

## PLENARY SESSION

### 1. Radionuclide Brain Perfusion & Metabolism Imaging In The Diagnosis Of Dementia

**Qaisar Hussain Siraj**

*Farwania Hospital & Molecular Imaging Centre, Kuwait*

Dementia, a deterioration or loss of intellectual abilities of sufficient severity to interfere with social or occupational performance or both, is becoming a major clinical problem in both developed and developing countries, with enormous repercussions on the individuals affected, social structure and health systems.

In neurodegenerative brain diseases, specific brain regions degenerate and specific patterns of metabolic brain activity develop before clear structural changes can be detected with imaging techniques. A decrease in brain synaptic activity in dementia is associated with a reduction in capillary perfusion and local glucose metabolism. Brain perfusion and metabolism imaging allows identification of disease-specific cerebral metabolic brain patterns in neurodegenerative brain diseases at an early disease stage.

A correct diagnosis of the subtype of dementia is important as it affects patient management and institution of appropriate medical therapy. Brain perfusion and metabolic imaging using SPECT or PET imaging provides a unique ability to detect early-stage disease-related changes in the human brain, monitor their progression in vivo, help in differentiating various forms of dementia and monitor treatment response.

### 2. Ultrasound of Thyroid Nodules, What Looks Malignant?

**Dr. Durr-e-Sabih MBBS. MS. FRCP. FANMB,**

*Director MINAR- Multan- Pakistan*

*Chair, Committee of the Asian Nuclear Medicine Board, dsabih@yahoo.com*

Ultrasound has emerged as the most important imaging modality for the initial evaluation of thyroid nodules. Interpretation of the ultrasound images is complex and the learning curve is steep. This paper describes the features to look for when doing a thyroid ultrasound and discusses the various international guidelines on the topic. Author's images will be shown that highlight significant features and also the overlap between benign and malignant.

### 3. Neuroimaging of Alzheimer's disease in routine practice

**Hiroshi Matsuda, MD, PhD**

*Integrative Brain Imaging Center, National Center of Neurology and Psychiatry*

Neuroimaging has played an adjunct role of early and differential diagnosis of Alzheimer's disease in routine practice. Of several neuroimaging modalities, MRI and brain perfusion SPECT have been commonly used in Japan with the aid of software programs for statistical imaging analysis, e.g., voxel-based specific regional analysis system for Alzheimer's disease (VSRAD) for MRI and easy Z-score imaging system (eZIS) for SPECT. In an early stage of Alzheimer's disease, specific findings of regional atrophy and perfusion reduction are

observed in some areas. In the posterior cingulate gyrus to precuneus and parietal cortex, greater perfusion reduction than atrophy is observed. In contrast, milder perfusion reduction than atrophy is observed in medial temporal structures. Early onset Alzheimer's disease shows more prominent perfusion reduction in the posterior cingulate gyrus to precuneus and parietal cortex than late onset Alzheimer's disease. Late onset Alzheimer's disease shows more prominent atrophy in medial temporal structures than early onset Alzheimer's disease. These findings are helpful for differentiation of Alzheimer's disease and other diseases manifesting dementia.

#### **4. New horizon of neuronuclear medicine in dementia**

**Hiroshi Matsuda MD, PhD**

*Integrative Brain Imaging Center, National Center of Neurology and Psychiatry*

Nowhere is the serious social problem of dementia more acute than in Japan, where an estimated one fourth of elderly persons already have or show signs of developing it. The prevalence of dementia has increased over the past few decades, either because of greater awareness and more accurate diagnosis, or because increased longevity has created a larger population of the elderly, the age group most commonly affected. More aging will develop from now on, and so it is predicted that 7 million elderly persons will be demented by 2025 in Japan.

Although the diagnosis of dementia is still largely a clinical one, based on the history and disease course, neuroimaging has dramatically changed our ability to accurately diagnose it. The role of neuroimaging in dementia nowadays extends beyond its traditional role of excluding

neurosurgical lesions. Neuroimaging in dementia is recommended by most clinical guidelines. Moreover new neuroimaging methods facilitate diagnosis of most of the neurodegenerative conditions after symptom onset and show promise for diagnosis even in very early or presymptomatic phases of some diseases.

Under these conditions, all clinicians and researchers who are involved in neuroimaging for dementia should decide which patients to scan, when imaging patients is most useful, which modality to use, how to handle imaging data from many institutions, and which analytical tool to use. I would like to give a presentation from brain perfusion SPECT to the latest modalities such as tau and amyloid PET imaging for the diagnosis of Alzheimer's disease and other dementias, and also provides information on analyzing imaging data.

#### **5. Challenges of radioactive iodine therapy for thyroid cancer**

**Henry Bom, MD, PhD, FANMB**

*Chairman, ARCCNM*

*Professor, CNU Medical School, Korea*

The reason why differentiated papillary thyroid cancer increases globally is not clear. Screening of thyroid cancer by ultrasonography can be a reason. Other causes such as high iodine consumption and genetic variation can be considered. Increasing tendency of papillary thyroid cancer in many countries in the world should be also considered together. The outcome of this phenomenon is not clear yet as the differentiated thyroid cancer has very low mortality rate.

As surgical skills for thyroidectomy improves the amount of remnant thyroid tissue decreases. Accordingly the strategy of radionuclide therapy of postoperative differentiated thyroid cancer (DTC)

The macroscopic extrathyroidal invasion is remained as a significant risk factor, however, it is not clear whether the microscopic extrathyroidal invasion is also a risk factor. Even the invasion of DTC to the central lymph nodes in the thyroid bed area is not clear whether it is a risk factor or not.

There is a trend of reducing the dose of iodine-131 for therapy of DTC especially for the low to intermediate risk group of patients. Still there is no consensus for the most preferable dose in these groups. Duration of admission at isolating rooms is different according to regulations of each country. Radiation safety issue is increasingly acknowledged by public in many countries. The current dosing of radioiodine therapy is usually empirical. To verify whether the dosimetry before therapy can improve the outcome of the patients we need more clinical data. It is also true for the prediction of radioiodine therapy for DTC. We need more data on how to identify and treat refractory patients to radioiodine therapy.

## **6. The Evolving Role Of Hybrid & Multimodality Imaging In Nuclear Cardiology**

**Qaisar Hussain Siraj**

*Farwania Hospital & Molecular Imaging Centre, Kuwait*

The increasing availability of sophisticated nuclear medicine hybrid imaging systems supplementing nuclear medicine functional studies (SPECT and PET) with structural imaging (CT and MRI) have now made it possible to combine functional and structural hybrid imaging or supplement functional imaging with structural imaging or vice versa.

In tandem with the continuing refinement and improvements in these hybrid systems, there has been a move from simple registration and localization hybrid imaging and attenuation correction to diagnostic quality structural imaging. This new environment has spurred the need for

requisite multimodality training encompassing several disciplines. The new generations of nuclear medicine 16-slice SPECT-CT cameras are now routinely being used for attenuation correction of cardiac SPECT, but additionally allow coronary artery calcium (CAC) measurements. The new 64-slice PET-CT cameras for PET myocardial perfusion imaging not only provide CAC measurements, but also allow entry-level cardiac CT angiography, which can complement perfusion imaging with the hybrid technique providing a higher diagnostic yield than the individual imaging modality alone. The emerging role of this multimodality imaging in nuclear medicine is discussed.

Certified nuclear medicine physicians are eligible for entry into training programs to acquire competencies in calcium scoring and cardiac CT including CT angiography. The path to training, competency and certification in cardiac CT is outlined as per current guidelines. The traditional boundaries between structural and functional imaging are fast becoming blurred with structural imaging increasingly allowing functional evaluation and functional imaging modalities merging with anatomical imaging.

## **7. Normal database construction of 123I-FP-CIT SPECT in Japan**

**Hiroshi Matsuda M.D., Ph.D.**

*Integrative Brain Imaging Center*

*National Center of Neurology and Psychiatry*

Single photon emission computed tomography (SPECT) imaging of the dopamine transporter (DAT) is widely used to assess the nigrostriatal function in parkinsonian syndromes. 123I-FP-CIT is by far the most widely used radiotracer not only in USA and Europe but also in Japan. Semi-quantification of striatal DAT binding appears to be a valuable tool to generate numerical values to assess the progression of diseases and to monitor the effects of

neuroprotective agents. In this large, multicenter Japanese study, we apply automatic VOI semi-quantification software named 'DaTView' (Nihon Medi-Physics) to obtain specific binding ratios (SBR) of striatum in DaTscans from more than 200 healthy subjects with dual-head or triple-head gamma cameras. DaTView based on the method developed by Tossici-Bolt et al is a measurement technique without anatomic standardization using bilateral whole striatal VOIs and whole brain except for striatal regions as a reference. The effect of age and gender on DAT uptake is explored to construct a normal database of DaTscan. Eight institutes are joining this multicenter study. In advance SPECT images form an anthropomorphic striatal phantom filled with different concentrations of  $^{123}\text{I}$  were acquired in all institutes. The purpose of the phantom study was to assess the different imaging systems for both their SPECT uniformities and the linearity of their response to  $^{123}\text{I}$ . Moreover the linear regression equation is calculated between striatal SBR values of phantom obtained from SPECT data and from radioactivity measured by well counter. Normal volunteers aging from 30 to 90 years undergo MRI and two SPECT scans after 3 hours post injection of  $^{123}\text{I}$ -FP-CIT with different SPECT scanners. All clinical data (UPDRS-III score, Beck Depression Inventory scale, Japanese version of the Montreal cognitive assessment score, and questionnaires about REM sleep behavior disorder) are inputted to electronic data capture that is linked to DICOM image archiving system of MRI and two DaTscan data. At this point there is a slight but significant age-dependent decline of approximately 8% by 10 years in striatal SBR. Women showed slightly but not significantly higher SBR values than men. Striatal SBR values remarkably varied under different reconstruction conditions of attenuation and scatter corrections. These differences in SBR can be reduced by application of the above mentioned linear regression equation of striatal SBR values between SPECT and well counter.

## 8. Management of Differentiated Thyroid Cancer (DTC)-Update

**Prof. Dr. Faridul Alam M D, Ph D**

*Director BIHS, Hospital & former Director National Institute of Nuclear Medicine and Allied Sciences.*

### ABSTRACT

Incidence of DTC is 1.2-2.6 per 100,000 individuals in men and from 2.0-3.8 per 100,000 in women in USA in 1995. The reported incidence has been increasing at more than 5%/yr for a decade. Recorded incidence of thyroid cancer increased by 2.4 fold between 1973 and 2002. In South Korea the incidence among people of 15 to 79 years of age (standardized to the world population) increased from 12.2 cases per 100,000 persons in 1993–1997 to 59.9 cases per 100,000 persons in 2003–2007. More than 40,000 people in the country were diagnosed with the disease in 2011. According to the Cancer Incidence in Five continents database maintained by the International Agency for Research on Cancer, the rate of thyroid-cancer detection has more than doubled in France, Italy, Croatia, the Czech Republic, Israel, China, Australia, Canada, and the United States. This increase has been attributed to increased diagnosis of tumors measuring < 2cm in diameter by ultrasonography and other imaging device as well as FNAC. As a result number of operation is increased. An analysis of insurance Claims for more than 15,000 Koreans who underwent surgery showed that 11% had hypoparathyroidism and 2% had vocal-cord paralysis. During the past two decades, multiple countries have had a substantial increase in thyroid-cancer incidence without a concomitant

increase in mortality. Studies comparing thyroid cancer incidence during different periods and across countries can help in estimating over diagnosis — that is, diagnosis of thyroid tumors that would not, if left alone, result in symptoms. Treatment of DTC is surgical removal of thyroid mass, thyroidectomy (partial, near total or total) followed by radioablation in selected cases. Considering all the things surgeons or physicians should take judicial decision before operation or radio ablation therapy, considering its nature of benignity and side effects of operation and radiation. Strategy of DTC treatment has substantially changed both in operation, radioablation and follow up. This presentation will give an update.

## **DEVELOPMENT AND PROMOTION OF NUCLEAR MEDICINE SESSION**

### **1. The Asian Nuclear Medicine Board, Why do we need it?**

**Dr. Durr-e-Sabih, MBBS. MS. FRCP.**

*FANMB Director MINAR- Multan- Pakistan*

*Chair, Committee of the Asian Nuclear Medicine Board, dsabih@yahoo.com*

The Asian Nuclear Medicine board emerged and evolved to address the peculiar needs of nuclear medicine physicians of the region. This paper describes the *raison d'être* of the board, discusses the evolution and future directions of this very important resource for nuclear medicine physicians of Asia.

### **2. How to improve education and training of nuclear medicine in Asia?**

**Henry Bom MD, PhD, FANMB**

*Chairman, ARCCNM*

*Professor, CNU Medical School, Korea*

The Asia Oceania Federation of Nuclear Medicine

and Biology (AOFNMB), the Asian Regional Cooperative Council for Nuclear Medicine (ARCCNM) and the Asian School of Nuclear Medicine (ASNMB) are working together to promote nuclear medicine in Asian region. Foundation of the Asia Oceania Journal of Nuclear Medicine and Biology gives more chances of publication and communication among nuclear medicine professionals in Asia. Recently the new board system, the Asian Nuclear Medicine Board (ANMB), started in 2014. Goal of ANMB include standardization and harmonization of education and training in Asia. Those who passed the ANMB examination were named the Fellow of ANMB (FANMB), and were invited to become active members of various clinical researches. Leaders of AOFNMB is discussing to organize a new research network with the name of the Asia Oceania Research Initiative Network (AORIN). The aim of AORIN is clinical collaborative researches in this region. Multicenter clinical trials are designed by clinical investigators in neurology and thyroidology as the first trial. Newer clinical trials are expected to be started soon.

Recently the Regional Cooperative Agreement (RCA) initiated a new project to improve education and training of nuclear medicine professionals as well as referring doctors in Asia. RCA regional countries to build up expert network of nuclear medicine in the region.

### **3. Current status of Nuclear Medicine services in Myanmar**

*Professor Kyin Myint, President, Myanmar Nuclear Medicine Society, Myanmar*

**Background:** The Department of Radioisotope, the forerunner of future Department of Nuclear Medicine was founded at Yangon General Hospital in 1963, following the visit of Dr. E. H. Belcher, the

then Head of the Division of Life Sciences of the International Atomic Energy Agency (IAEA), and consultation with local health authorities (Ministry of Health, Myanmar). Continuous development of Rectilinear scanner (1966), Three-probe scintillation detector (1968), Planar Gamma Camera and RIA automatic well-counter (1974), SPECT gamma camera (2000), SPECT-CT (2014), PET-CT and 18 MeV CYCLOTRON (2015) provide effective clinical uses of Radio-isotopes in Myanmar, improving health-care status. Radioiodine ( $^{131}\text{I}$ ) therapy for thyrotoxicosis and Differentiated Thyroid Carcinoma has been done since 1974. Postgraduate program of one-year Diploma course has started in 1997 and upgraded to three-year Master degree in 2007 in a liaison with University of Medicine 1, Yangon. 15 Nuclear Medicine Physicians have been qualified under this program and 11 residents are under training now. Myanmar Nuclear Medicine Society (MNMS) was formed in 2014 and the present membership status is 44. Department of Nuclear Medicine in Myanmar is planning to introduce PRRT and Theranostics with existing hybrid imaging facilities (SPECT-CT & PET-CT).

**Methodology:** The Government of MYANMAR in collaboration with International Atomic Energy Agency (IAEA) has played a pivotal role not only for successful implementation of the projects, but also for sustainable growth and upgrading of Nuclear Medicine services in MYANMAR.

**Results:** Five Nuclear Medicine centers (including military hospital) throughout the country are actively running with 4 SPECT gamma cameras, 5 SPECT-CT cameras, 1 PET-CT, 1 Cyclotron and 3 well-equipped RIA laboratories to fulfill the service. Regarding private Nuclear Medicine service, one SPECT-CT center and one Nuclear Cardiology center have run actively in Yangon and two more radioisotope therapy centers will appear in 2017.

**Conclusion:** Myanmar Nuclear Medicine society is a

major steering body to communicate with other allied societies for the upgrading and growth of Nuclear Medicine services in Myanmar.

#### 4. Development of Nuclear Medicine in Bangladesh

**Mizanul Hasan, MBBS, M.Phil, FANMB**

*Director, National Institute of Nuclear Medicine & Allied Sciences, Dhaka, Bangladesh.*

The history of nuclear medicine in Bangladesh is quite old. The first nuclear medicine centre was established back in 1962. Now a total no. of 22 centers including one national institute situated in Bangabandhu Sheikh Mujib Medical University in Dhaka is giving nuclear medicine services to more than 100,000 patients annually in different parts of the country. Most of them are thyroid patients while cardiac, bone, kidney and other studies are done routinely. So far therapy is concerned the country is mainly doing  $^{131}\text{I}$  therapy for Ca-thyroid and thyrotoxicosis patients.

Almost all the nuclear medicine centers in Bangladesh are equipped with a number of gamma & SPECT cameras. A few have acquired SPECT-CT also. The country has established its first PET-CT and a cyclotron in a private hospital in Dhaka in the year of 2010. In government sector also one PET-CT scanner is giving regular services since January 2016. A few more PET-CT scanners are on the way.

The National Institute of Nuclear Medicine & Allied Sciences (NINMAS) in Dhaka is a post graduate institute which offers post graduate degree in nuclear medicine. It also runs different training programs for physicians as well as for technologists. The institute and the other centres are involved in different local & regional projects in collaboration with IAEA, RCA and other international organizations including GOB projects.

Though the country's nuclear medicine service is

very old but regular supply of radio-isotope is still a big problem for smooth functioning of nuclear medicine centers. The only radioisotope centre of the country at Savar cannot meet the demand of the patients. The country is dependent on a third country for its total demand. Many a times the supply is not in time and sometimes the whole lot is cancelled for many a reason. This brings a great suffering to the patients especially the therapy patients who are waiting in a long schedule.

Bangladesh is progressing fast in socio-economic factors. It has already achieved the MDG in health sector and now progressing for SDG. Keeping pace the nuclear medicine field is also progressing fast. The government is modernizing the facilities of the old centers and planning to establish 8 more new nuclear medicine centers in different parts of the country in next few years. Some private sectors are also coming up.

### **5. Activities of SNMB during the Last One Year – A Pictorial Journey**

**Dr. Raihan Hussain, MBBS, DNM, FANMB, PhD.**

*Professor & Chief Medical Officer, Head, Nuclear Cardiology Division and PET-CT Divisions, National Institute of Nuclear Medicine and Allied Sciences, BSMMU campus, Dhaka, BAEC.*

*President, Society of Nuclear Medicine, Bangladesh, e-mail: raihan\_h@yahoo.com*

#### **ABSTRACT**

SNM, Bangladesh is a vibrant body with active and enthusiastic members working together for the development of the discipline. Although it may not be a large body, but nevertheless it has proved its capability in performing big tasks and promoting Nuclear Medicine in the country and in international arena. Apart from regular organizational administrative and managerial works it has achieved unique standards in arranging excellent and successful national and international conferences. Despite many limitations and tight schedule in daily workload the members of SNMB are highly active in various conferences, meetings,

seminars etc in home and abroad.

Here a brief pictorial presentation is being made to have a look of our society's activities in the past one year.

## **6. Radiation Incidents in Medical Field: Occurrences, Types, Consequences, Safety Concerns and the Lessons to be Learned.**

**Prof. Shahana Afroz MBBS, MPhil, MD, PhD.**

*Member, Bangladesh Atomic Energy Regulatory Authority (BAERA)*

### **PET-CT SESSION**

#### **1. Impact of PET-CT in Management of Colorectal Cancer**

**Molla Abdul Wahab, Shamrukh Khan and Mehedi Masud**

*Department of Nuclear Medicine, United Hospital, Dhaka*

#### **ABSTRACT**

Although CT (Computerized Tomography) still remains the imaging modality of choice in the diagnosis of colorectal cancer (CRC) and anal cancer. However, advances in imaging technologies especially molecular imaging in Nuclear Medicine have expanded the role of MRI and PET-CT (Positron Emission Tomography-computed tomography). Hence in near future the main role of CT will be questionable not only in diagnosis of CRC and but also in management. CRC is increasing in Bangladesh due to change of lifestyle and food habits. So focusing on the evolving role of 18FDG PET-CT in the diagnosis, radiation therapy planning, therapy assessment, and post therapy monitoring of CRC and anal cancer has a good impact to increase the survival rate and decreased sufferings of patients

with financial benefit.

18FDG PET-CT is a valuable imaging modality that impacts the clinical management of patients with CRC and those with anal cancer in such a way that may supersede the role of CT in near future.

**Keywords:** PET-CT, 18FDG - Fluoro-deoxy glucose, Colorectal cancer, Radiotherapy, Radiation planning, therapy monitoring.

#### **2. Treatment Monitoring in Multi Drug Resistance Tuberculosis Using 18 F FDG PET- CT**

**<sup>1</sup>Shamim M F Begum, <sup>1</sup>Fatima Begum, <sup>2</sup>Md Abdus Shakur Khan, <sup>2</sup>Subhashish Dey, <sup>1</sup>Khokon Kumar Nath, <sup>1</sup>Nahid Hossain, <sup>1</sup>Nasreen Sultana, <sup>1</sup>Raihan Hussain and Jamshed Bomanji**

*1 National Institute of Nuclear Medicine and Allied Sciences, Dhaka, Bangladesh*

*2 National Institute of Diseases of the Chest and Hospital, Dhaka, Bangladesh*

*3 Institute of Nuclear Medicine, University College Hospital, London, UK*

#### **ABSTRACT**

**Objective:** Tuberculosis (TB) is a global public health problem with the WHO estimate of 9.6 million people around the world developing TB and 1.5 million people dying annually from it. Among the South East Asian region, Bangladesh is one of the eleven countries that has a high TB burden and globally it stands at the sixth position. Generally TB has an excellent outcome with the standard treatment. However, there are subsets of patients who develop multidrug resistance TB (MDR TB) and extra-pulmonary TB (EPTB), they have serious consequences. Customized and adequate treatments

of these patients mandate the precise localization of the disease. Fluorine-18 Fluorodeoxyglucose Positron Emission Tomography-Computed Tomography (18F FDG PET-CT) is a noninvasive new imaging tool and can play a potential role not only in localizing the disease but also in assessing the treatment of MDR TB.

Objective of this study was to examine the efficacy of 18F FDG PET-CT in both localization of lesions and in monitoring treatment response in patients with MDR TB.

**Patients and Methods:** Study was conducted at National Institute of Nuclear Medicine and Allied Sciences, BSMMU Campus together with the National Institute of Chest Disease and Hospital, Mohakhali, Dhaka, Bangladesh under an IAEA project (Coordinated Research Project-15021).

The study was approved by the Medical Research Ethics Committee, NINMAS. In this prospective study, culture positive TB patients with confirmed MDR were selected purposively. There were 14 patients (12 male and 2 female) with age range 18 to 65 years (average age 26.35 years). Nine patients had past history of TB. All patients underwent a baseline whole-body 18F FDG PET-CT scan before starting anti-tuberculosis treatment for MDR TB. Follow-up PET-CT scan was done in 10 patients after two months of initiation of anti-TB drug and another scan after six months of first follow up. The maximum standardized uptake value (SUV<sub>max</sub>) of most FDG avid pulmonary and extra pulmonary lesions were recorded and compared. The size of the lesions were measured and then compared.

**Results:** 18 F FDG PET-CT detected active pulmonary TB lesions in 12 cases, extra-pulmonary lesions in pleura and lymph nodes in 11 cases and bone in 1 case. The mean SUV<sub>max</sub> value of pulmonary, pleural and lymph node lesions were  $9.7 \pm 3.4$ ,  $8.3 \pm 4.9$  and  $7.3 \pm 6.7$  respectively in baseline scan. The average size of pulmonary lesions was  $63.1 \pm 8.7$  mm and involved lymph node was  $16.1 \pm 7.6$  mm in baseline study. The second 18F FDG PET-CT (after 2 months)

showed reduced FDG uptake intensity, with a mean percentage decrease of SUV<sub>max</sub> of 40.12 % in pulmonary lesions (7 patients), 59.7% in pleural lesions (3 patients) and 57.61% in lymph nodes (7 patients). The third FDG PET-CT scan showed persistent reduced FDG uptake intensity. The recorded reduced mean percentage of FDG uptake intensity were 84.49 % (8 patients), 95.74 % (5 patients) and 68.24% (7 patients) in pulmonary, pleural and lymph node lesions respectively. Follow-up scans also showed morphological change with reduction in size of the lesions.

**Conclusion:** 18 F FDG PET-CT plays a potential role in treatment monitoring of both pulmonary and extra pulmonary MDR TB. More than 40% reduction of SUV<sub>max</sub> value after two months of anti MDR TB treatment suggests good response.

### 3. FDG PET-CT in Detecting Tumor Recurrence not Evident in Whole Body 131-I Scan in Differentiated Thyroid Carcinoma

**Sadia Sultana, Fatima Begum, Shamim M F Begum, Nurun Nahar and Raihan Hussain**

*National Institute of Nuclear Medicine & Allied*

*Sciences Correspondence: Sadia Sultana,*

*email: sadias1964@gmail.com* ABSTRACT

**Objective:** Thyroglobulin (Tg) is used as tumor marker in the follow up of patients with differentiated thyroid carcinoma (DTC) following radioactive iodine (RAI) ablation. High serum Tg indicates local recurrence or metastasis and usually associated with positive iodine (131-I) whole body scan (WBS). In some patients metastatic tissue fails to uptake iodine resulting in negative WBS in spite of high serum Tg. These metastases are usually associated with aggressive clinical behavior and cannot be treated with RAI. Surgery is the only curative treatment option for these iodine refractory metastases. Exact localization of tumor foci is necessary for successful resection. FDG-PET has been

used for detection of high Tg and negative WBS metastases for many years.

Objective of this study was to find out FDG avid metastatic lesions in differentiated thyroid carcinoma (DTC) patients with high serum thyroglobulin (Tg) or anti thyroglobulin antibody (TgAb) with negative iodine (<sup>131</sup>I) whole body scan (WBS).

**Patients and Methods:** The study included 18 DTC patients, 13 female, 5 male with mean age 42.3 years (range 26-72 years) who developed elevated Tg or TgAb and negative WBS at different follow up stages (Mean follow up period 7.7 years, range 1-29 years). PET-CT was indicated for high serum Tg in 12 patients and for rising TgAb in 6 patients. All of them underwent <sup>18</sup>F-FDG PET-CT scan from January to October 2016 in National Institute on Nuclear Medicine and Allied Sciences (NINMAS), Bangladesh following standard protocol.

**Results:** Among 16 patients 14 patients showed hypermetabolic lesions at different sites of body while in two patients no hypermetabolic lesion was detected in FDG PET-CT scan. Among two PET-CT negative patients one had rising TG and one had rising TgAb. Among 16 PET positive patients hypermetabolic cervical lymph nodes were found in 15 patients, mediastinal lymph nodes in six patients. One patient had lesion in vocal cord, one had multiple FDG avid focal lesions in both lungs and two patients had axillary lymph nodes. A total of six patients showed FDG avid bony lesions in different vertebra, ribs and femur. Six patients showed single site involvement- of them five in cervical lymph nodes and one in mediastinum. Rest 10 patients had multiple sites involvement- in cervical regions, mediastinum, axilla, lung, bones and vocal cord.

**Conclusion:** FDG PET-CT imaging gives new insight in the management of iodine refractory DTC patients.

**Key words:** PET-CT, DTC, Rising Tg/TgAb, Negative

whole body scan.

#### 4. PET-CT in Pediatric Patients with Lymphoma-One Year Experience at NINMAS, Dhaka

<sup>1</sup>Fatima Begum, <sup>1</sup>Shamim M F Begum, <sup>1</sup>Raihan Hussain, <sup>1</sup>Sadia Sultana, <sup>2</sup>ATM Atikur Rahman, <sup>1</sup>Lutfun Nisa, <sup>3</sup>Kamila Afroj Quadir, <sup>4</sup>Thomas Pascual and <sup>1</sup>Mizanul Hasan

<sup>1</sup>National Institute of Nuclear Medicine and Allied Sciences, Dhaka, Bangladesh

<sup>2</sup>Department of Pediatric Hematology & Oncology, Bangabandhu Sheikh Mujib Medical University, Dhaka, Bangladesh

<sup>3</sup>Bioscience Division, Bangladesh Atomic Energy Commission, Dhaka, Bangladesh.

<sup>4</sup>Division of Human Health, Department of Nuclear Sciences and Applications, International Atomic Energy Agency (IAEA), Vienna, Austria

#### ABSTRACT

**Objective:** <sup>18</sup>F-FDG PET-CT (<sup>18</sup> fluorine deoxyglucose positron emission tomography-computed tomography) started on 6th January 2016 at National Institute of Nuclear Medicine and Allied Sciences (NINMAS) –the first public facility in Bangladesh. The pediatric patients were included on the very first date. The objective of this study was to analyze the PET-CT findings in pediatric patients with lymphoma at baseline, interim and after treatment and disseminate the knowledge to the concerned physicians.

**Patients and Methods:** This study was approved by Medical Research Ethics Committee, NINMAS. Consent from parents of each patient was taken. A total 24 pediatric patients were referred to National Institute of Nuclear Medicine and Allied Sciences (NINMAS) during January- December 2016. Four patients were excluded from the study as diagnosis was not confirmed as lymphoma. Twelve children

Interim PET-CT in 4 patients after 2 cycles of ABVD chemotherapy showed complete response in 2 patients and partial response in 2 patients. Those 8 patients who referred after completion of chemotherapy; 6 had HL and 2 were diagnosed as NHL. Baseline PET-CT scan was not available in those patients, only baseline CT was available in 2 patients. PET-CT evaluation of those 8 children showed- one patient had no metabolically active disease suggesting complete response, 4 patients showed restaging in stage –II, 2 patients at stage-III and one patient at stage-IV.

**Conclusion:** PET-CT is an important imaging modality for baseline staging, observing the disease progression in interim scan, to assess the treatment response and recurrence in pediatric patients with HL and NHL, although number of NHL patients was less in this study.

## 5. Cancer of Unknown Primary: Initial experience with PET-CT scan

<sup>1</sup>Shankar Kumar Biswas, <sup>2</sup>Md. Zakir Hossain and <sup>1</sup>Md. Sanowar Hossain

<sup>1</sup>Institute of Nuclear Medicine & Allied Sciences, Dhaka  
<sup>2</sup>Consultant Radiologist, Medinova Medical Services Ltd.

### ABSTRACT

**Objective:** Cancer of unknown primary (CUP) denotes metastatic tumour detected when the site of primary origin cannot be identified based on clinical history, complete physical examination, routine laboratory tests, imaging with radio metabolic techniques and careful review of histopathological specimens. Although one third of advanced tumours presents with metastases at the time of diagnosis. In the majority of cases the organ site of primary lesions are shortly evident after clinical, pathological and radio metabolic evaluation.

**Patients & Methods:** Seven patients (Age: 58 ± 19 Yrs & M: F: 5:2) were referred for PET-CT scan in Medinova Medical Services Ltd. with cancer of

unknown primary (CUP) during a period of January 2013 to July 2015. PET-CT scan was done in 128 slice GE Discovery VCT System. One hour after iv administration of 18 F-FDG images were taken. High resolution contrast CT scan images were also obtained of the same area. Two patients presented with metastatic bone pain, two patients with metastatic cervical lymph nodes, one with multiple space occupying lesions in brain, one with metastatic lung lesions & one patient presented with pericardial tamponade. All patients underwent a thorough investigations and no definite primary source of cancer could be identified.

**Results:** Primary cancer sites could be identified in three cases only on PET-CT scan images. Intense FDG avid (SUVmax: 8.44) nodular lesion in the left lung detected in one case which was finally diagnosed as primary. In the 2nd case hyper metabolic lesion (SUV max: 12.13) in the superior segment of left lower lobe was the primary and that was responsible for brain metastases. In the 3rd case lung was also the source of primary lesion (SUVmax: 10.73). After a meticulous observation of the PET-CT scan images no abnormal focal or diffuse hyper metabolic lesion could be identified elsewhere in the body surveyed in the rest 4 cases which could be designated as the primary lesion.

**Conclusion:** PET-CT scan could be the investigation of choice in a view to search the primary source of cancer where diagnosis is very important to start the specific treatment.

### PROFFERED ORAL PRESENTATION

#### 1. Comparison between Conventional SPECT and SPECT-CT in Detection of Parathyroid Adenoma or Hyperplasia

<sup>1</sup>Mohana Hossain, <sup>1</sup>Shankar Kumar Biswas, <sup>2</sup>Jasmine Ara Haque, <sup>3</sup>Hosne Ara Rahman, <sup>1</sup>Fatema Sultana Haque, <sup>1</sup>Rubina Begum, <sup>1</sup>Md. Sanowar Hossain, <sup>1</sup>Farhana Rahman, <sup>1</sup>Sadia Hossain, <sup>1</sup>Afroza Akhter and <sup>1</sup>Shaila Sharmin

<sup>1</sup>Institute of Nuclear Medicine and Allied Sciences,

*Dhaka Medical College campus, Dhaka, BAEC, Bangladesh.*

*2National Institute of Nuclear Medicine and Allied Sciences, Shahbag, Dhaka*

*3Institute of Nuclear Medicine and Allied Sciences, Mitford, Dhaka, BAEC, Bangladesh.*

#### ABSTRACT

**Objective:** The purpose of the study was to compare between <sup>99m</sup>Tc sestamibi dual phase SPECT and SPECT-CT to evaluate the advantage of one over another in detecting and localizing abnormal parathyroid glands in patients with primary hyperparathyroidism who were scheduled for surgery including patients with failed parathyroidectomy.

**Patients and Methods:** A total number of 37 diagnosed cases (Female 27, male 10) of primary hyperparathyroidism with an age range of 16-74 years were evaluated in this study. SPECT and SPECT-CT were performed on each patient. Findings of each individual technique were reviewed blindly and comparison was made between these different imaging modalities regarding detection and localization of diseased parathyroid gland. Surgical location and histopathological findings were served as the gold standard. The imaging results were compared with the operative results to determine sensitivity, specificity, PPV, NPV and accuracy for each method.

**Results:** Out of 37 patients of primary hyperparathyroidism, 33 cases were detected to have diseased glands (78.89% adenoma and 21.21% cases of hyperplastic parathyroid glands) on surgery whereas 4 patients showed no hyperactive parathyroid tissue. Among 33 surgery positive cases, 3 patients had ectopic parathyroid gland and 5 patients had history of failed parathyroidectomy. SPECT and SPECT-CT scans were true positive in 31 and 32 patients respectively. Among 5 cases of primarily failed parathyroidectomy, SPECT and SPECT-CT scan correctly interpreted 3 and 4 cases respectively. All 3 cases of ectopic glands were

identified successfully by SPECT and SPECT-CT but with precise anatomic information with the latter approach. The study revealed almost similar validity test results for both SPECT (sensitivity-93.93%) and SPECT-CT (sensitivity-96.9%) which was not statistically significant, particularly in case of normally located diseased gland.

**Conclusion:** SPECT-CT has no significant additive value over conventional SPECT in diagnosing parathyroid adenoma or hyperplasia. It should be preserved in cases of ectopic gland, previously failed parathyroidectomy or inconclusive planar / SPECT results. Elimination of CT portion will save the patient additional time, unnecessary radiation exposure and expense.

**Key words:** Parathyroid adenoma, Primary hyperparathyroidism, parathyroid scintigraphy, SPECT.

## 2. Solitary and Multiple Metastatic Bony Lesions in Bone Scan of Carcinoma Breast patients

**Samira Sharmin, Md. Mahbub ur Rahman, Hosne Ara Rahman, Jamiul Hossain, Jesmine Ferdous and Farida Yasmin**

*Institute of Nuclear Medicine and Allied Sciences, Sir Salimullah Medical College Campus, Mitford, Dhaka*

#### ABSTRACT

**Objective:** Carcinoma breast is the common malignant disease in women. The purpose of this study is to see the distribution pattern of skeletal metastasis in bone scan of carcinoma breast patients.

**Patients and Methods:** This retrospective study was conducted in Institute of Nuclear Medicine and Allied Sciences, Mitford, Dhaka over a period of two years from January 2014 to December 2015. About 560 patients were enrolled who underwent Tc-99m MDP bone scan by Dual Head Simens Gamma Camera. In case of some suspected solitary lesions other modalities like FNAC, MRI were considered for confirmation.

**Results:** The total number of patients were 560. Mean

age of the patients  $55.47 \pm 10.50$  with a range of 29 to 78 years, among them 558 were female (99.64%) and 2 were male (0.36%). Bone scan were negative for metastasis in 395 (70.53%) cases and positive in 155 (27.68%) and super scan in 10 (1.7%). 29 (17.5%) had solitary metastasis, mostly found in ribs 31.03% (n = 9), followed by dorsal vertebrae 20.17% (n = 6), lumbar vertebrae 13.8% (n = 4), manubrium and skull both showed the same percentage of metastasis 10.34% (n = 3), sternum 7% (n = 2), cervical vertebrae and pelvis both showed 3.41% (n = 1). In case of solitary metastasis appendicular skeleton showed no involvement. In case of multiple metastasis (n = 155) the highest percentage of metastatic lesion found in lumbar vertebrae 13.30% (n = 60), followed by pelvis 12.6% (n = 57), ribs 11.7% (right n = 27, left n = 30), sacrum and dorsal vertebrae showed the same percentage (10%, n = 46) of metastatic lesions, sternum 8.3% (n = 37), skull 8% (n = 33), manubrium 7.1% (32), femur 5.3% (right n = 13, left n = 11), humerus 2.7% (n = 12), clavicle 1.5% (n = 7). Multiple metastases were found bilaterally in ribs and pelvis. Upper end of femur and humerus were more affected than lower ends.

**Conclusion:** Multiple metastasis were common than solitary metastasis and axial skeleton is more affected than appendicular skeleton, mostly spine. Distribution of metastatic lesions in skeleton can guide oncologist regarding management and prognosis.

**Key words :** Bone metastasis, Carcinoma Breast, Bone scan.

### 3. Survival Outcome in Patients with Severe Left Ventricular Dysfunction Detected by Gated SPECT Myocardial Perfusion Imaging

**Azmal K. Sarker, Faria Nasreen, Lutfun Nisa and Raihan Hussain**

*National Institute of Nuclear Medicine and Allied Sciences (NINMAS), BAEC, BSMMU campus, Shahbag, Dhaka, Bangladesh.*

ABSTRACT

**Objective:** Severe left ventricular (LV) dysfunction is

found in a proportion of patients with coronary artery disease (CAD) who are referred to National Institute of Nuclear Medicine and Allied Sciences (NINMAS) for a Gated SPECT Myocardial Perfusion Imaging (GSMPI). Severe LV dysfunction leads to heart failure which have guarded prognosis. The purpose of this study was to determine the survival outcome of patients who were diagnosed severe LV dysfunction on the basis of quantitative parameters derived from GSMPI.

**Patients and Methods:** Fifty two patients with severe LV dysfunction were selected from 879 patients who underwent GSMPI from January 2007 to December 2009 at NINMAS. The GSMPI criteria for severe LV dysfunction were LV Ejection Fraction (EF) < 40% and a corresponding End Diastolic Volume (EDV) > 130 ml. After forming a database of these 52 patients, telephonic interviews were conducted to obtain clinical details of the outcome of each patient.

**Results:** Fifty two patients (M / F = 50 / 2) with mean age  $51.6 \pm 9.5$  (32 - 75) years were diagnosed to have severe LV dysfunction with mean EF  $27.7 \pm 5.5$  (18 - 39)% while the mean EDV being  $223 \pm 69.7$  (135 - 486) ml. Follow up data of 19 (M / F = 18 / 1) patients with mean age  $52.9 \pm 7.4$  (38-65) years, EF  $29.1 \pm 6.6$  (18 - 39)% and EDV  $211 \pm 45.4$  (135 - 320) ml were available. Nine (47.4%) patients were alive at the time of follow up and 10 (52.6%) patients were found to be deceased. In this group one and five year survival were estimated to be 68 and 47%. Among the patients who underwent coronary revascularization (CR) after imaging and those who were on medical management (MM), test of equality of survival distributions for two different treatment strategies revealed no difference (Log Rank significance,  $p > 0.05$ ).

**Conclusion:** Five year survival in this study group diagnosed with severe LV dysfunction by GSMPI was 47% where treatment strategies did not contribute to significant difference of survival.

### 4. Role of <sup>99m</sup>Tc DTPA Renal Scintigraphy for Evaluating Renal Parenchymal Function in Patients with Ectopic Kidneys: 6 Months Experience

**Shaila Sharmin, Afroza Akhter, Tania Sultana, Shankar Kumar Biswas and Sanowar Hossain**

*Institute of Nuclear Medicine & Allied Sciences, Dhaka Medical College Hospital, Dhaka, Bangladesh.*

**ABSTRACT**

**Objective:** Renal ectopia is a condition characterized by failure of the mature kidney to reach its normal position. This retrospective study was designed to evaluate renal parenchymal function in patients with ectopic kidneys by <sup>99m</sup>Tc-DTPA renal scintigraphy.

**Patients and Methods:** This retrospective study was carried out on 7 (M: F: 3:4, age 28 ± 22 years) patients from June to November, 2016. Clinical profile and renal scintigraphy findings of all the patients were recorded. Renogram was done immediately after I.V administration of 5mCi <sup>99m</sup>Tc-DTPA (diethylenetriaminepentaacetic acid) in both anterior and posterior views and continued for 30 minutes. Diuretics was given on 13 minutes. In children, the dose was adjusted to body weight and height. Two senior nuclear medicine physicians evaluated renal scintigraphy images. All patients had DMSA (dimercaptosuccinic acid) renal scan and ultrasonography of KUB region.

**Results:** Among 7 patients, 4 (57%) had right sided ectopic kidney and 3 (43%) had left sided ectopic kidney. Pelvic position of ectopic kidneys (5 patients, 71%) was the most common and umbilical position (2 patients, 29%) was the next. In DTPA renogram, 3 patients (43%) had moderate renal parenchymal insufficiency, 2 patients (29%) had mild parenchymal insufficiency, 1 patient (14%) had mild to moderate parenchymal insufficiency and 1 ectopic kidney (14%) showed fairly normal parenchymal function. The mean split function of ectopic kidneys was 45% and the mean glomerular filtration rate (GFR) was 35.9 ml per minute.

**Conclusion:** <sup>99m</sup>Tc DTPA renal scintigraphy plays a pivotal role for evaluating renal function in patients with ectopic kidneys prior to design proper management.

**5. Sentinel Lymph Node Mapping and Use of Gamma Probe in Exclusion of Carcinoma Breast Metastasis: Initial Experience in Apollo Hospitals Dhaka.**

**<sup>1</sup>Md Fazlul Kabir, <sup>2</sup>M F Hossain, <sup>3</sup>Mizanul Hasan, <sup>3</sup>Jasmine Ara Haque, <sup>1</sup>Sharmin Farhana, <sup>1</sup>Shohag Mia and <sup>1</sup>Ruhul Quddus**

*<sup>1</sup>Department of Nuclear Medicine, Apollo Hospitals Dhaka;*

*<sup>2</sup>Department of G & L Surgery, Apollo Hospitals Dhaka;*

*<sup>3</sup>National Institute of Nuclear Medicine and Allied Sciences (NINMAS), BSMMU, Dhaka.*

**ABSTRACT**

**Objective:** The sentinel lymph node (SLN) is the first draining node from a cancer-bearing area and is therefore the first to be manifested for metastasis. In breast cancer it has been shown to predict the axillary status. Axillary dissection provides information determining prognosis and need for adjuvant therapy but often carries certain morbidities. Our aim was to determine the feasibility of detecting the SLN and whether the SLN accurately predicts the axillary status.

**Patients and Methods:** Siemens E.CAM Dual Head SPECT was used for SLN mapping, Nano scan produced by Radiopharmacy Laboratory Ltd, Budaros, Hungary for preparing nanocolloid and Capintec Gamma Probe (Europrobe) for identification and surface marking of the SLN. A total of 0.5 - 0.8mCi (20-30MBq) of nanocolloid taken in a 1 ml syringe was injected intradermally in areola of the affected breast in 4 divided approximately equal doses in 4 quadrants. Dynamic sequential 10 sec images were obtained in anterior and lateral projections for 5 minutes from immediately after injections. Then 1 minute images were taken every 5 minutes till 45 minutes. If SLN was not visualized, delayed image was taken after 2 hours. Radioactive marker was used to correspond it with the SLN activity and location was marked on the

skin. Gamma probe was used to reconstruct the SLN. Surgical resection of SLN was done followed by frozen section biopsy.

**Results:** SLN mapping has been performed and tested in different countries since long, but there has not been any significant activity on this in Bangladesh. Patients with stage I and II breast cancer and non-palpable axillary nodes were eligible for the procedure. We excluded pregnant women, those having h/o previous axillary surgery and those with advanced breast cancer with multiple enlarged axillary nodes. Five consecutive patients of breast carcinoma fulfilling the inclusion criteria were included in this study. SLNs were successfully identified in 4 out of 5 cases. The first case did not show SLN due to suboptimal injection. Among the rest, one had metastases where mastectomy with axillary clearance was done; only lumpectomy was done in the remaining 3 patients who had no metastasis.

**Conclusion:** Although it was the initial experience in the hospital, SLN mapping and biopsy proved feasible and successful. By this method, patients who are negative on frozen section biopsy would be spared from axillary node dissection. However further work on this is required to reach a firm conclusion and long term follow up is also essential.

## 6. Use of Radioactive Sources in Medical Facilities: Analysis of Radiation Protection, Safety and Security Issues

**A S Mollah, A Z M Salahuddin, M H Jahangir and M Altab Hossain**

*Department of Nuclear Science and Engineering  
Military Institute of Science and Technology (MIST),  
Mirpur, Dhaka-1216.*

### ABSTRACT

**Objective:** Both sealed and unsealed radioactive sources are used in hospitals throughout the world for diagnostic and therapeutic purposes. Hospitals are, by their nature, less secure than other licensed

nuclear sites and the ever-changing patient/visitor (and staff) population is a further complicating factor. Hitherto, security of radioactive materials in hospitals has tended to be considered from the perspective only of radiation safety but this approach is no longer sufficient. Radioactive sources can pose hazards to individuals' health if undue exposure to the ionizing radiation they emit occurs. Since the terrorist attacks of September 11, 2001, the potential use of radioactive sources and special nuclear materials (SNM) to perpetrate malevolent acts, involving Radiological Dispersal Device (RDD, aka "dirty bombs"), Improvised Nuclear Devices (IND) and Radiological Exposure Devices (RED) has emerged and become a cause of utmost concern. In this paper, an analysis of the radiation control and nuclear security issues associated to the use of radioactive sources in the medical sector is performed. The associated radiation safety issues and the prevention and mitigation of incidents and accidents will be discussed based on D-values as per IAEA guidelines.

**Methods :** High activity single sealed sources (such as  $^{60}\text{Co}$ ,  $^{137}\text{Cs}$ ) are used in teletherapy units, although these are becoming less common as they are replaced by linear accelerators, and in blood irradiator units, which are in widespread use. Lower activity sealed sources ( $^{192}\text{Ir}$ ,  $^{60}\text{Co}$  etc.) are used in brachytherapy. High activity unsealed  $^{131}\text{I}$  source is used typically for the treatment of thyroid cancer while diagnostic doses of unsealed radioactive materials have much lower activities. The activity of used sources spans a wide range, from pCi up to the MCi range. Considering the variety of uses and the associated activities, the categorization of radioactive sources is based on their potential to cause deterministic health effects, stochastic health effects not being considered. D-values are given (ref. IAEA-TecDoc-1344, 2003) in terms of the activity above which a radioactive source is considered to be "a dangerous source" as it exhibits a significant potential to cause severe deterministic effects if not managed safely and securely. For a given radioactive source of activity A, the D-values are evaluated based on the exposure scenarios

resulting from an unshielded radioactive source. After September 11, 2001, the security risk and hazards of radioactive sources, which were until then primarily a safety concern, were re-assessed and gained additional importance.

**Results:** A case study, not discussed in detail here, concerns the security of radioactive sources in a major hospital. Security arrangements need to be in place and implemented in order to deter, monitor and detect (using cameras, high security metal or hardened doors, identification cards with security technology, biometric access control, digital locks, etc.), assess (using decision systems on monitoring of alarms and by adequately training security officers and staff members), delay (anchoring therapy units, using motion sensors and balanced magnetic switches, etc.) and respond to security threats [2]. Education and training on radiological protection, safety and security issues should be implemented regularly. The department of Nuclear Science and Engineering of MIST is conducting a course on radiation protection, safety and security issues including computer simulation and modeling.

**Conclusion:** A radioactive source that is secure (namely radioactive material is kept under proper control, physically protected) is not necessarily a safe radiation source. On the other hand, a radioactive source cannot be safe if its radioactive materials are not secure. In brief: the hazards associated to the use of radioactive sources must be taken into account; safety and security issues are of paramount importance in the use of radioactive sources; radiation sources can be used to perpetrate terrorist acts (RDDs, INDs, REDs); and disused sealed radioactive sources (DSRS) & orphan sources trigger radiological protection, safety and security concerns.

## 7. Effectiveness of Preoperative Lymphoscintigraphy

### for the Detection of Cervical Lymphnode Metastasis in Patient with Oral Squamous Cell Carcinoma

<sup>1</sup>Md. Ahsan Habib, <sup>1</sup>Quazi Billur Rahman, <sup>2</sup>Rokeya Begum, <sup>2</sup>Shamim M F Begum, <sup>2</sup>Pupree Mutsuddy, <sup>2</sup>Azmal Kabir Sarkar and <sup>2</sup>Khokon Kumar Nath

<sup>1</sup>Oral & Maxillofacial Surgery Department, BSMMU, Dhaka.

<sup>2</sup>National Institute of Nuclear Medicine & Allied Sciences, Dhaka

#### ABSTRACT

**Objective:** Oral squamous cell carcinoma is one of the most common malignant tumors. Oral cancer is the cancer of squamous epithelium of oral cavity, which are the sixth most common malignancy reported worldwide and one with highest mortality rate among all malignancies.

Lymphatic spread is the most important as well as the most frequent pathway for the spread of oral malignancies. Determining the presence or absence of nodal metastasis is of paramount importance for staging, treatment planning and prognosis. Lymphoscintigraphy provides a minimally invasive method for determining the disease status of the cervical nodal basin, without the need for a formal neck dissection. The objective of the study was to assess the diagnostic performance of lymphoscintigraphy for the detection of lymph node metastasis in patient with oral squamous cell carcinoma.

**Patients and Methods:** This was a prospective study done in Oral and Maxillofacial Surgery Department, BSMMU and National Institute of Nuclear Medicine & Allied Science, Dhaka during the period of July 2015 to June 2016. A total of 36 patients with oral squamous cell carcinoma were included in this study. Radioisotope technique was used in the detection of cervical metastases in patients with histologically proven oral squamous cell carcinoma.

Patients were assessed by lymphoscintigraphy after diagnosis of oral squamous cell carcinoma and then it was compared with postoperative histopathology report.

**Results:** Lymphoscintigraphically out of 36 patients, 23 had lymphatic channel obstruction where histologically 20 patients had lymph node metastasis. There were 20 true positive cases, 13 true negative cases, 3 false positive cases but no false negative case was found. The test of validity results was observed that sensitivity 100%, specificity 81.25%, accuracy 96.66%, positive predictive value 86.96% and negative predictive value 100.0%.

**Conclusion:** Lymphoscintigraphy for the detection of cervical lymph node metastasis has an important role for the management of oral squamous cell carcinoma. It is also cost effective and it will decrease the morbidity.

### **8. Imaging Characteristics of Lung Cancer on 18FFDG PET-CT: Relationship with Epidermal Growth Factor Receptor (EGFR) protein Expression Status & Survival**

**Zeenat Jabin and Henry Hee-Seung Bom**

*Department of Nuclear Medicine, Chonnam National University Hwasun Hospital, Jeonnam, South Korea*

#### **ABSTRACT**

**Objective:** To identify CT and 18FFDG PET features associated with epidermal growth factor receptor (EGFR) protein over expression in lung cancer patients and evaluate whether imaging features and EGFR-over expression can help predict the clinical outcome.

**Patients and Methods:** Lung cancer patients attending the department of Nuclear Medicine,

Chonnam National University Hwasun Hospital (CNUHH) and Chonnam National University Hospital (CNUH) for diagnosis, staging, re-staging and response assessment with 18F-FDG-PET/CT are included in this ongoing study. Retrospective analysis of previous lung cancer patient's data is being reviewed to assess the survival pattern. CT and 18F-FDG-PET image interpretations are done by Nuclear Medicine Physicians. EGFR protein expression status is determined through immunohistochemical (IHC) analysis of resected or biopsied lung tissues where the intensity score of the staining is recorded. Imaging characteristics on CT and FDG-PET are assessed in relation to EGFR-over expression and the outcome is noted.

**Results:** Large tumor diameter with higher SUV max showing changes like Ground Glass Opacity (GGO) in CT are over expressing EGFR protein especially in Non small cell lung cancer (NSCLC) patients who were never smokers and predominantly females.

**Conclusion:** EGFR-over expression is associated with high SUVmax, large tumor diameter and small GGO proportion. CT and FDG-PET findings, which are closely related to EGFR over expression, can be valuable in the prediction of clinical outcome.

**Keywords:** Lung Cancer, 18FFDG PET-CT, EGFR over expression, Immunohistochemical analysis.

### **9. Agreement between Thyroid Uptake of 99mTc Pertechnetate and 131-I**

**Sadia Hossain, Sanowar Hossain, Shankar Kumar Biswas and Fatema S Haque**

*Institute of Nuclear Medicine and Allied Sciences, Dhaka Medical College Hospital Campus, Dhaka, Bangladesh.*

#### **ABSTRACT**

**Objective:** With the advancement of science, the

scope of  $^{131}\text{I}$  thyroid uptake in diagnosis and treatment of thyroid diseases has become limited. Uptake test with  $^{99\text{m}}\text{Tc}$  pertechnetate along with a thyroid scan, which is done almost routinely, could be a better option when needed. This will not only exempt the patients from relatively higher radiation burden of  $^{131}\text{I}$  but also cause significant reduction of procedural time. Moreover, the thyroid image we get along with the uptake may guide with additional information. This study was done to provide preliminary data regarding thyroid uptake test with  $^{99\text{m}}\text{Tc}$  in our population and to assess the possibilities of introducing this safer and convenient radionuclide in our routine practice.

**Patients and Methods:** This cross sectional, comparative study was conducted from January to December of 2015 on 59 participants in Institute of Nuclear Medicine and Allied Sciences, Dhaka. Patients coming for a radioactive iodine uptake test along with a thyroid scan were enrolled. Uptake of  $^{99\text{m}}\text{Tc}$  Pertechnetate at 20 minutes and  $^{131}\text{I}$  at 24 hours were measured. Data were analyzed between the two uptake values based on clinical conditions, serum TSH levels and gland size.

**Results:** Almost perfect agreement and a strong positive correlation (Kappa value = 0.933 &  $r = 0.845$ ) were found between the results of two modalities. The hyperthyroid group showed a moderate agreement ( $k = 0.5$ ) and a moderate positive correlation ( $r = 0.6$ ). The participants with thyroiditis revealed a perfect agreement ( $k=1$ ) and a strong positive correlation ( $r=0.981$ ). Almost perfect correlation was found between participants with enlarged and non-enlarged glands ( $r = 0.776$  &  $0.801$  respectively). Agreement analysis revealed almost perfect agreement ( $k = 0.88$ ) in the group with enlarged and moderate agreement ( $k = 0.6$ ) in participants with non-enlarged glands. Low serum TSH group showed perfect agreement ( $k = 1.0$ ) and a strong positive correlation ( $r = 0.748$ ). The group with normal TSH level revealed a perfect agreement with  $k = 1$  but a moderate correlation ( $r$

= 0.418).

**Conclusion:** Good agreement and correlation were found between thyroid uptakes of  $^{99\text{m}}\text{Tc}$  at 20 minutes with gamma camera and that of  $^{131}\text{I}$  at 24 hours. Agreement and correlation in different clinical settings also showed consistency. Therefore,  $^{99\text{m}}\text{Tc}$  may be considered for uptake test in a regular basis as it may yield a reliable result in a simple, quicker and more convenient method.

## 10. Papillary Microcarcinoma within Hashimoto's Thyroiditis and Lymph Node Metastasis - Case Report of a 9 Years Old Girl

Tania Sultana, Shaila Sharmin, Afroza Akhter, Rubina Begum, Shankar Kumar Biswas and Md.

Sanowar Hossain

*Institute of Nuclear Medicine and Allied Sciences, Dhaka.*

### ABSTRACT

Thyroid cancer remains a rare disease in children less than age 10, with an annual incidence of less than one per million. It is more common in older children and adolescents, with 15.4 cases per million per year in 15-19 year olds. It has a peak incidence at age 50 years and beyond.

Hashimoto's thyroiditis (HT) is the most common autoimmune thyroid disease and the most common cause of hypothyroidism. Some studies have demonstrated a higher risk of papillary thyroid carcinoma (PTC) with HT whereas others did not observe the increased risk. At FNAC the mean prevalence of PTC in HT was 1.2%, whereas at thyroidectomy the mean prevalence was 27.56%.

Papillary thyroid microcarcinomas (PTMCs) are small ( $\leq 10$  mm) thyroid cancers. The majority of these is not palpable and is clinically unapparent. They are usually found incidentally and rarely behave as cancers. Most PTMCs have an excellent prognosis, but a few present with palpable

Our objective was to observe of medical cyclotron operation by a set of protocol to improve  $^{18}\text{F}$  saturation yields over increasing beam current, sudden loss of functioning and prevent unwanted events during few productions in the points of one year experience at a cyclotron facilities center in Bangladesh.

**Materials and Methods:** The cyclotron facilities center where we performed had self-shielded, xed-energy isochronous cyclotron (MINItrace ,GE Healthcare) which accelerates negatively charged hydrogen ions ( $\text{H}^-$ ) to 9.6 MeV energy and maximum extracted beam current on target is at least 50 A . The cyclotron has targetries to produce  $^{18}\text{F}$ ,  $^{13}\text{N}$  and  $^{15}\text{O}$  under automated control. We only solely observed  $^{18}\text{F}$ - for the synthesis of  $^{18}\text{F}$ -FDG. The  $^{18}\text{F}$ - ions are produced by the  $^{18}\text{O}(\text{p}, \text{n})^{18}\text{F}$  nuclear reaction in assembly lled with 2.2 ml of enriched  $^{18}\text{O}$  water at LTF panel. We followed a set of protocol and monitored ion source, enrichment of  $^{18}\text{O}$  water volume, target current, energy of the beam, variation in helium pressure on the target, bombardment duration, status of the delivery lines from target to the radiochemistry module, rinsing the target with  $^{16}\text{O}$  water and total number of previous bombardments on the same target were recorded.

To measure the performance of the system the measurable quantity related to the produced activity. The quantity is called Saturation yield or simply S-value. The activity in the target at any time can then

be expressed

$$A = S \cdot I_{\text{beam}} \left( 1 - \left( e^{-\lambda t} \right) \right) \text{ so } S = \frac{AEOB}{\left( 1 - \left( e^{-\lambda t} \right) \right) I_{\text{beam}}}$$

The S-value can be estimated by entering the produced activity at end of bombardment AEOB, t is the bombardment time and  $I_{\text{beam}}$  is the average current during the production. The unit for the S-value is milli Curie per microampere, mCi / A. Target saturation yields were measured in single beam mode using enriched water  $\text{H}_2^{18}\text{O}$ . Beam times were of 60 to 80 minutes. Saturation yield were carried out at target current 25, 30,35,40,45, and 50 A.

**Results:** The frequent problems encountered were with the ion source, RF, and target foil rupture. These problems were solved by changing the fuse of RF, and rebuilding the target, the effect of target leak - that is, rupture of vacuum window - can be avoided by immediate stoppage of bombardment. Rinsing with  $^{16}\text{O}$  water after bombardment increases the life of the target and delivery line  $^{18}\text{F}$  yields for total target currents have plotted.  $^{18}\text{F}$  saturation yields remain consistent for target current ranging from 25 A to 40 A. The target can withstands up to 40 A without detrimental effect on target foils. There were no deterioration in yield observed with increasing beam current of the range.

**Conclusion:** Routine production with 25 to 40 A of target current found to be reliable without detrimental impact on  $^{18}\text{F}$  yields. The amount of  $^{18}\text{F}$  recovered from the target is not necessarily the same as the amount of product nuclei actually produced in the target material. For instance, in the case of  $^{18}\text{F}$  liquid target, the high activity of the  $^{18}\text{F}$  is an important factor. Especially the amount of contaminations within the target system (target, lter, delivery lines etc.) was severely affecting the recovered amount of activity. This is reason why it was so important to keep the liquid uoride target systems extremely clean and performed regular lter changes, pre-irradiations with  $^{16}\text{O}$  water, rinsing of the target with  $^{16}\text{O}$  water and change of delivery lines etc.

**Keywords:** GE MINItrace cyclotron, Saturation yields, Target current operation,  $^{18}\text{F}$  production

## 12. Role of $^{99\text{m}}\text{Tc}$ MDP Bone Scintigraphy for Evaluation of a Malignant Mesenchymal Bone Tumor in a 65 Years Old Male Patient: A Case Report

Afroza Akhter, Shaila Sharmin, Tania Sultana, Shankar Kumar Biswas, Rubina Begum and Sanowar Hossain

*Institute of Nuclear Medicine and Allied Sciences, Dhaka Medical College Hospital Campus, Dhaka, Bangladesh.*

ABSTRACT

**Objective:** Bone tumors are mostly of mesenchymal origin. Usually malignant mesenchymal bone tumors are aggressive in nature, rapidly growing and more frequently affecting children and adolescent age group than elderly patients. But in this patient the nature of the lesion was slowly progressive without involvement of other system, moreover presented in advanced age. So it was an unusual presentation of malignant mesenchymal bone tumor in an elderly age group.

**Case report:** A 65 year old male patient came to our department to perform  $^{99m}\text{Tc}$  MDP bone scintigraphy. He gave history of accidental trauma to his right shoulder after a sudden fall one year back. He took some analgesic but it was not satisfactory. In the mean time he complained of gradual swelling and pain on his right shoulder. Then an X-ray of right shoulder was advised by a local doctor and it revealed diaphyseal and granular sclerotic infiltrations in the head and upper shaft of right humerus with pathological fracture at the neck. Then he was referred to an oncologist for further evaluation keeping in mind a strong suspicion of malignancy. CT scan was also done which showed osteolytic lesion in right humerus. Biopsy was taken from the lesion and report revealed large anaplastic cells having loose chromatin arranged in singly with inflammatory cells, suggestive of malignant mesenchymal bone tumor. His bone scintigraphy report revealed large irregular area of increased tracer uptake in the upper shaft of right humerus including right shoulder joint and also there was no other metastatic deposit elsewhere on bone scan. Though the lesion was slowly progressive but it was locally advanced. First there was a thin linear fracture line just below the head of humerus followed by complete separation of head of humerus just after one month of diagnosis. Finally, patient developed avascular necrosis of head of humerus. Other biochemical and hematological reports were quite normal. No metastatic deposit on chest X-ray. Patient gave no history of weight loss or anorexia. He got two cycles of chemotherapy. Serial X-rays were done for follow up purpose and finally he was advised for surgical excision.

**Conclusion:** Bone scintigraphy could play an important role for evaluating primary lesion as well as to exclude any metastatic lesion elsewhere in the body which is very important for disease management.

### 13. Elastoscans to Differentiate Benign from Malignant Thyroid Lesions and Correlation with Cold Nodule in Thyroid Scan and Histopathology.

<sup>1</sup>A K M Fazlul Bari, <sup>2</sup>Gita Rani Hawlader, <sup>1</sup>Sadia salam

<sup>1</sup>National Institute of Nuclear Medicine and Allied sciences (NINMAS)

<sup>2</sup>Dhaka Medical College

#### ABSTRACT

**Objective:** The aim of this study was to assess the efficacy of non invasive real time elastoscans in differentiating the diagnosis of thyroid nodules and accuracy to detect thyroid cancer in comparison to cold nodule detected in radio-isotope thyroid scan and to correlate with histopathology .

**Patients and Methods:** Strain ratio was calculated in 43 patients. In color coding elastography method those lesions shows red color and strain ratio is higher than 5 considered as malignant lesion. All the patients also done thyroid scan to detect cold nodule. Fine needle aspiration cytology was done. All the patients underwent either total thyroidectomy or hemithyroidectomy or nodulectomy and histology was used as gold standard.

**Results:** In gray scale Ultrasonogram 21 patients shows single nodular goiter and 22 multinodular. Elastographic evaluation on the patients population revealed positive for malignancy in 9(21%) patients, intermediate lesions in 11(26%) patients, benign lesions in 23(53%) patients. Radio-isotope scan done on the patient population revealed cold nodule in 32(74%) patients, hot nodule in 5(11%) patients and warm nodule in 6(14%) patients. Out of these 32 patients with cold nodular goiter, 28(87%) patients shows benign lesions and 4(12%) patients shows malignancy in Elastography findings and in