

Commentary

Academic Radiology's July Issue is entirely dedicated to the issue of Over Diagnosis. Over diagnosis is not a wrong diagnosis. It is a correct finding that is over emphasised. It is not often recognised that this may lead to over treatment that increases the morbidity as well as the financial burden on the patients. Radiologists need to make sure that their conclusions in radiological reports are relevant to the clinical condition. Just because a condition or a lesion may be treated or investigated does not necessarily mean that it is relevant to the patient's clinical problem or outcome. Chasing irrelevant details may actually harm the patients.

Maintenance of vascular access in haemodialysis patients is literally a matter of life or death. The basic principle is to maximise the life of any access that is available. Arteriovenous fistulae are the mainstay of long-term vascular access in these patients. If their function deteriorates they need to be evaluated prior to intervention. Due to the nephrotoxicity of the contrast agents their angiographic evaluation requires careful management and is sometimes problematic. The development of non contrast Magnetic resonance angiography (MRA) addresses this issue very elegantly. Jin et al describe their experience with this technique. They find non contrast MRA to be reproducible and reliable in the detection of haemodynamically significant stenosis. The down side is that the equipment needed for this examination remains expensive and therefore not widely available.

Computed Tomography (CT) is now the single largest source of radiation delivered to the human genome on a global basis. With the increasing use on multi detector CT the radiation dose is a real concern. We have all seen the horrifying images of the band of alopecia induced by CT angiography of the intracranial circulation. In this context all the manufacturers are trying to come up with a dose reducing algorithm. Mirsadraee et al describe the use of one such algorithm. Although this is a propriety add on from one particular manufacturer, this study is very relevant in the Pakistani context as this manufacturer is the market leader in the country. The study found that when the dose reduction algorithm was applied during CT pulmonary angiography (CTPA) it significantly reduced the noise in low dose examinations. Applying this in the clinical practice would reduce the radiation dose in both small and large patients without affecting the diagnostic quality of the images. Although they only studied this in CTPA the conclusion can be applied to all body applications.

Having said that Radiologists are responsible for most of the radiation burden on the human population some reassuring news from Scandinavia. Nordenskjold et al describe the follow up of all the children in one geographic area that had been exposed to radiation during radiographic pelvimetric assessments. They compare their school performance with unexposed siblings and the general population and find no statistically significant difference. Interestingly on univariate analysis of radiation vs school performance the children exposed to radiation did better than controls. Before people start putting this data forward as an example of beneficence of low dose radiation and start waving the hormesis banner please note that the effect disappeared when confounders were accounted for in the multivariate analysis. To borrow a quote from Disraeli "There are three kinds of lies: lies, damned lies, and statistics."

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Radiologists and Overdiagnosis

Overdiagnosis is the detection of disease when treatment is likely to be redundant or harmful, and awareness of the condition likely to induce anxiety rather than lead to meaningful empowerment. The disease is typically at its earlier stages, inhabiting a milder spectrum of phenotype, and clinically silent.

Overdiagnosis is not the same as a false positive diagnosis, although both lead to overmedicalization. Overdiagnosis is bona fide disease, a true positive, whereas a person who tests positive for a condition and is later shown not to have that condition is a false positive.

The distinction between false positives and overdiagnosis is important to appreciate to understand why overdiagnosis is controversial. The arbiter of a diagnostic test, that is whether the positive test is a true or false positive, is verification by a truth. The truth is known as the gold standard. Disease can be defined at anatomic pathology which is considered the most indisputable truth. Often disease is defined by imaging, clinical features, and laboratory tests, which comprise criteria established through consensus by an expert panel. The criteria becomes the reference standard for the disease.

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W.T. Jin, G.F. Zhang, H.C. Liu, H. Zhang, B. Li, X.Q. Zhu

Non-contrast-enhanced MR angiography for detecting arteriovenous fistula dysfunction in haemodialysis patients

AIM: To assess the diagnostic value of non-contrast-enhanced magnetic resonance angiography (NCE-MRA), using time-of-flight and black-blood MRA, in the evaluation of arteriovenous fistulas in haemodialysis patients in comparison to multidetector computed tomography angiography (MDCTA).

MATERIAL AND METHODS: NCE-MRA and MDCTA were performed on the same day in 21 patients on maintenance haemodialysis with dysfunctional arteriovenous fistulas. The fistulas included three segments: arterial inflow, anastomosis, and venous outflow. Two experienced observers, who were blinded to the results of the NCE-MRA, recorded in consensus the significant stenoses ($\geq 50\%$) seen on CTA. Two other experienced observers, unaware of the results of CTA, independently recorded significant stenoses ($\geq 50\%$) in the NCE-MRA. The sensitivity, specificity, positive predictive value, negative predictive value,

and accuracy of NCE-MRA were calculated, with MDCTA as the standard reference.

RESULTS: Sixty-three vascular segments in the 21 patients were clearly displayed. For the two observers of NCE-MRA, the accuracy was 98% and 95.4%; sensitivity 96.4% and 96.4%; specificity 97.1% and 94.3%; positive predictive value 96.4% and 93.1%; and, negative predictive value 97.1% and 97.1%. Inter-/intra-observer agreement for detecting stenosis was excellent for NCE-MRA, with a weighted kappa of 0.968 (95% confidence interval [CI], 0.874–1) and 0.936 (95% CI, 0.848–1).

CONCLUSION: Non-contrast-enhanced MRA, using time-of-flight and black-blood MRA, is a reproducible and reliable imaging technique for detecting $\geq 50\%$ stenosis in dysfunctional haemodialysis arteriovenous fistulas.

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S. Mirsadraee, N.W. Weir, S. Connolly, J.T. Murchison, J.H. Reid, N. Hirani, M. Connell, E.J. van Beek

Feasibility of radiation dose reduction using AIDR-3D in dynamic pulmonary CT perfusion,

AIM: To assess the feasibility of radiation dose reduction with adaptive iterative dose reduction (AIDR-6 3D) reconstruction in dynamic pulmonary CT perfusion.

MATERIALS AND METHODS: CTP examinations of 10 patients acquired at 100 kVp/50 mAs were reconstructed with filtered back projection (FBP) and AIDR-3D. Artificial noise was added to raw data (pre-reconstruction projection data) to simulate lower tube current scanning. Radiodensity (in Hounsfield units), noise, and perfusion values were compared.

RESULTS: There was no significant difference in noise between the full and simulated reduced tube current with AIDR-3D reconstruction ($p = 1$). There was significantly lower noise in lung tissue with AIDR-3D images when compared to reconstructions without

AIDR-3D ($p = 0.005$) and no significant change in the radiodensity ($p = 1$; mean difference ± 6 HU). Mean perfusion values increased significantly at lower tube currents (25 and 12.5 mAs), compared to 50 mAs ($p = 0.005$). This effect was significantly greater in larger patients compared to thin patients.

CONCLUSION: AIDR-3D produced significantly lower noise images than FBP-based algorithms and maintained consistent noise levels in lung at 12.5 mAs, indicating this algorithm is suitable for reduced dose lung perfusion imaging. Iterative reconstruction allows significant radiation dose reduction of up to fourfold in smaller patients, and up to twofold in the medium/large size patients. The increase in perfusion values at 25% simulated tube currents is attributed to attenuation bias.

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A.C. Nordenskjöld, M. Palme, M. Kaijser,

X-ray exposure in utero and school performance: a population-based study of X-ray pelvimetry

AIM: To investigate the association between exposure to ionising radiation from pelvimetric examinations in utero and school performance.

MATERIAL AND METHODS: This was a population-based cohort study comprising 46,066 children born in the county of Östergötland, Sweden, from 1980 through 1990. Through record linkage between Swedish registers, children exposed in utero to X-ray pelvimetry examination were compared to other children born in the same county during the study period, as well as to their unexposed siblings. Outcome variable was primary school grades, expressed in centiles and calculated through linear regression.

RESULTS: In the univariate analysis, children exposed

to X-ray pelvimetry in utero had higher school grades compared to unexposed children (point estimate 3 centiles, 95% confidence interval (CI): 1.5 to 4.6). When sex, mother's education and income, birth order, and birth position were included in the analysis; however, the difference was reduced and the association was no longer statistically significant (PE 1.4, 95% CI: -0.1 to 2.8). Comparing exposed children with their siblings showed no statistical difference in univariate analysis or in multivariate analysis.

CONCLUSION: No suggestion was found of a negative effect on school performance from in utero exposure of diagnostic X-ray pelvimetry.