Introduction

Hemorrhoids are one of the most common anorectal disorders.\(^1\) The Goligher's classification grades internal hemorrhoids based on their appearance and degree of prolapse (Table 1). Clinically, third-degree hemorrhoids are anal cushions that prolapse through the anus on straining and require manual placement into the anal canal, while fourth-degree internal hemorrhoids are permanent prolapses that are irreducible. Both third and fourth degree internal hemorrhoids are the main indications for hemorrhoidectomy and hemorrhoidopexy.\(^2\) Excisional hemorrhoidectomy can be performed using scissors, diathermy, or a vascular-sealing device such as LigaSure™.

Stapled hemorrhoidopexy is a common procedure for prolapsed hemorrhoids, and can be performed with the EEA™ Hemorrhoid and Prolapse Stapler Set with DST Series™ Technology. This procedure is generally used for patients with third or fourth degree internal hemorrhoids, presenting with more than three prolapses. Stapled hemorrhoidopexy is a technique used to excise redundant mucosal tissue and resuspend the hemorrhoids into the anal canal, using a specific circular stapling device. This interrupts the blood supply to the hemorrhoids and reduces the risk of available rectal mucosa from prolapsing.

Lohsiriwat\(^2\) recently reviewed the clinical management of hemorrhoids and found that amongst several others, Stapled hemorrhoidopexy with LigaSure™ Small Jaw and Stapled Hemorrhoidopexy with EEA™ Hemorrhoid and Prolapse Stapler with DST™

### Table 1. Classification of Hemorrhoids\(^9\)

<table>
<thead>
<tr>
<th>Grade</th>
<th>Characteristics</th>
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<tbody>
<tr>
<td>I</td>
<td>Prominent hemorrhoidal vessels, no prolapse</td>
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<tr>
<td>II</td>
<td>Prolapse with Valsalva and spontaneous reduction</td>
</tr>
<tr>
<td>III</td>
<td>Prolapse with Valsalva requires manual reduction</td>
</tr>
<tr>
<td>IV</td>
<td>Chronically prolapsed manual reduction ineffective</td>
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</tbody>
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Note: This article contains graphic content for illustrative purposes.
postoperative complications of hemorrhoidectomy include acute urinary retention, with an incidence of as much as 36%, postoperative bleeding, septic complications, loss of anal sensation, mucosa prolapse, anal stricture as well as fecal incontinence.

Dr. Wong Kutt Sing, a colorectal surgeon from the Raffles Hospital (Raffles Medical Group, Singapore), has been using the LigaSure™ Small Jaw and EEA™ Hemorrhoid Stapler for the past year. This Clinical Experience Paper puts together Dr. Wong’s experiences with performing hemorrhoidectomies and stapled hemorrhoidopexies using these instruments. Additionally, he shares how the use of these instruments circumvents complications associated with these procedures.

**LigaSure™ Small Jaw in Excisional Hemorrhoidectomy**

The LigaSure™ Small Jaw is designed for use in confined surgical spaces where precision and visibility are a necessity. It provides an integrated cutting mechanism independent of sealing thus leaving critical cutting decisions in the hands of the surgeon. This multifunctional device is capable of sealing, blunt dissection, grasping and dividing tissue, thereby reducing the exchange of instruments. LigaSure™ technology seals vessels of ≤ 7mm, lymphatics, pulmonary vasculature and tissue bundles in approximately 2-4 seconds using the ForceTriad™ energy platform.

LigaSure™ Small Jaw hemorrhoidectomy (Figure 2) has rapidly gained acceptance for the treatment of symptomatic hemorrhoids as it offers various advantages over conventional diathermy for open hemorrhoidectomy. In a review of 666 patients who underwent hemorrhoidectomy for symptomatic prolapsed hemorrhoids (grade III and IV), the mean operative time with LigaSure™ Small Jaw was 18.7 ± 4.1 minutes, and mean hospital stay was 1.5 ± 0.6 days.¹ This review showed that the recurrence rate at 2 years follow-up after hemorrhoidectomy with LigaSure™ was a low 3.1% for chronic grade III or IV hemorrhoids and was comparable with conventional hemorrhoidectomy.¹ No immediate postoperative bleeding or other procedure-related complications were observed; 3.2% of patients had delayed postoperative bleeding, most of which resolved spontaneously, and no recurrence or persistent anal pain was reported during the 1 year follow-up period.

**Figure 1.** LigaSure™ Small Jaw instrument LF1212 specifications

- 16.5mm seal length
- 14.7mm cut length
- 18.8cm instrument length
- 28˚C Jaw Angle

**Figure 2.** Application of Ligasure™ Small Jaw

- Figure 2A. Before surgery.
- Figure 2B. The Eisenhammer is used to isolate the prolapsed tissue and an atraumatic forceps is used to grasp the prolapsed tissue, which is then excised with LigaSure™ Small Jaw.
- Figure 2C. After surgery.
An experienced handler of bipolar diathermy, Dr. Wong has since performed more than 60 open hemorrhoidectomies with LigaSure™ Small Jaw and has observed improvements in clinical outcomes and significant benefits to patients (Table 2).

### Clinical Outcomes
- Reduced rate of stenosis, charring and pruritus
- Reduction in incidence of wound infections

### Benefits to Patients
- Significant reduction in duration and intensity of postoperative pain to approximately 1-2 weeks
- Quicker recovery and return to daily activities

**Product Features of LigaSure™ Small Jaw**
- Lower mean external maximum jaw temperature and reduced lateral thermal spread

**Table 2: Clinical outcomes and benefits for patients**

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Dr. Wong has noted that LigaSure™ Small Jaw overcomes a main drawback of diathermy – reduction in collateral tissue damage as a result of heat. While there is a greater lateral thermal spread with bipolar diathermy, the mean external maximum jaw temperature of the LigaSure™ Small Jaw instrument was found to be lower, at approximately 80°C after multiple activations, which accounts for the decrease in charring and collateral tissue damage and enhanced wound healing.

**Product Features of LigaSure™ Small Jaw For Surgeons**
Aside from the notable benefits to patients, Dr. Wong stated that the LigaSure™ Small Jaw is presently his instrument of choice for open hemorrhoidectomies as the graduated seal width (1-4 mm) enhances precision while the longer jaw length of 18.8 mm allows grasping of more tissues. LigaSure™ Small Jaw also allows for more efficient performance of the procedure—the device’s multifunctional capabilities minimize exchange of instruments, LigaSure™ Small Jaw also cools to < 60 °C in one second. It has also been reported that the mean procedure time for LigaSure™ Hemorrhoidectomy is ~22 min that is the normal duration of an open hemorrhoidectomy performed by Dr. Wong. Furthermore, when vessel sealing is completed by the device, there is automatic cessation of energy delivered allowing surgeons to perform the operation with greater ease. The device is also ergonomically sound with an angled jaw that makes for better reach and access.

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**EEA™ Hemorrhoid and Prolapse Stapler Set with DST Series™ Technology**
The End-to-End Anastomosis (EEA)™ Hemorrhoid and Prolapse Stapler with DST Series™ Technology provides advantages in each of the four steps of stapled hemorrhoidopexy – dilation, pursestring placement, tissue incorporation, stapling and resection.

**Figure 3. EEA™ Hemorrhoid and Prolapse Stapler Set with DST Series™ Technology**

**Access**
- Anoscope with innovative Bridge Design suspends prolapsing tissues to provide optimal access while placing the pursestring
- Detachable Anvil technology separates the Anvil from the instrument and provides direct access to captured tissues
- Winged Port design allows vertical or horizontal placement between the buttocks

**Visibility**
- Transparent Port and Anoscope enable the surgeon to visualize the underlying anatomy while placing the pursestring
- Detachable Anvil technology provides clear visualization of the captured tissues

**Consistency**
- Anoscope markings help guide even pursestring placement
- DST Series™ Technology provides optimal staple formation for a wide range of anastomotic scenarios
- Anchor points on Detachable Anvil provide consistency in tissue specimen formation

In Dr. Wong’s experience, the transparent port and anoscope kit enhances access, increases visibility of underlying tissues and enables accurate and consistent placement of the pursestring for complete anastomosis.
An existing challenge of hemorrhoidopexy is identifying and capturing the appropriate amount of mucosa to be removed as this varies with the extent of prolapse. EEA™ Hemorrhoid Stapler set helps overcome this challenge – the transparent anoscope allows direct access and clear visualization of tissues that are to be captured during pursestring placement. The anoscope markings enable a consistent circumferential pursestring placement, while anchor points on the anvil also aid with consistency and even tissue-capture.

The one-handed release of the safety latch and firing of the stapler allows for greater ease of performing the procedure while an audible click reassures the surgeon that the centre rod has been firmly attached to the stapler. With the Directional Stapling Technology (DST)™, the rectangular wire cross-section of the staples bends more readily in the intended direction, enabling an even resection and minimizing trauma to the surrounding tissues.

**Stapling Made Smarter**

Traditional Staple

Round wire cross-section is more prone to bending in more than one direction in challenging applications.

DST Series™ Staple

Rectangular wire cross-section bends more reliably in the intended direction.

**Tips for New Users**

**Figure 5. Application of EEA™ Circular Hemorrhoid and Prolapse Stapler Set**

**Figure 5A.** The winged port is placed in the anal canal and secured with sutures. The winged port is designed to allow vertical or horizontal placement between the buttocks. The transparent port enables visualization of the underlying anatomy during pursestring placement.

**Figure 5B.** The bridge of the anoscope is pre-threaded with SURGIPRO™ CP412 (BLUE on GS-22 Needle).

**Figure 5C.** The dilated anal canal and transparent anoscope enable the dentate line and underlying anatomy to be visualized. Once inserted, the anoscope markings are used to place a consistent circumferential pursestring. The pursestring is positioned to capture the desired tissue while ensuring that the final staple line is appropriately proximal to the dentate line.
Figure 5D. The amount of tissue to be resected is assessed and the appropriate anvil anchor point is selected. The detachable anvil proximal to the pursestring suture is inserted and secured with the pursestring suture by threading through one of the three anchor points of the anvil previously selected.

Note: The orange-marked anchor point should be reserved for instances involving a significant amount of prolapse and should only be employed by users experienced with the device.

Figure 5E. The center shaft of the stapler is extended fully by twisting the adjustment knob counter-clockwise until it stops. With the center rod held in one hand, the center rod is mated to the stapler by inserting the blunt center rod into the female shaft receptacle. The center rod is pushed firmly until it clicks (audible click) into its fully seated position. Visual inspection of the attachment should be done at this juncture to ensure that the center rod and stapler are fully mated. The pursestring should be removed and reapplied if unwanted tissue has been incorporated or if any gaps have been discovered as this would result in an incomplete anastomosis.

Figure 5F. Before firing the stapler, a vaginal examination is conducted to rule out entrapment of the posterior vaginal wall for female patients.

The device is introduced gently into the anus and closed fully by turning the twist knob in a clockwise direction. The device is closed with neutral tension and the knob is turned clockwise until the ready-to-fire indicator displays a green line.

To fire the instrument the safety latch underneath the handle is first released, the handles are then squeezed firmly until the handles come into contact with the safety latch. An audible and tactile click indicates full firing of the stapler. After firing, the handle is released and the safety latch is returned to the locked position. The twist knob is turned once counter-clockwise and the instrument is gently removed.

Figure 5G. The anastomotic doughnut is then examined for completeness and the staple line is inspected for hemostasis.

Figure 5H. The anoscope is replaced and final hemostasis is completed with additional suturing.

Figure 5I. After completion of surgery
Deciding between LigaSure™ Small Jaw or EEA™ Hemorrhoid and Prolapse Stapler with DST Series™ Technology

As previously described, surgery is generally indicated for patients with third or fourth degree hemorrhoids. Dr. Wong shared that he applies a more stringent criteria for surgery to ensure the risk of complications is kept to the minimum; LigaSure™ Small Jaw is generally used for patients presenting with external components and for patients with a single prolapsed tissue while stapled hemorrhoidopexy is reserved for patients with more than one prolapsed haemorrhoid but with minimal external components.

Modified technique for use with LigaSure™ Small Jaw

Dr. Wong advised that much of the Milligan-Morgan technique is transferrable for use with the LigaSure™ Small Jaw™ for excisional hemorrhoidectomy. In addition, based on his experience, Dr. Wong has developed a slight modification to further reduce collateral damage to surrounding tissues during dissection and sealing. With this modification, he uses the Eisenhammer to isolate prolapses while maintaining muco-cutaneous bridges before applying the LigaSure™ Small Jaw™ device (Figure 4). By ensuring that greater mucosal and less cutaneous margins are captured Dr. Wong has been able to reduce charring of tissues, pain and incidence of stenosis.

EEA™ Circular Hemorrhoid and Prolapse Stapler Set

Dr. Wong has cautioned a slightly steeper learning curve with the use of the anoscope bridge with respect to threading of the suture. Thus, he has advised users to pre-thread the suture across the bridge before placing the pursestring to prevent entangling and enable a clearer field of view (Figure 5B).

Closing Notes

Not only does the LigaSure™ Small Jaw lead to improved clinical outcomes compared with conventional diathermy3,4, its multifunctional and ergonomical features result in a shorter operation time. This translates to an increase in resources available and an associated reduction in risk of complications. Applying an appropriate selection criteria, the EEA™ Hemorrhoid Stapler also offers distinct advantages to patients that present with a greater number and severity of prolapse, by enabling an even pursestring placement for a complete anastomosis.

Both the LigaSure™ Small Jaw and EEA™ Hemorrhoid Stapler have been shown to result in significantly less postoperative pain, less bleeding and less analgesic use, thereby allowing a quicker return to daily activities and increased patient satisfaction.
References


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