Radiation Physics Consultants

Quarterly Newsletter

November 2009

Do You Need Help?

If you have any questions or need to contact us for physics testing, radiation shielding evaluations, or radiation safety training, please call or email us at anytime at the following:

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Regarding the CT-Perfusion overdoses at Cedars-Sinai and the FDA safety investigation notification:

Recently there has been some information circulating about CT overdoses. The FDA report and the news stories in the media right now are a little light on detail, but it is clear that the standard manufacturer's protocol was altered incorrectly. One of the online stories about this incident mentioned that the scanner was a GE. Two facilities with GE multi-slice scanners were contacted to determine the default protocols for brain perfusion; they are as follows:

1) The first series, non-contrast, is a standard CT of the head, 120 kVp, 140 mA, 2.0 seconds per rotation for a total of 280 mAs per slice. CTDI for this portion of the scan was around 50 mGy.

2) The second series is a post-contrast CT-Cine which radically differs from the standard CT of the head in terms of technique, 80 kVp, 200 mA, 0.5 seconds per rotation for 45 seconds. A total of 100 mAs per image and 90 images in the same location are taken. This is a very high number of repeated images to the same area, but at a low kV and mA because high noise is tolerated for this series. Total dose for this portion of the scan is around 500 mGy.

It is important to realize that this protocol, which is the one the FDA referenced as the "expected" value of dose, is already ten times higher than a normal CT of the head. This dose to the patient can be justified when medically necessary because of the value of the information obtained, but it still can have consequences. It should also be remembered that a normal CT of the head is not a low-dose procedure and carries risks to the patient with it, but with proper techniques those risks can be minimized.

It appears the error in technique came from a breakdown in education. The protocol was changed to give an image quality higher than was required for the series. This could have been done in several ways, changing the mA, kVp, rotation time, or modifying the number of images acquired in one location. Unfortunately high dose images look better than low dose images, so without looking at techniques or dose reports it is difficult to tell something is wrong. With a modified technique and the high number of images in one location, it would be surprisingly easy to reach a total CTDI of 3000 to 4000 mGy. This is further aided by the fact that the high heat capacity of most modern CT tubes makes it physically possible to give this much radiation in a short period of time with no tube loading warnings.

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CT QC Reminder:

We want to remind all facilities who have CT Scanners that the Daily QC tests MUST be performed on the CT Scanner every day before first use on patients. Not only must the QC test scans be run, but you must VERIFY that all results pass the specific test criteria. If a test fails, re-run the QC testing procedure again to assure it was not a fluke. If a QC test still fails, DO NOT use the CT scanner on patients. Contact your service engineer immediately to get the problem remedied as soon as possible.

***Important:**
Minnesota Department of Health Rule 4732.0860 Subpart 9 requires that the **RSO** must perform a **quarterly** review of the CT Daily QC records and sign off that they are being performed properly. This cannot be reviewed by the technologists, but it must be the RSO or your CT physicist (especially if the RSO is not very experienced with CT).

(CT-Perfusion overdoses at Cedars-Sinai – continued from page 1)

It appears that this was an awareness-level failure of radiation safety. It wasn't something specific to this manufacturer or this type of scanner. GE has stated in the media that nothing was wrong with the unit, and at least one media outlet has reported that dose information was being provided. All GE scanners that are capable of performing this procedure provide an estimate of dose before performing the scan. This data is also available to be saved as part of the patient's case. However, if nobody is looking at it, or if nobody understands what a "normal" or "expected" dose is, then the information is wasted.

Unfortunately, national standards for dose to patients from CT scans simply do not exist at the moment. There are some nationally published averages for particular types of procedures, and the ACR has begun enforcing dose limits for some procedures as a part of its accreditation procedure, but there are currently no regulatory limits.

Dose to patients from CT has not been strongly emphasized as a point of concern. The manufacturer's defaults give us guidelines that we have as a starting point for "appropriate" techniques like CT-perfusion. The best course of action for any facility is to not change the given manufacturer protocols unless you know EXACTLY what you are doing, and why. Manufacturer's representatives and physicists are available to help suggest changes in protocol to reduce dose, but the radiologist has the final say in what is used.

Radiation Physics Consultants, Inc. does measure dose yearly, for standard head and abdomen protocols...and we have found that the estimated CTDI numbers provided by GE are typically quite accurate (within a few percent or so of what we measure). So, knowing what range is "normal" for particular types of scans is a facility's first line of defense for preventing something like this from occurring. 50 mGy for a head is not a problem. If 50 mGy is used for an abdomen something is wrong. Use 4000 mGy for a CT-perfusion brain and you too may be in the National news.

To summarize, based on what we know right now, the incident appears to have been caused by the operator making changes to the established protocol. You may want to consider having a policy in place about how and when protocols are changed. Current protocols could be reviewed to assess CTDI values and whether they are reasonable for the particular exam. Also, everyone involved with the scanner should have an idea about what are the normal CTDI ranges for exams, and where to find this information on the scanner. The CTDI should be closely monitored for all dynamic studies, and the physicists at Radiation Physics Consultants Inc. are available to work with you and your radiologists to optimize your CT protocols.

If you do not want to receive this newsletter in the future, please email us at jhulteen@smdc.org to assure we remove you from our mailing list.