

# **NECROTIZING SOFT TISSUE INFECTION CAUSED BY COMMUNITY ACQUIRED METHICILLIN RESISTANT *STAPHYLOCOCCUS AUREUS*: AN EMERGING DEADLY ENTITY**

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## **ABSTRACT**

A 42 year old male presented with a 5 day history of minor trauma to the left upper limb, followed by progressively increasing pain, swelling and discoloration of skin. On examination, the patient was found to be septic and died within 24 hours of admission, despite aggressive surgical management. Postmortem examination revealed extensive necrosis of the upper limb and chest wall muscles. Culture of swabs taken from spleen and affected muscle groups yielded a pure growth of Methicillin resistant *Staphylococcus aureus* (MRSA).

The necessity for early diagnosis and appropriate antibiotic treatment in necrotizing soft tissue infections as well as the emergence of community acquired MRSA as a potential pathogen highlighted in this case.

## **KEY WORDS:**

Necrotizing fasciitis, Deliquescent Spleen, Methicillin resistant *Staphylococcus aureus*

## **CASE REPORT**

Mr. MP was a previously healthy 42 year old labourer with no history of Diabetes Mellitus. He sustained blunt trauma to his left hand from a falling piece of wood with no evident breach of skin. By evening he had developed pain and swelling around his left wrist joint for which he was treated by a

local general practitioner with pain medication. On day three following injury, the swelling was marked and pain unbearable. The patient was treated by a traditional ayurvedha physician with oils and remained at home. Due to the worsening condition he sought allopathic treatment at the local hospital on day 5 after the trauma.

On admission he was severely ill, dyspneic and had cold extremities. Pulse rate was 116 beats per minute and blood pressure was 90/60mm Hg. Peeling of the skin on his left forearm and hand with blackish discoloration and blistering was noted. He was treated for septic shock with intravenous fluids, Cefuroxime and Metronidazole. Fasciotomy of the left upper limb was done within hours of admission. Tissue necrosis was noted, and debridement was done. He was transferred within hours of surgical intervention to the intensive care unit of a tertiary care hospital. As the patient was deteriorating further, disarticulation of the left upper limb at the shoulder was done soon after admission. Extensive tissue gangrene involving the muscles of the limb was noted at surgery. No pus was seen. The patient died seven hours after admission to the ICU; about twenty hours after the initial hospital admission. A private laboratory isolated Methicillin sensitive *Staphylococcus aureus* (MSSA) on culture of the blister fluid.

Post mortem examination of the body and amputated limb revealed severe muscle destruction in the amputated limb and upper

1/3 of the left anterior chest wall. (Fig 1 & 2) The Spleen and liver were enlarged and the spleen was deliquescent. (Fig 3) All features were compatible with septicemia while the kidneys showed features of acute renal failure. Histology of tissue revealed hemorrhagic myositis with severe fasciitis.

Swabs were taken for culture from multiple muscle groups in the amputated limb and a deep swab from the spleen. Pure growths of Methicillin Resistant *Staphylococcus aureus* (MRSA) were cultured from all swabs.



**Figure 2: Necrotic muscles of amputated upper limb**



**Figure 1: Skin necrosis on left chest wall**



**Figure 3: Enlarged deliquescent spleen**

## DISCUSSION

Necrotizing infections of the skin, subcutaneous tissues and muscle are described using many, somewhat confusing, terms (ie: necrotizing fasciitis, synergistic necrotizing cellulitis, anaerobic cutaneous

gangrene, necrotizing cutaneous myositis, synergistic myonecrosis etc). These terms, based on anatomic location, depth of tissue involvement and type and number of causative organisms, often overlaps, and makes it difficult to identify a specific entity. The term “necrotizing soft tissue

infection' is now recommended for use since the management strategies for this group is essentially the same<sup>1</sup>.

Necrotizing soft tissue infections are both fortunately and unfortunately uncommon. Fortunately as the morbidity and mortality associated with it is very high. Unfortunately, as the rarity of the condition makes most primary care physicians, who often encounter the patient in the first instance, unfamiliar with its clinical presentation<sup>2</sup>. The delay in diagnosis and treatment is one of the biggest problems in necrotizing soft tissue infections with only 15-30% of cases having an accurate diagnosis on admission<sup>2</sup>. This is one of the main reasons for the high mortality, as illustrated in this case.

Risk factors for necrotizing soft tissue infections include diabetes mellitus, burns, obesity and trauma<sup>3</sup>. Rare cases of necrotizing infections following insect bites have also been reported from some countries, including Sri Lanka<sup>4</sup>. In many patients, however, no predisposing factor is found.

Clinically this patient showed the classical sub-acute progression of symptoms after minor trauma followed by pain that was out of proportion with the skin manifestations. The paucity of external signs at the beginning often misleads the first contact doctor. The infection spreads in the subcutaneous tissue, fascia and sometimes muscle, and the natural lack of fibrous attachments in the limbs and trunk facilitate spreading of infection along tissue planes. Skin manifestations of black/ blue discoloration (necrosis) and blister formation, occur late, with wide spread infection and dermal vessel thrombosis. By this time the patient will display signs of septicaemia, and treatment, even if rapid and aggressive, may be of no avail, as seen in this case.

Differentiation of cellulitis, erysipelas and necrotizing soft tissue infection by skin manifestation is possible. Erysipelas is a bacterial skin infection involving the upper dermis. It is seen as an intensely erythematous, indurated plaque with a sharply demarcated border that characteristically extends into the superficial cutaneous lymphatics, causing lymphangitis. The tenderness in necrotizing soft tissue infection often goes beyond the point of redness, unlike in cellulitis, where tenderness is usually limited to the affected area of skin. However these features occur relatively later on in necrotizing soft tissue infections and while they are fairly specific, are not sensitive indicators, with only about 10-40% of cases exhibiting these features. Areas of anesthesia due to dermal nerve ending necrosis and crepitus are also indicators of the more severe necrotizing infection<sup>3,5</sup>.

Microbiologically, the causative organisms of necrotizing soft tissue infection are divided into two groups. Type 1, that is caused by a mixed aerobic and anaerobic infection and type 2 that is mono-microbial and most commonly caused by group A beta hemolytic streptococci (*Streptococcus pyogenes*). While type 2 has been described as sometimes occurring as a mixed infection with *S. aureus*, *S. aureus* alone causing necrotizing soft tissue infection has been described as an emerging clinical entity only in the last decade<sup>6</sup>.

Necrotizing fasciitis caused by community acquired MRSA (CA-MRSA) or MSSA as a single pathogen was initially thought to be only seen in immune-compromised patients. However literature over the last 10 years, revealed that both CA-MRSA and CA-MSSA are causative agents in the immune competent population as well<sup>6,7</sup>.

In this patient's case, while it is possible that the initial trauma resulted in micro-trauma and inoculation of the organism, it is also possible that the tissue damage that resulted

from the impact, made the underlying muscle and soft tissue susceptible to infection of an already bacteremic patient. The initial identification of the organism as MSSA may not be accurate as the quality of antibiotic sensitivity testing in the most private sector laboratories is poorly controlled, and performed without the supervision of a consultant microbiologist. The isolate could not be obtained for re-testing. The second isolate was identified in the quality controlled university microbiology laboratory. The course of the disease is very similar to that described in the literature<sup>6</sup>, and although Miller et al<sup>8</sup> document a 100% survival rate in their cases and postulate that necrotizing fasciitis due to MRSA may be less virulent than infections with other organisms, this case shows that progression to septic shock and death can occur within days, if untreated.

The emergence of MRSA as a possible etiological agent in necrotizing fasciitis raises issues regarding the empirical treatment in terms of IV antibiotics, in addition to the mandatory surgical debridement. Recommendations now include treating for MRSA until causative organism/s can be identified. Therefore, IV clindamycin for anaerobes and aerobic gram positive cocci (and for reducing toxin production by organisms), metronidazole for anaerobes, aminoglycoside or fluoroquinolone for gram negative organisms and vancomycin or linezolid for MRSA are used until such infections can be excluded.<sup>5,6</sup>.

## CONCLUSION

Necrotizing soft tissue infection needs to be considered as a possible diagnosis in patients presenting with fever, cellulitis and pain out of proportion to the physical findings. Since CA-MRSA is an emerging entity it is necessary to entertain a suspicion of CA- MRSA infection and treat

empirically as delay in therapy can lead to rapid death.

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