

Volume 10 - Issue 6, 2010 - RSNA 2010 Round-up: Imaging Management Top Session Picks

Use and Overuse of Exams

» Emergency Departments See Substantial Increase in Ct Exams

A new study reports that the use of computed tomography (CT) in U.S. emergency departments is growing exponentially. If the growth trend continues, by 2011, nearly 20 percent of all emergency department (ED) visits may involve a CT exam. The results of this study were presented today at the annual meeting of the Radiological Society of North America (RSNA) and published online and in the journal *Radiology*.

"It is not surprising that CT utilisation has increased," said lead researcher David B. Larson, M.D., M.B.A., director of quality improvement in the department of radiology at Cincinnati Children's Hospital Medical Centre in Ohio. "What's surprising is the sustained high rate of that growth. However, recent developments, such as increased awareness of cost, radiation concerns, national healthcare reform legislation and the economic recession, are likely to inhibit further growth."

Dr. Larson's research team used data collected by the National Hospital Ambulatory Medical Care Survey from 1995 through 2007 to identify nationwide trends associated with CT use in the ED. The researchers performed statistical analysis on a mean of 30,044 ED visits from each year over the 13-year period to estimate overall usage of CT in the ED.

"We have seen a remarkable growth in CT utilisation, not only in the number of ED visits that involve CT imaging but in the percentage of patients walking into the ED that receive a CT," Dr. Larson said.

According to the analysis, the number of ED visits that included a CT exam increased from 2.7 million in 1995 to 16.2 million in 2007, a 5.9-fold increase and an average growth rate of 16 percent per year. The percentage of ED visits involving a CT exam rose from 2.8 percent in 1995 to 13.9 percent in 2007.

"CT is a wonderful technique that is widely available," Dr. Larson said. "Over the 13 years in our study, image resolution improved significantly, making CT a great tool to look for kidney stones, appendicitis and coronary artery disease."

For much of the 13-year period studied, headache was the complaint most commonly associated with a CT exam in the ED. But by 2007, headache was surpassed by abdominal pain as the complaint most often associated with CT imaging. In 2007, patients with abdominal pain represented 12.8 percent of all ED visits involving CT.

CT exams to investigate abdominal pain have a higher radiation dose than CT exams used to determine the cause of a headache. The study found that, overall, the use of CT for complaints that are typically related to exams with a higher radiation dose grew faster than those typically related to exams with a lower radiation dose. This suggests that the radiation dose associated with CT in the ED may be growing at a faster rate than the growth in the overall use of CT.

» MRI May Help Determine Time of Stroke Onset

Magnetic resonance imaging (MRI) of the brain could expand the number of stroke patients eligible for a potentially life-saving treatment, according to a new study, published online and in the December issue of the journal *Radiology*.

Some patients who suffer an acute ischaemic stroke — in which a blood clot or other obstruction blocks blood flow in the brain — can be treated with a drug called tissue plasminogen activator, or tPA, that dissolves the clot and restores blood flow. However, the clot-busting drug can only be administered within four and a half hours of the onset of a stroke; when given beyond that window of time, the drug can cause bleeding in the brain.

According to the American Stroke Association, stroke is the third leading cause of death in the United States behind diseases of the heart and cancer. Approximately 795,000 Americans suffer a new or recurrent stroke each year.

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"As many as a quarter of all stroke patients cannot be given tPA because they wake up with stroke symptoms or are unable to tell their doctor when their stroke began," said lead researcher Catherine Oppenheim, M.D., Ph.D., professor of radiology at Université Paris Descartes in France. In the study, Dr. Oppenheim and her team of researchers reviewed data from consecutive patients with acute ischemic stroke treated at Sainte-Anne Hospital in Paris between May 2006 and October 2008. The time of stroke onset was well defined in all patients and each underwent MRI within 12 hours.

The 130 patients in the study included 77 men and 53 women (mean age 64.7). Of those, 63 patients underwent MRI within three hours of stroke onset and 67 were imaged between three and 12 hours after stroke onset. The radiologists analysed different types of MRI data on the patients, including fluid-attenuated inversion recovery (FLAIR), diffusionweighted imaging (DWI) and apparent diffusion coefficient (ADC) ratios.

Using the MRI data alone, the radiologists were able to predict with greater than 90 percent accuracy which patients had experienced stroke symptoms for longer than three hours. "When the time of stroke onset is unknown, MRI could help identify patients who are highly likely to be within the three-hour time window when tPA is proven effective and approved for use," Dr. Oppenheim said. According to Dr. Oppenheim, using MRI to determine the duration of a stroke would change the way stroke is managed in the emergency setting.

» Combined Imaging Technologies May Better Identify Cancerous Breast Lesions

By combining optical and x-ray imaging, radiologists may be better able to distinguish cancer from benign lesions in the breast, according to a new study published in the online edition and January issue of *Radiology*. Researchers at Martinos Center for Biomedical Imaging at Massachusetts General Hospital in Boston helped develop a combined optical/x-ray imaging system capable of obtaining both structural and functional information of the breast.

The two technologies used were digital breast tomosynthesis (DBT), a three-dimensional application of digital mammography, and diffuse optical tomography (DOT), which measures levels of hemoglobin concentration, oxygen saturation and other cellular characteristics, based on how light from a near-infrared laser is absorbed and scattered within tissue. "By co-registering optical and x-ray data, radiologists are able to map suspicious findings and analyse the functional characteristics of those areas," said lead researcher Qianqian Fang, Ph.D., a radiology instructor at Harvard Medical School.

In the study, combined DBT and DOT was performed on 189 breasts from 125 women with an average age of 56 years. To perform the procedure, an optical source and detector probes were attached to a DBT unit and, with the breast compressed, optical data was acquired. The optical probes were then removed without altering the breast compression and a DBT scan was performed.

"We are very excited about adding optical imaging to DBT, because it is low-cost, safe, noninvasive and fast," Dr. Fang said.

Of the 189 imaging studies, 138 were negative, and 51 showed evidence of lesions. As determined by breast biopsy, 26 lesions of the 51 lesions were malignant, and 25 were benign. In the 26 malignant tumors, total haemoglobin concentration (HbT) was significantly greater than in the normal glandular tissue of the same breast. Solid benign lesions and cysts had significantly lower HbT contrast compared to the malignant lesions.

In the study, oxygen saturation levels were significantly lower in cysts compared to those in malignant and solid benign lesions and glanest tissue.



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