

Loop Drainage Technique vs. Conventional Incision and Drainage for Management of Skin and Soft Tissue Abscesses: Systematic Review and Meta-analysis

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Abstract

Background: The loop approach is an alternative to packing that does not require large incisions can be used in both small and big abscesses, preventing premature closure and fostering prolonged drainage in the same way as packing does. **Aim:** This work aims to determine the efficacy and safety of the Loop Drainage Technique (LDT) versus Conventional Incision and Drainage (CID) for the management of skin and soft tissue abscesses. **Materials & Methods:** A systematic search was performed over different medical databases to identify general surgery studies, which studied the outcome of the LDT group versus the CID group of skin and soft tissue abscesses patients. We conducted a meta-analysis process on the overall failure rate as a primary outcome (failure is defined as the need for repeat incision and drainage, intravenous antibiotics, admission, or surgical intervention). The failure rate in adult and pediatric patients is considered secondary outcomes. **Results:** Seven studies were identified involving 877 patients, with 410 patients in the LDT group, and 467 patients in the CID group. Our meta-analysis process showed a highly significant decrease in the overall failure rate in the LDT group compared to the CID group ($p=0.01$). Also, we found a non-significant difference in failure rate in adult patients ($p>0.05$), and a highly significant decrease in failure rate in pediatric patients in the LDT group compared to the CID group ($p=0.003$). **Conclusion:** To conclude, the Loop drainage technique for management of skin and soft tissue abscesses is better in a decrease in the overall failure rate (need for repeat incision and drainage, intravenous antibiotics, admission, or surgical intervention) also decrease failure rate in pediatric patients but not significant in decrease failure rate in adult when compared to conventional incision technique.

Keywords: Loop drainage; Incision; Drainage, Skin; Soft tissue abscesses

Introduction

In the emergency room, cutaneous abscesses are commonly treated. In the United States, nearly 1.4 million Incisions and Drainage (I&D) procedures for these infections are performed each year. [1] While some sort of I&D is certainly the gold standard, additional abscess cavity packing is debatable. [2] I&D with or without oral antibiotics, packing, or drainage are all alternatives for outpatient management of cutaneous abscesses. Since community-acquired Methicillin-Resistant *Staphylococcus Aureus* (ca-MRSA) has emerged as the most common cause of abscess formation, complete I&D and judicious antibiotic administration have become increasingly important. Antibiotics have historically been recommended following I&D, although research suggests that antibiotic usage is ineffective for simple abscesses. [3] The American College of Emergency Physicians (ACEP) "choosing wisely guidelines" and the Infectious Disease Society of America (IDSA) have previously advised against using antibiotics in a variety of situations. The use of I&D alone to treat cutaneous abscesses is

becoming more common; the effective technique is especially crucial. The LOOP procedure, which involves inserting one or more vascular loops around the abscess cavity, is an alternative to standard packing that keeps the abscess chamber draining. [4]

The LOOP approach is an alternative to packing that does not require large incisions can be used in both small and big abscesses, preventing premature closure and fostering prolonged drainage in the same way as packing does. [5] After the loculations are bluntly opened and the cavity is irrigated, and an avascular loop is introduced into the abscess cavity through two tiny incisions. The vascular loop is loosely tied and left in place for several days to allow the wound to drain, after which it is cut

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and gently retracted from the wound. Multiple vascular loops can be implanted to span the whole abscess cavity if the abscess is large. It is not necessary to modify or replace vessel loops. [6]

This work aims to determine the efficacy and safety of the Loop Drainage Technique (LDT) vs. Conventional Incision and Drainage (CID) for the management of skin and soft tissue abscesses.

Literature Review

Our review came following the (PRISMA) statement guidelines. [7]

Study eligibility

The included studies should be in english, a journal published article, and a human study describing skin and soft tissue abscesses patients. The excluded studies were either animal or non-english studies or articles describing deep abscesses.

Study identification

Basic searching was done over the PubMed, Cochrane library, and Google scholar using the following keywords: loop drainage, incision and drainage, skin and soft tissue abscesses.

Data Extraction

Comparative studies, clinical trials, and Randomized Controlled Trials (RCTs), which studied the outcome of the LDT group vs. CID group of skin and soft tissue abscesses patients, will be reviewed. Outcome measures included the overall failure rate as a primary outcome (failure is defined as the need for repeat incision and drainage, intravenous antibiotics, admission, or surgical intervention). The failure rate in adult and pediatric patients is considered secondary outcomes.

Study selection

We found 80 records, 50 excluded because of the title; 30 articles are searched for eligibility by full-text review; 10 articles cannot be accessed; 5 studies were reviews and case reports; the

desired procedure not used in 8 studies. The studies which met all inclusion criteria were 7 studies.

Statistical Analysis

Pooled Odds Ratios (OR), Proportions (%), with 95% Confidence Intervals (CI) assessed, using a statistical package (MedCalc, Belgium). The meta-analysis process was established via I²-statistics (either the fixed-effects model or the random-effects model), according to the Q test for heterogeneity.

The included studies were published between 2011 and 2020. Regarding the type of included studies, 4 studies (out of 7 studies) were RCTs, while 3 studies were retrospective. Regarding patients' characteristics, the total number of patients in all the included studies was 877 patients, with 410 patients in the LDT group, and 467 patients in the CID group, while their average empiric antibiotic use was (95%). The mean age of all patients was (21.4 years) [Table 1]. [8-14] Our meta-analysis included 7 studies comparing 2 different groups of patients; with a total number of patients (N=877) [Table 2].

Each outcome was measured by

Odds Ratio (OR)

- For the overall failure rate
- For failure rate in adult patients
- For failure rate in pediatric patients

Concerning the primary outcome measure, we found 7 studies reported the overall failure rate. I² (inconsistency) was 0%, Q test for heterogeneity (p>0.05), so fixed-effects model was carried out; with overall OR=0.53 (95% CI=0.336 to 0.859). The fixed-effects model of the meta-analysis process revealed a highly significant decrease in the overall failure rate in the LDT group compared to the CID group (p=0.01) [Figure 1].

Concerning the secondary outcome measures, we found 4 studies reported failure rate in adult patients. I² (inconsistency) was 0%,

Table 1: Patients and study characteristics.

N	Author	Type of study	Total	Number of patients		Age (average years)	Empiric antibiotic use (%)
				LDT group	CID group		
1	McNamara et al. [8]	Retrospective	219	85	134	7	100
2	JG Ladde et al. [9]	Retrospective	142	51	91	2	88
3	Özturan et al. [10]	RCT	46	23	23	35.5	---
4	Gaszynski et al. [11]	Retrospective	53	36	17	38.8	100
5	Rencher et al. [12]	RCT	81	41	40	7.2	93.8
6	J Ladde et al. [13]	RCT	196	99	97	22	94.9
7	Schechter-Perkins et al. [14]	RCT	140	75	65	37.5	---

Table 2: Summary of outcome measures in all studies.

N	Author	Primary outcome		Secondary outcomes			
		Overall failure rate		The failure rate in adult patients		The failure rate in pediatric patients	
		LDT group	CID group	LDT group	CID group	LDT group	CID group
1	McNamara et al.	0	1	---	---	0	1
2	JG Ladde et al.	2	15	---	---	2	15
3	Özturan et al.	6	9	6	9	---	---
4	Gaszynski et al.	0	0	0	0	---	---
5	Rencher et al.	3	3	---	---	3	3
6	J Ladde et al.	13	19	13	10	0	9
7	Schechter et al.	9	12	9	12	---	---

Q test for heterogeneity ($p > 0.05$), so fixed-effects model was carried out; with overall OR = 0.82 (95% CI = 0.469 to 1.444). The fixed-effects model of the meta-analysis process revealed a non-significant difference in failure rate in adult patients in the LDT group compared to the CID group ($p > 0.05$) [Figure 2].

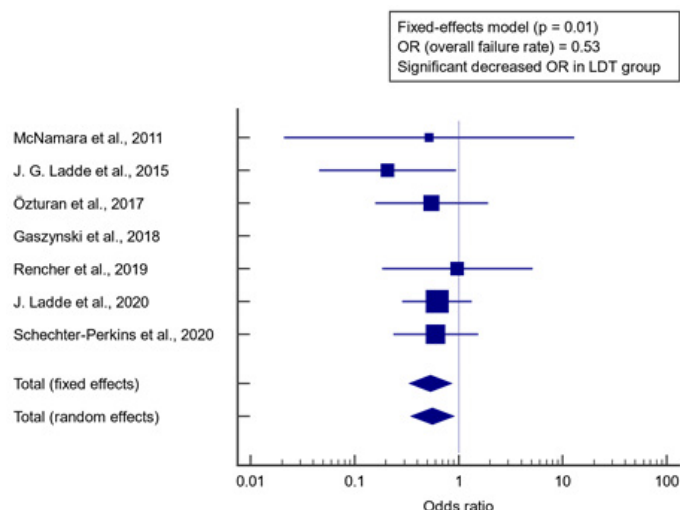


Figure 1: Forest plot (overall failure rate).

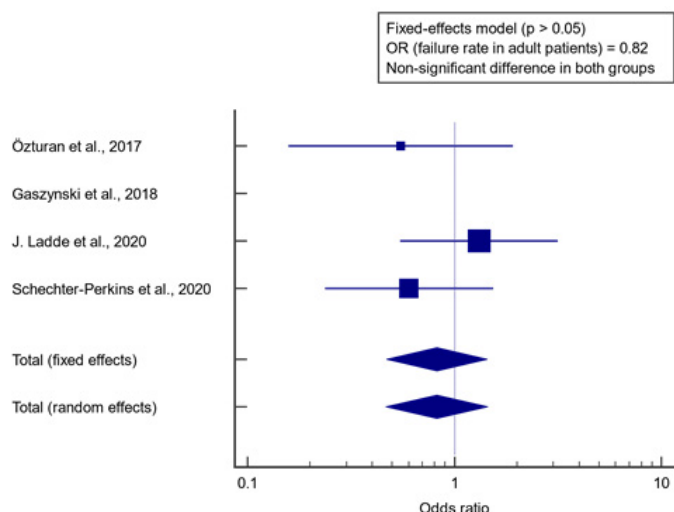


Figure 2: Forest plot (failure rate in adult patients).

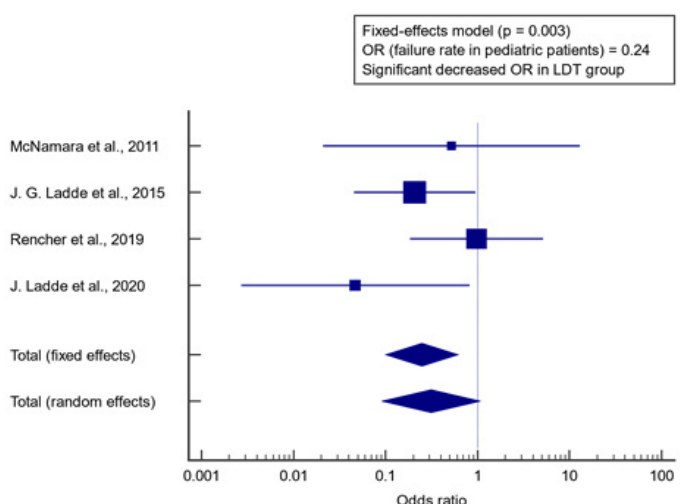


Figure 3: Forest plot (failure rate in pediatric patients).

We found 4 studies reported failure rate in pediatric patients. I^2 (inconsistency) was 27.9%, Q test for heterogeneity ($p > 0.05$), so fixed-effects model was carried out; with overall OR = 0.24 (95% CI = 0.100 to 0.615). The fixed-effects model of the meta-analysis process revealed a highly significant decrease in failure rate in pediatric patients in the LDT group compared to the CID group ($p = 0.003$) [Figure 3].

Discussion

This work aims to determine the efficacy and safety of the Loop Drainage Technique (LDT) versus Conventional Incision and Drainage (CID) for the management of skin and soft tissue abscesses. The included studies were published between 2011 and 2020. Regarding the type of included studies, 4 studies (out of 7 studies) were RCTs, while 3 studies were retrospective. Regarding patients' characteristics, the total number of patients in all the included studies was 877 patients, with 410 patients in the LDT group, and 467 patients in the CID group, while their average empiric antibiotic use was (95%). The mean age of all patients was (21.4 years). Our meta-analysis included 7 studies comparing 2 different groups of patients; with a total number of patients ($N = 877$). Concerning the primary outcome measure, we found 7 studies reported the overall failure rate. Using the fixed-effects model of the meta-analysis process revealed a highly significant decrease in the overall failure rate in the LDT group compared to the CID group ($p = 0.01$) which came in agreement with Gottlieb et al.; Gottlieb et al.; Long et al. [5,15,16]

Gottlieb et al. found that, when compared to CID, a meta-analysis of eight studies ($n = 910$ individuals) found that the LDT resulted in fewer treatment failures. When only randomized controlled trials were considered, the result remained the same. However, no difference was identified in the adult and pediatric subgroups. [15] Long et al. reported that, when compared to traditional incision and drainage, the loop drainage approach has a lower risk of treatment failure. Gottlieb found that a study of data from four trials revealed that the LOOP had a lower failure rate than standard incision and packing, with an Odds Ratio (OR) of 2.63 in favor of failure, but additional research is needed. [5]

Concerning the secondary outcome measures, we found 4 studies that reported failure rates in adult patients. Using the fixed-effects model of the meta-analysis process revealed a non-significant difference in failure rate in adult patients in the LDT group compared to the CID group ($p > 0.05$) which came in agreement with Salfity et al.; Schechter et al. [17,18]

Salfity et al. reported that the majority of the patients in this study were admitted to the hospital with a perirectal abscess (95.7% vs. 94.7%, $P > 0.05$) and similar abscess diameters (5.1 cm vs. 4.08 cm). Even while the conventional group had a larger rate of patients with recurring abscesses, the difference was not statistically significant. Similarly, there was no difference in the proportion of patients readmitted in either group (21.2% versus 14.3%, $P > 0.05$). Schechter et al. reported that between the two therapy groups, there was no significant difference in complications requiring hospitalization (5.9% vs. 6.1%).

Concerning the secondary outcome measures, we found 4 studies that reported failure rates in pediatric patients. Using fixed-

effects model of the meta-analysis process revealed a highly significant decrease in failure rate in pediatric patients in the LDT group compared to the CID group ($p=0.003$) which came in agreement with Aprahamian et al.; Hamreus et al.; Ladd et al.; Lautz et al.; Aprahamian, et al; reported that micro incisions and loop drainage are safe and efficient therapy options for children with subcutaneous abscesses. [19-22] The findings reduce the need for repeated wound packing and make postoperative wound management more straight forward. Loop drainage allows for a faster discharge time, decreased recurrence rates, and less scarring.

Hamreus, et al. reported that, when compared to open drainage, loop drainage results in lower costs, shorter hospital stays, and a lower rate of operation failure in pediatric patients with subcutaneous abscesses. [20] Ladd et al. performed a retrospective assessment of 128 pediatric patients who had cutaneous abscesses and were treated with loop drains. There were no recurrences or severe morbidity associated with the operation. Loop drains are a successful approach for draining and treating complex abscesses in children with poor postoperative wound care. [21]

Lautz et al. found that Incision and loop drainage in the treatment of subcutaneous abscesses in children in all anatomical regions was demonstrated to be safe and successful. These discoveries minimize the need for repeated wound packing and make postoperative wound management more straightforward. Compared to other procedures, loop drainage takes less time to discharge and has a lower recurrence rate. [22] On other hand, our result came in disagreement with Seal et al. who compared the effects of I&D with packing against vascular loops on abscess drainage in children observed that no difference in complication/treatment failures or return PED visits between the two approaches. [23]

Conclusion

To conclude, the Loop drainage technique for management of skin and soft tissue abscesses is better in a decrease in the overall failure rate (need for repeat incision and drainage, intravenous antibiotics, admission, or surgical intervention) also decrease failure rate in pediatric patients but not significant in decrease failure rate in adult when compared to Conventional incision technique.

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All the listed authors contributed significantly to the conception and design of study, acquisition, analysis, and interpretation of data and drafting of the manuscript, to justify authorship.

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