Clinical Applications of Dual-Energy CT

Hamid et al. (2021), in *Korean Journal of Radiology*

Products
Dual-Energy Computed Tomography (DECT) for improved material differentiation and clinical imaging applications.

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Clinical Background
DECT provides enhanced imaging capabilities by differentiating tissues based on atomic number and electron density. It offers superior lesion detection, quantifies iodine content for contrast evaluation, and reduces metallic artifacts, making it useful in oncology, vascular, musculoskeletal, and emergency imaging.

Aim of Study
To evaluate the clinical applications of DECT across multiple medical disciplines, focusing on tissue characterization, artifact reduction, vascular imaging, and improved contrast differentiation.

Cohort Study
DECT was utilized in multiple imaging scenarios, including head and neck, thoracic, abdominal, vascular, and musculoskeletal applications. Studies analyzed its ability to improve contrast resolution, differentiate materials, and provide virtual non-contrast (VNC) images to reduce radiation exposure.

Link to paper

Results

- DECT improved **brain imaging**, distinguishing contrast enhancement from hemorrhage.
- **Myocardial perfusion defects** were detected with greater accuracy.
- **Pulmonary embolisms and perfusion abnormalities** were better visualized, especially in COVID-19 cases.
- **Liver, pancreatic, and renal tumors** were more clearly defined using iodine quantification.
- **Carotid artery and pulmonary angiography** showed enhanced clot detection and reduced plaque artifacts.
- **Musculoskeletal imaging** improved bone marrow edema detection and metal artifact reduction

Summary

- DECT enhances **lesion detection and tissue differentiation** beyond conventional CT.
- **Reduced metallic artifacts** allow better imaging of prosthetics and surgical implants.
- **Virtual non-contrast (VNC) imaging** reduces radiation exposure by eliminating additional scan phases.
- DECT improves diagnostic confidence in **neurological, cardiac, thoracic, abdominal, vascular, and musculoskeletal conditions**.
- Future advancements in **image reconstruction and spectral filtering** may further optimize **clinical applications and radiation dose reduction**.

Source: Hamid, S., Nasir, M. U., So, A., et al. (2021). DOI: 10.3348/kjr.2020.0996, in *Korean Journal of Radiology*.