

Four-Decade Follow-Up of Plutonium-Contaminated Puncture Wound Treated with Ca-DTPA

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Contaminated wounds are a major route of internal deposition of radionuclides for nuclear and radiation workers. They may result in significant doses to the radiosensitive organs and tissues in an exposed individual's body. The U.S. Transuranium and Uranium Registries' whole-body donor (Case 0303) accidentally punctured his finger. The wound was contaminated with plutonium nitrate. The wound was surgically excised and medically treated with intravenous injections of Ca-DTPA. A total of 16 g Ca-DTPA was administered in 18 treatments during two months following the accident. Eighty-seven urine samples were collected and analyzed over 14 years following the accident. An estimated ^{239}Pu activity of 78 Bq was excreted during Ca-DTPA treatment. Post-mortem radiochemical analysis of autopsy tissues indicated that forty years post-accident 12.2 ± 0.3 Bq of ^{239}Pu was retained in the liver and 17.5 ± 0.7 Bq in the skeleton. To estimate the plutonium intake, late urine measurements, which were unaffected by chelation, and post-mortem radiochemical analysis results were evaluated using the IMBA Professional Plus software. Application of the NCRP 156 wound model with default parameters for soluble strong material resulted in a credible fit to the data ($p > 0.05$). The residual intake was estimated to be 47.6 Bq that resulted in committed effective dose of 24.1 mSv. Ca-DTPA treatment reduced this individual's radiation dose by a factor of 2.6.

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