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Chief Editor

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EXCRETORY PHASE CT UROGRAPHY: MODIFIED TECHNIQUE FOR IMPROVE URINARY COLLECTING SYSTEM DISTENTION AND DECREASE DENSITY OF EXCRETED CONTRAST.

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ABSTRACT

Purpose: To determine if oral water with and without combined intravenous saline infusion and body rotation improved imaging of the urinary collecting system on excretory phase multi-detector CT urography.

Materials and Methods: 42 consecutive renal donors underwent 16-detector CT urography. The excretory phase imaging was performed 400 seconds after intravenous contrast injection either with conventional supine technique (n=17) or modified technique (n=25; after intravenous injection of 250 ml of 0.9% saline and body rotation). Two radiologists retrospectively reviewed blindly and independently scored, 1) degree of distention of collecting system, 2) degree of opacification. Bladder volume was calculated.

Results: The modified cohort had significantly improved distention scores in the intrarenal segments ($p<0.05$) and bladder ($p<0.005$) and larger mean bladder volume ($p<0.001$) as well as significantly higher mean opacification quality scores in the modified cohort ($p<0.005$).

Conclusion: A significantly improved excretory-phase CT urogram was obtained by intravenous saline infusion and body rotation.

INTRODUCTION

A variety of approaches have been advocated for improved distention of the urinary collecting system on multi-detectors CT urography (MDCTU) including scanning in the prone and supine positions,[1] scanning after abdominal compression,[1-6] scanning after supplementaly intravenous infusion of 0.9% saline,[7-8] delayed scanning,[4,8] and scanning after furosimide injection.[9] However, these approaches each have limitations. Imaging in both prone and supine positions increases radiation exposure and imaging time. Use of abdominal compression is cumbersome, may add radiation dose and has shown variable results in achieving distention.[1-6] Use of a 250 ml intravenous saline bolus alone was found to have a non-visualization rate as high as 25% in distal ureteral segments.[8]

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In addition to achieving consistent distention of the urinary collecting system, improving the quality of ureteral opacification (i.e. minimizing beam hardening and achieving homogenous opacification) is important for detecting and characterizing a variety of abnormalities.[10-11] In some studies, use of a saline bolus resulted in diluting excreted contrast and decreasing contrast density with resulting improved excretory image quality.[7-8] In our routine CT urogram protocol, we had patients drink 500 ml of oral water prior to scanning, but anecdotally observed that scans were still degraded by nonvisualized distal ureteral segments, beam hardening and contrast layering artifacts. A simple technique for consistently distending the intra and extra renal collecting system while obtaining a consistent, moderately dense, as well as homogenous opacified urogram was necessary. The purpose of this study was to determine if we could consistently achieve these twin goals, based on a modified MDCTU technique utilizing 500 ml of oral water supplemented by intravenous bolus infusion of 250 ml of 0.9% saline and body rotation prior to obtaining an excretory phase CT urogram in a cohort of potential renal donors who underwent 16-detector CTU.

MATERIAL AND METHODS

Subjects:

This retrospective study was reviewed by our institutional review board (IRB) and was granted an exemption; informed consent was not required. Total 42 consecutive renal donors who underwent donor evaluations between June 2003 and January 2004 were included in the study. All donors were scanned on one of three 16-detector CT scanners (Sensation 16; Siemens Medical system, Erlangen, Germany).

MDCTU = Multi-detectors CT urography

CT Technique:

All examinations were performed on a 16 -detector row CT scanner (Somatom Sensation 16; Siemens Medical system, Erlangen, Germany). Each donor fasted for at least 3 hours prior to the scan and ingested 500 ml of water, within 15-20 min of the scan Unenhanced CT scans were obtained helically using the following parameters: 120 kVp, 200-240 mAs, 12 mm table speed, 0.5 sec rotation speed, 0.75 mm collimation, 5 mm reconstruction. Unenhanced scans were used to ensure the presence of two separate and symmetric kidneys, detect renal calculi and characterize incidental renal, adrenal and liver lesions. Using a power injector, 100-150 ml of nonionic intravenous iohexol (350 mg of iodine/ml) (Omnipaque 350, GE Health, Princeton, NJ) dosed to weight (100ml: less than 100 lbs, 125 ml: 100-200 lbs, 150 ml: greater than 200 lbs) was injected into antecubital vein through 18-gauge peripheral I.V. line at 4.0 ml/sec. The arterial phase scans were initiated using an automatic bolus-tracking program (Smartprep; Siemens Medical Solution, Erlangen, Germany). A region of interest was placed in the abdominal aorta, just above kidneys. Scanning was triggered at 5 seconds after threshold of 150 HU in the region of interest was reach. Volumetric scans were acquired from the level of the celiac axis to the common iliac artery bifurcation using the following parameters: 120 kVp, 200-240 mAs, 12 mm table speed, 0.5 sec rotation speed, 0.75 mm collimation, and reconstruction with 60% overlap. We reconstructed images at 0.75 mm thickness with 0.6 mm interval for arterial phase. A standard body filter without edge enhancement was used for reconstruction. Nephrographic phase images were acquired 85 seconds following the arterial phase, covering the same area described with similar parameters. Images were reconstructed at 2 mm thickness at 1 mm intervals (50% overlap). Finally, excretory phase images were acquired from the celiac axis to the urinary bladder base approximately 5 minutes after nephrographic phase (approximately 400 seconds after injection) with either the conventional or modified technique. The following parameters were used: 120 kVp, 120 mAs, 15 mm table speed, 0.5 sec rotation speed, 0.75 mm collimation, and 1 mm thickness reconstruction with 0.6 mm interval, extending base.

Conventional technique for excretory phase imaging:

A conventional MDCTU protocol was employed in the first 17 donors (June 2003-August 2003; 11 women, 6 men; mean age: 38 years; age range: 18-58 years). Although these donors ingested 500 ml of oral water within 15-20 minutes of their scan, no other modifications were made. Donors were imaged in the supine position according to the protocol described, approximately 5 minutes after nephrographic phase was acquired (approximately 400 seconds after contrast injection).

Modified technique for excretory phase imaging:

A modified MDCTU excretory phase protocol was used to scan the next 25 consecutive renal donors (13 women, 12 men; mean age: 40 years; age range: 19-54 years). All donors in cohort also drank 500 ml of oral water within 15-20 minutes of their scan and were then imaged with the following modifications: 1) each donor received an intravenous bolus of 250 ml of 0.9% saline supplement after arterial phase scan using a dual headed power injector at a rate of 4 ml/second. 2) After saline infusion and nehprograhpic phase imaging, each donor was asked to rotate in position 3 times on the CT table and imaged in the supine position 300 seconds after the nephrographic phase (400 seconds after contrast injection).

Image analysis:

Excretory phase 16-detector row CT data sets were then loaded on a 3D workstation (Vitrea 2; Vital Images; Plymouth, Mn). Two experienced abdominal radiologists (6 years experience, each) blinded to all donor data retrospectively and independently reviewed the excretory phase data sets from both cohorts in random order on 3D workstations. The reviewers used axial images, supplemented by other 2D reformations (e.g. multiplanar reformation (MPR), maximum intensity projection (MIP)) and 3D reformations (e.g. volume rendering (VR)) according to reader preference.

Each blinded reader was asked to subjectively score the degree of distention and quality of intraluminal contrast density for the entire urinary collecting system and bladder according to the following scoring system: (Figures 1-4)

Fig. 1 Oblique volume-rendered (VR) images obtained with a 16-detector row CT scanner demonstrate degree of distention in intrarenal collecting system and renal pelvis and density of excreted contrast.

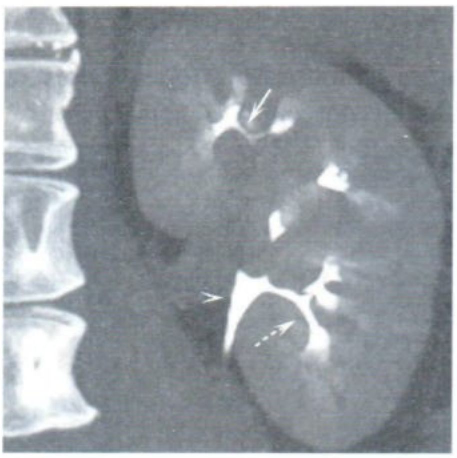


Fig.1A 38 years old female, coronal VR image: arrow = score 1 for upper pole calyx distention, dash arrow = score 2 for lower pole calyx distention, arrow head = score 2 for renal pelvic distention, and score 1 for density of excreted contrast in collecting system.

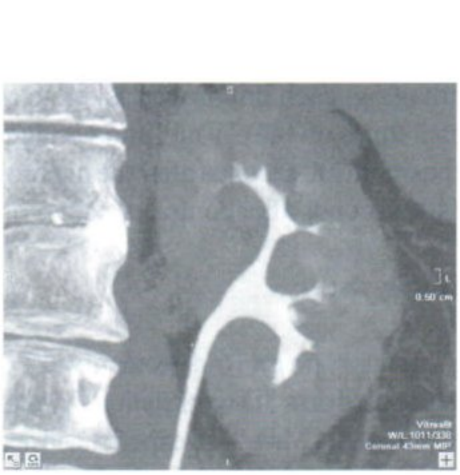


Fig.1B and 1C, 40 years old man, coronal and axial VR images demonstrate score 3 for intrarenal collecting system and renal pelvis distention, and score 2 for density of excreted contrast in collecting system

Fig. 2 40 years old man, selected axial CT urographic images demonstrate distention score for the ureter.

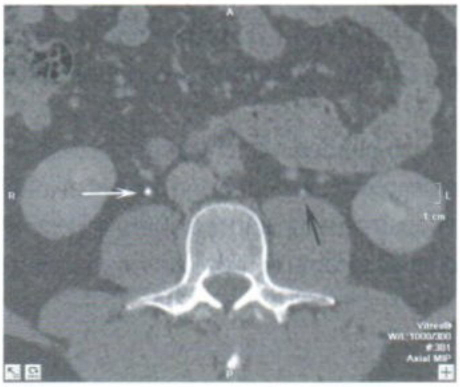


Fig.2A black arrow = score 1 for left proximal ureter distention, white arrow = score 2 for right proximal ureter distention.

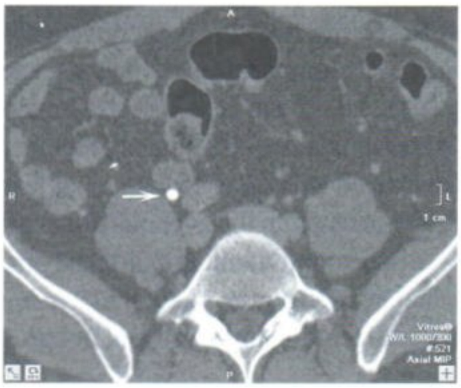


Fig.2B white arrow = score 3 for right mid ureter distention.

Fig. 3 Axial CT urographic images demonstrate different scores for distention and density of excreted contrast for bladder in different consecutive donors.

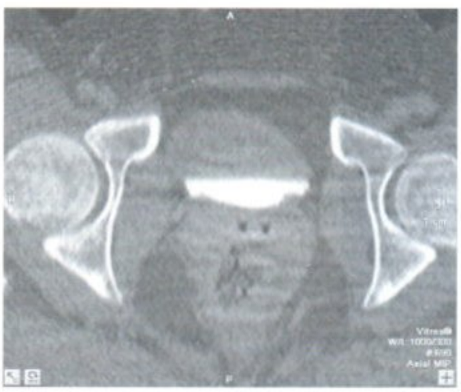


Fig.3A score 0 for distention and density of excreted contrast

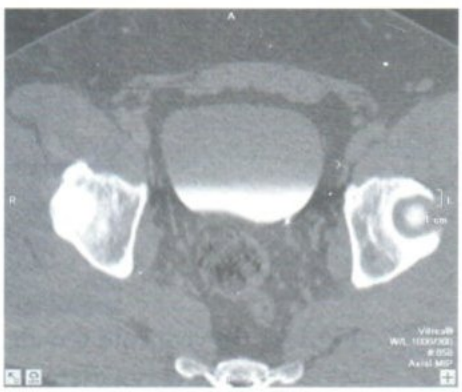


Fig.3B score 1 for distention and density of excreted contrast

Fig. 3C score 2 for distention and density of excreted contrast 3C, score 2 for distention and density of excreted contrast.

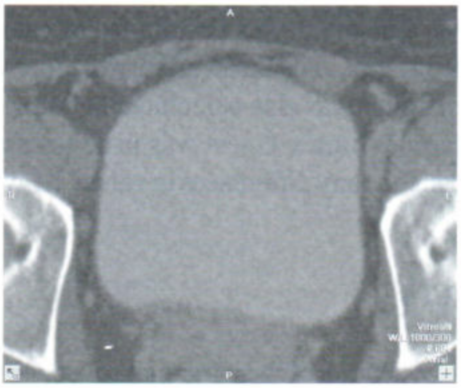


Fig. 4 49 years old woman, axial CT urographic image demonstrates score 2 for bladder distention and score 3 for density of excreted contrast in the bladder.

Scoring system for distention of upper pole, lower pole intra renal collecting system, renal pelvis, and proximal, mid and distal ureteral segments (6 segments bilaterally)

Score 0: non-visualization
Score 1: less than 50% distention
Score 2: 50-75% distention
Score 3: full distention

Scoring system for urinary bladder distention

Score 0: bladder collapse
Score 1: moderate distention
Score 2: full distention

Scoring system for quality of contrast material in collecting system

Score 0: hyperdense excreted contrast with beam hardening artifact
Score 1: hyperdense excreted contrast without beam hardening artifact
Score 2: homogeneous optimal density of contrast material

Scoring system for quality of contrast material in the urinary bladder

Score 0: hyperdensity of contrast material with beam hardening artifact
Score 1: hyperdensity of contrast material with contrast- urine level
Score 2: Acceptable density of contrast material with minimal contrast-urine level
Score 3: homogeneous, optimal density of contrast material

We divided the intrarenal collecting system (IRC) and extra-renal ureter bilaterally into the following six segments: upper and lower IRC, renal pelvis, proximal (above the iliac crest), mid (between level of iliac crest to sciatic notch) and distal ureter (below the sciatic notch). Two abdominal imagers (6 years experience, each) reviewed the images and assigned the scores for distention of each segment of both kidneys as well as the urinary bladder, and for density of excreted contrast in collecting system and the urinary bladder.

Using volumetric analysis software on the 3D workstation, the excretory phase volume of the urinary bladder in each donor was calculated by manually outlining the bladder with an electronic cursor. The calculated cross sectional area of each section was then summed to give a relative estimate of bladder total volume in milliliters.

Data Analysis:

For each reviewer, the mean scores for bilateral collecting system distention (6 segments per side and bladder) and intraluminal density (collecting system and in the urinary bladder) were calculated separately for both the conventional and modified cohorts. Inter

-observer agreement was determined by calculating weighted Kappa. The mean urinary bladder volume for each donor was also calculated in both cohorts. The Mann-Whitney U test was used to assess the significance of any differences in values between cohorts.

RESULTS

Distention of the intrarenal collecting system and renal pelvis:

Overall, both reviewers scored upper and lower poles intrarenal segments bilaterally were well visualized without any non-visualized segments in either cohort, (Figure 5-6). Both reviewers scored the degree of distention to be significantly better ($p<0.05$) in the modified technique cohort as compared to the conventional cohort. The raw mean scores for renal pelvis distention bilaterally for both reviewers were the best of all six segments analyzed in the modified cohort, and were slightly better than in the conventional cohort with no significantly different.

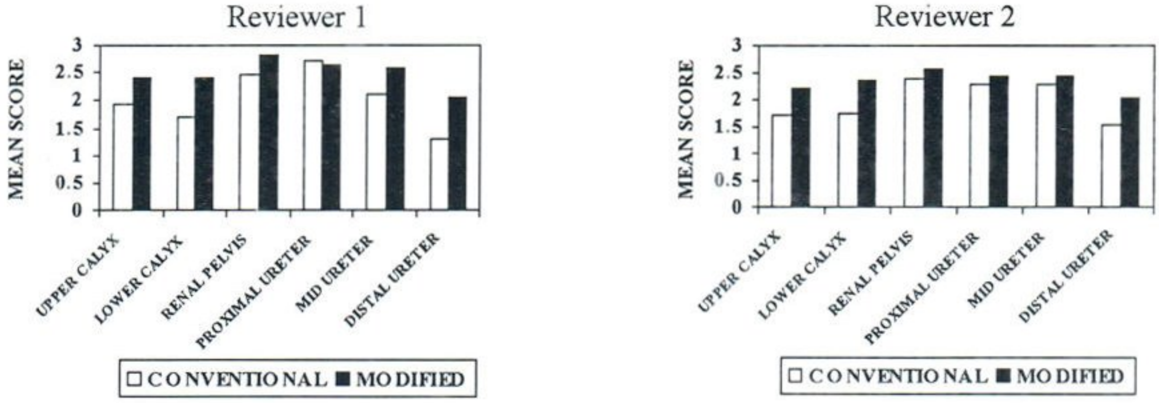


Fig. 5 Vertical bar graphs compare mean score of distention for right collecting system between conventional and modified technique in reviewer 1 (A), and reviewer 2 (B) Statistically difference in mean score for right intrarenal collecting distention between convention technique and modified technique of both reviewers, $p<0.05$

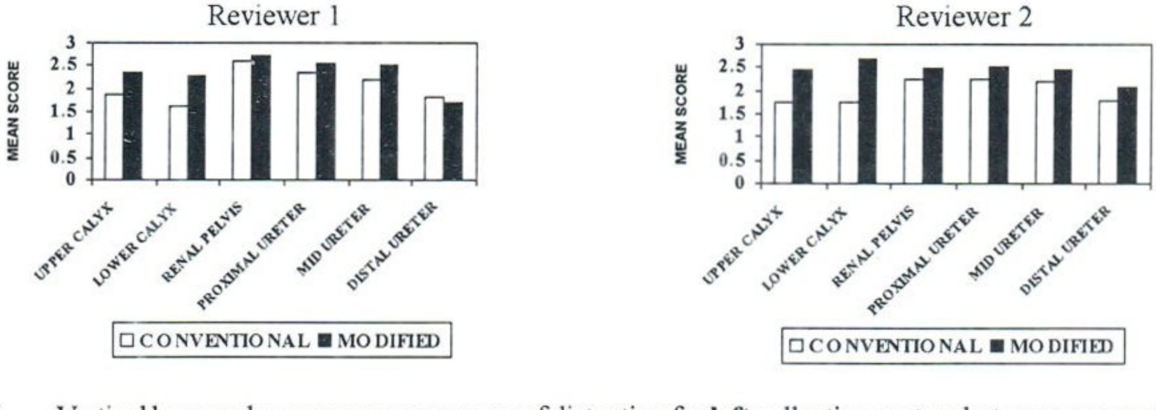


Fig. 6 Vertical bar graphs compare mean score of distention for **left** collecting system between conventional and modified technique in reviewer 1(A), and reviewer 2 (B) Statistically difference in mean score for **left intrarenal collecting distention** of left kidney between convention technique and modified technique of both reviewers, $p<0.05$

Distention of the extrarenal collecting system:

Overall both reviewers scored the degree of distention of the proximal and mid ureteral segments to be well distended in both cohorts, although the scores were generally slightly higher ($p > 0.05$) for the modified cohort. The raw mean distention scores for both cohorts were higher in these two segments compared to all the other segments except the renal pelvis bilaterally. There were no non-visualized segments in either cohort in the proximal ureters. For mid ureter segment, both reviewers scored a non-visualized segment in on the right side in the same single case (4% (1/25 right systems)) in the modified cohort. One reviewer also scored a non-visualized segment in on the right side in a single case in the conventional cohort. Both reviewers scored mean degree of distention of the distal ureteral segments to be slightly lower than other ureteral segments. The mean distal ureteral distention scores were generally slightly better ($p > 0.05$) in the modified cohort. However, there were significantly less non visualized segments overall compared to the conventional cohort, ($p < 0.05$). (Non visualized segments: reviewer 1 conventional: 23.5% (8 of 34 distal ureteral segments) vs modified: 6% (3 of 50 distal ureteral segments); reviewer 2: conventional: 23.5% (8 of 34 distal ureteral segments) vs modified: 4% (2 of 50 distal ureteral segments))

Distention of the bladder:

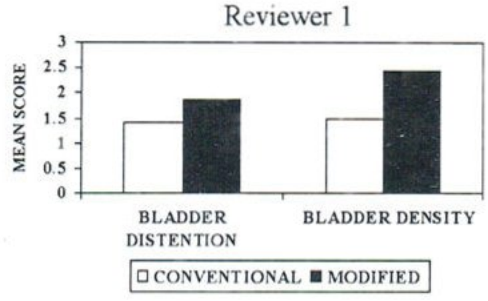
Both reviewers scored degree of distention of the urinary bladder ($p < 0.005$), (Figure 7) to be significantly better in the modified technique cohort. The latter assessment was confirmed by the relatively larger calculated mean urinary bladder volume in the modified technique cohort (393.69 ml vs 161.54 ml; $p < 0.001$) compared to the conventional technique cohort.

Assessment of Interobserver agreement:

Both reviewers achieved moderate to good agreement (weighted Kappa statistic = 0.42-0.76) for assessment of the degree of collecting system distention, and moderate agreement for degree of bladder distention (weighted Kappa statistic = 0.46).

Density and homogeneity of excreted contrast in urinary tract system:

Both reviewers scored the overall quality of opacification (contrast density and homogeneity) of intraluminal excreted contrast density to be significantly better for the modified cohort as compared to the conventional cohort, ($p < 0.005$) in the intra and extrarenal collecting system and also in the bladder (Figure 7). There was good agreement between reviewers in assessment of quality of intraluminal excreted contrast (K = 0.65-0.72)



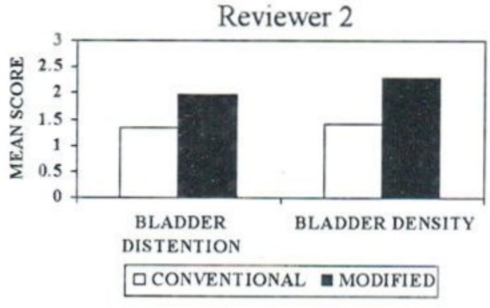


Fig. 7 Vertical bar graph compares mean score of density for urinary bladder distention and density between conventional and modified technique in both reviewers 1(A), and reviewer 2(B). Statistically difference in mean score of urinary bladder distention and density between convention technique and modified technique of both reviewers, $p < 0.005$

DISCUSSION

16-detector CT has enabled acquisition of near-isotropic volumetric data in the renal excretory phase to facilitate high resolution, diagnostic quality CT urograms with IVU like projections familiar to radiologists and urologists. However, the reproducibility and quality of these CT urograms is variable and may be degraded by a variety of factors including lack of distention of the intra-and extra-renal collecting system, as well as inhomogenous opacification of the collecting system and bladder due to layering of excreted contrast and beam hardening artifact caused by high attenuation from concentrated excreted contrast. These problems have been described on both conventional excretory urography and also affected CT urography. Theoretically, improving collecting system distention with a uniform, intermediate density opacification from excreted contrast should enable better evaluation of ureteral lumen and wall.

There is no clear consensus among radiologists that methods of achieving these goals and a variety of techniques have been advocated. Various forms of abdominal compression in either one or two acquisions have been advocated to improve distention of the proximal, mid and distal ureters.[1-6] One group[2] uses a split dose technique with post compression imaging of the upper ureters and compression release views of the lower ureters. Others advocate imaging the excretory phase in the after release of compression.[4,8] However, compression is cumbersome, may require multiple acquisitions in some protocols and has limited visualization of the distal ureter. However, a more recent study found that abdominal compression did not significantly improve distention or opacification of the urinary tract.[8] Other techniques advocated to improve distention include use of a 250 ml intravenous 0.9% saline bolus[1,8] or administration of furosimide.[9] Aside from the issue of distention, improving the overall quality of the excreted contrast to achieve a moderate density, homogenous opacified urogram has only been examined in a few studies[1,8,12]

In this study, both control and modified technique cohorts ingested 500 ml of oral water within 20 minutes prior to multidetector CT scan, since this had routinely been part of the protocol for many years. However, since we had anecdotally observed some non-visualized segments and some scans degraded by excretory phase beam hardening, we modified the technique to include a supplemental infusion of 250 ml of intravenous 0.9% saline due to its relative ease of hydration and its proven effect in improved collecting system distention and dilution of excreted contrast described in excretory urography[13-14] and in multi-detector CT urography.[7,8] Body rotation on the CT table just prior to excretory phase imaging was intended to preclude contrast layering and achieve more homogenous contrast opacification in the collecting system and bladder in this population.

In this study, overall distention was generally very good over a range of six intrarenal and extrarenal collecting system segments and bladder in both the control and modified technique cohorts. However, the modifications (intravenous saline bolus and body rotation) in the latter cohort generally resulted in better distention of the entire collecting system and the bladder. Overall distention was scored well in the proximal and mid ureters bilaterally with an incrementally higher mean distention score in the modified technique cohort. A significantly higher mean score for distention was noted in the intrarenal collecting system and bladder with a significant decrease in the percentage of non-visualized distal ureteral segments (23.5% vs 4-6%). Previously, studies assessing the use of an intravenous saline bolus have reported mixed results. McTavish et al.[7] in a comparison different techniques found that a 250 ml saline injection and excretory imaging at 480 to 600 second delay significantly improved "opacification" only in the distal ureter, but not in the intrarenal collecting system or proximal ureters. Caoli et al.[8] in a retrospective study, which compared four techniques in a non-renal donor population, found slight improvement in distention of all portions of the renal collecting system with both saline administration and abdominal compression techniques. Overall distention was significantly better in the intrarenal collecting system and bladder as compared to other segments of the ureters in the saline cohort. Based on our results, we believe that overall distention in the intra renal and extra renal collecting system and bladder is consistently improved by use of both oral water and a supplemental intravenous saline bolus, especially in the difficult to image distal ureters. The use of oral water may be especially helpful to distend the distal ureters. In comparison to the 26% and 27% of non visualization rate reported by Caoli et al.[8] in the control and saline injected cohorts, we found a 23.5% non-opacification rate in controls (oral water only) which significantly decreased to 4-6% in the modified cohort (oral water, intravenous saline and body rotation). Further, there were no significant non-visualized segments in proximal and mid ureters in our series, whereas Caoli et al.[8] found an 8% and 16% non visualized rate in the proximal and mid ureters respectively even in the saline augmented cohort.

Aside from providing consistently good collecting system and bladder distention, the overall quality of excreted contrast was scored significantly higher in the modified technique cohort in both the intra renal and extra renal collecting system and bladder. Specifically there was there was significantly and consistently less subjective beam hardening and contrast layering artifacts. All subjects in the modified cohort were able to perform body rotation on the CT table during the waiting period for the excretory phase scan. The results support those of previous studies demonstrating a decreased density of excreted intraureteral contrast after saline administration. Both McTavish et al.[7] and Caoli et al.[8] found improved mean opacification scores to be improved in patients, who received an intravenous saline bolus compared to controls who did not receive a bolus.

Our study has limitations. We used subjective -criteria for grading of distention and intraluminal contrast density by two readers, with quantification of only bladder size. However, we believe that this is more clinically relevant since judgments related to distention and quality of opacification are usually subjective. Further, our study was performed in presumed healthy potential renal donors Modifications such as oral water ingestion, intravenous saline bolus and body rotation may not be possible patients with cardiac, renal or liver disorders and body rotation may not be successful in disabled, elderly or obese patients. Finally, this utility of these techniques in detecting urothelial pathology was not assessed, since this study was designed to assess technical improvements.

CONCLUSION

Excretory phase 16-detector CTU performed with oral water and supplemental infusion of saline with body rotation enabled consistently good distention and quality of excreted contrast of urinary tract system.

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DEEP FIBROMATOSIS (DESMOID TUMOR) IN THE TRUNK AND ABDOMEN: CT/MRI AND PATHOLOGICAL FINDINGS

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ABSTRACT

Objective: To describe imaging findings (Computerized Tomography [CT]/ Magnetic Resonance Imaging [MRI]) correlated with pathological findings, of the deep fibromatosis (desmoid tumor) in the trunk and abdomen.

Material and methods: We retrospectively reviewed such cases in Ramathibodi hospital from January 2001 to December 2005, who had CT/MRI imaging along with pathological slices available.

Results: Seven cases were enrolled in the study ; four of 7 had CT examinations and the other 3 had MR imaging. The locations were extra-abdominal (n=4), intra-abdominal (n=2), and abdominal-wall desmoid tumor (n=1). The margins were well-defined (n=3), partially well-defined (n=3), and ill-defined (n=1). On CT, they were iso- or hypodense. On MRI, although the lesions were iso- to hypointense-T1 and heterogeneously hyperintense-T2 ; there were ill-defined areas of hypointensity in both T1 and T2-weigthed images that was the signal of fibrous tissue. Most lesions showed moderate to strong enhancement after IV contrast injection. Histology showed area of spindle cells in dense collagen fiber, with small & large slit-like vessels. There was no nuclear atypia in majority.

Conclusion: Deep fibromatosis (desmoid tumor) has nonspecific CT findings. In MRI, identifying area of hypointensity on both T1WI and T2WI, with varying degree of enhancement after Gadolinium injection, helps in the diagnosis of the nature of fibrous-origin tumors.

INTRODUCTION

Fibrous-origin tumor is one category of soft tissue tumor that composed entirely of fibrocytes, fibroblasts, myofibroblasts, or mixtures of these three components. Histologically, fibrous tumor may be categorized into benign, intermediate and malignant groups.[1] True incidence is unknown.[2] Majority of cases were found in the extremities (60%), trunk and retroperitoneum (30%).[3] In abdomen, painless mass is the most common sign and symptom and prompts the patients to request imaging studies. CT scan and MR imaging are extremely helpful modalities to visualize tumor details and extension.[4] Unfortunately, definite diagnosis using CT scan alone seems to be difficult.

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The tumors in the intermediate group such as desmoid tumor are quite common. They may behave aggressively mimicking malignancy and cause confusion in the imaging studies. Differentiation between benign and malignant conditions, being very important for management planning, is difficult[3-7] but have to be obtained. Therefore, definite diagnosis is usually based on histological and cytological examinations. In this study, we aimed to review cases in Ramathibodi Hospital and describe the CT/MRI and pathological findings of the deep fibromatosis (desmoid tumor) in the trunk and abdomen.

MATERIALS AND METHODS

The protocol of this study was approved by the Internal Review Board (IRB) and Ethics Committee (EC) of Faculty of Medicine, Ramathibodi Hospital, Mahidol University, Bangkok, Thailand.

Patients

The cases of fibrous-origin tumor were retrieved from surgical pathology reports in the archives of Department of Pathology, Ramathibodi Hospital, from January 2001 to December 2005. According to classification of the fibrous-origin tumor of the Armed Forces Institute of Pathology (AFIP) in 2001.[1] The well known malignancy, malignant fibrous histiocytoma (MFH), was not included in this study because it is a subgroup of fibrohistiocytic tumors.

CT and MRI

The CT scans were performed by using either the 4-slices Multidetector CT (Light Speed plus; GE Medical System, Milwaukee, WI, USA) or the 64-slices Multidetectors CT (Somatom Sensation Cardiac 64; Siemen, Germany).

The upper abdominal CT was performed after administration of the oral contrast medium. The whole abdominal CT was performed after administration of oral and rectal contrast media. Plain axial CT scans were performed with contiguous 3-mm collimation. All enhanced studies were performed after intravenous administration of the Iopromide (Ultravist; Schering Germany) or Iohexol (Omipaque; Amersham, China) with 3-mm slice thickness for upper, lower and whole abdominal CT ; and 2-mm slice thickness for the chest study if there was any.

The MRIs were performed by using 1.5 Tesla machine (CV/I & NV/I; General Electric Medical System, Milwaukee. WI, USA). The MRI sequences for the pelvis consisted of transaxial plane in T1-weightd image (WI), T2WI and T1WI with fat suppression (FS); coronal plane in T1WI and T2WI with FS, and sagittal plane in T2WI with FS. Gadolinium enhanced study was performed by using T1WI with FS in axial and sagittal planes. The MRI sequences for the back included transaxial plane in T1WI, T2WI and T1WI with FS; Coronal plane in T1WI and T2WI with FS, and sagittal plane in T1WI. Gadolinium enhanced study was performed by using T1WI with FS in axial and coronal planes. All sequences were performed with 5.0-mm slice thickness and 1.0 mm gap.

All tumors were reviewed for number, location and size in greatest dimension. The margins were scored as ill-defined, partially well-defined, or well-defined. Presence of hemorrhage, necrosis, calcification, adjacent structural invasion, lymphadenopathy and metastasis were recorded.

For CT scan, we recorded the lesion attenuation as hypodense, isodense or hyperdense. For MR imaging, we recorded the signal intensity relative to the muscle. After intravenous administration of the CT/MRI contrast media, degree of enhancement was recorded as mild, moderate and strong. Pattern of enhancement was recorded as homogeneous and inhomogeneous.

A board certified radiologist and a resident in

Radiology reviewed all images using e-film workstation, version 2.1 (Merge E-film Medical System, USA) on the Window XP operating system (Microsoft Cooperation, USA) with consensus agreement.

Pathology

The reports and microscopic slides of the selected cases were reviewed by a senior pathologist who was an expert in soft tissue tumors in our institute.

RESULTS

There were 115 cases of fibrous-origin tumor in the surgical pathology report of Department of Pathology, consisted of intermediate and malignant groups. Intermediate group (n=80) consisted of desmoid (n=63) and inflammatory pseudotumor (IP) (n=17). The desmoid tumors were found in the head and neck (n=2), extremities (n=32), trunk and abdomen (n=29).

Only seven patients had complete CT (n=4) or MRI (n=3) available. There were 3 males and 4 females, mean age 34.6 years (15-58).

Table 1 summarized data of the patients. Of 7 cases of desmoid tumors, 4 were extra-abdominal (chest wall, back and buttock), 2 were intra-abdominal (mesentery) and 1 was abdominal-wall desmoid. All of them were undergone excisional biopsy for diagnosis and wide excision for treatment. Two cases had recurrence.

The CT or MRI findings

Four patients had CT scans and three had MRI. The mean size was 11.1 cm (range 4.3-15.5). The intra-abdominal group had the largest diameter, averaging 14.0 cm. Three desmoid tumors had well-defined, 3 had partially well-defined, and one had ill-defined margin.

For 4 patients with CT scan, 2 had hypodense attenuation in non-enhanced images, and the rest of tumors had isoattenuation (Fig 1-2)

For 3 patients with MRI, non-enhanced T1WI studies showed variable signal intensity, whereas T2WI showed mixed hypersignal intensity (Fig 3). Two of 3 patients had focal areas of hyposignal in both T1WI and T2WI (Fig 4).

After the administration of the contrast media, all tumors were enhanced in different degrees: minimal (n=1), moderate (n=2) and strong (n=4) (Fig 1-3). The majority of the tumor showed no calcification, hemorrhage, necrosis or adjacent organ invasion. There was no evidence of lymphadenopathy or metastasis.

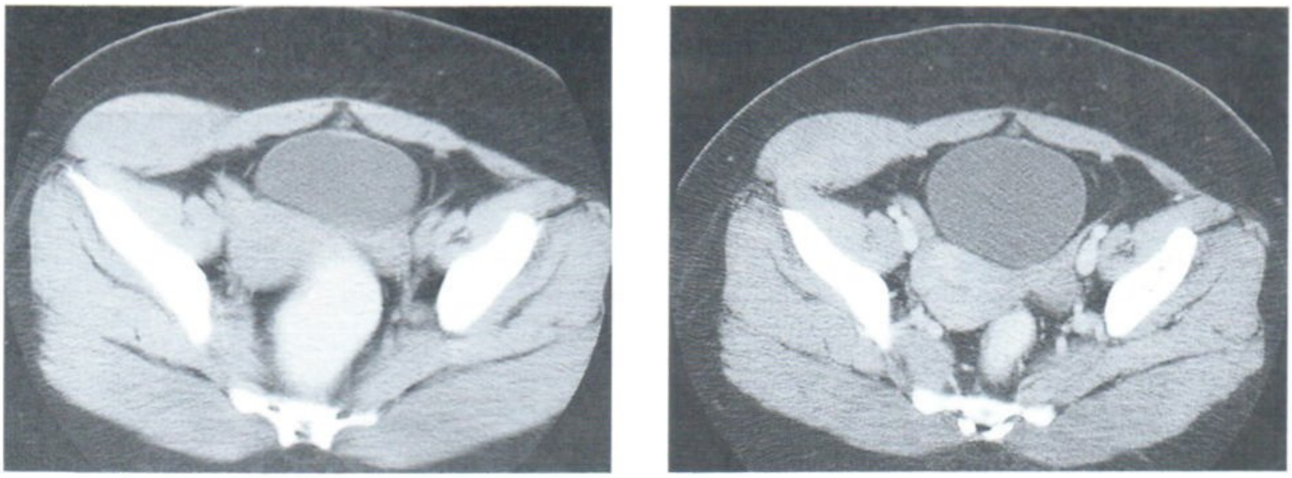
The pathology

The gross pathology revealed mostly ovoid-shape and some irregular-shape masses. All lesions had well-defined or rather well-defined border. The cut surface showed inhomogeneous whitish-tan, whitish-gray or yellow-white tissue with whirling appearance. There were 2 encapsulated masses. Large hemorrhage was seen in 1 case. Histological analysis showed spindle cells in dense collagen fiber. Small and large slit-like vessels were seen. There was no nuclear atypia, except 1 case in the mesentery (case 3) that presented 2-3/50HPF of mitosis. Focal area of fat entrapment was seen in 2 cases. The immunostains were performed in two patients. There was positive reactivity for CD-34 and CD-117 in the lesion at buttock (case 5), and positive reaction for vimentin in the lesion at mesentery (case 3).

Table 1 Summarized CT/MRI and pathological findings of seven cases of desmoid tumors

Case No.	Age (year)	Sex	Location	Mean size (cm)	Number of lesion	CT or MRI findings					Pathological remarks
						Margin	Homogeneity	Attenuation or Signal(SI)	Enhancement	Other findings	
1	28	F	Abdominal wall	10.1	1	Partially well-defined	Inhomogeneous	CT - Isodense	Moderate	-	-
2	44	M	Mesentery	12.6	4	Ill-defined	Inhomogeneous	CT - Isodense	Moderate	Abdominal wall invasion, bowel loop encasement, Hemorrhage, Calcified	-
3	58	M	Mesentery	15.5	1	Well-defined	Inhomogeneous	CT - Hypodense	Strong	Small bowel invasion	Large hemorrhage, Mitosis 2-3/50HPF Immunostain: Positive: Vimentin Negative: CD34, CD68, CD117, S-100, Smooth muscle actin, Desmin
4	32	F	Buttock	4.3	1 with LR*	Well-defined	Homogeneous	MRI - IsoSI T1WI Mixed SI T2WI	Strong	-	Fat entrapment
5	15	M	Buttock	15.0	1	Partially well-defined	Inhomogeneous	MRI - HypoSI T1WI MixedSI T2WI	Strong		Immunostain: Positive: CD34 and CD 117 Negative: Smooth muscle actin -
6	36	F	Chest wall	6.5	1 with LR*	Partially well-defined	Homogeneous	CT - Hypodense	Mild	Pectoralis major and minor muscle invasion Hemorrhage	Fat entrapment
7	29	F	Back	13.4	1	Well-defined	Inhomogeneous	MRI - IsoSI T1WI Mixed SI T2WI	Strong	Hemorrhage	

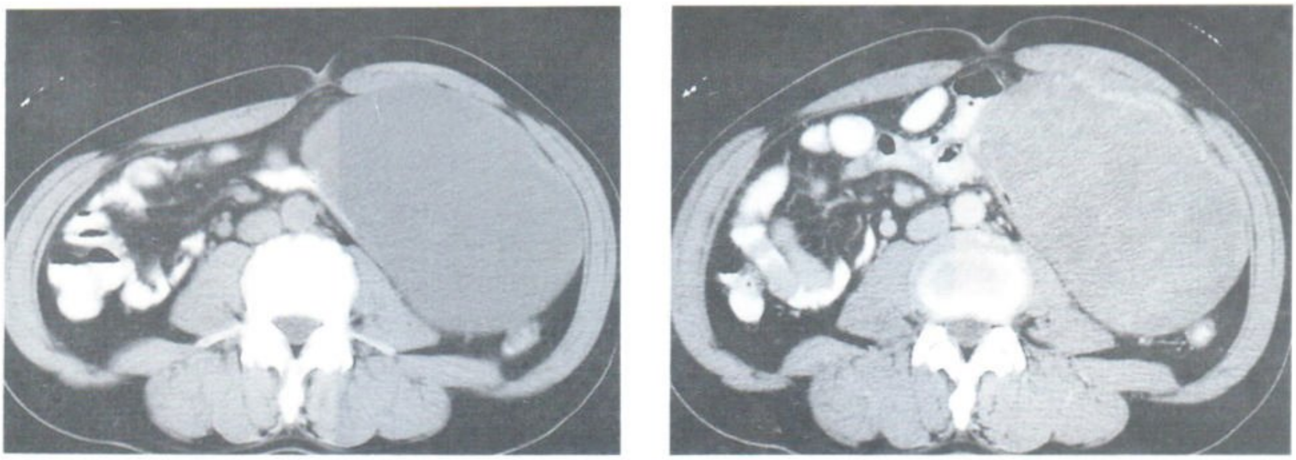
***LR** = Local recurrence



A B

Fig. 1 Case 1; A 28 years old female with abdominal desmoid

Nonenhanced (A) and enhanced (B) CT scans reveal rather ill-defined mixed isodense to hypodense mass with mildly heterogeneous enhancement at the right external oblique muscle.



A B

Fig. 2 Case 3; A 58 years old male with mesenteric desmoid tumor

Nonenhanced (A) and enhanced (B) CT scans reveal a well-defined isodense lesion with heterogeneous enhancement at the mesentery of the left abdomen.

Fig. 3 Case 5; A 15-year-old male with desmoid tumor at the left buttock.

Fig. 3A Coronal T1WI reveals a large, lobulated, ill-defined heterogeneous hyposignal solid mass at the left buttock.

Fig. 3B Coronal T2WI with FS reveals heterogeneous signal of the lesion with multifocal internal low signal areas.

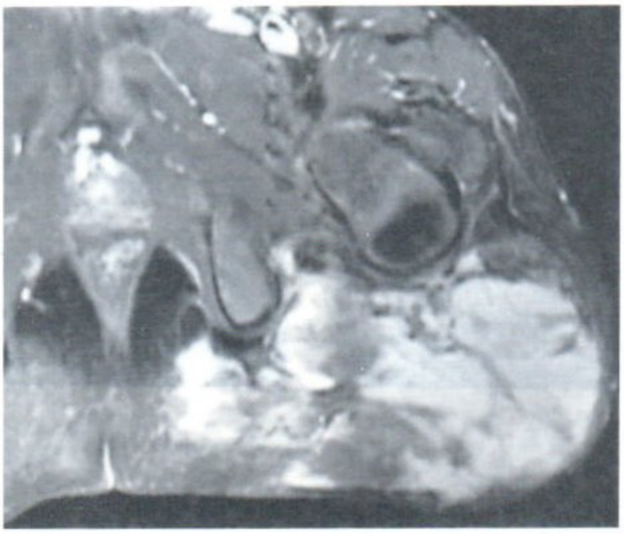


Fig. 3C Axial T1WI with FS after Gadolinium injection reveals no enhancement of multifocal low signal areas in T1WI and T2WI.

A

B

Fig. 4 Case 7; A 29 years old female with desmoid tumor in left side of back

A-B. Axial T1WI (A) and T2WI (B) reveal areas of hyposignal intensity in central portion of the mass in both T1WI and T2WI, representing fibrous area.

DISCUSSION

The fibrous-origin tumor is a group of soft tissue tumor that may occur in any part of the body. They are divided into 3 histology classifications: benign, intermediate, and malignant. The intermediate group is a tumor that might lead to misdiagnosis because of its aggressive appearance and behavior, accompanied by nonspecific imaging findings.

The term desmoid was introduced by Mueller in 1838[8] to describe the tendon-like consistency of the tumor. These tumors do not metastasize, but have a habit of local invasiveness and recurrence after removal are common. The reported incidence is between 3 and 4 cases per million annually.[1-2] The mean age in our study is 34.6 years, in accordance with the literatures (between 25 and 40 years).[9] We also found female predominance, particularly during the reproductive age, corresponded to the study of Kulaylat et al[10] in which there was a relationship between extra-abdominal desmoid and steroid sex hormone. The cause of desmoid tumor is unknown; but surgical or accidental trauma, pregnancy, estrogen hormones, Gardner's syndrome or familial adenomatous polyposis (FAP) are known association.[10-12] In our study, one patient has a known incidence of FAP (case 2). The patients with FAP has 1000-fold increased risk compared to the general population.[10] FAP-associated desmoid tumors occur in intra -abdominal sites in 80-95% of cases, most commonly at mesentery (55-72%) as seen in our study.

The desmoid tumors are traditionally divided, on the basis of anatomical location; into intra -abdominal, extra-abdominal and abdominal-wall desmoid. Intra-abdominal desmoid (intra-abdominal fibromatosis) are those developed in abdominal cavity (e.g. mesentery, retroperitoneum and pelvic cavity). The lesions developed in the abdominal wall, were called abdominal-wall desmoid (e.g. case 1 in Fig. 1). Those lesions originated from deep soft tissue outside the abdomen were classified as extra-abdominal desmoid (extra-abdominal fibromatosis e.g. in the buttock, back, or chest wall).

The CT and MRI were the most useful modalities for evaluating the size and extension of desmoid tumor before surgery. The appearance of these tumors depends on the relative amounts of fibroblast proliferation, fibrosis, collagen contents, and vascularity of the tumor.[13]

In accordance with previous studies, the CT features of desmoid tumor in our study ranged from well-defined to ill-defined. They were isodense or hypodense in noncontrasted CT scan with variable degree of contrast enhancement.[13-15]

The MRI findings in our study correspond to other studies.[8, 14, 16, 17] Three cases of extra-abdominal desmoid tumors revealed variable signal in T1WI, whereas hyper- or inhomogeneous signal are seen in T2WI. Areas of hypointensity in both T1WI and T2WI were frequently seen in the central portion of the mass, that were undetectable from CT images (Fig 4). After Gadolinium injection, variable degree of enhancement was found the same degree as seen in the CT images.

The histologic features were first described by Bennett, as dense fibrous neoplasm arising from the fascial sheaths of striated muscle.[18] On gross histopathologic examination, desmoid tumors were usually circumscribed lesions but they might have irregular or infiltrative border. On cut surface, they were white and coarsely trabeculated, resembling scar tissue. Histologically, desmoid tumors composed of bland spindle or stellate fibroblastic cell embedded in a collagenous stroma, without evidence of muscular or neural differentiation, and with a little or no inflammatory component. They might infiltrate a djacent viscera and tissue at the periphery.[2, 8, 10, 13-15, 17] The cases in our study also presented with similar findings.

Several authors tried to explain MR signals by histological composition. After correlating MRI findings with the histological composition, areas with low signal on both T1WI and T2WI without enhancement represented areas of dense collagen (fibrous component), whereas areas of high signal in T2WI with markedly enhancement represented compact cellular areas. These findings were important for diagnosis of fibromatosis.

The limitations in our study were, first, we excluded more than half of the cases (22 from 29) because of incomplete images or pathological slices. Secondly, due to the inferiority in soft tissue resolution of CT scan, there was no study that correlate exactly the CT attenuation with histologic composition. In our study, the tumor at the abdominal wall (case 1) had a focal area of nonenhancing hypodensity in the central portion, compatible with large area of bleeding, histologically.

In conclusion, deep fibromatosis (desmoid tumor) has nonspecific CT findings. MRI can help both in evaluation and making histological diagnosis due to the signal characteristic of the fibrous tissue. Imaging modalities are found to be useful to evaluate the extension preoperatively, to follow up after treatment, and to detect recurrence if there is any. A study in larger group of patients with complete imaging and histological results would further extend the knowledge about this particular type of tumors.

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SPINAL CORD COMPRESSION DUE TO EXTRAMEDULLARY HEMATOPOIESIS IN THALASSEMIA: EFFECTIVE RESULTS OF RADIOTHERAPY: A REPORT OF TWO PATIENTS AND REVIEW OF THE LITERATURE

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ABSTRACT

Spinal cord compression due to extramedullary hematopoiesis is a rare complication in patients with thalassemia. Radiation therapy is one of the effective modalities of treatment. This is a report of two patients with thalassemia who had different degrees of paraplegia due to spinal cord compression from extramedullary hematopoietic tissues. The neurological symptoms relived after radiotherapy. The results confirm the role of radiation therapy as an effective treatment for this complication.

Keywords: Spinal cord compression, Extramedullary hematopoiesis, Thalassemia, Radiation therapy

INTRODUCTION

Extramedullary hematopoiesis (EMH) is a compensatory mechanism encountered in chronic anemia such as thalassemia, hemolytic anemia, myelofibrosis and other hemoglobinopathies.[1-12] The most common sites of EMH are liver, spleen and lymph nodes.[4]

Spinal cord compression from EMH is a rare condition. The ideal treatment is controversy. Treatment options include surgery, radiotherapy, blood transfusion, hydroxyurea therapy or any combination of this modalities.[14-20]

The reported cases presented with paraplegia and the diagnosis was based on clinical history and computed tomography findings. Awareness, carefully evaluation, early diagnosis and prompt treatment can prevent the irreversible damages to the spinal cord and help the patients to be relieved from the symptoms and get their good quality of lives back.

CASE HISTORY 1

A 36 years old Thai male with known history of thalassemia major presented with progressive lower limb weakness, numbness and progressive gait difficulties over a period of 4 weeks. He complained of impairing of sensation on the trunk, just above the nipple line down to both lower limbs and both feet. Two weeks before this visit he was unable to walk accompanied with uncontrollable micturation and defecation. His past medical history revealed right distal ureteric stone and gout. Splenectomy was done last 11 years. He has one sister with thalassemia.

Physical examination revealed pallor and mild jaundice. His blood pressure was 110/70 mmHg, pulse rate was 86/minutes with regular rhythm and normal body temperature. Systolic ejection murmur was detected along the left parasternal border. The liver was enlarged 7 cm. below the right costal margin. It has smooth surface with hard consistency on palpation.

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His neurologic examination revealed normal mental status, fully alert, oriented with normal speech and language. Cranial nerves were normal. He was paraparetic, and muscle strength was 2/5 for the proximal and 2/5 for the distal muscles on both sides. Neither muscular atrophy nor fasciculation was detected. Deep tendon reflexes were hyperactive and the plantar responses were extensor on both sides. There was sensory loss to pin-prick starting from the T4 dermatome downwards.

On laboratory examination, his hemoglobin levels were 6.1 gm%, Hct 24.0 %, RBC 3.13 ml/cu.mm, MCV 76.6 fl, MCH 19.3 pg, MCHC 25.2 g/dl, leukocyte 32,000 cells/cu.mm. (PMN 42%, lymphocyte 48%, Band form 3%, Myelocyte 3%, Metamyelocyte 4%), platelet 589,000 cells/cu.mm. Blood smear showed few anisocytosis and poikilocytosis. Hypochromia (3+) was present.

The renal function tests were normal.

Chest radiography showed mild cardiomegaly with paravertebral soft tissue shadow along both sides of mid thoracic spines, compatible with extramedullary hematopoiesis. The bony trabeculations of the thoracic cage are coarse (Fig. 1).

Non-contrast enhancement CT scan of the thoracic spines was done and the result revealed hyperdense, nodular-shaped mass running along the posterior aspect of spinal canal, compressing the thecal sac and displacing the thoracic cord anteriorly, from the upper T3 level to mid T10 levels (Fig. 2, 3, 4).

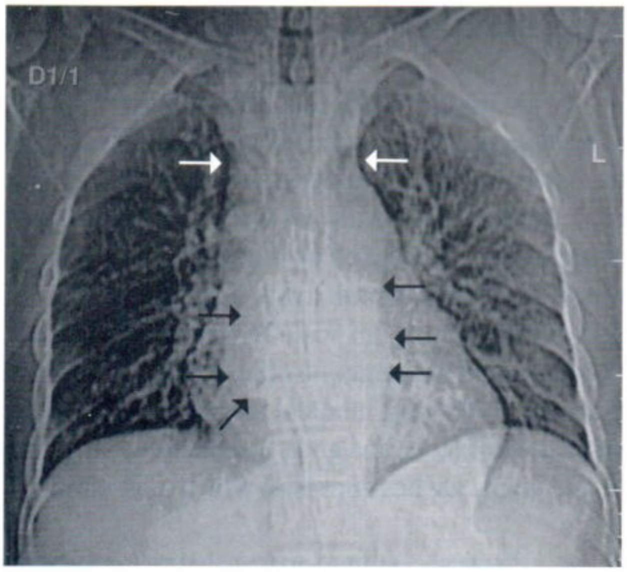

Fig.1 Chest roentgenograph demonstrates coarse bony trabeculations and paravertebral soft tissue shadow along both sides of mid thoracic spines.

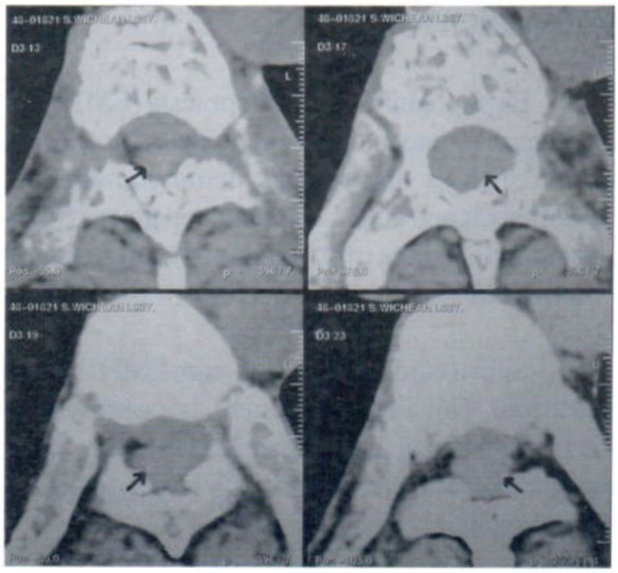

Fig 2 Axial non-contrast enhancement CT scan shows the mass causing compression and anterior displacement of the spinal cord.

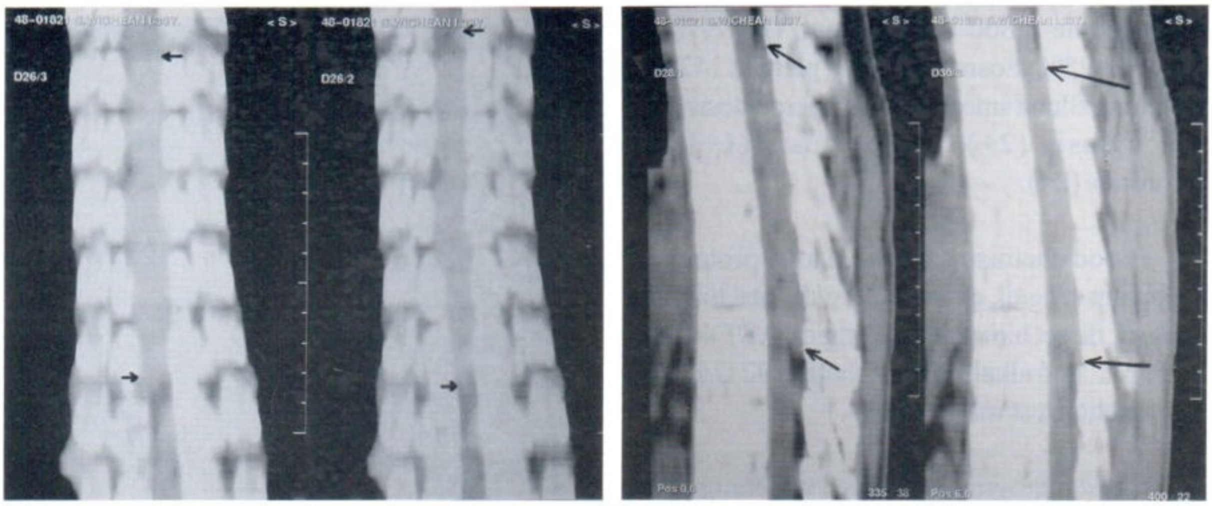

Fig 3&4 Curve coronal and sagittal reconstruction of non-contrast enhancement CT scan showed hyperdense, nodular-shaped masses, running in the posterior aspect of spinal canal, compressing the thecal sac and displacing the thoracic cord anteriorly.

A surgical biopsy was considered, but not performed due to the awareness of the risk of hemorrhage and the strong clinical evidence of EMH. Intravenous steroid was administered and radiotherapy was the selected treatment. The patient was treated with fractionated radiation to a field which included T3-T10 vertebrae to a total dose of 20 Gy in 10 fractions in 2 weeks through a posterior field.

By the end of the 1st week of treatment, there was marked improvement in motor neurological symptoms and at the completion of radiotherapy he enjoyed spontaneous ambulatory with mild residual weakness and numbness. Twenty months later, the patient showed normal gait, no motor weakness, no sensory impairment. His micturation and defecation returned to normal. He can do his daily life activities and house works.

CASE HISTORY 2

This patient was a 26 years old Thai male, who was diagnosed with thalassemia since during childhood. He presented with low back pain, progressive lower limb weakness, numbness and gait difficulties for 8 months. He complained of impairment of sensation on the trunk, at the level of nipple down to both lower limbs and both feet, without the symptoms of bladder and bowel dysfunction.

Physical examination revealed pallor and mild jaundice. His blood pressure was 120/70 mmHg, pulse rate was 84/minutes and rhythmic and his body temperature was 37.7 °C. The liver was enlarged 8 cm. below the right costal margin. Splenomegaly was also detected. The spleen was palpable 9 cm. below the left costal margin.

His neurologic examination revealed normal mental status, fully alert, oriented with normal speech and language. Cranial nerves were normal. Motor examination was normal in upper extremities, lower extremities revealed mildly increased tone, no atrophy or fasciculation. The muscle strength was 4/5 on the proximal and 4/5 on the distal muscles on both sides. Deep tendon reflexes revealed hyperreflexia of both knees and ankles and the plantar responses were extensor on both sides.

On laboratory examination, his hemoglobin levels were 7.4 gm%, Hct 23.8 %, RBC 3.45 ml/cu.mm, MCV 68.9 fl, MCH 21.4 pg, MCHC 31.0

g/dl, leukocyte 8,800 cells/cu.mm. (PMN 72%, lymphocyte 25%, Eosinophil 3%), platelet 142,000 cells/cu.mm. Blood smear showed microcytosis (2+), poikilocytosis (2+), anisocytosis (1+) and hypochromia (2+).

Blood chemistry revealed total protein 7.7 g/dl, albumin 4.7 g/dl, globulin 2.7 g/dl, total bilirubin 3.79 mg/dl, direct bilirubin 0.67 mg/dl, AST 44 U/L, ALT 13 U/L, and alkaline phosphatase 92 U/L. The kidney function test was normal.

Chest radiography showed widening of the costal end of anterior ribs bilaterally, as the result of underlying hemolytic anemia and multilobulated paravertebral soft tissue along both sides of mid thoracic spines, the left is larger than right, representing extramedullary hemopoiesis (Fig. 5).

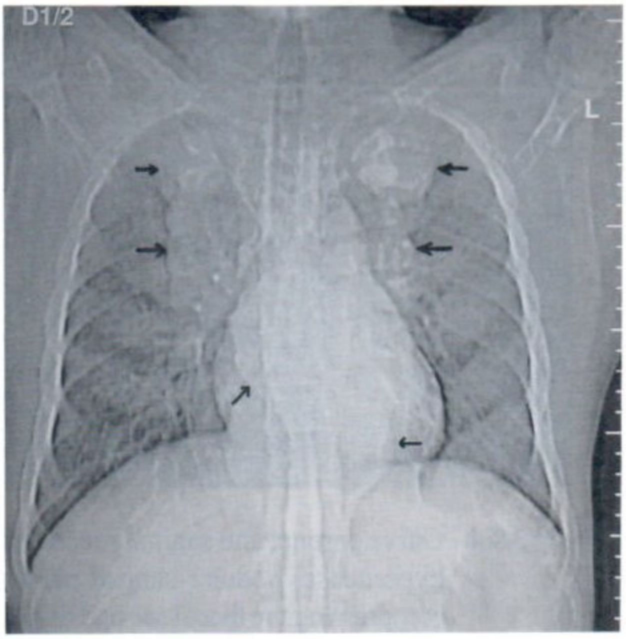

Fig. 5 Chest roentgenograph demonstrates expanded anterior ribs ends consistent with medullary hyperplasia. Multilobulated paravertebral masses are seen along both sides of mid thoracic spines.

Myelography was done and showed partial blockage of the contrast flow from T9 up to C6 levels (Fig. 6-9)

Fig. 6

Fig. 7

Fig. 8

Fig. 9

CT scan post myelogram showed bilateral lobulated paravertebral masses from T1 to T12 levels accompanied with intraspinal extradural mass along the posterior aspects of the spinal canal, extending from lower T2 to upper T10 levels, causing compression and anterior displacement of thecal sac and spinal cord (Fig.10-12).

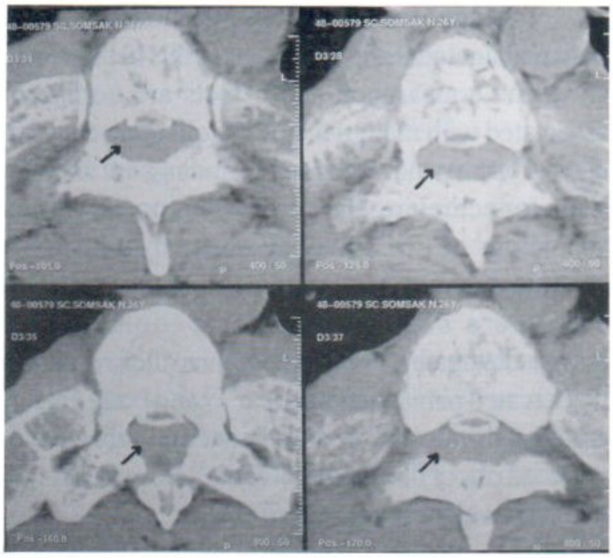

Fig. 10 CT myelography in axial view shows extradural mass producing compression and anterior displacement of the spinal cord.

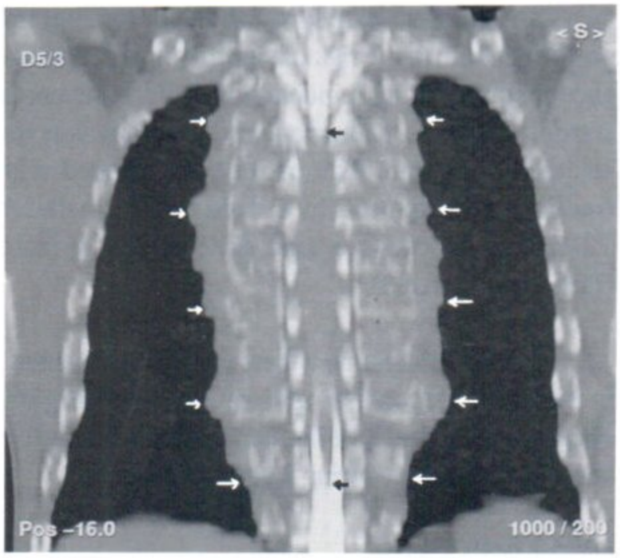

Fig. 11 Curve coronal reconstruction of CT intraspinal myelography shows both lobulated paravertebral masses and intraspinal extradural lesion.

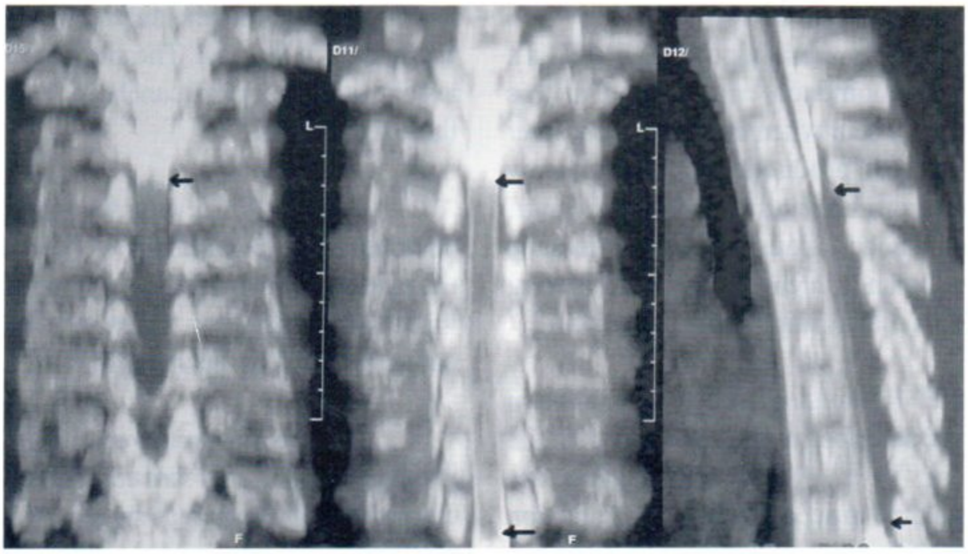

Fig. 12 Curve coronal and sagittal reconstruction of CT myelography show the levels of the compression and extension of the lesion.

A surgical biopsy was considered, but not performed due to the risk of significant hemorrhage and the strong clinical evidence of EMH. Intravenous steroid was administered and radiotherapy was the selected treatment. The patient was treated with fractionated radiation to a field which included T2-T10 vertebrae to a total dose of 20 Gy in 10 fractions in 2 weeks.

After the treatment there was an improvement in sensory perception and motor neurological symptoms. Clinically he has demonstrated no further neurological deficit during 2 years of follow up.

DISCUSSION

Thalassemia is a genetic disease with defective systhesis of alpha or beta globin chain (s) of hemoglobin, resulting in chronic anemia which causes expansion of the red marrow space and secondary bony changes.[21]

Extramedullary hematopoiesis (EMH) is a compensatory phenomenon encountered in this condition that may occur when there is chronic over stimulation of red cell production on bone marrow spaces. The most common sites of EMH are the liver, spleen and lymph nodes. Unusual locations include kidneys, adrenal glands, breast, spinal cord, pleura, pericardium, dura mater, adipose tissue and skin.[22]

Spinal EMH causing cord compression in thalassemia, first described by Gatto et al. in 1954 23 is extremely rare.[1-3, 13, 23-38] A number of mechanisms have been postulated to account for the predilection for involvement of the thoracic region in spinal EMH. These include extension of EMH tissue through the thinned trabeculae at the proximal rib ends,[39] direct expansion from adjacent vertebral bone marrow, and development of EMH tissue from branches of the intercostals veins. The narrow central canal,[30, 32] and limited mobility of the thoracic spine predisposes itself to spinal cord compression.

Diagnostic difficulties may arise in terms of both management and treatment of this benign lesion since the appearance and effects are commonly associated with malignancies.[38] Collecting data from clinical history and radiographic findings are important tools for achieving the correct diagnosis. Clinical suspicions of EMH may be raised by a history of chronic haemolytic anemia, evidence of EMH elsewhere such as hepatoslpenomegaly or lymphadenopathy. Plain radiographs often reveal well demarcated paraspinal masses[25, 33] and bony changes associated with chronic anemia such as trabeculation, widened ribs or thickened calvaria.[25] Bony destruction or pathological fractures are absent.

Because the EMH lesions are very vascular so biopsy is not considered for the fear of serious hemorrhage.

With modern imaging technique ie. computed tomography (CT) scan, magnetic resonance imaging (MRI), the diagnosis and differential diagnosis is more easily than in the past. The site and extension of the lesion within the spinal canal can clearly be shown by these techniques.[40-43]

MRI is currently the gold standard for demonstrating spinal EMH[27, 34, 44] and for delineating the extent of spinal cord involvement.[33] CT scan is a valuable investigation for patients in whom MRI is contraindicated or unavailable.[40]

There is still controversy regarding the optimal management of spinal cord compression due to EMH. Treatment options include surgery, blood transfusion, radiotherapy or any combination of these modalities.[14-20] More recently,the use of drugs such as hydroxyurea, which act by enhancing haemoglobin levels has been reported.[45-46]

Surgical decompression can provide both an accurate tissue diagnosis and rapid decompression to prevent permanent spinal cord damage.[27, 47-51]

However, when the evidence of EMH is confirmed by radiological findings in a patient with history of chronic hematologic disorder such as thalassemia, histologic proof may be less important to the overall treatment.[33, 44] Disadvantages include the risk of surgery (hemodynamic compromise, spinal cord injury or instability19 and kyphosis associated with multilevel laminectomy), the difficulty in completely resection because of the diffuse nature of EMH and the possibility of recurrence.

Blood transfusion therapy is another method and has been used as first-line treatment with complete neurologic recovery.[52] This suppresses the erythropoiesis which results in a regression of the EMH mass, thereby relieving the symptoms of cord compression to some extent.[53-56] Issaragrisil and colleagues.[21] Reported successful initial suppression of EMH by transfusion in 12 patients with spinal cord compression and thalassemia; however, because recurrences were noted in all patients, it is generally accepted that transfusion therapy should be used in concert with another modality.[21, 2]4 Slow achievement of response in patients with rapidly progressive symptoms and iron accumulation with hemosiderosis are major drawbacks to this form of therapy.

Radiation is considered as treatment of choice in EMH as hematopoietic tissue is extremely radiosensitive and low-dose radiotherapy is enough to relieve the spinal cord compression and provides a rapid lasting response.[3, 23, 31, 57-59] In the literature, different dose of radiation are mentioned varying from 10 to 35 Gy fractionated with 1-2 Gy per day over 1-3 weeks.[3, 38, 41-42, 58, 60-64] Tissue edema associated with radiation can sometimes result in neurological deterioration during the initial phase of treatment[24, 65] which is minimized by concomitant steroid therapy. In addition to primary treatment, radiotherapy is commonly employed with other treatment such as post-operative following laminectomy to reduce the likelihood of recurrence[27, 28, 30] or combined with blood transfusion in cases in which there is recurrence after a single treatment (blood transfusion or radiotherapy).[66]

Hydroxyurea (HU) has been associated with increase of the total percentage of fetal hemoglobin and the number of F-cells, as well as the total hemoglobin concentration and mean corpuscular volume in sickle cell patients.[67, 68] Although there is limited experience with HU in thalassemia, some studies have demonstrated successful regression of EMH with HU therapy.[46, 47, 67-68] However, prospective studies to define influence factors to response and rate of EMH recurrence after HU therapy are necessary.

CONCLUSION

Spinal cord compression from extramedullary hematopoiesis is uncommon but can cause severe and irreversible neurological sequelae. After low-dose radiotherapy alone in these 2 patients, rapid responses occurred without significant adverse reaction. The result suggests that low-dose radiotherapy should be considered as an effective and safe treatment for this situation.

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The purpose of this study is to compare and contrast overall accuracy of the FAST exam results performed by the two groups (refered as Group I and Group II) of FAST-trained emergency medicine residents using the experienced radiologists as the gold standard.

PATIENTS AND METHODS

The Group II's FAST training took place from December 2006 to March 2007. Emergency medicine residents participation is voluntary but limited to the first-year residents. In Group II, three emergency medicine residents were accepted. The FAST training is adapted from the one offered at the University of Vermont.[10] Details are shown in table 1.

Table 1 The FAST training curriculum for first year medicine residents offered at Nopparat Rajathanee Hospital

Phase I:
A three-hours of Continuing Medical Education in ultrasound. The topics to be considered including:

1. Physics
   - Fundamentals of the ultrasound wave
   - Pulse echo principle
   - Angle of ultrasound beam
   - Acoustic impedance/tissue density attenuation-absorption and scatter
2. Instrumentation
   - Transducer frequency-effect on resolution and penetration
   - Gain/attenuation
   - Power, depth, and magnification
   - Image orientation
   - Image display - freeze frame and real time modes
3. Basic knowledge for FAST performance and interpretation
   - Peritoneal spaces and peritoneal fluid flow
   - Transducer application
   - Ultrasound finding on negative FAST exam
   - Ultrasound finding on positive FAST exam
   - FAST interpretation

Phase II:
Practical Training Part I.

Phase III:
Practical Training Part II.

Phase I lasts three hours. It offers physics of ultrasound waves, instrumentation, basic knowledge in performing FAST and result interpretation.

Phase II lasts three hours as a practical training. Participants have hands-on FAST examination on four healthy volunteers which yield only negative results.

Phase III lasts three hours as yet another practical training. At this time, however, participants perform FAST on four patients with intraperitoneal free fluid which all yield positive results.

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Upon completion of the Phase I training step, the Phase II, practical training was implemented both during and after official hours when at least one emergency resident and the radiologist were available, whenever not interfering with the patient's emergency management. The study was performed only in trauma patients during the secondary survey of ATLS (Advanced Trauma Life Support) by using the Aloka SSD-1100 ultrasound (Japan) available in the Emergency Department.

In less severe cases, patients were transferred to the Radiology Department for the FAST exam using the 3535-B08 model of B-K ultrasound (Denmark).

While using the Ultrasound transducer, the ultrasound wave frequency is set at 3.5 or 5 MHz. The placement of transducer is based on what recommended by Ma OJ, et al.[11] The transducer is placed on subxyphoid region, right upper quadrant, right flank, left upper quadrant, left flank and suprapubic region in order to find fluid in pericardial space, hepatorenal fossa, right paracolic space, splenorenal space, left paracolic space and retrovesicle space respectively as shown in figure 1.

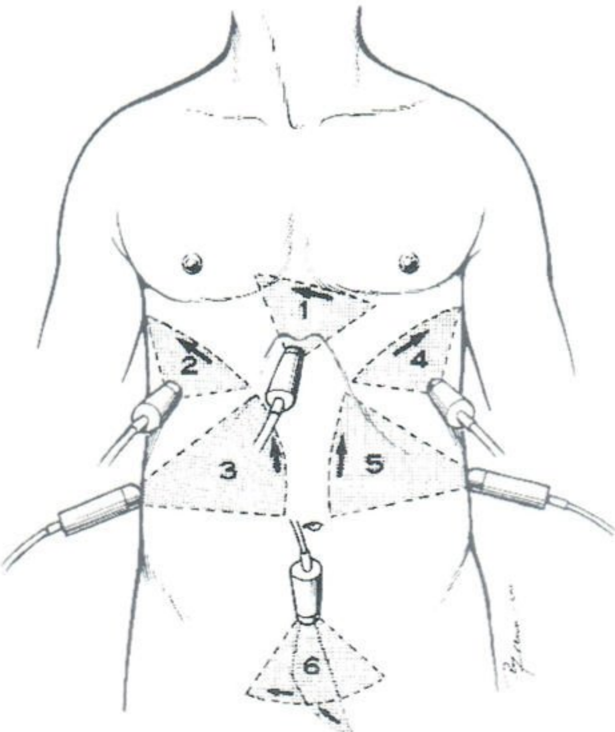

Fig. 1 Application of transducer for FAST recomended by Ma OJ, et al.

Emergency residents reported results either negative or positive for each and every peritoneal space. The experienced radiologist then performs the FAST exam using the same ultrasound machine after emergency residents have completed their tasks. At this point, the radiologist is not aware of the results performed by emergency medicine residents. Once both have completed, their results are compared. If there are discrepancy on their results in one or more peritoneal spaces, the FAST exams were performed again by the emergency residents under the supervision of the radiologists for proctor purposes only.

The FAST result is considered positive when fluid is found in one or more spaces while it is considered negative when fluid is not found in any space at all.

After data has been collected, the FAST results performed by Group II is evaluated statistically 12 for sensitivity, specificity, accuracy, positive and negative predictive values using the FAST results performed by the experienced radiologists as the gold standard.

The statistical outcomes (sensitivity, specificity, accuracy, positive and negative preditive values) of both groups are then analyzed using Pearson Chi-square test to determine if the outcomes are statistically significant.

RESULTS

FAST exams were performed on 47 patients: 37 males (78.72%) and 10 females (21.28%) with average age of 40.45±12.15 years. The mechanism of injuries consisting of nineteen fall-from-height, (40.43%), twelve motor-vehicle and traffic accident, (25.53%), eleven assaulted patients (23.40%) and five gun-shot patients (10.64%).

The comparison of FAST results performed by three emergency residents and radiologists were shown in Table 2.

Table 2. FAST results and scan time performed by emergency residents (er) and radiologists (R)

				er	R		er	R		er	R		er	R		er	R		er	R		er	R		er	R
pt	age (year)	sex	history	subxyphoid region (pericardial space)			right upper quadrant (hepatorenal fossa)			right flank (right paracolic space)			left upper quadrant (splenorenal space)			left flank (left paracolic space)			suprapubic region (retrovesicle space)			FAST results			scan time (minute)	
1	21	m	fall from height	n	n	a	n	p	d	p	p	a	n	p	d	p	p	a	p	p	a	p	p	TP	5	0.5
2	15	m	MVA	n	n	a	n	n	a	n	n	a	n	n	a	n	n	a	n	n	a	n	n	TN	4	1
3	50	m	gut shot	n	n	a	p	p	a	n	n	a	n	n	a	n	n	a	n	n	a	p	p	TP	6	1
4	44	m	assault	n	n	a	n	n	a	n	n	a	n	n	a	n	n	a	n	n	a	n	n	TN	5	1
5	56	m	MVA	n	n	a	n	n	a	n	n	a	n	n	a	n	n	a	n	n	a	n	n	TN	4	2
6	36	m	pedestrian	n	n	a	n	n	a	n	n	a	n	n	a	n	n	a	n	n	a	n	n	TN	5	3
7	39	m	gun shot	n	n	a	p	p	a	p	p	a	n	p	d	n	p	d	n	p	d	p	p	TP	5	3
8	42	f	fall from height	n	n	a	n	n	a	n	n	a	n	n	a	n	n	a	n	p	d	n	p	FN	5	2
9	31	m	fall from height	n	n	a	n	n	a	n	n	a	n	n	a	n	n	a	n	n	a	n	n	TN	5	4
10	42	f	pedestrian	n	n	a	n	n	a	n	n	a	p	n	d	n	n	a	p	p	a	p	p	TP	5	4
11	63	m	fall from height	n	n	a	n	n	a	n	n	a	n	n	a	n	n	a	p	n	d	p	n	FP	5	4
12	33	m	assault	n	n	a	n	n	a	n	n	a	n	n	a	n	n	a	n	n	a	n	n	TN	5	3
13	46	m	fall from height	n	n	a	n	n	a	n	n	a	n	n	a	n	n	a	n	n	a	n	n	TN	5	2
14	45	m	MVA	n	n	a	n	n	a	n	n	a	n	n	a	n	n	a	n	n	a	n	n	TN	5	2
15	60	m	fall from height	n	n	a	n	n	a	n	n	a	n	n	a	n	n	a	n	n	a	n	n	TN	4.5	4
16	34	f	assault	n	n	a	n	n	a	n	n	a	n	n	a	n	n	a	n	n	a	n	n	TN	4	2
17	42	m	fall from height	n	n	a	p	p	a	p	p	a	n	n	a	n	p	d	p	p	a	p	p	TP	3	2
18	21	m	fall from height	n	n	a	n	p	d	n	p	d	n	p	d	n	p	d	p	p	a	p	p	TP	3	0.5
19	15	m	MVA	n	n	a	n	n	a	n	n	a	n	n	a	n	n	a	n	n	a	n	n	TN	3	1
20	50	m	gut shot	n	n	a	p	p	a	n	n	a	n	n	a	n	n	a	p	n	d	p	p	TP	3	1
21	44	m	assault	n	n	a	n	n	a	n	n	a	p	n	d	n	n	a	n	n	a	p	n	FP	5	1
22	36	m	pedestrian	n	n	a	n	n	a	n	n	a	n	n	a	n	n	a	p	n	d	p	n	FP	5	3
23	39	m	gut shot	n	n	a	p	p	a	p	p	a	n	p	d	n	p	d	n	p	d	p	p	TP	5	3
24	42	f	fall from height	n	n	a	n	n	a	n	n	a	n	n	a	n	n	a	n	p	d	n	p	FN	5	2
25	31	m	fall from height	n	n	a	n	n	a	n	n	a	n	n	a	n	n	a	n	n	a	n	n	TN	5	4
26	42	f	pedestrian	n	n	a	n	n	a	p	n	d	p	n	d	n	n	a	p	p	a	p	p	TP	5	4

pt	age (year)	sex	history	subxyphoid region (pericardial space) er	R		right upper quadrant (hepatorenal fossa) er	R		right flank (right paracolic space) er	R		left upper quadrant (splenorenal space) er	R		left flank (left paracolic space) er	R		suprapubic region (retrovesicle space) er	R		FAST results er	R		scan time (minute) er	R
27	63	m	fall from height	n	n	a	n	n	a	n	n	a	n	n	a	n	n	a	n	n	a	n	n	TN	5	4
28	33	m	assault	n	n	a	n	n	a	n	n	a	n	n	a	n	n	a	n	n	a	n	n	TN	5	3
29	46	m	fall from height	n	n	a	n	n	a	n	n	a	n	n	a	n	n	a	n	n	a	n	n	TN	5	2
30	45	m	MVA	n	n	a	n	n	a	n	n	a	n	n	a	n	n	a	n	n	a	n	n	TN	5	2
31	60	m	fall from height	n	n	a	n	n	a	n	n	a	n	n	a	n	n	a	n	n	a	n	n	TN	4	1.5
32	34	f	assault	n	n	a	n	n	a	n	n	a	n	n	a	n	n	a	n	n	a	n	n	TN	2	2
33	42	m	fall from height	n	n	a	p	p	a	n	p	d	n	n	a	n	p	d	p	p	a	p	p	TP	5	3
34	35	f	assault	n	n	a	n	n	a	n	n	a	n	n	a	n	n	a	n	n	a	n	n	TN	4	2
35	21	m	fall from height	n	n	a	p	p	a	p	p	a	n	p	d	n	p	d	p	p	a	p	p	TP	3	0.5
36	15	m	MVA	n	n	a	n	n	a	n	n	a	n	n	a	n	n	a	n	n	a	n	n	TN	3	1
37	50	m	gut shot	n	n	a	n	p	d	n	n	a	n	n	a	n	n	a	n	n	a	n	p	FN	4	1
38	44	m	assault	n	n	a	n	n	a	n	n	a	n	n	a	n	n	a	n	n	a	n	n	TN	5	1
39	56	m	MVA	n	n	a	n	p	d	n	p	d	p	n	d	n	n	a	p	p	a	p	p	TP	7	2
40	33	m	assault	n	n	a	n	n	a	n	n	a	n	n	a	n	n	a	n	n	a	n	n	TN	5	3
41	46	m	fall from height	n	n	a	n	n	a	n	n	a	n	n	a	n	n	a	n	n	a	n	n	TN	5	2
42	42	f	fall from height	n	n	a	n	n	a	n	n	a	n	n	a	n	n	a	n	n	a	n	n	TN	5	2
43	46	m	fall from height	n	n	a	n	n	a	n	n	a	n	n	a	n	n	a	n	n	a	n	n	TN	5	2
44	34	f	assault	n	n	a	n	n	a	n	n	a	n	n	a	n	n	a	n	n	a	n	n	TN	4	2
45	60	m	MVA	n	n	a	n	n	a	n	n	a	n	n	a	n	n	a	n	n	a	n	n	TN	5	1.5
46	42	m	fall from height	n	n	a	p	p	a	p	p	a	n	n	a	n	p	d	p	p	a	p	p	TP	7	3
47	35	f	assault	n	n	a	n	n	a	n	n	a	n	n	a	n	n	a	n	n	a	n	n	TN	4	2
mean	40.45																								4.61	2.18
S.D.	12.15																								0.97	1.06

er = emergency resident, R = radiologist, m = male, f = female, n = negative, p = positive, a = agree, d = disagree
MVA = motor vehicle accident, TP = true positive, TN = true negative, FP = false positive, FN = false negative

There are thirteen true positive, twenty eight true negative, three false negative and three false positive cases

The prevalence, sensitivity, specificity, accuracy, positive and negative predictive values of FAST results performed by Group II of emergency medicine residents compared to those performed by the experienced radiologists as the gold standard were shown in Table 3.

Table 3 Summary of findings (group II, 2006)

Number of patients enrolled	47
True positives	13
True negatives	28
False negatives	3
False positives	3
Prevalence	34.04%
Sensitivity	81.25%
Specificity	90.32%
Accuracy	87.23%
Positive predictive value	81.25%
Negative predictive value	90.32%
Scan time	
Emergency residents	4.61±0.97 mins
Radiologists	2.18±1.06 mins

The prevalence, sensitivity, specificity, accuracy, positive and negative predictive values of FAST results performed by Group I of emergency medicine residents compared to those performed by the experienced radiologists as the gold standard is shown in Table 4.

Table 4 Summary of findings (group I, 2005)

Number of patients enrolled	30
True positives	16
True negatives	10
False negatives	3
False positive	1
Prevalence	63.33%
Sensitivity	84.21%
Specificity	90.90%
Accuracy	86.66%
Positive predictive value	94.11%
Negative predictive value	76.92%
Scan time	
Emergency residents	7.63±2.44 mins
Radiologists	3.2±0.70 mins

The Pearson Chi-Square test on Group I and II is shown in Table 5.

Table 5 FAST result comparison of Group I and II

No.	Value	Group I (2005)	Group II (2006)	Sig
1	Prevalence	63.33 %	34.04 %	0.012*
2	Sensitivity	84.21 %	81.25 %	0.817
3	Specificity	90.90 %	90.32 %	0.955
4	Accuracy	86.66 %	87.23 %	0.942
5	Positive predictive value	94.11 %	81.25 %	0.258
6	Negative predictive value	76.92 %	90.32 %	0.237
7	Scan time	7.63±2.44 mins	4.61±0.97 mins	0.000*

In table 5, it is shown that the difference of sensitivity, specificity, accuracy, positive and negative predictive values of the FAST results between Group I and II of emergency medicine residents is statistically insignificant ($p \geq 0.05$), on the contrary, the difference of prevalence of patient samples and scan time between Group I and Group II is statistically significant ($p < 0.05$).

DISCUSSION

FAST examination and limited sonography used to evaluate injured patients to answer a specific question whether there is hemoperitoneum, were compared.

FAST was initially developed and designed principally for non-radiologists by Rozycki et al. in 1993[13, 14] and has grown dramatically throughout the past decade.[15-17]

FAST has gained popularity due to its portable, rapid, noninvasive and repeatable nature. Unlike CT, FAST can be performed as a bedside imaging procedure and requires no nephrotoxic contrast agent and no radiation hazard to be worried.[8] Melniker LA, et al.[18] in prospective study, 246 thoracoabdominal trauma patients participated in the trial. Among those patients, some were randomly selected for a FAST screening test which received 64% shorter time to operation. Additionally, it is found that CT used, length of stay, complication and hospital charges had significantly adding ratios of favoring the FAST group.

In various research and publications,[19,20] it had been concluded that non-radiologist clinicians are able to perform FAST with high accuracy and received similar results to those performed by radiologists. According to the German Board of Surgery, FAST trainings are offered as a part of the curriculum for surgical residents and must be completed for board certification.[21] In 1997 the American Board of Surgery included ultrasonography competency as a required element of U.S. surgical residency training.[16]

The difference of FAST results performed by both groups of emergency medicine residents at Nopparat Rajathanee hospital were not statistically significant. The high consistency of sensitivity, specificity, accuracy, positive and negative predictive values is due to the fact that both groups have received the same theoretical and practical trainings. The most crucial step is to provide immediate feedback to the emergency medicine residents when the false results occur. This allows them to learn from their mistakes and how to avoid them in the future. The learning process is accelerated as a result.

The average scan time of Group II is approximately 4.61 minutes which is less than Group I of 7.63 minutes. This is statistically significance but it could be overlooked because according to most papers,[16, 22-23] the scan time were average of less than 4 minutes.

Group II has prevelance of patient samples of 34.04% which is less than that of Group I of 63.33%. This is acceptable because the prevalence in most papers range from 5 to 40%.[24,25]

It is concluded that the overall accuracy of both groups is not different and satisfactory in general.

CONCLUSION

Nopparat Rajathanee hospital has been offering the FAST training to its emergency medicine residents since 2005. At present, two groups of emergency medicine residents have been trained with satisfactorily accurate results in overall compared to the radiologist as the gold standard. It is concluded that their FAST exam can be used as the primary screening test. Hence, the FAST training for emergency medicine residents should be encouraged and supported.

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UNILATERAL OPHTHALMOPATHY AFTER RADIOIODINE ABLATION IN A PATIENT WITH WELL-DIFFERENTIATED PAPILLARY THYROID CARCINOMA COEXISTENT WITH HASHIMOTO'S THYROIDITIS: A CASE REPORT.

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Thyroid-associated ophthalmopathy (TAO) is an inflammatory orbital disease of autoimmune origin. The most common cause of TAO is Graves' disease, but it may also arise in other conditions, eg. Hashimoto's thyroiditis or thyroid carcinoma. We present a case of the patient with well-differentiated papillary thyroid carcinoma coexisting with Hashimoto's thyroiditis who developed left eye proptosis and left eyelid retraction 2 months after post-operative radioiodine ablation. Laboratory findings showed a high serum thyroglobulin antibody titer and elevated FT4 from thyroxine suppressive therapy. No iodine uptake at the orbital region was detected. After reduction of the thyroxine dose and a short course of oral corticosteroid, the patient's eye problems improved and the thyroglobulin antibody titer also decreased. An association between the therapy given in this case and ophthalmopathy on pre-disposing Hashimoto's thyroiditis cannot be excluded.

Key words; thyroid carcinoma, ophthalmopathy, Hashimoto's thyroiditis, radioiodine ablation, I-131

INTRODUCTION

Thyroid-associated ophthalmopathy (TAO) is an inflammatory orbital disease of autoimmune origin with the potential to cause severe functional and psychosocial effects. Pathogenesis of the disease is not yet fully understood. TAO has a variable clinical presentation; it may cause severe damage to vision and orbital architecture.[1] The most common associated cause of TAO is Graves' disease, which is far more commonly associated with TAO than other diseases, including Hashimoto's thyroiditis[2,3] or thyroid carcinoma.[4] Correlation between Hashimoto's thyroiditis and well -differentiated thyroid carcinoma has been reported, in approximately 23.8% -26.7% of cases.[5,6]

In the present report, we describe a case of the woman with well-differentiated papillary thyroid carcinoma coexisting with Hashimoto's thyroiditis who developed thyroid-associated ophthalmopathy after a single low dose of radioiodine ablation. To our knowledge, there is only one report in the literature on TAO after radioiodine treatment in a patient with disseminated thyroid carcinoma[7] but there is no report on TAO in patient with differentiated thyroid carcinoma coexistent with Hashimoto's thyroiditis.

CASE REPORT

A 40-years-old Thai woman had a asymptomatic neck mass of 3 cm. for 4 months. FNA of the nodule was suspicious for malignancy and her blood

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test showed normal thyroid hormones level. She underwent a near total thyroidectomy. The histopathology reported a 2 cm papillary carcinoma on the left lobe and another of 3 mm on the right lobe. Hashimoto's thyroiditis was also detected in the rest of both lobes. She was referred to our division 1 month after the operation. The physical examination, including the eyes, revealed no abnormalities. A chest radiograph was normal. The results of the screening tests are shown in Table 1, showing elevated titer of antibody against thyroglobulin in serum (ATg ; Serodia ®-ATG, Fujirebio inc., Chuo-ku, Tokyo, Japan; positive control 1:1,600). Thyroid ablation was done with radioiodine (I-131 30 mCi). A whole body scan 1 week later showed uptake at the thyroid bed only. Thyroxine 200 μg. daily was given (body weight of 52 kg).

Approximately 2.5 months later, she experienced discomfort in her left eye. An eye examination revealed left eye proptosis, left upper eyelid retraction and periorbital swelling. There was full movement of the extraocular muscles. She had no complaint of any abnormal vision. A thyroid function test approximately 3 hours after taking thyroxine showed slightly elevated FT4 and suppressed TSH (FT4 = 1.88 ng/dl, TSH = 0.02 mIU/mL). A CT scan of the orbit was refused. The thyroxine dose was reduced to 200 μg/day, six days per week for a short period, and oral prednisolone was started at 60 mg/day, tapered off over 6 weeks. Three months later, her left ophthalmopathy had partially improved and the serum thyroglobulin antibody titer had also decreased to 1:320. At the present date (June 2006), her I-131 whole body scan study and serum thyroglobulin level are all negative. The serum thyroglobulin antibody are stable at 1:320 during 1 year follow up. Her ophthalmopathy has further improved after we increased thyroxine back to the previous dose. (Figures 1-4)

Table 1 Serial laboratory findings on serum in a patient with Hashimoto's thyroiditis coexistent with differentiated papillary thyroid carcinoma

Month/Year	Tg, ng/ml (2.7-21)	Anti-Tg	TSH, mIU/mL (0.25-4)	FT4, ng/dl (0.7-1.75)	Remarks
10/2004	0.24	1:1,280	42.45	-	1st ablation
1/2005	-	-	0.02	1.88	Ophthalmopathy
4/2005	-	1:320	>100	-	WBS post 1st ablation Partially improved ophthalmopathy
4/2006	<0.1	1:320	>100	-	WBS post 2nd ablation Stable eye symptoms
6/2006	-	-	0.299	2.06	Obviously improved ophthalmopathy

Fig.1

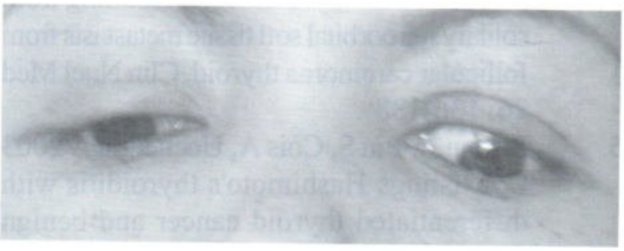

Fig.2

Fig.3

Fig.4

Fig.1-4 (see attached files) Photos of the same patient in April 2006 (1 year 2 months after oral prednisolone treatment) showing upper eyelid retraction, mild periorbital swelling and mild proptosis on the left eye. The motility of the eye muscles and vision are normal.

DISCUSSION

Thyroid-associated ophthalmopathy (TAO) is an autoimmune ophthalmopathy, closely related to autoimmune thyroid disorder, in which the ocular muscles and the retro-ocular fat and connective tissue are the putative targets of immune reactions.[3] It is the most frequent cause of unilateral or bilateral proptosis in adults.[1] Most cases of TAO are associated with Graves' ophthalmopathy. It may also arise from other causes including Hashimoto's thyroiditis[2,3] and thyroid carcinoma,[4] but these are extremely rare. Other non-thyroidal diseases which can cause proptosis, eg. neoplasm proptosis, orbital pseudotumor or abscess, have also been reported.

Hashimoto's thyroiditis and Graves' disease are autoimmune thyroid diseases (AIDs) that are generally thought to be discrete clinical entities with different outcomes. It has been suggested that they may share the same pathogenic mechanism.[8] The finding of ophthalmopathy in patients who appear to have Hashimoto's hypothyroidism support this concept.[2,3]

Although TAO can occur in patients with Hashimoto's thyroiditis, such an occurrence is far less common than in patients with Graves disease. Kaspar et al.[9] studied prevalences of serum antibodies against eye muscle antigens in patients with TAO, Graves' hyperthyroidism and Hashimoto's thyroiditis. He found these patients had significant levels of anti-G2 antibodies compared to normal subjects and multinodular goiter patients ($p<0.05$). This may explain in part the occurrence of TAO in patients with Graves' disease and Hashimoto's thyroiditis.

A previous report by Basu et al. in 2001[4] described a case who presented with unilateral proptosis with thyrotoxicosis resulting from solitary orbital soft tissue metastasis from follicular thyroid carcinoma. The diagnosis was made by CT scan and radioiodine uptake in the orbital area. In our patient, there was no evidence supporting such metastasis, although the patient did not wish a CT scan which could have confirmed this.

To our knowledge, there is only one report describing ophthalmopathy after radioiodine treatment of a thyrodectomized patient with thyroid cancer.[7]

Radioiodine treatment has previously been shown to be associated with development of TAO in various thyroid disorders including Graves' disease and toxic multinodular goiter.[10] This effect of radiation may be related to an effect on T-cell populations, as activated T-cells have been shown to appear in the circulation after radioiodine treatment. This activation and enhanced contrasuppressor activity may in part be responsible for the rise in autoantibodies after radioiodine, which may also contribute to the worsening of ophthalmopathy.[11]

Coexisting Hashimoto's thyroiditis with differentiated thyroid carcinoma can be found in up to 26.7% of the thyroid carcinoma patients.[6] To the best of our knowledge, there has been no report prior to this one describing the development of ophthalmopathy following radioiodine treatment in patients who have both coexisting conditions. This case appears unique in that context. However, the appearance of ophthalmopathy only a few months after treatment is a remarkable finding, which may not be coincidental. Radioiodine itself can aggravate ophthalmopathy in underlying thyroid disorders, especially in patients such as this one with a tendency to some autoimmune activity. Early detection and treatment can be aided by an earlier follow up period after the radioiodine treatment. We hope that this case will be useful for other clinicians treating thyroid carcinoma patients.

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OMENTAL LEIOMYOMA AND LYPHANGIOMA CASE REPORT.

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ABSTRACT

Mixed type of omental leiomyoma and lymphangioma are rare benign solid tumor. We reported ultrasound and CT findings of large omental leiomyoma and lymphangioma in a 24 years old female, who presented with abdominal distention and feeling of fullness in the abdomen. Complete surgical removal was performed and the pathologic result verified the roentgen diagnosis.

INTRODUCTION

Omental solid tumor is a rare tumor. Most common presentation is distended abdomen, palpable abdominal mass, or feeling of fullness. We reported sonographic and CT findings of a case of a large omental leiomyoma and lymphangioma in a 24 yrs old female patient. Surgical removal of the tumor mass was performed and the pathologic result confirmed the roentgen the diagnosis.

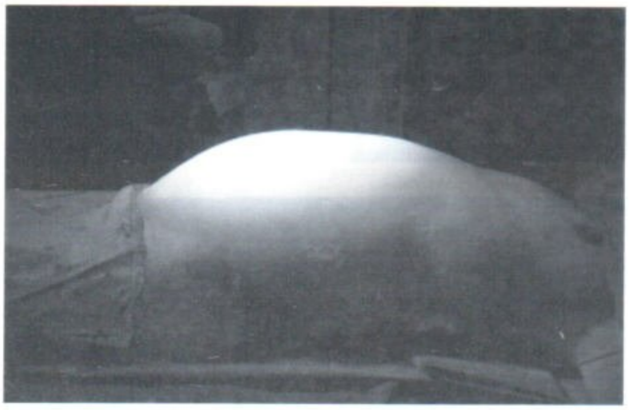

Fig. 1 Photograph shows distended abdomen

CASE REPORT

A 24 yrs old female presented with some abdominal discomfort and feeling of gradual distention during the last 2 years. Physical examination reveals abdominal distention with a huge mass occupying from the upper to the middle part of the abdomen, left side. (figure 1)

Ultrasound reveals a large well defined border, inhomogeneous intermediate echoic mass occupying the left half of the abdomen. (figure 2)

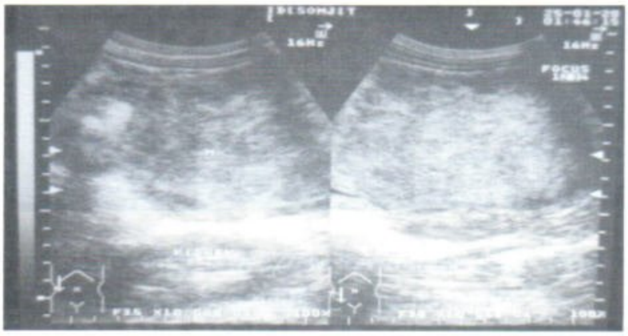

Fig. 2 US reveals large well defined border, inhomogenous, intermediate echoic solid mass at left side of upper abdomen, not connected to the uterus.

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Computed Tomography (CT) showed a large well defined border, inhomogeneous mixed attenuated solid mass with minimal enhancement, about 24x15 cm in size, occupying the left side of abdominal cavity (figure 3) Multiple small tubular enhancement structures and small cystic lesions abuted the anterior surface at the upper pole of the mass were noted. The loops of small bowel were displaced to the right, laterally. The stomach and spleen were also displaced up ward and laterally. The abnormal solid mass was not attached to the ovary or uterus. No ascites or definite enlarged abdominal nodes, were noted.

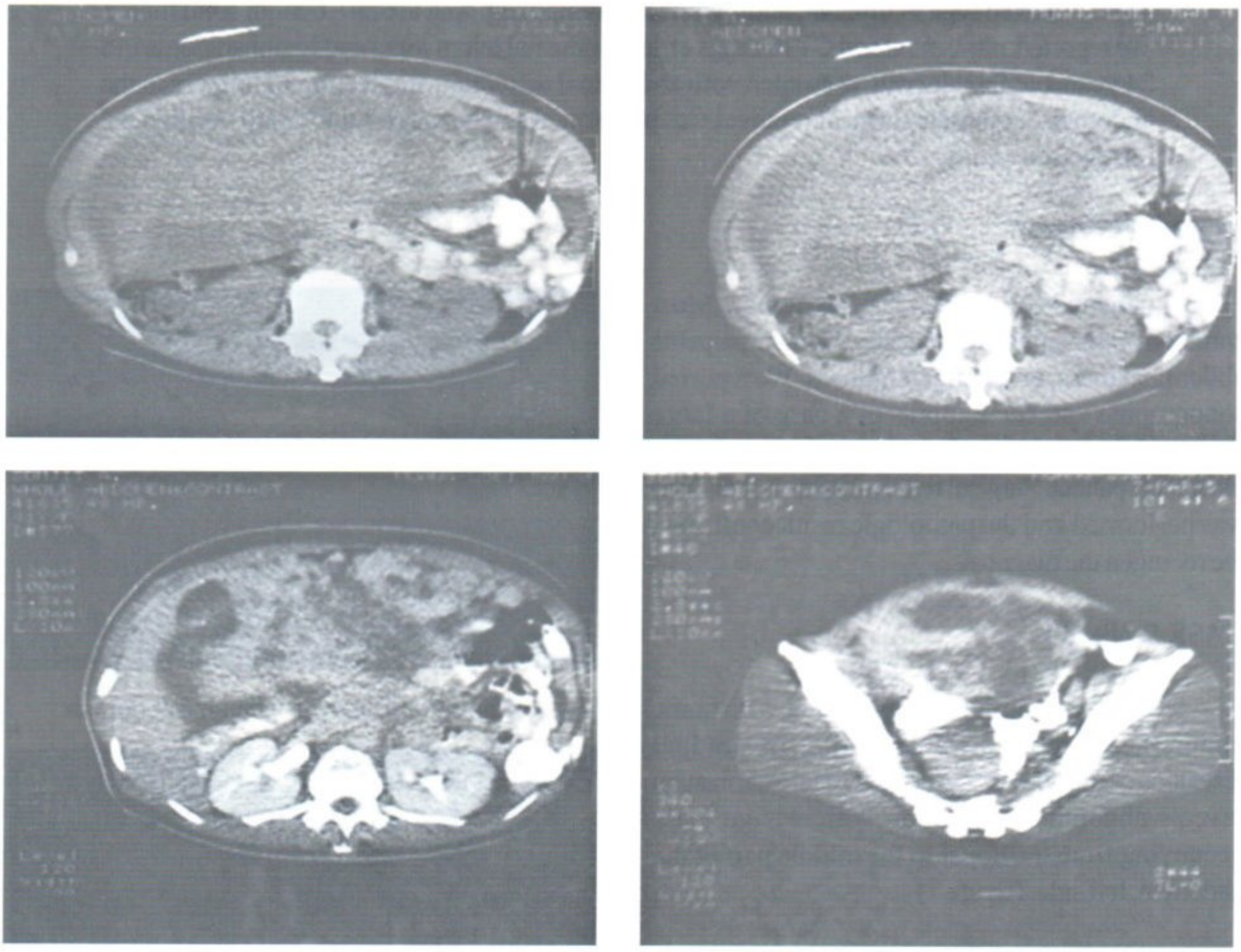


Fig. 3 CT scan showed a large, well defined border, inhomogeneous mixed attenuated solid mass with minimally enhancement, not attatched to the uterus. Multiple small enhancement tortuous tubular structures and small cystic lesions at the anterior surface of mass, were noted.

On operation, finding showed a large well defined encapsulated solid mass occupying in the upper part of the left side of the abdominal cavity, occupying the whole part of greater omentum. The loops of small bowel were displaced to the right side of abdomen. Multiple tortuous dilated veins and lymphaedena were seen, at the anterior surface of the upper part of mass. (figure 4) Complete tumor removal with intact capsule was performed. (figure 5)

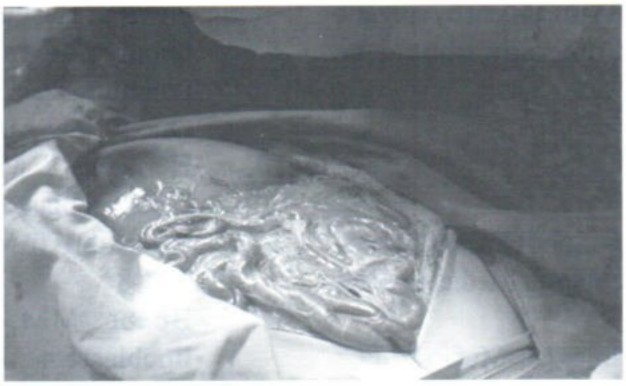
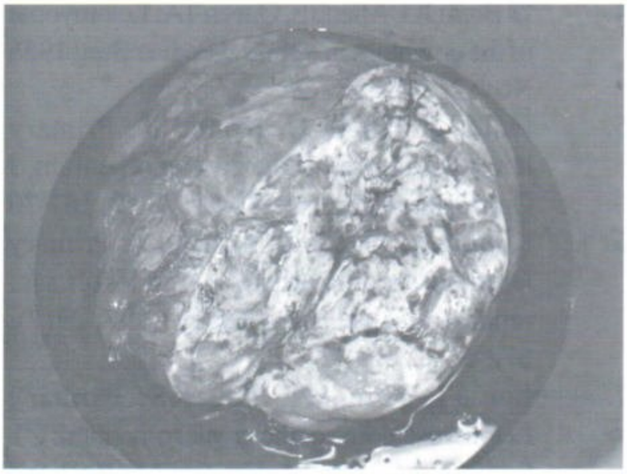


Fig. 4 At the operative field, multiple tortuous dilated veins and lymphaedema were seen at the surface of the abdominal mass.

A



B

Fig. 5 Large well defined encapsulated tumor mass, about 30x30 cm in size (A) was removed. Cut surface of the tumor mass (B)

DISCUSSION

Solid omental mass is rare, particulary leiomyoma which is about 15 % of all primary omental tumor.[1-3] Leiomyoma is a benign tumor of smooth muscle and lymphangioma is the rare benign tumor of lymphatic duct.[1-4,14-16] Althrough the greater omentum is mainly composed of adipose tissue, vascular and lymphatic, the omental tumor predominately consisted of smooth muscle tissue that possibly arise from smooth muscle of small blood vessels.[1-4]

The most common malignant tumors are leiomyosarcoma, hemangiopericytoma and fibrosarcoma.[1-16] The most common benign tumors included gastrointestinal stromal tumors[13] which have malignant potential, dependent on tumor size, mitotic activity and invasive growth are leiomyomas, lipomas and fibromas.[1,2,4]

The informative findings of the investigation such as ultrasound, CT scan, MRI or tumor markers should be helpful for therapeutic planning.[7,16] The benign conditions will be cured by surgery, but the malignant conditions, combined treatment by surgery, chemotherapy and/or radiotherapy, should be considered.

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METASTATIC THYROID CANCERS TREATED AT RANGPUR.

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ABSTRACT

Thyroid cancer can appear as metastatic disease involving skeletal system as depicted in the two patients treated by surgery, radioiodine ablation and thyroxine at Rangpur.

INTRODUCTION

Well-differentiated papillary and follicular thyroid carcinoma may present with distant metastases in bone, lung, brain, lymphnode etc. and respond well to total thyroidectomy, radioiodine ablation therapy and thyroxine.[1] Iodine-deficiency disorders are common in Northern Bangladesh and we started thyroid investigations by radionuclide techniques and ultrasound at Rangpur since 1990. Thyroid cancer treatment was started in CNMU, Rangpur in 1996 and the initial results were published in 2003.[2]

CASE 1

A 40-years-old woman presented with a history of swelling in front of neck and left side of forehead gradually increasing since 2004. X-ray showed osteolytic lesion in left frontal bone. Isotope bone scan shows highly vascular left frontal spot in dynamic phase (Fig.-l) and dough-nut sign[3] in static phase (Fig.-2). Thyroid scan shows a cold nodule in lower pole of right lobe (Fig.-3). On 10th April 2006, she had near-total thyroidectomy and excision of left frontal swelling. Biopsy showed bony metastatic deposit of poorly differentiated follicular thyroid carcinoma with vascular invasion. She had 152 mCi of ^{131}I ablation on 18 April/06 and post-therapy scan showed faintly increased concentration of radioiodine only in thyroid bed and left frontal area. She was advised to take thyroxine 150 micrograms/day and followups in Nov. 2006 and March 2007 showed her euthyroid clinically and biochemically.

CASE 2

A 37-years-old woman presented with paraparesis for two and a half months. Spinal surgery at 5th thoracic vertebra was done on 30 May 2006 and biopsy showed bony metastases from follicular variant of papillary carcinoma of thyroid. Total thyroidectomy was done on 9 June/06. She was given 138 mCi of ^{131}I on 27 July/06. Now she can walk with a brace and is taking thyroxine 150 to 200 micrograms / day. She is euthyroid in last followup 9 months after ^{131}I treatment.

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Isotopic Bone Scanning of Case I patient.

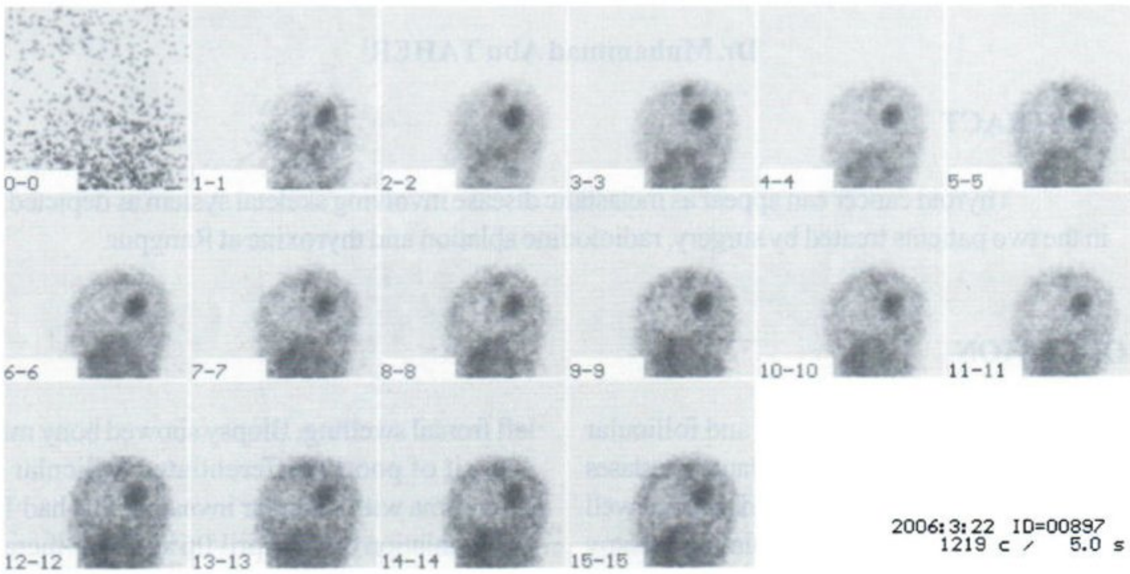

Fig.1 Dynamic bone scan shows vascular swelling on Lt. frontal bone.

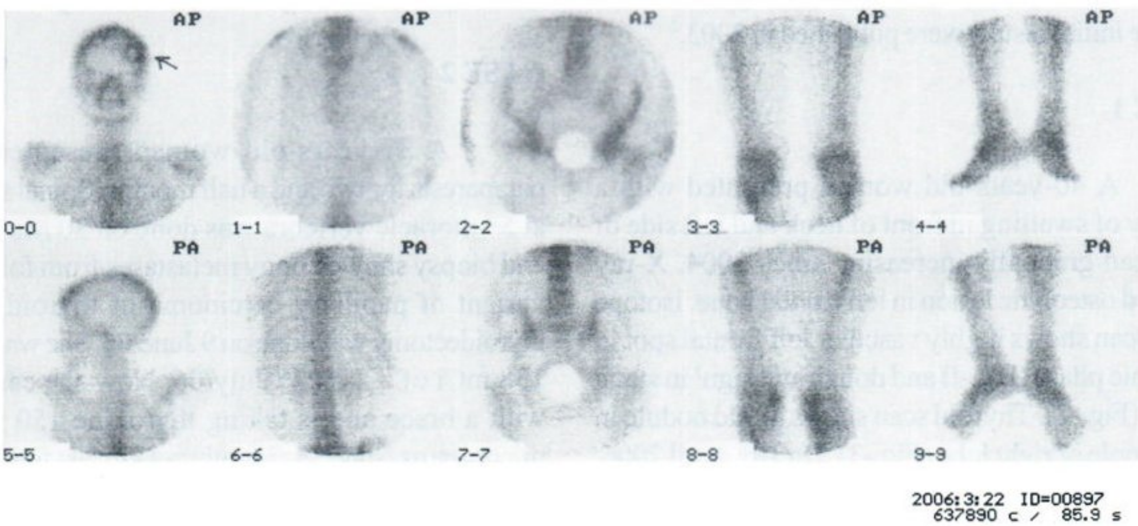

Fig.2 Static bone scan shows doughnut sign on Lt. frontal bone.

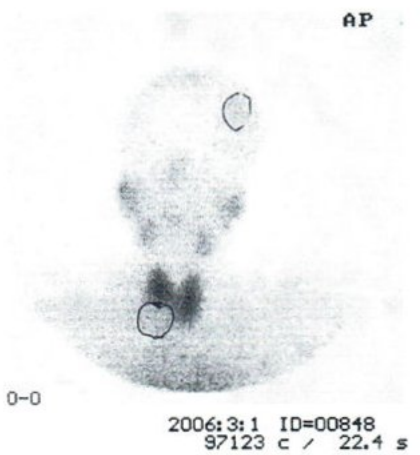

Fig.3 Thyroid scan shows cold nodule in Rt. lobe of thyroid.

DISCUSSION

Most of our common people are not conscious about health and many persons are seen with long -standing goiters. As well-differentiated thyroid carcinoma is amenable to be cured, we should treat these patients with utmost care.

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