Abstract of Radioactively Labeled Autologous Leukocytes in Patients with Infected Prosthetic Joints

Lindsay Brammen1, Johannes Holinka2, Reinhard Windhager2, Helmut Sinzinger3
1Vienna Medical University, Department of Surgery, Vienna, Austria
2Vienna Medical University, Department of Orthopedics, Vienna, Austria
3ISOTOPIX, Institute of Nuclear Medicine

Objective: A serious complication of joint replacement surgery is infection, which results in prolonged invalidity due to decrease in joint function and hospitalization, often resulting in removal and subsequent re-implantation after lengthy antibiotic therapy. Labeled leukocyte scintigraphy (LS) is considered a valuable tool in preoperative diagnosis of prosthetic joint infections. The aim of this study was to examine imaging of in vitro radioactively labeled autologous leukocytes and bone marrow scans in their accuracy and reliability in detecting infection in patients with prosthetic joints. Furthermore, inflammation markers CRP and WBC count were analyzed for their accuracy in detecting prosthetic joint infection.

Methods: This single center study included all patients suspected of having prosthetic joint infections between January and September 2013 at the Vienna General Hospital. A total of 45 mL blood was drawn from a peripheral vein and leukocytes were radioactively labeled with Tc-99m-HMPAO according to protocol. The labeled leukocytes were then re-injected into a peripheral vein. A whole body scintigraphy and local images were recorded with a double-headed gamma camera four hours after re-injection. Additional local images were taken taken approximately 24 hours following re-injection. In the case of positive LS, bone marrow scintigraphy was conducted 48 hours after re-injection. Local images were recorded 30 minutes after injection of 370 MBq Tc-99m-nanocolloid.

Results: This study included a total of 50 patients. All the patients underwent subsequent bacterial and histological testing via joint aspiration or operation of the joint. The most common joint investigated was knee (27), followed by hip (9), shoulder (2), and elbow (1). Other cases involved the complete femur (6), tibia (2), leg (2), and foot (1). Pathogens isolated from the joints included Staphylococcus epidermidis and Candida albicans. The sensitivity of LS was 63%, specificity 90%, PPV 56% and NPV 93%. Overall accuracy was calculated to be 86%. Pre-diagnostic testing with CRP and WBC count were analyzed for their accuracy in detecting prosthetic joint infection. Mean CRP was 3.9 mg/dl. Thirty-one patients had a CRP-level higher and 12 patients lower than the cut-off. The sensitivity was 57%, specificity 28%, PPV 13%, NPV 77% and accuracy 33%. Lastly, only 3 patients had WBC counts higher than the cut-off. WBC count had a sensitivity of 0%, specificity 92%, PPV 0%, NPV 88% and overall accuracy 82%.

Conclusion: Leukocyte scintigraphy has been described as a useful diagnostic tool in the diagnosis of suspicion of bone and soft tissue infection, fever of unknown origin and suspicion of acute appendicitis. Tc-99m HMPAO labeled WBC scintigraphy is a rapid and very accurate method for detecting those pathologies, and it is evaluated visually. Our results showed that WBC scintigraphy might be evaluated semiquantitatively and reliable used for diagnosis of suspected bone and soft tissue infection.

Key words: Bone, soft tissue, infection, Tc-99m HMPAO - labeled white blood cell scintigraphy

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