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Original Research Article

Comparative study conventional incision and drainage versus primary closure with negative suction drainage of soft tissue abscess

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ABSTRACT

Background: An abscess refers to a confined collection of pus within tissues, organs, or specific body spaces, arising from tissue breakdown within the dermal and deeper skin layers. It is a hallmark of infection, identified as an inflammatory lesion containing purulent material, which commonly occurs as a response to a range of biological, chemical, or physical injuries to host tissues. The typical signs of an acute abscess include redness, tenderness, warmth, and swelling, often presenting a fluid-like consistency when pressed. While the overlying epidermis remains intact, the dermis hosts inflammatory cells and degraded tissue. Distinguishing an abscess from similar conditions is essential; erysipelas affects the upper dermis, while cellulitis involves loose connective tissue beneath the dermis, often mimicking an abscess.
Methods: This comparative hospital-based study evaluated wound healing time and scarring between two treatment approaches: conventional incision and drainage versus primary closure with a negative suction drain. Fifty patients were randomly divided into two groups: Group A: 25 patients treated with conventional incision and drainage; Group B: 25 patients receiving primary closure with suction drainage following incision and drainage.
Results: Primary closure with suction drainage showed faster wound healing, reduced postoperative pain, shorter hospital stays, and a lower recurrence rate compared to the conventional approach.
Conclusions: Incorporating primary closure with suction drainage is advantageous over traditional methods, suggesting a need for wider adoption among surgeons as it provides faster recovery, less pain, and improved cosmetic outcomes.

Keywords: Abscess, Incision and drainage, Negative suction drain, Primary closure, Scar, Wound healing

INTRODUCTION

A skin abscess is a localized accumulation of pus that typically forms in response to infection or the presence of foreign substances beneath the skin, resulting from the breakdown of tissue and surrounded by inflammation.[1] This condition is most often caused by bacterial infections, with the body's tissue reacting defensively to limit the spread of the infection. In this process, foreign materials or pathogens destroy local cells, which prompts the release of cytokines that draw a high concentration of white blood cells to the area, and increasing blood flow to the infected site.[2]

Typically, a cutaneous abscess can be diagnosed through clinical examination alone, presenting as a painful, warm, soft tissue mass that feels fluctuant and is accompanied by surrounding redness and firmness.[3] Differentiating an abscess from cellulitis is essential since cellulitis, unlike an abscess, generally responds to antibiotic therapy without drainage. In cases where physical findings are inconclusive, ultrasound imaging can help confirm the presence, size, and exact location of an abscess.[4]

In smaller abscesses, conservative treatments like warm compresses or antibiotics may suffice, and some abscesses may even drain on their own. However, as abscesses grow, increased inflammation and pus collection create tissue tension, reducing blood flow and making conservative measures less effective. Surgical intervention through incision and drainage (I&D) is often required to relieve pressure, reduce infection, and promote healing.[5]

Options for treating an abscess surgically include conventional incision and drainage without primary closure, which remains a popular choice but often leaves a noticeable scar, delays wound healing, and can result in painful dressing changes.[6] This conventional approach was challenged in 1951 by Ellis, who introduced primary closure after I&D, a method that can improve healing rates, reduce pain, and lead to more favourable cosmetic outcomes.[7,8]

This study, conducted at our tertiary care centre, aimed to evaluate the effectiveness of primary closure with negative suction drainage for abscess management by comparing wound healing time and scarring with the conventional approach. Also, the study aimed to compare the outcome of primary closure with negative suction drainage of abscess with a conventional method of incision and drainage with respect to wound healing time and scaring. This study objective was to study the duration of healing time, to study the duration of hospital stay and to study complications.

METHODS

This hospital-based comparative study was conducted to evaluate the outcomes of primary closure with negative suction drainage versus conventional incision and drainage in terms of wound healing time and scarring. Using random sampling, we divided participants into two groups: Group A: 25 patients undergoing conventional incision and drainage for abscess management; Group B: 25 patients receiving incision and drainage with subsequent primary closure and placement of a suction drain.

Study design and period

This hospital-based comparative study conducted for 18 months from June 2022- December 2023.

Study population

The study included all patients over 18 years of age, both sexes, with abscesses measuring over 5 cm at their longest dimension, admitted to the general surgery ward of a tertiary care centre. Study was conducted in Sassoon General hospital.

Inclusion criteria

Patients with abscesses larger than 5 cm at the longest dimension, patients aged 18 years or older, patients who provided signed, informed consent before the procedure were included.

Exclusion criteria

Patients with abscesses on the perianal or facial regions, abscesses under 5 cm in size, abscesses with necrotic patches, cold abscesses, patients who did not consent to the procedure were excluded.

Methodology

Following approval from the Institutional Ethics Committee, written informed consent was obtained from all participants. Upon enrolment, each patient's medical history was reviewed, and a physical examination was conducted. Participants were divided randomly into two groups: Group A: Conventional incision and drainage with gauze packing; and Group B: Incision and drainage followed by primary closure with a negative suction drain.

Operative procedure

For each patient, preoperative preparation and anaesthesia were administered based on the abscess location and patient age. Prophylactic antibiotics, specifically amoxicillin (1000 mg) combined with potassium clavulanate (200 mg), were given intravenously before anaesthesia. The surgical site was cleansed with a 10% povidone-iodine solution and draped for aseptic technique. An incision was made at the most prominent area of the abscess, and pus was collected for culture and sensitivity testing. The abscess cavity was thoroughly drained, curetted, and irrigated with povidone-iodine and hydrogen peroxide solutions.

In Group A, the wound was packed with gauze and dressed daily, with cleaning using povidone-iodine and hydrogen peroxide. In Group B, a suction drain was inserted into the abscess cavity, and primary closure was performed. The first dressing change was on the third day, followed by changes as needed. The suction drain was removed once drainage reduced to less than. The suction drain was removed once drainage decreased to minimal(less than 5 ml per day) and sutures were typically removed between the 7th and 14th days, provided the suture line appeared healthy.

For Group A, healing time was recorded from the day of the incision until the complete obliteration of the abscess cavity, while for Group B, healing time was measured from the day of incision until the removal of sutures, confirming proper approximation of the skin edges. Both groups were monitored for recurrence at 1, 2, and 3 months post-procedure. Recurrence was defined as the development of a new abscess, sinus, or fistula after the initial wound had healed.

Additionally, wound culture sensitivity was assessed on days 0, 3, and 7 to identify any organisms present. Wound healing progress was measured using the Bates-Jensen

Wound Assessment Tool, while pain was assessed using the Visual Analog Scale (VAS).

RESULTS

This hospital-based comparative study evaluated the outcomes of conventional incision and drainage versus primary closure with negative suction drainage in managing abscesses, with a focus on wound healing time and scarring.

Patient demographics

The mean age of patients in Group A was 41.28±13.38 years, while Group B's mean age was 42.64±14.48 years. Both groups exhibited a male preponderance, with males comprising 60% of Group A and 68% of Group B. The upper limb, including the axillary region, was the most common abscess site in both groups (40% in Group A and 32% in Group B), followed by abscesses in the lower limb and gluteal areas (24% and 28%, respectively). Other affected regions included the anterior abdominal wall, breast, anterior chest wall, and back.

Microbiological findings

In both groups, *Escherichia coli* (*E. coli*) was the most frequently isolated organism, appearing in 24% of Group A and 20% of Group B cases. The distribution of isolated organisms in each group is summarized below:

Table 1: Distribution of isolated organisms in each group.

Organism	Group A		Group B		P value
	N	%	N	%	
E. coli	6	24	5	20	>0.05
Polymicrobial	4	16	6	15	
Pseudomonas	4	16	2	8	
MRSA	3	12	3	12	
Klebsiella pneumonia	2	8	2	8	
MSSA	1	4	1	4	
No growth	5	20	6	24	
Total	25	100	25	100	

MRSA-Methicillin-resistant Staphylococcus aureus; MSSA-Methicillin-sensitive Staphylococcus aureus

Healing time: Wound healing was significantly faster in Group B, with a mean duration of 8.84±2.90 days, compared to Group A's mean healing time of 16.76±5.88 days.

Hospital stay: The average duration of hospital stay was also notably shorter for Group B (10.44±4.06 days) compared to Group A (14.96±5.91 days).

Recurrence rate: Three patients in Group A experienced recurrence, while only one patient in Group B had a recurrence, indicating a lower recurrence rate with primary closure and suction drainage.

Pain assessment: postoperative pain was assessed using the Visual Analog Scale (VAS) on days 1, 3, 5, and 7. The table below shows the mean day-wise pain scores, demonstrating that patients in Group B (primary closure) experienced significantly less pain on each postoperative day compared to those in Group A (conventional method):

Table 2: Mean day-wise pain scores.

VAS	Group A	Group B
	Mean±SD	**Mean±SD**
Day 1	7.40±0.756	4.56±0.580
Day 3	5.42±0.758	3.36±0.485
Day 5	3.90±0.641	2.32±0.471
Day 7	2.76±0.555	1.06±0.242

DISCUSSION

Abscesses frequently lead to emergency department visits due to their painful and inflammatory nature. Traditional surgical principles have held that highly contaminated or infected wounds should not be closed primarily, resulting in a preference for conventional incision and drainage with healing by secondary intention. However, recent studies have increasingly supported primary closure following incision and drainage for acute abscesses. Researchers have noted benefits of primary closure, including faster healing, reduced hospital stay, less pain, improved scarring, and lower recurrence rates.[9]

In our study, the average age for patients treated with the conventional method (Group A) was 41.28 years, with a standard deviation of ±13.38, while the mean age for those treated with primary closure (Group B) was 42.64 years, with a standard deviation of ±14.48. A male predominance was observed in both groups, similar to findings by Singh et al, where the male-to-female ratio was roughly 1.5:1 in the conventional group and 1.6:1 in the primary closure group.[9]

The most frequently identified organism in our study was *E. coli*, present in 24% of Group A and 20% of Group B cases. Singh et al found *Staphylococcus aureus* to be the most common organism, though *E. coli* was still identified in a notable percentage of cases, which is consistent with our findings.[9]

In comparing wound healing times, our study revealed significantly faster healing with primary closure and suction drainage (8.84±2.90 days) compared to the conventional method (16.76±5.88 days). This is in line with results from Singer et al, who reported a mean healing time of 7.8 days with primary closure, compared to 15 days with conventional treatment.[10] Similarly, Dubey et al found that primary closure resulted in healing times between 7 and 11 days, while the conventional approach ranged from 12 to 36 days.[11]

This study finding also showed a shorter hospital stay for the primary closure group, with a mean stay of 10.44±4.06 days versus 14.96±5.91 days for the conventional group. Abraham et al observed similar outcomes, with hospital stays reduced by 40-60% in patients treated with primary closure.[12]

The recurrence rate of abscesses was lower in the primary closure group, with only one patient experiencing recurrence, compared to three in the conventional group. Although this difference was not statistically significant, it suggests a potential benefit of primary closure in reducing recurrence. Pain scores were consistently lower in the primary closure group across all postoperative days, as measured by the Visual Analog Scale (VAS), indicating less discomfort for patients with primary closure and suction drainage. This aligns with findings from Parakh and Diwakar, as well as Raju et al, who also reported lower postoperative pain in patients receiving primary closure.[13,14]

This study highlights that primary closure with suction drainage offers advantages over the conventional method, including faster healing, reduced pain, shorter hospital stays, and improved cosmetic outcomes. Based on these findings, we recommend primary closure as a preferred approach for abscess management, emphasizing its cost-effectiveness and superior results.

This study had several limitations. First, the sample size was relatively small, limiting the generalizability of the findings to larger populations. Future studies with larger sample sizes are needed to confirm the results. Additionally, this study was conducted at a single tertiary care centre, which may introduce location-specific biases and limit the applicability of findings to other settings. We also did not assess the long-term outcomes beyond the three-month follow-up, so the study may not capture late recurrences or delayed complications.

CONCLUSION

The use of primary closure with suction drainage following incision and drainage for abscess management was associated with faster wound healing, reduced postoperative pain, shorter hospital stays, and a lower recurrence rate compared to the conventional incision and drainage method. This study supports the routine use of primary closure as a preferred technique for managing abscesses, given its benefits in patient recovery and cosmetic outcomes.

Recommendations

We recommend that surgeons consider adopting primary closure with suction drainage over the conventional method, as it offers better clinical results and cost-effectiveness, ultimately enhancing patient quality of care.

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Ethical approval: The study was approved by the Institutional Ethics Committee of B.J.G.M.C AND Sassoon General Hospital, Pune, India

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