

Three principles for radiation safety: time, distance, and shielding

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Pain physicians usually use C-arm fluoroscopy for the treatment of patients. The C-arm fluoroscope is an important device for pain interventions. However, pain physicians can be exposed to radiation during use of C-arm fluoroscopy. According to a previous study in Korea, most pain physicians were worried about the adverse biological effects of radiation exposure [1]. However not many pain physicians had knowledge of radiation safety [1,2]. Furthermore, not many pain physicians used radiation protective devices and radiation protective methods [1,2]. Even though almost all pain physicians had used thyroid protectors and aprons, the use of lead glasses and gloves was low. For reducing radiation exposure, there are 3 principles : time, distance, and shielding.

1. Time

Radiation exposure can be accumulated over the time of exposure. In C-arm fluoroscopy guided interventions, the time spent checking the C-arm fluoroscopy is related to the radiation exposure. The longer the exposure time, the more radiation exposure to the pain physician. Therefore, it is important to reduce the usage time of C-arm fluoroscopy [2,3]. For reducing the usage time, the physician has to improve his skill in intervention and the radiographer has to check the X-ray at the correct location, and at the

right moment without blurred image.

2. Distance

A greater distance from the radiation source can reduce radiation exposure. The amount of radiation exposure is not inversely proportional to the distance from the radiation source, but is inversely proportional to the square of the distance [2,4]. This means that double the distance from the radiation source can reduce the radiation exposure not to 1/2 but to 1/4. Therefore, maintaining a greater distance from the X-ray generator is a very effective method for radiation safety. In a previous study of radiographers, two steps behind the mobile support structure can decrease the exposure of the radiographer by about 80% [4]. In another study, being only 20 cm farther from the center of the X-ray field can decrease the radiation exposure by about 73% [5].

3. Shielding

There are many shielding devices such as caps, lead glasses, thyroid protectors, aprons, radiation reducing gloves, and so on, for radiation safety during C-arm fluoroscopy-guided interventions. Even though the protective effect is enough for radiation safety, no use of the devices

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cannot protect the physician from radiation. In Korea, the use rate of the apron and thyroid protector by pain physicians is over 80% [1,2,6]. However, the use rate of lead glasses was about 40%, and the use rate of radiation reducing gloves was lower than 35% [1]. The radiation shielding devices are expensive, and the use of shielding devices can be uncomfortable. However, when a physician uses these devices, they can be protected from radiation exposure.

Reducing the time of radiation exposure, a greater distance from radiation sources, and the use of shielding devices for radiation protection are important. Even if pain physicians have to use these three principles, I want to emphasize the importance of distance from the radiation source, because the longer distance from the radiation source may be more effective than reducing time or the use of shielding devices. If a pain physician decreases the time of radiation exposure in half, his radiation exposure will be halved. If a pain physician uses radiation protective devices with double the lead equivalent thickness, his radiation exposure will also be halved. However, if a pain physician stands double the distance from a radiation source, his radiation exposure will reduce to 1/4. Physicians do not pay money for a longer distance from the radiation source. Therefore, all physicians can use the

principle of greater distance easily.

Do you want to reduce your radiation exposure? Please remember the 3 principles; time, distance, and shielding.

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