

Topical tannic acid application decreases posthemorrhoidectomy pain: a novel idea

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Background

Posthemorrhoidectomy pain represents an annoying problem for the surgeon and the patient; although it can be controlled with an analgesic ladder, its management remains in question.

Purposes

The current study investigated the efficacy of topical tannic acid powder in reducing postoperative pain, in promoting wound healing after open diathermy hemorrhoidectomy, and in the prevention of secondary hemorrhage.

Patients and methods

A prospective, randomized trial was conducted on 97 patients suffering from grade 3 or 4 internal or external hemorrhoidal disease to compare posthemorrhoidectomy pain and wound healing with the use of topical tannic acid applied to the surgical site compared with placebo. Postoperative follow-up was for 3 months.

Results

Postoperative pain in patients given topical tannic acid improved during the first 2 days (VAS: 1.2 ± 0.4 vs. 8.2 ± 0.6 ; $P < 0.05$) and on day 7 (VAS: 3.6 ± 0.6 vs. 6.3 ± 0.5 ; $P < 0.05$); wound healing also improved significantly [mean postoperative edema score: 3.0 vs. 7.0, $P < 0.05$; and mean overall wound healing score: 4.0 vs. 6.0, $P < 0.05$], although there was no difference as regards primary and secondary healing ($P > 0.05$). In addition, secondary hemorrhage in the topical tannic acid group was significantly less (mean score, 2.0 vs. 12.0; $P < 0.05$).

Conclusion

Topical tannic acid application plays an important role in diminishing postoperative pain, in improving wound healing after open diathermy hemorrhoidectomy, and in preventing secondary hemorrhage.

Keywords:

hemorrhoidectomy, pain control, tannic acid

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Introduction

Tannic acid (Fig. 1) is odorless but has a very astringent taste. Pure tannic acid is a light yellowish and amorphous powder. Tannic acid is a polymer comprising gallic acid molecules and glucose. It is distributed in tea, nettle, wood, berries, and Chinese galls [1,2].

Tannic acid has antibacterial, antienzymatic, and astringent properties. It has constricting action upon mucous tissues. It also has antioxidant and antimutagenic properties [3,4].

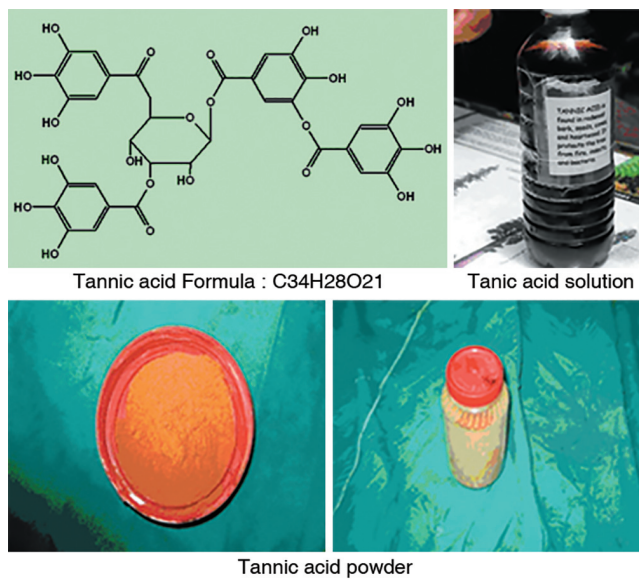
Tannic acid can be administered through more than one route: oral, in the form of solution, and topical, in the form of powder. It has many side effects: it causes extra heartbeats, hallucination, fits, allergy, and blood disorders [1].

The physiology of postoperative pain involves transmission of pain impulses through splanchnic (not vagal) afferent fibers to the central nervous system, where they initiate spinal, brain stem, and cortical reflexes. Spinal responses result

from stimulation of neurons in the anterior horn, resulting in skeletal muscle spasm, vasospasm, and gastrointestinal ileus. Brain stem responses to pain include alterations in ventilation, blood pressure, and endocrine function. Cortical responses include voluntary movements and psychological changes, such as fear and apprehension. These emotional responses facilitate nociceptive spinal transmission, lower the threshold for pain perception, and perpetuate the pain experience [5–7].

Hemorrhoidectomy remains a painful operation, but for most patients it is extremely successful as a means of controlling symptoms from third-degree piles. The single most important challenge after surgical hemorrhoidectomy is the management of postoperative pain. Postoperative pain likely has two major components: first, discomfort from the surgical incision in the uniquely sensitive anoderm and perianal skin and, second, discomfort from tissue inflammation resulting from bacterial infiltration of the wound. Decreasing pain from the surgical incision itself can be accomplished by minimizing surgical trauma [7,8].

Figure 1



Tannic acid formula, solution and powder.

Optimal management of posthemorrhoidectomy pain requires planning. Effective postoperative pain control has numerous benefits: enhanced breathing, increased mobility, and prevention of gastrointestinal immotility [9–11].

Effective posthemorrhoidectomy pain control should be administered according to a protocol of increasing strength (analgesic ladder): paracetamol, nonsteroidal anti-inflammatory drugs, patient-controlled morphine analgesia [8,12].

Patients and methods

After obtaining approval from the local ethical committee of Benha University and fully informed written patient consent, this study was conducted by including 97 patients who were fit for surgery from Benha University and a private hospital during the period October 2012–May 2014. A prospective, randomized trial was conducted to compare posthemorrhoidectomy pain, wound healing, and prevention of secondary complications with the use of topical tannic acid powder applied to the surgical site in 50 patients (group A) compared with 47 patients administered placebo carrier (group B). The study population comprised 63 (64.9%) female and 34 (35.1%) male patients; 79 (81.4%) were between 21 and 43 years of age and 18 (18.6%) were above 43 years (Table 1).

Patients included in this study were suffering from primary hemorrhoids of grade 3 [73 cases (75.3%)] or grade 4 [24 cases (24.7%)], internal or external hemorrhoids; there were 89 (90.7%) noncomplicated

Table 1 Distribution of cases

Preoperative parameters	N (%)
Approach	
Group A: topical tannic acid application	50 (51.6)
Group B: placebo carrier application	47 (48.4)
Sex	
Female	63 (64.9)
Male	34 (35.1)
Age (years)	
Between 21 and 43 years	79 (81.4)
>43 years	18 (18.6)
Grades	
Grade 3	73 (75.3)
Grade 4	24 (24.7)
Types of primary origin	
Noncomplicated hemorrhoids	89 (90.7)
Complicated hemorrhoids	9 (9.3)
Associated anal fissure	
Group A	16 (16.4)
Group B	19 (19.6)

cases and nine (9.3%) complicated cases (with massive bleeding, thrombosis, or gangrene). Sixteen (16.4%) patients in the tannic acid group and 19 (19.6%) patients in the control group had an associated fissure-in-ano and underwent fissurectomy and sphincterotomy in addition to hemorrhoidectomy (Table 1).

Patients suffering from kidney or liver disorder, skin allergy and heart problems, as well as pregnant and breast-feeding women were excluded.

All patients were submitted to full history, clinical examination, and laboratory tests as follows:

- (1) History: patient history was taken to exclude pregnancy, lactation, and allergy or to diagnose the grades of hemorrhoids, usually present with bleeding or prolapse and with frequent complaints of discharge of mucus, pruritus, and some discomfort. Symptomatic hemorrhoids are often intermittent. Bleeding is commonly associated with constipation and straining. Hemorrhoids are often associated with skin tags, which may cause irritation and difficulty in maintaining anal hygiene. If hemorrhoids prolapse, they may spontaneously return to the anal canal after straining; large hemorrhoids may be irreducible. Thus, hemorrhoids may be classified as first degree (piles that never prolapse), second degree (piles that prolapse but spontaneously return), third degree (piles that prolapse and require digital replacement), and fourth degree (piles that are permanently prolapsed) [13].
- (2) Clinical examination:
 - (a) General examination: this was carried out in a meticulous way and included the airways, vital signs, and back, abdominal, and skeletal examination (body weight) to ascertain fitness.

- (b) Local examination: it was carried out to detect severe skin allergy and to diagnose hemorrhoids; some hemorrhoids can be diagnosed solely by inspection. There may be skin tags and descent of the hemorrhoids during straining. When hemorrhoids become evident during straining they appear as two or three circumscribed swellings, as compared with the circumferential appearance of a full-thickness rectal prolapse. Furthermore, most patients with hemorrhoids do not have a patulous anus, as do patients with rectal prolapse. Digital examination is important to detect the presence of anal pathology and to assess anal tone [14].
- (3) Preoperative investigations: preoperative examinations included analysis of complete blood count, blood sugar, and liver functions, renal function tests, ECG in patients above 40 years, and specific tests to confirm the presence of hemorrhoids — that is, proctoscopy at rest and during straining. Proctosigmoidoscopy is important to exclude any rectal pathology, particularly polyps, proctitis, or a neoplasm in patients above 50 years of age.

Operative procedures

There are two techniques for hemorrhoidectomy. The operation may be performed as an open procedure so that any discharge of blood, serum, or pus can drain easily, or a closed hemorrhoidectomy may be performed in which the mucosa and the skin defect are closed, which leaves an intact anal canal. The techniques used in this study were open diathermy hemorrhoidectomy after general (better), spinal anesthesia and lithotomy (better), or prone jackknife position. The patient was placed with the feet in stirrups and the anal canal was gently dilated. A proctoscope was inserted to identify the site of the three principal hemorrhoids. A weak adrenaline solution (1: 200 000) in saline was infiltrated around the skin adjacent to each primary hemorrhoid and further injection was made in the lower part of the intersphincteric space and in the submucosal plane under the hemorrhoid. Tissue forceps were then applied to each pile and to the skin adjacent to the hemorrhoid. The procedure started with the 7 o'clock hemorrhoid, followed by the 3 o'clock hemorrhoid, and finished with the 11 o'clock hemorrhoid, and hence the operation field was not obscured by bleeding. The tissue forceps held the hemorrhoid and its adjacent skin was grasped in the left hand. A V-shaped incision was made in the surrounding perianal skin with scissors. The cut was deepened toward the anal canal to reveal the lower fibers of the internal anal sphincter. The sphincter was gently swept away with tissue forceps from the hemorrhoid. The scissors were then used to excise the hemorrhoidal tissue within the

anal canal, which left the apex of the hemorrhoid with its arterial supply and venous drainage intact for ligation. The pedicle of each hemorrhoid was then enclosed in an arterial clip, and the pedicle was transfixed using nonabsorbable suture material. Hemostasis was then secured from the bed of the hemorrhoid by use of cautery. Only then was the pedicle ligated. The ligature was left long so that in the event of any further bleeding the pedicle could be easily identified and delivered into the operative field. Each hemorrhoid was dealt within the same manner; however, well-established skin bridges between each V-shaped segment of excised skin must remain. At the end of the operation, an anal speculum was inserted to ensure complete hemostasis. Then topical tannic acid powder or placebo carrier was applied to the surgical site. Finally, gauze dressings containing mixed tannic acid and lignocaine cream 2% were applied to each hemorrhoidal area [15–20].

Outcome items

Pain and wound healing were assessed on postoperative days 2, 7, and 14. But secondary hemorrhage was assessed on postoperative day 7.

Pain was evaluated using a visual analog score (VAS). Patients in both groups ranked the level of pain from 0 (no pain) to 10 (very severe pain). Narcotic analgesic (morphine; 10 mg) requirement was also recorded.

Wound healing and secondary hemorrhage were evaluated at 2–8 and 2 weeks, respectively, by taking high-quality color digital photographs of the surgical site. Photographs were independently ranked according to three categories: category A, postoperative edema; category B, primary versus secondary healing; and category C, overall wound healing.

These data are shown in Figs. 2–4.

Results

Ninety-seven patients were prospectively enrolled in this study. Fifty patients received topical tannic acid and 47 patients received the inert carrier. None of the patients were lost to follow-up, and data collection was complete.

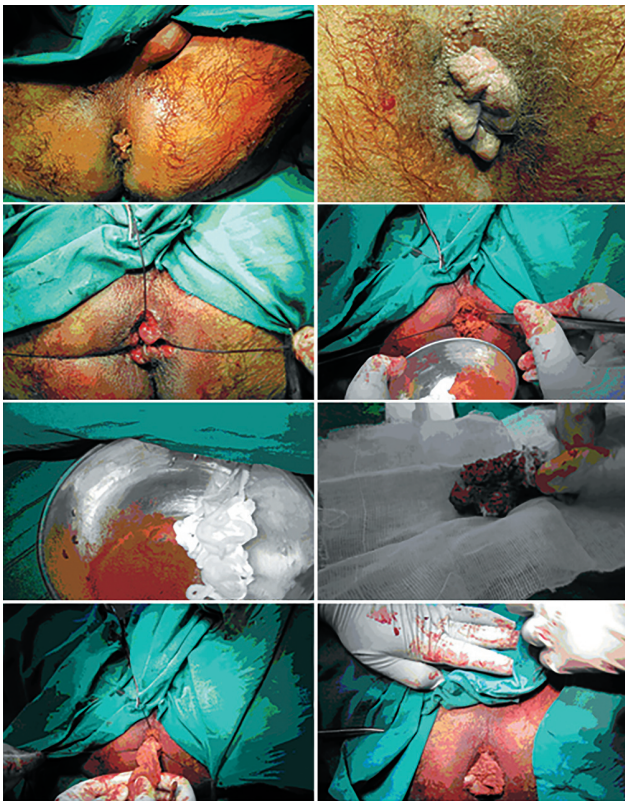
Patients in the topical tannic acid group experienced significantly less postoperative pain during the first 2 days (VAS: 1.2 ± 0.4 vs. 8.2 ± 0.6 ; $P < 0.05$) and on day 7 (VAS: 3.6 ± 0.6 vs. 6.3 ± 0.5 ; $P < 0.05$). However, on day 14 (2.9 ± 0.3 vs. 3.2 ± 0.7 ; $P > 0.05$) there was no significant difference between groups (Table 2 and Graph 1). This was confirmed from significant difference in narcotic requirements between the topical tannic acid and control groups ($P < 0.05$). There was significantly

lower narcotic analgesic requirements in the topical tannic acid group during the first 2 days and on day 7.

Wound healing in the topical tannic acid group was significantly better than in controls when ranked according to category A (postoperative edema) (mean score, 3.0 vs. 74.4; $P < 0.05$) (Table 3 and Graph 2).

There was no difference between the two groups when incisions were ranked according to category B (primary vs. secondary healing) ($P > 0.05$) (Table 4 and Graph 3).

Figure 2



Steps of posthemorrhoidectomy with topical application of tannic acid.

Figure 4



Group B (control).

In addition, category C (overall wound healing) was ranked significantly better in the topical tannic acid group (mean score, 4.0 vs. 63.8; $P < 0.05$) than in controls (Table 5 and Graph 2).

As regards secondary hemorrhage, patients in the topical tannic acid group experienced significantly less postoperative secondary hemorrhage on day 7 (mean score, 2.0 vs. 12.0; $P < 0.05$) (Graph 4 and Table 6).

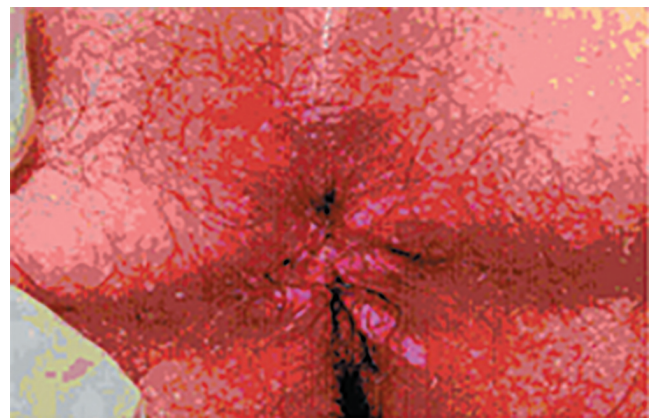
Table 2 Pain assessment using a visual analog score

Timing of pain	Group A	Group B	P-value
First 2 days	1.2 ± 0.4	8.2 ± 0.6	>0.05 (significant)
7 days	3.6 ± 0.6	6.3 ± 0.5	>0.05 (significant)
14 days	2.9 ± 0.3	3.2 ± 0.7	>0.05 (NS)

Table 3 Wound healing assessment at 2 weeks according to category A

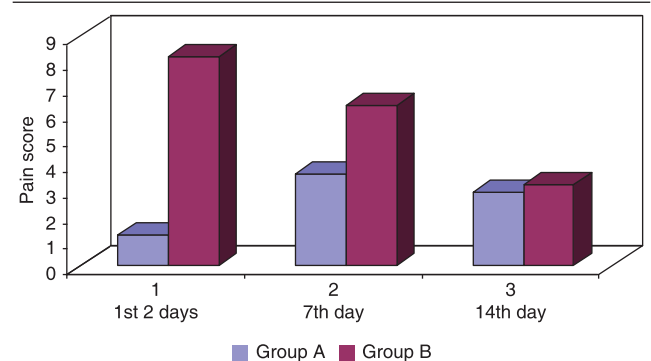
Category A	Postoperative edema [N (%)]	Total number of cases	P-value
Group A	15 (30)	50	>0.05 (significant)
Group B	35 (74.4)	47	

Figure 3



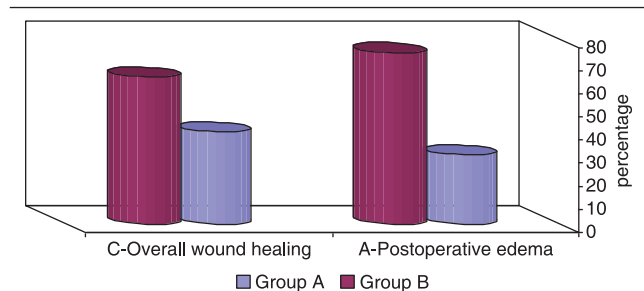
Group A (topical tannic acid).

Graph 1



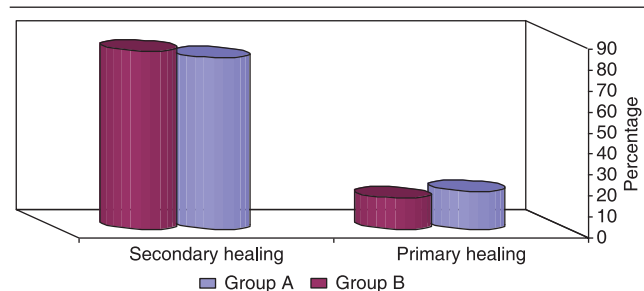
Pain assessment using a visual analog score.

Graph 2



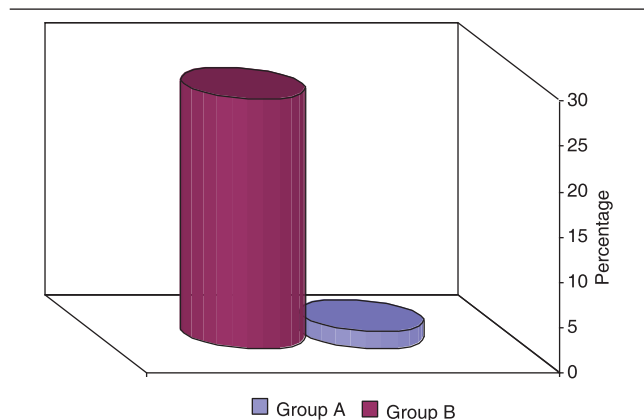
Wound healing assessment at 2 weeks, according to category A and C.

Graph 3



Wound healing assessment at 2 weeks, according to category B.

Graph 4



Secondary hemorrhage assessment on day 7.

Patients with secondary hemorrhage in group A were treated only with conservative measures but patients in group B were treated either by conservative measures [4 (30.7%)] or by surgical intervention, such as stitch ligation or diathermy [9 (69.3%)] (Table 7).

Discussion

Hemorrhoids usually present with bleeding or prolapse. Patients also frequently complain of discharge of mucus, pruritus, and some discomfort. Symptomatic hemorrhoids are often intermittent.

Table 4 Wound healing assessment at 6–8 weeks according to category B

Category B	Primary healing [N (%)]	Secondary healing [N (%)]	Total cases	P-value
Group A	9 (18)	41 (82)	50	>0.05 (NS)
Group B	7 (14.8)	40 (85.2)	47	

Table 5 Wound healing assessment at week 8 according to category C

Category C	Overall wound healing [N (%)]	Total number of cases	P-value
Group A	20 (40)	50	>0.05 (significant)
Group B	30 (63.8)	47	

Table 6 Secondary hemorrhage assessment on days 7–10

Postoperative	Secondary hemorrhage [N (%)]	Total number of cases	P-value
Group A	1 (2)	50	>0.05 (significant)
Group B	13 (27.6)	47	

Table 7 Secondary hemorrhage assessment on days 7–10

Secondary hemorrhage management	Group A [N (%)]	Group B [N (%)]
Conservative	1 (100)	4 (30.7)
Surgical	0 (0)	9 (69.3)

Bleeding is commonly associated with constipation and straining [13].

Hemorrhoidectomy remains a painful operation, but in most patients it is extremely successful as a means of controlling symptoms of third-degree piles, and in the majority of patients the operation is successful at controlling prolapse and bleeding [7].

The objective of treatment is to alleviate symptoms, not necessarily to improve the appearance of the anal canal. Asymptomatic patients with hemorrhoids do not justify treatment, because the therapy could cause more trouble than the underlying disease pathology [21,22].

The current study revealed the importance of topical tannic acid application after open diathermy hemorrhoidectomy in diminishing postoperative pain, directly by its astringent effect and indirectly by its antibacterial property [3].

Tannic acid improves wound healing by its direct antienzymatic effect and indirectly by reducing postoperative wound infection, directly through its antibacterial property and indirectly by adequate postoperative hemostasis through its constricting action upon mucous tissues [1].

Finally, topical tannic acid significantly decreases postoperative secondary hemorrhage through its vasoconstrictive effect directly on the mucous membrane and indirectly through its antibacterial property [3,4].

Conclusion

From the above-mentioned data, the following points can be concluded: Use of topical tannic acid is inexpensive, entails no allergic reaction, is easily available, has no systemic effects, and is easy to apply in open diathermy hemorrhoidectomy. It successfully reduces postoperative pain, improves wound healing, and reduces the incidence of postoperative secondary hemorrhage ($P > 0.05$). However, there is no significant difference in the type of healing — that is, primary and secondary healing ($P > 0.05$).

Acknowledgements

Conflicts of interest

None declared.

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