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Navigating the Risks of CT Radiation

Recent months have seen an unprecedented level of attention over the potential cancer risk posed to patients who undergo CT (Computed Tomography) scans as a result of exposure to ionizing radiation.

Two multicenter studies published in this week's *Archives of Internal Medicine* suggest that clinical CT radiation doses are much higher than previously expected, resulting in an increased lifetime potential cancer risk. The statistics supporting these claims are troubling, although perhaps not unexpected.

Dr. Smith-Bindman & colleagues used clinical data from national databases to evaluate the level of radiation dose associated with several common CT imaging exams in a sample of 1119 patients. Their results showed a high degree of variability in dose between different types of CT studies, overall doses which were much higher than previously thought, as well as doses which differed significantly within and across institutions, with a mean 13-fold variation between the highest and lowest dose for each study type

In the second study, Dr. Berrington de Gonzalez & colleagues, using risk models based on the 2006 Biological Effects of Ionizing Radiation VII, estimated that approximately 29,000 future cancers could be related to CT scans that were performed in the US in 2007 alone. Their study suggested that the largest contributors to radiation dose are abdominal and pelvic scans, followed by chest studies.

These two ground-breaking studies have shed light on what many radiologists and physicians have been speaking to for years. While there is significant utility for CT scans in the acute trauma setting and for identifying solid tumours of the chest & abdomen, it is important to acknowledge the risk-benefit ratio when considering this imaging technique. According to the Canadian Institute for Health Information, there were 3.4 million CT scans performed in Canada in 2007. The Canadian Association of Radiologists asserts that up to one-third of CT scans are inappropriate. In light of the studies published this past week, it is reasonable to consider the value of utilizing alternate imaging techniques that do not expose a patient to ionizing radiation when appropriate.

A sound alternative can be found in Magnetic Resonance Imaging (MRI). MRI uses non-ionizing radio frequency signals to acquire its images, utilizing a magnetic field, radio waves and computer technology to generate detailed three-dimensional images of body tissue and anatomy.

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While CT provides good spatial resolution (the ability to distinguish two structures an arbitrarily small distance from each other as separate), MRI provides comparable resolution with far better contrast resolution (the ability to distinguish the differences between two arbitrarily similar but not identical tissues). In the case of tumour detection, imaging of the brain, spinal cord & vertebral applications, blockages in the vascular system, and soft tissue injury, MRI, in non-acute circumstances, is documented clinically to be generally superior to CT.

While CT may continue to be relied upon in the hospital setting because of its ease of access, it is important for patients to weigh all the circumstances and consider other perhaps safer and better imaging alternatives. Both the American College of Radiology and the Canadian Association of Radiologists are encouraging physicians to be more accountable in this regard and to seek out imaging techniques, such as MRI, which provide a greater benefit/harm ratio to the patient.

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