

Radiation Exposure to the Surgeon's Hands:**A Practical Comparison of Large and Mini C-Arm Fluoroscopy**

*Michael M. Vosbikian, MD¹; Charles F. Leinberry, MD²; Derek Watson, RT³;
Asif M. Ilyas, MD²;*

*¹Thomas Jefferson University Hospital – Department of Orthopaedic Surgery,
Philadelphia, Pennsylvania, USA;*

*²The Rothman Institute at Thomas Jefferson University Hospital,
Philadelphia, Pennsylvania, USA;*

³Nazareth Hospital – Department of Radiology, Philadelphia, Pennsylvania, USA

Purpose: Controversy persists as to whether mini C-arm fluoroscopy units are safer than standard units. In particular, radiation exposure to the surgeon's hand, which is often closest to the surgical field, is also not well understood. To determine and compare the radiation exposure to the orthopaedic surgeon's hands with use of a standard and mini C-arm fluoroscopy units in a practical, clinically-based model.

Methods: Two attending hand surgeons monitored the radiation exposure to their hands with a ring dosimeter over a 14-month period using standard and mini C-arm fluoroscopic units. One surgeon performed all cases with a standard C-arm unit in a hospital setting, while the other performed all cases with mini C-arms in surgical centers. For each case, fluoroscopic time, the final dose displayed on the unit, and radiation per unit time were recorded and analyzed.

Results: A total of 160 consecutive cases were reviewed with 71 cases and 89 cases in the standard and mini C-arm limbs of the study, respectively. The median fluoroscopy time per case was 37.7 seconds with the large C-arm and 88 seconds with the mini C-arm. The median dose reported by the large C-arm was 0.68 mGy/case, while the median dose reported by the mini C-arm was 9.97 mGy/case. With dose as a product of time, the median calculated values were 0.02 mGy/second for the large C-arm group and 0.28 mGy/second for the mini C-arm group. The ring exposures showed an exposure of 380 mrem and 1100 mrem for the large and small C-arm group, respectively.

Conclusion: The mini C-arm resulted in more than a 10-time increase in radiation exposure dose and more than 3 times greater dosimeter absorption to the surgeon's hand, compared to the standard C-arm. While it has been shown that the mini C-arm produces less scatter of ionizing radiation, in a practical model the mini C-arm may not be a safer alternative to the large C-arm with respect to the surgeon's hands. Although below the maximum recommended radiation dose per year with either model, based on these findings, we would recommend taking precautions toward radiation exposure by utilizing protective equipment and minimizing fluoroscopic time.

- The FDA has not cleared this drug and/or medical device for the use described in this presentation (i.e., the drug or medical device is being discussed for an "off label" use). For full information, refer to page 600.