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 have 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 99mTechnetium 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 metastasis 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. Nodule volumetry, nodule perfusion analysis, dual-energy applications and computer-aided detection are latest methods for evaluation of lung cancers. Dual-phase helical CT & MDCT have increased detection & staging of pancreatic neoplasms and acute pancreatitis. MRI in combination with secretin-enhanced MRCP, MRA, MRS & 18 F-FDG-PET are useful in management of pancreatic malignancies. OCT helps in evaluating pancreaticobiliary ductal system. DECT noninvasively characterizes renal calculi with minimal radiation dose. Multiparametric MRI has improved evaluation of renal cysts, small renal masses & prostate cancers. Modern Radio-diagnostic Imaging helps in diagnosis of inborn errors of metabolism. MRS Spectroscopy based ‘Chemical Autopsy’are used for ruling out IEM in unexplained deaths. Novel imaging technologies with good clinical acumen have great impact in better patient care.

Keywords: Radio-diagnosis, tumour imaging, thyroid imaging.

Abstract: The field of Radiodiagnosis has advanced with modern diagnostic and therapeutic tools which have improved outcome in various specialties. With advanced technology like PET scan and advanced MRI, prognosis of cancer has improved due to early diagnosis, response analysis and prompt recurrence assessment. Novel Techniques like SPECT, PET, USG elastography, OCT, SonoVue & pulse inversion harmonic imaging have increased sensitivity of thyroid screening. Whole-body FDG PET-CT is helpful in metastases in patients with radioiodine negative scans. Newer CT methods like 131 I SPECT-CT can localise metastasis even in normal sized lymph nodes. Nodule volumetry, nodule perfusion analysis, dual-energy applications and computer-aided detection are latest methods for evaluation of lung cancers. Dual-phase helical CT & MDCT have increased detection & staging of pancreatic neoplasms and acute pancreatitis. MRI in combination with secretin-enhanced MRCP, MRA, MRS & 18 F-FDG-PET are useful in management of pancreatic malignancies. OCT helps in evaluating pancreaticobiliary ductal system. DECT noninvasively characterizes renal calculi with minimal radiation dose. Multiparametric MRI has improved evaluation of renal cysts, small renal masses & prostate cancers. Modern Radio-diagnostic Imaging helps in diagnosis of inborn errors of metabolism. MRS Spectroscopy based ‘Chemical Autopsy’are used for ruling out IEM in unexplained deaths. Novel imaging technologies with good clinical acumen have great impact in better patient care.
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 cholangiopancreatography (MRCP), MR angiography (MRA), MRS & \(^{18}\)F-FDG-PET is useful in management of pancreatic malignancies [9]. C-11 labeled 5-HPT, I-Dopa 111In-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 pancreatociliary 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 intrauterine 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 has great impact in better patient care.

REFERENCES

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