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Techniques to reduce radiation dose resulting from daily imaging guidance procedures

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Dose to patients: from MV-CBCT

2 -12 cGy depending on imaging procedures



Miften et al., Med Phys, 34, 3760-3767, 2007

Tomo MVCT dose at the center of a 30 cm water phantom dependency on acquisition protocols				
MVCT in Tomo				
Acquisition mode	dose (cGy)			
Fine pitch (4mm couch travel/rotation)	2.5 cGy			
Normal pitch (8mm couch travel/rotation)	1.2 cGy			
Coarse pitch (12mm couch travel/rotation)	0.8 cGy			
Courtesy of Edward Chao, Accuray Incorporated	d and T. Rock Mackie, UW, Madison, WI			











Which procedure has lowest dose?			
20%	1.	MV portal imaging	
20%	2.	MVCT	
20%	3.	kV radiograph	
20%	4.	kV-CBCT	
20%	5.	MV-CBCT	
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Methods of accounting for the imaging doses

- Patient specific imaging dose calculations
 - Advantages:
 - Individual patient CT based image dose calculation
 - · Accurate organ dose calculations from image procedures
 - Disadvantages:
 - Require patient CT based image dose calculation
 - · Limitations of implementation in treatment planning system
 - Requires additional imaging beam configuration in a commercial treatment planning system
 - Inaccuracy of model-base dose calculations algorithm for kV beams





Summery Managing imaging guidance dose to patients Use x-ray imaging efficiently: Choose the procedure and the frequency suitable for the purpose Use available techniques to reduce dose to organs at risks kV-imaging dose is much lower than MV imaging dose Document and account for imaging dose to organs Patient specific imaging dose calculations, Non-patient specific imaging dose estimations AAPM TG-180