Radiation exposure risk from ^{177}Lu-PSMA-617 in hematuric patients

What should urologists know?

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The recent Health Canada approval of ^{177}Lu-PSMA-617 (Pluvicto®) represents an important advancement in the treatment of metastatic castration-resistant prostate cancer. This radioligand therapy, which delivers β-particle radiation to prostate-specific membrane antigen (PSMA)-expressing cells, has demonstrated improved outcomes in trials such as VISION and PSMAfore.[1,2] While primarily managed by medical oncology and nuclear medicine, urologists are increasingly encountering patients receiving this therapy, particularly in inpatient settings, where catheter care may be required. Given the radioactive nature of the compound and its renal clearance, there is a pressing need to evaluate radiation exposure risks to healthcare providers in scenarios involving hematuria and catheter irrigation.

Dosimetry data shows that ^{177}LuPSMA617 delivers modest but meaningful radiation doses to non-malignant tissues, with implications for both patient safety and exposure to healthcare workers. In a recent systematic review and meta-analysis, Ells et al reported median absorbed doses per GBq of ^{177}LuPSMA617 as follows: kidneys (0.55 Gy), salivary glands (0.81 Gy), lacrimal glands (2.26 Gy), and bone marrow (0.03 Gy).[3] With the standard Canadian dose of 7.4 GBq per cycle, this translates to organ doses of approximately 4.1 Gy to kidneys, 6.0 Gy to salivary glands, and over 16.7 Gy to lacrimal glands per cycle, explaining common side effects such as xerostomia and dry eyes. These findings underscore the preferential accumulation of radiation in excretory and secretory tissues.

In terms of excretion, ^{177}LuPSMA617 is largely eliminated in the urine. Over 50% of administered activity is excreted within the first 24 hours, with the mean effective half-life of urine radioactivity at <6 hours.[4,5] Peak blood activity occurs within the first 1–2 hours post-infusion and declines rapidly thereafter. These findings emphasize the potential for transient but significant urinary and hematogenous radiation shortly after administration — an important consideration for healthcare professionals involved in early post-treatment care.

Several studies have monitored radiation exposure doses to nurses, radiopharmacists, and physicians involved in drug administration and patient care, and report mean whole body radiation doses from 2–7 μSv per treatment.[4,6] These values reflect brief but repeated close contact during preparation, injection, and immediate post-injection patient handling, typically over a span of 30–60 minutes. For comparison, a single chest X-ray delivers approximately 0.1 mSv and an abdominal computed tomography scan approximately 7 mSv.[7] Notably, these occupational exposures remain far below the annual dose limits set by the Canadian Nuclear Safety Commission (CNSC), which are 20 mSv per year averaged over five years, with a maximum of 50 mSv in any single year.[7]

Applying these findings to urologic care, providers may encounter patients with hematuria, catheter blockage, or retention within hours of receiving treatment. Hematuria (all grades) was reported in 8.5% of the ^{177}LuPSMA617 arm in the VISION trial, with 2.5% having hematuria of grade ≥3.[1] Given the concentration of activity in urine, providers irrigating catheters or handling drainage bags could experience low but measurable exposure. While radiation exposure to nuclear medicine staff has been quantified, direct measurements of exposure to healthcare workers performing urologic procedures, such as catheter irrigation, have not yet been published. Until such data are available, adherence to standard radiation precautions remains essential to protect frontline providers, specifically in the first 24 hours after administration.

Recent reviews recommend specific precautions for bedside care: staff should wear gloves, limit time

spent near urine bags, maintain distance where feasible, and consider shielding when handling freshly voided urine.[8,9] Facilities may also consider flagging the charts of patients who have received recent radioligand therapy to prompt appropriate precautions.

As ^{177}LuPSMA617 becomes more widely used, we believe increased awareness of radiation safety in the urologic context is warranted. Future studies assessing real-time dosimetry during common interventions, such as catheter irrigation, would be valuable. In the interim, reinforcing nuclear safety principles among urologists, trainees, and nurses remains a practical and necessary step.

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