The Usefulness of Local High-Dose Continuous Antibiotics Perfusion Therapy for Bone and Soft-Tissue Infection

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Purpose: The involvement of necrotic tissue in lesions and the biofilms that form around implants have been indicated as key factors that make osteochondral infections intractable. Once a biofilm is formed, 100 to 1000 times the minimum biofilm eradication concentration (MBEC) of minimum inhibitory concentration (MIC) is required to inhibit it. It is difficult to transfer the concentration to lesions intravenously, so we have to treat bone infections by administering the antimicrobial agent locally. IMAP (intramedullary antibiotics perfusion) involves placing marrow needles near the lesion and then continuously infusing antibiotics into the marrow through them. Infection is rarely confined to just the bone, and the surrounding soft tissue is also affected. ISAP (Identify Selective Antibacterial Peptides) is a method that involves circulating the antimicrobial agent by indwelling the double-lumen tube for the surrounding soft tissue, continuously infusing the antimicrobial agent from the subcutaneous circuit, and connecting the main circuit to the negative-pressure wound therapy (NPWT) and applying sufficient negative pressure from the surface layer and the deep layer to aspirate the drainage. Below are the results of the local high-dose continuous antibiotics perfusion (LHdCAP) therapy, IMAP+ISAP treatments that we have performed on patients with bone and soft-tissue infections. It is speculated that this therapy can potentially be used for the sedation of bone infections while still preserving the tissue, since administering the microinjection of the antimicrobial agents from the vicinity of the lesion results in the antimicrobial agents spreading to the bone tissue.

Methods: Since April 2016, we have utilized LHdCAP to treat 32 cases of various bone and soft-tissue infections that had been diagnosed as involving pyogenic arthritis, 12 of which involved osteomyelitis, and 20 that were postsurgical infections that included osteosynthesis. The procedure begins by thoroughly washing and debriding the area. Then, a line for the injection is placed into the bone marrow or subcutaneous of the infected lesion. Finally, a subcutaneous drain or part is used in combination with NPWT on the open wound. Gentamicin sulfate was chosen as the antibacterial agent to be continuously injected. In all cases, IV antibiotics were also administered in combination with the aforementioned procedure.

Results: Staphylococcus aureus, including 13 strains of methicillin-resistant S. aureus (MRSA), 9 strains of methicillin-sensitive S. aureus (MSSA), 8 other known strains, and 2 unknown strains, was determined to be the causative bacteria. The treatment effect was evaluated with the goal of determining the local average and the negativization of C-reactive protein. The average indwelling period was 11.4 days, and the presence or absence of any adverse events was also analyzed. There were no adverse events due to adverse reactions observed; however, there were2 cases in which the infection recurred.

Conclusion: LHdCAP is considered to be one of the more useful treatment options for bone and soft-tissue infections; however, going forward, the repeated investigation is essential, in order to accumulate further basic data and to evaluate the extent of the spread of the antimicrobial drugs administered.