

Preliminary study of dose estimation using fingernail/EPR and OSL method

Choi Hoon, Byeong Ryong Park, Il Nam Hyun, Byung Il Lee, Young Khi Lim

Radiation Health Research Institute
388-1, Ssang moon Dong, Do Bong Gu, Seoul, KOREA(132-703)

1. Introduction

- EPR dosimetry methods studied for a part of human body and personal belongings like fingernails, teeth, glass of mobile phone.
- Dosimetry using a part of human body contain critical weak points, in case of fingernails, like showing complex signals from cutting process and on fading time.
- Thus, one method for dose assessment is easily lack of credibility and reliability to sure exact exposed dose of radiation patients

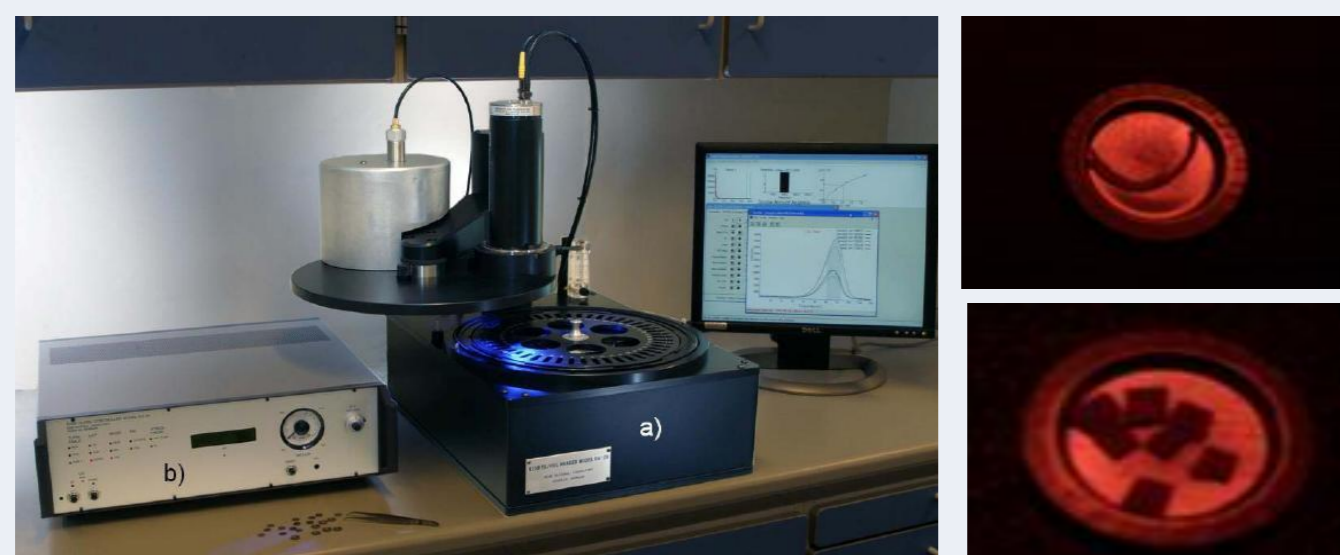
- Secondary method using same sample can give more reliable result than other methods so, in this study, we tried same fingernail samples for dosimetry using OSL(Optically Stimulated Luminescence) method
- As pilot study, using samples from male volunteers, fading test and bleaching test was done by RISO(Denmark) OSL system

2. Objectives

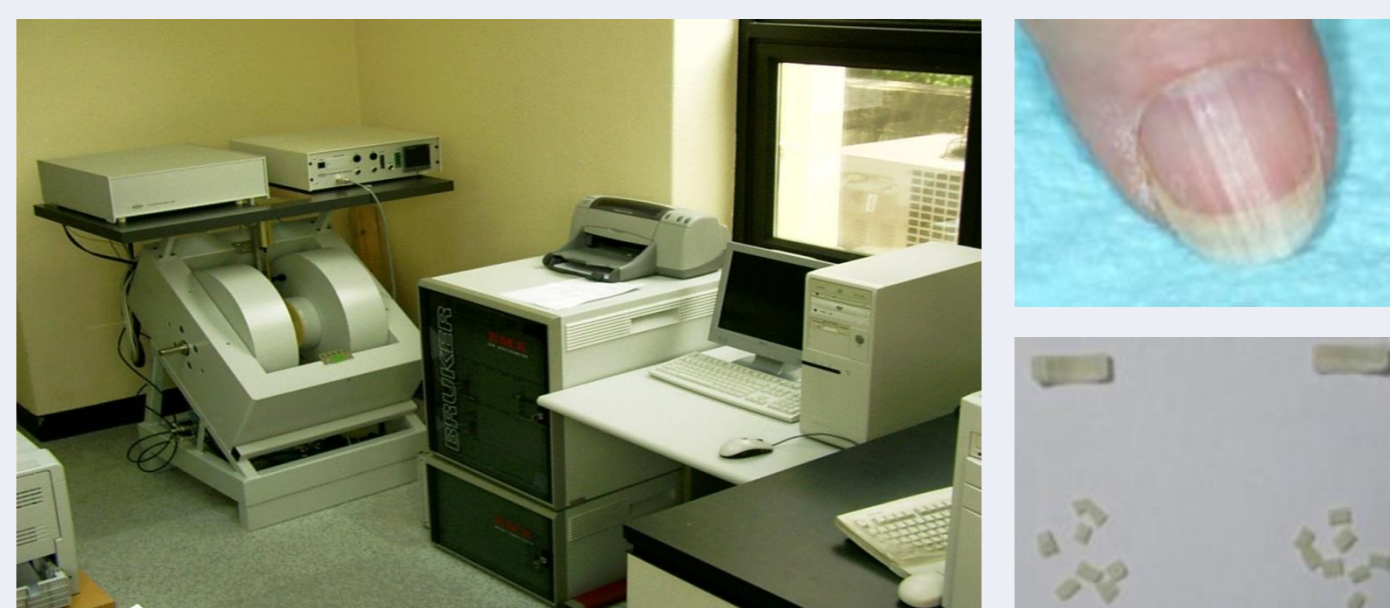
- For using OSL dosimetry method, fading and bleaching characteristics of some samples like fingernail, toenail and teeth are problems
- Critical problems for each dosimetry method shall be tested for application
- Practical possibility of different dose estimation methods for real situation shall be discussed

3. Methods

- OSL(Optically Stimulated Luminescence) system using green and blue LED
- Fingernail clippings was experimented

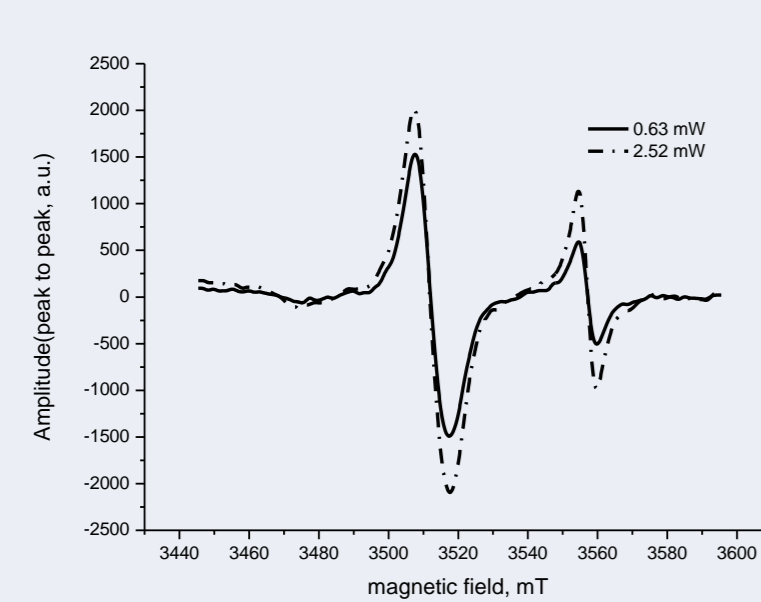


- EPR(Electron Paramagnetic Resonance) spectrometer using fingernail was also used

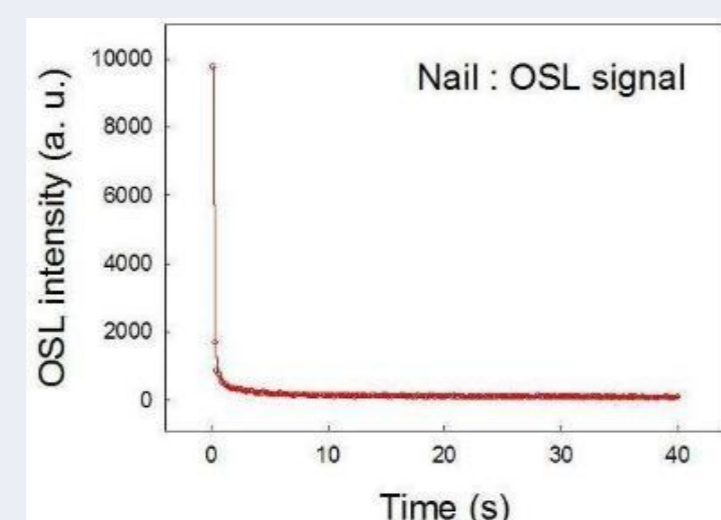


- Fingernail samples from same volunteers were used for experiment EPR and OSL
- Sample was cutting at 1mm wide and 2mm long size for EPR system and fingernail and toenail samples for OSL were cut into smaller size for signal fading test
- All nail samples were dried for 72 hours at dehumidify system to enhance signals

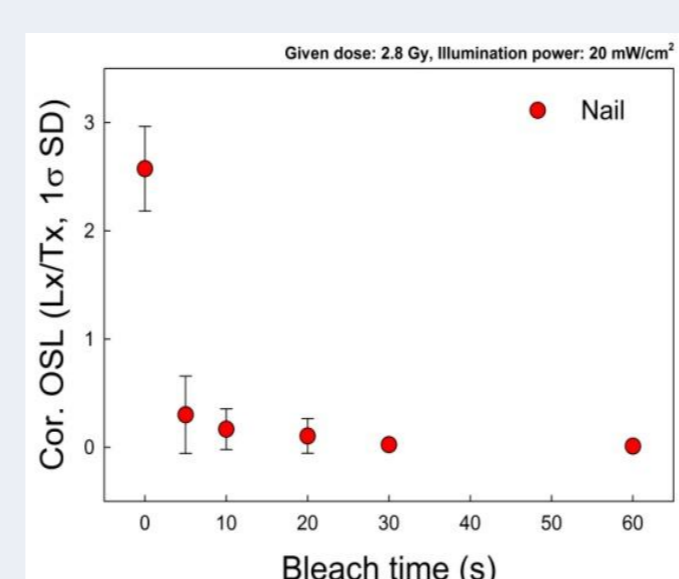
4. Results



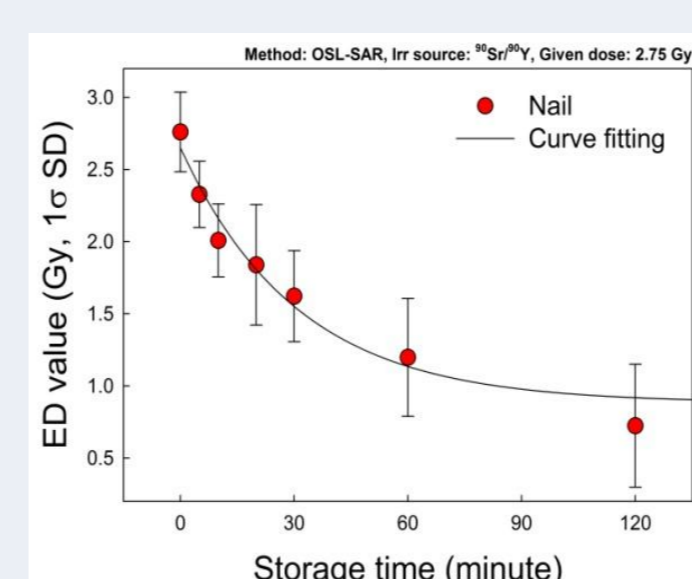
Signal by EPR spectrometer of fingernail clippings at two microwave power level (right : Mn reference, solid line : 0.63 Mw, dashed line : 2.52 Mw)



OSL signal of nail sample exposed to 1 Gy of beta rays



- Left side : bleaching test of fingernail sample exposed to 1 Gy of beta rays
- Right side : fading test of fingernail sample exposed to 3 Gy of beta rays, signal disappeared in two hours for 74 % of original signal



5. Discussion & conclusion

- Fingernail/OSL dosimetry has weak points for signal signal stability reliability to be applied for practical radiation emergency situation
- Fading and bleaching problem should be tested for different sample conditions
- For avoid above problems, toenail shall be experimented for future time
- In future study, effect to signals on the quality of radiation shall be tested for gamma and beta rays