

**The Care and Treatment of Skin and Soft Tissue
Infections among Injection Drug Users in the
Community Setting**

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I. Introduction

Skin and soft tissue infection (SSTI) is a common problem among injection drug users (IDU). SSTI is one of the leading diagnoses for admission to San Francisco General Hospital (Ciccarone, 2001). One community-based study in San Francisco estimated that one of every three IDU has an active abscess at any given time (Binswanger, 2000). Given an estimate of 17,000 people who inject illicit drugs in San Francisco, there are over 5000 people or one out of every 150 San Franciscans living with an abscess at any given time. While most SSTI either resolve without medical intervention or are treated with simple incision and drainage (I+D), there are rare complications that can lead to sepsis, amputation and death.

The vast majority of SSTI can be treated by outpatient providers. Care and treatment of SSTI can be an opportunity to engage users in discussion around harm minimization, drug treatment and prevention of viral and bacterial infections. Unfortunately, in many cities there is limited medical capacity to treat the large number of IDU suffering from SSTI. In addition, the severe criminal penalties for drug use and possession that presently exist in the United States creates a situation where many users are hesitant to seek care in hospitals or clinics for fear of being reported to the criminal justice system. Many medical providers express a judgmental attitude when treating drug users who seek care for SSTI, creating a negative reinforcement for people who use drugs to seek out medical care in a timely manner.

This manuscript is intended to be a primer on the care and treatment of SSTI among injection drug users. It is intended for primary care providers, nurses and lay practitioners who care for people who inject drugs in community settings. While I+D is a simple procedure, we recommend that all SSTI be treated by a licensed provider in a controlled environment. However, if a licensed provider is not available, we hope that this manuscript will assist all people working with drug users to treat people living with SSTI in a manner that reduces suffering to the greatest extent possible.

II. Risk Factors for Developing SSTI

Why some injectors develop abscesses and others do not is not well understood. Some behaviors that are known to increase the likelihood of developing an SSTI include injecting intramuscularly (muscling), subcutaneously (skin-popping) or missing an intended intravenous (IV) injection. The role of skin hygiene and using sterile needles is not fully understood but it is believed that injecting with a needle that has been previously used increases the likelihood of developing an SSTI. In addition, cleaning skin with soap and water and/or using an alcohol wipe at least 60 seconds before injecting may reduce the likelihood of developing an SSTI. Length of time injecting may be another risk factor for developing SSTI. Many users who have been injecting for more than ten years develop chronic, recurrent abscesses that may be related to colonization with an abscess inducing sub-species of a common skin bacterium (*Staphylococcus aureus*).

Blaming the Drug

It is a common belief among drug users and health professionals that injecting a non-sterile, contaminated substance is the cause of most SSTI. When comparing insulin dependent diabetics, who inject sterile insulin two to three times a day to people who inject illicit drugs, there is a much higher incidence of SSTI among drug users. However, bacteria that are cultured from the wounds of IDU almost always are bacteria found living harmlessly on the skin of most people.

The relationship between the injected material and the development of an SSTI is complicated and poorly understood. Some drugs such as amphetamines (speed, ice, etc.) or cocaine are lipophobic and therefore are not easily absorbed intramuscularly (IM) or subcutaneously (SQ). These substances when injected IM or SQ will immediately induce a burning sensation and initiate an inflammatory response. This inflammatory response can be a precursor for developing an SSTI as the user's immune system will wall off the site of a missed IV injection creating a favorable environment for bacterial proliferation and SSTI development. Therefore, users who inject amphetamines or cocaine who miss IV injections or inject SQ or IM are at high risk for developing an SSTI.

Currently in San Francisco, heroin is the most prevalent injectable illicit drug. Unlike amphetamines or cocaine, heroin can produce a psychoactive effect when injected intramuscularly. Most regular heroin users inject IM or SQ if they have a history of injecting consistently for more than five years. Interestingly, unlike the injection of community obtained heroin, the injection of pharmaceutical products typically does not lead to the development of SSTI. One potential explanation for this difference is that the adjuvants used to cut the heroin are responsible for initiating an inflammatory response. As with the IM or SQ injection of amphetamines and cocaine, the development of an

inflammatory response walls off the injection site, recruits bacterial nutrients and creates an environment favorable for bacterial growth and SSTI development. Other than the rare cases of necrotizing fasciitis, wound tetanus and wound botulism, the bacteria that contaminates heroin is not thought to be the bacteria that causes disease.

III. Recognizing Complications of SSTI

While SSTI is a common problem among people who inject drugs, serious complications of SSTI are rare. However, when complications do occur, the outcomes can be severe and include the possibility of prolonged hospitalization, amputation and death. For the community provider caring for drug users it is essential to recognize the signs of these complications so that referral to a hospital for evaluation and treatment can be initiated in a timely manner.

A. Endocarditis, sepsis, and septic emboli

The most common serious complication of SSTI are endocarditis or sepsis. Endocarditis is caused by bacteria either attaching to the lining of the heart, while sepsis is a condition where bacterial proliferate in the blood of the injector. The most common indication of systemic infection is a fever greater than 102.5 degrees Fahrenheit (38.5 degrees Celsius). The so-called “shooter with a fever” must be referred to a hospital to rule out endocarditis/sepsis. Treating an injector with a fever with oral antibiotics will not sufficiently treat endocarditis/sepsis and can lead to the selection of a resistant bacterium that will be more difficult to treat with standard intravenous antibiotics.

Unfortunately, not all people with endocarditis or sepsis present with a fever.

Particularly among immuno-compromised individuals (which includes many long term heroin users, people with HIV, etc.), endocarditis may present with a lower than normal temperature, chest pain that varies with position, prolonged malaise, gray pallor and/or a new heart murmur. While even the most experienced providers can miss the diagnosis of endocarditis, one rule of thumb is, if an individual looks sicker than usual when presenting for treatment of an SSTI, further diagnosis and work-up is warranted.

Another complication of endocarditis or sepsis is septic emboli. Rarely, bacteria can collect at distant sites from the original infection setting up colonies in the buttock or more seriously, in peripheral arteries. Septic emboli that initiate SSTI in the buttock can be treated in a similar manner to SSTI that develop at the site of injection (see below). However, an unexplained swollen hand or foot in an injector should be evaluated in a hospital to rule-out septic emboli to a peripheral artery.

Pseudo-aneurysm

An abscess that develops over the site of a major artery (carotid, sub-clavian, brachial, radial, ulnar, femoral, popliteal, dorsalis pedis, etc.) should only be I+D'd by a surgeon. Abscesses that develop superficial to an artery may have eroded into the artery itself creating a pseudo-aneurysm. A pseudo-aneurysm is a condition where the skin is the only barrier between the environment and the artery. Lancing a pseudo-aneurysm can lead to extensive bleeding. Repair of a pseudo-aneurysm includes repair of the damaged artery below the aneurysm and must be performed by a trained surgeon in the operating room.

B. Necrotizing Soft Tissue Infection

Necrotizing soft tissue infection (NSTI) or so-called “flesh eating bacteria” is one of the most common local complications of SSTI. Nonetheless, NSTI was a complication in less than 1% of all cases of over 7000 SSTI cases treated at San Francisco General Hospital (SFGH) between 1995 and 2000. NSTI is caused by rapidly proliferating bacteria (often clostridium species) that excrete toxins that erode the integrity of muscle and fascia. Cases of NSTI occasionally come in clusters and may be associated with a contaminated batch of heroin. Treatment of NSTI includes extensive (and often repeated) debridement and occasionally amputation. Despite aggressive treatment, individuals presenting with an NSTI can have as high as a 34% mortality (McHenry, 1995).

NSTI are variable in their presenting signs and symptoms, but significant findings include preexisting cellulitis, skin changes (including vesicles, bullae or necrosis), air visible on roentgenogram, and white cell count over $20 \times 10^9/L$ (Bosshardt, 1996; Elliott, 1996). Some published reports have noted (Ward, 1991; Sudarsky, 1997) that while most early stage clinical signs are often minimal, pain is generally disproportionate to these signs. A wound that is rapidly progressing (erythema or redness covering more area every hour) with concomitant systemic symptoms of fever, malaise and confusion should be presumed to be an NSTI until proven otherwise. Diagnosis of NSTI can only be made definitively at the time of I+D and debridement.

Despite the fact that NSTI may present as a routine SSTI, a review of all cases of NSTI at SFGH concluded that no cases of SSTI that were treated surgically in the outpatient setting developed an NSTI (Hobart, 2001).

Community providers treating injectors for SSTI should always be concerned about rapid diagnosis of NSTI. Nonetheless, fear of NSTI should not preclude treating routine SSTI with small incisions using local anesthesia.

C. Wound Botulism and Wound Tetanus

Wound botulism (WB) and wound tetanus (WT) are extremely rare complications of injection drug use (CDC, 1995; CDC, 1998). Between 1996 and 1998 there were 26 documented cases of WB in California (Passaro, 1998). WB and WT develop when toxins are excreted by bacteria that may have contaminated heroin during processing. Symptoms of WB and WT are systemic rather than local and are rapidly progressing and primarily neurologic in nature. Cases of WB and WT usually present, epidemiologically, in clusters.

IV. Diagnosis of Skin and Soft Tissue Infection

Hippocrates knew well the signs and symptoms of SSTI: redness, warmth, swelling and pain. In general, the goal of a diagnostic evaluation is to determine which wounds need referral to a hospital, which wounds are true abscesses that need incision and drainage and which wounds need more conservative treatment such as antibiotics or warm compresses.

Time

Time is an important factor in determining which wounds need drainage. For the most part, pus filled abscesses do not develop sooner than 3 days after injection. Some novice users occasionally present to providers a few hours after missing an IV injection complaining of a red swelling around the site of the an injection. Usually, this presentation is caused by the immediate chemical reaction due to injection of an irritant (e.g. heroin or amphetamines) stimulating an inflammatory reaction. This inflammatory reaction usually resolves without treatment in a few days. An abscess usually begins to develop three to ten days after injection and slowly grows in size and discomfort over the following week. Abscesses in the buttock area can continue to grow for many weeks eventually reaching a size where over a liter of pus can be expressed.

While a pure abscess has a well-defined area of erythema contiguous with the fluctuant (fluid filled) area, some SSTI present with an area of erythema that is beyond the boundaries of the abscess itself. These so-called cellulitic abscesses need to be monitored closely and treated with broad-spectrum antibiotics to prevent rapid progression and cellulitis. Patients that present with erythema that grows in size daily beyond the boundaries of abscess often need hospitalization.

Diagnostic Procedures:

Often times it is difficult to assess if a wound is pus filled or scarred from recurrent injection and infection at the site. A skilled provider can often palpate the wound and

determine whether a wound is fluid filled. If examination is equivocal, an 18-gauge needle attached to a 3-cc syringe can be inserted into the wound in an attempt to draw out pus. If there is no pus, the wound should be treated with hot soaks until pus develops or the wound heals spontaneously. If pus is expressed, I+D is indicated.

V. Treatment

Most SSTI resolve spontaneously without medical intervention. In the Bible, one of the punishments of Job was to be covered with boils. Despite the lack of antibiotic and surgical treatment in biblical times, Job recovered from these wounds without any long lasting adverse consequences. Drug users often self-treat SSTI cutting pus filled wounds with kitchen knives or keys. Despite the considerable discomfort of self-treating, most users recover most of the time.

Nonetheless, if fluctuance is appreciated or if pus is found on diagnostic procedure, the recommended treatment is incision and drainage by a trained professional. The role of antibiotics for non-fluctuant wounds is discussed below.

A. Preparation

As with any surgical procedure, the provider should explain all the steps of the procedure to his or her patient. We have found that a thorough explanation of what the user can expect can often overcome the user's fear of the procedure.

Universal body fluid precautions should always be practiced including gloves and eye protection. Sterile technique is not necessary as the wound is already contaminated with skin bacteria. However, clean technique should be adhered to.

The patient should be placed in a comfortable position where the provider can have easy access to the wound site. The wound should be cleaned with alcohol wipes followed by application of Povidine solution covering the wound and at least a three-inch margin around the site.

B. Anesthesia

The ability to adequately perform an I+D is dependent on the adequacy of the anesthesia. Heroin users are more sensitive to painful stimuli when they have not recently injected than people who are not opiate dependent. A heroin user who injects a quarter gram of pure heroin a day (most street heroin is between 10-30% opiate (DAWN data, unpublished)) is injecting the equivalent of two thousand milligrams (2 grams) of morphine sulfate. Most emergency departments have standing protocols that prohibit providers from using more than 20 milligrams of morphine sulfate for surgical procedures. Rather than use parenteral (injectable) narcotic pain medications, we recommend liberal use of local anesthesia, usually lidocaine. For large wounds such as buttock wounds or for people who do not get adequate pain control with local anesthesia, monitored conscious sedation may be necessary to achieve adequate pain management. Conscious sedation using Brevital (methohexital), fentanyl and/or Versed (midazolam) must be performed in the hospital or emergency department.

After the surgical field is adequately prepared, the local anesthetic can be injected. Most preparations of lidocaine contain a preservative that causes a stinging sensation when injected. The stinging can be overcome by neutralizing the preservative with one part sodium bicarbonate to ten parts lidocaine. Most pain fibers in the body are relatively superficial. Therefore, a small bore needle (no larger than 25-gauge) attached to between a 3-cc and 40-cc syringe (using 1-2% lidocaine without epinephrine) should be placed in the subcutaneous tissue and inserted along the length of the wound up to the hub of the syringe, if necessary. The anesthetic is then injected as the needle is withdrawn. Users often describe the initial penetration of the skin as the most uncomfortable part of the process. To prevent a second penetration of the skin prior to having adequate anesthesia, the needle can be re-inserted at a 45-degree angle from the initial injection for further injection of anesthetic without removing the needle completely from the injection site (Figure 1). This procedure can then be repeated a third time to cover as much area as possible of the wound prior to removing the needle from the skin.

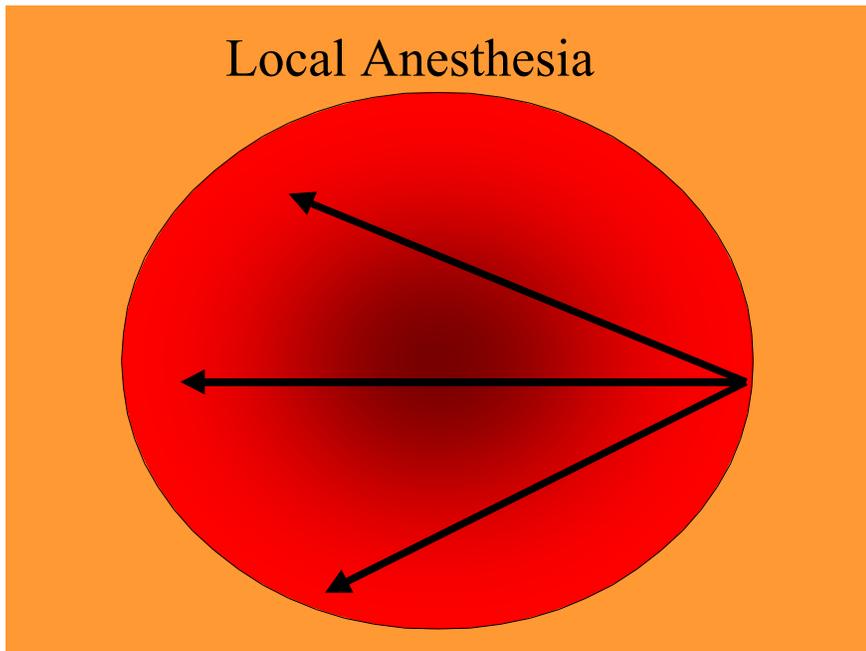


Figure 1

Once the initial injection has been completed, further injections of anesthetic can be performed penetrating the skin through areas that have been already anesthetized. Lidocaine is most effective five minutes after injection. During the five minutes it takes for the maximum effect of the anesthetic to be achieved, the provider can engage the patient around harm reduction and drug treatment strategies. Prior to incising the wound, the provider should check that adequate anesthesia has been achieved by pinching the wound with a pick-up or hemostat. If the patient still complains of discomfort, more lidocaine can be injected up to 300 cc for a 60 kilogram individual.

C. Incision

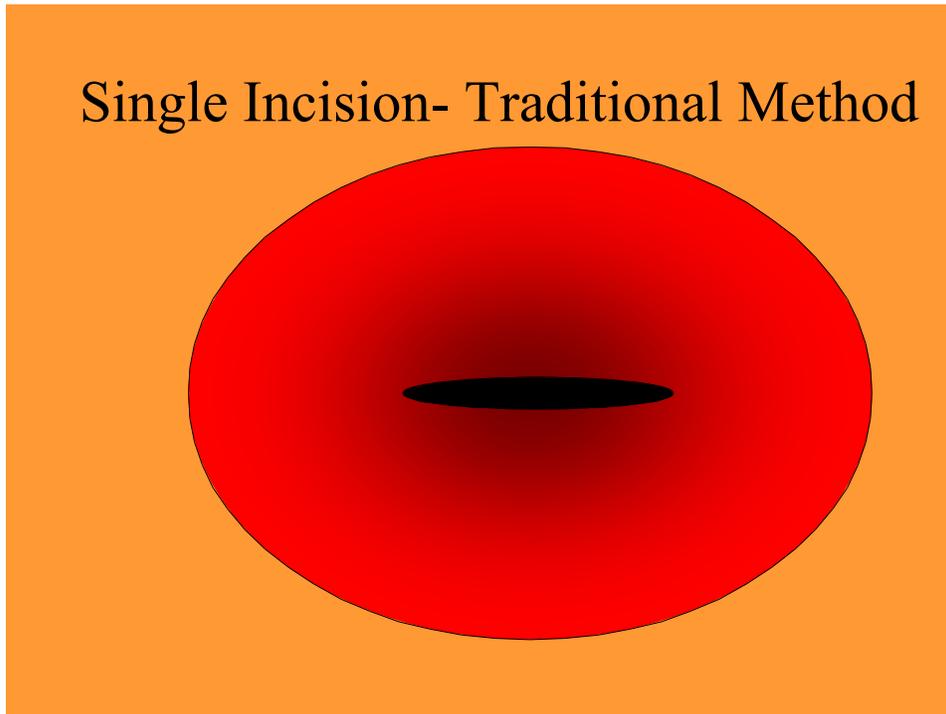
To determine the direction of the incision, the provider should attempt to visualize where a scar that will eventually develop at the site of the wound will have the best cosmetic effect. For most shoulder and arm abscesses, the incision should be along the long axis access of the arm to give the best cosmetic result.

Prior to incision, the provider should inform him or herself of the possible large nerves or arteries that are in the area of the I+D. As stated above, community providers should not perform I+D above major arteries. Knowledge of normal human anatomy is an important pre-requisite to performing I+D.

For small abscesses (less than 4 cm in diameter), we recommend the traditional single incision approach (Figure 2). The incision should only be as large as necessary to express the pus fully from the fluctuant area below the skin and to assure that adequate packing can be achieved (usually 2-3 cm). The incision should be made swiftly and

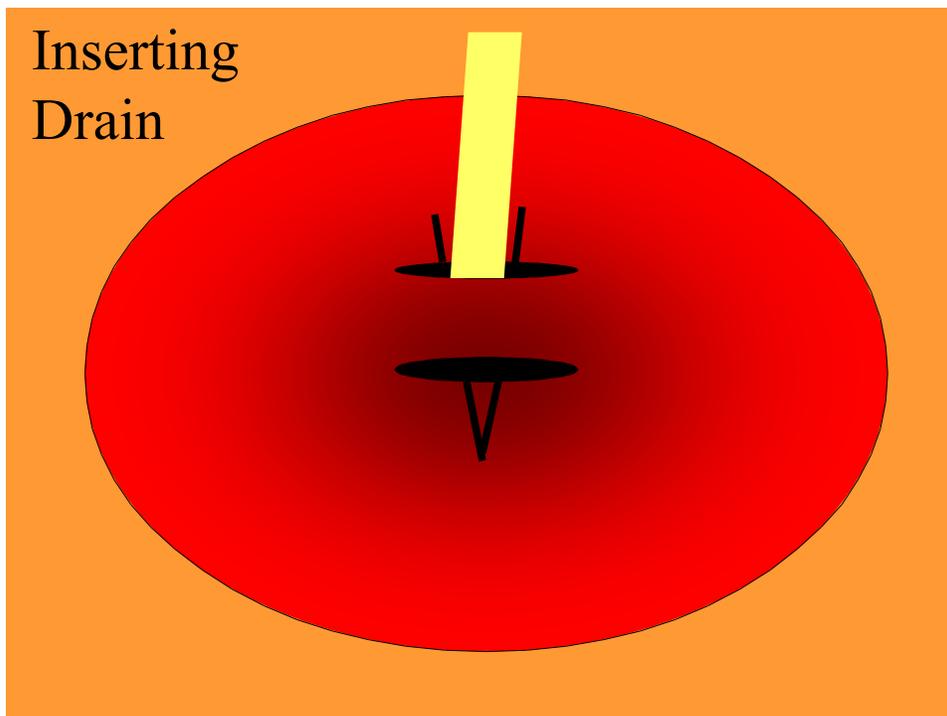
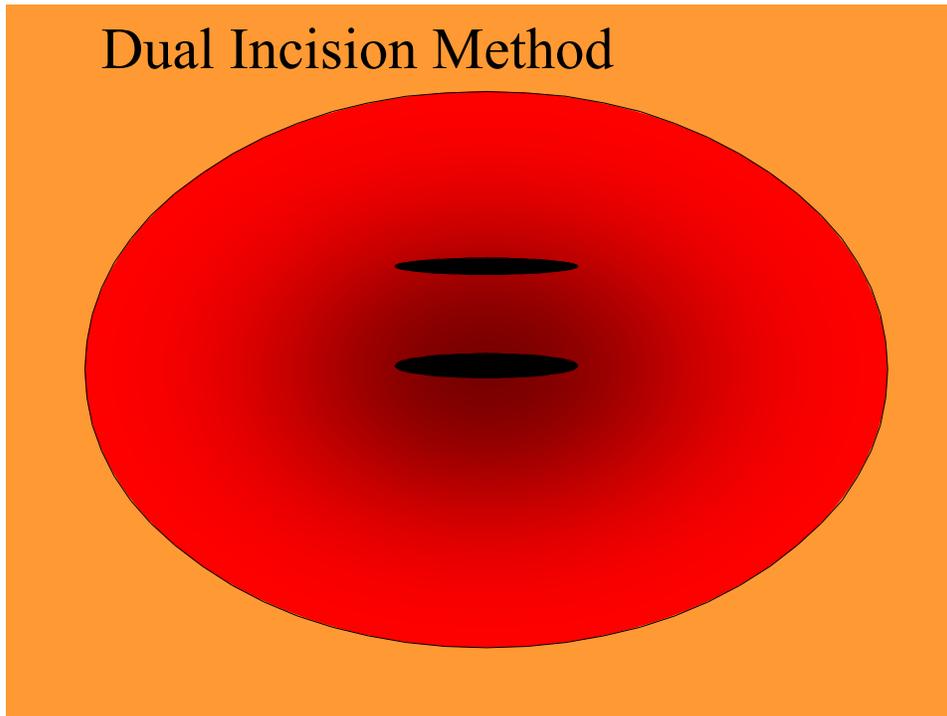
confidently using an number 11 scalpel. Be prepared for the possibility of sero-sanguinous fluid being expressed with some force upon the initial opening.

Figure 2

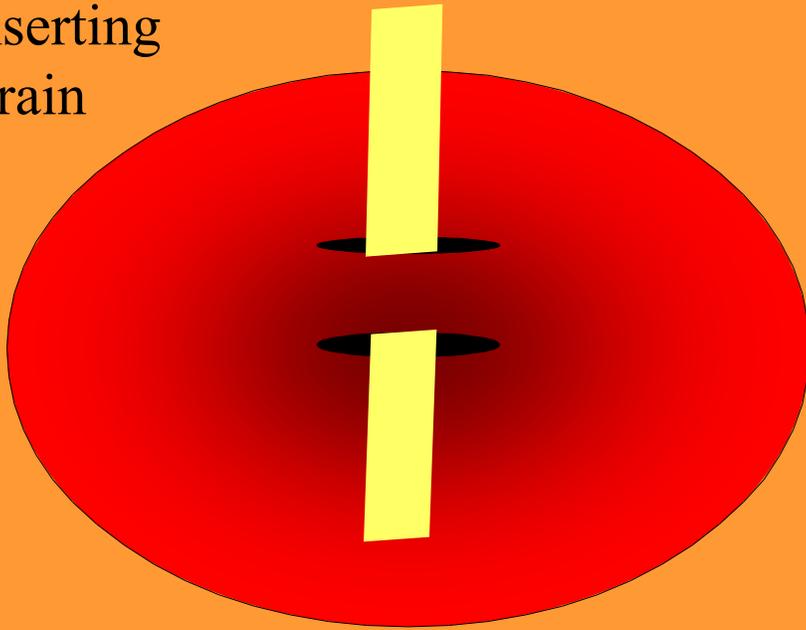


For larger incisions, we recommend making two parallel incisions with at least one centimeter separating each incision. Following expression of pus (see below) and irrigation, a latex drain can be inserted between the two incisions so that the viable tissue can be used as an anchor for the drain. The ends of the drain are then sewn together with surgical ligature creating a stable device that prevents premature closure of the wound (see Figures 3-6).

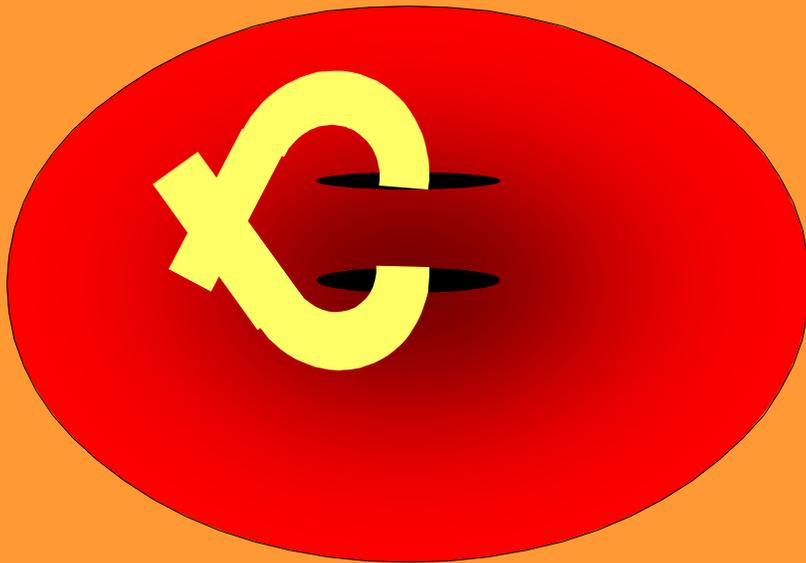
Figure 3-6



Inserting
Drain



Sew ends together to form stable loop



The advantage of this second technique is that it obviates the need for repeated packing following I+D. Following insertion of the drain, a clean dressing can be applied and no further manipulation of the wound is required for one week. After one week, the patient can return to the provider who performed the I+D and have the wound inspected. If production of sero-sanguinous material has stopped, the drain can be removed and the wound can heal by secondary intention. If sero-sanguinous material continues to be expressed, the drain can remain in place until fluid has ceased to be expressed from the wound.

D. Drainage, Packing and Dressing the Wound

Following incision, the goal of the procedure is to express all the pus and necrotic tissue that resides within the body of the abscess. Occasionally pus can be trapped behind loculations. If there is adequate anesthesia, loculations can be broken up with the wooden end of a sterile Q-tip inserted into the wound. Lastly, irrigating the wound with sterile saline can be useful in particularly large and complex wounds.

If a traditional single incision method was used, it is often necessary to pack the wound with Nu-Gauze or Calcium Alginate (so-called “sea-weed” dressing) to prevent the wound from premature closure. Packing must be removed every other day until the wound has healed by secondary intention (see Figure 7).

Figure 7



Following drainage, the wound should be dressed with bulky gauze dressing to absorb the continued expression of sero-sanguinous fluid. Mesh stockinettes or surgical tape can be used to secure the dressing. The dressing should be changed every other day and inspected for the presence of skin breakdown or progressing erythema.

E. Antibiotics

The usefulness of antibiotics following successful I+D is unknown. Antibiotics should not be offered to patients who have a pus filled wound who refuse I+D. Antibiotics do not penetrate adequately into pus filled spaces so that the bacteria within the wound will not “see” an adequate concentration of antibiotics. This will create a situation where selection of antibiotic-resistant-bacteria is likely. Methacillan resistant Staphylococcus

aureus (MRSA) is common among IDU. More than 40% of the bacteria that have been cultured at SFGH in the second half of 2000 have been MRSA (Charlebois E, personal communication). It is unlikely that commonly available oral antibiotics will be effective against MRSA. Anecdotally, it appears that individual who have abscesses that culture positive for MRSA do as well as individuals who have abscesses that do not grow MRSA. Despite the lack of proven efficacy of antibiotics, we recommend offering Staphylococcus covering antibiotics (e.g. Cephalexin or Dicloxicillan) following successful I+D. Our experience is that IDU expect antibiotics as part of “good care” and may benefit from the placebo effect of initiating antibiotics even if the antibiotics themselves do not improve the likelihood of healing.

Antibiotics are beneficial in the setting of cellulitis. As stated above, if the area of erythema in a cellulitic wound is expanding, hospitalization is recommended. However, if a patient refuses to enter the hospital, a broad-spectrum, long-acting, injectable antibiotic such as Ceftriaxone (1 gram given every 24 hours until erythema regresses followed by oral antibiotics as above) can be effective. We also recommend the use of Ceftriaxone in large cellulitic abscesses even after I+D.

F. Aftercare and Follow-up

The follow-up rate among IDU who undergo I+D is low in our community setting in San Francisco. Nonetheless, good outcomes are common. When bad outcomes do occur, they often could have been prevented with adequate follow-up. Patients should return to have the wound checked between 48-72 hours following I+D and on a regular schedule following the first follow-up visit to evaluate and treat potential complications.

Progression of the infection with or without signs of sepsis may require hospitalization or further debridement. If antibiotics are offered, patients should be instructed to complete the seven-day course of medications to reduce the likelihood of development of drug resistant bacteria.

Pain control following I+D is a challenge, especially among heroin users. As stated above, the relative potency of available narcotic pain medicines is significantly less than the usual daily intake of heroin. Nonetheless, we recommend offering a limited course (3 days) of a narcotic pain medicine (acetaminophen with codeine or hydrocodone) following I+D.

VI. Prevention

Preventing the development of SSTI among long time injection drug users who inject intramuscularly is difficult. We recommend that a new needle be used for every injection. If a heroin user cannot consistently successfully inject intravenously, they should initially inject intramuscularly rather than attempt IV injection followed by IM injection with a bacterially contaminated needle. Skin cleaning with soap and water followed by cleaning with alcohol pads administered at least 60 seconds prior to injection may reduce the likelihood of developing an abscess. Injecting IV rather than IM or SQ may also reduce the likelihood of developing an abscess but is often not an option for a user that has scarred veins from years of previous injections.

Undoubtedly, the most effective prevention intervention to reduce the likelihood of developing an SSTI due to injection drug use is effective drug treatment. Reducing or

eliminating the number of injections experienced by an user can also reduce or eliminate the development of SSTI. . Opiate replacement treatment, such as methadone maintenance, may be the most effective intervention available to reduce the likelihood of developing SSTI.

VII. Conclusion

Skin and soft tissue infections are common among injection drug users. Treatment for most common forms of SSTI is relatively simple and can be provided by most community health care providers. Early diagnosis and treatment can prevent the serious complications of SSTI such as sepsis and endocarditis. Knowledge of the rare but serious complications of SSTI such as necrotizing fasciitis is an essential component of the evaluation of drug users seeking care for SSTI. A comprehensive system to engage drug users that includes harm minimization counseling, drug treatment, availability of sterile syringes, adequate anesthesia prior to incision and drainage, small incisions and provider respect for the difficult choices drug users make every day can reduce the burden of SSTI for both IDU and the health care system.

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