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Surgical Approaches to Soft Tissue Infections in Disaster and Earthquake Treatment

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Abstract

Soft tissue injuries are common following disasters. Even without disruption of tissue integrity, crush-type traumas can be complicated by secondary infections. Systemic signs should be alerting for generalizing progressive infections. When suspected, except for localized abscesses or cellulitis, debridement, surgical incision, and drainage are necessary.

Keywords: Earthquake injuries, necrotizing fasciitis, soft tissue infection

Introduction

In addition to crush injuries, soft tissue infections may occur under earthquake conditions, even in simple injuries due to suboptimal decontamination. In major traumatic injuries, it is possible to see soft tissue infections that can reach necrotizing fasciitis even if there are no simple incisions, abrasions, or lacerations.[1]

In skin–soft tissue infections (SSTIs), the basic signs of inflammation often predominate. It should be suspected in the presence of localized or generalized but asymmetrical edema, erythema, and pain or when these findings become more prominent in patients whose primary treatment has been provided.

When determining the appropriate treatment, it is crucial to take into account factors such as the patient's immune status, exposure history (including contact with animals, water, or trauma), and travel history, especially in areas where multidrug-resistant organisms are prevalent. For patients with severe purulent SSTIs, cellulitis, or surgical site infections, it is recommended to administer broad-spectrum antibiotics, including an agent effective against methicillin-resistant *Staphylococcus aureus* when the risk is high. Additionally, implementing appropriate measures for source control is necessary.[2] For better disease management, it is important to classify the extent of the disease, since therapeutic options can vary from simple oral antibiotic regimens to surgical incision and drainage procedures or amputations. From a surgeon's point of view, the Infectious Diseases Society of America classification is very practical and easy to use. Depending on the need for complex procedures, soft tissue infections can be classified into uncomplicated or complicated.[3] Uncomplicated SSTIs refer to infections that affect only the outer layers of the skin and can be resolved with surgical incision alone, if required. On the other hand, complicated ones are skin infections that involve deeper layers of soft tissue or necessitate extensive surgical procedures. Surgical consultation is crucial for necrotizing skin and SSTIs.

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As in every patient, it is essential to evaluate the systemic findings of the patient with clinical symptoms. In cases where tachycardia, hypotension, and acute phase elevations are not accompanied, self-limiting cellulitis, erysipelas, or limited abscesses if accompanied by palpable mass or fluctuation are included in the differential diagnosis. If systemic findings are present, gas can be detected in the tissue with the presence of crepitation on physical examination. Although gas gangrene is not often accompanied by purulent fluid, progressive purulent soft tissue infections in the skin subcutaneous fascia tissues may have occurred as a result of the infection of niches such as hematoma and serous fluid caused by idiopathic or localized traumas in the subcutaneous tissues. Crepitation and, if possible, the presence of gas on radiographs may indicate necrotizing soft tissue infections.

Radiology can help to determine the extent of infection or localization of any abscesses, but the diagnosis is clinical most of the time. In progressive necrotizing soft tissue infections, gas images can be observed in simple x-rays or computerized tomography. Classical soft tissue changes related to inflammation can be observed under ultrasound and the presence of any type of collection can differentiate between deep tissue abscesses and more superficial non-purulent conditions such as erysipelas or cellulitis, for the latter of which linear effusions in the soft tissue without any gross collections are typical. However, a clinician may not have an opportunity to reach complex imaging techniques in disaster states, hence making thorough clinical examination an essential part in making an urgent diagnosis.[4] Imaging studies cannot definitively rule out necrotizing infection and should not delay surgical interventions.

Acute Treatment

If a progressive severe SSTI is suspected, it is necessary to relieve the compartments with incisions made from the area where clinical findings are present, and tissue culture should be taken if it can be studied. After irrigation is complete, it is recommended to care for the open wound formed in the debridement area with a moist absorbent dressing 2 times a day (usually). The main treatment for soft tissue infections with necrotizing gas or purulent progressive soft tissue infections is incision and drainage; therefore, when suspected, indiscriminate debridement of non-viable tissues and

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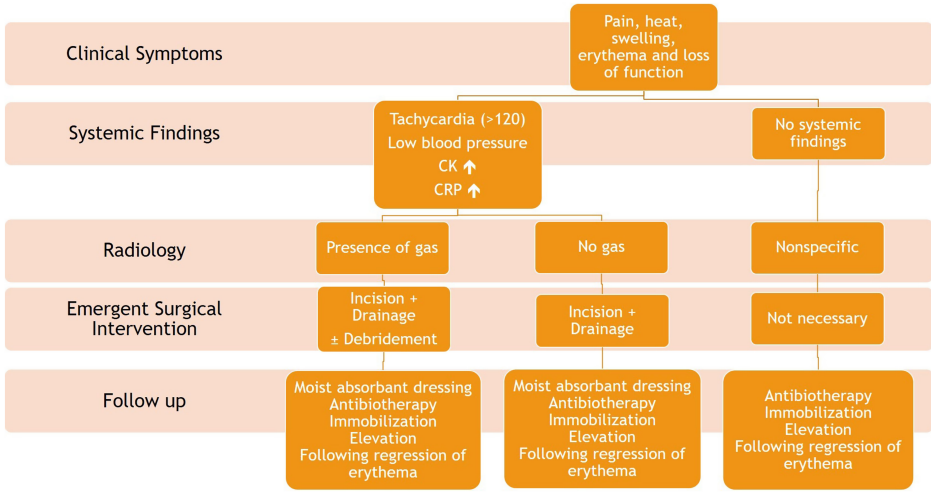

Figure 1. The algorithm for soft tissue infections.

opening of appropriate pouches for drainage is a life-saving intervention. To confirm the diagnosis, after a 2-3 cm incision made following the application of appropriate local anesthetic to the suspected area, the discharge of purulent fluid (abscess) or the non-bleeding of the tissue opened with the discharge of serous sink fluid-gray colored fluid (necrotizing fasciitis) may help in the diagnosis. In the examination performed under the tissue with the help of a finger under sterile conditions, the separation of the tissue from the fascial planes without resistance can be a sign of necrotizing fasciitis, and as mentioned, this is a surgical emergency.

Causative organisms vary according to the underlying cause and geographical conditions, but most commonly *Staphylococcus aureus and Streptococcus pyogenes* are culprits behind the SSTIs. Severe conditions such as myonecrosis can be caused by clostridial species, but most of the time they are polymicrobial.[3] Depending on the available antibiotics, in addition to a penicillin-derived broad-spectrum antibiotic, an easily accessible anaerobic antibiotic like clindamycin can be started empirically.[5] When clinical stability is achieved, the treatment goal for severe SSTIs is pathogen-directed therapy and antimicrobial de-escalation.

In cases where surgical treatment is not required, the main treatment for localized infections such as cellulitis and erysipelas, apart from the drainage of localized abscesses with small incisions, is elevation, ice application, restriction of mobilization, and of course antibiotherapy. It is possible to follow the regression of the erythema by drawing the borders of the erythema with a pencil in the first application, in order to relieve the clinical follow-up and to follow the patient's progression.[6,7] Figure 1 explains the appropriate algorithm for soft tissue infections.

Despite antibiotic therapy, proper pouch opening, and dressing, the progression of infection toward the proximal of the drawings and the progressive increase in necrosis burden means that progressive soft tissue infection cannot be stopped. In these cases, it may be necessary to refer the patient to advanced centers or to plan emergency amputation surgery if the patient's condition is unstable.

Moist Absorbent Dressing Change Technique

1) The dressing is opened. The gauze pads in the open wound area are removed. Sterile gloves are worn.
2) Wipe the open wound around the wound with a dry gauze cloth. If necessary, sharp debridement is applied.
3) When it is time to change the dressing, the gauze pads are moistened with physiological saline. Sterile conditions are maintained and the gauze cloths are opened in 1 layer, then squeezed until the water does not drip, and they are made moist.
4) It is placed in opened-opened pouches in a single layer in contact with the entire defect area.
5) The dressing is fixed after it is covered with dry gauze or pads.

Conclusion

Soft tissue infections may require immediate surgical intervention. For this reason, it is important to reveal the requirement of urgent intervention even in disaster and earthquake situations. In this article, an emergency response algorithm for soft tissue infections is presented.

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