

Radiation nephropathy is associated with a glomerular thrombotic microangiopathy and progression to end stage kidney disease

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Radiation nephropathy is a rare but potential complication following total and localised radiotherapy treatment. Total body irradiation (TBI) is declining; however, newer treatments for inoperable neuroendocrine tumours (NETs) with peptide receptor radionuclide therapy (PRRNT) are on the rise. Yttrium 90-dotatoc (Y90) is a somatostatin analogue labelled with Y90 used for somatostatin positive NETs. Y90 is eliminated through the kidney and found intact in the urine, having a cumulative effect in the renal parenchyma. Despite fractionation and co-administration of renoprotective intravenous amino acids, targeted radionuclide therapy can still be nephrotoxic. Therefore, PRRNT may lead to a re-emergence of radiation nephropathy.

We reviewed at biopsy-proven radiation nephropathy in the Oxford Kidney Unit (OKU) between 2010 and 2019. Three cases were found in the pathology electronic archive: one associated with total body irradiation prior to stem cell transplantation and two cases (both in 2019) associated with Y90.

All three patients presented with hypertension, microscopic haematuria, proteinuria, anaemia, thrombocytopenia and declining renal function. A proximal renal tubular acidosis (RTA) was observed in the two patients who received Y90. Time from radiation exposure to 50% loss of estimated glomerular filtration rate (eGFR) and end stage renal failure (ESRF) was variable and described (see table). Deterioration in renal function was quicker in patients with pre-existing hypertension and in the patient with a single kidney. Both patients on Y90 received a 10% amino acid c-infusion and fractionated doses of radiotherapy. Two patients required renal replacement therapy (RRT) and the third one died as a result of a carcinoid crisis as she reached ESRF.

Biopsy features in all three patients were of an acute glomerular thrombotic microangiopathy (TMA). Chronic tubulointerstitial damage varied from moderate to severe.

We highlight that radiation nephropathy has a long latency and can present months after exposure. It tends to be irreversible. Renal biopsy often shows features of a TMA. Despite fractionation and amino acid co-administration, nephrotoxicity is an established risk factor for loss of kidney function. Patients with pre-existing hypertension and reduced kidney volume are at particular risk. We suggest patients should be counselled about the risk of progressive chronic kidney disease as a result of their treatment and a multidisciplinary approach taken in their ongoing management.