



ORIGINAL ARTICLE

Three-cavity clearance (TCC) can decrease the fistula rate after drainage of a perianal abscess: a case–control study

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Abstract

Objective: The aim of this study was to evaluate the safety and efficacy of three-cavity clearance (TCC) used for the treatment of perianal abscess.

Methods: A case–control study of patients with perianal abscess was conducted at the Second and Third Affiliated Hospitals of Nanjing University of Chinese Medicine from June 2013 to March 2016. Clinical data from 46 patients who had TCC were analysed. At the same time, 46 patients had simple incision and drainage and 46 patients had abscess drainage and cutting seton (radical abscess incision); the data from these patients were also analysed. The length of hospital stay, time of wound healing, fistula rate and anal incontinence were assessed.

Results: The rate of fistula formation in the TCC group was 13.0%—significantly lower than that in the group with simple incision and drainage (39.1%, $p < 0.01$) and similar to the group with radical abscess incision (8.7%, $p > 0.05$). Two patients (4.3%) in the group with radical abscess incision had anal incontinence, flatus and soiling; their Wexner scores were 6 and 3, respectively. There was no anal incontinence in the TCC group or the simple incision and drainage group. There were no statistical differences in the time of wound healing and length of hospital stay among the three groups (both $p > 0.05$).

Conclusion: TCC is a safe and effective sphincter-preserving procedure for perianal abscess formation and can decrease the fistula rate after perianal abscess drainage. It appears to be a valuable method that can be used in clinical practice; however, further studies are needed to verify this finding.

Key words: Three-cavity clearance (TCC); perianal abscess; anal fistula; drainage; cutting seton

Introduction

Perianal abscess formation is an infectious disease; 90% of cases are caused by anal gland infections [1]. Abscess drainage is the primary procedure used to treat a perianal abscess. However, the rate of anal fistula, after abscess drainage, is about 7–66%

[1–3]. In order to reduce the rate of post-operative fistula formation, some surgeons perform a direct incision of the suspect fistula or use the cutting seton procedure when performing drainage of a perianal abscess [4–7]; this is referred to as a ‘radical abscess incision’. The evidence has shown that the ‘radical

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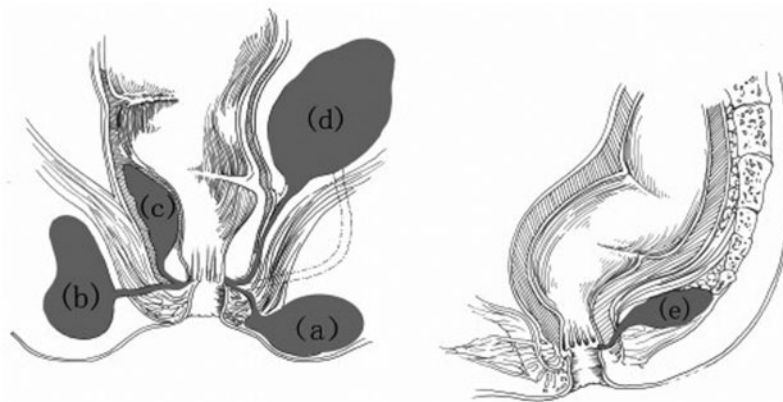


Figure 1. The diagram of three cavities. (A), (B) and (E) show the cavities outside the external sphincter (conventional called anorectal cavity); (A) shows the subcutaneous cavity, (B) shows the ischiorectal cavity and (E) shows the posterior rectal cavity; (C) shows the submucosal cavity (cavity between mucosa and internal sphincter); (D) shows the intersphincteric cavity (cavity between internal and external sphincters).

abscess incision' may cause sphincter damage and lead to anal function disorders [8,9].

Notably some patients with a perianal abscess will not develop an anal fistula after drainage [10]. Therefore, some patients with a perianal abscess can be completely cured by abscess drainage without injury to the anal sphincter. In view of this, according to the pathological origin of perianal abscess, we designed a new procedure called 'three-cavity clearance (TCC)' [11]. According to the pathological pathway of the anal abscess development, we divide the anorectal space into three cavities: a cavity between the mucosa and internal sphincter (submucosal cavity), a cavity between the internal and external sphincters (intersphincteric cavity) and a cavity outside the external sphincter (conventionally called anorectal cavity) (Figure 1). When the abscess drainage is done, we lay open these three cavities; as a result of this procedure, infections may be eliminated and the rate of post-operative anal fistulas may be decreased. In this study, patients with a perianal abscess after TCC were followed up and evaluated for surgical safety and efficacy to determine whether the outcome after TCC is better than abscess drainage and 'radical abscess incision'.

Patients and methods

Patients and groups

Patients with a perianal abscess who were treated at the Second Affiliated Hospital and Third Affiliated Hospital of Nanjing University, Chinese Medicine, from June 2013 to March 2016 were analysed retrospectively. All patients were diagnosed with a perianal abscess by endorectal ultrasonography (EUS) or magnetic resonance imaging (MRI), according to the diagnosis criteria of the *Practice Parameters for the Management of Perianal Abscess and Fistula-in-Ano* (2011, America) [2]; pregnant and lactating women were diagnosed by EUS. Among them, 46 patients who received TCC were regarded as the study group. At the same time, 46 patients had simple incision and drainage and 46 patients had cutting seton of the same gender, and the same position of the anal abscess; age difference was within 5 years. These patients were included in the control groups. The study was approved by the ethics committee of the Third Affiliated Hospital of Nanjing University, Chinese Medicine, and had informed-consent approval from all patients.

Operative procedures

TCC: after routine disinfection drapes were placed, an incision was made at the center, where the abscess most evidently fluctuates (Figure 2A); sufficient drainage was performed of the external sphincter cavities such as the ischiorectal cavity (Figure 2B) and the posterior rectal cavity. The intersphincteric cavity was divided to make sure the intersphincteric cavity was drained sufficiently (Figure 2C). Finally, an incision of the submucosal cavity was made (Figure 2D) and the mucosa and submucosal tissue around the cavity was cut along the sphincter surface. If hemorrhoid bleeding occurred, the hemorrhoids close to the infected area were ligated.

Simple incision and drainage were carried out according to the routine treatment as previously reported in the medical literature [2,3]. Radical abscess incision was performed as previously reported [5].

Similar pre-operative preparation, anesthesia methods (lumbar anesthesia) and operative position (lateral position) were adopted for the three groups of patients. The same post-operative management was used for all three groups of patients: the patients were treated with an analgesia pump on the day of the operation, had routine intravenous drip of antibiotics for 3 days and took a regular Chinese Medicine bath and had a dressing change on the second post-operative day.

Observation indexes

The results were obtained from clinical observations, outpatient reexamination and follow-up calls by telephone. The wound-healing time was defined as the duration when the clinical symptoms disappeared and the wound was healed. Hospitalization time was calculated from the first day of admission to the day of discharge. Recurrence was defined as the clinical manifestations of perianal abscess at the same site after recovery from the initial pathological condition. The diagnosis of post-operative fistula was based on the *Practice Parameters for the Management of Perianal Abscess and Fistula-in-Ano* [2]. Incontinence was evaluated by the Wexner score [12].

Statistical methods

SPSS 19.0 software was used for the analysis. The means with standard deviation (SD) were used to indicate the measurement data. One-way ANOVA was applied to comparisons among

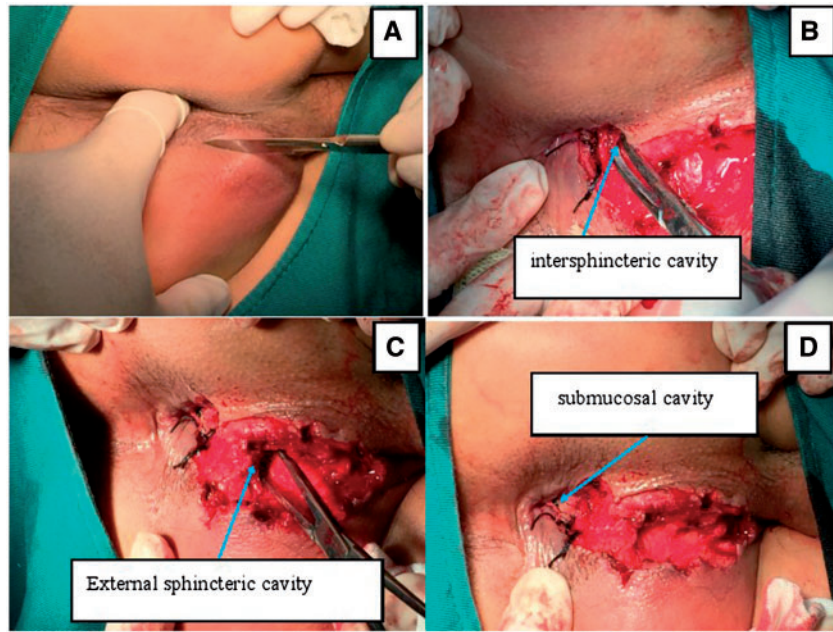


Figure 2. The procedure of TCC. (A) Make an incision at the center where the abscess fluctuates most evidently. (B) Drainage of external sphincter cavities. (C) Divide the intersphincteric cavity. (D) Make an incision in submucosal cavity, cut the mucosa and submucosal tissue around the cavity along the sphincter surface, and ligate the hemorrhoids around the infected area.

Table 1. Results of the three groups after surgery

	Group I (n =46)	Group II (n =46)	Group III (n =46)	P-value
Wound-healing time, day	55.1±33.8	53.9±23.7	42.5±21.9	>0.05
Hospitalization time, day	9.70±5.48	9.90±5.84	9.44±4.65	>0.05
Fistula rate, n (%)	18 (39.1)	4 (8.7)	6 (13.0)	<0.01
Anal incontinence, n (%)	0 (0.0)	2 (4.3)	0 (0.0)	>0.05

groups with measurement data. The pairwise comparison was applied to Least Significant Difference methods. Percentages were used to represent the enumeration data and the Chi-square test was used for comparison among groups. A p -value < 0.05 was considered to be statistically significant.

Results

A total of 138 cases were included in this study, including 114 males and 24 females. The classification of the perianal abscess was as follows: 18 patients had an intersphincteric cavity abscess, 54 had an ischioanal cavity abscess, 6 had a perianal with subcutaneous cavity abscess, 45 had a posterior rectal cavity abscess and 15 had a pelvic-rectal cavity abscess. All of the patients were followed up by EUS or MRI in the outpatient clinic. The mean follow-up time was 18.3 ± 5.7 months.

Wound-healing time

In the simple incision and drainage group (Group I), the longest healing period was 186 days, the shortest 15 days and the mean was 55.1 ± 33.8 days. Ten patients whose wounds did not heal required a secondary surgery. In the radical abscess incision group (Group II), the longest healing period was 100 days, the shortest 18 days and the mean was 53.9 ± 23.7 days. In the TCC group (Group III), the longest healing period was 120 days, the shortest 24 days and the mean was 42.5 ± 21.9 days. There was

no statistical difference for wound-healing time among the three groups ($p > 0.05$, [Table 1](#)).

Hospitalization time

In Group I, the longest hospitalization time was 27 days, the shortest 2 days and the mean was 9.70 ± 5.48 days. In Group II, the longest hospitalization time was 32 days, the shortest 2 days and the mean was 9.90 ± 5.84 days. In Group III, the longest hospitalization time was 30 days, the shortest 4 days and the mean was 9.44 ± 4.65 days. There was no statistical difference for hospitalization time among the three groups ($p > 0.05$, [Table 1](#)).

Fistula rates

Among 138 patients in this study, 28 patients developed an anal fistula, including 24 males and 4 females. In Group I, 18 patients (2 females and 16 males) developed an anal fistula, including 1 with an intersphincteric abscess, 7 with an ischioanal abscess, 7 with a posterior rectal cavity abscess, 1 with a perianal subcutaneous abscess and 2 with a pelvic-rectal cavity abscess. In Group II, three males and one female developed an anal fistula, including two from a posterior rectal cavity abscess and two from a pelvic-rectal cavity abscess. In Group III, five males and one female developed an anal fistula, including two from an intersphincteric abscess, two from an ischioanal abscess and two from a pelvic-rectal cavity abscess. The fistula rate was

higher in Group I (39.1%) than in Group II (8.7%) and Group III (13.0%) ($p < 0.01$, Table 1). There was no recurrent perianal abscess among the three groups.

Anal function

During the follow-up, two patients in Group II failed to control flatus and soiling, and had Wexner scores of 6 and 3, respectively. There were no patients with incontinence in Group I or in Group III (Table 1).

Discussion

About 7–66% of patients with a perianal abscess may develop an anal fistula after simple incision and drainage [1–3]. The main reason for this occurrence may be incomplete abscess drainage, or no treatment of the internal opening and incomplete clearance of the intersphincteric cavity, where the perianal abscess originates. Some surgeons perform ‘radical abscess incision’ to decrease the fistula rate after anal abscess drainage. But most studies showed that the ‘radical abscess incision’ of a perianal abscess may injure the anal sphincter and patients may be at high risk for anal incontinence [2,3]. A Cochrane systematic review of ‘radical abscess incision’ versus simple incision and drainage included 5 Randomized Clinical Trials and a total of 405 cases; the results showed that the fistula rate decreased significantly (relative risk 0.17; $p < 0.001$) but the anal incontinence rate increased greatly (relative risk 2.46; $p = 0.140$) [13].

Our goal was to find a method that would decrease the fistula rate after perianal abscess drainage without increasing the anal incontinence rate after the operation. We designed the ‘TCC’ to manage the perianal abscess [11]. Most prior studies showed that there was an anal gland between the external sphincter and the internal sphincter; the anal glands have an opening in the anal recess [14]. When the anal gland opening was obstructed, the gland cannot secrete normally and may cause infection and the development of an intersphincteric abscess. Then the abscess may extend in three ways: first, extension along the intersphincteric cavity, a second extension to the anal recess where a submucosal abscess may develop, and the third extension to the external sphincter cavity where an ischioanal abscess may develop, or a posterior rectal cavity abscess, or a pelvic-rectal cavity abscess [11,15]. Therefore, when one suffers from a perianal abscess, there may be an abscess in these three cavities. If we just open one or two cavities, the remnant cavity abscess may cause repeated infection and lead to an anal fistula. We considered that, if we open the three cavities at the same time, perhaps the fistula rate would decrease after abscess drainage. Starting in June 2013, we began doing the TCC procedure for patients with a perianal abscess and the outcome was encouraging. The fistula rate was 13.0%, which is lower than the abscess drainage group (39.1%). The difference was significant and implied that the TCC can decrease the fistula rate after abscess drainage. The fistula rate for radical abscess incision was 8.7% and the difference was not significant compared with the TCC group. Therefore, the TCC can achieve the same outcome as radical abscess incision without injury to the anal sphincter.

Neither the TCC group nor the incision and drainage group showed anal incontinence, which indicates that the TCC does not lead to further anal function loss, although, in the radical abscess incision group, two patients suffered from anal function loss. This suggests that the radical abscess incision operation

during the acute inflammation of perianal abscess increased the risk of anal incontinence [12,16]. The hospital stay time and the wound-healing time did not significantly differ; this implies that the patients who had TCC did not have an increase in injury to the anal sphincter compared to the other two operation groups.

In conclusion, the results of this study showed that TCC is a safe and effective sphincter-preserving procedure for perianal abscess formation and is associated with a decreased fistula rate after perianal abscess drainage.

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Conflict of interest statement: none declared.

References

1. Ommer A, Herold A, Berg E et al. Cryptoglandular anal fistulas. *Dtsch Arztebl Int* 2011;108:707–13.
2. Steele SR, Kumar R, Feingold DL et al. Standards Practice Task Force of the American Society of Colon and Rectal Surgeons. Practice parameters for the management of perianal abscess and fistula-in-ano. *Dis Colon Rectum* 2011;54:1465–74.
3. Read DR, Abcarian H. A prospective survey of 474 patients with anorectal abscess. *Dis Colon Rectum* 1979;22:566–8.
4. Quah HM, Tang CL, Eu KW et al. Meta-analysis of randomized clinical trials comparing drainage alone vs primary sphincter-cutting procedures for anorectal abscess-fistula. *Int J Colorectal Dis* 2006;21:602–9.
5. Knoefel WT, Hosch SB, Hoyer B et al. The initial approach to anorectal abscesses: fistulotomy is safe and reduces the chance of recurrences. *Dig Surg* 2000;17:274–8.
6. King SK. Should we seek a fistula-in-ano when draining a perianal abscess? *J Paediatr Child Health* 2010;46:273–4.
7. Vasilevsky CA, Gordon PH. The incidence of recurrent abscesses or fistula-in-ano following anorectal suppuration. *Dis Colon Rectum* 1984;27:126–30.
8. Scoma JA, Salvati EP, Rubin RJ. Incidence of fistulas subsequent to anal abscesses. *Dis Colon Rectum* 1974;17:357–9.
9. Rosen SA, Colquhoun P, Efron J et al. Horseshoe abscesses and fistulas: how are we doing? *Surg Innov* 2006;13:17–21.
10. Parks AG. Pathogenesis and treatment of fistula-in-ano. *Br Med J* 1961;5224:463–9.
11. Chen Y, Wang X, Jin H et al. Feasibility investigation of three cavity clearance in treatment of perianal abscess. *Zhonghua Wei Chang Wai Ke Za Zhi* 2016;19:442–5.
12. Jorge JM, Wexner SD. Etiology and management of fecal incontinence. *Dis Colon Rectum* 1993;36:77–97.
13. Malik AI, Nelson RL, Tou S. Incision and drainage of perianal abscess with or without treatment of anal fistula. *Cochrane Database Syst Rev* 2010;7:CD006827.
14. Beck DE, Roberts PL, Saclarides TJ. *The ASCRS Textbook of Colon and Rectal Surgery*. New York, NY: Springer, 2011, 221.
15. Theerapol A, So BY, Ngoi SS. Routine use of setons for the treatment of anal fistulae. *Singapore Med J* 2002;43:305–7.
16. Nevler A. The epidemiology of anal incontinence and symptom severity scoring. *Gastroenterol Rep (Oxf)* 2014;2:79–84.