

Current Status of Surgical Treatment for Hemorrhoids - Systematic Review and Meta-analysis

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Hemorrhoids are one of the most common anorectal disorders. Conventional hemorrhoidectomy is the most commonly practiced surgical technique. Stapled hemorrhoidectomy (procedure for prolapse and hemorrhoids [PPH]) and Ligasure hemorrhoidectomy are newly developed methods for the surgical management of hemorrhoids. The objective of this study was to compare the effectiveness and safety of these two novel techniques with that of conventional hemorrhoidectomy. From the MEDLINE data-base, we obtained papers published between January 2000 and September 2009 and retrospectively studied randomized, controlled clinical trials that compared PPH versus conventional hemorrhoidectomy or Ligasure hemorrhoidectomy versus conventional hemorrhoidectomy. Both PPH and Ligasure hemorrhoidectomy were superior to conventional hemorrhoidectomy with regard to operation time, early postoperative pain, urinary retention, and time to return to normal activity. However, skin tags and recurrent prolapse occurred at higher rates in the PPH group. Although both new techniques have short-term benefits, especially in reducing extreme postoperative pain, more powerful clinical studies with long-term follow up and larger sample sizes should be conducted for further evaluation of outcomes. (*Chang Gung Med J* 2010;33:488-500)



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Key words: hemorrhoid, hemorrhoidectomy, stapled hemorrhoidectomy, PPH, Ligasure hemorrhoidectomy

Hemorrhoids, cushions of vascular tissue in the Anus, are one of the most common anal disorders. Etiologic factors for hemorrhoidal disease include constipation, diarrhea, prolonged straining, pregnancy, heredity, erect posture, increased intraabdominal pressure with obstruction of venous return, aging, and internal sphincter abnormalities. Patients with hemorrhoids may complain of bright red bleeding from the rectum, anal pain, anal masses and pro-

trusion, difficulties with perianal hygiene, and cosmetic deformities. Patients with symptomatic hemorrhoids who have failed nonoperative treatments may require surgery. Conventional surgical hemorrhoidectomy involves excision of the hemorrhoidal cushions and is the most effective treatment for hemorrhoids. The Milligan-Morgan (open) and Ferguson (closed) hemorrhoidectomy are the most commonly used techniques worldwide.^(1,2) However, there are a

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few common complications associated with conventional hemorrhoidectomies, such as urinary retention, postoperative bleeding, significant pain, anal stenosis, and incontinence. Several modifications have been proposed to improve the postoperative outcome, and especially to reduce postoperative pain.

Stapled hemorrhoidectomy and Ligasure hemorrhoidectomy

In 1998, to minimize postoperative discomfort following conventional surgery, Longo proposed a new technique – stapled hemorrhoidectomy (also known as procedure for prolapse and hemorrhoids [PPH]) – for treating hemorrhoids.⁽³⁾ PPH is performed with a specially designed stapling device to excise a complete ring of mucosa above the dentate line. The crucial characteristic of this procedure is the absence of any perceived perianal wounds, which therefore should be less painful than conventional hemorrhoidectomy.

In addition, the Ligasure vessel sealing system (Valleylab; Boulder, CO, U.S.A.) is another recently introduced instrument consisting of a bipolar,⁽⁴⁾ electrothermal, hemostatic device that ensures complete coagulation of vessels up to 7 mm in diameter with minimal surrounding thermal spread and limited tissue charring. This instrument could be an ideal tool for hemorrhoidectomy because it enables effective, bloodless excision of hemorrhoids with minimal tissue trauma, and hence, possibly reduces postoperative pain and wound healing time.

The goal of this review was to compare the effectiveness and safety of the two new techniques with that of conventional hemorrhoidectomy (Milligan-Morgan or Ferguson hemorrhoidectomy) based on a systematic review of prospective, randomized, controlled trials.

Search strategy from MEDLINE

All original, randomized, controlled, clinical trials that compared stapled hemorrhoidectomy versus conventional hemorrhoidectomy or Ligasure hemorrhoidectomy versus conventional hemorrhoidectomy for the treatment of symptomatic hemorrhoids were identified. The analysis included papers published between January 2000 and September 2009 that were identified in a MEDLINE search. The search terms were as follows: hemorrhoid, hemorrhoidectomy, stapled hemorrhoidectomy, PPH, Ligasure hemor-

rhoidectomy, prospective, randomized controlled trial.

Inclusion criteria and data analysis

Only prospective, randomized, controlled trials comparing PPH versus conventional hemorrhoidectomy, or Ligasure hemorrhoidectomy versus conventional hemorrhoidectomy were included in further meta-analysis. Comparative studies (nonrandomized and retrospective), case series, and case reports were not included. Studies published in languages other than English were excluded. All letters, abstracts, and personal communications were also excluded.

The present review focused on comparing PPH versus conventional hemorrhoidectomy and Ligasure hemorrhoidectomy versus conventional hemorrhoidectomy with regards to operating time, postoperative pain, length of hospital stay, time to return to normal activity, residual external skin tags, and postoperative complications. Data were extracted independently from each study and differences were analyzed. The meta-analysis and forest plots were conducted by the Review Manager 5 software tool of the Cochrane Collaboration.

The systematic literature search identified 30 randomized, controlled trials, 19 comparing PPH versus conventional hemorrhoidectomy and 11 comparing Ligasure hemorrhoidectomy versus conventional hemorrhoidectomy.⁽⁵⁻³⁴⁾ The baseline characteristics of patients in the trials included in the meta-analysis are summarized in the Table 1. We focused on the following outcomes: operation time, early postoperative pain, major postoperative hemorrhage, time to return to normal activity, postoperative anal stenosis, postoperative incontinence, residual skin tags, and recurrent prolapse.

Outcome – operation time

Compared with conventional hemorrhoidectomy, significantly shorter operation times were reported for PPH (Fig. 1A; $p < 0.00001$) and Ligasure hemorrhoidectomy (Fig. 1B; $p < 0.00001$).

Outcome – early postoperative pain

The assessment of postoperative pain varied for each study and was complicated by varying stages of recovery. A visual analog scale (0 indicating no pain and 10 indicating severe pain) was the most commonly used scoring method. The pain scores, either

Table 1. Baseline Characteristics

Study	Year	Country	Group	No. of patients	Mean age	M/F
PPH vs. Conventional hemorrhoidectomy						
Mehigan	2000	U.K.	PPH	20	57.1	6/14
			Milligan-Morgan	20	55.7	11/9
Rowsell	2000	U.K.	PPH	11	52.7	7/4
			Milligan-Morgan	11	58.2	6/5
Ho YH	2000	Singapore	PPH	57	44	29/28
			Milligan-Morgan	6		
Ganio	2001	Italy	PPH	50	47	
			Milligan-Morgan	50	48	
Shalaby	2001	Egypt	PPH	100	44.1	60/40
			Milligan-Morgan	100	49.1	64/36
Ortiz	2002	Spain	PPH	27	48.6	15/12
			Milligan-Morgan	28	46.6	17/11
Correa-Rovelo	2002	Mexico	PPH	42	43.7	22/20
			Ferguson	42	46.6	19/23
Pavlidis	2002	Greece	PPH	40	45	25/15
			Milligan-Morgan	40	49	22/18
Hetzer	2002	Switzerland	PPH	20	50.4	15/05
			Ferguson	20	44.8	16/4
Kairaluoma	2003	Finland	PPH	30	47	13/17
			Milligan-Morgan	30	48.5	19/11
Cheetham	2003	U.K.	PPH	15	37	10/5
			Milligan-Morgan	16	39.5	12/4
Palimento	2003	Italy	PPH	37	51	24/13
			Milligan-Morgan	37	55	23/14
Bikhchandani	2004	India	PPH	42	46	34/8
			Milligan-Morgan	42	48.6	36/6
Senagore	2004	U.S.A.	PPH	75	51	49/26
			Ferguson	77	48	58/19
Ortiz	2005	Spain	PPH	15	47	8/7
			Milligan-Morgan	16	49	11/5
Gravie	2005	France	PPH	63	51	
			Milligan-Morgan	63	44	
Ho KS	2006	Singapore	PPH	29		14/15
			Ferguson	21		8/13
Huang	2007	Taiwan	PPH	300	46.5	165/135
			Ferguson	296	45.6	166/130
Wong	2008	Hong Kong	PPH	21	53	13/8
			Milligan-Morgan	20	47	13/7

Table 1. Baseline Characteristics (Continued)

Study	Year	Country	Group	No. of patients	Mean age	M/F
Ligasure hemorrhoidectomy vs. Conventional hemorrhoidectomy						
Palazzo	2002	U.K.	Ligasure	18	44	6/12
			Milligan-Morgan	16	49	6/10
Jayne	2002	U.K.	Ligasure	20	48	11/9
			Milligan-Morgan	20	43	10/10
Milito	2002	Italy	Ligasure	29	52	13/16
			Milligan-Morgan	27	48.2	17/10
Thorbeck	2002	Spain	Ligasure	56		
			Milligan-Morgan	56		
Chung	2003	Taiwan	Ligasure	30	47.1	18/12
			Ferguson	31	44.9	12/19
Franklin	2003	U.K.	Ligasure	17		
			Ferguson	17		
Wang	2006	Taiwan	Ligasure	42	47.1	20/22
			Ferguson	42	47.5	21/21
Muzi	2007	Italy	Ligasure	125	47.1	60/65
			Milligan-Morgan	125	47.5	53/72
Altomare	2008	Italy	Ligasure	146	49	80/66
			Milligan-Morgan	127	48	76/51
Bessa	2008	Egypt	Ligasure	55	33	36/19
			Milligan-Morgan	55	31.9	40/15
Tan	2008	Singapore	Ligasure	22	36.6	13/9
			Milligan-Morgan	22	43.3	9/13

Abbreviations: PPH: Procedure for Prolapse and hemorrhoids; M: male; F: female; U.K.: United Kingdom; U.S.A.: United States of America.

at 24 hours after surgery or during the first bowel movement, were collected for further analysis from each study. Significantly less postoperative pain was experienced by patients in the PPH (Fig. 2A; $p < 0.00001$) and Ligasure groups (Fig. 2B; $p < 0.0001$) than those in the conventional groups.

Outcome – early postoperative urinary retention

Both the PPH groups and Ligasure groups had lower incidences of acute urinary retention after surgery than the conventional hemorrhoidectomy groups (Fig. 3).

Outcome – major postoperative hemorrhage

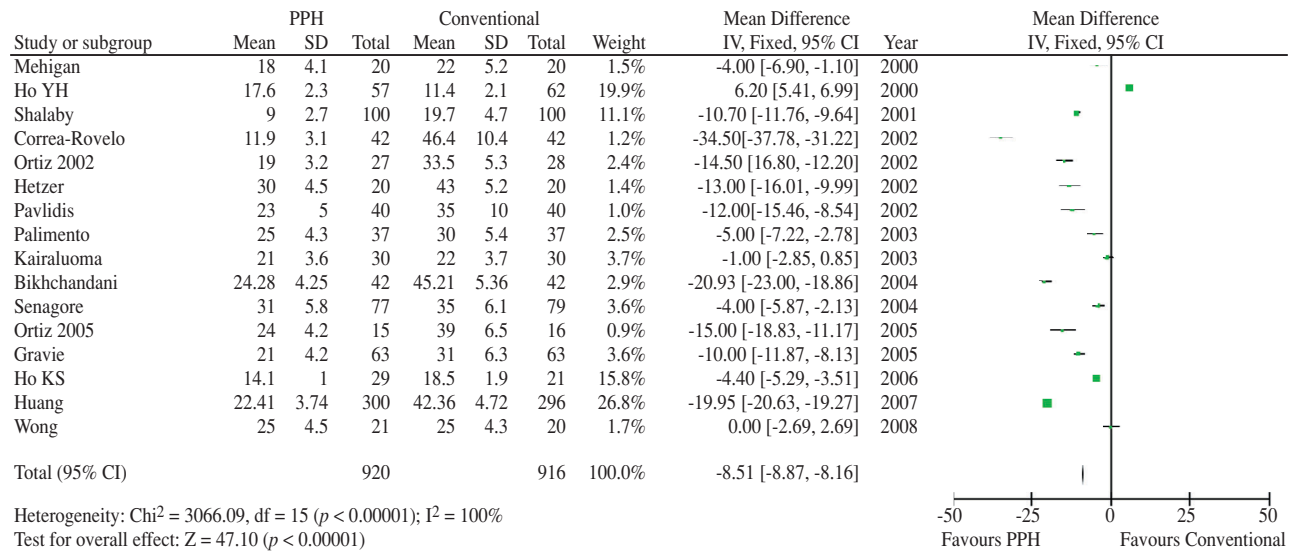
Major postoperative hemorrhage was defined as

bleeding requiring surgical intervention or warranting hospital re-admission. The incidence of major postoperative hemorrhage was low and comparable in each treatment group as shown in Fig. 4A (PPH versus conventional hemorrhoidectomy, $p = 0.15$) and Fig. 4B (Ligasure hemorrhoidectomy versus conventional hemorrhoidectomy, $p = 0.19$).

Outcome – time to return to normal activity

On average, the time to return to normal activity was shorter for the PPH groups than for the conventional hemorrhoidectomy groups (Fig. 5A; $p < 0.0001$). Likewise, based on limited available documents, the Ligasure groups resumed normal activities faster than the conventional groups (Fig. 5B; $p < 0.0001$).

A



B

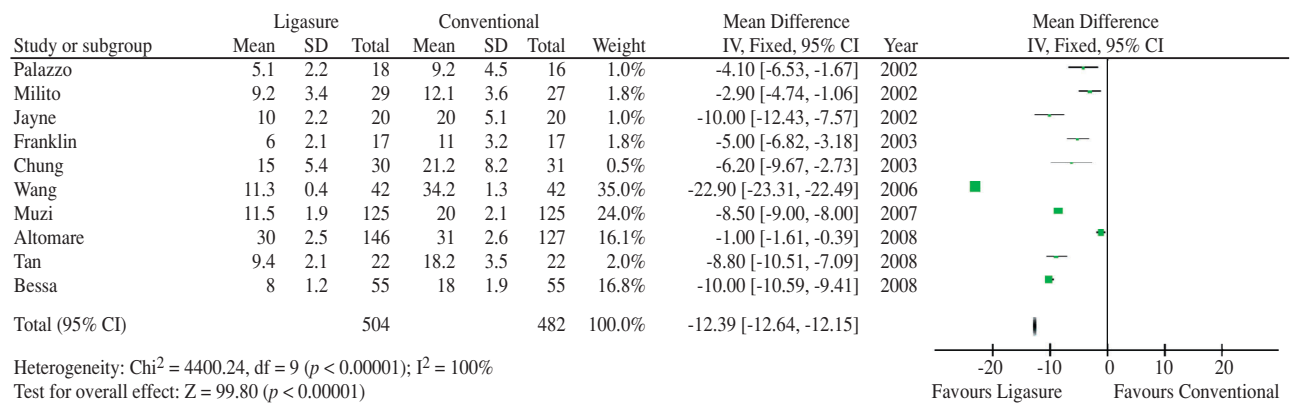


Fig. 1 Operation time (minutes): (A) PPH vs. conventional hemorrhoidectomy; (B) Ligasure vs. convention hemorrhoidectomy.

Outcome – postoperative anal stenosis and incontinence

There were no detectable differences between the PPH and conventional groups, or between the Ligasure and conventional groups in the incidence of postoperative anal stenosis and incontinence.

Outcome – residual skin tags

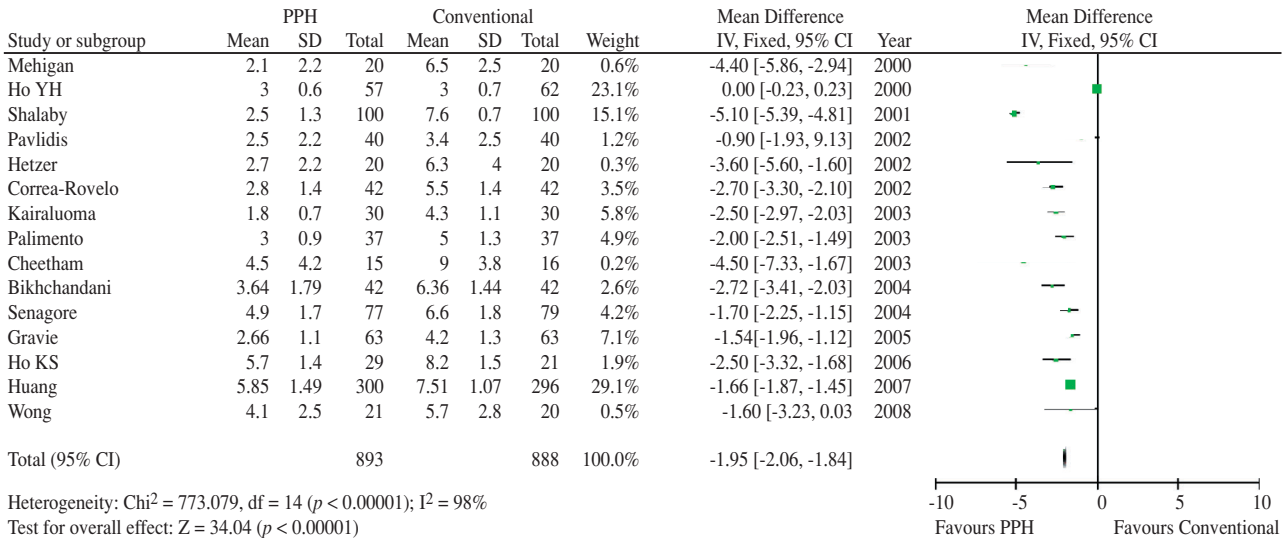
The incidence of residual anal skin tags was significantly greater in the PPH groups than that in the conventional groups (Fig. 6; test for overall effect: Z

= 2.61; $p = 0.009$). Documented data about residual skin tags from studies comparing Ligasure groups with conventional groups were not available.

Outcome – recurrent prolapse

On average, there was better control of recurrent prolapse in the conventional groups than PPH groups (Fig. 7; $p < 0.0001$), although there was statistical heterogeneity between the studies ($\text{Chi} = 10.66$, $p = 0.30$, $I^2 = 16\%$).

A



B

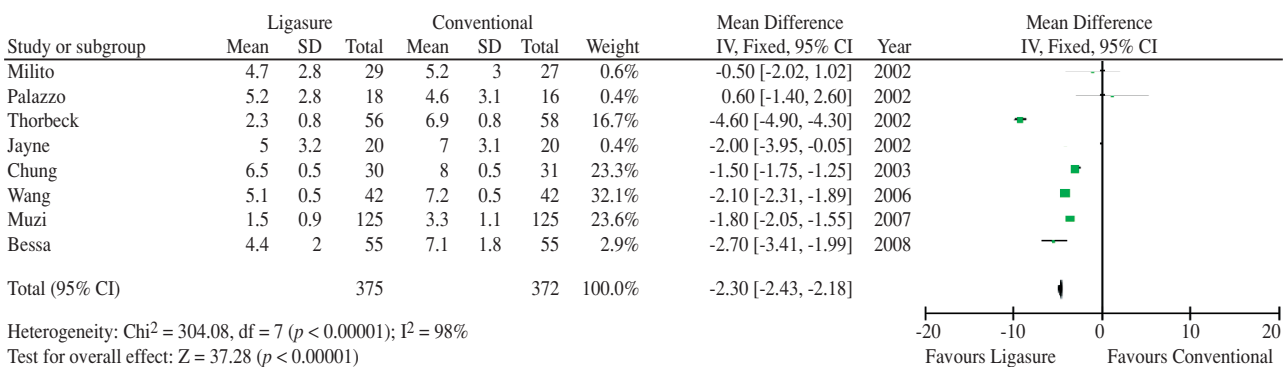


Fig. 2 Early postoperative pain: (A) PPH vs. conventional hemorrhoidectomy; (B) Ligasure vs. conventional hemorrhoidectomy.

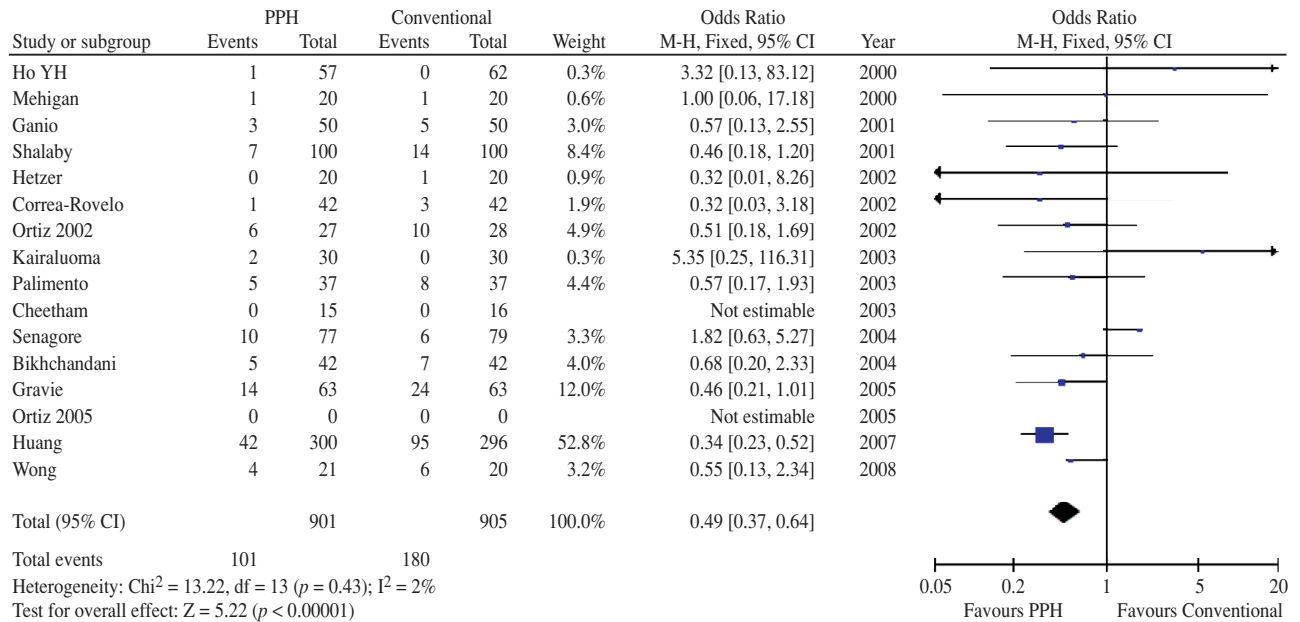
Conclusions

Indications for surgical hemorrhoidectomy include symptomatic hemorrhoids too extensive for nonoperative management, failure of medical treatment, and concomitant conditions, such as anal fissures or ulcers, that require surgery. Conventional hemorrhoidectomy, including open and closed methods, is accepted as the gold-standard for surgical treatment of hemorrhoids worldwide. However, the main drawback of conventional hemorrhoidectomy is extreme postoperative pain, especially when defecating. The complications of conventional hemor-

roidectomy are usually minor, including urinary retention, bleeding, infection, stenosis, and incontinence.

In 1998, Longo introduced an alternative method, PPH, for the surgical treatment of hemorrhoids using a circular stapling instrument which removes a ring of redundant rectal mucosa or expanded internal hemorrhoids. The goal is to pull the prolapsed hemorrhoid tissue back up into its normal position within the anal canal as well as to disrupt the arterial inflow that traverses the excised segment. In this method, skin tags and enlarged external

A



B

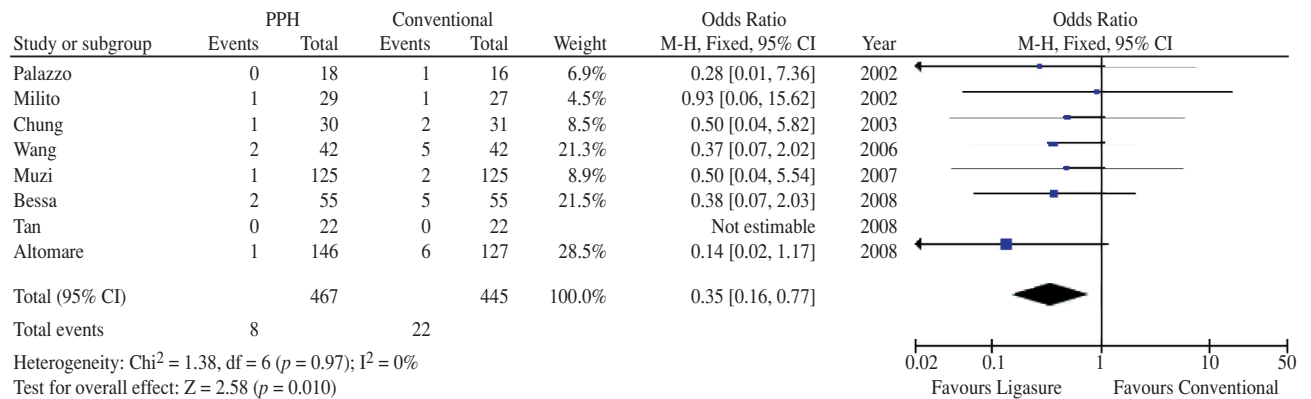


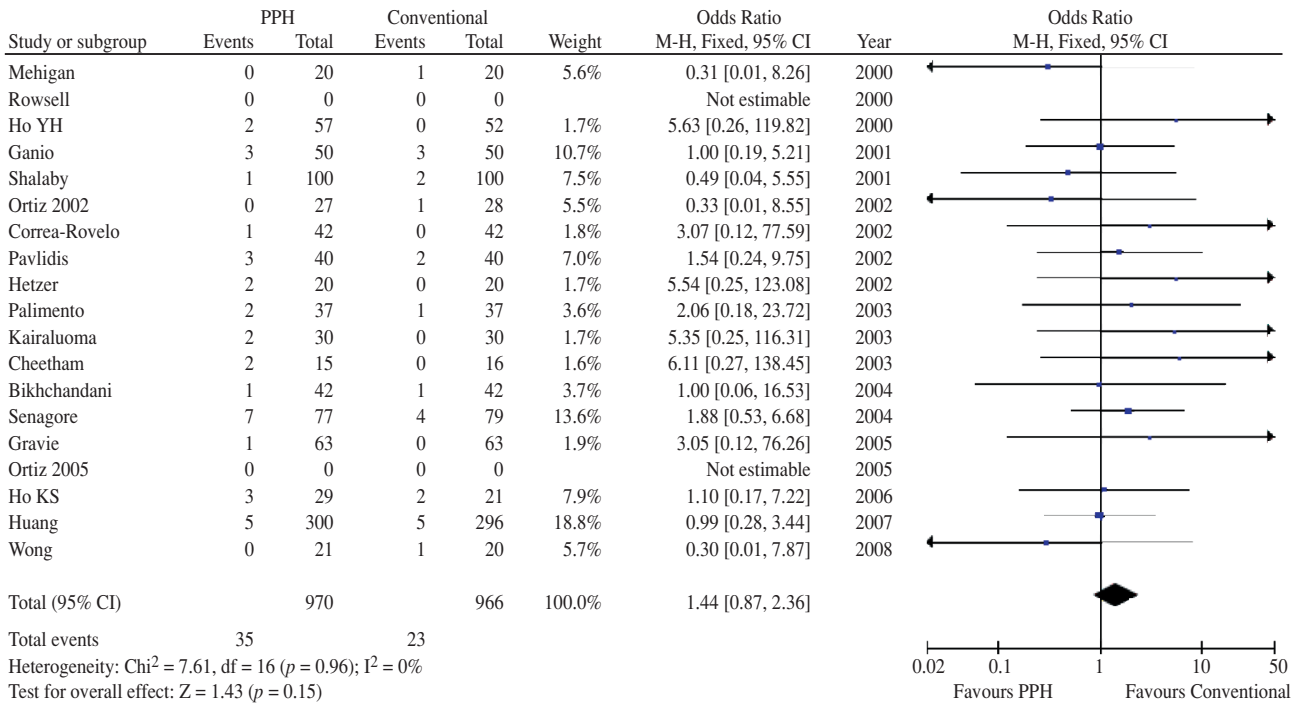
Fig. 3 Early postoperative urinary retention: (A) PPH vs. conventional hemorrhoidectomy; (B) Ligasure vs. conventional hemorrhoidectomy.

hemorrhoids are not removed, which undoubtedly contributes to the reduced pain scores. This was confirmed in this systematic review. The advantages of PPH were a shorter operation time, less postoperative pain, less postoperative urinary retention, and a quicker return to normal activity. Although there are several short-term benefits, the long-term outcome is relatively poor compared with that of conventional hemorrhoidectomy, mainly considering the rate of

residual skin tags and recurrent prolapse. Accordingly, PPH should not be recommended for patients who have symptomatic external hemorrhoids.

Another interesting subject concerns whether PPH is superior to other less invasive procedures, such as rubber band ligation of hemorrhoids. Rubber band ligation is a well-accepted procedure and is supposed to be safe and effective for symptomatic

A



B

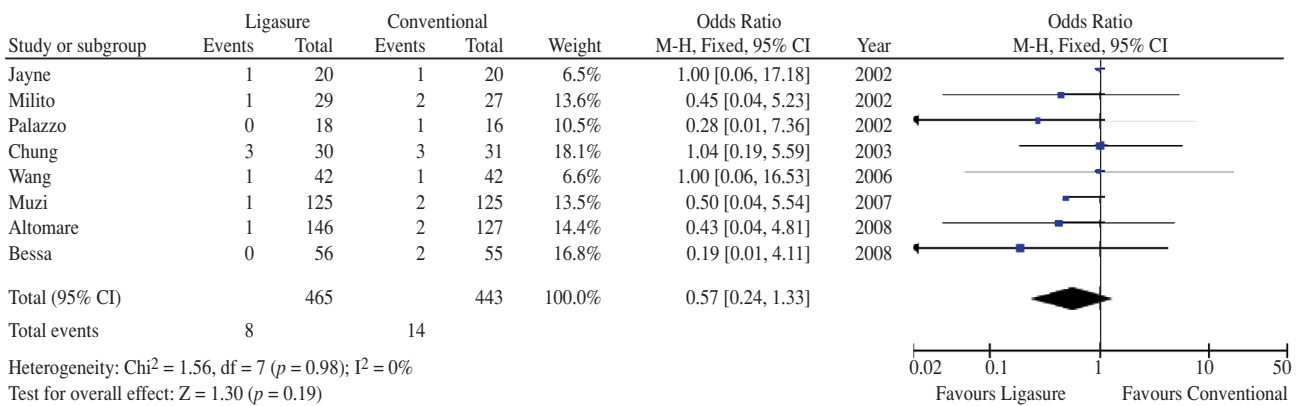


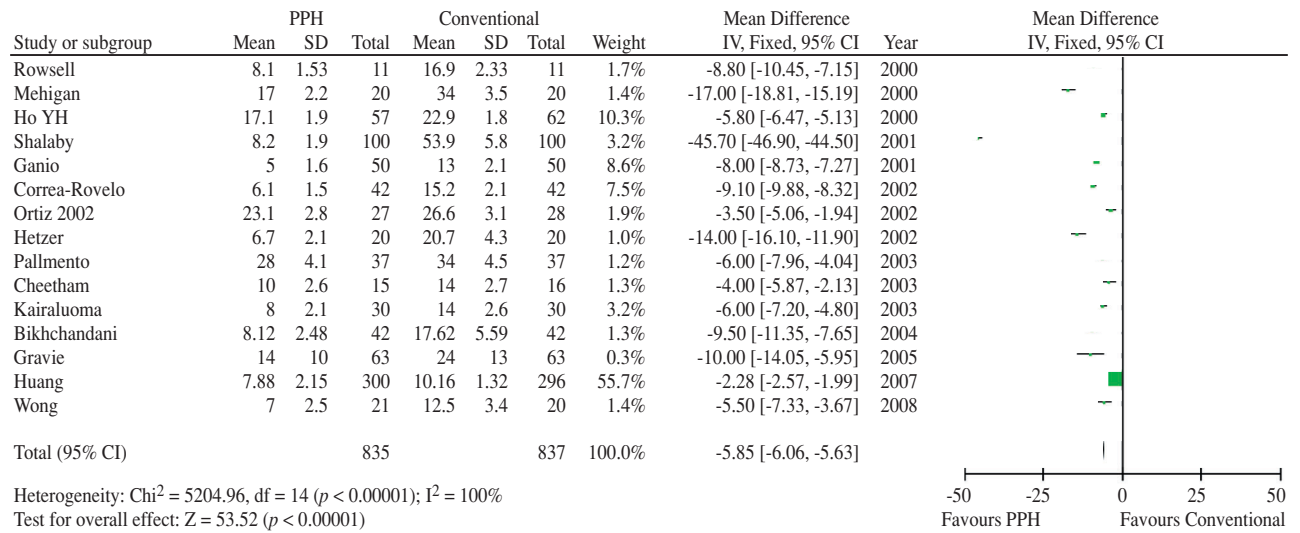
Fig. 4 Major postoperative hemorrhage: (A) PPH vs. conventional hemorrhoidectomy; (B) Ligasure vs. conventional hemorrhoidectomy.

internal hemorrhoids. However, hemorrhoids recur in approximately one-third of patients who receive rubber band ligation which is much higher than that for PPH (8.7% in this review).⁽³⁵⁻³⁹⁾

PPH is technically demanding, and placement of the purse-string at the correct height and depth is

critical. Of particular note, serious complications following PPH have been reported, including rectal perforation, pelvic sepsis, rectovaginal fistula, intra-abdominal bleeding, and Fournier's gangrene.⁽⁴⁰⁻⁴⁷⁾ Further surgery, either an exploratory laparotomy or diverting stomy, was done in these cases. In addition,

A



B

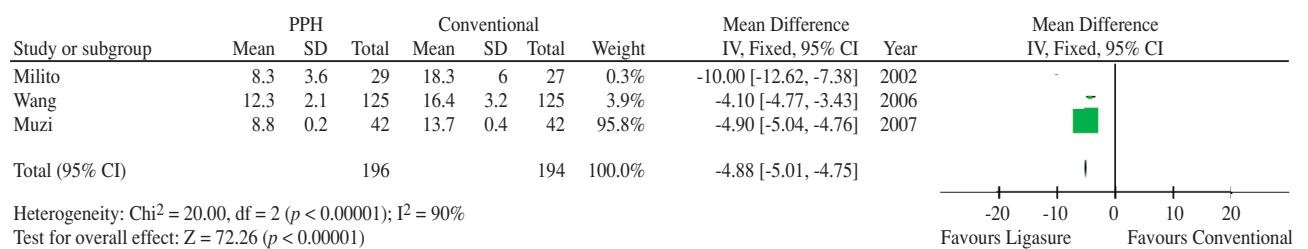


Fig. 5 Time to return to normal activity (days): (A) PPH vs. conventional hemorrhoidectomy; (B) Ligasure vs. conventional hemorrhoidectomy.

Cheetham et al. reported that 31% of patients experienced severe pain and fecal urgency,⁽⁴⁸⁾ which persisted for up to 15 months after PPH. This may result from placing the purse-string suture too close to the dentate line with unintentional stapling of the sensitive anoderm and sphincters. An important caveat is that misapplication of the purse-string suture, at either an inadequate level (too high or too low) or inadequate depth (too deep or too superficial), may result in serious postoperative complications.

The Ligasure system is another recently introduced device which allows accurate application of bipolar diathermy to vascular structures with minimal thermal spread and limited tissue charring. Technically, it is simple and easy to learn because the new technique is a modified conventional hemor-

rhoidectomy which offers excellent hemostatic control and avoids the need to ligate the pedicles. Improved hemostasis may also offer better visibility and therefore a more accurate dissection. From this systematic review, Ligasure hemorrhoidectomy is superior to conventional hemorrhoidectomy in terms of operation time, postoperative pain, urinary retention and time to return to normal activity. Although early functional and symptomatic outcomes have been satisfactory, long-term follow-up of patients following Ligasure hemorrhoidectomy is necessary.

Although both new techniques, PPH and Ligasure hemorrhoidectomy, provide short-term benefits, especially in reducing extreme postoperative pain, more clinical research should be conducted to evaluate long-term outcomes.

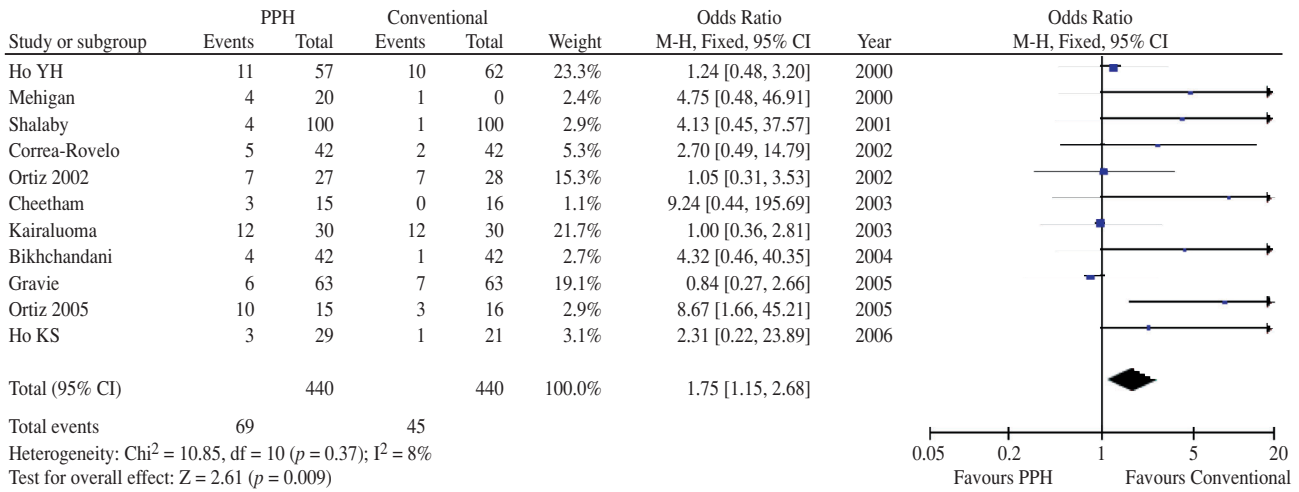


Fig. 6 Residual skin tags: PPH vs. conventional hemorrhoidectomy.

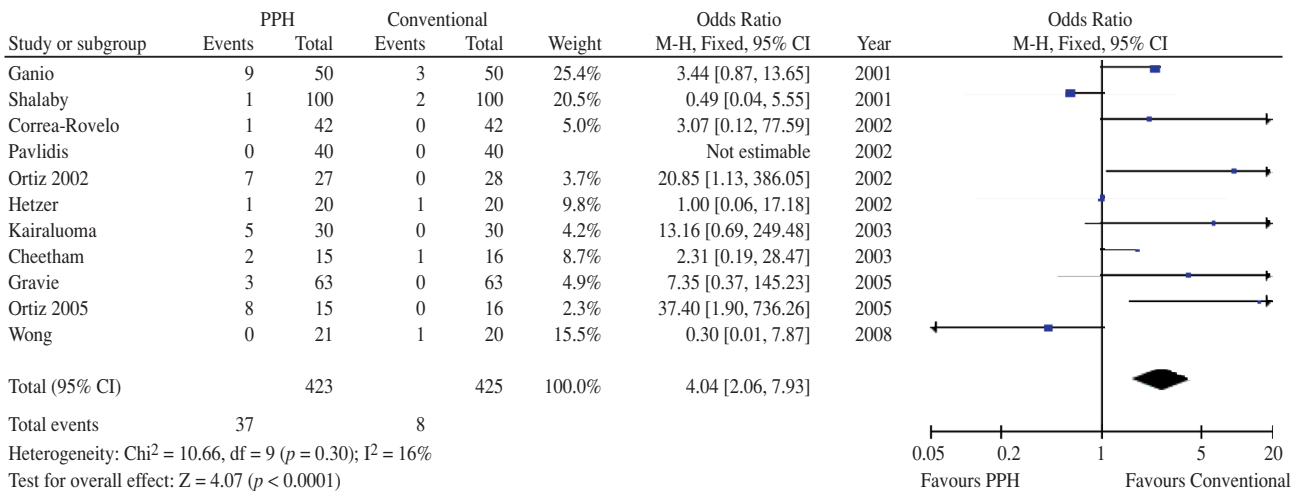


Fig. 7 Recurrent prolapse: PPH vs. conventional hemorrhoidectomy.

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痔瘡外科手術治療的現況—文獻回顧和整合分析

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痔瘡是最常見的肛門疾病之一，傳統的痔瘡切除是最常被應用的外科手術治療。近幾年，痔瘡環狀切除手術和 Ligasure 痔瘡切除手術是比較新的外科技術，也漸漸的被推廣當中。本篇的目的就是想要比較這兩個新的技術和傳統的痔瘡切除手術間的差異和利弊。我們利用 MEDLINE 回溯分析，從 2000 年一月至 2009 年九月所有前瞻隨機性的研究，包含比較痔瘡環狀切除手術和傳統的痔瘡切除手術或 Ligasure 痔瘡切除手術和傳統的痔瘡切除手術的研究。結果發現痔瘡環狀切除手術和 Ligasure 痔瘡切除手術兩者在降低手術時間、術後疼痛、術後排尿不順、以及恢復到正常活動的時間都比傳統痔瘡手術較好；但是痔瘡環狀切除手術有較高比率的外在皮膚贅肉以及復發脫出的機率。雖然這兩種新技術都有短期的好處，尤其是降低手術後的疼痛；此外，應該要有更多更好的臨床試驗不僅有長期追蹤的結果也有較多的研究個案來確實評估最忠實的結果。(長庚醫誌 2010;33:488-500)

關鍵詞：痔瘡，痔瘡切除手術，痔瘡環狀切除手術，PPH，Ligasure 痔瘡切除手術

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