Low-dose computed tomography of the abdomen and lumbar spine

av

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Abstract


Radiography is a common radiologic investigation despite abundant evidence of its limited diagnostic value. On the other hand, computed tomography (CT) has a high diagnostic value and is widely considered to be among the most important advances in medicine. However, CT exposes patients to a higher radiation dose and it might therefore not be acceptable simply to replace radiography with CT, despite the powerful diagnostic value of this technique. At the expense of reduced CT image quality, which could be adjusted to the diagnostic needs, low-dose CT of abdomen and lumbar spine can be performed at similar dose to radiography. The aim of the current thesis project was to evaluate low-dose CT of the abdomen and lumbar spine and to compare it with radiography. The hypothesis was that CT would give better image quality and diagnostic information compared to radiography at similar dose levels. Firstly, the diagnostic accuracy of low-dose CT of the abdomen was evaluated. Results showed that low-dose CT of abdomen has a high sensitivity and specificity compared to radiography, i.e., it has higher diagnostic accuracy. Similar results were obtained from our systematic review. Secondly, in a phantom study, an ovine phantom was scanned at various CT settings. The image quality was evaluated to obtain a protocol for the optimal settings for low-dose CT of lumbar spine at 1 mSv. This new protocol was then used in a clinical study to assess the image quality of low-dose CT of the lumbar spine and compare it to radiography. Results showed that low-dose CT has significantly better image quality than radiography. Finally, the impact of Iterative reconstruction (IR) on image quality of lumbar spine CT was tested. Iterative reconstruction is a recent CT technique aimed to reduce radiation dose and/or improve image quality. The results showed that the use of medium strength IR levels in the reconstruction of CT image improves image quality compared to filtered back projection. In conclusion, low-dose CT of the abdomen and lumbar spine, at about 1 mSv, has better image quality and gives diagnostic information compared to radiography at similar dose levels and it could therefore replace radiography.

Keywords: Tomography, X-Ray Computed; Radiography; Radiation Dosage; Abdomen; Spine; Lumbosacral Region; Regression Analysis.

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