Editorial

Advances an Radio-Diagnosis

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Introduction

Various radiological imaging techniques like X-ray radiography, ultrasound, computed tomography (CT), positron emission tomography (PET) & magnetic resonance imaging (MRI) are used to diagnose &/or treat diseases. There has been tremendous developments in radiodiagnosis with great impact in multiple fields like oncology, endocrinology, urology & metabolic diseases. Cure rates have increased with advances in imaging for Lung cancer, Neuroblastoma, Endometrial carcinoma, Rectal cancer, gliomas & Hepatocellular carcinoma [1]. Modern multi-parametric imaging like PET scanning & advanced MRI techniques provides anatomical & functional data for patient care thereby increasing response & recurrence assessment & overall prognosis.

Dramatic progress in thyroid imaging in single photon-emission computed tomography (SPECT), PET, USG elastography, CT, MRI & optical coherence tomography (OCT) [2]. USG has been a gold standard for thyroid screening & its accuracy & specificity has increased with improved gray scale, Doppler sonography, use of specific contrast (e.g. SonoVue) & pulse inversion harmonic imaging [3]. Various isotopes are used for thyroid evaluation like ^{99m}Technetium pertechnetate (for focal nodule), ^{131} Iodine (for assessing cancer recurrence/ residue), ^{18} fluoro-deoxy-glucose & gallium-67 (for thyroid lymphoma) [4]. F18-fluorodeoxyglucose-PET (^{18} F-FDG-PET) is most accurate for detecting recurrence or metastatis of medullary thyroid carcinoma.

Combination of PET with CT or MRI (PET/CT or PET/MRI) increases sensitivity & specificity of detecting occult & residual/recurrent thyroid cancer. Whole-body FDG PET-CT is nowadays recommended for assessing metastases in patients with radioiodine negative scans. ^{131} I SPECT-CT can localise metastasis even in normal sized lymph nodes. USG elastography, Fusion PET-CT, PET-MRI, Diffusion-weighted imaging (DWI) & MR spectroscopy (MRS) using long echo-time (TE) help in differentiating benign & malignant thyroid nodules [5]. Latest methods for evaluation of lung cancers include nodule volumetry, nodule perfusion analysis, dual-energy applications and computer-aided detection [6]. Dual-energy CT, ^{18} F-FDG-PET & DWI-MRI can be used to differentiate benign from malignant tumours. Pancreatic Imaging has improved significantly. Dual- phase helical CT & multidetector computed tomography (MDCT) with better spatial resolution has increased detection & staging of pancreatic neoplasms & acute pancreatitis [7]. Perfusion CT, a dynamic scanning method after contrast administration is useful in diagnosing pancreatic diseases (e.g. necrotizing acute pancreatitis, mass forming chronic pancreatitis) & angiogenesis in neoplasms (e.g. pancreatic & ampullary adenocarcinoma, cystadenoma, endocrine tumors)[8] . Early detection of small (<2 cm size) adenocarcinomas in resectable stage improves prognosis.

Technical innovation in MRI like phased-array coils has better spatial resolution & faster T1- & T2-weighted sequences for imaging upper abdomen in single breathhold. MRI in combination with secretin-enhanced magneticresonance cholangiopancreaticography (MRCP), MR angiography (MRA), MRS & ^{18} F-FDG-PET is useful in management of pancreatic malignancies [9]. C-11 labeled 5-HPT, l-Dopa, ^{111}In-octreotide SPECT, hybrid PET/ CT & SPECT/CT detects endocrine pancreatic tumors. Optical coherence tomography (OCT) uses infrared light to produce high-resolution, cross-sectional, subsurface imaging which is used in evaluating pancreaticobiliary ductal system.

Renal assessment has also improved with advances in radioimaging. Dual-energy computed tomography (DECT) provides volume-rendered angiographic images which noninvasively characterizes renal calculi. Along with split bolus techniques, single DECT provides arterial, nephrographic & pyelographic phases in single series, thereby reducing radiation dose. Multiparametric MRI has

also improved evaluation of renal cysts, small renal masses & prostate cancers. Modern Radio-diagnostic Imaging helps in diagnosis of inborn errors of metabolism, both in intra-uterine state with known family history & after birth even if asymptomatic. MRS findings are typical for selected IEMs like prominent signal at 8.3 ppm in gray & white matter in Adenylosuccinate lyase (ADSL) deficiency; elevated pyruvate at 2.37 ppm in Pyruvate dehydrogenase (PDH) deficiency & lactate accumulation in Leigh`s Disease [10].

MRS Spectroscopy based 'Chemical Autopsy'are used for ruling out IEM in unexplained deaths. In cases where conventional autopsy or necropsy is declined virtuopsy (using CT / MRI) yields more information.

Hence the spectrum of novel imaging technologies along with good clinical acumen have great impact in better patient care.

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