

Patient Radiation Dose during Interventional Atrial Septal Defect Occlusion

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Background

Transcatheter atrial septal defect (ASD) occlusion is an established procedure worldwide with excellent results and few complications. Still, there is extremely limited data on radiation dose levels during this procedure.

Objectives

To determine radiation dose (RD), fluoroscopy time (FT), Kerma Area Product (KAP), and number of Frames (N) in ASD interventional occlusion in adult and paediatric patients in a major center in Greece.

Methods

- Patients were divided according to age in groups: 5-10y, 10-15y and 15-18y
- Collection of clinical (weight, BMI, BSA) data
- Collection of radiation related data:
 - Kerma Area Product (KAP)
 - Fluoroscopy time (FT)
 - Number of frames (N)
- Effective doses were calculated using appropriate conversion factors for each age group

Hospital	Total Procedures collected	X-ray Machine	Antiscatter grid YES or NO	Acquisition frames per second	Fluoroscopy pulses per second
Onassis Cardiac Surgery Center	161	SIEMENS Zee Biplane angiography machine with flat panel detector	Yes	15 f/s	7.5 p/s

Results - 161 patients

5-10 years old	Mean	Median	min	max	Third quartile (75%)
Fluoroscopy Time (min)	6.9	6.6	1.9	18.9	7.4
Effective dose (mSv)	8.6	5.8	2.0	27.0	10.9
Age (years)	7.5	7.4	5.1	9.6	8.5
Frames	689.7	639	82	1475	947.5
Body Surface Area (m ²)	1.0	1.0	0.7	1.5	1.1
BMI (kg/m ²)	16.4	15.5	10.5	30.3	7.4

10-15 years old	Mean	Median	min	max	Third quartile (75%)
Fluoroscopy Time (min)	5.1	4.6	2.6	9.3	5.9
Effective dose (mSv)	6.6	5.6	1.8	25.8	8.1
Age (years)	12.5	12.4	10.3	14.9	13.9
Frames	507.1	409.0	177.0	1181.0	633.3
Body Surface Area (m ²)	1.4	1.5	1.0	1.9	1.6
BMI (kg/m ²)	19.7	21.5	8.8	26.0	23.4

15-18 years old	Mean	Median	min	max	Third quartile (75%)
Fluoroscopy Time (min)	6.2	5.7	3.5	11.9	6.2
Effective dose (mSv)	4.9	7.2	2.4	10.0	14.0
Age (years)	16.1	15.7	15.1	17.2	16.9
Frames	695.3	575	276	1321	866
Body Surface Area (m ²)	1.7	1.6	1.6	1.9	1.7
BMI (kg/m ²)	21.2	21.2	19.6	23.1	21.9

Conclusions

- Radiation dose varies greatly during transcatheter ASD occlusion according to age.
- Fluoroscopy time and number of frames are not adequate measures for radiation exposure monitoring.
- Given the radiosensitivity of paediatric patients, optimisation of radiation protection measures and establishment of diagnostic reference levels should be encouraged.