Cardiac CTA for evaluation of cardiac function in patients with congenital heart disease: the good, the bad and the ugly

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The report by Dr. Han et al. [1] illustrates the spectrum of practice concerning the evaluation of cardiac function using computed tomography angiography over a 7 year span. Innovations during that time led to disparate radiation exposure results in the study groups which can be classified as the good, the bad and the ugly.

First the ugly: practices that predominantly image adults often do not adequately adjust technique to image children. Three children imaged at a facility that performed studies predominantly on adults had their CTA examinations performed using 120 kVp energy. The result was a much higher radiation dose than necessary and no doubt inferior image contrast than would have been achieved if 80 or 100 kVp energy was utilized. The routine use of 120 kVp or greater energy at institutions that predominantly image adults continues today despite the recommendations of the Image Gently campaign [2]. In my experience in Arkansas, about 85 % of pediatric abdomen examinations performed in community hospitals use 120 kVp or greater energy as opposed to the pediatric hospital in which 85 % of studies use 100 kVp or less.

The bad is the wide range of radiation doses for patients performed at the different institutions. Mean effective radiation dose ranged from 3.6 to 9.2 mSv. The highest radiation doses were in the institution that performed all studies on older equipment than was available at the other two institutions. Although some dose reduction strategies were employed, iterative reconstruction was not available.

Not all institutions can be on the leading edge of technology. The other two institutions had a combination of first generation dual source scanner cases without iterative reconstruction and later second generation dual source scanner cases performed with iterative reconstruction. Iterative reconstruction allows for significant radiation dose reduction [3].

The good news is that one of the three institutions reduced the mean effective dose for studies to 3.6 mSv with fully 75 % of their cases performed using less than 6 mSv. An increased cancer risk due to ionizing radiation exposure in atomic bomb survivors is frequently cited as a reason to limit the use of computed tomography. However, no increase in cancer risk is present in atomic bomb survivors who received less than 5 mSv [4]. A recent paper evaluating the effects of radiation on protein and genetic biomarkers in patients undergoing cardiac computed tomography showed no abnormalities in patients who received less than 7.5 mSv [5]. These findings suggest that computed tomography for cardiac function as it can be practiced today poses no measurable radiation exposure risk.

Compliance with ethical standards

Conflict of interest I have no conflict of interest.

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