-Assisted Laparoscopic Colectomy

Taragona, E. et al. University of Barcelona

- 54 patients in RCT comparing HALS and LAS colectomy for left (31) or right (23) colon lesions (CA, volvulus, polyps)
- HALS – 7-7.5 cm LLQ or RUQ transverse hand access incision
- LAS extraction incision in same area as hand access.

**Hand-Assisted Laparoscopic Colectomy**

Taragona, E. et al. University of Barcelona (cont.)

<table>
<thead>
<tr>
<th></th>
<th>HALS</th>
<th>LAS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Conversion</td>
<td>2%</td>
<td>22% (4/6 to HALS)</td>
</tr>
<tr>
<td>Complications</td>
<td>26%</td>
<td>22% (1 leak each)</td>
</tr>
<tr>
<td>Hospital Stay</td>
<td>6 days</td>
<td>6 days</td>
</tr>
<tr>
<td>Peritoneal Cytology</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Benefit of HALS</td>
<td>9</td>
<td>4</td>
</tr>
<tr>
<td>Operating Time</td>
<td>120 min.</td>
<td>135 min.</td>
</tr>
</tbody>
</table>
Hand-Assisted Laparoscopic Colectomy

Taragona, E. et.al. University of Barcelona (cont.)

Inflammatory Response

- IL6:
  - increased in HALS > LAS  POD 1-5

- C Reactive Protein:
  - increased in HALS > LAS  POD 1-3

Fig. 1. Dundee Multitool in the closed position.

Fig. 2. A-F Deployment of two instruments (scissors and needle driver) from the Dundee Multitool.

Fig. 3. Photograph of the extruded needle driver of the Dundee Multitool in use during open surgery.
**Potential Advantages**
- Decrease OR time
- Ability to overcome intra-op difficulties
- Reduction of conversion to open
- Shorter learning curve for surgeons

**Potential Disadvantages**
- Loss of advantages of pure laparoscopic approach
- Treatment of patients inappropriately with laparoscopy

**Conclusions**
- Offers similar outcomes to laparoscopic
- May be a bridge to laparoscopic technique
- Brings more difficult cases into the realm of minimally invasive surgery