



# An alternative to open incision and drainage for community-acquired soft tissue abscesses in children

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## Abstract

**Background:** The continually rising incidence of soft tissue abscesses in children has prompted us to seek an alternative to the traditional open incision and drainage (I&D) that would minimize the pain associated with packing during dressing changes and eliminate the need for home nursing care.

**Study Design:** A retrospective review of all patients with soft tissue abscesses from November 2007 to June 2008 was conducted after institutional review board approval. Patients who were treated with open I&D were compared to those treated with placement of subcutaneous drains through the abscess cavities. Both groups received equivalent antibiotic treatment, and all patients were followed in outpatient clinics until infection resolved. The demographics, presenting temperature, culture results, and outcomes were compared between these 2 groups.

**Results:** A total of 219 patients were identified; 134 of them underwent open I&D, whereas 85 were treated with subcutaneous drains. The demographics, anatomical location of the abscesses, and bacteriology were comparable between the 2 groups. There were equal number of patients in each group who presented with fever initially. Of those treated with open I&D, 4 had metachronous recurring abscesses within the same anatomical region and 1 patient required an additional procedure because of incomplete drainage. There were no recurrences or incomplete drainages in the subcutaneous drain group. The cosmetic appearance of the healed wound from subcutaneous drain placement during the immediate follow-up period is better than that of an open I&D.

**Conclusions:** Placement of a subcutaneous drain for community-acquired soft tissue abscesses in children is a safe and equally effective alternative to the traditional I&D.

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Conventional incision and drainage (I&D) has been compared to incision and curettage and primary suturing of an abscess cavity under antibiotic coverage in numerous studies that were completed decades ago [1]. Open I&D followed by irrigation and wound packing has been, and currently is, accepted as the standard of care for the treatment of soft tissue abscesses [2]. Recently, the number of soft tissue abscesses secondary to *Staphylococcus aureus* (both methicillin-resistant and methicillin-sensitive strains) has dramatically increased [3,4]. Numerous expert opinions and constructed guidelines continue to support the use of open I&D as the standard of care for this disease [5-8]. However, this intervention is associated with a number of problems in the pediatric population. In our experience, the perceived suffering associated with the pain during wound packing can be emotionally devastating to parents. The dressing changes for these children often require more than one person, including one person to hold down the screaming child and one to change the dressing. Home nursing care is often necessary to educate the parents and provide wound care to the child. The incisions for these children are proportionally larger compared with similar incisions in adults, and we expect the long-term cosmesis to be poor.

As an alternative to conventional I&D, we present a minimally invasive approach to the treatment of soft tissue abscesses that involves placement of subcutaneous drains. We hypothesize that this technique will eliminate the pain associated with dressing changes and obviate the need for home nursing care while demonstrating comparable efficacy in the resolution of the abscess cavity and surrounding cellulitis.

## 1. Methods

### 1.1. Patient population

After institutional review board approval (DB#2262), all patients who presented to the Women and Children's Hospital of Buffalo with soft tissue abscesses requiring surgical drainage from November 2007 to July 2008 were analyzed. All of the patients were evaluated by the Pediatric Surgical Service and drained by a member of the surgical team. These patients were treated with either open I&D or placement of subcutaneous drains through the abscess cavity based on the preference of the attending surgeon (see procedure below). All procedures were carried out either in the emergency department under conscious sedation or in the operating room under general anesthesia. The decision to use conscious sedation was made in consultation with the emergency department physician. The usual admission criteria include fever (defined as a temperature  $>38.5^{\circ}\text{C}$ ), extensive cellulitis, lethargy, and/or inability to perform proper wound care as determined by caretakers themselves and the treating surgeons or nursing staff. Postoperative

analgesia was provided using oral acetaminophen, ibuprofen, codeine, hydrocodone, morphine, or hydromorphone.

Children who had open I&D were treated with daily wound packing with plain packing strips. During the child's visit to the emergency department or inpatient stay, wound care instructions were given to the parents or equivalent care takers. Home care nursing was arranged to provide adequate wound care in the outpatient setting for at least one visit. The decision to discontinue further visit is made jointly by the home care nurse and the caretaker of the child if proper wound care could be provided without additional assistance.

Children who had subcutaneous drains placed had a different postoperative care regimen. Wounds were washed with soap and warm water twice daily and as needed whenever the wound was soiled; they were covered with dry gauze or a clean diaper. Patients were discharged when the fever and cellulitis had resolved and adequate pain control could be achieved with only oral agents. The admission and discharge criteria were the same for both groups. Because of the increasing incidence of community-acquired *S aureus* soft tissue infections, sulfamethoxazole/trimethoprim or clindamycin was used empirically for a total of 10 to 14 days.

### 1.2. Surgical technique

The extent of induration and fluctuance of the abscess is first assessed. In cases of open drainage, an incision is made until the abscess cavity is encountered. The cavity is then bluntly explored to ensure that all subcutaneous loculations are broken down. The incision may be lengthened to provide exposure of the entire abscess cavity for packing (Fig. 1). In cases of subcutaneous drain placement, stab incisions are made at each end of the abscess cavity and the skin bridge overlying the abscess is left intact. Using a hemostat, blunt dissection is performed through the stab incisions in all directions to the extent of the induration to make certain that no loculations remain. A subcutaneous drain (either a Vessiloop [Medline Ind, Mundelein, Ill] or a penrose) is placed



Fig. 1 Open I&D wound.

into one of the stab incisions and pulled through the counter incision, traversing the entire abscess cavity. The abscess cavity is drained of all purulent material and the necrotic fat is vigorously expressed through the counter incision. In cases of larger abscesses, multiple drains may be placed. The ends of the drains were secured by tying the 2 ends together or with suture (Fig. 2). The contents of all abscesses were swabbed for culture. The wounds were irrigated with normal saline either through the incision or via the stab incisions using angiocaths. During the study period, all abscesses were drained by attending surgeons, pediatric surgery fellows, or general surgery residents.

### 1.3. Follow-up care

All patients were followed in the surgery outpatient clinic until either the open wounds were completely closed or until the subcutaneous drains were removed. The criteria for drain removal included complete resolution of erythema and induration and lack of purulent material when the wound tract was expressed. Most of the patients in the subcutaneous drain group were seen for an additional follow-up visit 2 weeks after drain removal. All patients were instructed to return to the emergency department or to the surgery outpatient clinic if there were any signs of recurrence.

### 1.4. Data collection and analysis

Demographics, admission status, and length of stay (LOS) were collected using the hospital computer database PowerChart (Cerner). Charts were reviewed retrospectively to identify the presenting temperature. Additional information gathered included the anatomical location of the abscesses, culture results, as well as data regarding reoccurring or incompletely drained abscesses requiring additional drainage procedures. All categorical data such as demographic information and locations of abscesses were analyzed with Wilcoxon 2-sample test, Fisher's Exact test, or  $\chi^2$  test. The LOS data were analyzed with the unpaired *t* test.



**Fig. 2** Drainage with subcutaneous drain placement.

## 2. Results

A total of 219 patients were included in our study. One-hundred thirty-four patients underwent open I&D and 85 had subcutaneous drains placed. The demographics, anatomical locations of the abscesses, and bacteriology were similar between the 2 groups (Table 1). Although the admission rates for both groups were the same, there was less need for home nursing care for those who had subcutaneous drains. The first 3 patients treated with drain placement had 1 to 2 home nursing visits to monitor for wound infection or recurrent cellulitis because of uncertainty regarding the outcome. Subsequent patients with subcutaneous drains placed did not have home nursing care ordered based on the feedback from the home care nurses and the patients' family (Table 2).

Although the presence of extensive cellulitis as judged by the treating surgeon is one of main reasons for admission, the degree of cellulitis was often inadequately documented. There were 34 patients who had fever at the time of presentation, and 17 of these patients underwent open I&D while the other 17 underwent subcutaneous drain placements. There was a slightly higher percentage of patients undergoing subcutaneous drain placement who had fever (20% vs 12.7%), but this is not statistically significant ( $P = .18$ ).

In patients who were treated with subcutaneous drains, the drains remained for a mean of 8.6 days (range, 2-19 days). All drains were removed in the surgery outpatient clinic

**Table 1** Patient demographics, abscess location, and bacteriology

	Open I&D (n = 134)	Subcutaneous drain (n = 85)
Mean age in years	7.6 ± 7.03	6.1 ± 6.59
Sex (male/female)	58/76	27/58
Race		
Caucasian	46 (34.3%)	35 (41.2%)
African American	59 (44%)	34 (40%)
Other	29 (21.7%)	16 (18.8%)
Anatomical location (n = 140), 6 with multiple sites		(n = 93), 8 with multiple sites
Head/neck	11 (7.9%)	2 (2.2%)
Chest/axilla/back	26 (18.6%)	13 (14.0%)
Abdomen	16 (11.4%)	7 (7.5%)
Groin/buttock/ perineum	50 (35.7%)	46 (49.5%)
Upper extremities	9 (6.4%)	6 (6.5%)
Lower extremities	28 (20.0%)	19 (20.4%)
Culture results		
MRSA	79 (59%)	47 (55.3%)
MSSA	23 (17.2%)	23 (27%)
No growth	7 (5.0%)	5 (5.4%)
Other <sup>a</sup>	25 (17.9%)	10 (10.8%)

<sup>a</sup> Included *Enterobacter*, *Citrobacter*, *Proteus*, *Streptococcus viridans*, *Escherichia coli*, *Klebsiella*, coagulase-negative Staph.

**Table 2** Admission status, LOS, and frequency of home nursing care

	Open I&D	Subcutaneous Drain	<i>P</i>
Admission status			1.000
Outpatient	88 (65.7%)	56 (65.9%)	
Inpatient	46 (34.3%)	29 (34.1%)	
Home nursing required (>2 visits)	69 (51.5%)	0	<.0001

without any need for sedation or anesthesia. There was one patient who was rehospitalized because of intolerance of oral sulfamethoxazole/trimethoprim. She was switched to intravenous clindamycin to complete a 10-day course of antibiotic therapy. There were no incomplete drainages or recurrent abscesses observed in this group. In contrast, 4 patients who had an open I&D required another drainage within 1 month of the original procedure for a new abscess in the same anatomical region but not at the exact same location. One patient had a repeat drainage procedure 4 days postoperatively as a result of an incomplete drainage.

Demographic data (Wilcoxon 2-sample test,  $P = .13$ ; Fisher's Exact test,  $P = .12$ ;  $\chi^2$  test,  $P = .59$ ), abscess location ( $\chi^2$  test,  $P = .19$ ), and culture results ( $\chi^2$  test,  $P = .25$ ) were shown to be comparable between the 2 groups. An outcomes analysis was then performed using the Fisher's Exact test, which demonstrated no significant difference between the 2 groups in admission status (Fisher's Exact test,  $P = 1.000$ ). Once admitted, they also had similar lengths of stay. The open drainage group had mean LOS of  $0.7 \pm 1.3$  days for those who had open drainages vs  $0.7 \pm 1.2$  days for those who underwent subcutaneous drainage (unpaired  $t$  test,  $P = 1.0000$ ). There is, however, a statistically significant difference in the need for home nursing assistance ( $P < .0001$ ).

Although there was no systemic review of wound appearance on all patients, we observed better cosmetic appearances from the less invasive approach. An anecdotal encounter of a patient who underwent both open drainage and subcutaneous drain placement for 2 separate abscesses showed a less apparent scar from the subcutaneous drain placement (Fig. 3A and B).

### 3. Discussion

There has been an increase in the incidence of skin and soft tissue abscesses in children without any associated risk factors [9]. At our institution, open I&D constitutes the primary therapy, which has been disfiguring and painful. In addition, daily packing causes emotional trauma to the child and poses an unwelcome challenge to the caretakers and health care providers. Most parents at our institution used a visiting nurse for the wound packing and dressing changes when they were instructed to pack the wounds. This added a



**Fig. 3** Comparison of the wound appearance after healing. A, Healed wound after open I&D of an abscess cavity spanning 2 cm 8 months ago. B, Healed wounds indicated by arrows after placement of 2 drains via 3 stab incisions 7 months ago through an abscess cavity spanning 3.5 cm; drain scars are marked with black arrows.

significant expense that included both the packing supplies and the home nursing visits. These factors prompted a search for an alternative treatment. It is likely that other institutions are using alternative approaches in the treatment of soft tissue abscesses, but these techniques have not been formally compared to the standard therapy of open I&D.

The less invasive approach presented above is beneficial for many reasons. First, pain with dressing changes is eliminated. Simple cleansing of the wound with soap and water does not require any additional training or expertise. Therefore, home care nursing is not necessary. Because most of the wounds encountered in our patient population were located in the groins, buttocks, and upper thighs, simply bathing and allowing the patients to immerse in warm soapy water were sufficient in cleaning the wounds. For older

children who had this problem, they simply showered. All of our patients and their caretakers were instructed to wipe down the tub or shower using antiseptic solutions before the next use by another person. Although our study does not include any analysis of financial data, we speculate that the total cost savings associated with this minimally invasive technique to be substantial by eliminating the need for home nursing services. The most important lesson from our study is that the alternative method of soft tissue abscess drainage is just as safe as the traditional.

The improved cosmesis with the subcutaneous drain is a subjective assessment. At this point, there is no validated model to evaluate wound appearance in pediatric patients. Our follow-up is not long enough to know the final appearance of these wounds. We postulated that stab incisions for wound explorations and drain placements would cause less dermal scar than longitudinal incisions that unroof the entire abscess. This is supported by the wound appearance of a single patient who had both drainage methods. Additional follow-up and wound assessment tools are needed for future studies in this regard.

The major disadvantage of using subcutaneous drains is that additional training is needed to effectively perform the procedure. Because exploration of the abscess cavity is performed blindly, more experience is necessary to appreciate tactile feedback from a surgical instrument to determine if all the loculations have been broken up and to avoid creating new subcutaneous tracts. However, we have successfully trained the general surgical residents and nurse practitioners to perform this procedure, although the nurse practitioners did not perform any drainage procedures during the study period.

As with all studies involving the surgical drainage of soft tissue abscesses, there are limited data on the long-term sequelae from the procedure, including cosmesis. Despite the better appearance of the scars resulting from subcutaneous drain placement in the short term, as demonstrated in our anecdotal patient, pediatric patients in general have a tremendous ability to heal wounds and the long-term cosmetic advantage may not be as dramatic as the comparison photographs in our current report.

Although we have an alternative drainage method that improves the comfort and ease of providing postoperative

care and decreases the associated cost, we have not addressed the underlying pathogenesis of such soft tissue infections that has accounted for the rising incidence. Because of this lack of understanding, we are not able to resolve other controversies surrounding the treatment of staphylococcal soft tissue infection, such as the concomitant use of antibiotics [10]. Our institutional protocol calls for a 10-day course of antibiotic therapy with sulfamethoxazole/trimethoprim being the first-line choice. Although the choice of antibiotic is based on historical data for similar types of infections, the duration of such therapy is strictly empirical [11]. We believe that the minimally invasive technique presented is an improvement in the therapy for the soft tissue abscess and comparable in efficacy to the open I&D.

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