Dose in neonatal thorax X-Ray.
Test of electrodes with different exposure parameters.

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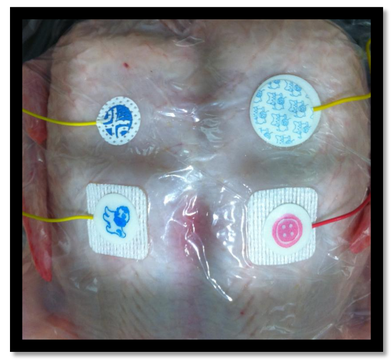
Introduction

In connection with our use of various electrodes for neonatal patients, we have learned that the degree of translucency of electrodes for a plain x-ray of the thorax varies between and within countries. As different hospitals in Europe, e.g. Germany and Spain, use different exposure values compared to Denmark. We decided to examine electrode translucency as a function of exposure values and dose.



Chicken Phantom with Ambu, KityKat, Tyco and 3M electrodes

Main questions

- How does the different exposures influence the dose?
- How does different exposures influence electrode translucency?

Methods

We performed the test on a 1700 gram chicken using the same equipment as we use for the neonatal chest exams. Reasons for using a chicken is that it gives a realistic image of the electrodes in relation to different tissue structures.

Apparatus:	Siemens Mobil Plus
Focus:	0,8
Filtering:	3,25 mm Al
Focus–Film distance:	1 m
Field:	9 × 10 cm
Phantom:	Chicken 1700 gram
Electrode:	7 various electrodes
CR plate:	Fuji IP Cassette Type C
CR Philips PCR Eleva Image Processing:	UNIQUE

	kV	mAs	µGy
Spain 1	48	0,80	8,8
Germany 1	50	1,60	20,5
Spain 2	55	1,60	28,0
Denmark 1	70	0,63	21,8
Denmark 2	77	0,63	27,8

Exposure parameters and dose with the apparatus specific mAs Characteristic Adjusted with backscatter factor BSF.

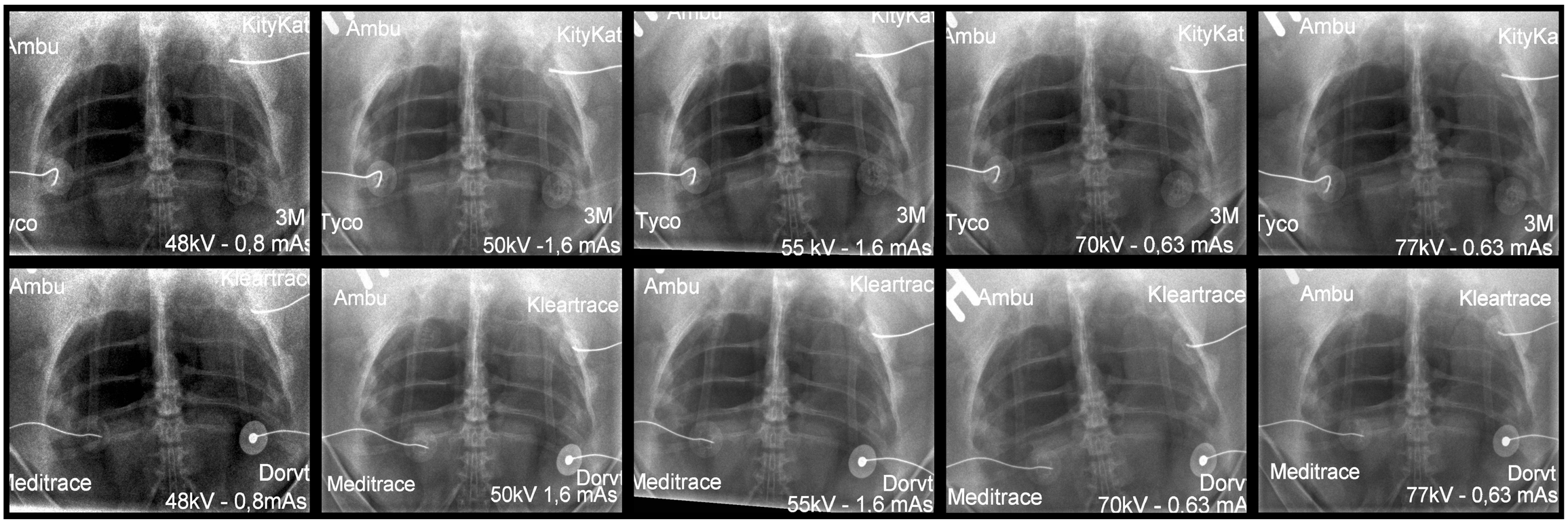
Results

To calculate the estimated dose we measured the dose mAs characteristic for the specific apparatus used for the test.
According to the Finnish organ dose program ”PCXMC Dose Calculation” the dose for the following exposures will be:

55 kV – 1,60 mAs Thyroid 5.5 nGy Effective dose 20.3 µSv
77 kV – 0,63 mAs Thyroid 4.6 nGy Effective dose 22.6 µSv

Conclusion

According to the ALARA principle there is a slight advantage in using 77kV - 0,63 mAs compared to 55kV -1,60 mAs in the form regarding the dose to the thyroid.
When increasing kV and lowering the mAs we observed a decrease in the dose to the thyroid and a slight increase in the image quality. However the effective dose to the patient is slightly higher.
The benefit of having a translucent electrode can be discussed but you have to be sure that the electrode is not misinterpreted as an abnormality due to lower voltages.
Some of the electrode appear to be slightly more opaque with the lower kV and might be mistaken as disease in the thorax.



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