

Appropriate Surgical Strategy for Accurate Amputation Level in CLI Based on MRI and Histopathology

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Commentary

The treatment of critical limb ischemia (CLI) in diabetic patients is challenging, and there has been no established surgical strategy for a specific level of amputation. Two types of CLI, one without infection and the other with infection, are categorized as type II and type IV, respectively, under the Kobe classification [1]. The efficacy of MRI in diagnosing diabetic foot osteomyelitis has been demonstrated in our previous studies^{2,3}: in neuropathic ulcers (types I, III), diabetic foot osteomyelitis can be reliably distinguished from reactive bone marrow edema in every detail, even in the presence of severe soft tissue infection. MRI is not useful in ischemic ulcers (types II, IV), however, because of insufficient interstitial fluid. In the present study, based on the histopathological differences found between ulcers type II and IV we present a strategy for the surgical treatment of CLI.

Type II ulcers (Figure 1) are of dry gangrene caused by ischemia. The reduced blood flow is caused by arterial plaque that reduces blood supply to peripheral parts of the body, especially the feet. Histopathologic examination showed only gangrene, but no infection of bone or soft tissue (Figure 2); also no destruction of bone cortex and no presence of cells in bone marrow. Therefore, local surgery has to be done after arterial reconstruction, and the site of resection needs to be made based on the sufficiency of blood supply [1-3].



Figure 1: Case 1: Type II ulcer

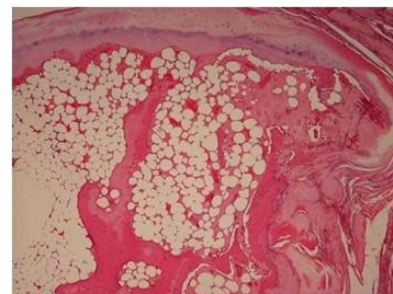


Figure 2: Histopathological findings of Case 1: Bone marrow (H&E; x40). There is no cell (gangrene).

Type IV ulcers, CLI with infection, are more difficult to treat due to the decision regarding which to carry out first: arterial reconstruction for ischemia or debridement of infection. 'Critical colonization' [4] should not be overlooked in this type (Figure 3): in the presence of severe ischemia, this ulcer sometimes displays no local sign of infection (for example, redness, swelling, heat), but bacteria are still present as critical colonization, and infection often occurs after revascularization..



Figure 3: Case 2: Type IV ulcer (Critical colonization)

Histopathologic examination showed that both bone marrow and soft tissue became gangrenous, and the areas proximal to the gangrene

were infected (Figure 4). Bones were infected through the bone cortex destroyed by the surrounding soft tissue infection

Such ulcers need to be carefully observed before deciding when to carry out local surgery. A faulty decision may lead to the patient losing the leg because of infection, even though revascularization may have been successfully done. Evaluating osteomyelitis with MRI after revascularization is essential.

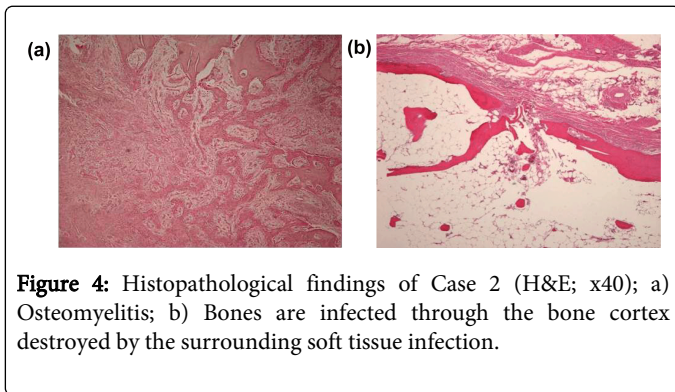


Figure 4: Histopathological findings of Case 2 (H&E; x40); a) Osteomyelitis; b) Bones are infected through the bone cortex destroyed by the surrounding soft tissue infection.

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