

ASSESSMENT OF RADIATION EXPOSURES IN BI-PLANE C-ARM
PEDIATRIC CARDIAC STUDIES

Wei-Kom Chu

Dept. of Radiology, University of Nebraska Medical Center
42nd and Dewey Aves., Omaha, Nebraska 68105, U.S.A.

ABSTRACT

Radiation exposures to patients and staff during cardiac catheterization has been investigated previously. However, to date, most studies assessed the amount and/or patterns of radiation exposures during examinations of adult patients. Few reports were on the subject of children's radiation exposure while undergoing the same procedure. Due to continuing improvement of modern-day neonatal care capabilities, more and more children as well as infants are being examined using catheterization procedures. In the past few years, bi-plane C-arm device have become the de-facto radiological system for children's catheterization studies. Children can be sedated and maintained in one position on the examination table throughout the entire procedure. By manoeuvring the C-arms, fluoroscopic or cine images in various projections can be easily obtained without much, or any, patient movement or cooperation. Objective of our project was to assess the range and average amount of radiation exposures to child patients undergoing various cardiac radiological examinations. Measurements were made on phantoms as well as patients. Radiation exposures to different size phantoms were measured under routine protocols. Results were then compared with that obtained on patients under clinical environments. All measurements were made at entrance and/or exit skin level. Thermoluminescent dosimeters were used as the primary measuring device complemented with a flat chamber x-ray monitor. The results indicated a wide range of values, e.g. for anterior chest wall it ranged from 15 mSv to 94 mSv per examination. Correlation of radiation exposures to patient size, examination type and technique factors were attempted. Scattered radiation patterns which determines the amount of staff exposure were also investigated. Results in this aspect were in agreement with previous reports. Dependent upon the C-arm orientation and other factors, the radiation exposure rate to staff during the radiation-on period ranged from minimum to more than 800 mR per hour at various locations within the examination room.