G35 Necrotizing Fasciitis: Manifestations, Microbiology and Connection With Black Tar Heroin

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After attending this presentation, attendees will gain knowledge regarding the manifestations and microbiology of necrotizing fasciitis and how it is related to injection of black tar heroin. The hypothesis is that necrotizing fasciitis caused by drug injection differs substantially from the same disease due to other causes.

This presentation will impact the forensic community and/or humanity by showing the relationship of necrotizing fasciitis to injection of black tar heroin and the importance of understanding the manifestations, microbiology, and causes of this infectious disease.

Introduction: Black tar heroin use is pervasive in the Seattle area. When intravenous (IV) drug users exhaust their IV sites, they resort to subcutaneous (SC) and intramuscular (IM) routes. Unfortunately, SC and IM injection promotes infection by introducing contaminated material into the tissue. Infections are common in heroin users, who often believe that the drug rather than the injection method is responsible. From what is known about black tar heroin, it is likely that either the raw drug or diluents contain clostridial spores, which are difficult to kill by the brief heating drug users employ. It is not uncommon for clusters of infections to be associated with a single batch of heroin. Because necrotizing fasciitis is often fatal, this study was initiated to delineate factors responsible for the disease.

Methods: King County Medical Examiner's Office assumes jurisdiction in all reported cases of necrotizing fasciitis, deaths related to drug abuse, and all infections that may represent a public health hazard. For this study, a records review over 7 years yielded 87 total deaths due to necrotizing fasciitis. Eliminating those that lacked identification of the infecting microorganisms left 65 cases in the present study. For these 65 cases, disease manifestations were correlated with the source of infection and the microorganism(s) identified.

Results: Of 32 cases due to drug injection, 17 grew cultures isolating a single organism; the remaining 15 were polymicrobial. Of the 17 single isolates, 13 were clostridia (4 *C. sordellii* and 2 *C. perfringens*). Of the 15 polymicrobial cultures, clostridia were present in 11, with *C. sordellii* representing 4 cases. Overall, clostridia accounted for 24 of 32 cases of necrotizing fasciitis due to black tar heroin injection.

All of 13 cases of necrotizing fasciitis developing after other types of trauma grew cultures containing at least one species of streptococci; 7 grew a single isolate, 4 of which were *S. pyogenes*. The remaining 6 cases were polymicrobial with various streptococci predominating.

In 14 cases developing apparently spontaneously, with no known trauma but several with comorbid conditions, 3 had single isolates of clostridia identified, 2 of which were *C. septicum*. Another 7 grew single isolates of streptococci, 5 of which were *S. pyogenes*. Two additional infections were due to *Staphylococcus aureus*, and the remaining 2 were polymicrobial.

In 6 cases complicating integument breakdown, such as ulcers and percutaneous feeding tube sites, all were infected by streptococci; 2 had single isolates of *S. pyogenes* and 4 were polymicrobial.

Conclusions: This study shows convincingly that necrotizing fasciitis due to clostridial infections is a potential consequence of IM or SC injection of black tar heroin. This disease has a high mortality rate. Although black tar heroin is the likely source, clostridia are unlikely to cause infection unless mechanically introduced into an anaerobic environment. Thus, the injection method rather than the drug is primarily responsible for the disease. There is insufficient evidence from this study to say whether clostridial spores came from the raw black tar heroin, from diluents, or from contaminated needles. The microbiology of cases of necrotizing fasciitis originating from other sources of infection differs from those due to drug injection; in these, streptococcal infections predominate. Compared to clostridia, group A streptococci (*S. Pyogenes*) are virulent and can cause fatal disease spontaneously or following superficial trauma. Accordingly, the organism itself is often primarily responsible for disease.

This study supports the conclusion that necrotizing fasciitis caused by injection of black tar heroin is substantially different from the same disease resulting from other causes. Cases associated with heroin injection are predominantly clostridial infections while the others are predominantly streptococcal infections. While all cases of necrotizing fasciitis are potentially fatal, this conclusion indicates that different prevention and treatment strategies are necessary depending on the underlying cause.

Necrotizing Fasciitis, Clostridial Bacterial Infections, Black Tar Heroin

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