Lead Shield and Protective Cap Reduce Operator Radiation Exposure by > 75%

Written by Toni Rizzo

Radiation exposure by interventional cardiologists has led to concern about the risk of malignancy. The relationship between radiation exposure and brain tumors remains unclear, but a recent case series described 36 cases of brain tumors that were diagnosed in interventional cardiologists who had an average of 23 years in practice. Half of the tumors were glioblastoma and 86% were in the left temporal lobe [Roguin A et al. SOLACI 2014; *Am J Cardiol* 2013; *EuroIntervention* 2012]. Given this concern, radiation exposure should be kept as low as reasonably possible. The objective of the RADIATION PROTECT trial [NCT02128035], presented by Ashraf Alazzoni, MD, McMaster University, Hamilton, Ontario, Canada, was to evaluate the efficacy of a pelvic lead patient drape and a nonlead surgical cap for reducing radiation exposure in interventional cardiologists.

This prospective, randomized, controlled trial enrolled patients with planned percutaneous coronary intervention (PCI), acute coronary syndrome (ACS) referred for coronary angiography and possible PCI, and stable angina referred for coronary angiography and a high likelihood of undergoing PCI. A total of 113 patients were included in the lead shield group and 115 patients were included in the control group. The surgical cap analysis included 229 patients. The light weight (53 g) No Brainer surgical cap is lead free and contains bismuth and barium.

The primary end points for the lead shield analysis were operator radiation dose (μSv) and operator dose indexed for air kerma (μSv/mGy). The primary end point for the protective cap was the difference between radiation doses external and internal to the cap.

There were no significant differences in procedural characteristics between the lead shield and control groups. The pelvic lead drape reduced the operator radiation dose by 75.6%, with a mean radiation dose of 6.38 μSv in the shielded group vs 23.57 μSv in the control group ($P < .0001$).

The pelvic lead drape reduced the operator dose indexed for air kerma by 71%, with 0.006 μSv/mGy in the lead shield group vs 0.02 μSv/mGy in the no shield group ($P < .001$). Subgroup analysis showed that radiation exposure was significantly reduced in all patient and operator subgroups (Table 1).

The use of protective surgical cap resulted in an 81% reduction in operator head radiation exposure, with 2.99 μSv inside the cap versus 10.75 μSv outside the cap ($P < .001$). The median operator comfort level with the protective cap during the procedure was 9 on a 1- to 10-point scale.

Limitations of the study included being conducted in a single center. Additionally, the patient radiation dose was not directly measured; however, there was no difference in air kerma between the shielded and control groups.

These results show that the lead shield and NO BRAINER surgical cap reduced operator radiation exposure by >75%. These simple protective measures can be easily incorporated into clinical practice to decrease exposure to radiation.

Table 1. Subgroup Analysis of Radiation Exposure

Subgroup	Lead Shield	Control	Reduction, %	*P* Value
CTO	10.34 ± 10.38	56.50 ± 57.74	80.29	.002
Non-CTO	6.04 ± 7.20	20.77 ± 22.06	75.30	< .001
PCI including rotablation	7.91 ± 8.44	18.73 ± 9.89	75.60	< .001
Coronary angiography only	3.40 ± 3.21	8.44 ± 5.89	72.38	< .001
Femoral	4.62 ± 7.49	38.28 ± 37.11	91.32	< .001
Radial	6.88 ± 7.51	18.14 ± 21.36	66.52	< .001
BMI tertile 1	3.33 ± 2.61	18.62 ± 21.16	77.98	< .001
BMI tertile 2	6.06 ± 6.62	31.94 ± 39.01	81.06	< .001
BMI tertile 3	9.77 ± 10.09	20.57 ± 18.25	65.63	< .001
Fellow	6.58 ± 7.93	21.67 ± 22.86	73.81	< .001
Staff	6.12 ± 7.05	26.41 ± 34.06	77.56	< .001

BMI, body mass index; CTO, chronic total occlusion; PCI, percutaneous coronary intervention.