



OPTIMISATION OF STAFF EXTREMITY AND EYE LENS DOSES IN INTERVENTIONAL RADIOLOGY.

RESULTS OF ORAMED MEASUREMENT CAMPAIGN

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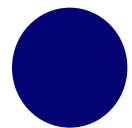
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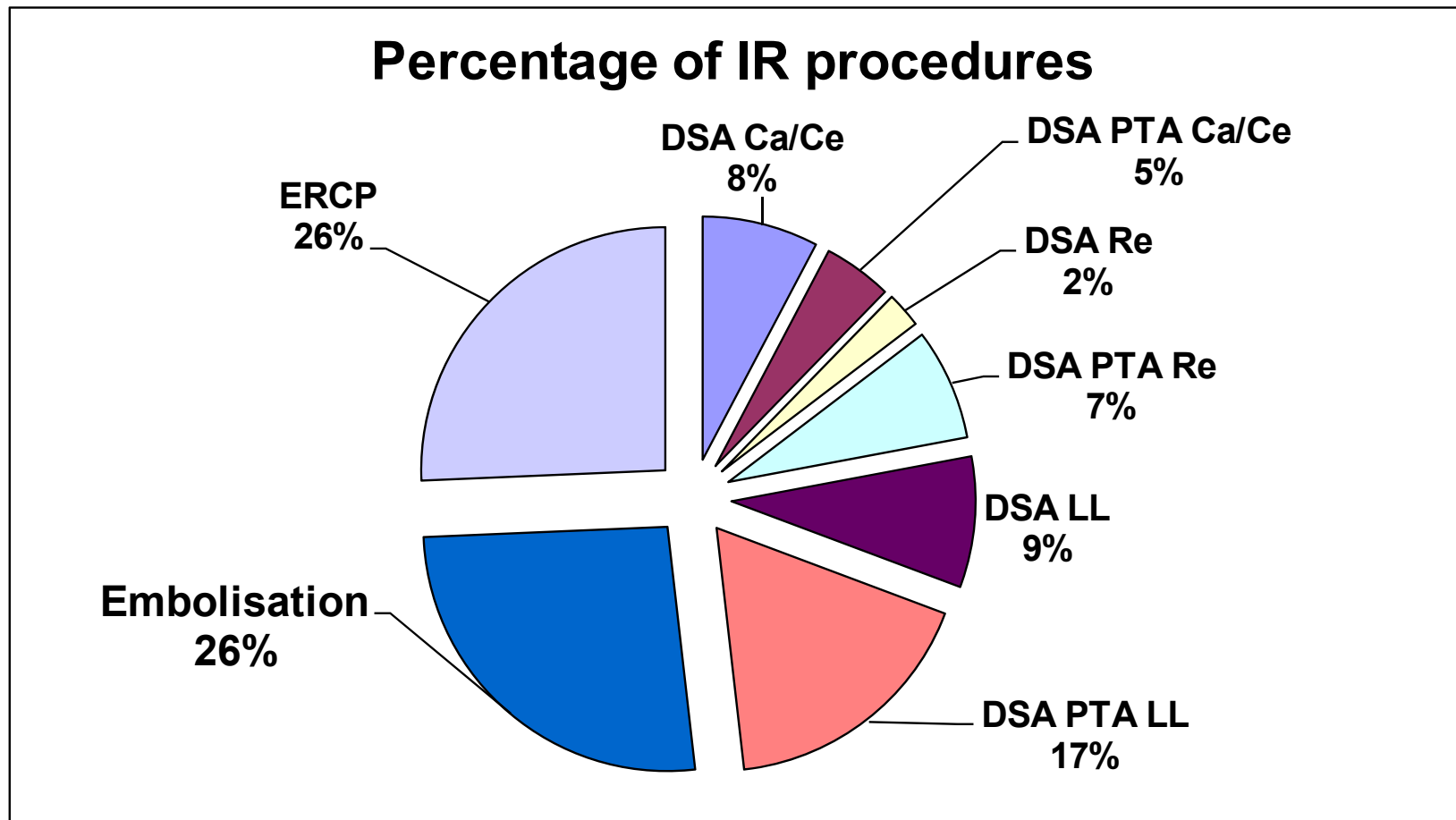
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INTRODUCTION

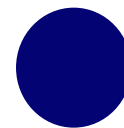
- 400 IR procedures indentified in EU
- 10% -12 % increase in the number of IR exams in a year
- Staff doses assessment within the framework of ORAMED
- 3 general categories of IR chosen for monitoring:
 - ✓ angiographies and angioplasties (of carotids and brain, lower limbs and renal arteries),
 - ✓ embolisation (chemoembolisation, neuroembolisation, liver and renal embolisations),
 - ✓ endoscopic retrograde cholangio-pancreatography (ERCP)



STATISTICS : MONITORED PROCEDURES

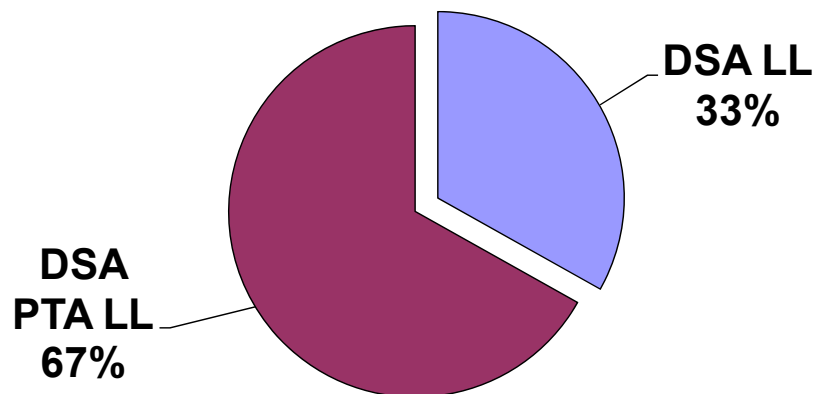


Total number of monitored IR operators 635



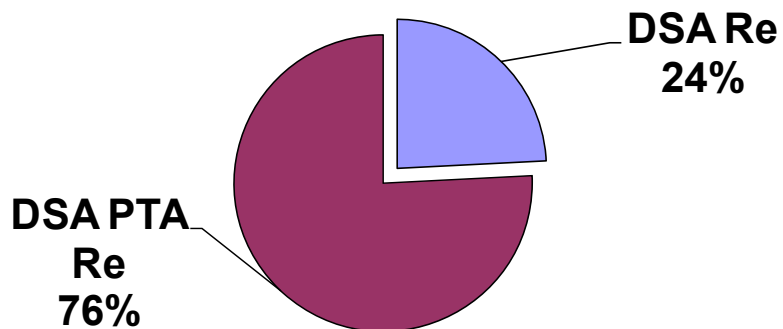
STATISTICS:DIAGNOSTIC AND INTERVENTIONAL PROCEDURES

Percentage of DSA PTA LL



	No
DSA Ca/Ce	49
DSA PTA Ca/Ce	29
DSA Re	15
DSA PTA Re	47
DSA LL	55
DSA PTA LL	111

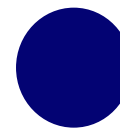
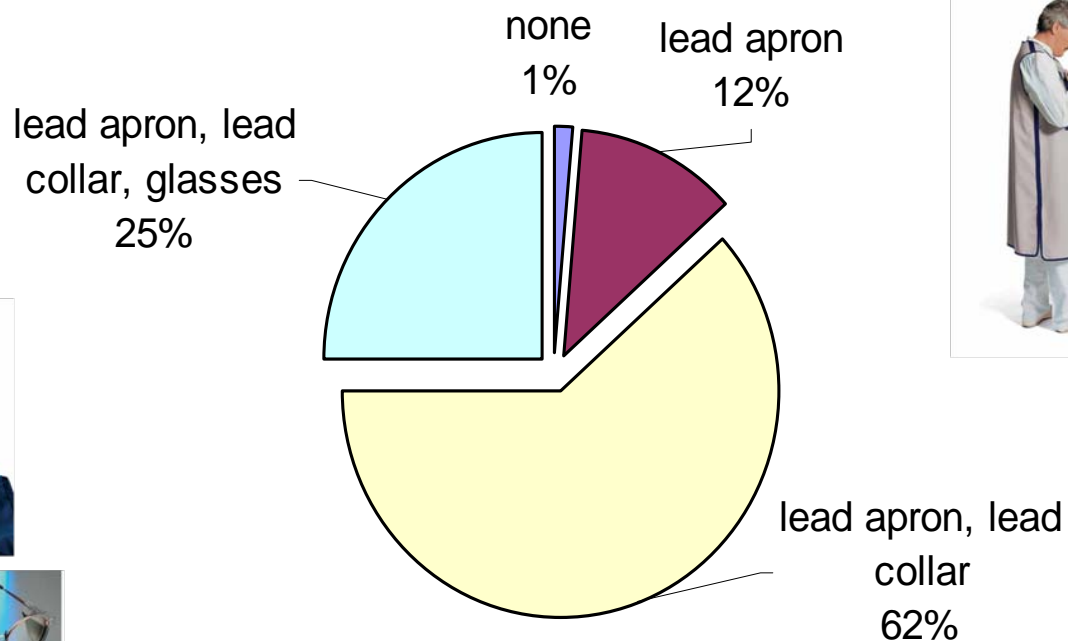
Percentage of DSA PTA Re



STATISTICS

PERSONAL PROTECTIVE EQUIPMENT

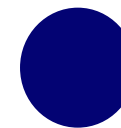
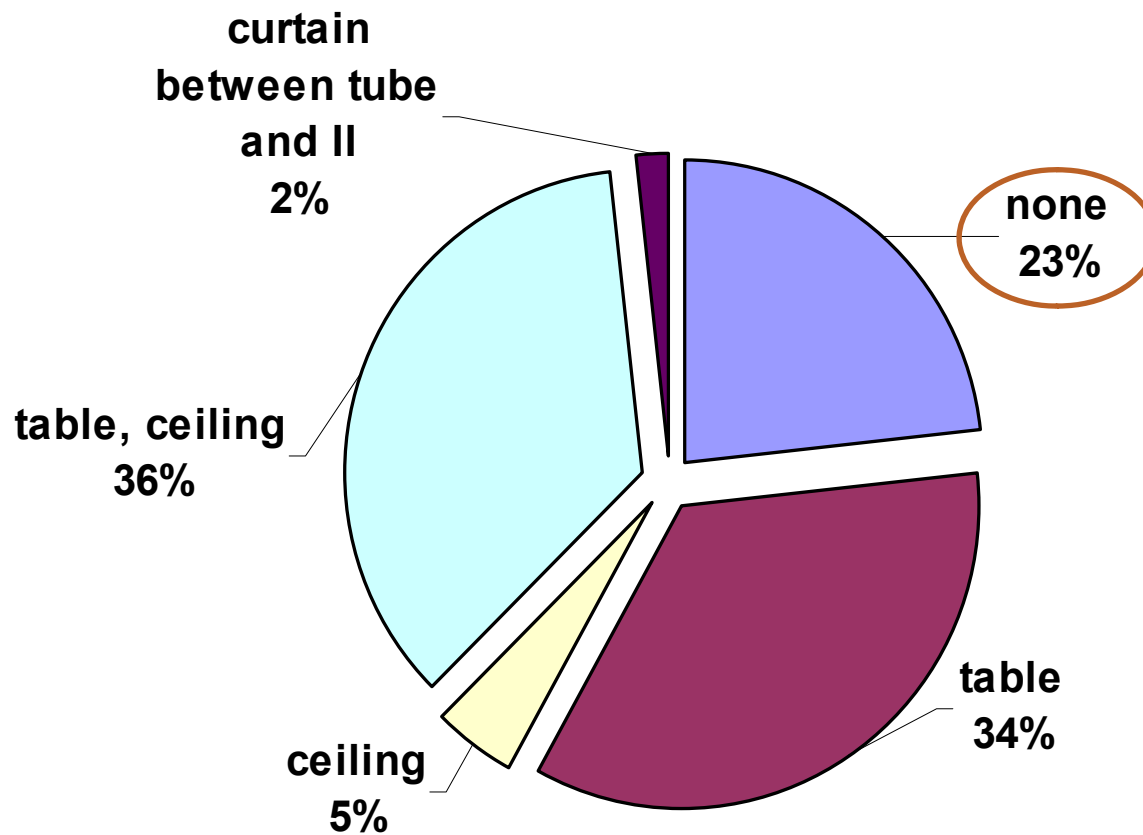
Percentage of personal protection



STATISTICS

ROOM PROTECTIVE EQUIPMENT

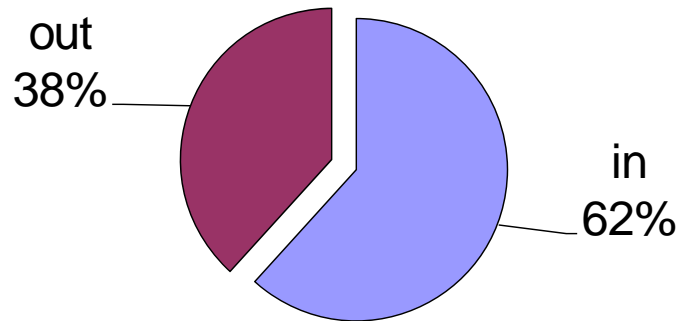
Percentage of room shielding



STATISTICS

USE OF AUTOMATIC CONTRAST INJECTOR

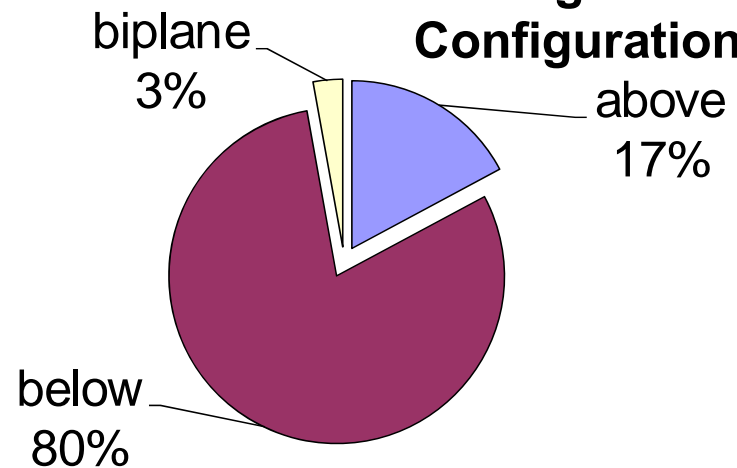
Percentage of In or Out during cine acquisition



Tube below

TUBE CONFIGURATION

Percentage of Tube Configuration

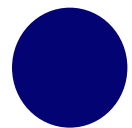


Tube above

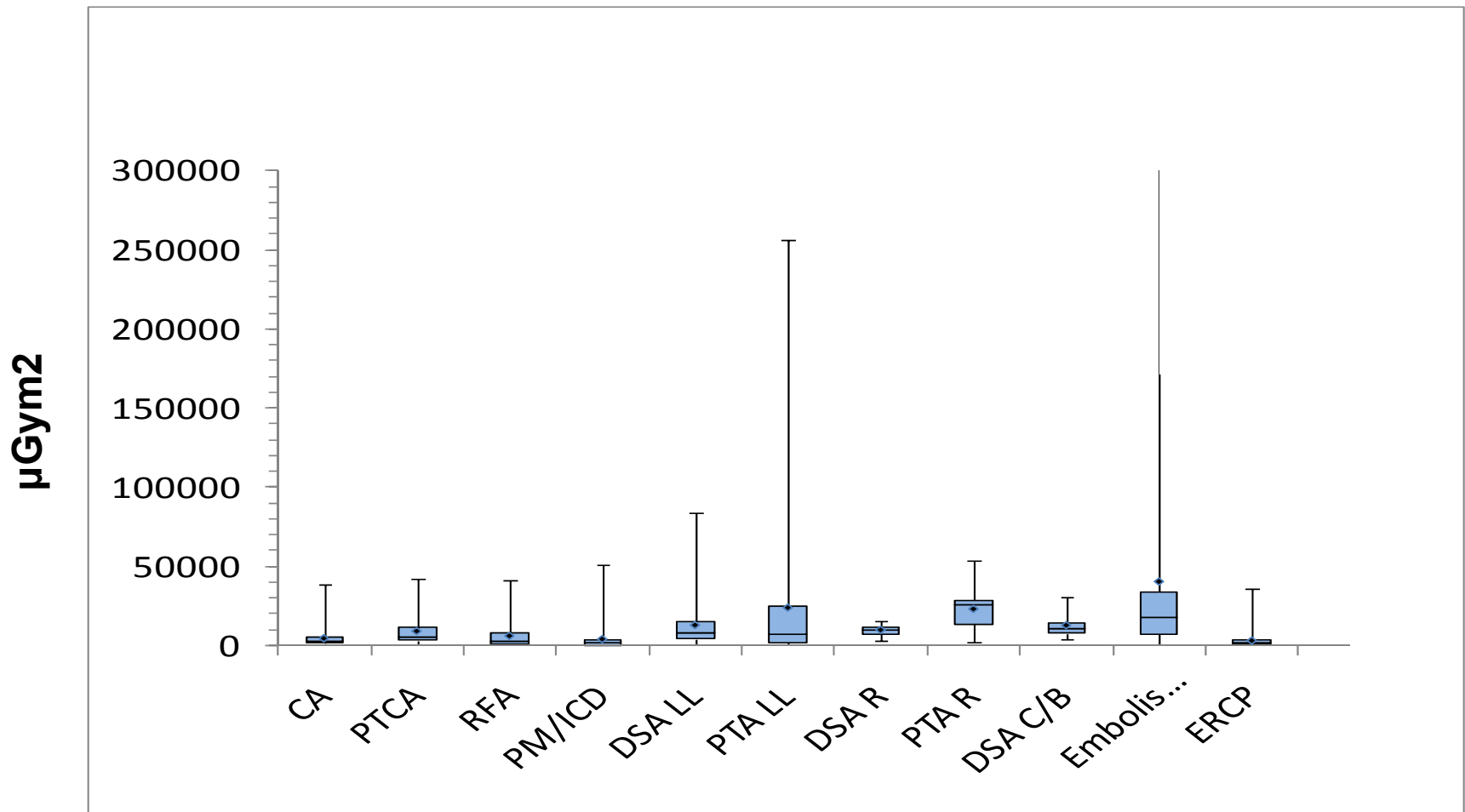
RESULTS OF THE MEASUREMENTS

Presented results demonstrate (in all dosimetric positions)

- Boxplots with KAP (Kerma Area Product) values for each IR procedure , as well as the comparison of median H_p /KAP values
- Effects of protective equipment used
- Influence of tube configuration
- Effect of using the automatic contrast injector and leaving the room during image acquisitions
- Effect of the location of access of the catheter

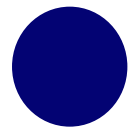


KAP VALUES FOR ALL IR PROCEDURES

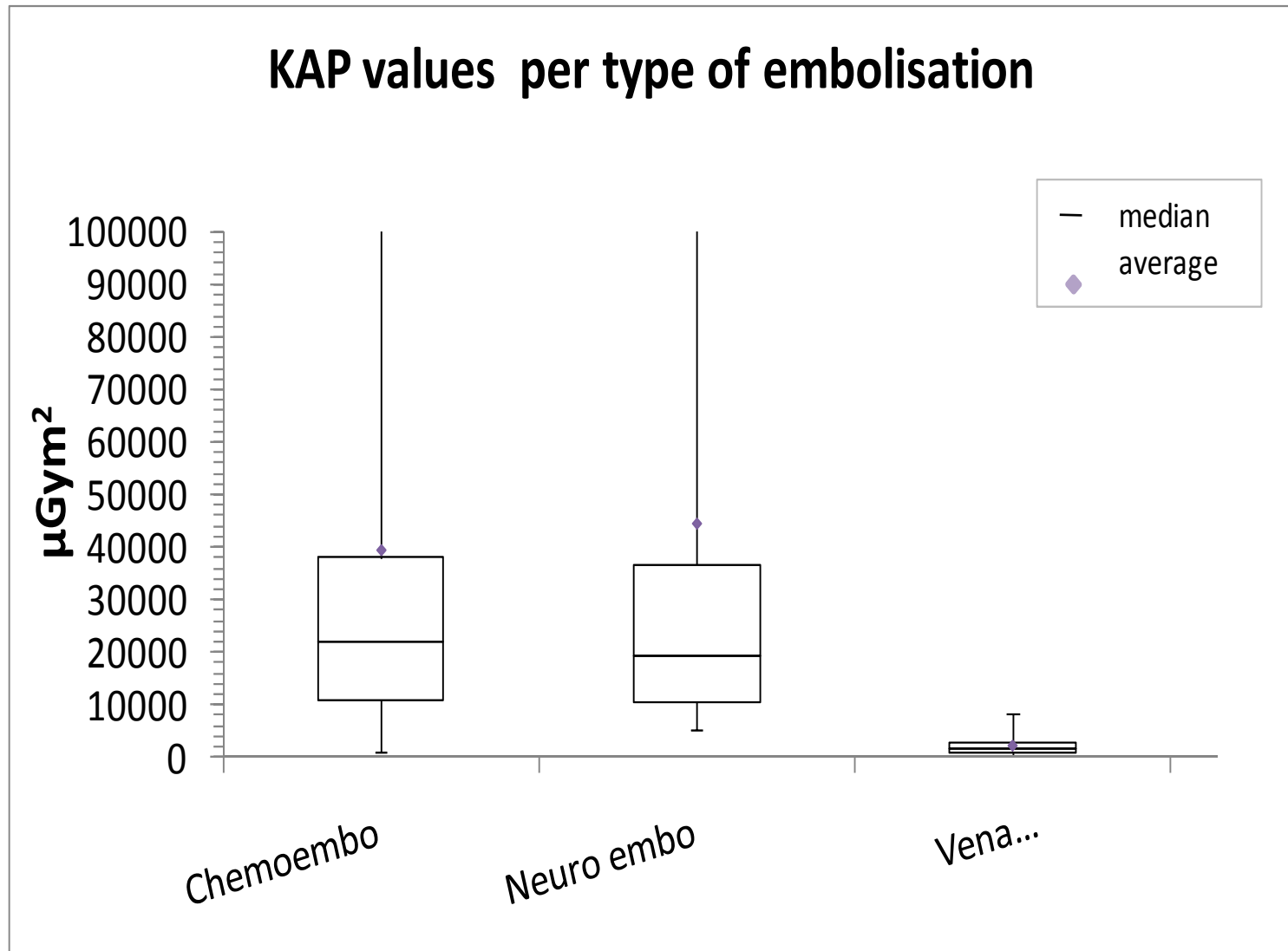


Highest median value of KAP for embolisations

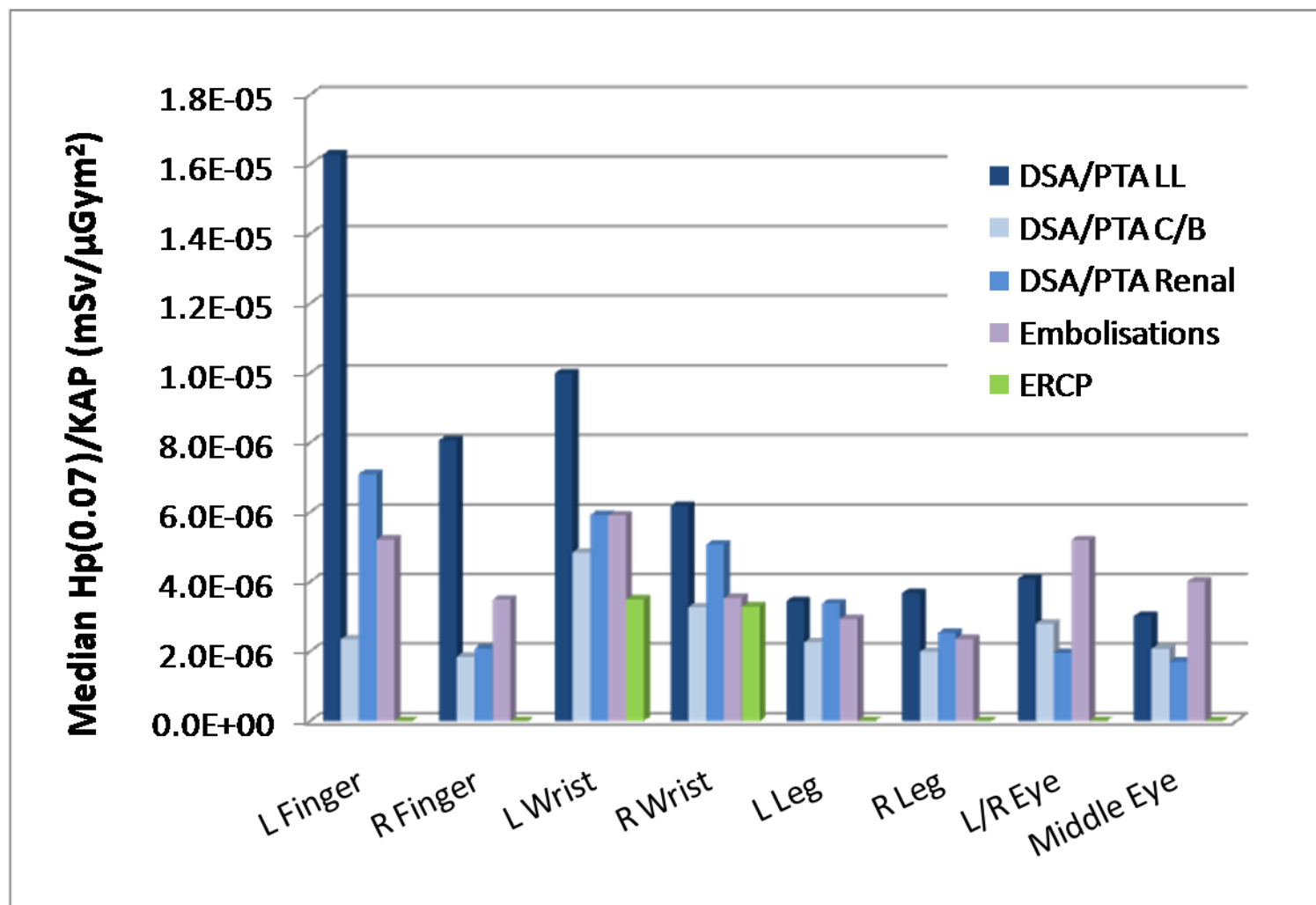
Lowest KAP for ERCP



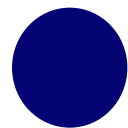
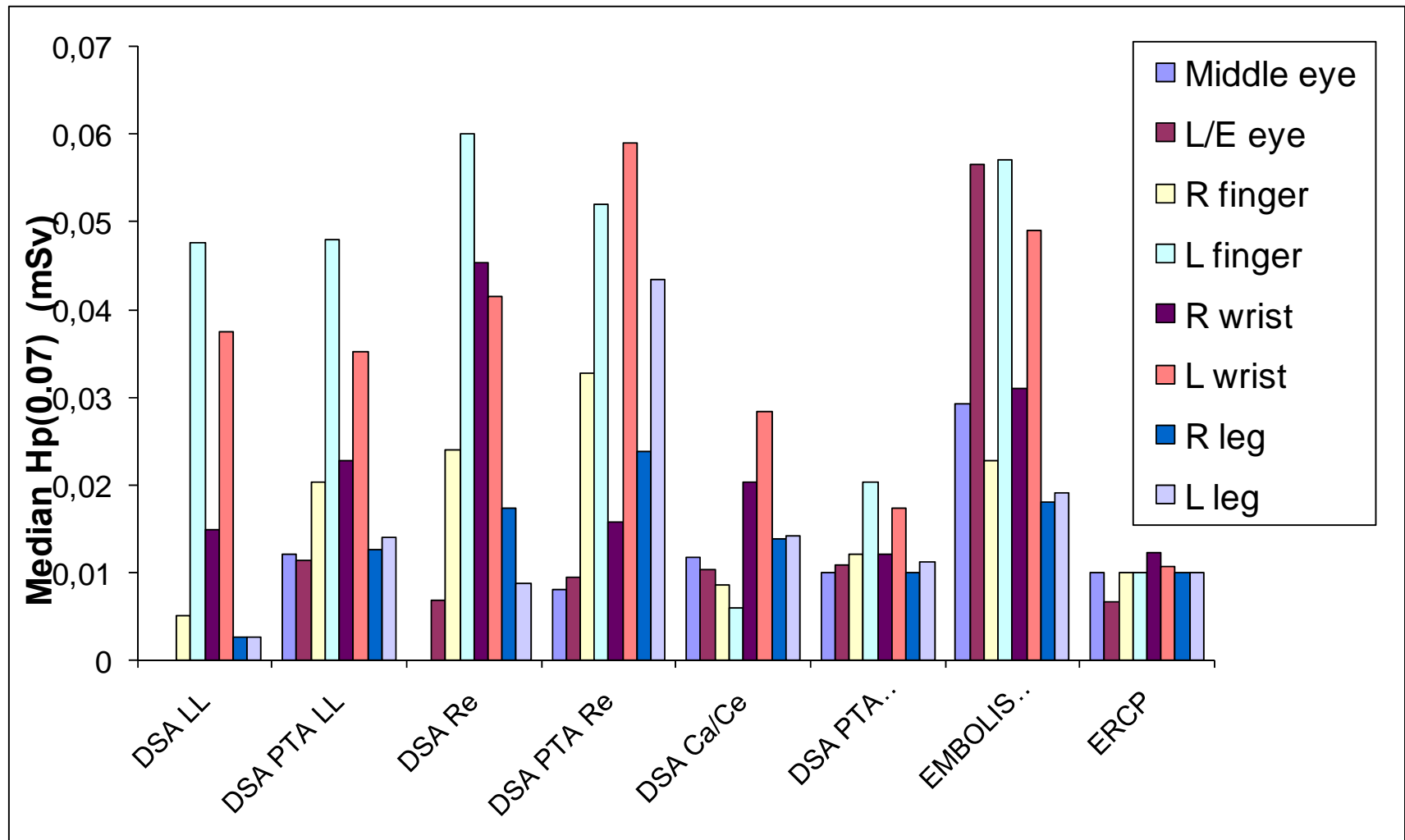
KAP VALUES FOR EMBOLISATIONS



MEDIAN $H_p(0,07)/KAP$ VALUES FOR IR PROCEDURES AND ALL DOSIMETRIC POSITIONS

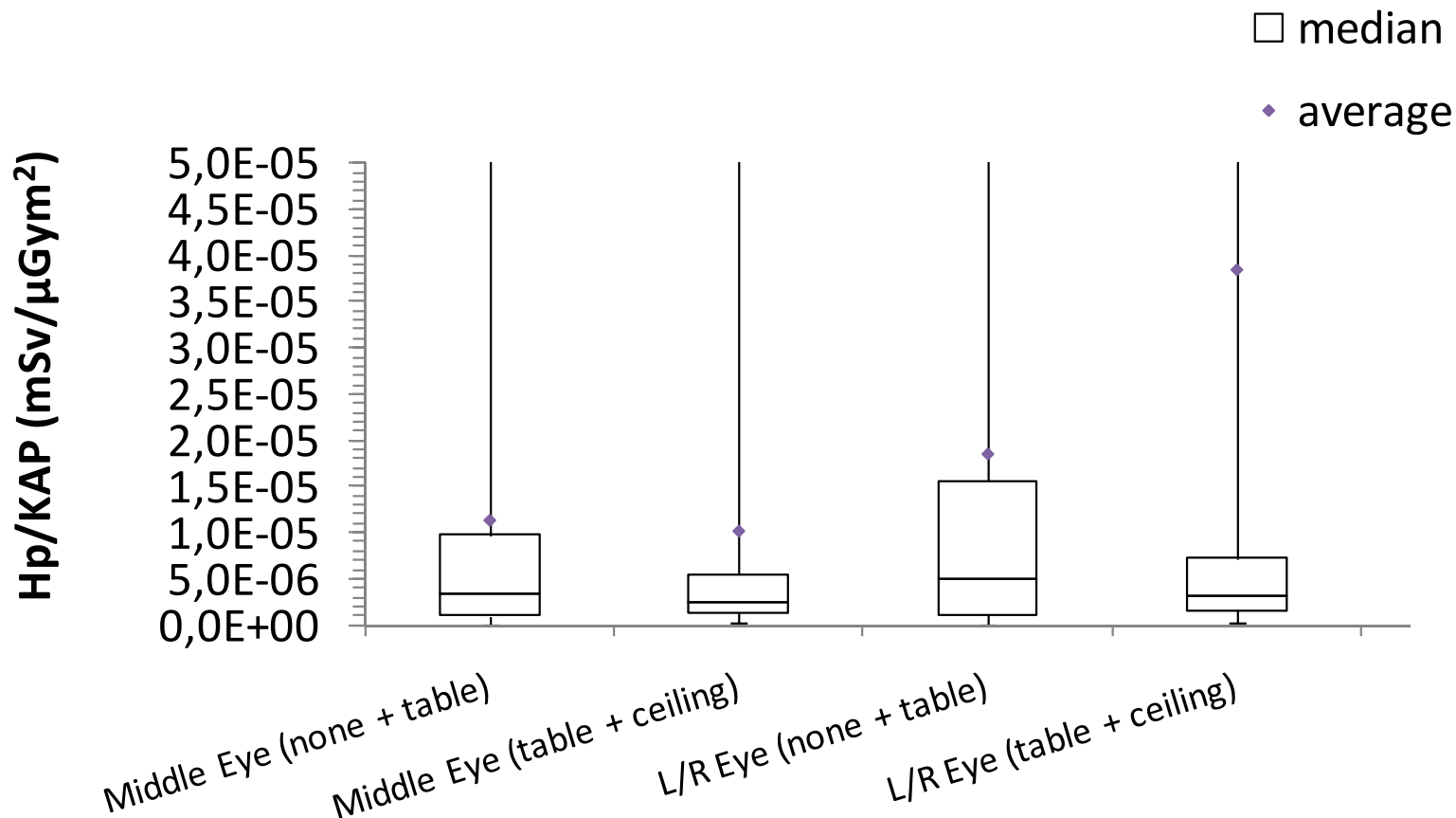


MEDIAN $H_p(0,07)$ VALUES FOR EACH IR

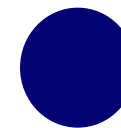


EFFECT OF ROOM PROTECTIVE EQUIPMENT

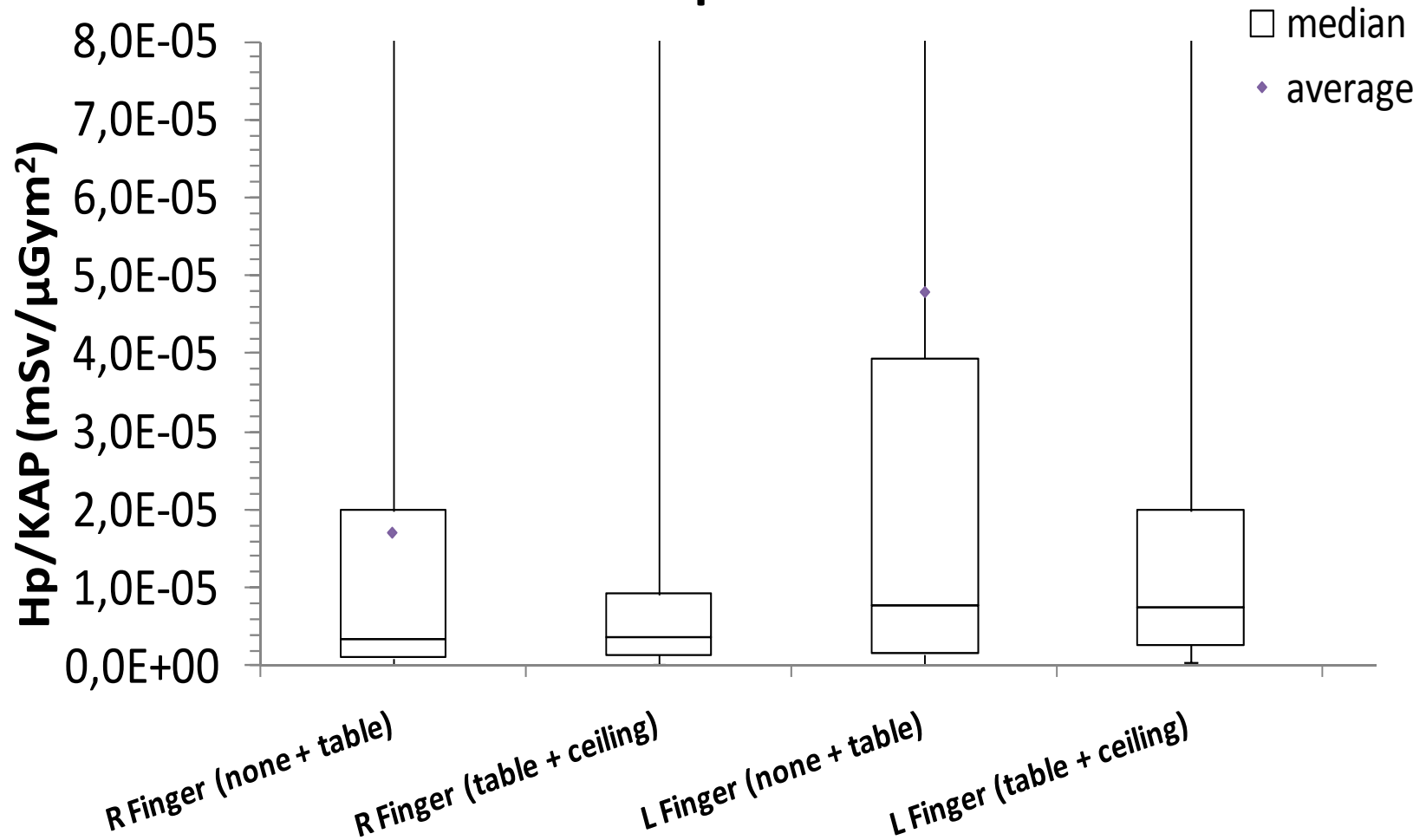
Effect of ceiling suspended shield to the **eyes** for IR procedures



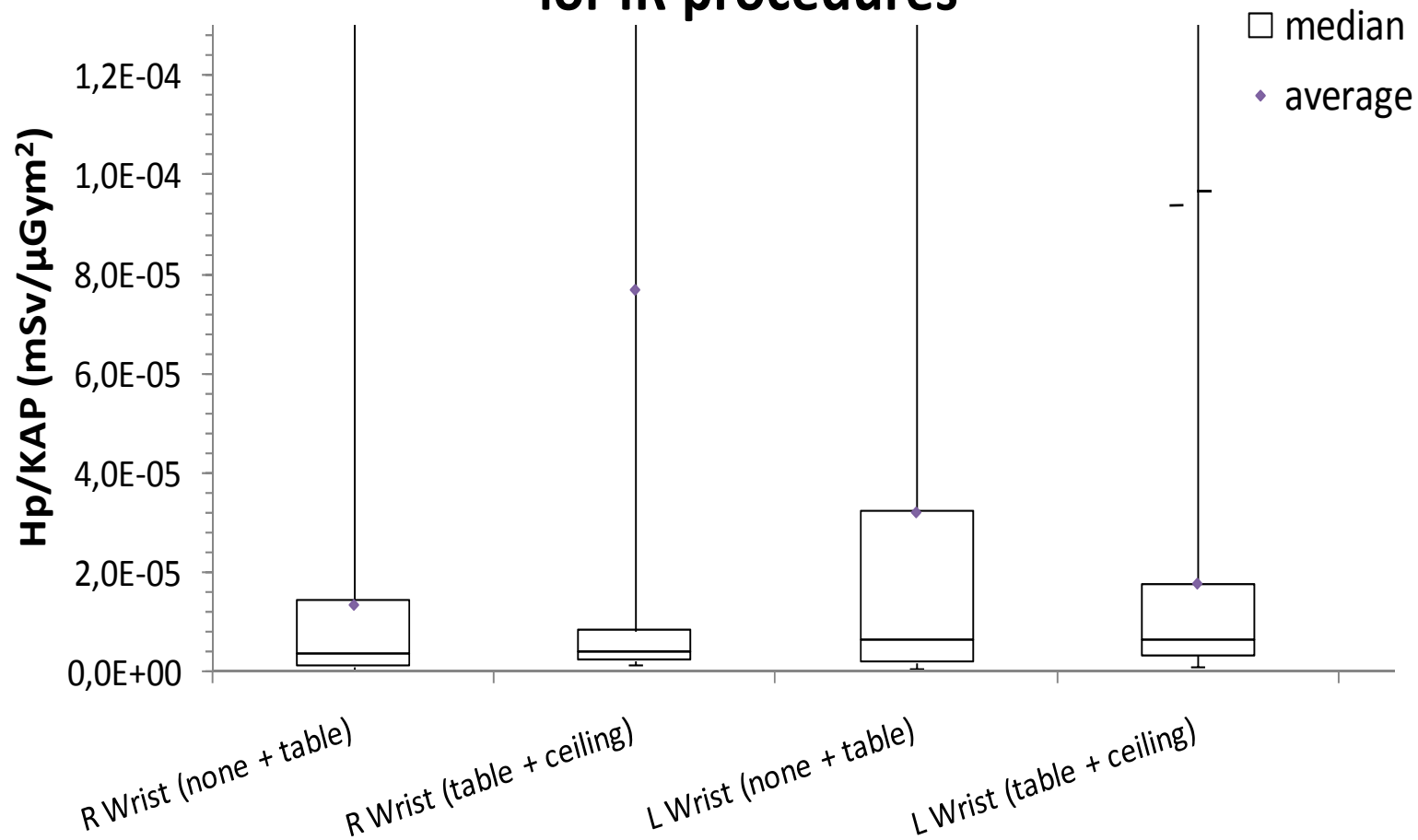
Ratio(without/with)				
M eye	L/R eye	R finger	L finger	
1,33	1,45	0,98	1,05	median



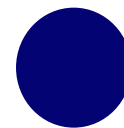
Effect of ceiling suspended shield to the fingers for IR procedures



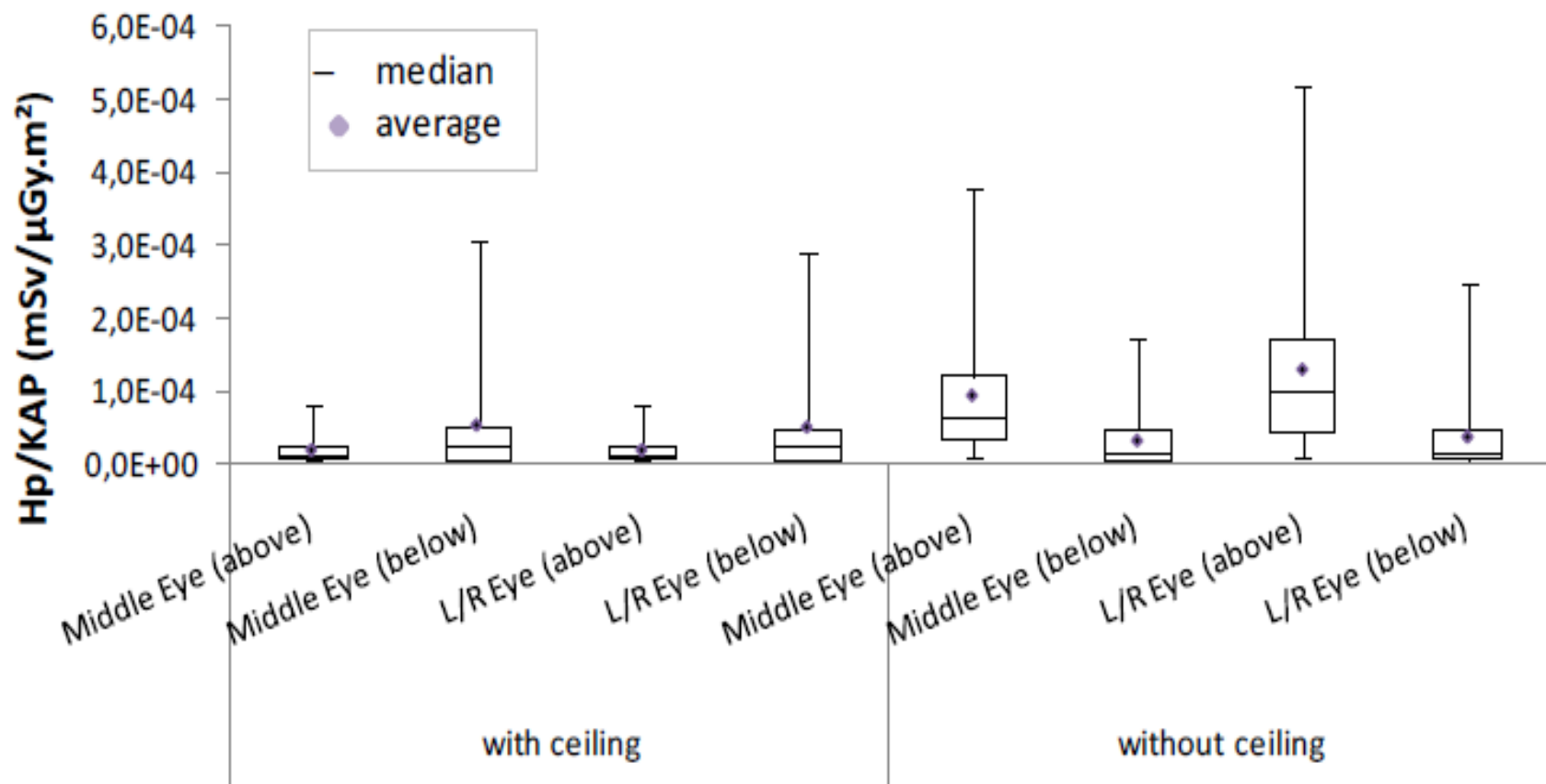
Effect of ceiling suspended shield to the wrists for IR procedures



Ratio(without/with)				
R wrist	L wrist	R leg	L leg	
0,92	0,99	4,48	6,77	median

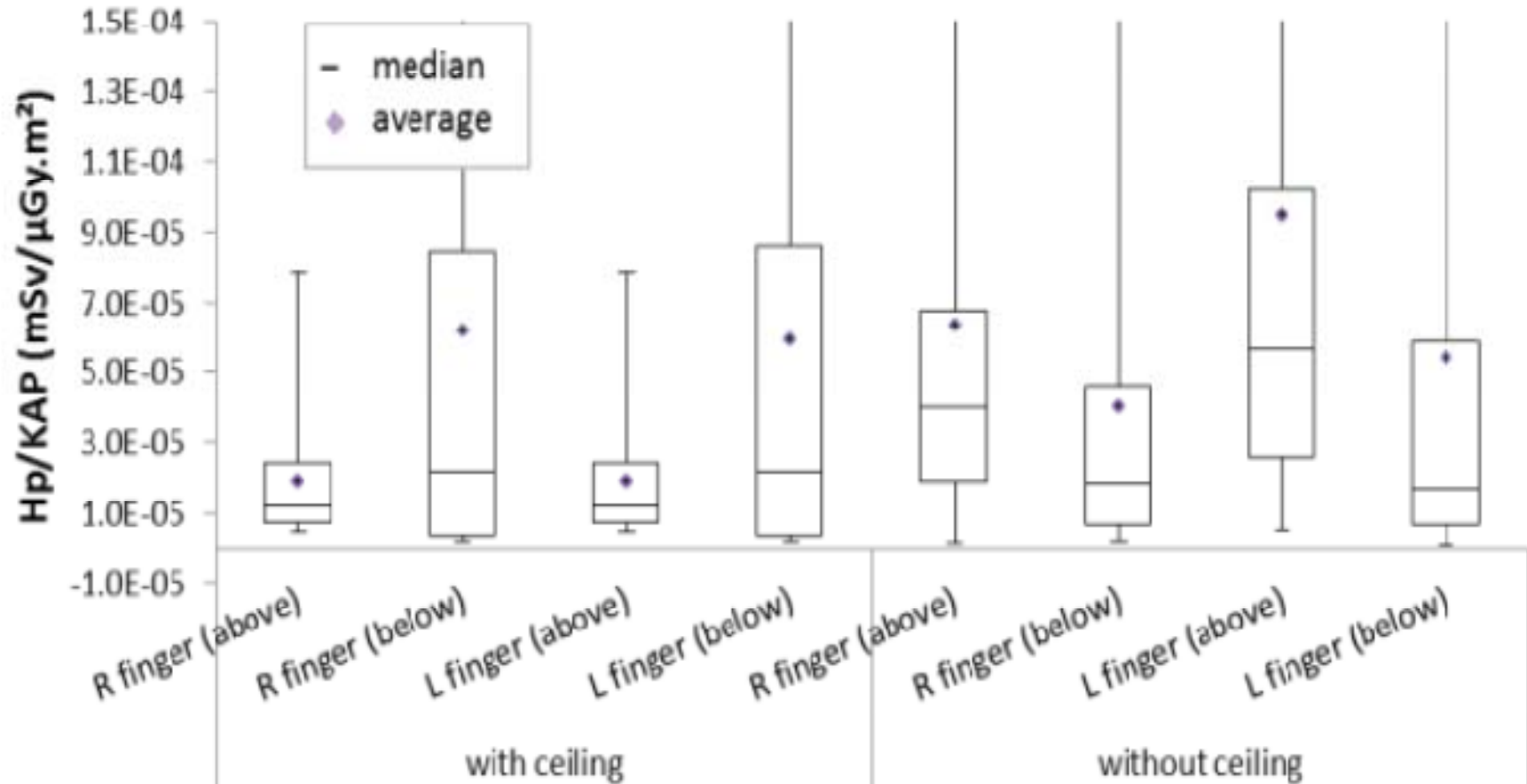


EFFECT OF TUBE CONFIGURATION FOR ERCP (EYES)



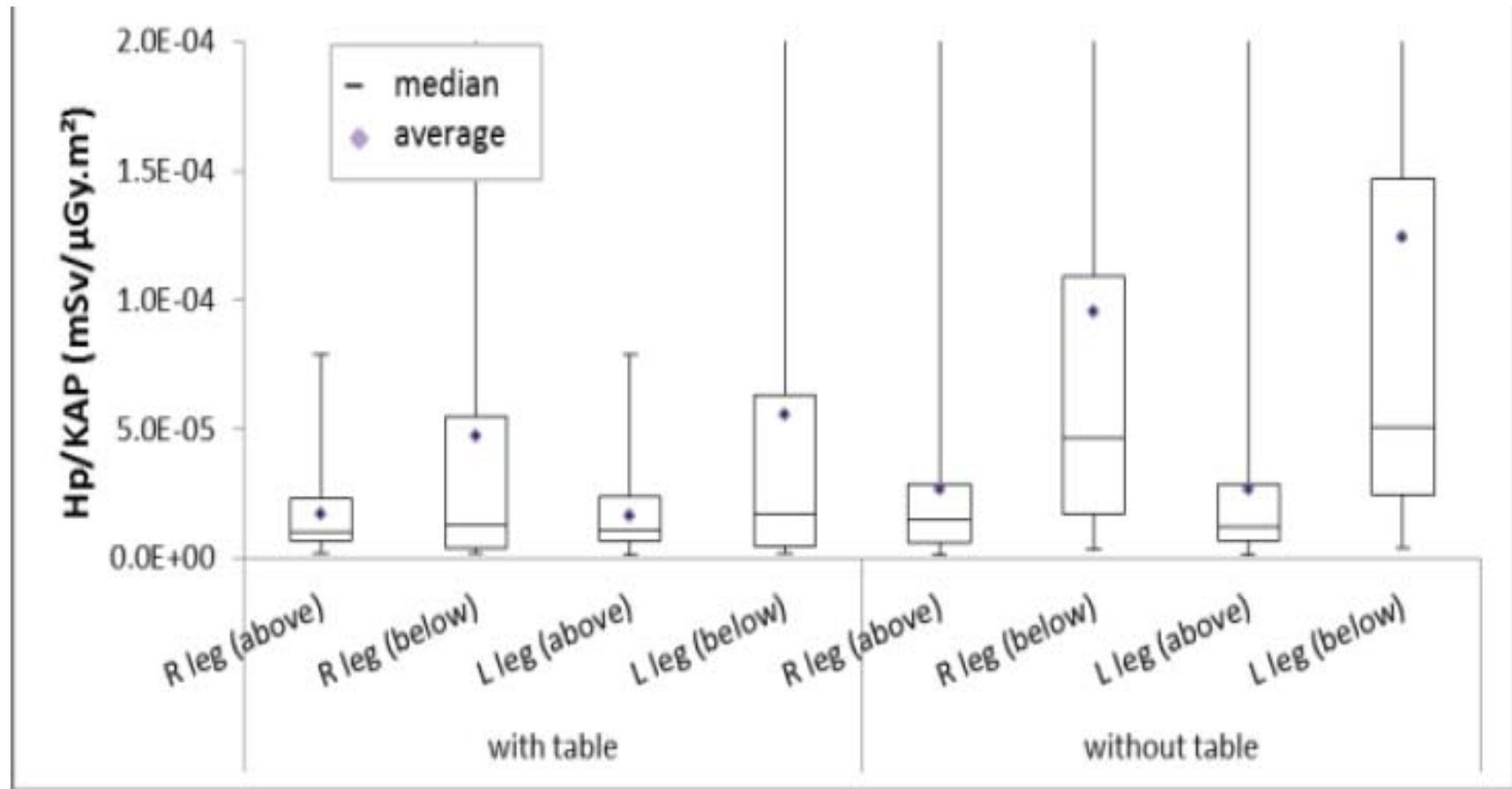
Ratio (above/below)			
with ceiling		without ceiling	
M eye	L/R eye	M eye	L/R eye
0,55	0,48	3,60	5,56

EFFECT OF TUBE CONFIGURATION FOR ERCP (FINGERS)



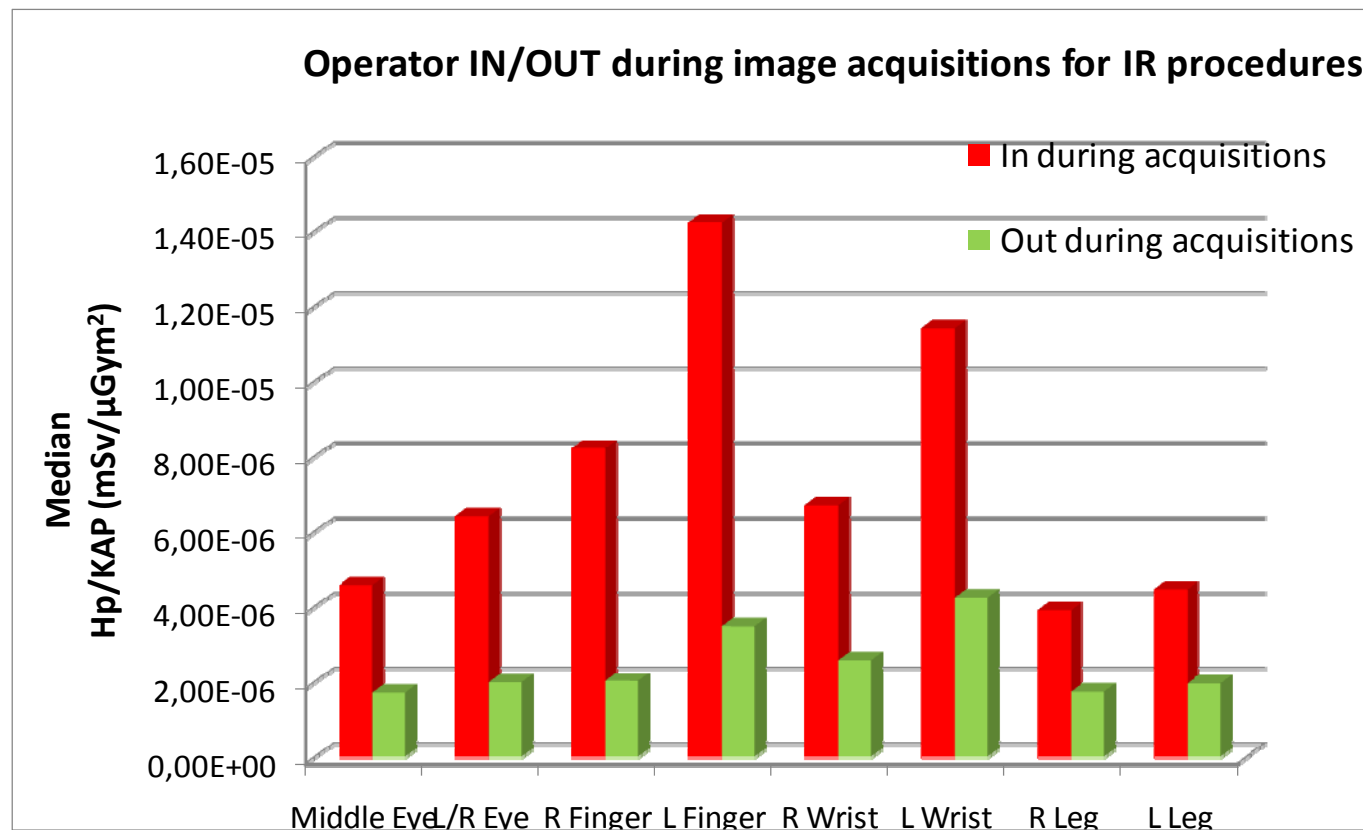
Ratio (above/below)			
with ceiling		without ceiling	
R finger	L finger	R finger	L finger
0,56	0,56	2,20	3,35

EFFECT OF TUBE CONFIGURATION FOR ERCP (LEGS)



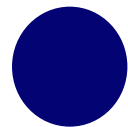
Ratio (above/below)			
with table shield		without table shield	
R leg	L leg	R leg	L leg
1,3	1,6	3,0	4,1

EFFECT OF “GOING OUT” DURING IMAGE ACQUISITION FOR IR PROCEDURES

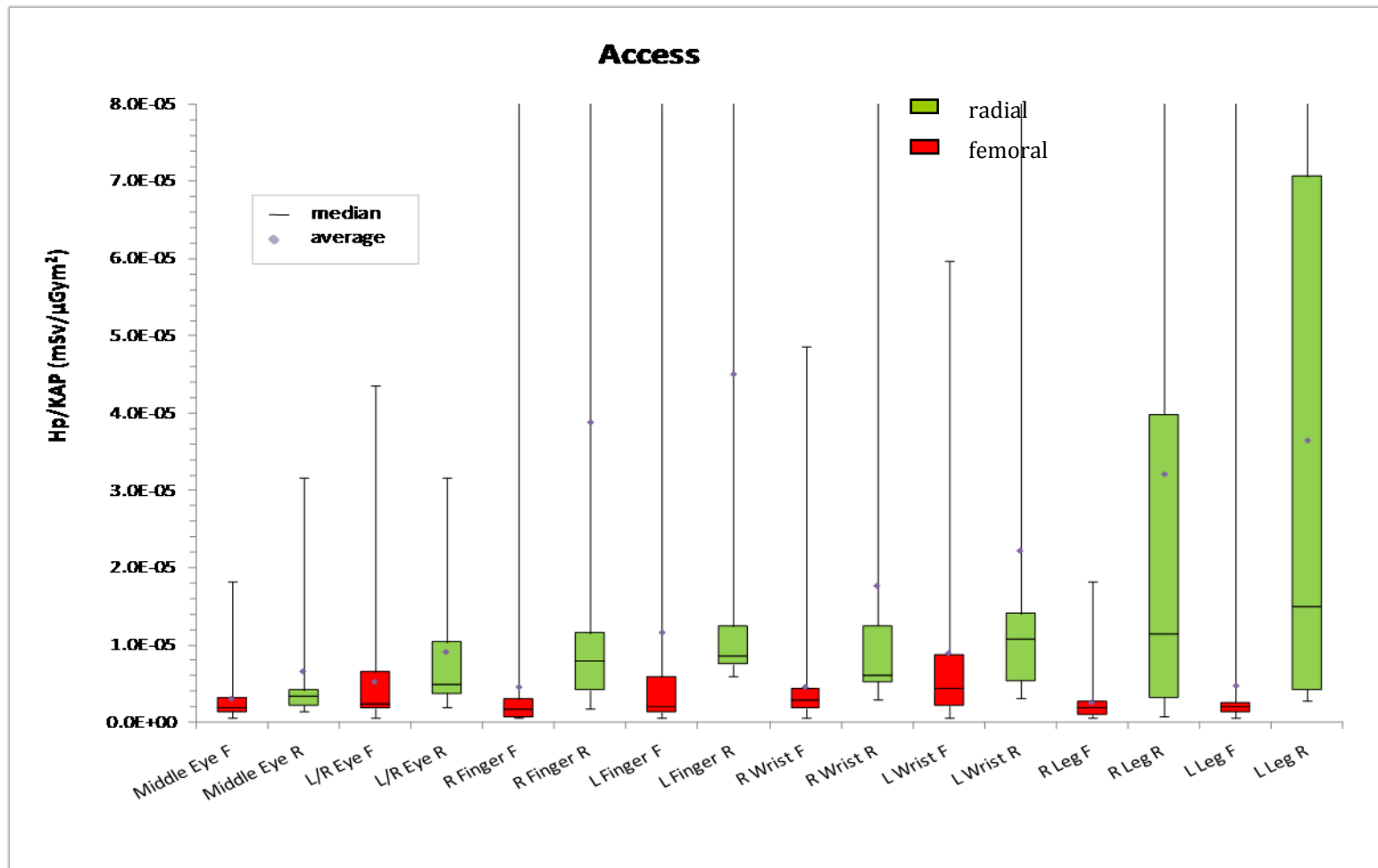


ratio (in/out)								
2,7	3,2	4,1	4,1	2,6	2,7	2,2	2,3	median

There is a significant effect of the “going out” parameter in reducing the doses in all dosimetric positions examined



EFFECT OF THE ACCESS FOR DSA PTA CA/CE

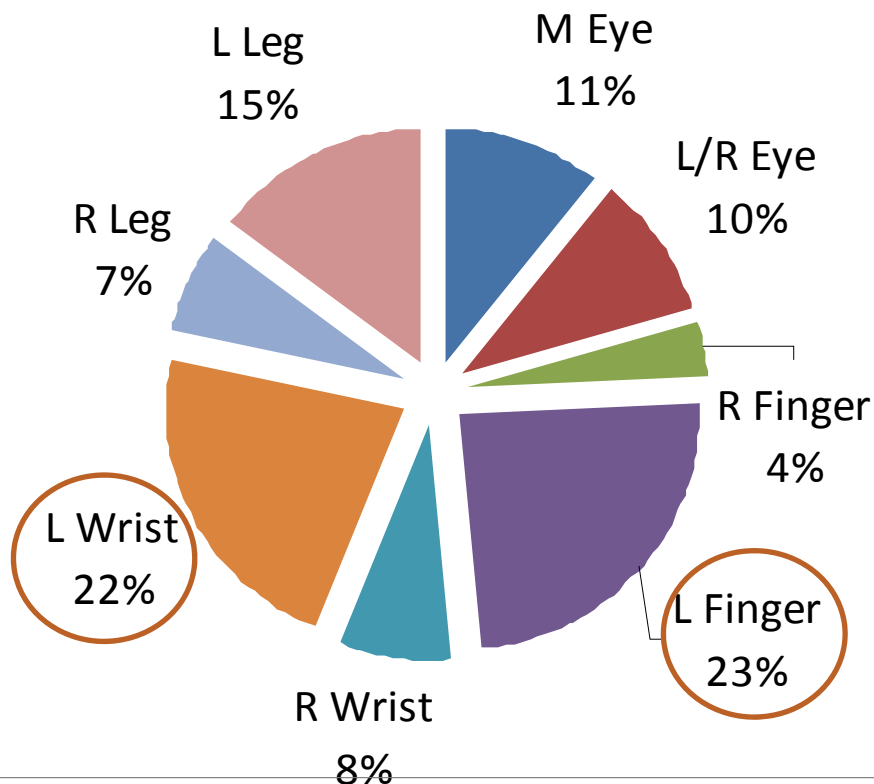


Ratio (radial/femoral)

M eye	L/R eye	R finger	L finger	R wrist	L wrist	R leg	L leg
1,78	2,00	4,54	4,39	2,04	2,42	7,48	6,22

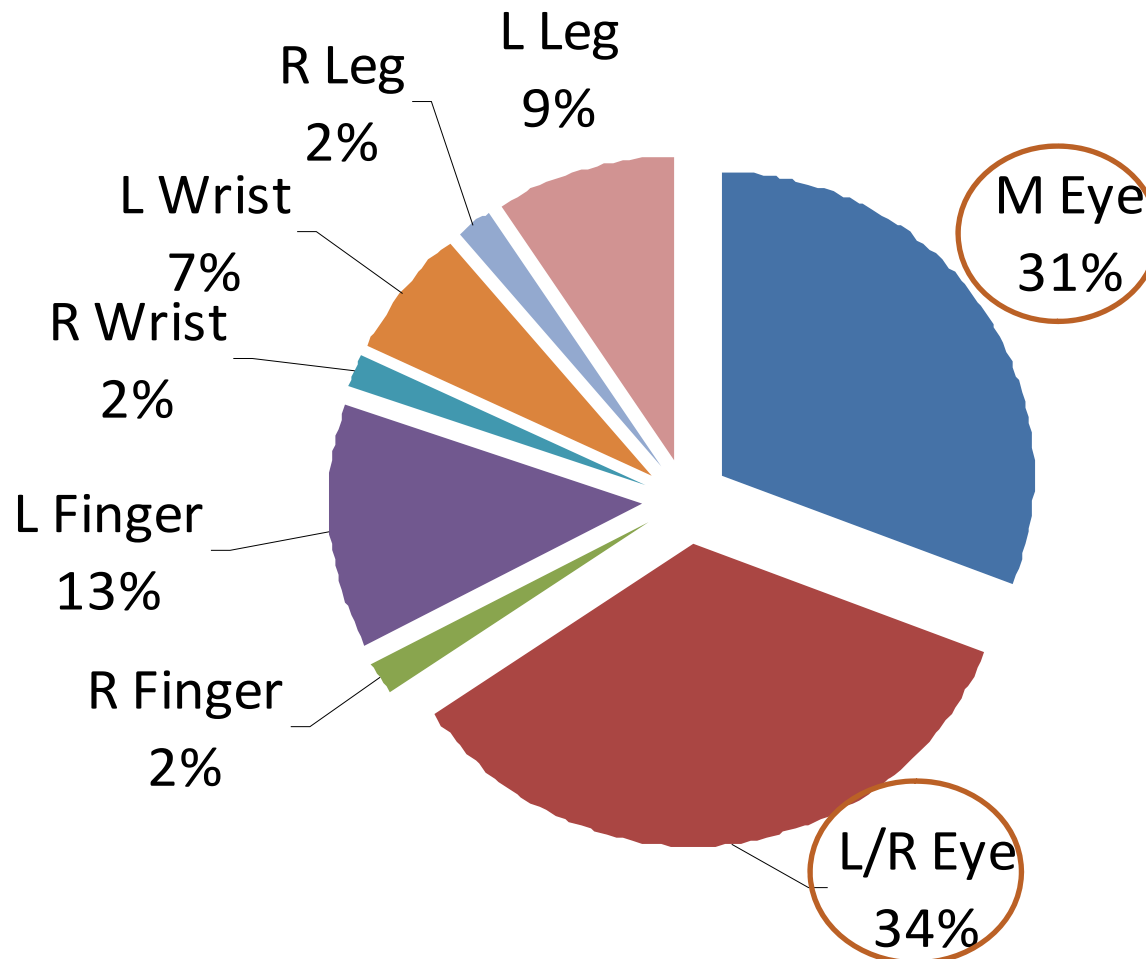
POSITION OF MAXIMUM DOSES FOR ALL IR

Position of the maximum dose in all procedures



The largest contribution to the maximum dose for all IR procedures was recorded on the *left finger and left wrist*.

POSITION OF MAXIMUM DOSES PER ANNUAL DOSE LIMITS

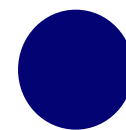


If we take into account, that the annual limit for the eye is lower than the limit for the skin and we divide the maximum doses by the respective limits, a bigger contribution of the eyes is observed

LOCATION OF MAXIMUM DOSES

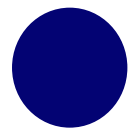
	L eye	M eye	L finger	R. finger	L wrist	Rwrist	L leg	R leg
Maximum dose mSv	4,1	3,2	7,3	0,9	9,5	1,32	7,8	2,8
out during cine	no	no	no	no	no	no	no	no
room protection	table	table	none	table	table	table	none	none
access	oral	oral	femoral	oral	femoral	oral	fermoral	oral
type of procedure	ERCP	ERCP	embol.	ERCP	embol.	ERCP	embol.	ERCP
KAP [μGym²]	11 451	11 451	19 068	7 361	74 520	11 451	270 995	18 048

maximum doses are found either when all unfavourable conditions are cumulated (during ERCP), or the KAP values are very high (embolisation)



CONCLUSION I.

- The presented results brought a lot of new informations on extremity and eye doses received by operators during IR procedures.
- The examination of various factors influencing the IR examinatonns have shown:
 - Eye doses are higher, when the tube is positioned above.
 - The effect of table shield is statistically important for reduction of leg doses.
 - Generally the doses are higher for the radial access than for femoral one. The diferences are higher when the ceiling shield is present.



CONCLUSION II.

- To define only one position where the maximum dose during IR procedure is measured is difficult, but it can be stated, that:
 - Larger contributions are found for the left finger and left wrist.
 - Taking into account that the annual limit for the eye is lower than the limit for the skin, dividing the maximum doses by the respective limits the highest values are found for the eyes.
 - The eye exposure becomes most important when personal protective equipment is not present

The study performed during ORAMED WP1 measurement campaign clearly specified the possibilities of staff doses reduction and optimisation of all parameters influencing the radiation load of operators during the chosen IR procedures .

Thank you for your attention !

