An Independent Study of X-drape® Reprint

Assessment of a Composite Radiation Shield in Exposure Reduction during High Dose Fluoroscopic Procedures.

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Purpose:
To assess the effectiveness of a composite radiation shield in reducing the personnel exposure to radiation during high dose fluoroscopic procedures.

Materials and Methods:
A Siemens Angiographic Room was used to conduct the study. The measurement geometry was simulated to represent a standard interventional special procedure, which included hanging lead drapes from the table rail for operator protection. The C-arm was positioned in the AP mode with the tube situated under the table and the image intensifier above the table. An abdomen phantom was placed on the angiographic table, with the table top to image intensifier distance of 30 cm. Image intensifier field of view was set at 24 cm. The source to image distance was 115 cm and the table stood 110 cm above the floor. A victoreen 451 P hand held ionization chamber was used for exposure measurements with and without the composite shield. An AADCO radiation shield (16" X 12") was attached laterally to the phantom for exposure measurements with the shield on. Measurements were made at a fixed distance of 1 meter from the beam entrance side of the phantom. Measurement locations and c-arm positions were adapted from a prior investigation on composite shields[1].

Results:
Measured exposure rates in mR/hr are presented in Table 1. The chest location (145 cm) received the highest exposure rate. The waist and knee level exposure rates were lower due to the presence of hanging lead drapes mounted to the table rail.

Table 1

Height	Location	Exposure rate in mR/hr Without Shield	Exposure rate in mR/hr With Shield	Dose Reduction %
170 cm	Eye @ 0º	16.60	5.30	68.07%
145 cm	Chest @ 0º	17.50	3.90	77.71%
105 cm	Waist @ 0º	3.50	1.70	51.43%
75 cm	Knee @ 0º	0.80	0.59	26.25%
170 cm	Eye @ 15º	10.40	3.30	68.27%
145 cm	Chest @ 15º	11.00	2.00	81.82%
105 cm	Waist @ 15º	1.60	0.86	46.25%
75 cm	Knee @ 15º	0.60	0.44	26.67%
170 cm	Eye @ 30º	6.20	1.70	72.58%
145 cm	Chest @ 30º	7.00	0.97	86.14%
105 cm	Waist @ 30º	1.70	0.34	80.00%
75 cm	Knee @ 30º	0.33	0.23	30.30%
170 cm	Eye @ 45º	2.50	0.60	76.00%
145 cm	Chest @ 45º	2.80	0.38	86.43%
105 cm	Waist @ 45º	0.63	0.16	74.60%
75 cm	Knee @ 45º	0.18	0.10	44.44%

Conclusion:
By using the composite radiation shield, a significant (upwards of 75%) reduction was seen in the exposure to the operator's chest area for all positions of the c-Arm. This has a considerable clinical bearing to reduce whole body chest badge readings by 75% or more. Thus the composite radiation shield is ideal for keeping the dose levels ALARA for personnel routinely exceeding the quarterly dose threshold (125 mRem or more).

1. G.D. Hartwell et al., Abstract No. 64, SIR 30th Annual Scientific Meeting, New Orleans, LA, April 5, 2005.