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Effectiveness of custom-made under-table shield in a C arm fluoroscopy unit

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Objectives: Interventional procedures for vascular access using mobile C arm fluoroscopy are increasing, however, under-table shields are difficult in applying to the arm board of the C arm angiography table that most centers have performed fluoroscopy-guided procedures without them. To overcome the limitations in the radioprotection strategy, we modified commercial tools and applied custom-made under-table shields. The purpose of this study is to quantitatively analyze the protective effect of the shields using real-time dosimeters.

Methods: To completely cover the angiography table equipped with an arm board, commercial shields were tailored and modified (Figure 1A).

Covering a table with custom-made under-table shields to protect directions to operators and assistants (Figure 1B).

There is no radiopaque material between the table and arm board, so the shields don't interfere with the fluoroscopy-guided procedures for the upper extremities (Figure 1C).

To quantitatively measure the dose equivalent of radiation, real-time dosimeters (RaySafe i2) were located one meter and two meters away from the table (Figure 1D).

Results: Digital subtraction angiography was performed five times with eight pulses per second mode using a mobile C arm fluoroscopy (GE OEC 9900 system), and the mean radiation doses were compared before and after applying the customized under-table shields. After the application of the under-table shield, the dose equivalent (μSv) was reduced by 34% at a 1-meter distance and 82% at a 2-meter distance, respectively (Figure 2).

Conclusions: To implement the principle of "As Low As Reasonably Achievable (ALARA)", the optimization of fluoroscopy settings and the application of radioprotective shields are critical. Among them, under-table shields have a huge role in a radioprotective strategy and should be emphasized even in the mobile C arm settings. We customized commercial shields to overcome the limitation of the radioprotective strategy in the mobile C arm fluoroscopy setting, and it was effective in reducing the radiation dose.

Figure 1. Modification and application of the custom-made under-table shields (A. The modified commercial under-table shield B. Application of the custom-made under-table shields on the C arm