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We read with great interest the article by Benson et al[1] on the potential clinical utility of photon-counting detector CT on temporal bone imaging. They prospectively recruited 13 patients who underwent clinically indicated temporal bone imaging on an energy-integrating detector CT (ie, conventional CT) and performed an additional temporal bone scan using an investigational photon-counting detector CT system. Reconstructed images from both examinations were then compared side-by-side by 2 blinded neuroradiologists using a 5-point Likert scale, and 2 important results were obtained: 1) significant preference for images from the photon-counting detector CT scanner; and 2) images obtained with this technique rated superior for the evaluation of all individual anatomic structures, with particularly higher scores on the oval window and incudostapedial joint. These results were mainly due to higher spatial resolution (0.2 mm image thickness versus 0.4 mm for conventional CT), with the additional advantage of performing the examinations with a 31% decrease in the total radiation dose (compared with conventional CT).

After reading these interesting results, we immediately recalled the role of conebeam CT (CBCT) in temporal bone imaging; thus, with the hope of adding to the aforementioned results, we would like to share some thoughts on this topic. CBCT systems operate using an x-ray beam with a conical geometry between the source and the detector; this is in contrast to the fan-beam geometry of conventional CT, in which the collimator restricts the x-ray beam to a 2D geometry.[2] This difference explains why, in CBCT systems using a 2D flat panel detector, a volumetric data set can be acquired with a single rotation of the gantry,[2] a fact that enables a spatial resolution of $\leq$0.1 mm with some systems, using low radiation protocols of about 10–100 μSv.[3]

Although initially used almost exclusively to perform dental radiology, such as implant placement-planning, temporal bone imaging applications became relatively frequent throughout some centers, obtaining a spatial resolution in the order of 0.075–0.15 mm with a much lower radiation dose than conventional CT scanners (in some cases down to 14% of the total dose obtained with a conventional CT[3]). This high spatial resolution leads to better capability of evaluating chronic otitis media complications (lysis of the long process or lenticular process of the incus, subtle tympanosclerosis, and/or incudostapedial subluxation), discrete fractures of the ossicles, dehiscence of the facial nerve canal or superior semicircular canal, and discrete foci of otosclerosis. One should remember that the latter can manifest solely as thickening and hypodensity of the stapes footplate (type Ia of the Veillon classification), which is much more easily detected on CBCT due to its higher resolution. However, this technique has a few limitations: 1) the high resolution comes with the expense of a long acquisition time (up to 40 seconds[3]), a problem for patients who are not able to cooperate enough (ie, pediatric and very elderly patients), leading to motion artifacts that degrade image quality; 2) the need for more powerful x-ray tubes to study the dense temporal bone, which can lead to image degradation by increased scatter, especially in patients with large heads.[3] There are, however, multiple approaches to scatter reduction, such as the use of a bowtie filter and an antiscatter grid.[2]

Nevertheless, many centers still rely on conventional CT for temporal bone imaging, possibly due to the reluctance to invest in a scanner that lacks soft-tissue contrast resolution (limiting its use in general diagnostic imaging[4]), with conventional CT having much broader general application. Due to the apparently similar diagnostic capabilities of CBCT and photon-counting detector CT (eg, higher resolution and lower radiation dose), we wonder if there could be an important difference in the diagnostic capability of the latter that could prevail over the somewhat clinically established CBCT. Moreover, it would be interesting for future studies to compare both of these techniques.

Disclosure forms provided by the authors are available with the full text and PDF of this article at www.ajnr.org.

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