*Original Article*

# Comparison of Conventional and Starion Hemorrhoidectomy for Prolapsed Hemorrhoids

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***Key Words***
Starion;
Hemorrhoidectomy

***Purpose.*** To compare the short-term outcomes between Starion and conventional hemorrhoidectomy.
***Method.*** We retrospectively analyzed patients with stage III and IV hemorrhoids who were operated on by a single surgeon at National Cheng Kung University Hospital between October 2015 and September 2016. Detailed information on the Starion and conventional hemorrhoidectomy procedures was provided to the patients before surgery, and they selected an operation method according to their preferences.
***Results.*** A total of 72 patients were included in the study, of which 48 received Starion hemorrhoidectomy. The mean ages were 50.08 ± 16.516 and 44.23 ± 11.693 years ($p$ = 0.087) in the conventional and Starion hemorrhoidectomy groups, respectively. Sex ratios (female to male) in the conventional and Starion hemorrhoidectomy groups were 2:1 and 11:1 ($p$ = 0.015), respectively. The operation time was shorter for Starion hemorrhoidectomy (17.73 ± 5.12 min vs. 21.79 ± 5.83 min, respectively; $p$ = 0.003). The severity of patients' hemorrhoids exhibited no significant difference ($p$ = 0.280); additionally, hospital stay, post operative pain score, post operative Meperidine injections, urine retention rates, and rebleeding cases exhibited no significant difference between the two groups.
***Conclusions.*** The Starion hemorrhoidectomy procedure enables surgeons to performing hemorrhoidectomy in a shorter operation time without increasing postoperative complications.
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For stage III and stage IV hemorrhoids, the standard operation had long been conventional open (Milligan-Morgan) and closed (Ferguson) hemorrhoidectomy, respectively. Both procedures have been proven to be equally safe and effective by many randomized trials and follow-up studies.[1-4] However, postoperative complications such as pain and bleeding are a major concern.

In response, LigaSure hemorrhoidectomy was proposed as an alternative treatment method, with the advantages of reduced postoperative pain, shorter operating time, and less perioperative bleeding.[5] Studies have reported no significant difference between LigaSure hemorrhoidectomy and the conventional approach after long-term follow-ups of patients.[6-8]

Other methods have also been developed to facili-

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tate hemorrhoidectomy, including circular stapled hemorrhoidopexy, ultrasonic scalpel hemorrhoidectomy, and Doppler-guided hemorrhoid artery ligation.[3,9,10] None of these procedures have been proven superior to the others.

The Starion TL$^2$ device, which uses tissue-welding technology, can reduce the temperature required for vessel control and dissection, and thus reduce the collateral tissue damage during application. It has been used in tonsillectomy with promising outcomes;[11] however, only one study has investigated the use of such a device for hemorrhoidectomy.[12] In this paper, we present our experience with using a Starion TL device at National Cheng Kung University Hospital.

## Materials and Methods

This was a retrospective review study, wherein we analyzed patients with stage III or IV hemorrhoids who were operated on by a single surgeon at National Cheng Kung University Hospital between October 2015 and September 2016. Patients with other anorectal diseases, such as fistula, abscess, and fissures, or those who had previously received anorectal surgery, were excluded.

During patients' visits to the outpatient department before surgery, detailed information was provided regarding the potential benefits and possible complications between the Starion and conventional hemorrhoidectomy procedures. The Starion device was not covered by health insurance and extra charges would be required. Patients then selected a surgical method according to their preference.

Patients were admitted to the hospital 1 day before surgery and received a sodium phosphate laxative enema at 5 a.m. The hemorrhoidectomy procedures were standardized for each case. All patients were operated under spinal or general anesthesia, according to the anesthesiologists' discretion. Patients were placed in the prone jack-knife position, and after being administered local anesthesia, a Hill-Ferguson retractor was used to expose the hemorrhoids. The tip of the hemorrhoid was lifted, and a V-shaped incision was made over the junction of the skin and anomucosa. Next, a small dissection was performed along the base of the hemorrhoid and above the sphincter muscle toward the pedicle vessel. In patients who received the Starion hemorrhoidectomy, a Starion device was applied to seal the vessel and cut the remaining pedicle. The mucosa defect was then approximated and continuously sutured to the edge of the anomucosa with 3-0 Vicryl Plus, while the skin defect was left open for drainage. In patients who received the conventional hemorrhoidectomy, a Kelly clamp was placed at the root of the pedicle and the pedicle was transected. Next, transfixing suture was placed at the transected pedicle and continous closure of the mucosa defect was performed with 3-0 Vicryl Plus sutures. Finally, the submucosa tissues were trimmed off accordingly before the approximation of the mucosa, while the skin defect was left open for drainage.

After the surgery, Spersin ointment was topically applied on the wound. The wound was also wrapped with Surgicel if oozing occurred. Sitz baths were started on the day after the operation in patients who underwent conventional hemorrhoidectomy. Additionally, Naproxen (250 mg/tab) was administered at a regular dose if patients had no contraindications; if nonsteroidal anti-inflammatory drugs were not suitable, tramadol 37.5 mg/acetaminophen 325 mg combination tablet (Ultracet) was administered as a replacement. If the pain remained intolerable, the IV analgesic Meperidine (50 mg per injection) was also given. Pain scores were evaluated using the visual analog scale (0-10). All patients were checked for voiding sensation and function after their surgery, and intermittent catheterization was performed in cases of severe bladder distention or if there was a failure to urinate 8 h postoperation.

Patients were discharged when their pain was tolerable, defecation and urination were normal, and their wound was dry with no bleeding or oozing. Outpatient department follow-ups were arranged at an interval of 2 weeks starting on the first week after discharge.

The $\chi^2$ test, Fischer's exact test, and independent-sample *t* test were used to analyze parameter associations between the two groups. Data were statistically analyzed using SPSS version 18. Statistical sig-

nificance was defined as $p < 0.05$ for all results.

## Results

A total of 72 patients were included in this study, and their preoperative characteristics are summarized in Table 1. Patients' mean ages were 50.08 ± 16.516 and 44.23 ± 11.693 years in the conventional and Starion hemorrhoidectomy groups, respectively ($p$ = 0.087). In the conventional hemorrhoidectomy group, the female to male ratio was approximately 2:1, whereas it was 11:1 in the Starion hemorrhoidectomy group ($p$ = 0.015). No significant difference was observed in the severity of hemorrhoids between the two groups ($p$ = 0.280).

Perioperative and postoperative details and outcomes are listed in Table 2. The operating time was 21.79 ± 5.83 min in the conventional hemorrhoidectomy group and 17.73 ± 5.12 min in the Starion hemorrhoidectomy ($p$ = 0.003). Pain scores on the day of operation and 1 day after operation, the number of Meperidine injections, and the number of days in the hospital were similar between the two groups. Additionally, blood loss in all patients with hemorrhoidectomy was minimal according to the record.

Regarding postoperative complications, the acute urine retention rate was 41.7% in the conventional hemorrhoidectomy group and 43.8% in the Starion hemorrhoidectomy group. All patients received catheterization and returned to normal voiding function before discharge. In all, 2 of the 24 patients (8.3%) in the conventional hemorrhoidectomy group and 3 of the 48 patients (6.3%) in the Starion hemorrhoidectomy group experienced obvious postoperative bleeding within 1 month postoperation. All of them visited our emergency room and received conservative treatment or surgical intervention. The characteristics of these patients are summarized in Table 3. The mean duration from operation to rebleeding was 6.8 days. Four patients recovered after conservative treatment and one required surgical intervention; during this operation, bleeding occurred from the edge of the patient's dehiscent wound. No fecal impaction, thrombosis, or wound infection was recorded in any of the patients, and none exhibited anal stenosis or fecal incontinence postoperatively. One patient in the Starion hemorrhoidectomy group presented with persistent anal pain,

**Table 1.** Pre-operative characteristics of patients

| | Traditional hemorrhoidectomy (n = 24) | Starion$^{TM}$ hemorrhoidectomy (n = 48) | *p* value |
|---|---|---|---|
| Age | 50.08 ± 16.516 | 44.23 ± 11.693 | 0.087 |
| Sex | | | |
| Female | 16 (66.7) | 44 (91.7) | 0.015 |
| Male | 8 (33.3) | 4 (8.3) | |
| Hemorrhoid grading | | | |
| III | 16 (66.7) | 39 (81.3) | 0.280 |
| IV | 8 (33.3) | 9 (18.7) | |

**Table 2.** Perioperative and post-operative characteristics

| | Traditional hemorrhoidectomy (n = 24) | Starion$^{TM}$ hemorrhoidectomy (n = 48) | *p* value |
|---|---|---|---|
| Operation time (min) | 21.79 ± 5.83 | 17.73 ± 5.12 | 0.003 |
| Pain score (0-10) | | | |
| POD 0 | 3.13 ± 2.38 | 3.88 ± 1.89 | 0.152 |
| POD 1 | 1.75 ± 1.11 | 1.90 ± 1.35 | 0.650 |
| Number of meperidine injections | 0.63 ± 0.77 | 0.83 ± 0.75 | 0.276 |
| Hospital stay (day) | 3.63 ± 0.64 | 3.81 ± 0.76 | 0.305 |
| Post-op urine retentions (cases) | 10 (41.7) | 21 (43.8) | 1.000 |
| Re-bleeding (cases) | 2 (8.3) | 3 (6.3) | 1.000 |
| Chronic wound pain (cases) | 0 | 1 (2.0) | |

**Table 3.** Characteristics of patients with obvious post-operative bleeding

| Patient No. | Age | Sex | Initial OP time (min) | Initial hemorrhoid grading | Initial hemorrhoid numbers | Days after OP | Initial OP method | Intervention |
|---|---|---|---|---|---|---|---|---|
| 1 | 38 | F | 15 | 3 | 3 | 7 | Starion | Conservative |
| 2 | 65 | F | 23 | 3 | 2 | 3 | Conventional | Conservative |
| 3 | 35 | F | 16 | 3 | 3 | 10 | Starion | Conservative |
| 4 | 68 | F | 25 | 3 | 3 | 9 | Conventional | Conservative |
| 5 | 58 | F | 15 | 3 | 3 | 5 | Starion | OR |

which was relieved after 1 year.

## Discussion

Hemorrhoids have long affected humans, and their presentation can range from small tender masses to diffuse acute bleeding that leads to shock. Treatment for hemorrhoids spans several approaches, from modification of diet and everyday habits in patients with mild symptoms to medical treatment in patients with a moderate severity to surgical treatment in patients with symptomatic grade III and grade IV hemorrhoids.[3,13-15] Conventional hemorrhoidectomy approaches, the Milligan-Morgan and Ferguson methods, were proposed and have been considered the gold standard for hemorrhoid operations since the mid-20th century; notably, both approaches are equally effective.[1,2,4] However, postoperative complications including severe wound pain and rebleeding are also considered major drawbacks of both techniques.

In the past decade, there has been considerable improvement in both surgical instruments and skills. For example, LigaSure hemorrhoidectomy using LigaSure sealers (Valleylab, Boulder, CO, USA) was proposed for vessel and tissue sealing. The devices transmit electrodiathermy energy between two jaws, with effects similar to that of a conventional bipolar device. Complete coagulation can be achieved for vessel diameters up to 7 mm, and lateral spreading of thermal injuries to surrounding tissue can be minimized to within 2 mm due to the special design of the device tip. Many randomized trials have been conducted to compare this method with conventional methods, with results revealing that LigaSure hemorrhoidectomy yields a more favorable postoperative pain score, requires less operating time, and induces less perioperative blood loss than the conventional approaches. In short, the LigaSure sealer is an ideal instrument for modern hemorrhoidectomy.[6-8,16-20]

The Starion TL$^2$, another vessel-sealing device, uses tissue-welding technology for handling tissues. This device facilitates direct heat and pressure to simultaneously seal and divide soft tissues, and effectively reduces the temperature required for sealing vessels to less than 100 °C. Thus, theoretically, it can effectively reduce the spreading of collateral thermal injury, resulting in less postoperative pain.[12]

In the present study, the operating time was significantly reduced in the Starion hemorrhoidectomy group compared with the conventional hemorrhoidectomy group. By using the tissue-welding technique of the Starion device, managing hemorrhoid pedicle vessels during surgery was easier and quicker, without increasing the risk of postoperative bleeding.

The most common postoperative complication in our study was acute urinary retention; however, all patients recovered under adequate pain control and catheterization. No difference was observed in wound pain scores between the two groups (Table 2). Of all 72 patients, 5 experienced postoperative bleeding and the rebleeding rate was 8.3% and 6.3% in the conventional and Starion hemorrhoidectomy groups, respectively ($p$ = 1.000). In previous studies, the rebleeding rate has ranged from 3.4% to 10% for LigaSure hemorrhoidectomy and from 3.6% to 10% for conventional hemorrhoidectomy.[1,17] One patient who received Starion hemorrhoidectomy presented with chronic anal pain, which subsided after 1 year. No other complications, such as anal stenosis, fecal incontinence, or wound infection, were observed.

Other advantages associated with using LigaSure

for hemorrhoidectomy, such as improved postoperative pain or decreased urine retention rate, were not noted in the present study. However, this may have been because the Starion hemorrhoidectomy group had younger patients and was mostly women. According to previous studies, younger patients are more sensitive to pain and women are more likely to present acute postoperative urine retention.[21-23] Thus, the results of postoperative pain or decreased urine retention rate may be explained by a possible baseline selection bias in the two groups.

Our study had several limitations. First, because it was a nonrandomized retrospective study, patients could select the treatment method according to their preference, which might have resulted in a baseline selection bias; as indicated, the Starion hemorrhoidectomy group had younger patients and was mostly women. This selection bias might have impacted the assessment accuracy of parameters such as postoperative wound pain score and the number of Meperidine injections. Second, the mean follow-up period was only 3 months; thus, no records were available for the patients' long-term outcomes, including recurrence. Third, we included only 72 patients in this study. It is possible that the aforementioned factors distorted the results.

## Conclusions

Starion $TL^2$ is an effective tool for hemorrhoidectomy, enabling surgeons to reduce operating time without increasing the risk of postoperative complications.

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**原　著**

# 傳統與 Starion$^{TM}$ 痔瘡切除術的結果比較

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**目的**　比較傳統與 Starion$^{TM}$ 痔瘡切除術的結果。

**方法**　回溯性的統計 2015 年十月到 2016 年九月，同一位醫師進行痔瘡切除的病人。這些病人在術前經解釋兩種治療的利弊之後，可自行選擇治療的種類。

**結果**　共統計了 72 位病人，其中 48 位進行 Starion 痔瘡切除術。傳統與 Starion 痔瘡切除術的病人在年齡、女/男比例為 50.08 ± 16.516 與 44.23 ± 11.693 歲 ($p$ = 0.087)、2:1 與 11:1 ($p$ = 0.015)。術前痔瘡的嚴重程度沒有差異 ($p$ = 0.280)。手術時間以 Starion$^{TM}$ 痔瘡切除術較短 (17.73 ± 5.12 分與 21.79 ± 5.83 分，$p$ = 0.003)。住院天數、術後疼痛、術後施打止痛藥劑數、尿滯留、再流血的數目上，兩組沒有明顯差別。

**結論**　Starion 能有減短痔瘡術的手術時間，並且與傳統手術相比不會增加手術後的併發症。

**關鍵詞**　Starion、痔瘡切除術。