


CLINICAL IMAGE

Post-radiosynovectomy imaging of Er-169 using scintigraphy and autoradiography

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Funding Information

No sources of funding were declared for this study.

Received: 28 December 2016; Revised: 10 March 2017; Accepted: 3 April 2017

Clinical Case Reports 2017; 5(6): 1048–1050

doi: 10.1002/ccr3.987

Introduction

Both the detection and imaging of the distribution of radiopharmaceuticals after targeted radionuclide therapy are essential for quality control and patient safety. However, measurements of pure β -emitters have been recognized as being ambiguous [1, 2]. Radiosynovectomy has been used for decades in the treatment of rheumatoid arthritis and hemophilia using Y-90 for large size joints, Re-186 for middle size, and Er-169 for smaller joints. Post-therapeutic imaging is recommended and is performed routinely after radiosynovectomy with Y-90 using bremsstrahlung and Re-186 using emitted gamma-rays (15%). However, there has been no imaging protocol for post-radiosynovectomy using Er-169. Er-169 has a low maximal β -energy (350 keV) with a maximum range of 1 mm in soft tissue, with a mean range between 0.2 and 0.3 mm. The negligible fraction of gamma-rays makes detection more difficult [3–6]. We performed post-therapeutic imaging of Er-169 after radiosynovectomy of MCP III joint using scintigraphy by gamma-camera and autoradiography by cobalt-57 pen-marker.

Key Clinical Message

Currently, there is no protocol for the detection of intra-articular distribution of Er-169 citrate after radiosynovectomy. We propose post-therapeutic imaging using scintigraphy and cobalt-57 pen-marker autoradiography. This technique evaluates the efficacy of the radiosynovectomy and patient safety and could be utilized for dosimetric protocol.

Keywords

Arthrosis, hemophilia, radionuclide therapy, radiosynovectomy, radiosynoviorthesis, rheumatoid arthritis, synovectomy, synovitis.

Method

A 55-year-old woman was referred to the Clinic for Nuclear Medicine at Bethesda Duisburg in April 2016 for radiosynovectomy. She was diagnosed with rheumatoid arthritis in 2001. Despite disease remission after initial treatment, she complained of a persistent intermittent synovitis in the MCP III joint of the right hand over the preceding 3 months, with no response to two intra-articular corticosteroid injections. A florid synovitis in the 3rd MCP joint of the right hand was confirmed by a three-phase bone scan, so that a radiosynovectomy was indicated.

Radiosynovectomy was performed with 37 MBq of Er-169 citrate. Erbium-169 citrate was purchased from CIS Bio International. The purity of the used charge was 99.99% with Ph of 5.7 labeled with particle sizes of 3–6 μ m. Dorsal imaging of the hand was performed 30 min p.i. by a gamma-camera (DDD Quantum) with a LEHR collimator (1) and without any collimator (2) each for 5 min. The energy window was estimated to be between 70 and 300 keV to acquire the best signal/noise ratio. The matrix size was 256 \times 256 with a pixel size of 2.3 mm.

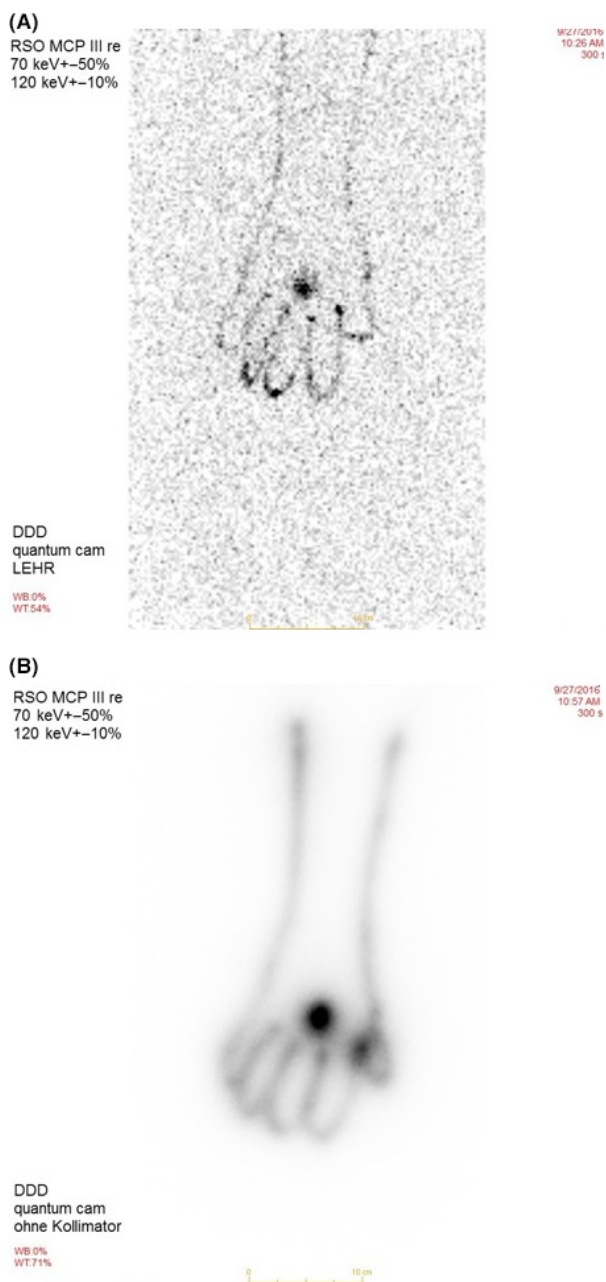


Figure 1. (A) Scintigraphy with LEHR collimator of the right after radiosynovectomy with Er-169 citrate outlined with a Co-57 marker reveals weak distribution of Er-169 citrate in MTP III joint. (B) Scintigraphy without collimator of the right after radiosynovectomy with Er-169 citrate outlined with a Co-57 marker reveals more pronounced distribution of Er-169 citrate in MTP III joint.

The count rate varied between 20 and 60 cps/MBq without collimator and decreased with a factor of 1000 with LEHR collimator. Spatial resolution was 15 ± 2 mm without collimator and 12 ± 2 mm with LEHR collimator. A cobalt-57 pen-marker was used to trace the outline of anatomical features.

Er-169 Imaging

The dorsal imaging of the right hand with (Fig. 1A) and without collimator (Fig. 1B) clearly detects Er-169 and visualizes the intra-articular distribution of Er-169 citrate in the 3rd MCP joint of the right hand, which was more pronounced without collimator (Fig. 2). Autoradiography with the cobalt-57 pen-marker enabled tracing the outline of anatomical features of the right hand of the patient.

Conclusions

We conclude that post-therapeutic detection and imaging of Er-169 are best achieved using scintigraphy without collimator, in combination with autoradiography with cobalt-57 pen-marker. Post-therapeutic imaging of targeted radionuclide therapy with Er-169 provides quality control and improves patient safety and should be considered for developing dosimetric protocols.

Authorship

JF, JE, SH, TG and EG: contributed to concept and design and writing the manuscript and to imaging protocol. LS: managed the studies and imaging. DK: drafted the discussion of the manuscript.

Conflict of Interest

None declared.

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