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Evaluation of Pulmonary Infection in Rabbits by Tc-99m Hmpao Labeled Leukocyte Scintigraphy

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Abstract

Objectives: Aim of this study was to determine the effectiveness of labeled leukocyte scintigraphy in pulmonary infection of rabbits and effect of increasing the incubation duration in this efficiency.

Methods: Five New Zeland white rabbits (5-6 month old, 2.5-3 kg) were subject of this study. The rabbit were divided into three groups (group 1: control, group 2: tracheal inoculation group, group 3: transthoracic inoculation group). The rabbits were inoculated by E. Coli administration one day prior to the scintigraphy in grup 2 and 3 rabbits. The labeled leucocytes scintigraphy was performed to all five rabbits. The images were evaluated by quantification (avarage counts in lungs). The quantitative values were compared by Paired Samples T test and p<0.05 considered significant.

Results: The labeling efficiency was similar in all five rabbits. The avarage counts in the lungs of group 2 were significantly higher than in group 1 and 3. The second rabbit in the group 3 (which had prolonged waiting period in incubation with Tc-99m HMPAO) had avarage counts similar to group 1.

Conclusion: The infection imaging by means of labeled leukocyte scintigraphy clearly demonstrates E. Coli pneumonia in rabbits when it is inoculated by transtracheal route and increasing the lenght of incubation with Tc-99m HMPAO with leukocyte do not benefit.

Key words: Pneumonia, rabbits, labeled leukocyte, scintigraphy

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Evaluation of Bone or Soft Tissue Infection with Tc-99m Hmpao White Blood Cell Scintigraphy: Semiquantitative Method

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Abstract

Objective: Aim the aim of this study was to investigate semiquantitatively the diagnostic performance of Tc-99m hexamethylpropylene amine oxime labeled white blood cell (Tc-99m HMPAO-WBC) scintigraphy in patients with suspected bone or soft tissue infections.

Methods: Material and Method twenty one patients who applied to Nuclear Medicine Departmant (for suspected prosthesis infection, diabetic foot, bone infection, graft infection) were evaluated retrospectively. Tc-99m HMPAO WBC scintigraphy imaging were performed to all patients. Planar images were taken 1., 2., and 4. hours after injecting the labeled leukocytes. Evaluation of infection with Tc-99m HMPAO WBC scintigraphy was done semiquantitatively. Relative uptake was determined by setting the region of interest (ROI) of lesion area on the anterior view. Rectangular ROI was set on the against limb (non-lesion). The ratio of the average pixel count in the lesion (L) to that in the non-lesion (NL) (L/NL ratio) was calculated at 1., 2., and 4. hours images. Final diagnosis was based on histopathology, microbiologic assays, or clinical and imaging follow-up.

Results: 0.55 and 1.55±0.74, 1.42±0.55, 1.40±0.55 in positive and control groups, respectively. Positive group revealed a statistically significant increase L/NL values in the data 3 hours images (p=0.002). However, no statistically significant was found between L/NL values in 3 hours imaging data in control group (p=0.223). All the data in the positive group found

a statistically increased steadily. Furthermore, statistically significant difference was found between the positive and control group at 2., and 4. hours images ($p=0.015$, and $p=0.006$) ± 0.43 , 2.05 ± 0.35 , 1.90 ± 0.35 values were found to be $1.74 \pm$ Results of the 21 patients, 11 were found to have infection (positive group), whereas 10 had normal (control group) pathologies on histopathology, microbiologic assays, or clinical and imaging follow-up. First, 2., and 4. hours L/NL (mean

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

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Abstract

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 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 was conducted in 43 patients. 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: While this study showed that CRP and WBC are not accurate pre-diagnostic markers for prosthetic joint infection, it was able to demonstrate that Tc-99m-HMPAO labeled autologous leukocytes in patients presenting with symptoms of prosthetic joint infection is accurate. LS is a feasible imaging method in patients with infection of prosthetic joints and may also be a helpful tool in other infection scenarios.

Key words: CRP, leukocyte labeling, prosthetic infection, scintigraphy, white blood cell

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