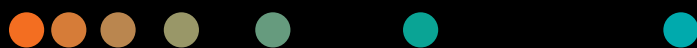


# Clinical Case Studies

Customer experiences  
from the region



Disclaimer

The outcomes by Siemens Healthineers’ customers described herein are based on results that were achieved in the customer’s unique setting. Since there is no “typical” hospital and many variables exist (e.g. Hospital size, case mix, level of IT adoption), there can be no guarantee that other customers will achieve the same results.

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# Titanium Contrast Enhanced Mammography(TiCEM) with 50° Wide-Angle HD Breast Tomosynthesis

Ain Shams University Specialized Hospital, Radiology Department, Egypt

Hossam El Farghaly, Siemens Healthineers Egypt

The use of contrast agents is a common practice in radiology. For example as used in CT, MRI and US. The purpose of injecting a contrast agent is to increase the visibility of vascular structures or to visualize contrast agent uptake in tissues. As Contrast Enhanced Dual Energy Mammography(CEDEM) is implemented on a standard mammography system, the high-energy (HE) and low-energy (LE) images must be acquired successively. With the introduction of the MAMMOMAT Revelation, Siemens Healthineers has implemented its CEDEM application 'Titanium Contrast-Enhanced Mammography (TiCEM)' which aims at improving diagnostic accuracy in the detection and characterization of breast tumors, by incorporating functional information.

The clinical workflow for a TiCEM examination starts with the injection of the contrast agent by means of a power injector. At the time of injection, the breast is not yet compressed to allow for normal tissue perfusion and unhindered inflow of the contrast agent into the breast. The dosage of the contrast agent is typically weight-dependent and varies between institutions. After a waiting time of approximately 2 minutes, the woman is positioned at the MAMMOMAT Revelation and the breast is compressed. Then, a low-energy (LE) and a high-energy (HE) image are acquired successively and a recombined image of that view called an Insight CEM image is calculated. These steps are then repeated for each additional view, without the need to perform a new contrast agent injection. The time window for performing multiple views with a single contrast agent injection lasts up to 10 minutes, although the views should be acquired without any unnecessary delays. The order in which the views are acquired seems to be of little clinical significance and does not appear to affect image quality. Care should be taken when handling the contrast agent to avoid contamination of the detector or the skin with pure contrast agent, as this might mimic calcifications or result in artifacts.

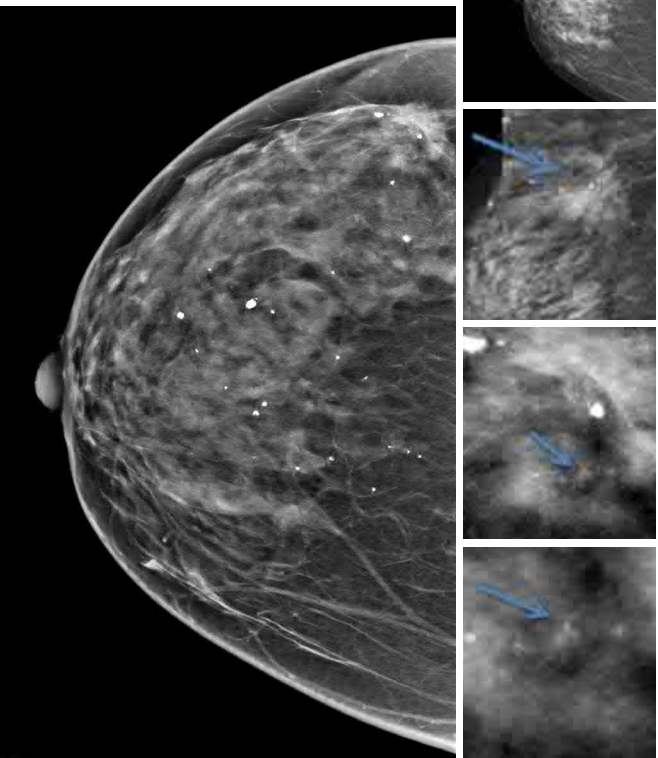
In breast care, Tomosynthesis technology – also known as three-dimensional (3D) mammography, revolutionizes diagnostic mammography. Tomosynthesis technology is slated to soon take over Full Field Digital Mammography (FFDM) by means of improved diagnostics, better image quality, reduced recall rates, workflow etc. Tomosynthesis technology creates an impact in almost every aspect of breast imaging from diagnostic breast cancer screening to interventions. It helps us to reduce the recall rate and false positive rates, irrespective of a women's age or breast density.

## History

Patient is a 52-year-old female, presented for screening. No personal or family history of breast cancer or any other cancer.

## 2D and Insight 2D Images

Clinical Evidence – TiCEM with 50° wide-angle HD Breast Tomosynthesis

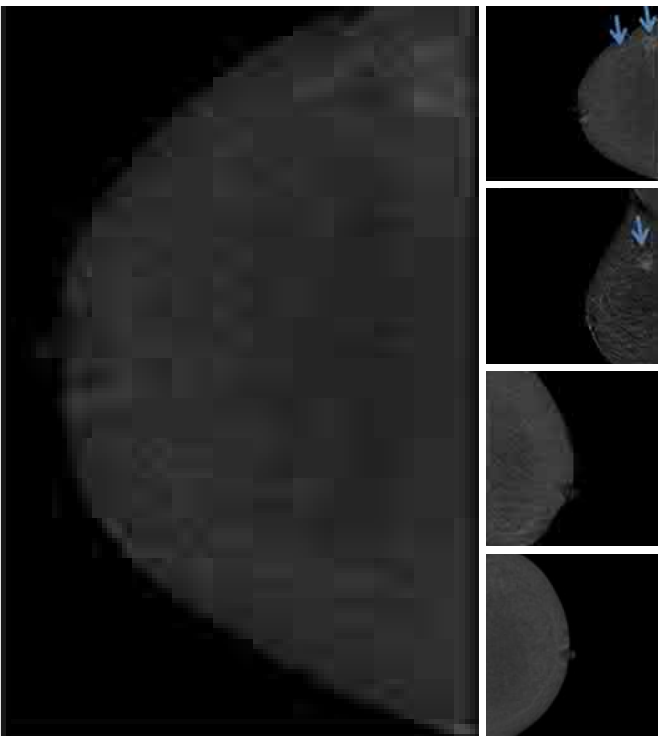


Further Tomosynthesis performed and the mass showed more conspicuity speculated margin and detected one additional adjacent smaller speculated lesion (elaborated in CC and MLO Tomo images).

## Tomosynthesis Scan Images



## Titanium Contrast Enhanced Mammography (TiCEM) Images



## Clinical findings

ACR density, heterogeneously dense breasts with a right side UOQ rounded shaped partly well circumscribed partly obscured margin mass.

RI showed the mass to intensely heterogeneously enhancing 2 cm in diameter yet, detected another smaller enhancing mass 6 mm in diameter, 2 cm away from the index mass. US confirmed those findings and guided for a micro biopsy.

**Impression:** Multifocal breast disease.

## Conclusions

High depth resolution is key for tissue separation in 3D mammography. Siemens Healthineers pioneered the 50° wide-angle HD Breast Tomosynthesis, reaching the highest depth resolution on the market (3.5 times higher depth resolution compared to narrow angle systems) and Titanium Contrast Enhanced Mammography (TiCEM) with its unique HE spectrum and an optimized titanium filter, which reduces X-ray tube load to enable seamless examinations. TiCEM delivers additional diagnostic information for more confident decision-making and helps to detect or rule out lesions. Being an integrated functionality of the Siemens Healthineers MAMMOMAT Revelation, TiCEM can help reduce scheduling conflicts and workload on other modalities making it a cost-effective alternative to breast MRI. Finally, guidelines are needed to achieve international standards in acquisition techniques and image interpretation.

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# New Clinical Trends in Ultrasound Breast Imaging

Mediclinic Hospital, Dubai, United Arab Emirates  
Dr. Alexandra Economacos

## Abstract

B-mode ultrasound is used as an adjunct to mammography to differentiate between benign and malignant breast lesions. An additional ultrasound technique is elastography which can evaluate the stiffness of tissues. It is believed that malignant lesions are generally stiffer than benign lesions. Virtual touch 2D Shear Wave Elastography (2D-SWE) is a new elastography method for measuring the stiffness of tissue. Because this method does not depend on the degree of compression, measurements are reliable and reproducible. 2D-SWE in combination with ultrasonography - has the potential to characterise abnormalities in more detail. Adding elastography to regular B-mode ultrasound improves the diagnostic specificity without loss of sensitivity. This suggests that Virtual touch 2D Shear Wave Elastography (2D-SWE) might change patient management and avoid unnecessary biopsies. However, further research involving a greater variety of abnormalities and larger study populations is indicated.

Below cases are done in combination of Ultrasound imaging, Virtual Touch 2D Shear Wave Elastography, Mammography and MRI Imaging.

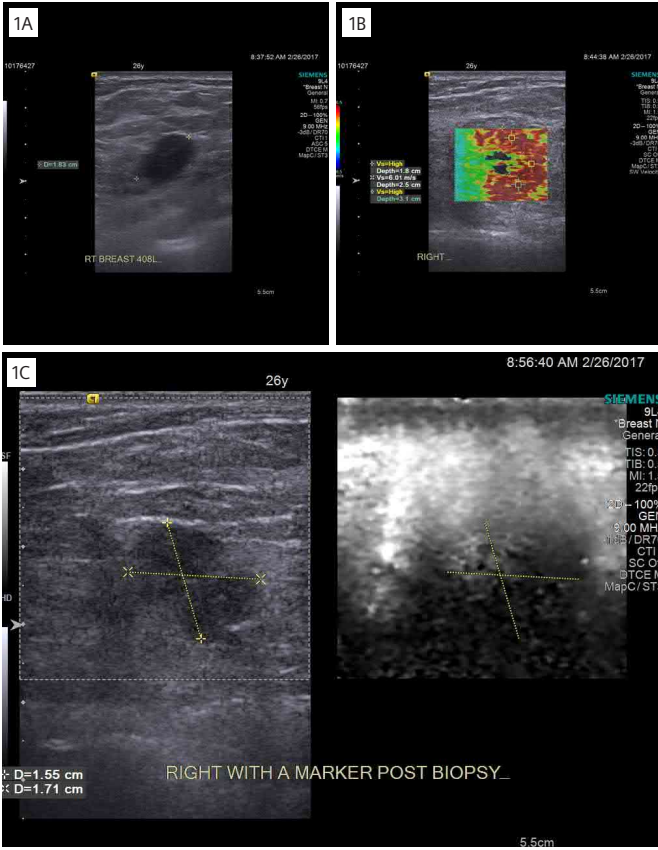


### Case 1

**Patient History:** 26-year-old lady with no family history of breast cancer, presents with newly felt lump in right breast (lower outer quadrant) and is not sure of duration. External US study suspects a 22 x 13mm hypoechoic mass with posterior enhancement and mild vascularity. Core biopsy is advised, and she presents for a 2nd opinion.

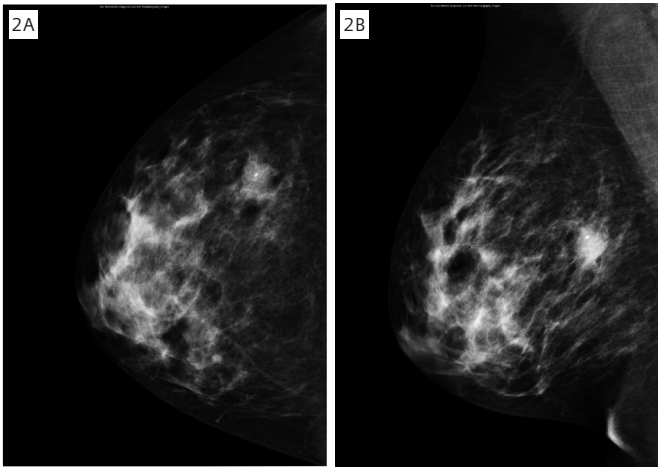
**Technology used:** Virtual touch 2D Shear Wave Elastography (2D-SWE)

**Virtual touch 2D Shear Wave Elastography (2D-SWE) Outcome:** Elastography images confirm a hardened lesion (red lateral aspect) with central necrosis (signal void) suggestive of liquefaction/necrosis. Further assessment with **2D-SWE** imaging confirms the lesion to reveal exaggerated hypoechoic margin beyond visible boundary, confirming adjacent hardened/ infiltrated parenchyma – conducted on post biopsy image.



**Fig. 1A** - Two-Dimensional image, **Fig. 1B** Virtual touch 2D Shear Wave Elastography (2D-SWE) image with color map and shear velocities, shows hardened tissue with red color presentation with High velocities, **Fig. 1C** Image with Virtual Touch 2D Shear Wave Elastography (2D-SWE) shows infiltration beyond identified boundaries, presentation is with black and white scale map.

Post core biopsy images were conducted to identify the presence of the marker and further characterize the mass.



**Fig. 2A** - Post core biopsy RCC - irregular hyperdense mass identified posterolateral with marker within.

**Fig. 2B** - Post core biopsy RML - irregular hyperdense mass identified posterolateral with marker within.

MRI confirms the unifocal irregular heterogeneously enhancing mass in the RUOQ with signal void within. Irregular and poorly defined margins are clearly apparent on the T1 nonfat suppressed study and are confirmed as enhancing tendrils with post contrast images revealing extension specifically posteromedial to the lesion.



**Fig. 3A** - Axial Subtraction image

**Fig. 3B** - T1 non fat suppressed with signal void boundaries, presentation is with Black and white scale map.

The patient was found to have a unifocal high grade ductal cancer with no metastases and she proceeded for further management.

### Case 2

**Patient History:** 53-year-old patient complained of a tender solid mass newly identified in her left breast at 15:00 hrs.

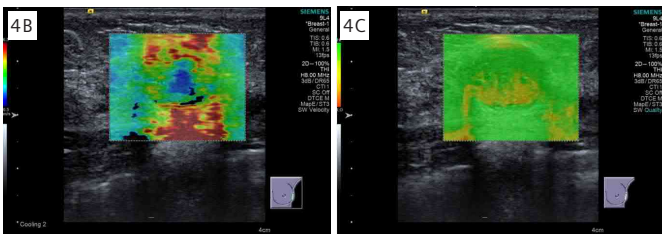
**Clinical Finding:** US reveals rounded ovoid mass with internal echoes and posterior transmission - features suggestive of complicated cyst but differential included a new solid lesion? Fibroadenoma.



**Fig. 4A** - Two-dimensional image, shows well circumscribed darkly hypoechoic /presumed anisoechoic mass with internal echogenic foci.



**Technology used: Virtual touch 2D Shear Wave Elastography (2D-SWE)**



**4 Fig. 4B - 2D-SWE** image with color map shows soft tissue with green and blue color presentation, and thick wall presentation with red color, **Fig. 4C** Image shows high quality map, reveals good quality elastography sonogram.

**Biopsy Result:** FNA conducted confirmed abscess.

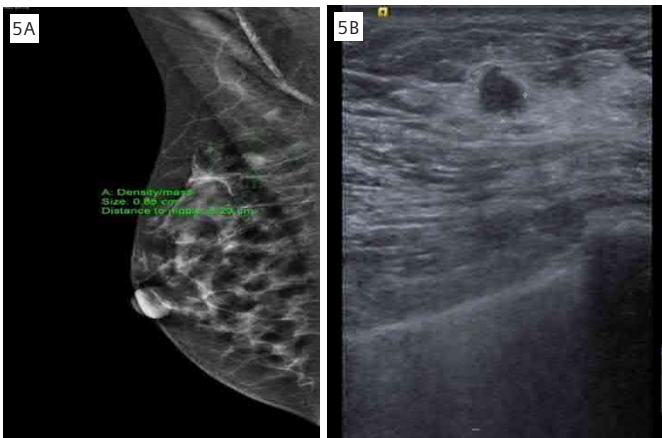
**Case 3**

**Patient History:** Missed cancer - externally presumed fibroadenoma.

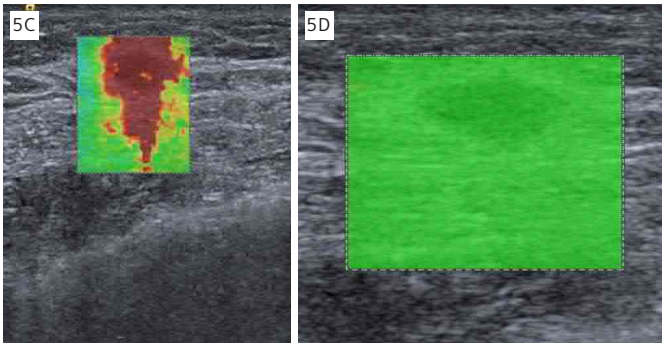
**Patient Age :** 42-year-old - No family history of cancer.

**Clinical Finding:** Unifocal well margined triangular mass, very posterior on upper RMLO was presumed to represent a benign mass. Patient sought 2nd opinion.

US reveals irregular lobulated hypoechoic mass in right upper inner quadrant adjacent to the pectoral muscle with echogenic margin.



**5 Fig. 5A** RMLO mammo with triangular density overlying the pectoral muscle in the upper aspect.  
**Fig. 5B** Two dimensional imaging shows irregular circumscribed hypoechoic mass with echogenic margin adjacent to pectoral muscle.

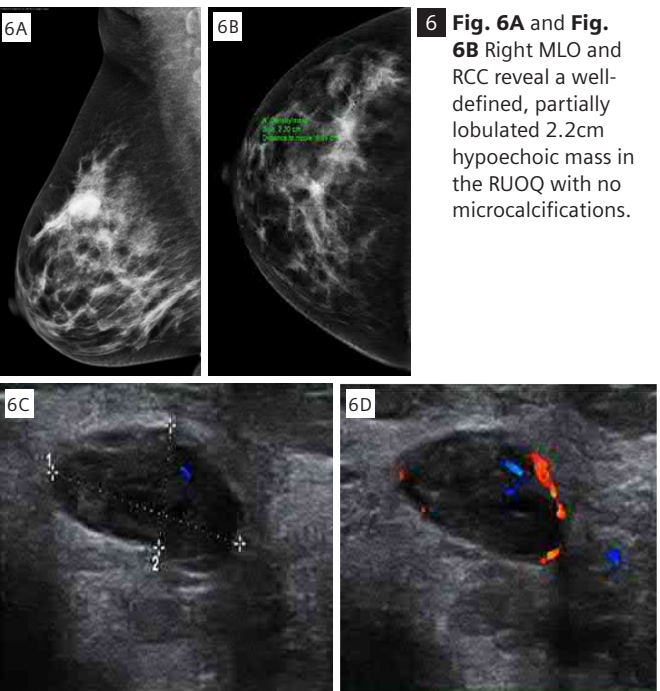


**5 Fig. 5C** shows **Virtual Touch 2D Shear Wave Elastography (2D-SWE)** imaging elastogram with red color map suggestive of hard tissue, with infiltration around, **Fig. 5D** shows high quality map reveals good quality elastogram.

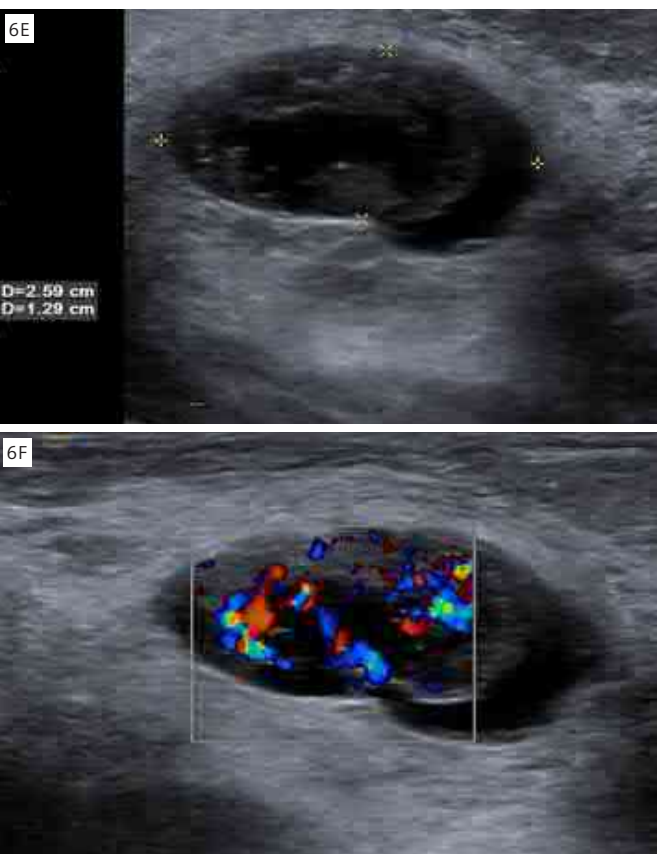
**Biopsy Result:** Invasive duct carcinoma with DCIS grade 1

**Case 4**

**Patient History:** 45-year-old patient with long standing mass RUOQ suspected in 2015 to represent fibroadenoma, annually same size and appearance but now patient feels that the lesion has recently started to grow.



**6 Fig. 6A and Fig. 6B** Right MLO and RCC reveal a well-defined, partially lobulated 2.2cm hypoechoic mass in the RUOQ with no microcalcifications.  
**6 Fig. 6C and Fig. 6D** 2D US and Doppler from 2015, ovoid hypoechoic mass with peripheral vascularity spanning 2cm -presumed then to be a fibroadenoma and was annually monitored.

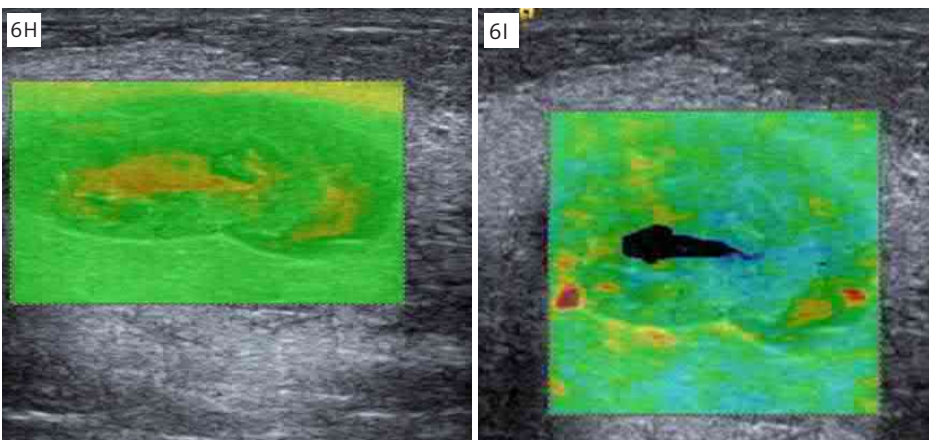


**6 Fig. 6E and Fig. 6F :** 2D US and Doppler – Follow up scan show 0.5cm increase in size as compared to previous scan, and increased vascularity on Doppler review.

**Technology used:** Virtual touch 2D Shear Wave Elastography (2D-SWE) elastography.

**Virtual touch 2D Shear Wave Elastography (2D-SWE)**

**Outcome:** 2D-SWE imaging reveal soft lesion on elastography.



**6 Fig. 6H and Fig. 6I** with features confirming a soft lesion and no marked adjacent hardening on 2D SWE with corelative map confirming good quality.

**Biopsy Result:** Core biopsy confirmed complex fibroadenoma which was excised and proven benign.

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**Contact**

Dr. Alexandra Economacos  
Head of Breast Imaging Department  
Mediclinic Comprehensive Cancer Centre





# Clinical Advantage of 3D Imaging in Intracranial Aneurysm

Arab Medical Center, Amman, Jordan

Dr. Hazem Habboub; Chief Tech. Ashraf Al Holy

## Abstract

Intracranial aneurysms have a variety of causes including high blood pressure, atherosclerosis, trauma, heredity and abnormal blood flow and abnormal blood flow at the bifurcation level (where major artery splits to branches). There are other rare causes of aneurysms. As an example, mycotic aneurysms are caused by infection of the artery wall.

## Pathophysiology/ progress of disease

- Artery wall at bifurcation level may become weak, causing a ballooning of the blood vessel wall to potentially form a small sac or aneurysm.
- Cerebral aneurysms are common, but most are asymptomatic and are found incidentally at autopsy.
- Aneurysms can leak or rupture causing symptoms from severe headache to stroke-like symptoms, or death.

Treatment strategies include traditional surgical repair of the aneurysm. This requires the neurosurgical team to perform major surgery that includes opening the head skull to put a clip across the weak blood vessel wall. On the other hand, some patients may be treated by an interventional radiologist or neurologist who may use a coil to fill the aneurysm to prevent bleeding.

## Case presentation

A 52-year-old female patient brought into AMC (Arab Medical Centre - Amman) emergency department, complaining of vertigo, dizziness and family reported syncopal attack at home. She is a smoker but has no history of hypertension or diabetes.

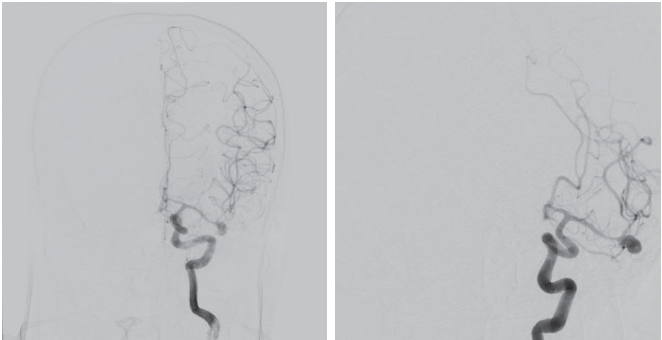
On presentation, patient was stable, conscious and oriented with severe headaches. Blood pressure was 169/105. Initial clinical diagnosis was confirmed by brain CT, MRA and MRI which confirmed left middle cerebral artery (LMCA) aneurysm. There was evidence of sub-arachnoid hemorrhage with no midline shift.

The neurologist, neurosurgeon and interventional radiologist decided that the interventional option in the catheter laboratory was the best option and in the best interest of the patient with excellent results anticipated.

The patient was immediately transferred to the catheter laboratory for the endovascular procedure and the angiogram was done.

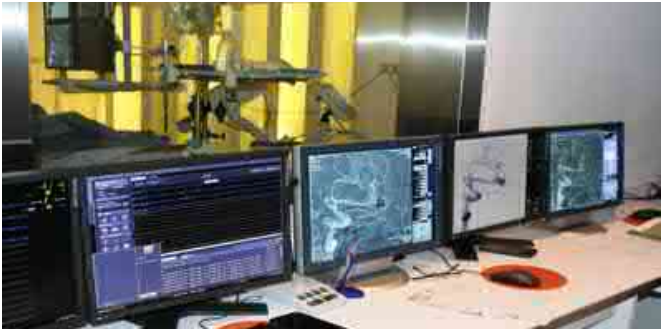
## Discussion

Cerebral angiogram confirmed the site of aneurysm in LMCA; however, the use of 3D technology facilitated road mapping of the aneurysm during the treatment.



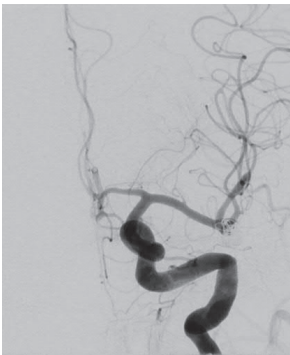
1 Left internal carotid artery angiogram, show medium sized left middle cerebral aneurysm with bi lobes and wide neck

3D mapping made the measurement of vessel dimension and anatomical relation to surrounding structures very clear. Clinical decision to treat with coils was smooth due to the clarity of images obtained.



2 3D rotational angiography shows MCA aneurysm

Final results of the procedure were very satisfactory with no complications and full clinical recovery of the patient



3 Left ICA angiogram, there are coils in the left middle cerebral artery bifurcation in the left MCA aneurysm. The aneurysm appears almost totally occluded

## Conclusion

The use of 3D technology enables the physician and catheter laboratory team to facilitate road mapping. This contributes to increase safety for patients during treatment of cerebral artery aneurysm and increases the potential success rate. The dimensions of the vessel can be easily visualized.

The technology can be adapted with software and is relatively easy to be trained to use.

3D technology helps in controlling the image throughout the procedure.

Finally, contrast media used to assist the interventional radiologist to perform full procedure with the right images is significantly less. Total time procedure is less in expert centers to image the right vessel in the optimum projection. Clear imaging is always accompanied with increased safety and lesser complications.



## Contact

Dr. Hazem Habboub  
M.D.D.M.R.D, F.R.C.R, F.A.C.R  
Interventional Vascular & Neuro Radiologist  
Arab Medical Center, Amman, Jordan



Chief Tech. Ashraf Al Holy  
Manager Cathlab Department  
Arab Medical Center, Amman, Jordan





# DLBCL of the Thyroid Staging by FDG PET/CT

Sultan Qaboos University Hospital, Muscat, Sultanate of Oman  
Dr. Naima Tag; Dr. Jawa Zabab, Department of Radiology and Molecular Imaging

### History

A 57-year-old female with a long history of multinodular goitre and hypothyroidism (> 20 years) on Levothyroxine. Presented with a rapidly increasing thyroid gland.

### Diagnosis

Ultrasound guided FNA showed typical lymphocytes, suggestive of B-cell lymphoproliferative disorder. Excisional cervical LN biopsy confirmed DLBCL (Diffuse large B-cell lymphoma).

Baseline F18 FDG PET/CT scan (image 1) showed intense diffuse uptake in an enlarged lobulated thyroid and FDG avid multiple cervical lymph nodes. No other abnormal uptake is seen in the rest of the scan. The patient received 6 cycles RCHOP.

End of therapy, F18 FDG PET/CT scan showed a good metabolic response with significant reduction in size of thyroid with moderate uptake. No significant FDG uptake was seen in few sub centimeter sized bilateral cervical (figure.2).

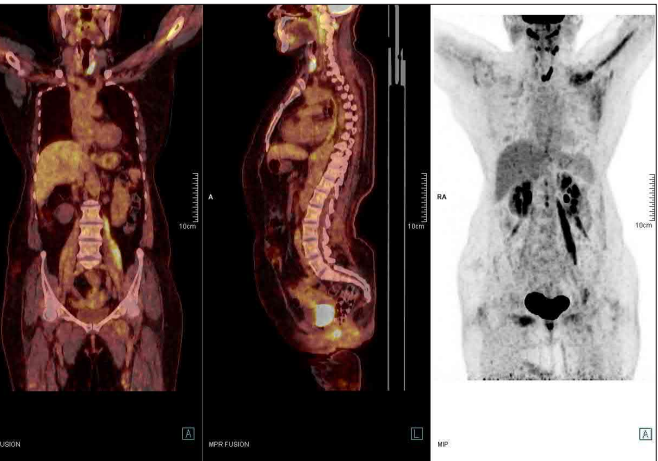
### Comments

Primary thyroid lymphoma is a rare neoplasm with only 1-5% of all thyroid malignancies and usually originates on underlying autoimmune thyroiditis. FDG PET/CT is well established in staging and therapy monitoring in high grade lymphoma, however one of the known pitfalls is inflammation. In this case, PET/CT images defined the extent of the disease in the initial scan very well, showing a good metabolic response at the end of the therapy scan with residual uptake in the thyroid gland which in part is likely due to underlying thyroiditis. A biopsy of the thyroid was done and it showed inflammation without disease involvement.

Images derived from Biograph mCT 128



1 Baseline scan



2 End of therapy

### Contact

Dr. Naima Tag  
Nuclear Medicine Physician  
Department of Radiology and Molecular Imaging  
Sultan Qaboos University Hospital, Oman



Dr. Jawa Zaba  
Nuclear Medicine Physician  
Department of Radiology and Molecular Imaging  
Sultan Qaboos University Hospital, Oman



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For more information, contact:

Maxine Haechler  
maxine.muir@siemens-healthineers.com  
healthineers.academy.ae@siemens-healthineers.com



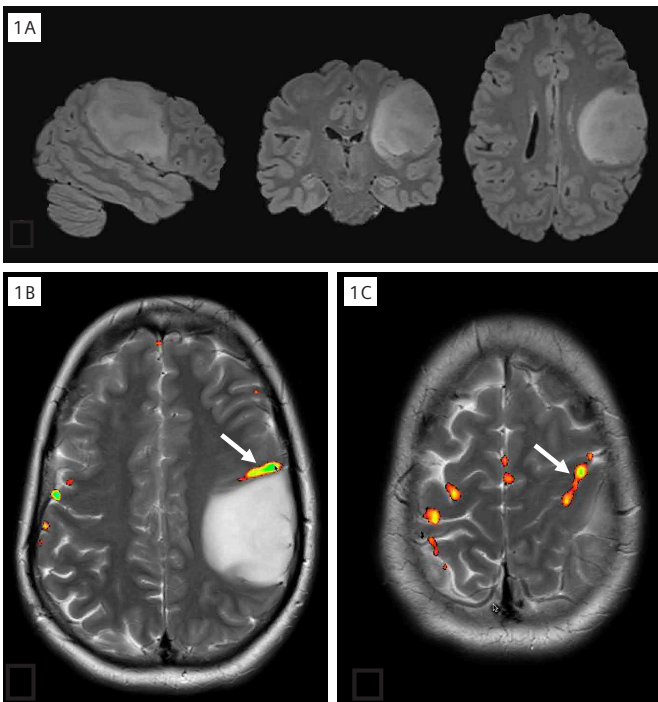


# Structural, Functional and Diffusion MRI for Pre-surgical Planning in a Patient with Low-grade Glioma

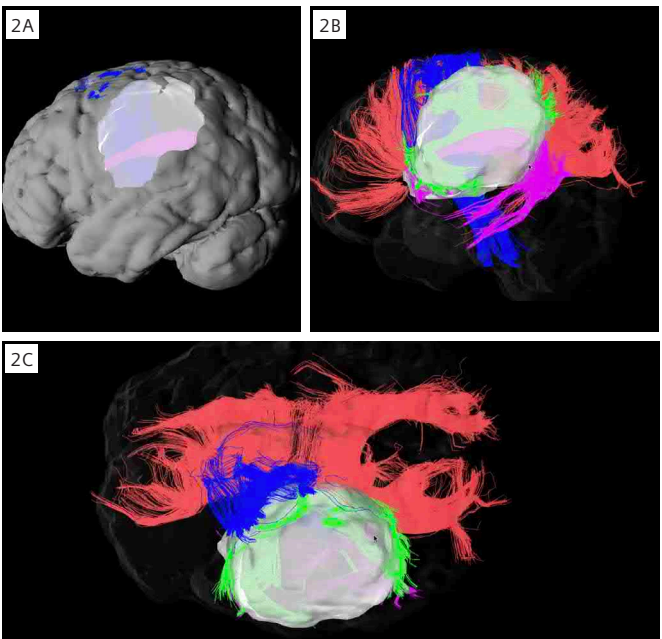
Collaboration between Cleveland Clinic Abu Dhabi and New York University Abu Dhabi  
Osama Abdullah and Florian Roser on behalf of the caregiver teams at CCAD

The Neurological Institute of the Cleveland Clinic Abu Dhabi (CCAD) has been established in 2015 as a quaternary healthcare institution to provide state-of-the-art care to complex neurosurgical cases. On the other hand, cutting-edge neuroimaging research at New York University Abu Dhabi (NYUAD) offers the local medical community access to latest development in neuroimaging research to complement routine clinical care.

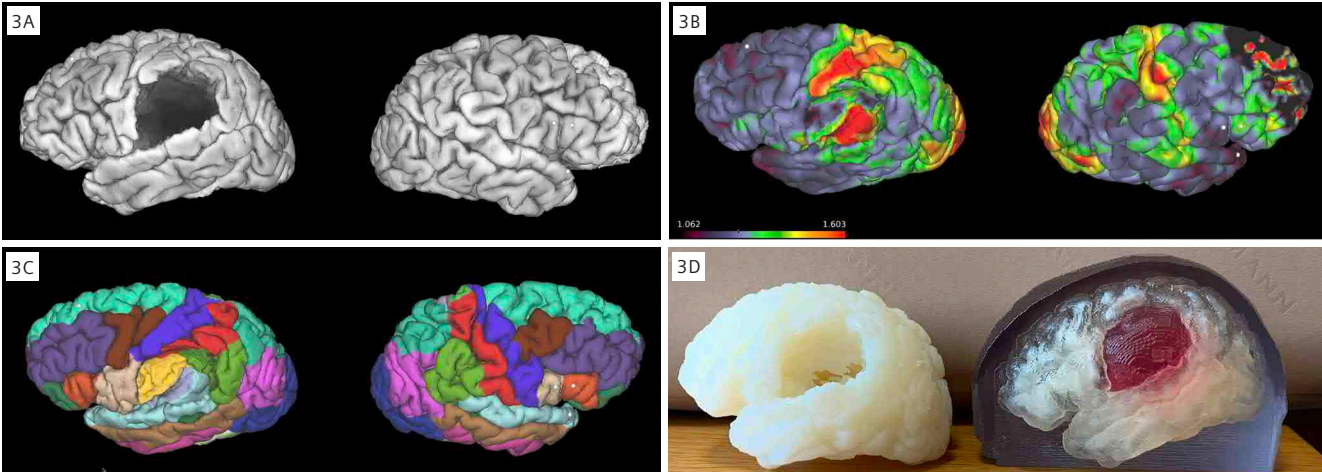
In this case report, a 32-year-old female presented with fronto-parietal low grade glioma in the left hemisphere. Given the proximity of this tumor to motor (precentral gyrus) and language areas (supramarginal and angular gyri), structural MRI was complemented with functional MRI for motor (hands and tongue) as well as diffusion tractography.



**1** Fig. 1A shows a FLAIR scan acquired using a MAGNETOM Skyra 3T system in CCAD with 0.4 mm isotropic resolution. Axial T2 Space scans with functional activation of tongue (Fig. 1B), and hands (Fig. 1C) are shown (white arrows).



**2** Manual segmentation of the tumor was performed using the FLAIR scan, and overlaid on diffusion-based fiber tractography (60 directions, isotropic resolution of 2.5 mm) as shown in Fig. 2. The various fiber bundles: Corpus Callosum (red), Corticospinal tract (blue), Arcuate Fasciculus (purple), and Superior Longitudinal Fasciculus (green) are shown in relation with the tumor.



**3** Fig. 3A shows virtual dissection of the tumor in relation to the healthy brain tissue. Fig. 3B shows the myelination map (calculated from T1-MPRAGE and T2-Space scans according to the Human Connectome's project protocol), Fig. 3C shows brain segmentation of the two hemisphere, where each color represents an anatomical parcel (e.g., postcentral gyrus in red, precentral gyrus in blue, etc), and Fig. 3D shows 3D-printed (using Stratasys J750 printer, courtesy of Oraib Al Ketan from NYUAD) models with and without virtual tumor resection.

Microsurgical navigation and fluorescence aided tumor resection surgery was performed with the patient in awake-state under continuous electrophysiological and neuropsychological neuro-monitoring. Within two weeks post-surgery, the initial decreased neurological motor function returned to approximately 90% of normal (and improving), productive language function is restored to about 50% (and improving), albeit with some remaining fluency deficits (likely due to closeness of the arcuate fasciculus to the tumor region).

## Conclusion

Multi-modal MRI evaluation with structural, functional, and diffusion tractography can play an important role in planning complex brain surgeries, selecting the right patients for awake surgeries and therefore contributes to optimal post-operative outcomes. Future efforts will focus on implementing language fMRI evaluation and directly use the fiber tractography and functional activation in neuro-navigation systems.



## Contact

Osama Abdullah, PhD.  
MRI Physicist - Core Technology Platforms  
New York University, Abu Dhabi





# Patient Safety - Radiation Dose Monitoring Through teamplay Solution

Medcare Hospitals & Medical Centres, United Arab Emirates

Dr. Shanila Laiju; Dr. Rajamagesh Duraisamy; Dr. Uday Patil; Dr. Neesha Nair; Shaheena Surani; Reda Fattah; Tahir Khan

## Background

Technological advances in medicine have given physicians the tools to diagnose and treat diseases much more quickly and accurately than they did a generation ago. Diagnostic imaging techniques have also improved over the years and have provided tremendous benefits to the patients. However, the use of diagnostic imaging technologies is associated with some degree of patient safety risk. First and foremost among these risks is the potential for harm related to excess exposure to ionizing radiation. According to AHRQ approximately 40% of patients diagnosed with cancer received radiation therapy at some point in their treatment. As the use of radiotherapy for certain types of cancer has grown, providers and researchers have raised concerns about the safety of radiation exposure. Reduction of unnecessary radiation exposure by justification of radiological medical procedures is a major goal for the Global Initiative.

## Problem

Medcare hospital is a multispecialty hospital and as per the radiology utilization approx. more than 200 CT scans are performed per month. In 2018, around 3000 patients underwent CT-scan evaluations. We cannot also avoid the fact that CT emits a powerful dose of radiation, in some cases equivalent to about 200 chest X-rays.

The Medcare radiation safety program includes quality control parameters for all the diagnostic equipment and protocols for patient and staff safety. However the current system is lacking to monitor real time data regarding maximum amount of radiation dose delivered to the patient during diagnostic procedures. In case any monitoring information is required it is totally dependent on the manufacturer company.

## Solutions

teamplay is a cloud-based software platform which uses data obtained directly from the equipment and applies analytics to this data to allow monitoring of the functioning of the Radiology department on a real time basis. As the data is taken directly from the equipment; data integrity is assured, and manual data capture errors can be eliminated. The data uploaded to the cloud is completely anonymized, ensuring patient privacy.

## Objective

1. To monitor the current dose level and deviations if any to both internal and national threshold
2. Drill-down, pinpoint issues and help decision-makers outline measures to resolve them
3. Standardization and objective comparison, with the integrated Radlex Playbook lexicon
4. Size-Specific Dose Estimates (SSDE) and effective dose calculation

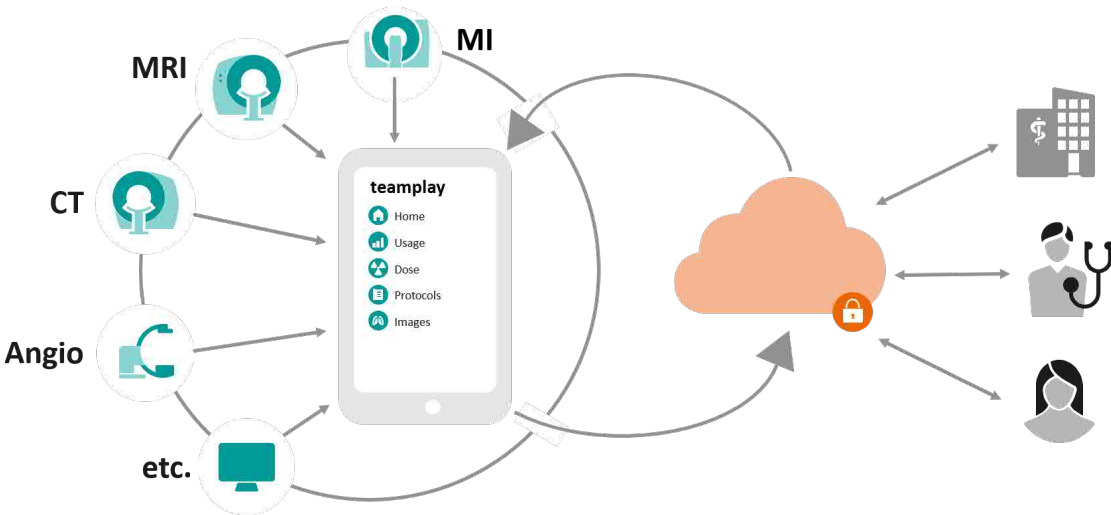
## Facts & Figures\*

\*Source: Medcare Hospitals

Medcare  
**4700**  
CT Scan/Year

**1 = 200**  
CT Scan Chest X-Ray

**2%** Researchers estimate that at least 2 percent of all future cancer in the US - approximately 29,000 cases and 15,000 deaths per year - will stem from CT scans alone



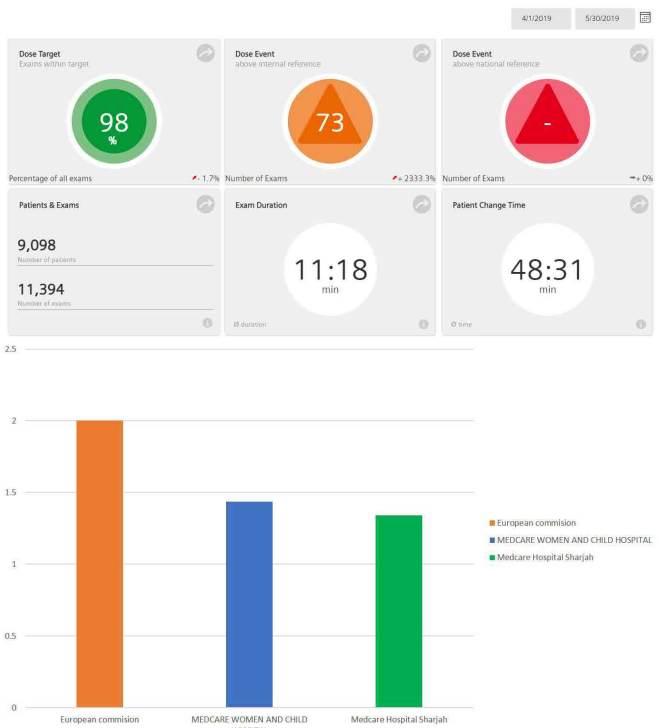
## Control Plan

To make sure the implied solution is working fine, a control plan is established. If an incorrect scan protocol is used, the protocol parameters stored on the CT scanner can be accessed with teamplay protocols and measures to optimize the scan protocol can be directly triggered.

## Results outcome and share success

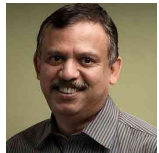
The dashboard on the Siemens Healthineers teamplay home screen indicates how many examinations have exceeded the internal limit of the hospital within a defined time period. As per the dashboard in April and May 2019, a total of 411 tests were performed and 5 were identified as exceeding the set dose limits. teamplay dose clearly lists all dose outliers and makes it possible to annotate them. To determine the root cause for dose outliers, the outliers can be analyzed and compared in detail with regards to modality, body region, operator, location and exam type. The resulting information provides a solid foundation for suitable countermeasures. If the cause for a dose outlier can be attributed to a faulty CT scan protocol for example, users can use teamplay protocols to immediately access the protocol parameters saved in the CT scanner and initiate measures to optimize the scan protocol. It also helps to identify the operator related issues which can be used to evaluate the competency of radiographer. This project would also help us to indicate reduction in the number of dose events and Median Radiation Dose for specified

anatomic parts being scanned as compared to that at the beginning of the project. As a successful deployment and 1st in the region, Siemens Healthineers requested Medcare to be a reference site in the region for their clients.



## Contact

Dr. Rajamagesh Duraisamy  
HOD Radiology  
Medcare Hospitals & Medical Centres, UAE





# Ultra-Low Dose Free Breathing Pediatric CT Imaging

Dubai Hospital, United Arab Emirates  
Medical Imaging Team

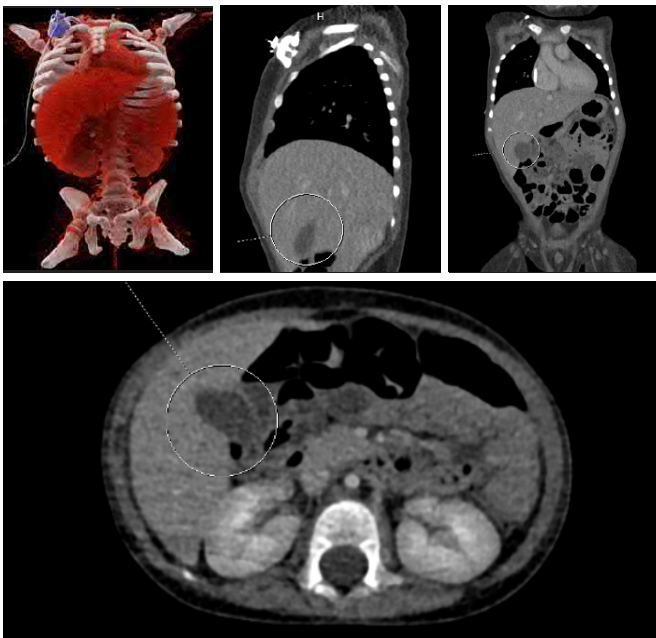
## Introduction

Anatomical and physiological differences between pediatric and adults require special attention when imaging pediatric patients. Before performing a pediatric CT examination, it is essential to fully evaluate the risks, radiation dose and benefits of the requested examination. Systematic efforts can be used to drive process and quality improvement in terms of optimizing CT radiation dose while maintaining image utility. The other challenge was the imaging without sedation and breath hold. Image quality is a key factor because these images are routinely used for clinical evaluation as well as for pre-operative surgical planning. Technologies have evolved and will continue to develop innovations that follow the ALARA (as low as reasonably achievable) principle.

## Prospective

Below are some novel clinical examples where the lowest radiation dose was achieved by using technologies such as CARE Dose 4D, CARE kV, Turbo flash, Sub-second rotation and ADMIRE iterative reconstruction (IR) algorithm.

### Pediatric Case Study #1 - DLP: 4 mGy x cm. Achieved effective dose level of 0.12 msv



MPR image with VRT clearly delineating hepatic focal lesion showing residual hypodensity

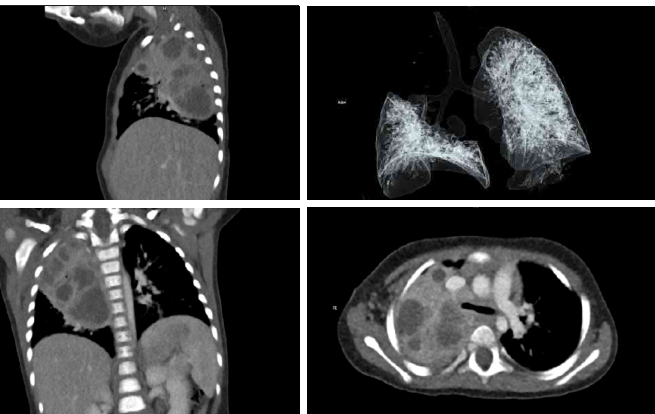
**History** - 7-month-old male infant presented for follow up study of invasive fungal infection treated with 6 weeks of antifungals

**Examination Protocol** - • 70 kV • 10 mAs/rot • Dedicated single acquisition ultra-fast pediatric protocol for chest, abdomen and pelvis • CARE Dose 4D and CARE kV • DLP:

4 mGy x cm. **Achieved effective dose level of 0.12 mSv** (Conversion Factor abdo pelvis k=0.030) with superior image quality.

**Diagnosis** - Follow up CT imaging depicts the appreciable therapeutic response and resolution of the previously seen right para tracheal and retro caval lymph nodes. The mid bilateral basal pleural effusion and basal atelectatic bands are no longer visible in the current study. The liver is still seen mildly enlarged with resolution of the previously seen enhancing hepatic focal lesion showing residual hypodensity.

### Pediatric Case Study #2 - DLP: 8 mGy x cm. Achieved effective dose level of 0.2 msv



MPR image with VRT clearly delineating heterogeneously enhancing mass like lesion involving the upper and lower lobes of right lung

**History** - 9-month-old female child presented for CT scan chest with right upper zone haziness and a query of mediastinal mass. Suspecting hepatoblastoma and further evaluation of staging.

**Examination Protocol** - • 70 kV • 18 mAs/rot • Dedicated single acquisition ultra-fast pediatric protocol for chest two phase (P+C) • CARE Dose 4D and CARE kV • DLP: 8 mGy x cm. **Achieved effective dose level of 0.20 msv** (Conversion Factor chest 1 year k=0.026) superior image quality.

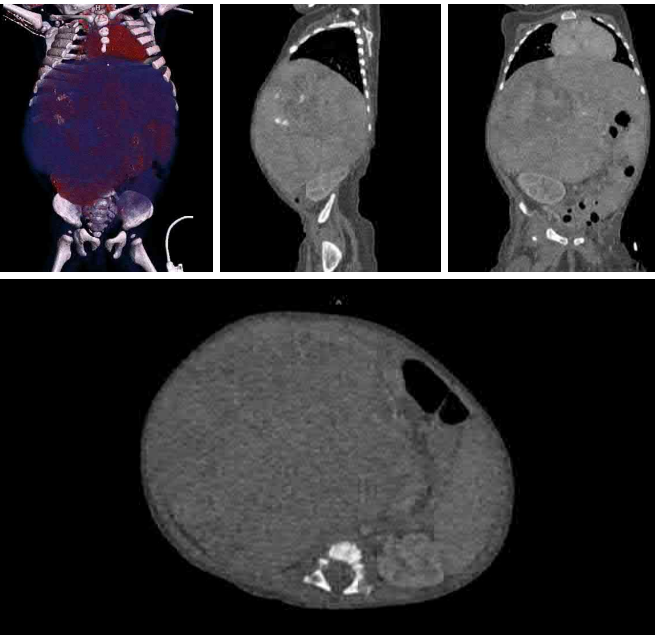
**Diagnosis** - Evidence shows last heterogeneously enhancing mass like lesion involving the upper and lower lobes of right lung. The lesion shows air bronchogram and multiple low attenuation areas. The features most likely represent infective etiology (necrotizing pneumonia)

### Pediatric Case Study #3 - DLP: 15 mGy x cm. Achieved effective dose level of 0.73 msv

**History** - 6-month-old boy presented for CT scan chest and abdomen with a query of pulmonary nodule and hepatic mass. Suspecting hepatoblastoma and further evaluation of staging.

**Examination Protocol** - • 70 kV • 24 mAs/rot • Dedicated single acquisition ultra-fast pediatric protocol for chest and abdomen • CARE Dose 4D and CARE kV • DLP: 15 mGy x cm. **Achieved effective dose level of 0.73 mSv** (Conversion Factor abdo pelvis 0-year k=0.049) superior image quality.

**Diagnosis** - Both the lung fields appear to be normal and there is no evidence of sizable pulmonary nodule large hepatic infiltrative neoplastic mass lesion. Likely hepatoblastoma.



MPR image with VRT clearly delineating heterogeneously enhancing mass like lesion involving the upper and lower lobes of right lung

### Pediatric Case Study #4 - DLP: 19 mGy x cm. Achieved effective dose level of 0.38 msv



MPR image with VRT clearly delineating the large hepatic infiltrative neoplastic mass lesion

**History** - 5-year-old boy presented for CT scan. Follow up study of Burkitt's lymphoma post-chemo.

**Examination Protocol** - • 70 kV • 30 mAs/rot • Dedicated single acquisition ultra-fast pediatric protocol for chest two

phase (P+C) • CARE Dose 4D and CARE kV • DLP: 19 mGy x cm. Achieved effective dose level of 0.38 mSv (Conversion Factor abdo pelvis 5-year k=0.020) with superior image quality.

**Diagnosis** - Post CT compared images are evidence of B cell lymphoma showing residual short segmental small bowel mural thickening with significant proximal small bowel dilation. Mild hepatomegaly and sub centimetric mesenteric lymph nodes are visible.

## Conclusion

Adapting new CT technologies opens doors to a decisive factor in critical emergency situations and complex pediatric imaging. It helps us to perform CT studies without the need for breath-hold with high-quality diagnostic imaging. This is the case for trauma patients as well as for very young or elderly patients who are unable to hold their breath either at all or for longer periods of time. Here, fast scans eliminate the potential need for sedation or intubation, and thereby save additional costs. For those patients who still require an anesthetic, fast scans also reduce the associated risks. The SOMATOM Force CT scan can scan the entire thorax in sub seconds, and it can scan the thorax, abdomen, and pelvis in 1 second in high-pitch mode. This leads to significantly reduced motion artifacts.

Pediatric imaging presents specific challenges that range from reducing X-ray doses to creating an anxiety-free environment during imaging procedures. Innovative concepts and new technologies can help address all these challenges.

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## Contact

Badriya Mohammed Hassan  
Senior Principal Radiographer  
CT - Team Leader  
Dubai Hospital, United Arab Emirates

Hashim Al-Awadhi  
Consultant, Radiographer  
Dubai Hospital, United Arab Emirates





# Increasing Patient Throughput and Scanner Efficiency with teamplay Solution

Dar Al-Shifa Hospital, Kuwait

Ahmad Hamza

## Overview

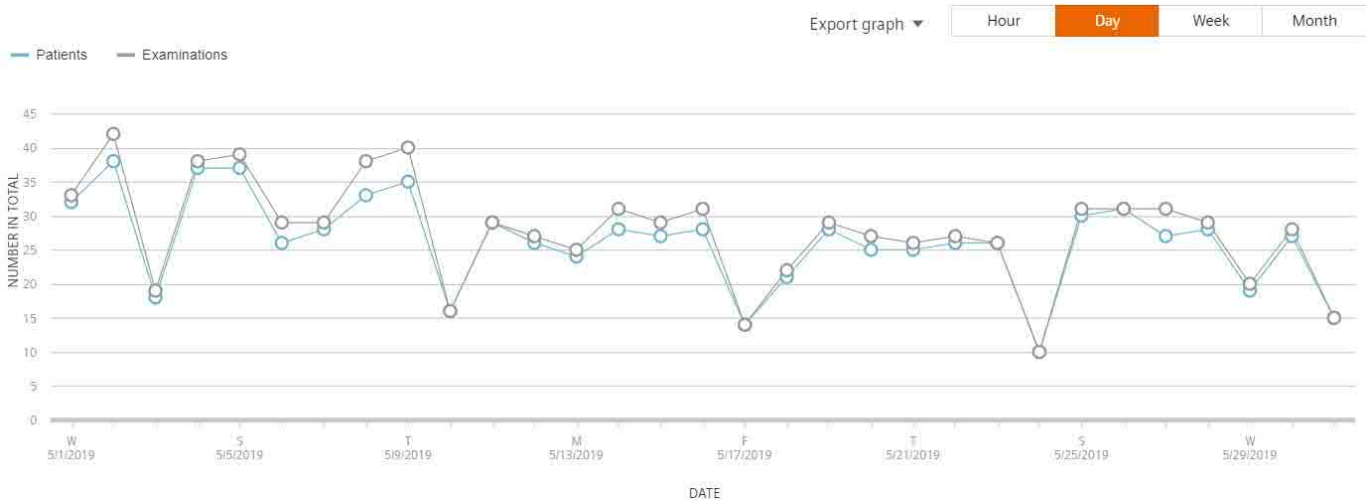
The Diagnostic Imaging Center at Dar Al-Shifa Hospital in Kuwait has adopted the Siemens Healthineers teamplay solution for radiology performance management, as it provided transparency in the radiology department that could not be obtained by using traditional methods. teamplay aggregates data from DICOM images generated by the modalities and turns it into information which allows to make informed decisions to increase productivity and efficiency.

## Key Issues

The key issues behind this project are perceived inefficiencies in the current turnaround process that have not previously been evaluated; but now the teamplay performance management, provides us a transparent view of our radiology department to monitor quantities like imaging throughput, utilization of staff, rooms, and our department's resources down to each device and procedure.

## Start for Data collection

The project started in May 2019 where data collected from the two MRI scanners, MAGNETOM Skyra and MAGNETOM Aera showed that the changing time between two MRI cases takes 64 minutes, the average scan time is 23 minutes per exam, total exams per month is 861 on both the scanners with 1.90 exams per hour.



## Summary of Findings

After analyzing the data collected from teamplay solution, it was found that:

- No significant average patient changing time differences between MRI rooms.
- The data from both MRI rooms show that there is a significant amount of non-value-added time between the

cases within the current turnaround process.

- Cancellation/no show, patient changing, no scan scheduled on friday for both MRI rooms.
- On friday, only one MRI room is operational, and this has a high negative impact (less productivity).

## Summary of Recommendations

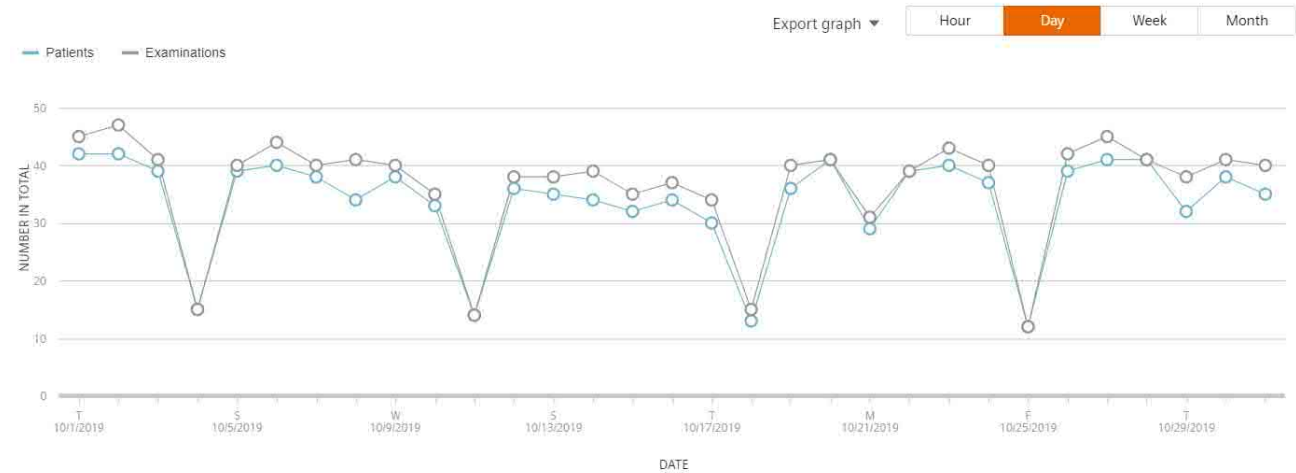
teamplay solution allowed to make objective decisions to increase workflow efficiency.

- Increase the number of nurses assigned in each MRI room - one nurse assigned for each MRI room.
- Organize the materials needed by creating electronic documentation in Arabic and English and send this by SMS link to patient mobile for preparation
- Improve communication skills of the appointment

officer especially with elderly patients by creating education videos for patient preparation.

- Investigate the layout of each individual room in order to optimize the new process steps and reduce walking distances - thus increasing efficiency.
- Optimize the scheduling practices on Friday to reduce scheduling delays.

## The New Result



After implementation of the actions decided, there was a reduction in the changing time between patients to 30 minutes, average scan time reduced to 22 minutes and the exams done per month increased to 1131 with 2.38 exams per hour.

## Contact

Ahmad Hamza  
Chief Technologist  
Dar Al-Shifa Hospital, Kuwait





# Introducing 3T MR Imaging with the New MAGNETOM Vida

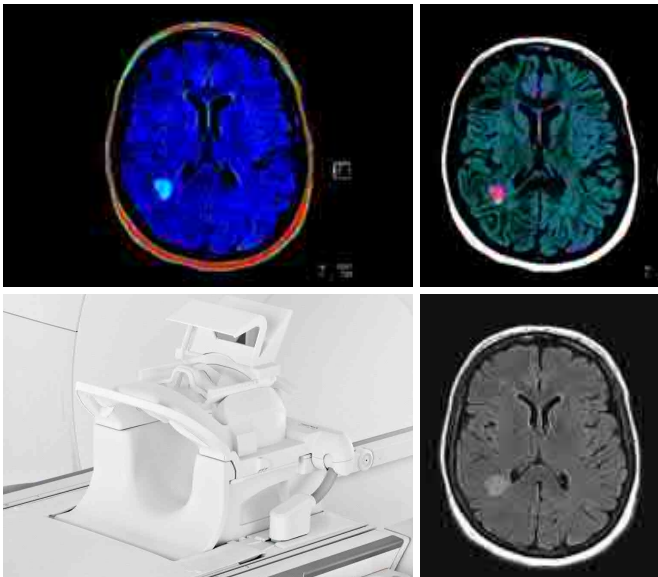
Jordan Hospital, Amman, Jordan

Dr. Mohammad Hiari

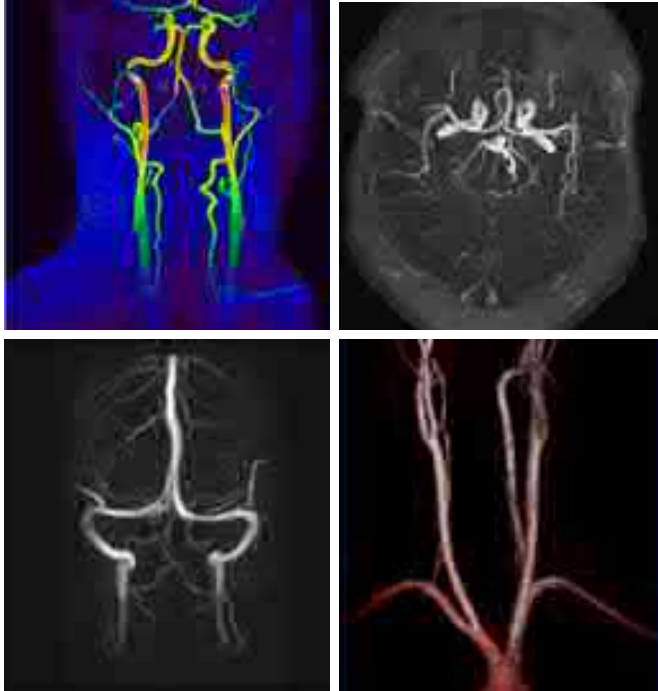
Jordan Hospital is a medical center in Jordan, one of the first clinical and research facilities to install the MAGNETOM Vida 3T MRI. The primary rationale to invest in the new technology platform is the system specifications and the clinical capabilities of the state-of-the-art 3T platform.

The Head/Neck 64 channel coil, with its anthropomorphic geometry, accommodates a large variety of patients while providing highest SNR for extreme iPAT performance with full coverage of the head and neck and seamless integration with the spine and body coils.

For every patient with white matter lesions, the Head/Neck 64 channel coil was used to detect central venous signs(cvs) to confirm or rule out multiple sclerosis.

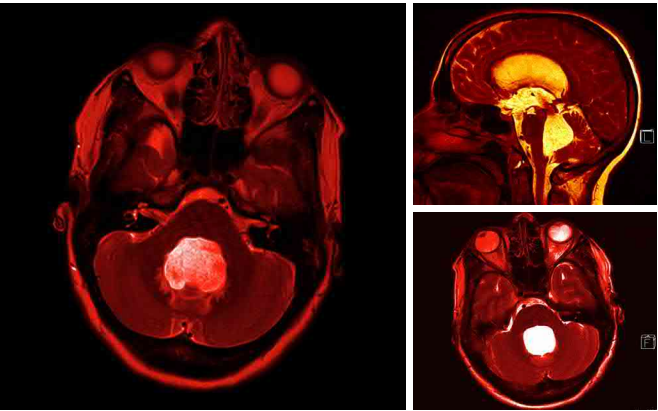


Neck and intracranial MRA and MRV, with Head/Neck 64 channel coil, without contrast.



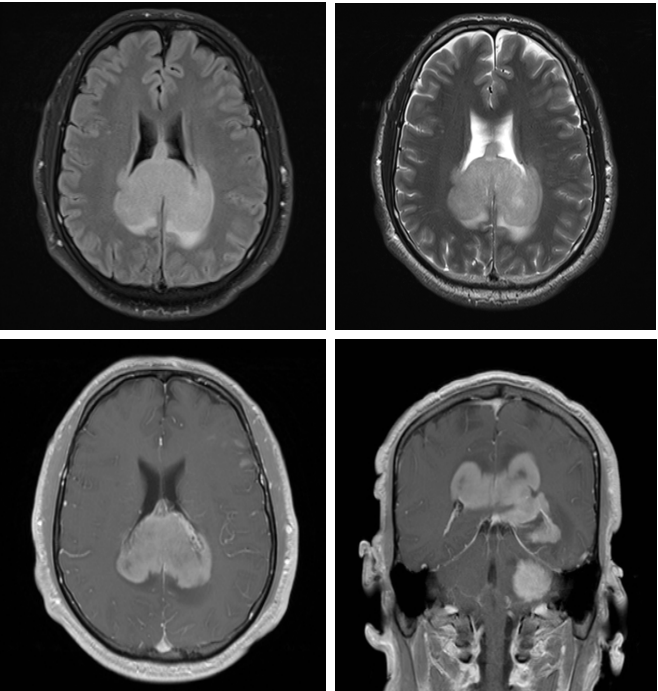
### Case 1

The images below show a 44-year-old male patient(on the MAGNETOM Vida system with Head/Neck 64 channel coil) which showed dilatation of the ventricular system (Quadri-Ventricular Hydrocephalus) with lack of CSF in the cisterna magna, secondary to obstruction at the level of the foramen of Magendie.



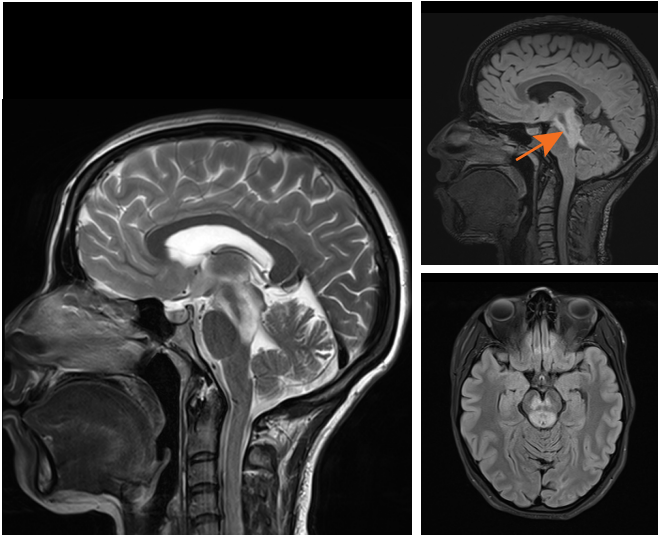
### Case 2

The below images show a brain MRI done on a 55-year-old male patient(not immunocompromised) showing a large enhancing butterfly lesion in the splenium of the corpus callosum and another lesion in the left cerebellar hemisphere which turned out to be Lymphoma Metastases.



### Case 3

Brain MRI was done for a female patient complaining of vague neurological symptoms including headache, vomiting and fever. Midbrain and hind-brain hyperintense signal is well appreciated on T2 and FLAIR sequences done on VIDA and the diagnosis of rhombencephalitis was highly suggested.



### Case 4

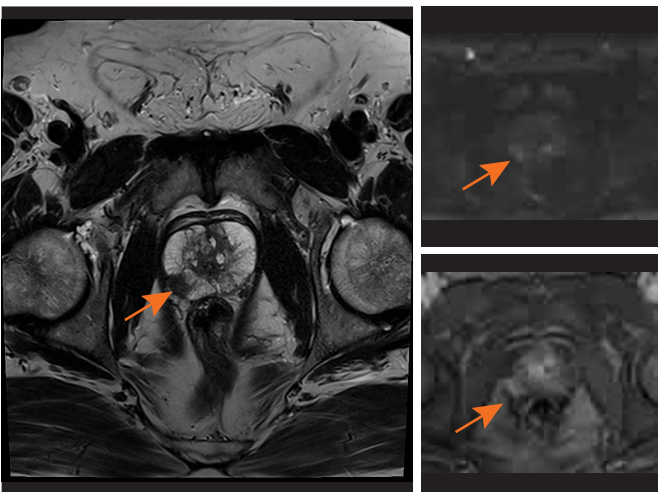
This is a 32-year-old female patient transferred to our hospital after a caesarian section with suspicion of intra-abdominal vascular injury.

Aortic CTA (not shown) was normal with no vascular injury. Abdominal MRV without any contrast on MAGNETOM Vida system has been performed and showed a long thrombus in the IVC. Subsequently, pulmonary CTA showed multiple emboli in the pulmonary artery branches.



### Case 5

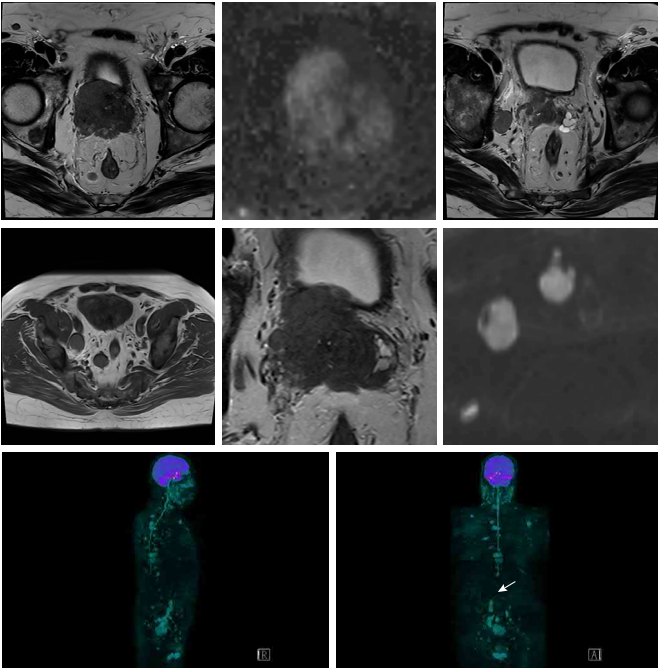
Efficient MR imaging performed with no endorectal coil in less than 15 minutes serves a triage test to avoid unnecessary biopsies.



A core prostate imaging protocol typically involves T2-weighted scans in at least two planes, diffusion weighted imaging, and dynamic contrast-enhanced imaging. As shown above, all relevant contrasts can be acquired in about 15 minutes acquisition time. You can therefore examine a patient in a slot lasting between 20 and 25 minutes.

### Case 6

**Large Prostate Cancer with Whole Body DWI**  
30 channel body coil was used for prostate imaging which is showing a signal drop on T2 for the whole gland as well as signal drop in the ADC map with diffuse restriction in 1200 b-value and is showing right seminal vesicles invasion as well as enlarged lymph nodes in the deep inguinal region and in the mesorectum indicating advanced prostate cancer PIRAD 5.



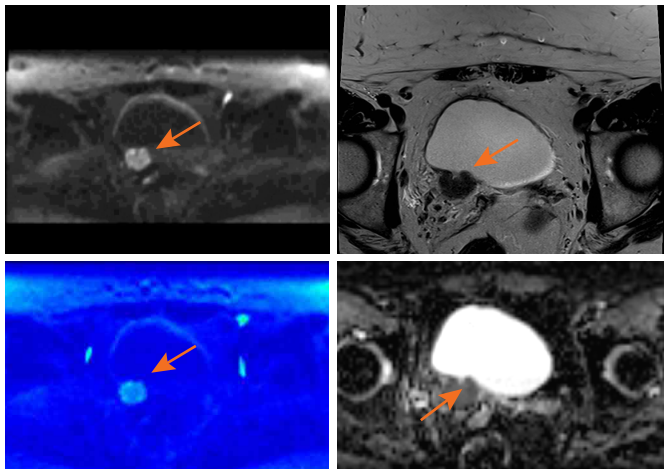
Above images show whole body DWI in high b-value displaying diffuse vertebrae, pelvis and lymph node metastases.

### Case 7

A urinary bladder MRI was performed on a 62-year-old female patient, demonstrating an exophytic mass growing from the right vesicoureteric junction invading the urinary bladder wall and showing strong diffusion restriction on

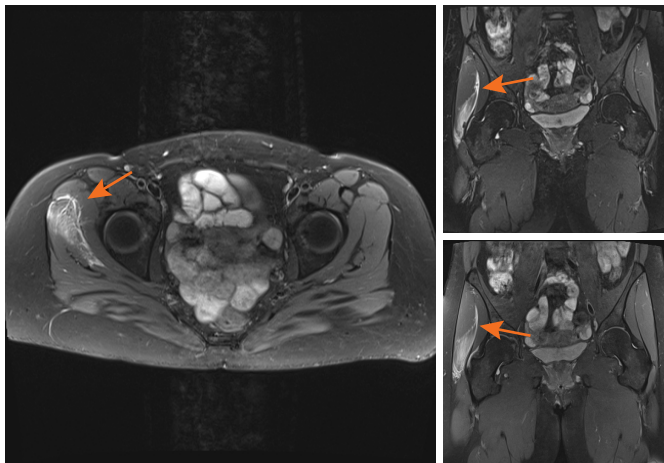


1200 b-value DWI indicating its malignant behavior in keeping with transitional urothelial cell carcinoma (TCC).  
Based on the below images and similar images of the pelvic urinary tumours a VI-RADS (V is for vesico-) should be implemented from now on whenever there is bladder tumor, for better staging like prostate tumours.



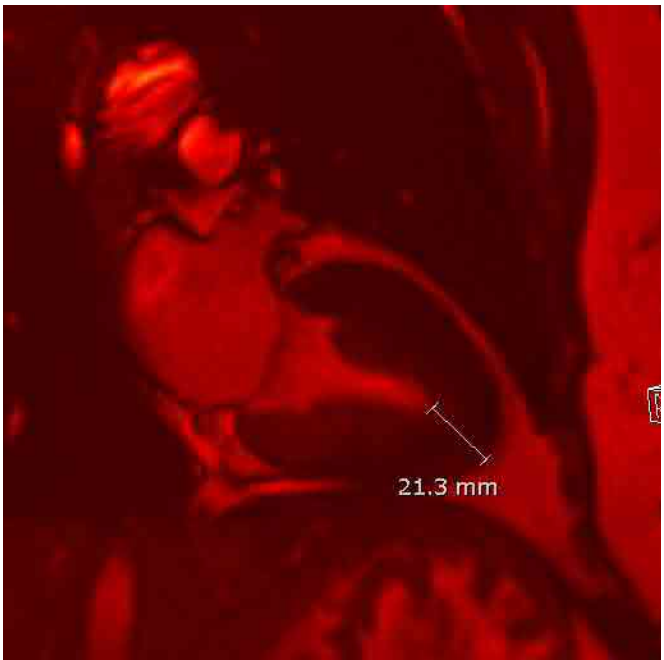
### Case 8

A young athletic lady complaining of right hip pain. Pelvic MRI has been performed on MAGNETOM Vida 3T system and clearly showed muscle contusion in the right gluteus medius.



### Case 9

30-year-old male patient complaining of shortness of breath and the cardiologist suspected myocardial disease on echo. Cardiac MRI was performed in both cine and static mode (short axis, long axis and two-chambers view) and showed hypertrophic myocardium without any infiltration of the myocardium. Hence, hypertrophic cardiomyopathy [HOCM] has been suggested.



### Contact

Dr. Mohammad Hiari, MD, FRCR  
Head of Radiology Department  
Jordan Hospital, Amman, Jordan



# Porencephalic Cyst on Brain Interictal 18F-FDG – PET/CT Scan

Sultan Qaboos University Hospital, Muscat, Sultanate of Oman

Dr. Naima Tag; Dr. Jawa Zabab, Department of Radiology and Molecular Imaging

### History

A 22-year-old male with right hemispheric medical refractory epilepsy was referred for interictal 18F-FDG – PET/CT possible evaluation for surgery intervention.

### Diagnosis

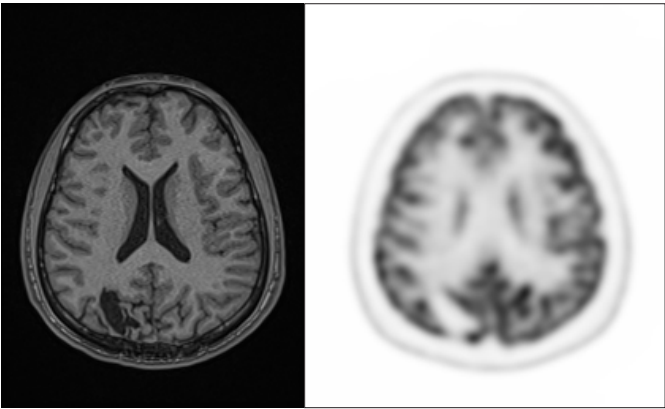
Pre surgery evaluation tests were acquired including :

- EEG: right occipital epileptiform discharges earlier
- CT brain: right occipital lesion with calcification.
- MRI brain: right parieto-occipital cysts suggestive of porencephalic gliosis (**Fig. 1**)
- The interictal 18F-FDG reveals hypometabolism at the site of the lesion seen in the MRI with accurate delineation of the lesion , which communicates directly with the ventricular system (**Fig. 2**)

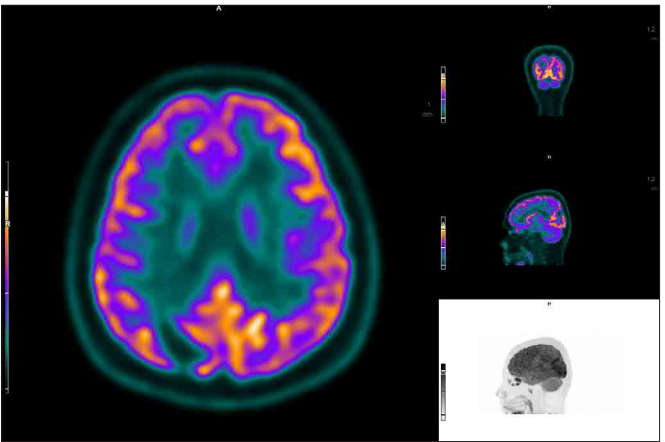
### Comments

18F-FDG is the most commonly used PET tracer in the evaluation of patients with epileps. This reflects the glucose metabolism related to the synaptic and neuronal activity of the brain tissue. Interictal 18F-FDG PET typically shows hypometabolism in the epileptogenic region. We report this case in which 18F-FDG PET-CT images reveal a hypometabolic area which communicates with the ventricles , therefore supporting the diagnosis of adult porencephalic cyst seen in the MRI.

The adult porencephalic cystic is a rare congenital disorder that results in cystic degeneration. Clinical features are variable as the cysts vary in size and location. Patients may be asymptomatic or may present with epilepsy, focal neurological deficits or mental retardation. Seizures may be partial or generalized. Treatment may include physical therapy and anti-epileptic drugs for seizure disorders. Surgery is advised in the patients with anti-epileptic drug resistant epilepsy.



1 Fig. 1



2 Fig. 2

### Contact

Dr. Naima Tag  
Nuclear Medicine Physician  
Department of Radiology and Molecular Imaging  
Sultan Qaboos University Hospital, Oman



Dr. Jawa Zaba  
Nuclear Medicine Physician  
Department of Radiology and Molecular Imaging  
Sultan Qaboos University Hospital, Oman



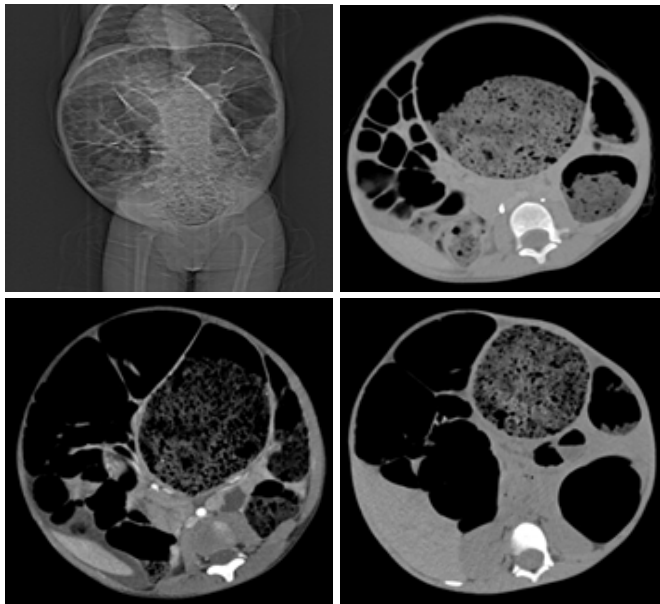


# Hirschsprung's Disease (HD) - Congenital Megacolon Child Imaging with Low Dose Technology

Wudassie Diagnostic Center, Addis Ababa, Ethiopia

## Epidemiology

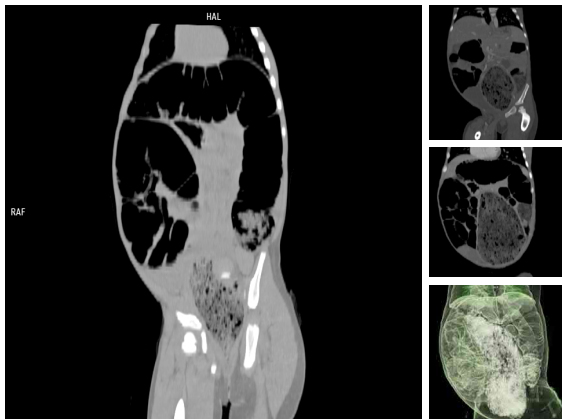
Hirschsprung's Disease (HD), also known as congenital aganglionic megacolon, is an anomaly characterized by an absence of ganglion cells in the myenteric and submucosal plexuses in a variable length of bowel segment, especially in boys. Hirschsprung disease affects approximately 1:5000-8000 live births. In short segment disease, there is a significant predilection for males which reduces with increasing length of involvement. Interestingly, it is almost never seen in premature infants.



1 Top, Axial plane study image, Axial arterial and delayed CT images. Pediatric 70 kV with 110 mAs imaging protocol.

## History

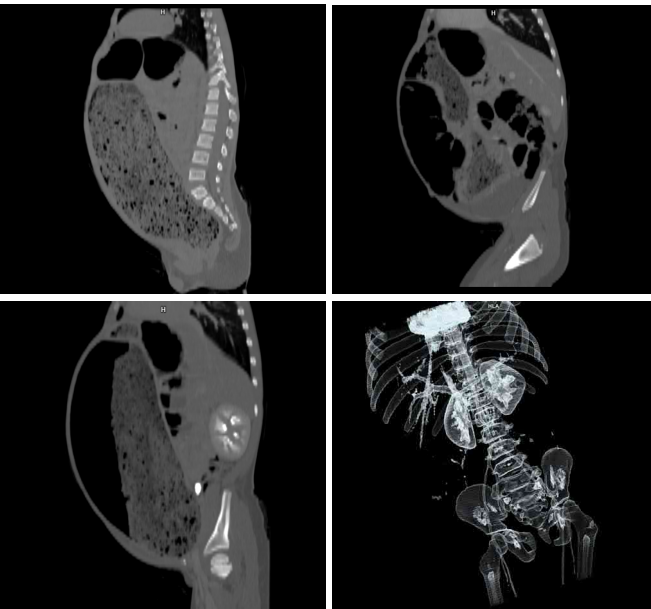
A 6-year-old male patient, presented with acute abdominal pain, swelling of the abdomen, vomiting and constipation. He was referred to the radiology department with a clinical suspicion of bowel obstruction. Whole abdomen low dose contrast CT was performed with dedicated child abdomen protocol.



2 Coronal images consecutively plain, arterial and delayed phases along with vrt hollo preset. Pediatric 70 kV with 110 mAs imaging protocol.

## Diagnosis

Whole abdomen low dose multi-phase CT study (total DLP 83 and effective dose 0.5 milli gray) performed on the Siemens Healthineers SOMATOM go.Top 128-slice CT scanner, showed a large bowel obstruction R/O Hirschsprung disease. Liver is normal in size and no focal lesions are seen. The large bowel loops are dilated markedly up to the rectosigmoid junction and filled with feces. There is no evidence of mass lesion. Both the kidneys, pancreas and spleen are normal. Urinary bladder is distended and normal in wall thickness.



3 Sagittal images consecutively plain, arterial and delayed phases along with vrt hollo vascular preset. Pediatric 70 kV with 110 mAs imaging protocol.

## Conclusion

Low-dose MDCT has a good role in localizing the site of TZ of HD in infants. Low dose technologies like tin filter and low kV imaging facilitate the achievement of the ALARA (as low as reasonably achievable) principle especially in pediatric CT imaging. Iterative reconstruction algorithm SAFIRE helps to reduce noise from low dose imaging and helps to visualize superior image quality in such low dose imaging. Such low dose protocols are important especially in developing countries like Ethiopia where a significant proportion of the population is in the pediatric age group (around 13 million people are under the age of 5 which constitute about 16% of the total population)

## Examination Protocol

Total mAs: 1855	Total DLP: 83	Scan	Q.ref.mAs @120kV	kV	Q.ref.mAs	eff. mAs	CTDIvol* mGy	DLP mGycm	T rot. s
Patient Position FFS									
Topogram	100			Sn100		25 mA	0 L	0	
Abdomen_NC	200	110		70	436	54	0.7 L	29	0.33
Abdomen_Cont	300	110		70	436	55	0.72 L	27	0.33
Abdomen_Delay	400	110		70	436	56	0.73 L	27	0.33

Scanner	SOMATOM go.Top 128-slice CT Scanner		
Scan area	Whole Abdomen	Rotation time	0.33 s
Scan mode	Helical	Pitch	1.5
Scan length	368.2 mm	Slice collimation	64 × 0.6 mm
Scan direction	Cranio-caudal	Slice width	3 mm
Scan time	3.6 Sec	Reconstruction increment	3 mm
Tube voltage	70 kV	Reconstruction kernel	B36
Effective mAs	100 mAs	SAFIRE Strength	3
Dose modulation	CARE Dose4D and CARE kV	Effective dose	1.6 mSv1
CTDI vol	0.73 mGy	DLP	83 mGy.cm

Estimated by applying a conversion factor of 0.020



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## Contact

Dr. Tesfaye Kebede, MD, SCR, SSBI  
Department of Radiology  
Wudassie Diagnostic Center, Ethiopia





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**Middle East Regional Office**

Siemens Healthcare LLC  
Building 71, Floor 2  
Dubai Healthcare City  
United Arab Emirates  
Tel: +971 4 366 0700