Comparison of a modified anoscope and the purse-string anoscope in stapled haemorrhoidopexy

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Abstract
AIM: To compare the results of the anoscope of the PPH kit and a modified anoscope during stapled haemorrhoidopexy.

METHODS: The hospital records of 37 patients who underwent stapled haemorrhoidopexy between 2001 and 2006 were reviewed. The purse-string suture anoscope in the PPH kit was used on 15 patients (Group 1), and the modified anoscope was used on 22 patients (Group 2). Demographic characteristics of the patients, operation time, surgeon’s performance, analgesic requirement, and complications were compared.

RESULTS: Operation time was significantly longer in Group 1 (42.0 ± 8.4 min vs 27.7 ± 8.0 min, P = 0.039). The surgeons reported their operative performance as significantly better in Group 2 (the results of the assessments were poor in ten, medium in four and good in one in Group 1, while good in all patients in Group 2, P < 0.001). The need for haemostatic sutures was significantly higher in Group 1 (six cases) and was needed in two cases in Group 2 (P = 0.034).

CONCLUSION: Operation time decreased and the surgeon’s satisfaction increased with use of the modified anoscope, and fewer haemostatic sutures were required if the surgeon waited longer before and after firing the stapler.

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Key words: Haemorrhoidal disease; Modified anoscope; Purse-string suture; Stapled haemorrhoidopexy; Stapled anopexy

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INTRODUCTION
Stapled haemorrhoidopexy is not only a safe method that can be compared with conventional haemorrhoidectomy procedures, but also has advantages such as reduced postoperative pain and early return to work[1,2]. Moreover, some studies suggest the applicability of stapled haemorrhoidopexy as a day case procedure[3]. However, some complications were noted after stapled haemorrhoidopexy, such as rectal perforation, intraperitoneal haemorrhage, recto-vaginal fistula, and perirectal haematoma. These complications are not observed after conventional haemorrhoidectomy. In addition, although stapled haemorrhoidopexy is the most recent surgical method for the treatment of haemorrhoidal diseases, the number of patients that developed pelvic sepsis after this surgical technique has reached the same number as after conventional haemorrhoidectomy[4,5]. It was suggested that these serious complications could be due to technical errors and could be avoided by eliminating the bite of the suture in deep layers of the rectum[6].

The ideal purse-string suture must enable removal of a ring of the desired thickness from the most appropriate part of the rectum. One major obstacle to the surgeon during the operation is blockage of vision due...
to internal haemorrhoids. If these internal haemorrhoids can be eliminated, then optimal purse-string suture can be performed\textsuperscript{10}. Some studies suggest that after modification of the anoscope of the PPH stapler kit (Ethicon Endo-Surgery, Cincinnati, OH, USA), purse-string suture applications have been performed with relative ease\textsuperscript{10-12}.

We first performed the stapled haemorrhoidopexy procedure in our clinic in 2001. We noticed the need for a modification of the anoscope of the PPH kit due to difficulties during the placement of the purse-string suture\textsuperscript{[10,11]}. Subsequently, we tried several modifications of the anoscope and using the modified anoscope, purse-string sutures were performed with ease, and staple haemorrhoidopexy was completed effectively.

In this study, the surgical findings and early postoperative results of patients in whom the purse-string suture anoscope of the PPH kit was used were compared with those of patients in whom the modified anoscope was used during stapled haemorrhoidopexy.

**MATERIALS AND METHODS**

Hospital and follow-up records of patients with grade III and IV haemorrhoidal disease who underwent stapled haemorrhoidopexy in our clinic between 2001 and 2006 were reviewed retrospectively. Gender, degree of haemorrhoidal disease, preoperative treatment, operation time, performance of the surgeon, analgesic requirement, haemostatic sutures, histopathological examination of the excised ring, postoperative complications, and hospital stay were evaluated. Patients with associated proctological diseases such as anal abscess, anal fissure and fistula were excluded from the study. The patients were informed about the details of the procedure and written informed consent was obtained. The patients were grouped as: (1) the patients on whom the purse-string suture anoscope in the PPH kit was used (PA group), and (2) the patients on whom the modified anoscope was used (MA group). The modified anoscope was sterilized by ethylene oxide before use in each patient. The purse-string suture technique which has been described previously, was used in the MA group\textsuperscript{[10,11]}. Stapled haemorrhoidopexy was completed using the stapler in the PPH (Ethicon Endo-Surgery, Cincinnati, OH, USA) kit in both groups. In the PA group, the surgeon waited for 30 s with the stapler closed after firing the stapler to ensure haemostasis. In the MA group, the surgeon waited for a total of 3 min, 90 s before and 90 s after firing the stapler. In the MA group, some of the operations were performed by inexperienced surgeons under the supervision of an experienced surgeon, whereas in the PA group an experienced surgeon performed the operations. The procedures were performed by six general surgeons, three of which were experienced. Diclofenac sodium 75 mg, IM was administered on demand after surgery, and pethidine HCl 50 mg, IM was given if diclofenac was insufficient. Patient age, gender, degree of haemorrhoidal disease, previous medical or surgical treatments, previous blood transfusions, pathological evaluation of the excised ring, the performance of the surgeons, postoperative analgesic requirement, early (during the first 30 d) or late (after the first 30 d) complications in both groups were investigated, and the differences between the groups were analyzed statistically.

In the first few postoperative hours, the surgeons were asked two questions in order to evaluate the procedure: Was the anoscope simple to use during the manipulation, and how would you evaluate your performance during the procedure? The surgeons who performed the operations were asked to evaluate their performances as good, moderate, or poor. The surgeons who performed operations in both groups evaluated their performances by making comparisons with their earlier experiences, however, the surgeons who performed operations only in Group 2 made their decisions without comparisons.

**Statistical analysis**

SPSS 10.0 was used for statistical analysis. Considering numerical values, Student's $t$ test was used for parametric measurements, and Mann Whitney $U$ test for non-parametric measurements. Considering categoric values, Pearson's Chi-Square test was applied for parametric measurements and Fisher's exact correct test for non-parametric measurements. A $P$ value less than 0.05 was considered statistically significant.

**RESULTS**

The records of 37 patients, who underwent stapled haemorrhoidopexy for the treatment of haemorrhoidal disease were investigated. Two types of anoscopes were used to aid purse-string suture application: the purse-string anoscope in the PPH kit was used on 15 patients (40.5) between September 2001 and March 2004, and the modified anoscope was used on 22 patients (59.5) between December 2003 and May 2006.

Mean age of the patients was $47.9 \pm 15.2$ years (range, 27-78 years), and $49.0 \pm 11.9$ years (range, 30-70 years) for the PA group and the MA group, respectively. There were 11 male and four female patients in the PA group and 17 male and five female patients in the MA group. There were no statistically significant differences between the two groups with respect to age ($P = 0.802$) and gender ($P = 0.541$). Mean duration of complaints was $94.8 \pm 83.5$ mo (range, 6 mo-20 years) for the PA group, and $112.1 \pm 98.5$ mo (range, 6 mo-30 years) for the MA group. Mean postoperative follow up time was $46.1 \pm 8.7$ mo (range, 36-66 mo) in the PA group and $21.9 \pm 9.9$ mo (range, 10-39 mo) in the MA group.

When the disease stage was considered, nine patients had third degree, and six patients had fourth degree haemorrhoidal disease in the PA group, whereas; 17 patients had third degree, and five patients had fourth degree haemorrhoidal disease in the MA group. There were no statistically significant differences between the two groups with respect to stage of the disease ($P = 0.222$).
Table 1  General characteristics of the patients, operative findings, and the differences between the two groups n (%)  

|                         | Group 1 (PA) | Group 2 (MA) | P value |
|-------------------------|--------------|--------------|---------|
| Number of patients      | 15 (40.5)    | 22 (59.5)    |         |
| Gender                  |              |              |         |
| Male                    | 11 (73.3)    | 17 (77.3)    | 0.541   |
| The degree of haemorrhoidal disease | 9 (60.0)    | 17 (77.3)    | 0.222   |
| II                      | 6 (40.0)     | 5 (22.7)     |         |
| Preoperative treatment  |              |              | 0.564   |
| Medical                 | 14 (93.3)    | 17 (77.3)    |         |
| Blood transfusion       | -            | 1 (4.5)      |         |
| Surgery                 | -            | 1 (4.5)      |         |
| Not required            | 1 (6.7)      | 3 (13.6)     |         |
| Haemostatic suture      |              |              | 0.034   |
| Required                | 6 (40)       | 2 (9.1)      |         |
| Early complication      |              |              | 0.683   |
| Bleeding                | 5 (33.3)     | 7 (31.8)     |         |
| Urinary retention       | 1 (6.7)      | 1 (4.5)      |         |
| Anal prolapse           | -            | 1 (4.5)      |         |
| Late complication       |              |              | 0.418   |
| Anal fissure            | 1 (6.7)      | -            |         |
| External pile           | -            | 1 (4.5)      |         |
| Thrombosis of haemorrhoids | -          | 1 (4.5)      |         |
| Histopathology of the donut |            |              | 0.933   |
| Normal                  | 13 (86.7)    | 19 (86.4)    |         |
| Smooth muscle           | 1 (6.7)      | 2 (9.1)      |         |
| Adenoma                 | 1 (6.7)      | 1 (4.5)      |         |
| Evaluation of the performance of the surgeon | | < 0.001 | |
| Poor                    | 10 (66.7)    | -            |         |
| Medium                  | 4 (26.7)     | -            |         |
| Good                    | 1 (6.7)      | 22 (100)     |         |

When previous treatment modalities (medical, blood transfusion, surgery) were considered, there were no statistically significant differences between the two groups (P = 0.564). General characteristics of the patients, intraoperative findings, and the differences between the two groups are shown in Table 1.

Mean duration of surgery was 42.0 ± 8.4 min (range, 30-60 min) for the PA group, and 27.7 ± 8.0 min (range, 18-45 min) for the MA group, and the difference was statistically significant (P = 0.039) (Table 2). Additional haemostatic suture application after removal of the stapler was required in six cases (40.0) in the PA group and in two cases (9.1) in the MA group; and the difference was statistically significant (P = 0.034). When the need for analgesics was considered, mean diclofenac sodium usage was 1.9 ± 1.5 times (range, 0-6 times) in the PA group, and 1.5 ± 1.1 times (range, 0-4 times) in the MA group. Mean pethidine HCL administration was 0.8 ± 1.1 times (range, 0-3 times) in the PA group, and 0.3 ± 0.6 times (range, 0-2 times) in the MA group. These differences between the groups were not statistically significant (P = 0.284, and P = 0.070, for diclofenac and pethidine, respectively) (Table 2). Urinary retention developed as an early complication in one patient in each group, and was relieved by urinary catheterization. Anal prolapse developed in one patient due to straining 8 h after the operation. Digital rectal examination revealed that the staple line was intact. Prolapsed mucosa was reduced, and gauze sponges were applied to avoid recurrence. Gauze sponges were removed 12 h later and the patient was warned about straining. The patient was free of complaints 24 h later. Anal prolapse did not recur and the patient had normal bowel movements. Bleeding occurred in five patients (33.3) in the PA group and in seven patients (31.8) in the MA group. Bleeding was minor in all cases and no additional treatment was required. Bleeding ceased spontaneously within 24 h in five patients in each group, and after 48 h in two patients in the MA group. No delayed haemorrhage occurred. When early complications were considered, there were no statistically significant differences between the two groups (P = 0.685). The mean hospitalization period was 1.7 ± 1.1 d (range, 1-3 d) in the PA group, and 1.5 ± 0.7 d (range, 1-3 d) in the MA group, and the difference was not statistically significant (P = 0.449) (Table 2). The surgeons ranked their performance as poor (n = 10), moderate (n = 4), and good (n = 1) in the PA group, and as good in all 22 operations in the MA group. The difference was statistically significant (P < 0.001). An anal fissure developed 6 mo after surgery in one patient in the PA group, and treatment with lateral internal sphincterotomy was unsuccessful. Thrombosed external haemorrhoids developed 1 mo after surgery in one patient in the MA group, and excision of the piles was performed under local anesthesia. A skin tag excision was performed in one patient in the MA group 7 mo postoperatively. When late complications in the two groups were considered, the difference was not statistically significant (P = 0.418). Histopathological evaluation of the donuts showed that the specimens from 13 patients in the PA group included only mucosa and submucosa. Additionally, a mucosal adenoma was reported in one patient, and muscularis propria in another patient in this group. In the MA group, 19 donuts included only mucosa and submucosa, two donuts also included muscularis propria, and one included a mucosal adenoma. There were no statistically significant differences between the two groups (P = 0.933).

DISCUSSION

Achieving a perfect purse-string may be difficult in stapled haemorrhoidopexy, even after meticulous application of the technique. The surgeon starts by placing the purse-string suture at a distance of 3-4 cm above the dentate line.

The operation time, need for analgesics, and length of hospital stay of the patients, and the differences between the two groups (mean ± SD) are shown in Table 2.

Table 2  Operation time, need for analgesics, and length of hospital stay of the patients, and the differences between the two groups (mean ± SD)  

|                         | Group 1 (PA) | Group 2 (MA) | P value |
|-------------------------|--------------|--------------|---------|
| Operation time (min)    | 42.0 ± 8.4   | 27.7 ± 8.0   | 0.039   |
| Needs for analgesics    |              |              |         |
| Average dose            |              |              |         |
| Diclofenac sodium       | 1.9 ± 1.5    | 1.5 ± 1.1    | 0.284   |
| Pethidine HCI           | 0.8 ± 1.1    | 0.3 ± 0.6    | 0.070   |
| Hospital stay (d)       | 1.7 ± 1.1    | 1.5 ± 0.7    | 0.449   |
and just deep enough to take the mucosa and submucosa, however, if internal haemorrhoids obscure the surgical field and if the tip of the needle causes bleeding while passing through the mucosa, further bites of the suture may not pass at the same distance and at the same depth. This may result in an uneven purse-string suture which is closer to the dentate line, goes through deeper tissues, or which skips the mucosa in some parts. Consequently, some parts of the staple line may be closer to the dentate line, or some parts of the donut may be thicker, or it may not be intact. A staple line close to the dentate line may cause acute or persistent pain, or bring about a risk of incontinence. It has been reported that patients with a staple line uniformly 22 mm above the dentate line needed fewer postoperative narcotic analgesics and returned to work earlier. In the case of an incomplete donut or a donut with thin parts, this may increase the risk of bleeding during the early postoperative period or recurrence in the late period.

Various modifications of the purse-string anoscope have been used for easier application of the suture and a new anoscope has been designed. Yamamoto et al. indicated that they have been using their modified anoscope over the last 2 years. We have been using our modified anoscope since 2003.

This is the first study to compare the conventional anoscope, and a modified anoscope used during stapled haemorrhoidopexy. Although this study is limited by its retrospective nature, the two groups of patients were statistically comparable in terms of age, gender, stage of haemorrhoidal disease and previous treatment modalities.

Median operation time for stapled haemorrhoidopexy has been reported to be between 15 and 38 min (range, 5-150 min). Median operation time for the PA group in our study was higher than that reported in the literature; however, the range in operation time was similar. When the MA group is considered, both median operation time and median range were in accordance with the literature. There may be a number of explanations for the difference in operation time between the two groups in the present study. First of all, the PA group covered a time period where the surgeons who applied this method were less experienced. In addition, the purse-string suture had to be repeated several times in some patients in this group, and the number of patients who required haemostatic sutures was higher in this group. We propose that all of these factors prolonged the operation time. One explanation for the shorter operation time in the MA group may be that the application of the purse-string suture with the modified anoscope was much easier. It can also be said that the surgeons performed the operation in a shorter time, as they had gained more experience with the procedure. However, it should be emphasized that inexperienced surgeons performed some of the operations under the supervision of an experienced surgeon in this group. Moreover, the purse-string suture was possible on the first attempt in most patients, and haemostatic sutures were required in a smaller percentage of patients in this group (9.1% in the MA group, and 40% in the PA group). The necessity for haemostatic sutures was reported to be 84% in a study in which the time elapsed before and after firing the stapler was not noted. Nahas et al. reported that they waited 30 s after firing the stapler and the necessity for haemostatic sutures was 20%. Racalbuto et al., in their study in which one min elapsed before and after firing the stapler, did not refer to the rate of haemostatic sutures, but reported the rate of bleeding as 6%. The PA group consisted of the initial patients who underwent haemorrhoidopexy surgery. Initially we paused for 30 s after firing the stapler for haemostasis. After the team gained some experience we increased the time before and after firing to 180 s considering that more efficient haemostasis could be achieved by longer compression on the vessels at the surgical site. When the two groups in the present study were compared with respect to the application of haemostatic sutures, it was observed that the number of patients who required additional sutures was significantly less in the MA group than in the PA group. This was an extra finding, and was not due to the features of the video- anoscope. A 3 min pause after closing the stapler may be tedious, but it is better than trying to apply additional haemostatic sutures if bleeding occurs after the stapler is removed. The haemostatic efficacy of keeping the stapler closed needs to be investigated by prospective controlled studies.

The rate of bleeding reportedly ranges between 5% and 85% in the literature. The rates of bleeding in the PA group and in the MA group in the present study were 33.3% and 31.8%, respectively. Bleeding was minor in all cases and stopped in most patients within 48 h without any need for additional interventions. Urine retention rates observed in the PA and MA groups were in accordance with the literature. We could not find a similar complication in the literature to the anal prolapse that we observed in one patient in the MA group. It did not seem to be due to anastomotic dehiscence because the stapler line was intact. The reasons for anal prolapse as an early postoperative complication may be due to excessive venous congestion and edema of internal haemorrhoids. Improvement of the clinical picture after reduction of the haemorrhoids confirmed this hypothesis.

The need for analgesics in each group was consistent with that reported in the literature. None of the patients suffered from persistent pain. Hospital stay, reported in the literature as 0-2 d was similar to that in the present study. When the two groups were compared in terms of late complications, there were no significant differences, also consistent with the literature. Results of the histopathological examination of the specimens obtained in this study were similar to those reported in the literature, and no significant differences between the two groups in this study were noted.

Satisfaction of the surgeons regarding technical performance during surgery was significantly higher in the MA group than in the PA group. As this was a retrospective study, it was difficult for the surgeons to remember their initial operations and commented so.
The decisions made by the surgeons were based on a comparison of the two anoscopes as they performed surgery in both groups, and they described their operative performances as better with the modified anoscope. In the MA group, the surgeons who performed the procedure for the first time did not have the chance to compare the anoscopes, but they too described their operative performance as good or sufficient. As all the surgeons noted that they would prefer to use the modified anoscope in future operations, we have been using only the modified anoscope for 4 years. These results need to be supported by prospective randomized studies.

In conclusion, with the help of our modified anoscope, the purse-string suture is easy to perform, the operation is completed in a shorter time, and the surgeons were more satisfied with their operative performances. Additionally, by waiting a total of 3 min, 90 s before and after firing the stapler, fewer haemostatic sutures were required. Using the modified anoscope, optimum application of the purse-string suture is achieved during stapled haemorrhoidopexy.

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