

Study on how to minimize radiation risks of angioplasty shows highest doses in men

March 15 2010

Body size, gender and the complexity of heart disease significantly influence how much cumulative radiation skin dose that patients receive during percutaneous coronary intervention (PCI) therapy, also known as angioplasty, according to a new Mayo Clinic study. The study was undertaken as a quality control initiative to reduce the potential radiation risks of cancer to patients and PCI operators.

Presented today at the annual meeting of the American College of Cardiology, the review of 14 months' worth of radiation data from 1,827 adult patients is an important early step in understanding ways to improve PCI safety and quality while optimizing therapeutic benefits. The Mayo Clinic study identified 20 clinical traits and circumstances that help predict whether a patient likely received higher or lower doses of radiation.

Identifying optimal means of using radiation in PCI is important because a chief advantage of PCI is its minimally-invasive nature in successfully opening vessels and placing stents, which makes it an increasingly popular option for treating select cases of [heart disease](#). PCI's minimally-invasive advantages include reducing patient trauma, speeding recovery and lowering costs, compared to traditional heart surgeries.

However, PCI owes its precision, safety and effectiveness to the X-ray fluoroscopy imaging used. X-ray fluoroscopy produces many images to make a movie that allows physicians to visualize the intricate vessel anatomy being treated and, therefore, holds the potential for increased

radiation risk.

The amount of radiation dose used during PCI procedures is generally much greater than that used for a typical X-ray image such as a chest X-ray. But because a chest X-ray is usually a screening test and a PCI is a lifesaving procedure, from the clinical perspective, the risk of not performing the PCI is much greater than the predicted radiation risk associated with the procedure.

Mayo study results show:

- Indicators of higher radiation dose included male gender higher body mass index (BMI); more complex disease, such as multiple diseased vessels or complex anatomy and lesions in the vessels; and previous history of coronary artery bypass graft (CABG) surgery.
- The median patient body mass index (BMI) was 29.7, with most patients having a BMI between 21 and 44.6. A BMI less than 30 can fall into normal (20-24.9) or overweight (25-29.9) categories.
- The median cumulative skin radiation dose was 1.5 Gray (Gy), a unit of absorbed radiation, with a range 0.34 Gy to 4.5 Gy. In general, the cancer risk for a typical PCI is likely about 0.05 percent, whereas the "natural cancer rate" from daily living is about 35 percent, the Mayo team noted.

Implications for Cure

"Radiation risk is a recognized hazard of our specialty that has not been systematically or aggressively addressed," explains Chet Rihal, M.D., lead cardiovascular physician on the study. "But our commitment to

patient safety and quality at Mayo Clinic, and to protecting operators who perform the therapy, makes this a priority issue for us. The next step for us is to follow up from this initial identification of the problem and lead efforts to formulate specific practice changes clinicians can use to improve safety while maintaining quality."

Data also showed that radiation doses that comparable patients received differed depending on which of the 13 physicians treated them. Dr. Rihal says investigating possible causes of this finding is among the goals of the next phase of study.

Nationwide, concern is growing across medical fields about reducing risks of radiation from all sources, such as X-rays and computed tomography (CT) scans, because radiation is a risk factor for developing certain cancers. Recently the U.S. Food and Drug Association (FDA) has been addressing accidental cases of overexposure to radiation in certain specialties. The Mayo Clinic study cases differ from the FDA efforts. Mayo's cases do not involve accidents or overexposure, but commonly accepted clinical best practices. "This work is a natural expression of Mayo's historic commitment to improving patient safety, care and quality of treatment," Dr. Rihal says. "We aren't correcting errors, just improving the way things are done for all concerned."

Mayo's is the largest study to identify clinical conditions that correlate with radiation dose level, and is therefore an important first step leading to designing ways to reduce radiation levels through quality improvement training. Another of the Mayo study's authors, Kenneth Fetterly, Ph.D., explains, "There is no standard model of the clinical determinants of radiation skin dose in PCI, so by using clinical data from a large sample of Mayo Clinic adult patients and commonly accepted statistical methods, we identified correlations between clinical variables and [radiation dose](#) that we hope will be useful in improving care."

In addition to Drs. Rihal and Fetterly, other Mayo Clinic physicians and scientists who worked on the study were Ryan Lennon; Malcom Bell, M.D.; and David Holmes Jr., M.D. Their work was supported by the Mayo Foundation for Medical Education and Research.

Provided by Mayo Clinic

Citation: Study on how to minimize radiation risks of angioplasty shows highest doses in men (2010, March 15) retrieved 19 April 2024 from

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