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ORIGINAL ARTICLE

Comparison of Primary vs Secondary Closure Technique after Incision and Drainage of Cutaneous Abscess

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Abstract

Introduction: Historically, cutaneous abscesses have been managed with incision and drainage (I&D), followed by secondary closure, allowing the wound to heal by secondary intention. However, with the availability of modern antibiotics, the feasibility of primary closure in select cases warrants investigation. This study aimed to evaluate and compare the clinical outcomes of primary versus secondary closure following I&D in patients with cutaneous abscesses. **Methods:** A cross-sectional study was conducted over one year at a tertiary care center in Central Gujarat, involving 676 patients diagnosed with cutaneous abscesses. Participants were randomly assigned to undergo either primary closure (Group A) or secondary closure (Group B) following I&D. Key outcome measures included healing duration, length of hospitalization, treatment failure, complications, and patient-reported satisfaction using the Visual Analogue Scale (VAS). A p-value of <0.05 was considered statistically significant. **Results:** Each group consisted of 338 patients. The average healing time in Group A was 8.27 ± 2.23 days, significantly shorter than in Group B. The mean duration of hospital stay for Group A was 2.24 ± 0.87 days, also significantly lower ($p < 0.001$). Group A experienced fewer complications and demonstrated superior cosmetic outcomes compared to Group B, with both differences reaching statistical significance ($p < 0.001$). **Conclusions:** Primary closure after I&D of cutaneous abscesses resulted in improved clinical outcomes, including faster healing, reduced hospital stay, fewer complications, and enhanced cosmetic appearance, when compared to the conventional secondary closure approach.

Keywords: Cutaneous Abscess, Incision and Drainage (I&D), Primary closure, Secondary Closure, Wound Healing Outcomes

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Graphical Abstract

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Background
 Traditionally cutaneous abscesses were treated through the secondary closure followed by Incision and Drainage (I & D). However, in this era of newer and more effective antibiotics, we need to evaluate whether the same patients can be treated with primary closure. This study was designed to compare the outcome following the primary and secondary closure.

Primary Closure of wound



Methods
 A cross-sectional study was carried out at a tertiary care hospital in Central Gujarat among patients of cutaneous abscess over a period of one year. Patients were randomized to primary and secondary closure following to I & D. Outcomes like Healing rate, Duration of treatment, Treatment failure rate, need for hospital admission and Overall patient satisfaction by Visual Analogue Scale [VAS] were compared. P-value less than 0.05 was considered as statistically significant.

Conclusion: Primary closure technique gave better outcome in terms of days required for healing, days required for hospitalization, pain followed by suturing and complication rate as compared to secondary closure technique.



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Introduction

Cutaneous abscess is a focal skin and subcutaneous tissue infection with collection of pus. It generally appears with painful, fluctuant swelling with a central pustule and associated erythema and cellulitis [1,2]. This disease is commonly seen in all ages and both sexes, and is a main load of outpatient and emergency department, which is increased in recent years.

Historically, the treatment of skin abscesses has been I&D with secondary intention healing—leaving the wound open to heal through natural processes of granulation and re-epithelialization. That's the approach favored by major organizations such as the IDSA (Infectious Diseases Society of America), WSES (World Society of Emergency Surgery), and SIS-E (Surgical Infection Society Europe) as well as a number of clinical guidelines [2,3]. The conventional treatment of

cutaneous abscesses has been incision and drainage (I&D) followed by secondary healing in which the open wound is allowed to heal by granulation tissue formation and epithelialization [4].

However, recent literature suggested a change of surgical practice where some clinicians proposed primary closure following I&D. Thus, the trend against primary closure of abscess cavities has been challenged, as recent data support the concept that this modality of therapy may promote more rapid wound healing, less pain, less infection-related morbidity, and better cosmetic results [5]. There are a few reports of good outcomes with this technique in various sites including the breast, neck, axilla, trunk, and extremities [6].

The purpose of this study is to determine the effectiveness and safety of primary closure versus traditional

secondary closure at treating cutaneous abscesses, focusing on outcomes such as time to healing, duration of treatment, failure rate, need for hospital admission, and overall patient satisfaction.

Methodology

Study Design

A cross-sectional comparative investigative study was conducted to evaluate the results of two closure methods post I&D.

Sample Size and Sampling

Two groups of 338 patients each were entered into the analysis, based on an 80% study power and 95% confidence level—Group A patients underwent primary closure and Group B patients entered secondary healing.

The study was conducted in the Department of Surgery of a tertiary care hospital in Central Gujarat - receiving patients from Central and South Gujarat regions and neighbouring states - Maharashtra and Rajasthan.

Eligible patients were those who presented to the ED with localized skin abscesses suitable for I&D. Exclusion criteria were patients with systemic infection (e.g., fever, chills, hypotension), immunosuppressed status (such as diabetes mellitus, HIV, or long-term corticosteroids), large abscesses with surrounding extensive cellulitis (>5 cm) and very tiny ones (<3 cm), and those with conditions that predispose to endocarditis (e.g., congenital heart disease, prosthetic heart valves, IV drug use, pacemaker).

Surgical Techniques

Incision and Drainage (Modified Hilton's) [7]

Diagnosis was established by Aspiration.

The skin was cut at the most prominent and depending part of the collection.

Pus was evacuated with the help of artery forceps or sinus forcep and deep dissection was carried out.

All loculi were broken down by finger dissection. pus sent for culture. The cavity was curetted and irrigated with saline.

Primary Closure Technique [8]

The wound was then closed with 3-0 nylon and a closed suction drain was left in place (Figure 1).

Secondary Healing Method [7]

The cavity was packed with povidone-iodine- and hydrogen peroxide-soaked gauze and allowed to remain open (Figure 2). For larger wounds with good granulation tissue, a secondary suture was performed at a later date.

Antibiotic Regimen

All patients were treated empirically with amoxicillin-clavulanate. Doses for children were 30 mg/kg IV q8h (in patients) and 40 mg/kg/day orally (outpatients). Adults received 1.2 g IV every 12 hours or 625 mg PO twice daily. Antibiotics were changed according to the culture and sensitivity.



Figure 1. Primary Closure of wound



Figure 2. Secondary Closure of Wound

Study Outcomes

Key outcome measures included:

- Healing rate
- Duration of treatment
- Treatment failure rate
- Rate of hospitalization
- Pain on the VAS

Results

A total of 338 patients were randomized in both arms. Demographic profiles (Table 1) demonstrated no statistically significant difference between the groups in the age and sex distribution.

Table 1. Sociodemographic details

Variables	Group A (n-338)	Group B (n-338)	P-value
Age (mean±SD)	37.58± 13.55	37.41 ± 13.92	0.87
Gender			
Male	174 (51.48%)	190 (52.20%)	0.21
Female	164 (48.52%)	148 (43.79%)	

Table 2 shows there was no significant difference between the two groups on the involved anatomy of

abscess and isolated pathogens, and manifestation was also similar.

Table 2. Clinical Profile of the patients

Variables	Group A	Group B	P-value
Site			
Buttock	66 (19.53%)	87 (25.74%)	0.55
Leg	53 (15.68%)	47 (13.91%)	
Breast	50 (14.79%)	44 (13.02%)	
Thigh	46 (13.61%)	49 (14.50%)	
Hand	20 (05.92%)	22 (06.51%)	

Arm	18 (05.33%)	22 (06.51%)	
Forearm	12 (03.55%)	14 (04.14%)	
Back	15 (04.44%)	18 (05.33%)	
Foot	13 (03.85%)	09 (02.66%)	
Chest	05 (01.48%)	04 (01.18%)	
Scalp	18 (05.33%)	10 (02.96%)	
Axilla	13 (03.85%)	07 (02.07%)	
Scrotum	09 (02.66%)	05 (01.48%)	
Organism isolated from the abscess			
Staphylococcus aureus	220 (65.09%)	226 (66.86%)	0.59
Streptococcus	78 (23.08%)	70 (20.71%)	
Proteus	16 (04.73%)	11 (03.25%)	
Klebsiella	05 (01.48%)	09 (02.66%)	
No organism	19 (0562%)	22 (06.51%)	

Compared outcomes (Table 3) showed statistically significant positive advancements for the primary closure group in most parameters,

hospitalization rates being an only exception to be found at similar levels between the groups.

Table 3. Outcomes

Variables	Group A	Group B	p-value
Time required for healing in days (Mean \pm SD)	8.27 \pm 2.23	9.72 \pm 3.55	<0.001
No of patients required hospitalization	85 (46.96%)	96 (53.04%)	0.33
Days of hospitalization Mean \pm SD	2.24 \pm 0.87	2.93 \pm 0.67	<0.001
VAS Score	Mean (SD)	Mean (SD)	
Day 2	7.56 (0.69)	8.11(0.58)	<0.0001
Day 3	6.00 (0.94)	6.38 (0.81)	<0.0001
Day 5	4.01 (0.95)	4.17 (0.95)	0.03
Day 7	1.96 (0.60)	2.07 (0.76)	0.03
Cosmetic Results			
Good	257 (76.04%)	235 (69.53%)	
Average	72 (21.30%)	67 (19.82%)	0.002
Poor	09 (02.66%)	36 (10.65%)	
Complication			
Yes	85 (40.48%)	125 (59.52%)	<0.0001

No	253 (54.29%)	213 (45.71%)	
Complications			
Secondary suturing	00	67 (53.60%)	
Additional drainage	18 (21.18%)	35 (28.00%)	<0.0001
Readmission	14 (16.47%)	23 (18.40%)	
Suture Reopen	53 (32.35%)	00	

Discussion

In the present study, comparison of primary closure of an acute abscess with negative suction drain versus secondary closure has been done to evaluate and assess. There is a traditional method of treating an acute abscess by incision and drainage, and after that secondary closure. Ellis et al in 1951 was the first person to do a primary closure of an abscess without drain [9]. Now a days of advancement it is debatable that primary closure improves the outcome as compared to secondary closure [10]. In addition, most prior studies were conducted prior to the era of methicillin-resistant *Staphylococcus aureus*. As a result, it is unclear whether the results of prior studies can be generalized to current incision and drainage of cutaneous abscesses (Figure 1 and 2).

In our study we had included equal number of patients (n-388) in each group. Group-A patients had been given primary closure and Group B

patients had been given secondary closure. Both the groups were compared in terms of socio-demographic characteristics and clinical parameters of wound to reduce the chances of confounding and bias. Both the groups were comparable in terms of socio-demographic profile and clinical profile (Tables 1 and 2; $p > 0.05$).

The time required for healing in days was 8.27 ± 2.23 for primary closure and it was 9.72 ± 3.55 in case of secondary closure. The difference was statistically significant. A systemic review by Singer AJ et al had time to healing after primary closure (7.8 days [95% confidence interval {CI}, 7.3-8.3]) and secondary closure (15.0 days [95% CI, 14.3-15.7]) [6]. The difference was statistically significant. Similar findings were there in Dubey et al. in which healing time for patients with primary closure and secondary closure were 7-11 days and 12-36 days respectively. The difference was statistically significant (p value < 0.05)

[8]. Therefore, we could say that primary closure patients required lesser healing time as compared to the secondary closure patients.

The hospitalization was seen in nearly 54 % of patients with secondary closure as compared to the 47% in primary closure. Although we did not find any statistically significant difference in number of hospitalizations in both groups, we found statistically significant difference in the number of days of hospitalization. As it is a newer technique for the management of cutaneous abscess there is lesser literature available in this context. Therefore, we cannot generalize the findings for hospitalization.

There was statistically significant difference between VAS score for each day in both the group. VAS score was lesser in patients with primary closure as compared to the patients with secondary closure. The similar findings were there in a study by AJ singer et al. [11]. There are other studies available which also states that conventional method (secondary suturing) has higher pain score and higher requirement for analgesics [12]. Therefore, we could say that pain was lesser in Group A as compared to Group B.

In our study we found a good cosmetic result in primary closure as compared to secondary closure. A study done by Quinn et al. also had similar finding that primary closure gives better cosmetic results as compared to secondary closure [13]. The complications were less in primary closure as compared to the secondary

closure, especially re-suturing. Re-suturing was only observed in patients with secondary closure. The similar findings were observed in studies done by Singer et al. and Kale et al. which shows complications were more commonly observed in patients with secondary closure as compared to primary closure [11,14].

Thus, we can conclude that primary suturing gives better outcomes in terms of healing rates, hospitalization, reduced pain scores, cosmetic results and complication rates.

Limitations

This study was limited to single-center research, which undermines the generalizability of the results to other regions or general setting. The study did not have a standardized antibiotic regimen, which could be a potential confounding factor. Finally, the patients could not be followed up post-discharge, which may lead to a lack of the assessment of side effects or miserable outcomes that could have developed after discharge.

Conclusion

The findings of this study are supporting primary closure over secondary following incision and drainage of localized cutaneous abscesses through the process being associated with smaller wound size, quicker healing, lower levels of postoperative pain, shorter LOS, less severe wound outcomes, and better cosmetic results. The hospitalization rate was a comparable finding, but all the other points, including patient

satisfaction, were consistently in favor of primary closure. This study challenges the belief behind secondary closure based on comparative evidence for a selective use of primary closure over SC for a well-defined localized cutaneous abscess. However large-scale, multicenter RCT are needed to corroborate the finding of this study.

Conflicts of interest

The authors declare that they do not have conflict of interest.

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No funding was received for conducting this study.

Author's Contribution

VB Conceptualization, data collection, manuscript drafting; PD: Literature review, data analysis; MB: Study design, critical revision of the manuscript; PT: Manuscript preparation, statistical assistance; PRC: Supervision, guidance on methodology; VDY: Final manuscript editing, corresponding author responsibilities

Ethical Considerations

The study was approved by the Institutional Ethics Committee. Subjects were explained the study protocol and written informed consent was obtained.

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