Optimization of contrast-enhanced CT of intra-abdominal chylus leakage

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Abstract

The aim of this study was to develop a new method to image intra-abdominal chylus leakage. Study was made with contrast-enhanced computed tomography and is still in process. I can not give any results or ready method in this presentation, but this is about introducing the research problem and the idea how to progress with it. I’m going to speak shortly about the history of CT, introduce what kind of a disease chylus-leakage is and to introduce the methods how we do the research and why, what we have aimed until this and what is the next step we are waiting for.

The lymph system is a complex and integral network of lymph vessels and organs throughout the body. The primary functions of the lymph system include its immunological role, the absorption of excess interstitial fluid and its return to the bloodstream, and the transport of long chain fat and fat-soluble vitamins. As the name implies, the lymph system carries lymph, comprised of white blood cells (primarily lymphocytes) and chyle from the GI tract, throughout the body. Chyle contains fat, as well as protein, electrolytes, lymphocytes, and other substances. Chyle leaks are rare, but when they do occur, they can be difficult to manage and treat. Our research concentrates into chyloperitoneum (chylous ascites) leak into the abdomen.

The first clinical CT scan on a patient took place on 1st October 1971 at Atkinson Morley's Hospital, in London, England. The patient, a lady with a suspected frontal lobe tumour, was scanned with a prototype scanner, developed by Godfrey Hounsfield and his team at EMI Central Research Laboratories in Hayes, west London. The scanner produced an image with an 80 x 80 matrix, taking about 5 minutes for each scan, with a similar time required to process the image data. Current CT scanners can produce images with a 1024 x 1024 matrix, acquiring data for a slice in less than 0.3 seconds, and are an integral part of a modern hospital's imaging resources. Today we have developed contrast enhancing agents, which do double our diagnostic accuracy.

In this study we used Lipiodol Ultra Fluid as a contrast agent. Lipiodol is an X-ray contrast medium for use in certain radiological investigations where it is desirable to outline a viscous or other structure with directly instilled radio-opaque material. On account of its low viscosity Lipiodol is suitable for introduction into narrow channels and may therefore be used in ducts and sinuses. The optimization here means that we should find balance between the dosage of Lipiodol so that we have enough contrast to diagnostic needs, but that it doesn't cause beam-hardening artefact in picture. Accurate localization of leakage is important before treatment with a surgical operation. We are trying to find out the right dosage by analyzing HU-numbers of the phantom images and patient images with different concentrations of contrast agent.