

## Abstract

Annual Meeting of The European Association of Nuclear Medicine,

Helsinki, September 2004

### ***Assessment of Fetal Risk from Sentinel Node (SN) Examinations in Pregnant Women***

Klausen TL, Chakera AH, Hesse B, Holm S.

Dept. Nucl. Med., Rigshospitalet, DENMARK

**Aim:** of the present study was to estimate radiation doses and associated fetal risks from SN examinations in pregnant women with melanoma (MM) or breast cancer.

**Methods:** Radiation doses to the fetus from peritumoral, subcutaneous, or intradermal administration of  $^{99m}\text{Tc}$ -albumin colloid were calculated for various distances from injection site, assuming the attenuation coefficient of absorbing media between injection site and the fetus to be that of water:  $0.1536\text{ cm}^{-1}$  at 140 keV. The risk of radiation induced fatal cancer in the fetus is assumed to be  $15 \cdot 10^{-5}$  / mSv (ICRP), the risk of genetic damage significantly lower. The risk of fetal organ damage is less well known, generally thought to be associated with a threshold value, although some studies/reviews indicate no threshold. Nearly all injected activity remains close to the injection site within 24 h, the activity is therefore considered a point source.

**Results:** The fetal radiation dose is 22, 2.6, and  $0.14\text{ }\mu\text{Sv}/\text{MBq}$  at a distance of 5, 10, and 20 cm, respectively. With an injected activity of 40 MBq the risk of fatal cancer for the three distances are  $1.3 \cdot 10^{-2}\%$ ,  $1.5 \cdot 10^{-3}\%$  and  $8 \cdot 10^{-5}\%$ , the genetic damage less frequent. The risk of fetal malformations is most likely zero with a threshold higher than that likely to be attained. Other risks such as pre-implantation or post-implantation death are all associated with threshold values also higher than the radiation doses mentioned above.

**Discussion:** The risk of fetal damage associated with SN procedures in MMs in extremities and head-neck region and in breast cancer is considered negligible with an injected activity  $\leq 40\text{ MBq}$ . Though the risk of fatal cancer is higher for SN procedures in MM closer to the fetus it is still very low. A small risk of malformations may exist. However, injecting  $<40\text{ MBq}$  seems acceptable in all cases, and a 1-day injection-scintigraphy-operation protocol will maintain high sensitivity of SN examinations<sup>1</sup>.

**Conclusion:** With injected activity  $< 40\text{ MBq}$  and a 1-day protocol for SN procedures the risk of fetal radiation damage will be similar to or less than that accepted with other diagnostic nuclear medicine procedures performed in pregnant women. Further the dose to the fetus is below the limits that apply to a pregnant radiation worker, and below the annual dose limit for the general public.

<sup>1</sup>) Chakera AH, Drzewiecki KT, Ravn Juhl B, Eigtved A. Sentinel node biopsy for malignant melanoma; a study of 241 patients. *Melanoma Res* 2004 Dec;14(6):521-6.