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Clinical application of the intersphincteric approach with internal incision combined with counter- drainage for deep perianal abscess

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Abstract

Purpose This retrospective study evaluates the clinical efficacy of the Intersphincteric Approach with Internal Incision combined with Counter-Drainage (IAICD) for Deep Perianal Abscess (DPA), thereby providing a foundation for selecting optimal surgical treatment methods in clinical practice.

Methods Using a retrospective cohort study design, we analyzed the clinical data of 120 patients who underwent inpatient surgical treatment for DPA at our hospital from January 2022 to June 2023. Of these, 57 patients underwent the IAICD (treatment group), while 63 patients received incision—drainage (control group). Clinical data from both groups were collected for statistical analysis. The primary outcomes measured were clinical efficacy, anal function scores and appearance scores. Secondary outcomes included postoperative pain, operation time, wound healing time and length of hospital stay.

Results The treatment group had 52 cured cases, with a cure rate of 52/57 (91.2%), whereas the control group had 48 cured cases, with a cure rate of 48/63 (76.2%). The treatment group's clinical efficacy was significantly better than the control group ($P=0.03$). The operation time was longer in the treatment group compared to the control group ($P<0.01$). There were no significant differences between the two groups in terms of anal function scores, appearance scores, postoperative pain, wound healing time and length of hospital stay ($P>0.05$). Multivariate logistic regression analysis revealed that IAICD was a protective factor for the clinical efficacy of DPA patients ($P=0.01$), While wound healing time and a history of perianal surgery were identified as independent risk factors associated with poor prognosis in patients with DPA ($P=0.039$, $P=0.032$).

Conclusion For patients with DPA who have high expectations for minimizing postoperative recurrence, a comprehensive preoperative evaluation—including a history of prior perianal surgery—precise intraoperative localization of the internal opening, and meticulous postoperative wound care can collectively optimize clinical outcomes. The IAICD procedure not only preserves anal sphincter function but also effectively reduces the recurrence rate of postoperative abscesses or fistula formation.

Keywords Deep perianal abscess, Intersphincteric Approach with Internal Incision combined with Counter-Drainage (IAICD), Recurrence, Fistula formation rate, Anal function

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Introduction

Perianal abscess is an acute purulent infection of the soft tissues surrounding the anorectum and is a common anorectal condition, accounting for approximately 25% of perianal diseases [1]. Perianal abscesses occur twice as frequently in men compared to women, with the peak incidence predominantly observed in individuals aged 20 to 50 years [2]. In 90% of cases, the infection is caused by the anal glands [3]. Additionally, perianal abscess can result from Crohn's disease, sweat gland infections, human immunodeficiency virus (HIV), radiation therapy, and other skin infections [4]. Clinically, anorectal abscesses are categorized into superficial abscesses and deep perianal abscess (DPA) based on the location of the lesions. DPA refers to abscesses occurring above the levator ani muscle, primarily including high intermuscular abscesses, submucosal rectal abscesses, and supralevator abscesses. Clinical manifestations can include swelling and pain around the anorectal area. In severe cases, systemic symptoms such as chills, fever, fatigue, weakness, and difficulty in defecation and urination may occur [5]. DPAs are particularly challenging due to their extensive lesion range, deep infection sites, and often hidden foci, leading to frequent misdiagnosis or missed diagnosis. Accurate diagnosis typically requires experienced clinicians to integrate clinical symptoms, specialized physical examinations, and imaging tests. Without timely treatment, the infection may spread, resulting in severe complications such as sepsis and septicemia, making DPA one of the more difficult conditions to manage in proctology [6].

Currently, the main treatment for DPA is surgery, including incision—drainage, incision and seton, staged seton, vacuum drainage, Hanley surgery, and their modified procedures. Among these, incision- drainage surgery is straightforward to perform, quickly drains pus to relieve swelling and pain, and achieves a certain therapeutic effect. However, the postoperative incidence of anal fistula formation remains significant, ranging between 35 and 50% [1, 7]. Incision and seton, Hanley surgery, and their modified procedures can significantly reduce the recurrence rate of abscesses and the formation rate of fistulas but may impair anal sphincter function to some extent [4, 8]. In this regard, to reduce the recurrence or formation of fistulas after DPA while preserving sphincter function, our team developed an intersphincteric approach to excise the internal opening, ensuring complete drainage of the pus cavity through three anatomical spaces (the submucosal space, the intersphincteric space, and the external sphincteric space). This technique, known as the intersphincteric approach with internal incision combined with counter- drainage (IAICD), aims to remove the internal opening while preserving sphincter function. The primary objective of this procedure is to reduce the postoperative recurrence of DPA and the formation of fistulas. Therefore, this study proposes the use of IAICD for the treatment of DPA. The study retrospectively analyzed the clinical data of patients who underwent surgical treatment for DPA at our hospital to investigate the clinical efficacy of different surgical methods. The basic clinical features, clinical efficacy, anal function and appearance scores, duration of surgery, length of hospital stay, wound healing time, and pain scores were compared between the two groups.

Methods

Study design and patients

This study was a retrospective cohort study. A researcher used the electronic medical record system of Xi'an Traditional Chinese Medicine Hospital to extract the inpatient records of DPA patients from January 2022 to June 2023. A total of 142 DPA patients were admitted. Of these, 22 patients were excluded (4 with Crohn's disease, 6 with malignant tumors, 3 on long-term oral immunosuppressive agents, 5 with necrotizing fasciitis, and 4 with missing or lost clinical data), leaving 120 patients. The patients were divided into two cohorts according to the surgical methods: the IAICD group (treatment group), which included 57 patients, and the incision—drainage group (control group), which included 63 patients (Fig. 1). These 120 DPA patients were treated in the same department and were all assessed as requiring surgery. Prior to surgery, the surgeon explained the details of both IAICD and incision—drainage to the patients, who then chose the surgical method after fully understanding the characteristics of each procedure. All operations were performed by experienced surgeons. Subsequently, a researcher recorded the data of the 120 patients and guided them to regular follow-up visits in specialist clinics. The outcome measures in this study were completed by both DPA patients and surgeons, with data subsequently recorded by a researcher. At the time of inclusion, baseline patient data were recorded, including demographics (age, gender, height, and weight), comorbidities (such as diabetes), education level, duration of symptoms, pre-admission antibiotic use, and a history of previous perianal surgery. Clinical examination results were documented prior to surgery, including white blood cell count, neutrophil ratio, procalcitonin (PCT) levels, C-reactive protein (CRP) levels, and bacterial culture of pus. The evaluation also provided a detailed description of the abscess's location and extent, as determined by endoluminal ultrasound or magnetic resonance imaging (MRI), as well as the precise position of the internal opening. Postoperative data included pain severity, operation duration, and length of hospital stay. Clinical follow-up

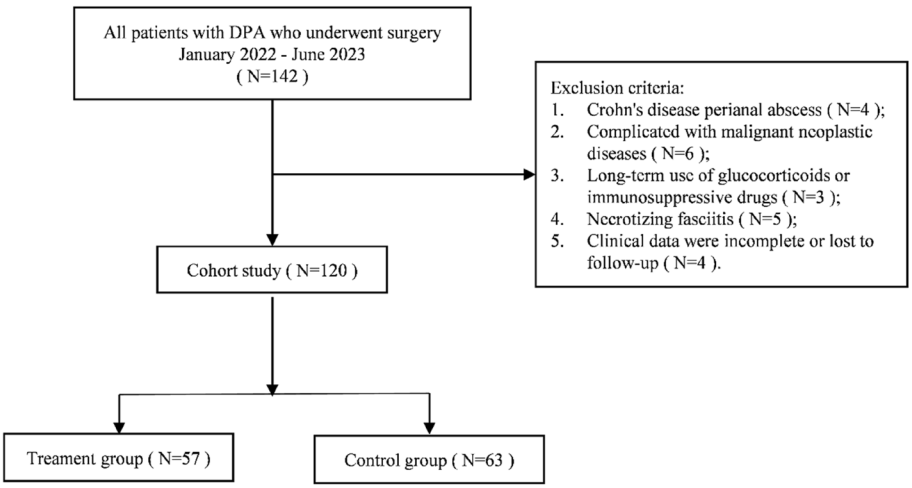

Fig. 1 The flow chart of study design

data encompassed wound healing time, anal function and appearance scores, abscess recurrence, and fistula formation. The study was conducted in strict adherence to the principles of the Declaration of Helsinki. The study protocol received ethical approval from the Ethics Committee of Xi'an Hospital of Traditional Chinese Medicine (LLSCYJ2023038), and written informed consent was obtained from all participants prior to enrollment.

Inclusion and exclusion criteria

DPA diagnostic criteria

The diagnosis of perianal abscess follows the relevant criteria of the Chinese Expert Consensus on Clinical Diagnosis and Treatment of Perianal Abscess [8]. The diagnosis is typically based on the patient's medical history, specialized physical examination, and imaging studies. Superficial abscesses usually present as perianal swelling and pain, while deep abscesses, such as those in the ischiorectal fossa or pelvirectal space, can be accompanied by perineum and lumbosacral swelling, pain, and systemic symptoms like fever in addition to local symptoms.

Patients inclusion criteria

(1) The diagnostic criteria for DPA were met, including high intermuscular abscess, ischiorectal abscess, deep posterior anal space abscess, deep retrorectal space abscess, supralevator abscess, and high rectal submucosal abscess; (2) Patients aged from 18 to 70 years old.

Exclusion criteria

(1) Superficial perianal abscess; (2) Crohn's disease perianal abscess; (3) Complicated with malignant neoplastic diseases; (4) Long-term use of glucocorticoids or immunosuppressive drugs; (5) Cases lost to follow-up during follow-up; (6) Necrotizing fasciitis cases.

Procedures and treatment

Preoperative preparation

Both groups of patients underwent comprehensive preoperative assessments, including blood, urine, and stool tests, liver and kidney function tests, electrolytes, blood glucose levels, coagulation profile, infectious disease screening, procalcitonin levels, ECG, and chest X-ray to rule out surgical contraindications. Transrectal ultrasound or MRI were utilized to determine the location of the internal opening and to evaluate the infection range of the perianal abscess. Preoperative preparation involved fasting and restriction of water intake for 6 h, shaving, and cleansing enemas. Combined spinal-epidural anesthesia was administered, and the lithotomy position was adopted for surgery. The perianal and perineal skin were disinfected and draped, and the anal canal and lower rectum were prepared with disinfection.

Operative technique

All operations were conducted by the same team of experienced surgeons to ensure consistency and maintain the highest standards of care. The control group was treated with incision—drainage, while the treatment group underwent the IAICD technique.

Control group

The abscess was aspirated from the most prominent area for bacterial culture. A radial incision was made at the aspiration site, extending through the skin, subcutaneous tissue, and abscess wall. The index finger was used to separate septa within the abscess cavity, ensuring complete

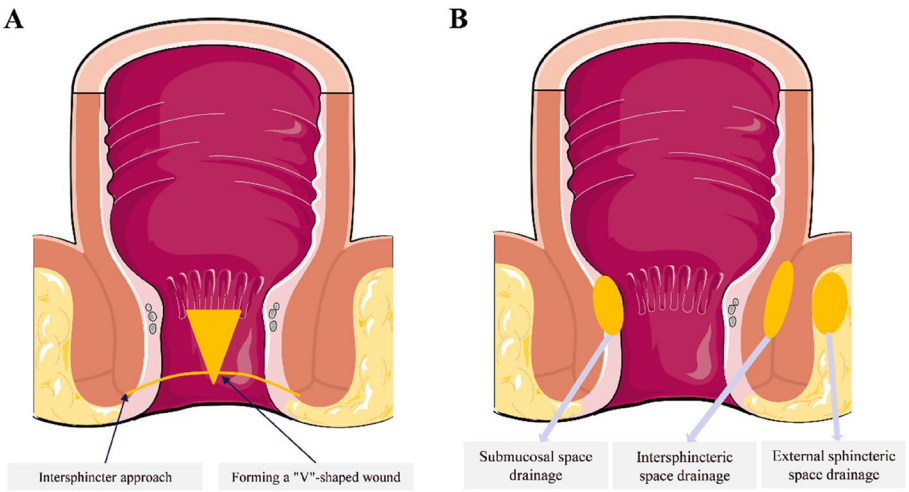

Fig. 2 Key points for IAICD. **A** Internal opening surgical approach; **B** Three-cavity drainage of perianal abscess

drainage of the pus. Infected necrotic tissue inside the cavity was scraped and cleared. For excessively large abscess cavities, multiple rubber band drains were used, while rubber tube drains were placed for deep cavities. The abscess cavity was thoroughly irrigated with hydrogen peroxide, and Vaseline gauze was used to pack the cavity. The packing was removed 24 h postoperatively.

Treament group

IAICD involves the excision of the internal opening and drainage of the pus cavity. The specific surgical procedures are as follows: preoperative transrectal ultrasound or MRI was used to determine the position of the internal opening. The puncture and pus aspiration methods were the same as those in the control group. A radial incision was made at the puncture site, serving as the main drainage opening. For patients with a preoperatively identified internal opening, a spherical probe was inserted into the abscess cavity and guided to exit at the dentate line corresponding to the internal opening. The skin, subcutaneous tissue, mucosa, and internal sphincter overlying the probe were sequentially incised from the intersphincteric space to the internal opening, creating a V-shaped incision with a broad inner base and a narrow external opening, which facilitated effective postoperative wound drainage (Fig. 2A). In cases where the internal opening could not be accurately located, prophylactic resection of the anal recess was performed at the thinnest point of the dentate line, as described above.

Drainage of the abscess cavity was accomplished using counter-drainage across Three-cavity: the submucosal space, the intersphincteric space, and the external sphincteric space (Fig. 2B). Multiple radial incisions were created at the apex, external margin, and base of the abscess cavity, tailored to its specific location and size, to facilitate counter-drainage. Adjacent drainage openings were interconnected using double strands of rubber bands (Fig. 3). If the distance between adjacent drainage openings was too great or there was an excess of tissue, annular drainage with a rubber tube was chosen. This involved cutting part of a number 18 T-tube for drainage and intermittently making several lateral drainage holes in the annular portion to facilitate effective drainage. For deeper areas of the abscess cavity, a rubber catheter was placed for additional drainage. The cavity was thoroughly irrigated with normal saline before being packed with Vaseline gauze strips. The packing material was removed 24 h postoperatively to ensure proper wound healing and drainage.

Postoperative treatment

(1) Postoperative analgesia: Oral analgesics, either alone or in combination with intramuscular analgesic drugs, were routinely administered on the day following surgery. (2) Postoperative anti-infection therapy: Antibiotics were administered to patients with severe DPA accompanied by local perianal and perineal infections, or those with systemic infections, diabetes. Complete blood counts were reassessed on the first and third days post-surgery. Antibiotic treatment was discontinued once the blood count returned to normal, and antibiotics were adjusted, if necessary, based on the results of the pus culture. (3) Postoperative dressing change and fumigation: 24 h post-surgery, remove the gauze packing from the abscess cavity and irrigate the cavity with a compound Huangbai solution. From the second day onwards, herbal sitz baths were administered twice daily in warm water (40 °C) for 10 to 15 min after defecation. Specialized proctology

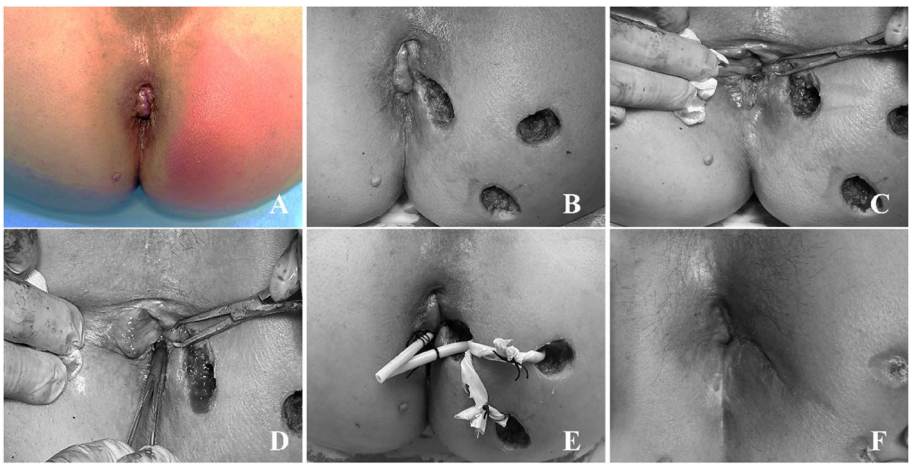

Fig. 3 The procedure of IAICD. **A** Show the extent of the abscess; **B** Open the abscess cavity and bluntly dissect the septum within the abscess cavity; **C** Make an arcuate incision between the internal anal sphincter to explore the position of the internal opening; **D** Excise the internal opening through the intersphincteric space; **E** The drainage of the pus cavity was performed using a three-cavity approach combined with counter- drainage; **F** 30 days post-surgery

dressing changes were performed twice daily, supplemented with bedside infrared and microwave physiotherapy, until the patient was discharged. (4) Removal of postoperative drainage tube: The drainage tube placed in the abscess cavity postoperatively was gradually withdrawn daily, starting one week after surgery, based on the drainage condition, until it was completely removed. For the annular drainage tube, it was replaced with a rubber band drainage one week later. The rubber band drainage was changed from double to single strands after one week, depending on the secretion condition, and was completely removed after a few days. The principles for removing the rubber bands were as follows: from top to bottom (removing the upper abscess cavity drainage bands first and the lower ones last), and from outside to inside (removing the outermost abscess cavity drainage bands first and the innermost ones last).

Follow-up

All patients underwent outpatient follow-up evaluations after discharge, during which the surgeon assessed wound healing, therapeutic efficacy, and anal function based on predefined primary and secondary outcome measures. During the first two months postoperatively, patients attended outpatient reviews twice a week. Follow-up assessments were conducted via telephone 6 months later and continued for a total of 12 months. Specialized examinations, such as transrectal ultrasound, perianal MRI, and anorectal manometry, were performed when necessary.

Outcomes

Primary outcomes

Clinical efficacy assessment criteria (1) Cured: Symptoms resolved, and the wound healed completely; (2) Not healed: Local wounds remained unhealed after exceeding the average healing period, or there were local abscesses or fistula formation; (3) Recurrence: The original abscess wound had healed, but recurrence occurred at the same site.

Anal function score Twelve months after surgery, the postoperative anal function of the patients was evaluated using the Wexner score, a validated assessment tool comprising five questions. This evaluation assessed the severity of fecal incontinence based on the frequency of solid stool incontinence, liquid stool incontinence, gas incontinence, the use of nursing pads, and lifestyle changes. The total score range for these five questions was 0–20 points, with 0 indicating normal anal function postoperatively, and 20 indicating complete anal incontinence. A higher score correlated with a more severe degree of anal function impairment [9].

Anal appearance score Twelve months postoperatively, changes in postoperative anal morphology were assessed using a scoring system. A completely normal appearance received a score of 0 points, the presence of scar tissue with abnormal proliferation received 1 point, and the appearance of anal deformity (including anal displacement, anal defect, etc.) received 2 points.

Secondary outcomes

Visual Analog Scale (VAS): The degree of pain in patients was evaluated using the VAS score, which was divided into 4 grades.

G0: no pain;
G1: mild pain (VAS 1–3), not requiring drug intervention;
G2: moderate pain (VAS 4–7), requiring analgesic intervention;
G3: severe pain (VAS 8–10), requiring combined analgesic injection intervention;

Other outcomes, such as operation time, length of hospital stay, and wound healing time, were recorded for both groups.

Statistical analysis

Data were analyzed using SPSS software (version 22.0; IBM Corp). Continuous characteristics were presented as mean ± standard deviation or median and interquartile range, with between-group differences compared using independent t-tests. Categorical variables were presented as counts and proportions, with between-group differences assessed using χ^2 test or non-parametric tests. The χ^2 test and t-test were utilized for univariate analysis, while binary logistic regression was employed in multivariate analysis. The value of $P<0.05$ was considered statistically significant.

Results

Characteristics of patients

A total of 120 DPA patients were included in the study, with 57 patients undergoing IAICD surgery and 63 patients undergoing incision—drainage. The demographic characteristics of the two groups were shown in Table 1. The treatment group comprised 49 males and 8 females, with a mean age of 38.02 years (ranging from 18 to 68 years). The control group included 51 males and 12 females, with a mean age of 40.27 years (ranging from 21 to 70 years). A total of 63 patients (53%) had used antibiotics prior to admission, and 49% held a bachelor's degree or higher, and 21 patients (18%) had a history of perianal surgery. No statistically significant differences were observed between the two groups in these aspects ($P>0.05$). 9 patients (7.5%) had diabetes mellitus, which was evenly distributed between the two groups.

The median duration of symptoms in both groups was 7 days. The abscesses primarily occurred in the intersphincteric and ischiorectal spaces, with 72% of the patients having abscesses that extended over more than two quadrants. More than 72% of patients were able to identify internal openings through preoperative examination. No significant differences were observed between the groups in this regard ($P>0.05$). Among the 83 patients (69%) from whom pus samples were obtained, 71 (86%) showed bacterial growth. The most commonly isolated bacteria were *Escherichia coli* and *Klebsiella pneumoniae*, with no significant differences between the two groups ($P>0.05$). There were no significant differences between the two groups in white blood cell count, neutrophil ratio, PCT and CRP ($P>0.05$).

Comparison of primary outcomes between the two groups

A total of 120 patients from both groups completed the 12-month follow-up, with no cases lost to follow-up. All patients were included in the final analysis. In the treatment group, 52 cases were cured, 2 case was not healed, and 3 cases relapsed, resulting in a cure rate of 91.2%. In the control group, 48 cases were cured, 9 cases were not healed, and 6 cases recurrence, yielding a cure rate of 76.2%. The clinical efficacy of the treatment group was significantly higher than that of the control group, with a significant difference ($P=0.03$). There were no significant differences between the two groups in anal function and anal appearance scores ($P>0.05$) (Table 2).

Comparison of secondary outcomes between the two groups

As shown in Table 3, postoperative pain was predominantly mild to moderate in both groups, there was no significant difference in pain 24 h after operation between the two groups ($P>0.05$).

As shown in Fig. 4, comparing the operation time, healing time, and hospital stay between the two groups, the operation time for the treatment group (49.49 ± 15.41) was significantly longer than that of the control group (32.67 ± 13.01), with the difference being statistically significant ($P<0.0001$). There were no significant difference in wound healing time (38.23 ± 7.77 *vs.* 37.24 ± 5.83) and length of hospital stay (9.37 ± 2.56 *vs.* 8.97 ± 2.65) between the two groups ($P>0.05$).

Results of univariate and c logistic regression analyses

Clinical efficacy was set as the dependent variable. The independent variables included in the univariate analysis were: gender, age, body mass index (BMI), education level, presence of diabetes, history of antibiotic use prior to admission, history of perianal surgery, duration of disease, site of abscess, extent of abscess, internal opening, IAICD, operation time, wound healing time, length of hospital stay, postoperative wound pain, white blood cell (WBC) count, neutrophil ratio, PCT, CRP, and bacterial culture of pus. As shown in Table 4, univariate analysis revealed that course of disease, wound

Table 1 Demographic characteristics of the two groups

Variables	Treatment group ($n=57$)	Control group ($n=63$)	P
Age (years)	38.02 ± 9.65	40.27 ± 11.26	0.24
Gender (M/F)	49/8	51/12	0.46
BMI (m^2/kg)	26.53 ± 3.80	25.49 ± 3.30	0.15
Diabetes (YES/NO)	4/53	5/58	0.85
Antibiotic (YES/NO)	26/31	37/26	0.15
Educational level (Junior or below/High school/Bachelor or above)	5/19/33	9/28/26	0.68
History of perianal surgery (YES/NO)	8/49	13/50	0.34
Course of disease (day), M (Q1, Q3)	7 (4.00,10.00)	7 (5.00,21.00)	0.19
Internal opening (YES/NO)	42/15	45/18	0.78
Abscess site			
Intersphincteric	20	22	0.58
Ischiorectal fossa	19	23	
Submucous	3	5	
Supralevator	1	2	
More than two site	14	11	
Extent of abscess (1 quadrant/2 or more)	16/41	18/45	0.95
Results of bacterial Culture in pus			
E. coli	23	26	0.72
Klebsiella-pneumoniae	8	7	
Enterococcus	2	0	
Proteus mirabilis	2	3	
Unpreserved	16	21	
No bacteria	6	6	
White blood Cell count ($\times 10^9$/L)	11.43 ± 4.31	12.27 ± 5.12	0.34
Neutrophil ratio (%)	76.23 ± 8.73	78.27 ± 8.82	0.21
PCT (ng/ml)	0.31 ± 0.18	0.34 ± 0.32	0.47
CRP/(mg/dL), M (Q1, Q3)	60.55 (24.47,87.21)	65.75 (33.20,117.41)	0.54

Data were reported as mean ± SD, number, and M (Q1, Q3)

Treatment group = IAICD; Control group = Incision-drainage

Table 2 Comparison of primary outcomes between the two groups

Indicators		Treatment group ($n=57$)	Control group ($n=63$)	χ^2	P
Clinical efficacy	Cured	52(91.2%)	48(76.2%)	-2.13	0.03
	Not healed	2(3.5%)	9(14.3%)		
	Recurrence	3(5.3%)	6(9.5%)		
Anal function		0.51 ± 0.57	0.52 ± 0.62	-0.14	0.89
Anal appearance		0.19 ± 0.4	0.16 ± 0.37	-0.49	0.63

Data were reported as mean ± SD, number and percentage

Treatment group = IAICD; Control group = Incision-drainage

Table 3 Comparison of pain degree 24 h after operation between the two groups

Pain level	Treatment group($n=57$)	Control group($n=63$)	χ^2	P
Normal (G0)	9(15.8%)	4(6.3%)	-1.15	0.25
Mild pain (G1)	24(42.1%)	28(44.4%)		
Moderate pain (G2)	20(35.1%)	26(41.3%)		
Severe pain (G3)	4(7.0%)	5(7.9%)		

Data were reported as number and percentage

Treatment group = IAICD; Control group = Incision-drainage

healing time, history of perianal surgery, and IAICD were significantly correlated with clinical efficacy in patients with perianal abscesses ($P=0.027$, $P=0.011$, $P=0.03$, $P=0.033$, respectively). These variables were subsequently included in the multivariate logistic regression analysis for further evaluation. Multivariate logistic regression analysis revealed that IAICD was a protective factor for the clinical efficacy of DPA patients ($P=0.01$), While wound healing time and a history of perianal surgery were identified as independent

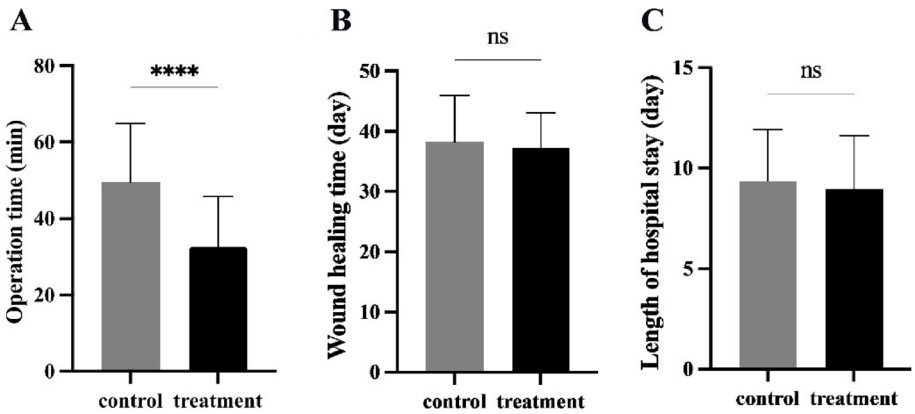

Fig. 4 Comparison of operation time, wound healing time and length of hospital stay between the two groups. ns: $P > 0.05$, ****: $P < 0.0001$. control: control group, treatment: treatment group

Table 4 Univariate and multivariate analysis of influencing factors of clinical efficacy

Variables	Univariate analysis		Multivariate analysis	
	OR (95% CI)	*P*	OR (95% CI)	*P*
Course of disease	1.26 (1.03, 1.55)	0.027	1.17 (0.92, 1.49)	0.207
wound healing time	1.09 (1.02, 1.17)	0.011	1.10 (1.01, 1.21)	0.039
History of perianal surgery (YES)	3.31 (1.13, 9.73)	0.030	4.18(1.13,15.43)	0.032
Internal opening (YES)	1.17 (0.39, 3.51)	0.784	2.47 (0.61,10.03)	0.207
Abscess site (More than two site)	2.45 (0.86, 7.02)	0.094	2.40 (0.65, 8.82)	0.188
Extent of abscess (2 or more)	1.23 (0.41, 3.68)	0.717	0.58 (0.16, 2.12)	0.411
IAICD	0.31 (0.10, 0.91)	0.033	0.18 (0.05, 0.66)	0.010

risk factors associated with poor prognosis in patients with DPA ($P = 0.039$, $P = 0.032$, respectively).

Discussion

Perianal abscesses typically arise from infections of the anal glands. The infection spreads through three potential spaces within the sphincter complex: the intersphincteric space between the internal anal sphincter (IAS) and the conjoint longitudinal muscle (CLM), and the intermediate and lateral spaces between the CLM and external anal sphincter (EAS) [10]. These infections can extend in various directions: downward to form perianal abscesses, laterally through the external sphincter to form ischiorectal abscesses, or upward above the levator ani to form supralevator or high intersphincteric abscesses [11, 12]. Clinically, anorectal abscesses are often divided into superficial abscesses and DPAs based on the location of the lesions. The most effective treatment for perianal abscesses currently is surgical treatment. According to the "Chinese Expert Consensus on Clinical Diagnosis and Treatment of Perianal Abscess" and the "Guidelines for Diagnosis and Treatment of Perianal Abscess, Anal Fistula, and Rectovaginal Fistula (2022 Edition)" [13], incision—drainage are commonly used surgical methods for treating perianal abscesses. This procedure is simple to perform, quick to recovery, and can achieve significant therapeutic effects. However, for DPA, due to their deeper location, larger abscess cavities, and thinner drainage strips, the drainage opening can close prematurely before the abscess cavity is completely healed. This can result in the persistence of gaps between the drainage opening and the sphincter, leading to insufficient drainage of the abscess cavity and a postoperative fistula rate of up to 50% [8, 13, 14]. The high rate of fistula formation or recurrence after perianal abscess drainage not only subjects patients to the pain of a second surgery but also increases the medical burden. To address this issue, clinicians have introduced the "Seton technique," which involves simultaneous incision—drainage along with internal seton placement. The gradual cutting action of the rubber band not only effectively eradicates the primary fistula and internal opening but also helps to partially preserve the function of the anal sphincter, thereby reducing the postoperative incidence of anal fistulas in perianal abscesses [15]. According to the 2024 European Society of Coloproctology Guidelines [16], the immediate

incision—drainage of fistulas are not recommended in the management of acute perianal abscesses. Although internal opening incision with seton drainage has a higher cure rate compared to simple incision—drainage, there is still some degree of postoperative anal function impairment. The selection of surgical methods for DPA has been a subject of controversy in clinical studies [5, 17]. Despite the differing approaches, the common goal remains to minimize patient pain, protect anal sphincter function, and reduce the high recurrence rate. Based on this, our study utilized an intersphincteric approach combined with counterpart drainage (IAICD) to treat deep abscesses.

It is widely acknowledged among scholars that conducting one-stage procedure during the acute phase can significantly shorten the treatment duration and alleviate patient suffering. Despite the challenges in identifying the internal opening during the acute phase, it is typically situated near the abscess, discernible by a palpable recessed anal sinus. Occasionally, purulent discharge is visible, facilitating the precise localization of the internal opening [18]. The IAICD surgical technique effectively eradicates the primary infection focus and maximizes drainage of infections located within the three interspaces. Multiple counter-incisions can be employed depending on the size of the abscess cavity, and the placement of drainage tubes can be determined based on the depth of the abscess to achieve adequate drainage. Removing the infection source or internal opening through the intersphincteric approach significantly reduces the rates of recurrence or fistula formation and greatly preserves anal sphincter function. The results of this study show that 52 cases were cured in the treatment group, with a cure rate of 52/57 (91.2%), while 48 cases were cured in the control group, with a cure rate of 48/63 (76.2%). In a study of 2,358 patients with perirectal abscesses who underwent incision—drainage, 37.4% were readmitted to the hospital or required further surgery. Among these, 3.4% (79 out of 2,358 cases) underwent additional surgery within 30 days of the initial procedure, with 79.7% of these additional surgeries performed to enlarge the incision—drainage [19]. Schouten et al. conducted a prospective randomized study involving 70 patients with perianal abscess. In this study, incision, drainage, and fistulectomy with primary partial internal sphincterectomy were performed on 36 patients, while only incision—drainage were performed on 34 patients with anorectal abscess. After a median follow-up of 42.5 months, the recurrence rates in the two groups were 2.9% and 40.6%, respectively, and the rates of anal dysfunction were 39.4% and 21.4%, respectively [18]. In our study, the treatment group demonstrated significantly better clinical efficacy compared to the control group. Although the operation time was longer in the treatment group, there were no significant differences between the two groups regarding wound healing time, hospital stay, postoperative pain, anal function score, and appearance score. We further evaluated patients' prognosis using univariate and multivariate logistic regression analyses and found that Multivariate logistic regression analysis revealed that IAICD was a protective factor for the clinical efficacy of DPA patients, While wound healing time and a history of perianal surgery were identified as independent risk factors associated with poor prognosis in patients with DPA. These findings indicate that these variables exert significant predictive value, even after adjusting for potential confounding factors. These results highlight the importance of carefully evaluating the patient's surgical history, wound healing management, and the surgical modalities used in patients with perianal abscesses. Addressing these factors proactively may aid in mitigating the risk of poor postoperative outcomes and optimizing therapeutic strategies. This indicates that the IAICD surgery can significantly reduce the incidence of postoperative fistula or recurrence, while achieving relatively good anal function and quality of life.

Key points of IAICD surgery preoperative assessment: clinicians should perform a comprehensive and accurate preoperative assessment, with imaging examinations being crucial. Endoanal ultrasound is advantageous due to its convenience, simplicity, and real-time imaging capabilities, allowing timely exploration of the lesion's size, depth, and pathway, which aids in assessing the disease's severity [20]. For patients with recurrent or complex deep abscesses, MRI can adequately reveal the extent of the abscess and effectively display fistulous abscesses connected to the anal canal and rectum [21]. This approach can prevent greater trauma and poor drainage caused by blind probing due to unidentifiable internal openings during acute inflammation or tissue edema. Secondly, intraoperative exploration of the abscess cavity should be thorough, making radial incisions for counter-drainage to ensure smooth drainage. The exploration process should avoid damaging the sphincter, and the internal opening's location should be determined based on preoperative imaging and intraoperative exploration. The internal opening should be incised through the intersphincteric approach, and for unclear internal openings, prophylactic incisions should be made in the corresponding anal crypts, with the mucosa and crypts on both sides ligated. The postoperative removal of drainage rubber bands should follow the principle of removing them from top to bottom and from outside to inside. The main factors affecting short-term recurrence after incision—drainage include: (1) Objective factors, such as patient physical conditions (diabetes, weakened immunity), the use of preoperative antibiotics, and improper

postoperative wound care. (2) Subjective factors, such as the surgeon's experience and the choice of surgical technique. There is considerable debate regarding the factors influencing postoperative recurrence or fistula formation after perianal abscess surgery [1, 22]. The author believes that the intersphincteric approach with internal opening incision combined with counter-drainage surgery balances the protection of anal function with the risks of recurrence and fistula formation.

Our study was a single-center, small-sample retrospective analysis, which inherently lacked the rigor and validity of a prospective randomized controlled trial, and therefore had several limitations. Patient selection bias: we included patients with DPA but excluded those with superficial abscesses. Consequently, the clinical efficacy of IAICD for all types of perianal abscesses warrants further investigation. Limited sample size and subgroup analysis: the relatively small sample size in our study precluded detailed subgroup analyses based on abscess location and the anatomical position of the internal opening. As such, the results may not fully represent the broader population of patients with perianal abscesses. Lack of objective postoperative functional data: postoperative follow-up lacked objective assessments of anal sphincter function, thereby limiting our ability to evaluate the impact of the surgical procedure on postoperative anal sphincter integrity and functionality comprehensively. Short follow-up period: the follow-up duration was relatively short, which was insufficient to confirm the long-term efficacy of the surgical approach. Future studies with extended follow-up periods and larger sample sizes will be necessary to provide more robust and accurate data, thereby enhancing the validity and generalizability of research on the clinical efficacy of IAICD. In summary, while our findings offer preliminary insights into the use of IAICD for the management of DPA, future research addressing these limitations is required to validate and expand upon our results.

Conclusion

In conclusion, while the IAICD procedure may extend the operative duration in patients with DPA, it remains a viable surgical option for those with higher expectations of reducing perianal abscess recurrence. This technique not only preserves anal sphincter function but also reduces the risk of fistula formation and recurrence. Nevertheless, this study is a single-center, retrospective clinical investigation with a limited sample size and short follow-up period. Further high-quality evidence from prospective, multicenter, and long-term studies is required to validate the long-term efficacy and safety of this surgical approach.

Abbreviations

IAICD	Intersphincteric Approach with Internal Incision combined with Counter-Drainage
DPA	Deep Perianal Abscess
PCT	Procalcitonin
CRP	C-reactive Protein
ECG	Electrocardiogram
MRI	Magnetic Resonance Imaging
VAS	Visual Analog Scale
IAS	Internal Anal Sphincterand
CLM	Conjoint Longitudinal Muscle
EAS	External Anal Sphincter

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Authors' contributions

Jian-Sheng Hu and Wen Wang contributed to the conception and design of the study. Data collection and analysis were performed by Jian-Sheng Hu, Yang Wu and Lin-Mei Sun. The initial draft of the manuscript was written by Jian-Sheng Hu, the revision of the paper was supported by Xue-liang Yang and Wen Wang and all authors reviewed and revised the manuscript. All authors read and approved the final manuscript.

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Data availability

The datasets used and/or analyzed during the current study are available from the corresponding author on reasonable request.

Declarations

Ethics approval and consent to participate

The study was conducted in strict adherence to the principles of the Declaration of Helsinki. The study protocol received ethical approval from the Ethics Committee of Xi'an Hospital of Traditional Chinese Medicine (LLSCYJ2023038). The written informed consent was obtained from all participants prior to enrollment.

Consent for publication

All enrolled patients written informed consent for their clinical data to be published in an online open access journal.

Competing interests

The authors declare no competing interests.

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