

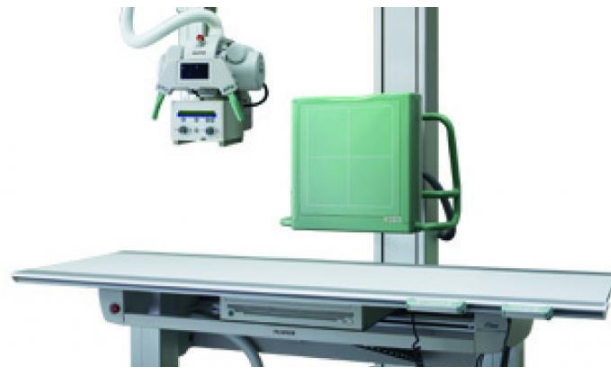
Dose from tomosynthesis of the bony anatomy

Comparison with digital radiography and CT

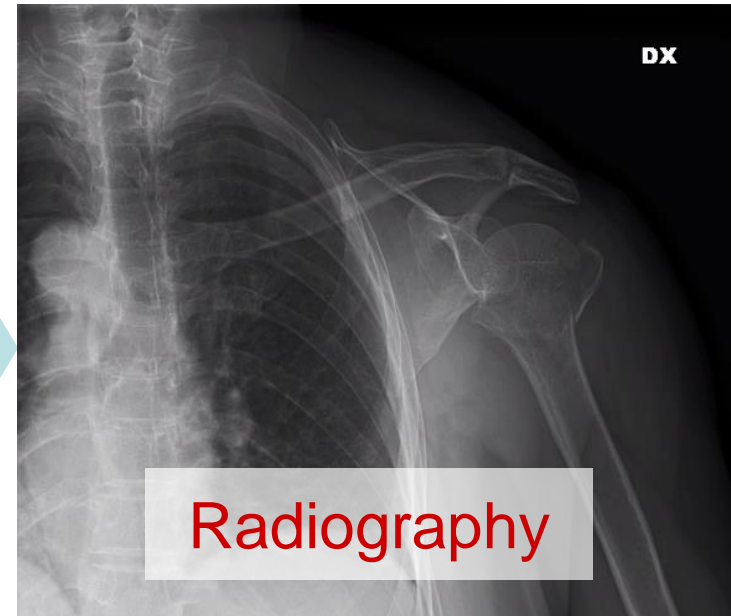
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Introduction



FujiFilm FDR AcSelerate



Radiography

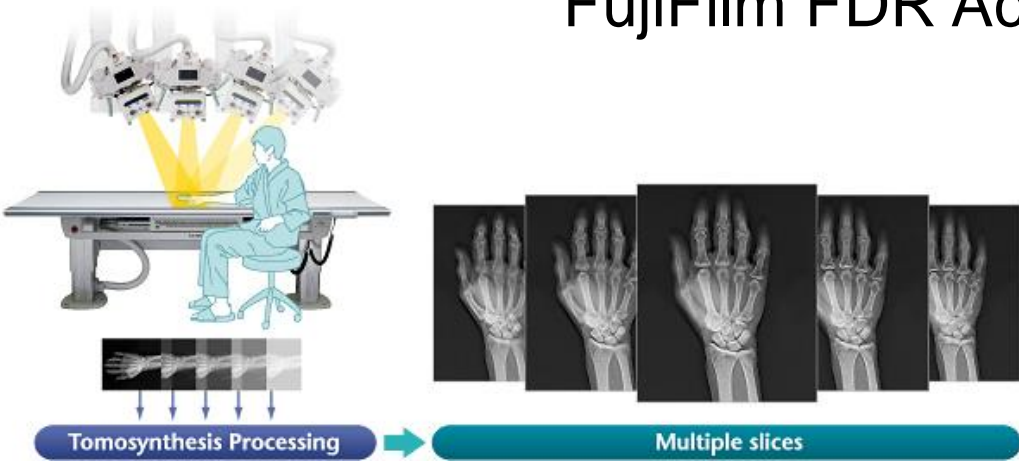
Radiography major **limitation**:

overlying projected anatomy

Possible solutions - 1

Tomosynthesis

FujiFilm FDR AcSelerate



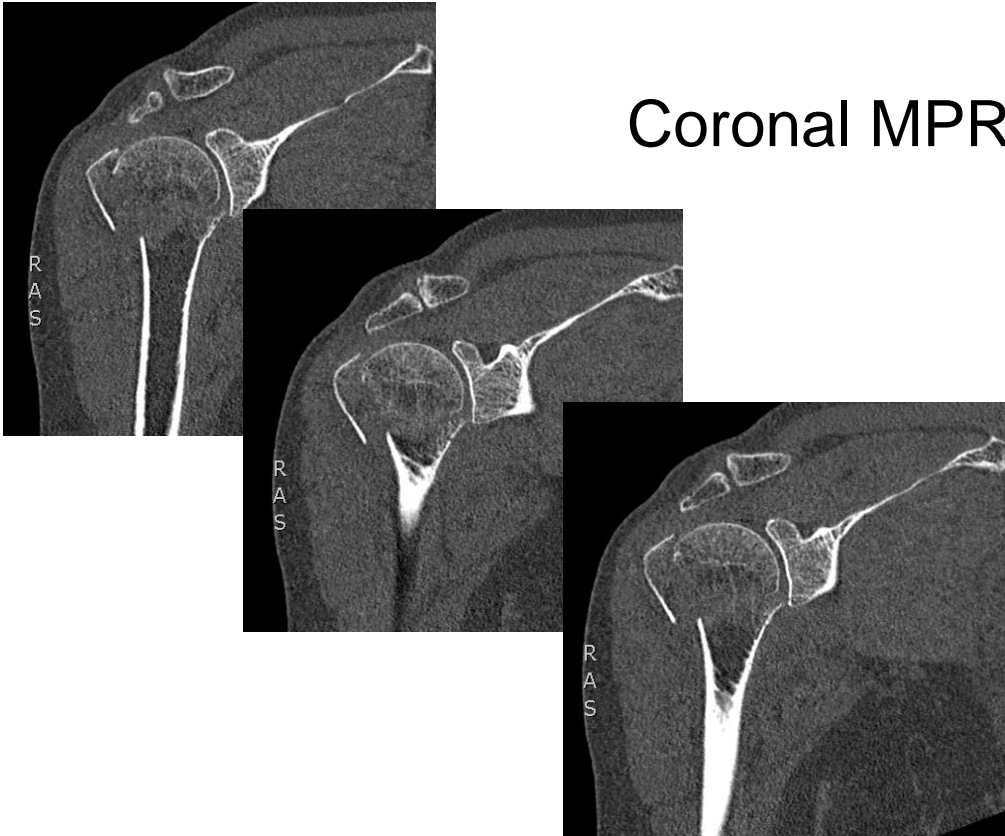
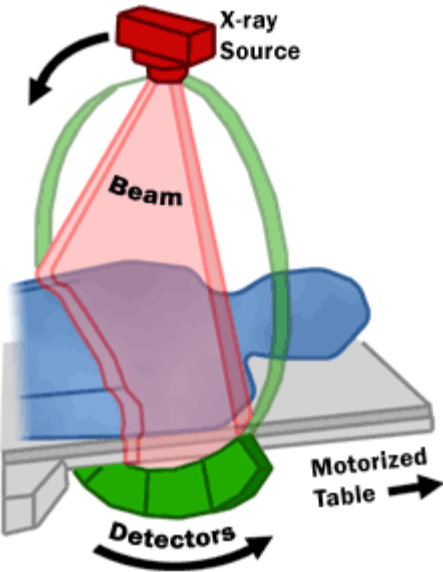
Available configurations

scan time (s)	Number of projections	Scan angle (α deg)			
		20	30	40	60
4	20	✓	✓	✓	
6	30		✓	✓	
8	40			✓	✓
9	45			✓	✓
12	60				✓

Possible solutions - 2

Computed tomography (CT)

Siemens Somatom Definition





Purpose



Evaluate and compare radiation **dose** to organs and effective dose from:

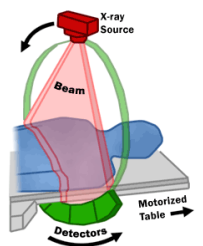
1. Radiography



2. Tomosynthesis

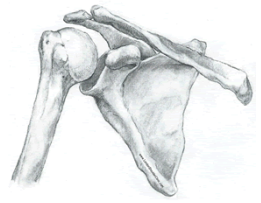


3. CT



In **bony anatomy** examination of

1. Shoulder



2. Hip



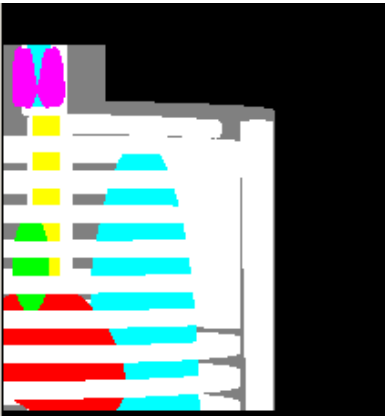
3. Lumbar spine



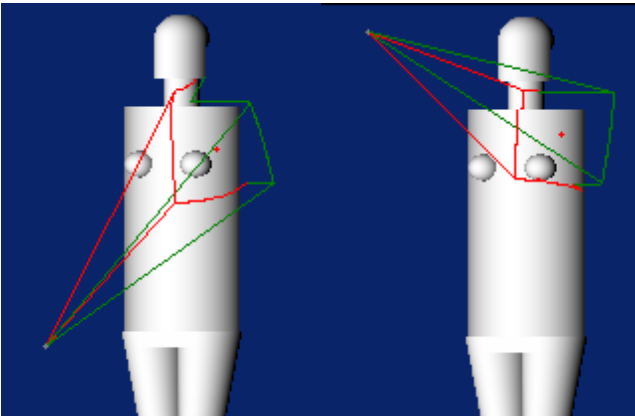
Method

Simulation of the exams with software for organ dose estimation

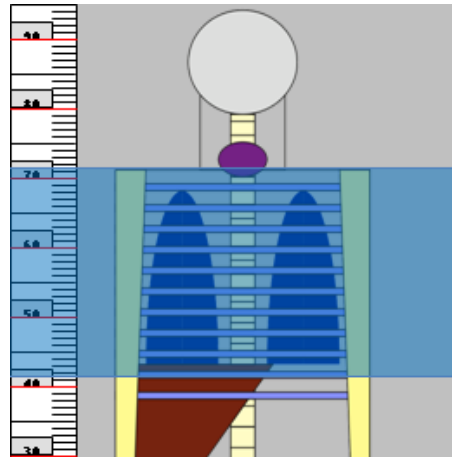
Radiography
PCXMC 2.0



Tomosynthesis
PCXMC20Rotation



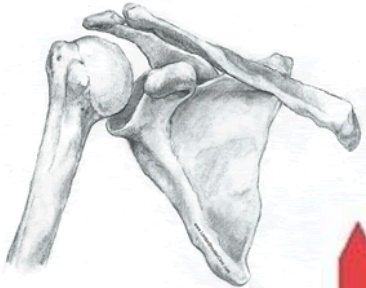
CT
CT-Expo



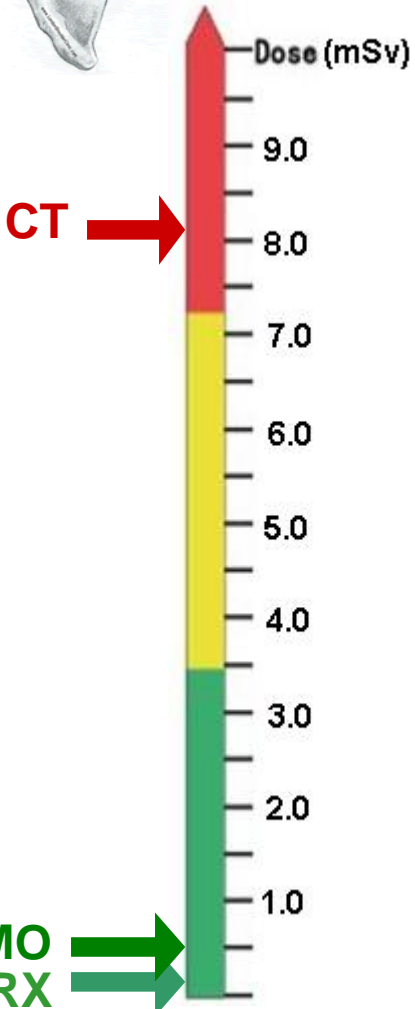


Radiation Dose

Results Shoulder



Radiography		Tomosynthesis		CT	
mAs	25	mAs/proj	4	mAs	230 (M)
kVp	75	kVp	65	mAs	170 (F)
FID (cm)	140	FID	130	kVp	120
		Total angle (°)	60	collimation (mm)	19.2
		Number of proj	60	pitch	0.9
ESAK (mGy)	0.87	ESAK (mGy)	3.8	nCTDIvol (mGy/100mAs)	8.5



Equivalent dose (mSv)			
	RX	TOMO	CT
Lung	0.16	0.70	20
Breast (F)	0.46	2.10	20
Thyroid	0.74	0.24	18
Effective dose (mSv)	0.13	0.40	8.2

* The effective dose is obtained as a weighted sum of sex-averaged organ doses



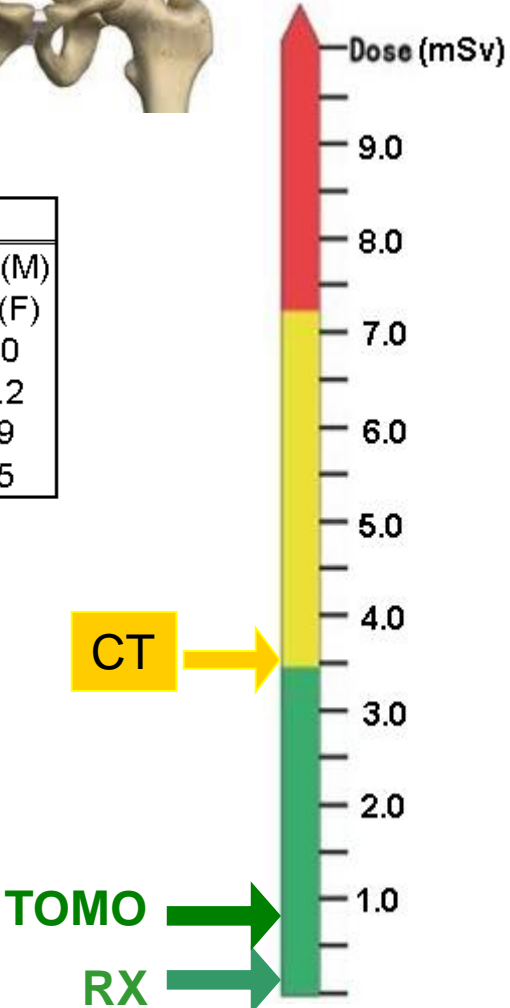
Radiation Dose

Results Hip



Radiography		Tomosynthesis		CT	
mAs	19	mAs/proj	5	mAs	120 (M) 105 (F)
kVp	70	kVp	80	kVp	120
FID (cm)	140	FID	130	collimation (mm)	19.2
		Total angle (°)	60	pitch	0.9
		Number of proj	60	nCTDIvol (mGy/100mAs)	8.5
ESAK (mGy)	0.65	ESAK (mGy)	3.6		

	Equivalent dose (mSv)		
	RX	TOMO	CT
Gonads	0.70 (M) 0.10 (F)	6.7 (M) 1.8 (F)	15.4 (M) 10.3 (F)
Colon	0.10	1.2	9
Uterus (F)	0.15	2.6	12.4
Effective dose (mSv)	0.05	0.77	3.6



* The effective dose is obtained as a weighted sum of sex-averaged organ doses

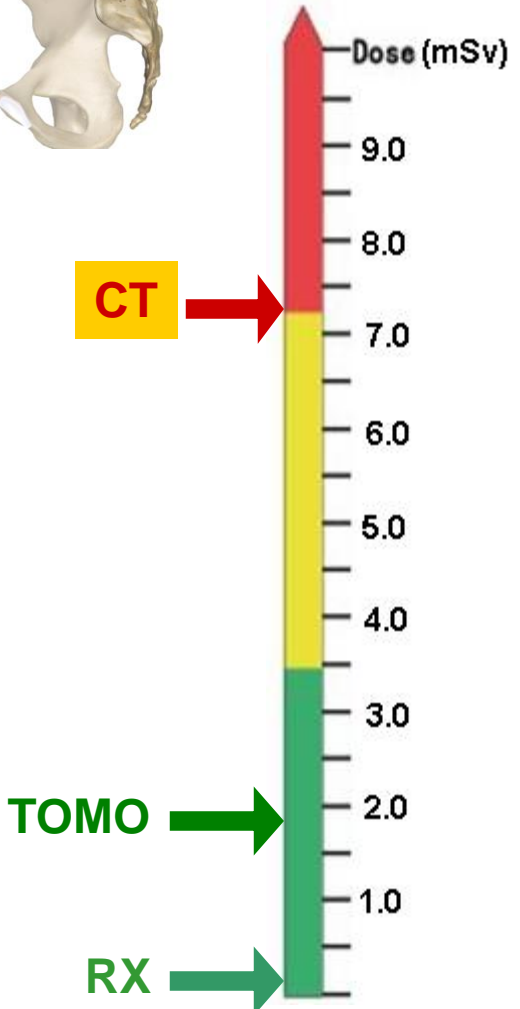


Radiation Dose Results Lumbar Spine



Radiography		Tomosynthesis		CT	
mAs	40	mAs/proj	12.5	mAs	220
kVp	85	kVp	100	kVp	120
FID (cm)	120	FID	130	collimation (mm)	19.2
		Total angle (°)	40	pitch	1
		Number of proj	45		
ESAK (mGy)	5.0	ESAK (mGy)	30.4	nCTDIvol (mGy/100mAs)	7.6

Equivalent dose (mSv)			
	RX	TOMO	CT
Gonads	0.50 (M) 0.30 (F)	2.70 (M) 5.80 (F)	0.70 (M) 16.7 (F)
Colon	0.26	5.3	15
Uterus (F)	0.42	4.9	19.7
Effective dose (mSv)	0.11	1.75	7.6



* The effective dose is obtained as a weighted sum of sex-averaged organ doses

Conclusions

Dosimetry is one of the factors that need to be evaluated before the prescription of a diagnostic radiological procedure.

With the parameters simulated in this study, **dose from tomosynthesis is lower (1/4 or less) than dose from CT** and higher (2 to 10 times) than dose from radiography both for the thoracic district and the abdominopelvic one.

