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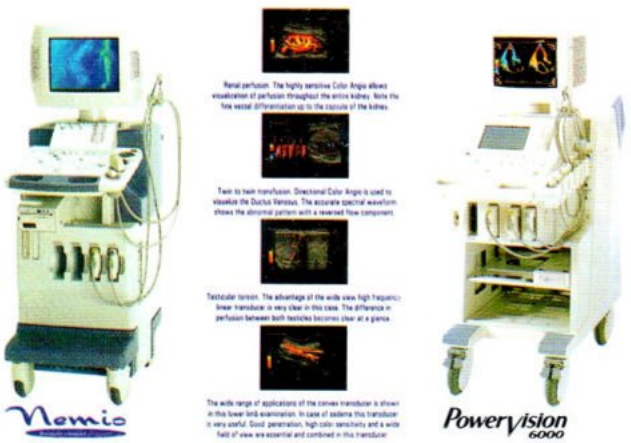

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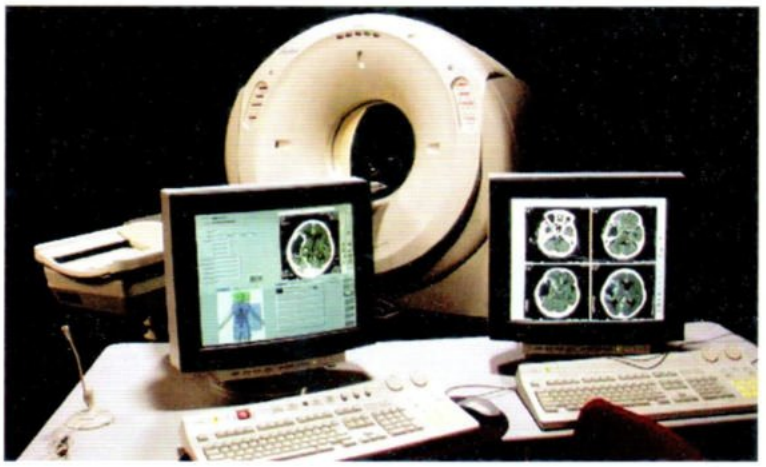

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CONTENTS

COMPARISON OF TC-99M APCITIDE SCINTIGRAPHY WITH CT ANGIOGRAPHY IN INTERMEDIATE PROBABILITY OF PULMONARY EMBOLI BY PIOPED CRITERIA USING PULMONARY ANGIOGRAPHY AS A GOLD STANDARD.

Supatporn TEPMONGKOL[1], M.D. Somjai WANGSUPHACHART[2], M.D.
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ABSTRACT

Objectives: Ventilation-perfusion (V/Q) lung scintigraphy has been considered to be the first-line investigation for suspected pulmonary thromboembolism (PTE). An intermediate probability finding is problematic. Further investigation is needed to confirm or exclude clots. This study was aimed to evaluate the role of Tc-99m apcitide to diagnose PTE and to compare the diagnostic efficiency with CT angiography (CTA) and pulmonary angiography (PAgram).

Design: Prospective study comparing efficiency of Tc-99m apcitide scintigraphy and CTA to diagnose acute PTE by using PAgram as a gold standard.

Setting: Patients in tertiary care hospital (King Chulalongkorn Memorial Hospital)

Participants: Six out of eightteen patients with intermediate probability for PTE by V/Q lung scintigraphy.

Results: Six patients were studied by Tc-99m apcitide (planar and SPECT) scintigraphy and CTA. Four of these had PAgram. Only one positive planar Tc-99m apcitide study were observed. Three out of four patients had concordant results of SPECT Tc-99m apcitide with PAgram. In one patient with negative Tc-99m apcitide, CTA and PAgram were diagnosed to be pulmonary infarction. For 2 patients in whom PAgram were not performed, Tc-99m apcitide agreed with CTA. Tc-99m apcitide had more positive lesions than CTA and PAgram in 2 patients.

Conclusion: Tc-99m apcitide scintigraphy is a promising mean to detect active clots in PTE. It has a potential to detect more active clots than CTA.

Key Words: Pulmonary embolism, GPIIB/IIIA receptor, scintigraphy, helical CT, pulmonary angiography

V/Q = Ventilation and Perfusion, **PTE** = Pulmonary Thromboembolism, **CTA** = CT angiogram, **PAgram** = Pulmonary Angiography, **PIOPED** = Prospective Investigation of Pulmonary Embolism Diagnosis

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INTRODUCTION

Untreated pulmonary thromboembolism (PTE) is a potentially fatal condition. Appropriate use of anticoagulant or thrombolytic agents improves survival.[1,2] However, effective therapy requires an accurate diagnosis. Lung scan is the principal imaging test for the diagnosis of this condition. The use of (ventilation and perfusion) V/Q lung scan is optimized when interpreted as very low, low or high probability of PTE according to the Prospective Investigation of Pulmonary Embolism Diagnosis (PIOPED) criteria with a concordant clinical likelihood of the disease.[3] In patients with lung scan interpretation of intermediate probability of PTE or patients with discordant clinical likelihood of PTE and lung scan interpretation will often require further investigations to diagnose deep venous thrombosis (DVT) using leg ultrasonography or venogram. If no DVT presents, an invasive method, pulmonary angiography (PAgram) should be performed. Many methods have been investigated to avoid performance of an invasiveness of PAgram. Recently, a new thrombus-avid, synthetic peptides labeled with gamma-emitting nuclide, Tc-99m apcitide (Acutect™; Diatide Inc.; Londonderry, NH), has shown its ability to detect acute DVT[4] and possibly pulmonary emboli.[5] CT angiography (CTA) is also a promising imaging method and has been recently used as a second-line procedure to clarify intermediate lung scintigraphic results.[6,7] This study is aimed to identify the use of Tc-99m apcitide scintigraphy to diagnose acute PTE and also to compare the efficacy of Tc-99m apcitide scintigraphy and CTA in detecting acute PTE using PAgram as a gold standard in patients with intermediate probability of PTE by V/Q lung scan.

MATERIALS AND METHODS

PATIENTS

Patients who had intermediate probability of PTE by PIOPED criteria were included in this study. Patients were excluded if they were pregnant or lactating, and if hepatic or renal function were impaired. All patients had clinical suspicion of having PTE or DVT not exceeding 30 days prior to the study. Pre-administered anticoagulant is not a contraindication for this study. Tc-99m apcitide scintigraphy and CTA were performed to diagnose PTE. Pulmonary angiography (PAgram) was used for gold standard. Each method was done within 7 days apart. The study was approved by Ethical Committee of the Faculty of Medicine of the institute. Informed consents were signed by each patient.

Tc-99m APCITIDE SCINTIGRAPHY

Tc-99m apcitide scintigraphic studies were done a day after lung scintigraphy in most patients (5 of 6) except one which was done 5 days apart. 740 MBq of Tc-99m apcitide (Acutect™, Diatech Inc) was injected intravenously with blood pressure monitoring every 15 minutes for 1 hour after injection. Whole body planar anterior and posterior views were obtained 1 and 3 hours post injection, using a single-headed GE Camstar gamma camera equipped with a medium-energy, general purpose, parallel hole collimator. Energy was centered at 140 keV with 20% window width. Single photon emission computed tomographic (SPECT) data at 3 hours post injection were collected 30 seconds/view in 360 degree for 64 views using 128x128 matrix size. Reconstruction was performed by a backprojection algorithm using Hanning filter with frequency cutoff 0.8 cm.[1]

CT ANGIOGRAPHY

Spiral CT of the pulmonary artery was done on Siemens Somatom plus 4 machine. Intravenous application of 100 mL of non-ionic, iodinated contrast medium at a flow rate of 3 mL/

DVT = Deep Venous Thrombosis

second was then performed. Scan was started 25 seconds after the start of injection covering the whole lung with spiral technique using 3 mm. collimation, pitch 1.5 and interval reconstruction 1.5 mm. Patients were instructed to hold breath in deep inspiration during the scan. In dyspneic patients the protocol was adapted accordingly.

PULMONARY ANGIOGRAPHY

PAgram was performed by a radiologist and a cardiologist by using Siemens Polystar machine. Iodinated contrast medium was injected into the main pulmonary trunk and subsequently into the right or left pulmonary artery according to V/Q lung scintigraphic defect. Digital subtraction technique was applied.

Tc-99m apcitide scintigraphy and CTA were done in all patients but PAgram were done in 4 out of 6 patients.

INTERPRETATION

All interpreters were blinded of each other studies results and lung scintigraphic result (except for the radiologist who performed PAgram who knew the side of abnormality in V/Q scintigraphy).

Tc-99m apcitide scintigraphy was interpreted as positive if there were either a persistent collection of this tracer in the area of lung with intensity more than the lung background from 1 hour to 3 hours post injection, or a focal collection in SPECT. All the studies were interpreted twice by a nuclear medicine physician with a lag time of at least 3 months. If the results interpreted were not within the same lobe, a second nuclear medicine physician was asked to confirm the finding.

CTA and PAgram were interpreted separately by 2 experienced radiologists.

CTA interpreter looked for acute and subacute embolism using criteria[8] as follows; intraluminal filling defect, wall adherent with a convex shape, and lack of opacification.

Acute PTE was diagnosed if the interpreter observed any filling defects, peripheral occlusions, and/or wedge-shaped perfusion defects on PAgram in at least 2 views.

All the results were then collected and identified the region of abnormality as upper, middle, or lower lung zone of right or left side. Concordance and discordance results of both Tc-99m apcitide scintigraphy and CTA were then compare with PAgram result.

RESULTS

Six of eighteen patients with intermediate probability V/Q lung scintigraphy according to PIOPED criteria who matched criterias mentioned above (5 women, 1 man; aged 39-74 yr; mean age 56.5 yr) were enrolled into this study. Four patients had PAgram. In the other two, PAgram was not performed due to unstability condition in one patient and the other refused to have this test. Data of each patient are shown in Table1. There were no symptoms suspecting PTE in 2 patients (WJ and AK) but the V/Q lung scintigraphy showed intermediate probability and were included in this study. Patient WJ had previous lung perfusion scintigraphy that showed abnormality. This is mentioned as "old" in Table 1 and also showed a new abnormality in the current V/Q study.

At the start of the study, anticoagulants were given in 4 of 6 patients but not exceeding 4 days prior to the study. Table 2 presents the results of Tc-99m apcitide scintigraphy, CTA, and PAgram.

PIOPED = Prospective Investigation of Pulmonary Embolism Diagnosis.

All planar Tc-99m apcitide studies were negative except for patient WJ (Figure 1). The results present in Table 2 were from SPECT studies. When compared with PAgram results, Tc-99m apcitide can correctly detect PTE in 2 out of 3 sites (one site in PAgram is pulmonary infarction). CTA detects correctly in 1 out of 3 sites. Tc-99m apcitide scintigraphy was not positive in one patient who had pulmonary infarction detected by CTA and PAgram. In 1 patient (patient AK) that had negative PA gram, Tc-99m apcitide scintigraphy and CTA were both negative. In one patient (patient SLE), Tc-99m apcitide scintigraphy was positive in 2 more sites than CTA and PAgram (Figure 2). In 2 patients that PAgram were not performed, Tc-99m apcitide scintigraphy and CTA both showed negative result in one patient (patient SF) and showed some discordant result in the other (patient KM). For the latter patient, both methods concordantly detected the abnormality at RLL but Tc-99m apcitide scintigraphy detected one more lesion at RUL which was concordant with the lesion in V/Q lung scintigraphy.

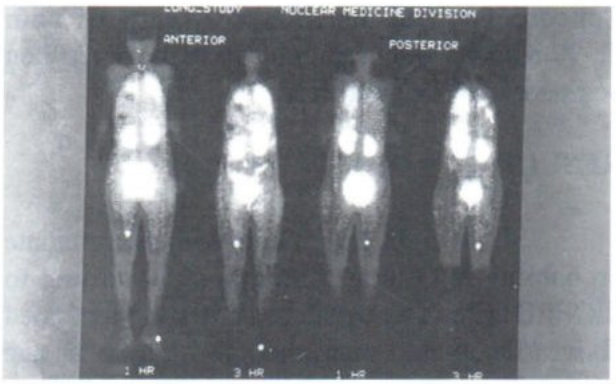
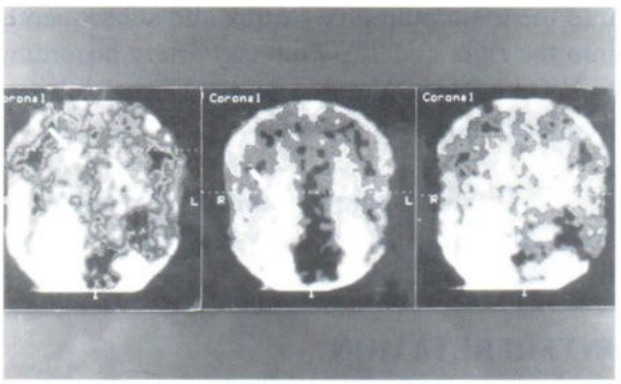
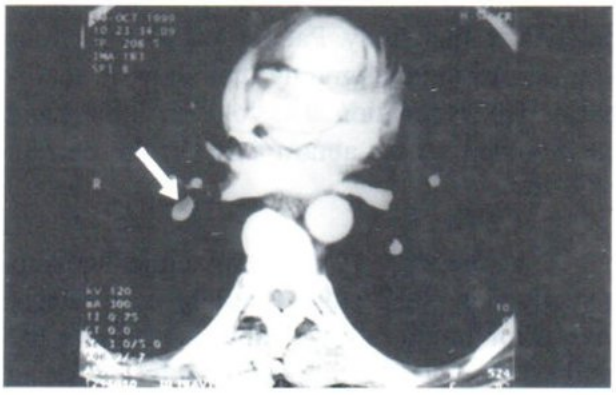


Fig. 1. Tc-99m apcitide whole-body planar scintigraphy at 1 and 3 hours post injection. A focus of abnormal uptake at the right lower lung field clearly seen at 3 hours (arrow). Also the other focus at right thigh.



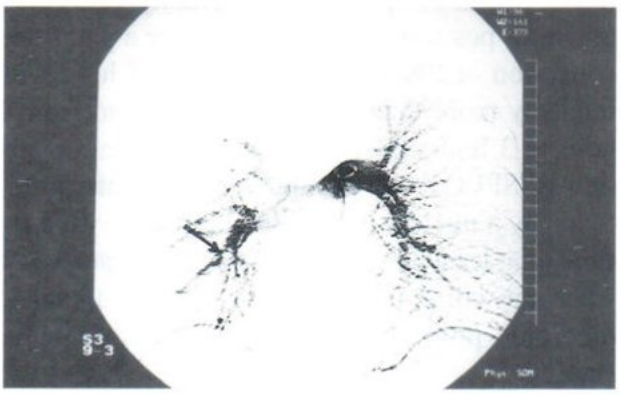
2A

Fig. 2A SPECT coronal views of Tc-99m apcitide revealed 3 foci of abnormal uptake at RUL, RLL, LLL (arrows)



2B

Fig. 2B Filling defect in right segmental pulmonary artery supplying RLL in CTA (arrow)



2C

Fig. 2C Pulmonary angiography (arrow).

TABLE 1. Patient demographics, symptoms&duration, lung scintigraphic result, anticoagulant therapy

Patient	Age	Sex	Symptom/sign	Duration *	Criteris for ITMED⁺ By V/Q scan	Defect site	Days of anticoagulant
WJ	39	F	Leg edema	-	1 lare MM	Sup.RLL(new) R apex, L lingula, both lat-basal(old)	1
SF	57	F	Leg edema	1 mo	1 moderate MM	L sup-lingula	13
AK	74	F	Leg edema	-	1 mod. match, neg.CXR	Ant-basal LLL	4
KM	58	F	Leg edema +dyspnea	3 d	1 mod.MM	Post RUL	0
SLE	47	M	Dyspnea	2 d	1 mod.MM	Ant LUL	0
SL	64	F	Dyspnea	7 d	1 mod.MM	Ant-basal LLL	3

* Duration of lung symptoms

⁺ITMED = intermediate lung scintigraphy probability, MM - V/Q mismatched, mod. = moderate size, CXR = chest x-ray

TABLE 2. Results of Tc-99m apcitide scintigraphy, CTA, and PAgram

Patient	Tc-99m apcitide		CTA		PAgram	
	No.*	Site	No.	Site	No.	Site
WJ	1	RLL	1	LLL	2	RUL, RLL
SF	0	None	0	None	ND⁺	-
AK	0	None	0	None	0	None
KM	2	RLL, RUL	1	RLL	ND⁺	-
SLE	3	RUL, RLL, LLL	1	RLL	1	RLL
SL	0	None	0	LUL (infarct)	1	LUL

* No. = number of sites abnormality suspecting of PTE according to criteria mentioned above.

⁺ND = not done

DISCUSSION

Tc-99m apcitide is a radiolabeled synthetic peptide containing an arg-gly-asp (RGD) sequence which enables the binding to the GP IIb/IIIa receptor expressed on the activated platelets.[9,10] It has been successfully used for the detection of acute deep venous thrombosis[4,5,11,12,13,14] for many years. However, for the use in acute pulmonary embolism diagnosis, there were only few cases that were reported in a series of deep venous thrombosis study.[5] From our result, although there were not a large number of cases, Tc-99m apcitide scintigraphy is able to detect more positive lesions than CTA. These are considered to be true in cases of a new thrombus. Old thrombus or infarcted lung should not be positive in Tc-99m apcitide scintigraphy. This was confirmed in 2 patients, øne (patient SL) with pulmonary infarction, the other (patient WJ) with old persistent defect seen in V/Q lung scintigraphy and had positive PAgram. Compared with CTA, Tc-99m apcitide agreed with CTA in 4 out of 6. Two of which were negative and the other two were positive for PTE. From all the data presented in this study, we found that there was no false negative for active clot detection by Tc-99m apcitide scintigraphy. However, there were some false positives of this test when we use PA gram as a gold standard. Two patients had positive Tc-99m apcitide lesions with negative CTA and PAgram (patient KM and SLE). The results may be false positive from some other conditions mentioned elsewhere[5,15] or peripheral lesions that could not be detected by the other 2 modalities.[16,17] In one of these 2 patients (patient KM), the positivity in Tc-99m apcitide scintigraphy was concordant with lung perfusion scintigraphy reflecting a possibility of true positive lesion. For the other false positive, inhomogeneity and high background causing difficulty of identifying true lesions may explain it. In these kind of patients, further delayed study may improve the lesion to background ratio. Some pitfalls of using Tc-99m apcitide scintigraphy are 1) the high background in the lung, even in the delayed study, making it difficult to detect clots by planar method.Thus, time consuming because of the need of SPECT, 2) The cost that is still high. The promising advantages are the direct targeting to the active clots and can be examined throughout the body in one study, which may be more cost-effective than performing other modalities in separate studies for deep venous thrombosis and PTE. Further study of more patients for sensitivity and specificity study, survival, and cost-effectiveness analysis should be done to see whether this test can be incorporated into the pulmonary embolism management line.

This study is the one to present a new imaging modality and new clinical potential indication for Tc-99m apcitide to help in the diagnosis of acute pulmonary thromboembolism.

CTA = CT angiogram, **V/Q** = Ventilation and Perfusion **PAgram** = Pulmonary Angiography, **PTE** = Pulmonary Thromboembolism

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BILATERAL CAROTID BODY PARAGANGLIOMAS : A CASE REPORT

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ABSTRACT

Carotid body paraganglioma is an uncommon tumor which arise from paraganglionic or chemoreceptor tissue at the carotid bifurcation. This is one of the most common primary sites for paragangliomas arising in the head and neck, mostly unilateral. Bilateral tumors is rare which occur in only 5% of sporadic and 33-38 % of familial paragangliomas. We report a quite rare sporadic case of bilateral tumors which had the characteristic CT and MRI findings.

INTRODUCTION

Paragangliomas arise in the head and neck at four primary sites ; the **carotid body**, **the jugular foramen, along the path of the vagus nerve**, and **the middle ear**. The carotid body is the most common site of these tumors. Less common sites include the sella turcica, pineal gland, cavernous sinus, larynx, orbit, thyroid gland, nasopharynx, mandible, soft palate, face, and cheek. Marchand reported the first paraganglioma (of the carotid body) in 1891. Numerous terms have been used since then to describe these tumors. The term "glomus tumor" was used to describe the rich arborization of blood vessels and nerves seen in these masses. Mulligan proposed the term "chemodectoma" to reflect the chemoreceptor tissue of origin.[5] Other names have included endothelioma, perithelioma, sympathoblastoma, fibroangioma, and sympathetic nevi. Based on the work of Glenner and Grimley, the term paraganglioma is currently accepted and widely used.[5] The typical patient is middle-aged and present late in the course of the disease, with a painless slow-growing mass. The carotid body paragangliomas is uncommon tumor but fascinating lesion. They arise within the carotid body, may be within or outside the adventitial layer of each common carotid arteries (CCA) at the bifurcation and characteristically splays the bifurcation of the CCA which result in the typical features on physical examination. These masses produce characteristic findings on radiologic images as well, particularly on computed tomographic (CT), magnetic resonance (MR) imaging. Nevertheless they also have the characteristic pathologically microscopic pattern. Surgery is the important role for treatment and very challenging. Bilateral involvement are rare which were previously reported in literature. We correlate the imaging features with the underlying pathologic findings and focus the distinctive features that is helpful in diagnosis.

A CASE REPORT

A 46 year-old woman was admitted with left neck mass for 12 years. About 12 years before admission, she developed left painless neck

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mass and was biopsied at the local community hospital. The pathological study was lymphadenitis. So she had no further treatment, but the mass was still growing slowly and she had got nasal voice.

Physical examination revealed a left upper lateral neck mass, about 7 cm. in the greatest diameter, pulsatile, compressible rubbery consistency with free horizontal mobility. Bulging of the left lateral oropharyngeal wall is seen and also, a right upper lateral neck mass was found, about 3 cm. in diameter with the same characteristic findings. No neurological deficit was detected.

Routine laboratory investigations were normal. Twenty four hours urine vinyl mandelic acid (VMA) was also normal.

Helical CT scan revealed hypo to isodensity to the muscle of bilateral carotid space masses with inward bulging into oropharyngeal airway by the bigger left sided mass on the precontrast axial image (Fig.1a) with rather homogeneous intense enhancement of the masses on the postcontrast scan (Fig. 1b). Splaying of internal carotid artery (ICA) from external carotid artery (ECA) at the carotid bifurcation is nicely shown on 3-D image reconstruction, the shaded surface display (SSD) and the maximum intensity projection (MIP) (fig. 3 a,b).

MRI revealed isosignal intensity to the muscle of the well defined bilateral tumors on T1W image and hyperintensity on T2W images (Fig. 2, 4). Multiple signal void due to tumor vessels within the masses on coronal T1W (Fig. 4a) and more conspicuous among hyperintense tumor stroma which was a characteristic "salt and pepper" appearance on T2W image (Fig. 4b) with homogeneous intense enhancement in post Gd-DTPA study (Fig. 5) were shown.

Splaying of ICA from ECA at the carotid bifurcation could be demonstrated in Sagittal oblique T1W and 2d TOF MR angiography. (Fig. 6 a,b)

The patient underwent operation on the left side first. The operative findings revealed a hypervascular mass surrounded the common, internal and external carotid arteries completely (Fig. 7). The adjacent nerves (CN X, CN XII, sympathetic chain and superior laryngeal nerves) were identified and kept away from the plane for dissection of the tumor. The tumor was dissected from common and internal carotid arteries in the adventitial layer closed to the arteries.

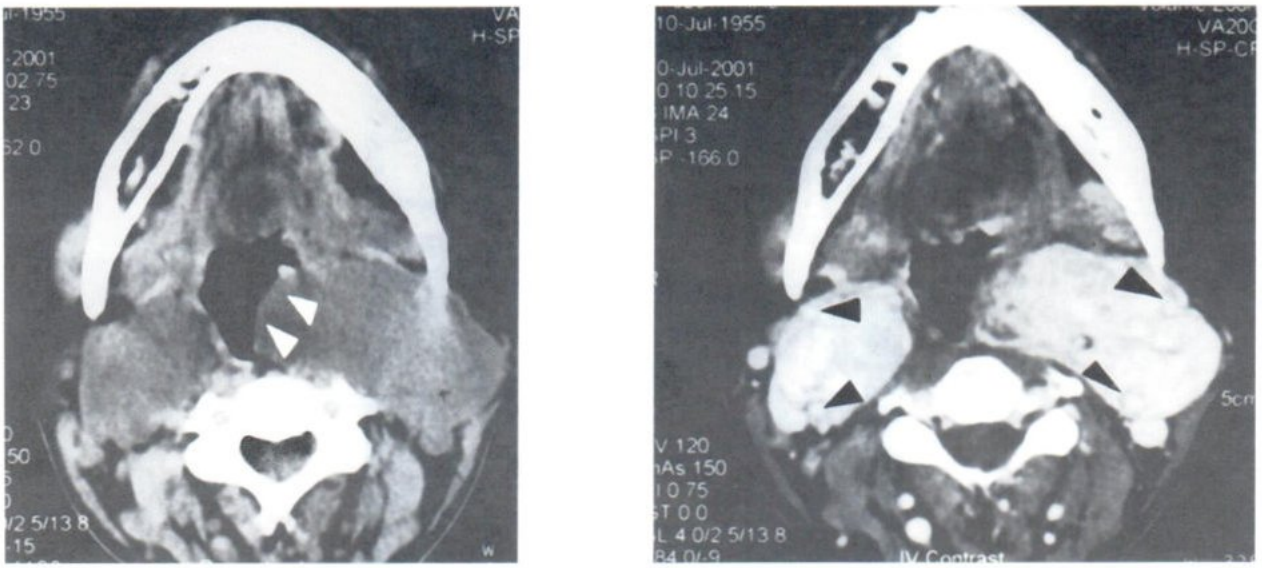
The external carotid artery was resected with the tumor. The patient had got left CN IX and superior laryngeal nerve palsies postoperatively.

The right sided mass was excised 2 months later. The tumor mass surrounded the carotid arteries partially. At this time the patient had got right CN IX and CN XII palsies postoperatively. Food and position modification were applied to the patient due to neurological deficits. Three months after the second operation, she has got full recovery of the neurological deficits.

Pathological study of both masses revealed the same findings of well defined, lobulated soft tissue mass with a fibrous pseudocapsule on gross specimen and visualized multiple tumor vessels of cut specimen (Fig. 8a). Microscopic study (Fig. 8b) reveal organoid growth pattern of cells as nests which contained of cuboidal, epitheloid cells and delicated vascularized fibrous septa which were termed Zellballen. Individual inner cells had moderately abundant granular cytoplasm. Bizzare nuclei are sometimes found, but lack of mitoses. The conclusive diagnosis was bilateral carotid body paragangliomas, without evidence of malignancy.

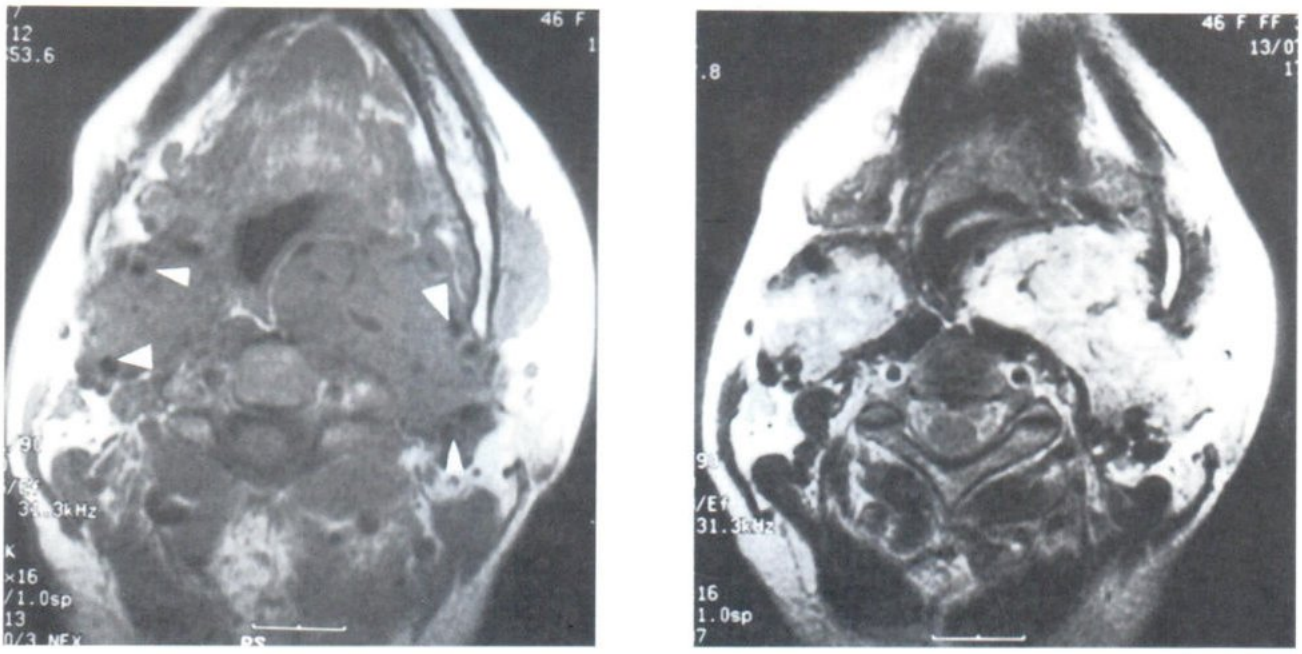
ICA = Internal Carotid Artery, **ECA** = External Carotid Artery

2d TOF MR = 2 Dimentional Time Of Flight Magnetic Resonance



1a 1b

Fig. 1 Axial CT scan (a) Homogeneous hypodensity of bilateral well defined carotid space mass with inward bulging into oropharyngeal airway (arrowhead) on precontrast image (b.) Intense enhancement of the masses after contrast injection with demonstrated splaying of ECA from OCA (arrowheads) at the carotid bifurcation by displacing ECA anteriorly ICA posteriorly



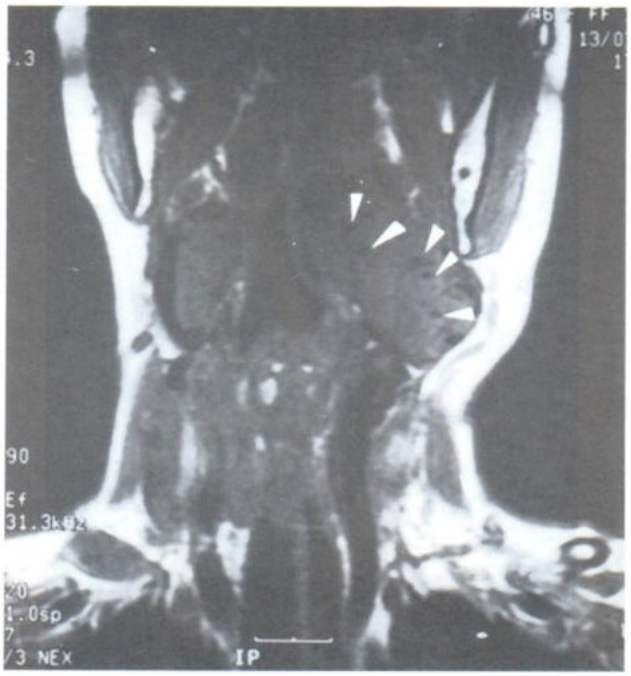
2a 2b

Fig. 2 Axial MR imagings (a.) The masses had isointensity to the muscles on T1W image with splaying of ECA from ICA (arrowheads) Internal serpentine and punctate flow void of tumor vessels within the masses is seen. (b.) More delineation of flow void tumor vessels among scattered hyperintense areas of slow flow and hyperintense of tumor stroma, giving "salt and pepper" appearance on T2W image.

3a

3b

Fig. 3 Three dimensional image reconstructions of helical CT ; SSD (Fig. 3a), MIP (Fig. 3b) Nicely shown bilateral carotid bifurcation masses, LT.mass (a.) and Rt. Mass (b.) with splaying of ECA from ICA at the carotid bifurcation



4a

4b

Fig. 4 Coronal MR imagings (a.) Multiple flow void structures within the isointense mass due to tumor vessels were shown (arrowhead) without area of hyperintensity of bleeding foci on T1W (b.) More conspicuous flow void structures in both masses among small scattered hyperintense foci of slow flow and hyperintense tumor stroma which was the characteristic "salt and pepper" appearance on T2W image

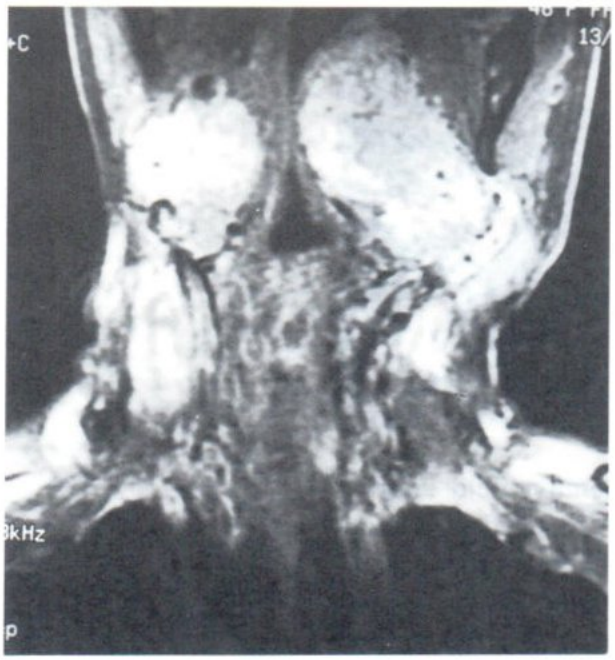
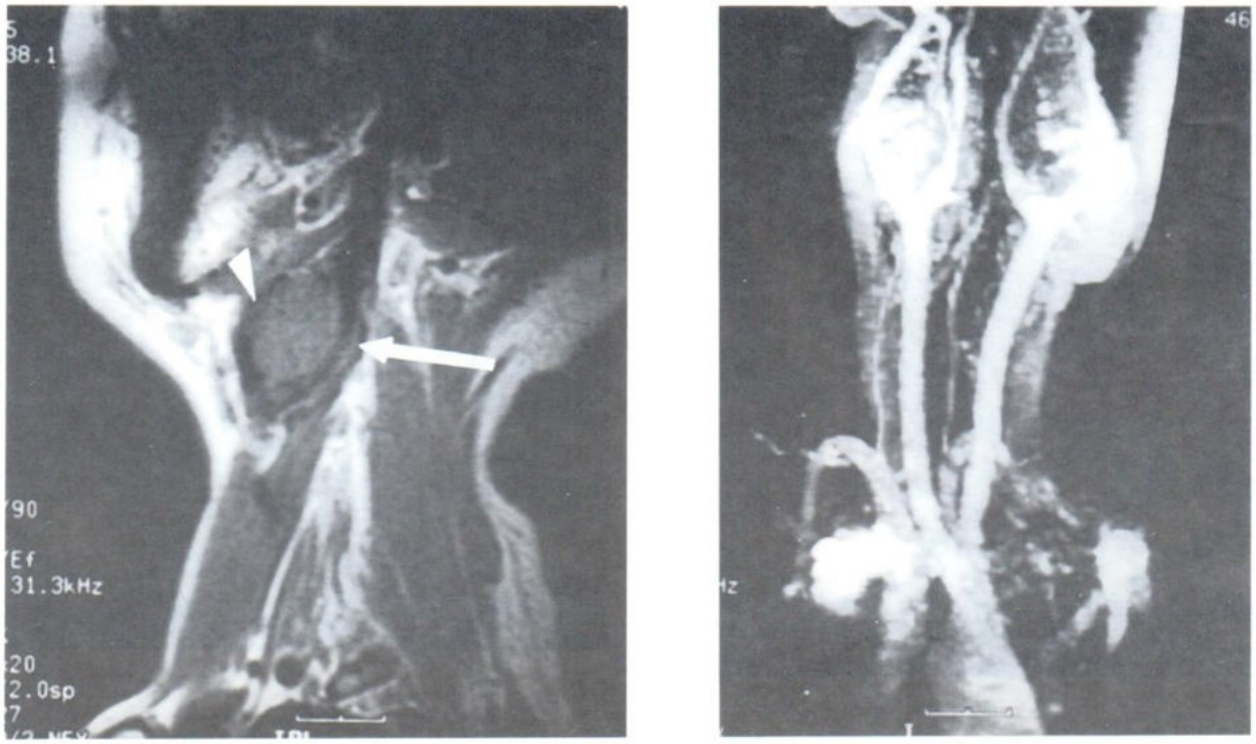


Fig. 5 Coronal MR imaging after post Gd-DTPA injection reveal homogeneous intense enhancement of the bilateral tumors causing more conspicuous internal flow void



6a 6b

Fig. 6 Sagittal Oblique T1W MR imaging (a.) and 2d TOF MR angiography (b.) : Nicely shown splaying of the carotid bifurcation, ECA (arrowhead) and ICA (arrow) in (a.)

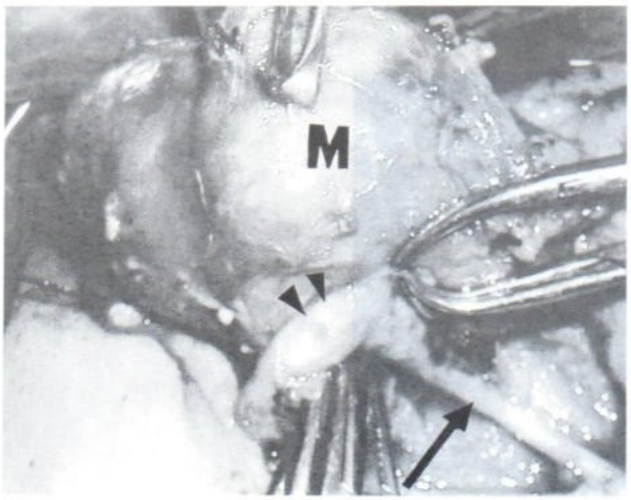
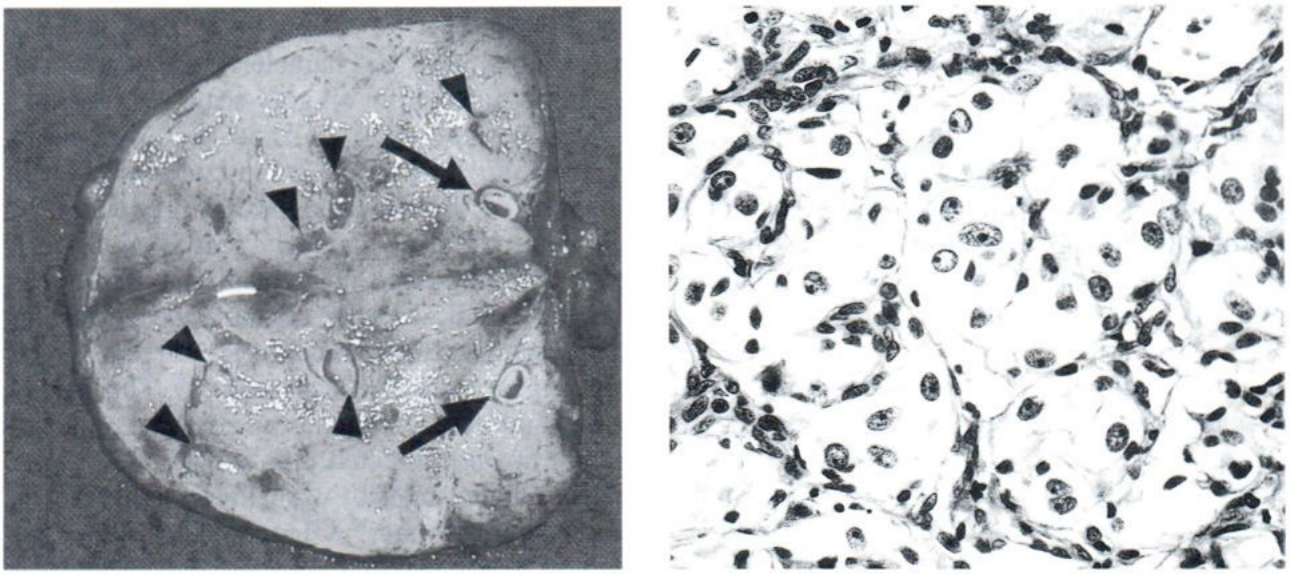


Fig. 7 Image from Intra-operative field ; during dissection the bigger Lt.sided mass from the adventitial layer at the carotid bifurcation, with demonstrated CCA (arrowhead) and ICA (arrow) ECA was incorpulated within the mass



8a 8b

Fig. 8 Pathologically images (a.) Cut surface of gross specimen revealed multiple tumor vessels (arrowheads) as in radiological images. ECA (arrow) was also demonstrated at the anterior part of the mass. (b.) Microscopic picture (40x) revealed the characteristic organoid growth pattern which termed Zellballen pattern with nests of cuboidal or epitheloid cells seperated by delicated vascularized fibrous septa. Individual inner cells have moderated abundant granular cytoplasm, bizarre nuclei are sometimes found, but lack of mitoses.

DISCUSSION

Paragangliomas account for 0.6 % of all neoplasms in the head and neck region and 0.03% of all neoplasms.[1] About 80 % of all paragangliomas are either carotid body tumors or glomus jugulare tumors.[2,3] Paragangliomas may be multicentric and may manifest as unilateral or bilateral lesions .These multicentric lesions may occur either synchronously or metachronously. The carotid body tumor is uncommon. After reviewing of the previous literatures of the carotid body paraganglioma within the last 9 years, there were a small number of patients about 10 cases within a 10 years period which comprised of 1-5 cases of bilateral tumors. These data supported the rarity of bilateral lesions. Bilateral carotid body occur in only 5% of sporadic and 33-38% of familial paragangliomas.[4] There was the largest series of 30 patients with these tumors with bilateral lesions in 16 patients over the 7 years period. The anatomy, physiology of the system, evaluation of the patients and their families including surgical techniques, postoperative sequelae were discussed by James L et al.[18] This tumor is a discrete mass found at the CCA bifurcation. The carotid body is situated within or outside the adventitial layer of each CCA at the level of their bifurcation. It commonly arises along the posteromedial wall at the bifurcation but may also be located along either the ECA or ICA. The carotid body initiates reflex changes in cardiovascular and respiratory activity and serves as a chemosensory reflex receptor by detecting changes in arterial partial pressures of oxygen and carbon dioxide, pHand other factors.[5,6,18,21] Then there was a case report of bilateral carotid body tumor and central alveolar hypoventilation by Roncoroni AJ, et al.[19] Known combinations of head and neck paragangliomas including vagal-

carotid body paragangliomas, carotid body-glomus jugulare tumor, carotid body-glomus jugulo-tympanicum tumors and simultaneous occurence of pheochromocytoma, papillary thyroid carcinoma, thyroid adenoma,[20] thymoma,[20] functioning extraadrenal paragangliomas,[5] and other endocrine disorders along with the carotid body tumor had also been reported, suggesting the possibility of a rare form of multiple endocrine neoplasia.[6]

Malignant behavior in head and neck paragangliomas is recognized with approximately the same frequency (2-13 % of cases) as in paragangliomas elsewhere in the body.[7] Metastatic involvement of the lungs, skull, vertebral bodies, cervical lymph nodes,[1] heart, liver, pancreas, pleura, dura mater, and skin have been described. Although some authors consider local invasion as a manifestation of metastatic spread, most autho-rities regard extension to regional lymph nodes or distant metastasis as the only reliable indicators of malignancy.[2,8,21] The prevalence of local recurrence and local invasion is estimated at only 10% for carotid body tumor,[2,8] but it's about 40%-50% for glomus jugulare tumor and 17% for vagal paragangliomas.[1]

The typical patient of the carotid body paraganglioma is middle-aged and present lated in the course of the disease, with a painless slow -growing mass. Only a few patients have clinical manifestations of compression symptoms include hoarseness of voice, lower cranial nerve palsies or carotid sinus syndrome. The overall prognosis of patients with a cervical paraganglioma is favorable. If there are bilateral tumors, the familial history should be asked.

But it may be a sporadic case as in our cases without a familial history, anyhow it may be found in a quite less frequency. Because of the hypervascularized nature of the tumor mass and arising within the adventitial layer of the CCA at the carotid bifurcation which produce the typical features of pulsatile masses with freely mobile in the horizontal direction on physical examination.

ICA = Internal Carotid Artery, **ECA** = External Carotid Artery **CCA** = Common Carotid Artery

Multiple radiological imaging modalities are helpful for the diagnosis of carotid body paragangliomas. The characteristic appearance of a carotid body tumor on gray-scale US scans is a round-to-oval, well defined, heterogeneous hypoechoic solid mass in the lateral neck with splaying of the common carotid bifurcation by displacing ECA anteriorly and ICA posteriorly.[9,10,11,12] By using a high resolution transducer, small vessel flow can be demonstrated within the tumor matrix. Encasement of the carotid vessels may occur on rare occasions.[10,21] The hypervascular nature of all tumor masses and predominantly upward directed intratumoral flow signal can be demonstrated by using the duplex and color doppler ultrasound.[22] CT scan shows homogeneous density mass with intense enhancement in post contrast study.

Splaying of the carotid bifurcation could be demonstrated on 3-D image reformations (MIP, SSD) of the helical CT. On MR imaging, paragangliomas typically exhibit a low signal or iso signal to the muscles on T1W sequence and a high signal intensity on T2W sequence with homogeneous intense enhancement on postcontrast study. Multiple serpentine and punctate areas of signal void characterize the typical paraganglioma with all MR sequences, these areas are variably distributed throughout the mass and are believed to represent flow voids in the larger intratumoral vessels as shown in our case. The "salt and pepper" appearance is very popularly used. The classical salt and pepper appearance was originally described by Olsen et al[11] from the appearances on T2W images. The "pepper" component represents the multiple areas of signal void interspersed with the "salt" component seen as hyperintense foci[12,2] (due to slow flow or hemorrhage) on both T1W, T2W images which there was less frequency of salt component. Some authors described this finding in another way by define the flow void of pepper among the background of salt or hyperintense tumor stroma on T2W or T1W post contrast images.[3] Scattered sites of high signal intensity on T2W, which contribute to giving the tumor a "salt and pepper"

MIP = Maximum Intensity Projection, **SSD** = Shaded Surface Display

appearance in our case, may be due to slow flow because there is no any hemorrhage within the tumor masses as shown in the gross specimen. This feature is limited to paragangliomas that are greater than 2 cm. in diameter[13] and is not considered diagnostic, as it has also been reported in other hypervascular lesions (metastatic hypernephroma, metastatic thyroid carcinoma). However accompanying this finding with splaying of the carotid bifurcation on T1W Sagittal or Sagittal oblique views, MRA could be helpful and characteristic in the diagnosis of these tumors. MR angiography may also be useful in defining the flow -related enhancement of feeding vessels in lesions larger than 1.5 cm. In addition from providing superior definition of location, extent, and characterization of paragangliomas, MR imaging also demonstrates better tumor involvement of the ICA and IJV in comparison with that seen with CT.[21] MR imaging can depict paragangliomas that are smaller than 5 mm., while CT examination with iodine contrast study allows the detection of tumors greater than 8 mm.in diameter.[14] For angiographic appearance, the typical appearance is a hypervascular mass with enlarged feeding arteries, intense tumor blush, and early draining veins. Rarely, avascular paragangliomas may occur. Carotid body tumor typically cause splaying of the ECA and ICA. The most common feeding vessels to any head and neck paraganglioma are the ascending pharyngeal artery (via the musculo-spinal artery) and the ascending cervical artery. With progressive tumor growth, other sources of arterial supply may be recruited from the facial, lingual, thyroid, posterior auricular, occipital, and deep cervical arteries.

The pathological features are a well defined, lobulated soft tissue mass within pseudocapsule with usually tan-gray to reddish-purple external surface of gross specimen[21] and multiple blood vessels on the cut surface as shown in our case. The characteristic microscopic pictures are organoid growth pattern seperated by numerous vascularized fibrous septa which termed Zellballen by Kohn which classically exhibit a nest architecture. Less commonly, trabecular, pseudorosette, or pseudoglandular patterns of cellular arrangements may be seen. The stroma surrounding these cells lines are the admixture of nerve fibers, endothelial cells, and vascular pericytes.

Optimal management of the carotid bifurcation paraganglioma is complete surgical resection. Surgery of carotid body tumor is a challenge to the surgeon because of the large vascularization of the tumor, involvement of the carotid vessels and the close anatomical relationship with the cranial nerves. It carries inherent risks of excessive blood loss and cranial nerve injury. Then a meticulous surgical technique is necessary. For our case, two surgeries were performed at different time and neither of them presented any morbidity.

CONCLUSION

A rare case of bilateral carotid bifurcation paragangliomas is presented. The clinical presentation, physical exam, radiological and pathologcal findings are characteristic as demonstrated. The literatures on carotid body paraganglioma are reviewed.

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IJV = Internal Jugular Vein

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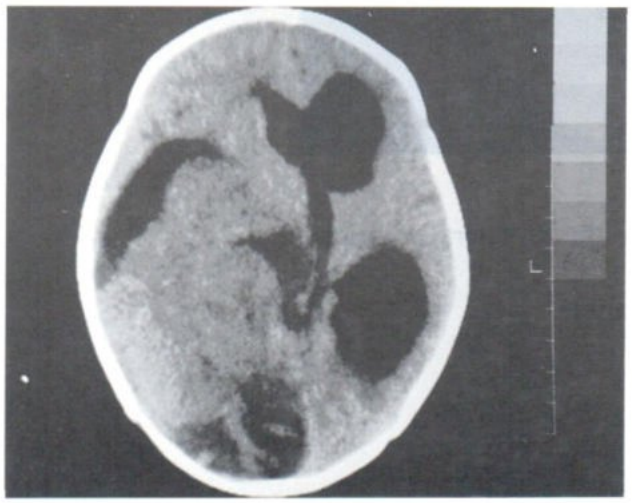
LATERAL VENTRICLE CHOROID PLEXUS IN INFANT. CASE REPORT AND REVIEW OF THE LITERATURE.

Pattama NAKBUMRUNG M.D.,[1] Parichad CHANPONG M.D.[2]

Choroid plexus papillomas are rare intracranial tumours of childhood. They usually occur within the first decade of life. Choroid plexus papillomas are benign lesions that arise from the epithelium of choroid plexus. We report a case of choroid plexus papilloma arising from the right lateral ventricle in a 6 months-old boy. The chief presenting signs and symptoms are drowsiness, poor feeding and papilledema. CT scans reveal a large intensely enhancing mass occupying in the right lateral ventricle with markedly hydrocephalus. The tumor was removed surgically and the pathological diagnosis was choroid plexus papilloma. In this report; we also discuss the pathology, radiologic manifestation by reviewing relevant literatures.

CASE REPORT

This 6 months-old boy was admitted at Suratthani Hospital with the symptoms of drowsiness and poor feeding. On physical examination, he had symptoms and signs of increased intracranial pressure such as projectile vomiting and papilledema, etc. The vital signs were normal. Plain skull films show no definite abnormalities. Cranial CT scan demonstrated a large intense enhancing well defined lobulated hetrogenous mass; about 6x9 cm, filling in the Rt. lateral ventricle and causing communicating hydrocephalus. The patient showed clinical improvement after the tumor was totally removed.



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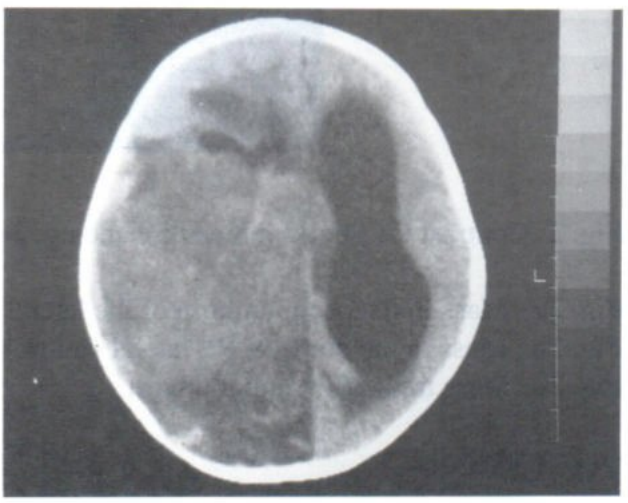

1b

Fig. 1 Pre-contrast CT reveals a large heterogenous isodense lobulated mass, 6x9 cm. In size filling in Rt. lateral ventricle with shifting of midline structure to the Lt. and markedly diffuse hydrocephalus.
Fig. 1a Mass in the Rt. occipital horn
Fig. 1b Mass in body Rt. lateral ventricle.

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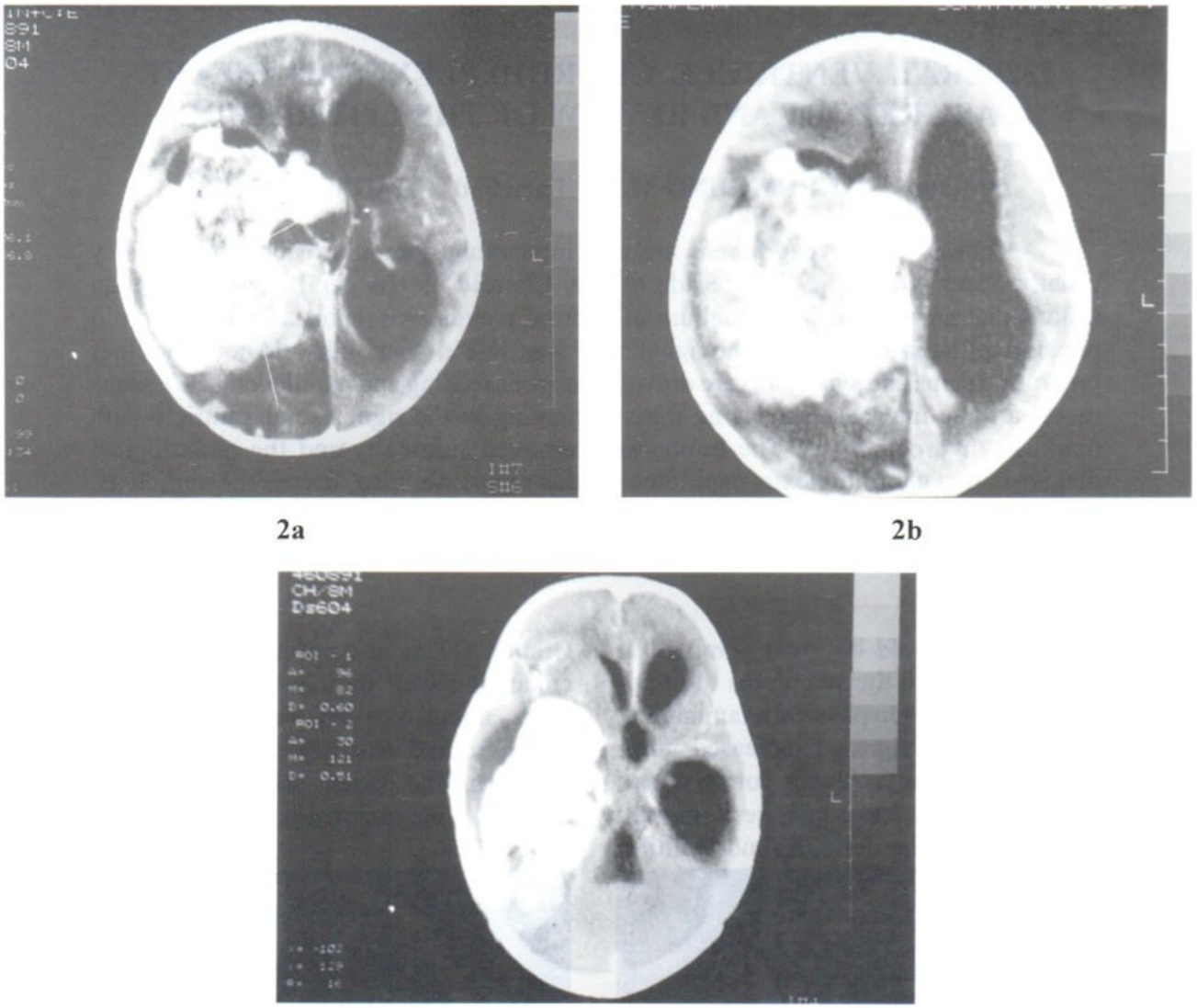

2a 2b

2c

Fig. 2 Contrast CT shows intense enhancing mass in the Rt. lateral ventricle

Fig. 2a Mass in Rt. occipital horn of the lateral ventricle
Fig. 2b Mass in the body of Rt. lateral ventricle
Fig. 2c Mass in the Rt. temporal horn.

DISCUSSION

Choroid plexus are rare and represent about 5% of supratentorial tumors and less than 1% of intracranial tumors in children.[2,3] They usually occur within the first decade of life and 20% -30% occur within the first year of life. They are most common in the neonate. These tumors arise from the epithelium of the choroid plexus.[3,4] The most common site is in the lateral ventricle. Ninety percent arise from the glomus of the lateral ventricle. The remaining papillomas arise from the fourth and third ventricle.[3,4] Histologically, these lesions consist of hyperplasia of both

the surface epithelium of the choroid plexus and the underlying vascular connective tissue core.[5] Occationally, the epithelium may exhibit malignant changes, and such tumors are then classified as carcinomas; these may extend into the adjacent brain parenchyma.[6] 5-10% of choroid plexus papilloma degenerate into carcinomas.[7] The symptoms are related to the large size of the lesion that produces a form of obstructive hydrocephalus. The literature states that choroid plexus papilloma produce an excess of CSF which contributes to the hydrocephalus. This is extremely rare. In the majority of cases, the hydrocephalus from choroid plexus papillomas is secondary to obstruction by the large mass effect of the lesion or results from hemorrhage and adhesions developing in the pathway of the flow of CSF.[8,9]

RADIOLOGIC FINDINGS:

On ultrasound,large choroid plexus papillomas appear as highly echogenic masses with irregular borders related to the glomus ofa the choid plexus and as associated with hydrocephalus. When tumor located in the third ventricle, the tumor can mimic acqueductal stenosis and the diagnosis may prove difficult, particularly in the prenatal period, unless the echogenic mass is visible.[8,9,10] Occationally, intratumoral cysts may also be seen on ultrasound in choroid plexus papillomas. If calcifications are present in the tumor, echogenic foci with shadowing may be seen. Typically, Dopplor ultrasound will show a biphasic flow on choroid plexus papillomas because of their highly vascular nature. This finding has been thought to be specfic for choroid plexus papillomas.[10-12]

CT:

On CT, choroid plexus papillomas may appear as well defined, homogeneous, usually hyperdense intraventricular masses. Tumor margins can be smooth (29%), lobulated (19%), or irregular (52%).[7] Irregular margins are found in 71% of malignant tumors and 43% of benign lesions. Papillomas are iso-dense or hyperdense to parenchyma in 75% of cases, and 25% are hypodense or heterogeneous.[11-13] Tumor calcification on CT has been reported in 24% of choroid plexus tumors.[14] Hemorrhage within the tumor may also be seen. In most case, there is fairly intense, homogeneous enhancement after infusion of contrast medium.[15] Most of the tumors are associated with marked hydrocephalus; occationally, a large mass in the trigone can cause entrapment of the ipsilateral temporal horn. Choroid plexus papillomas may show limited parenchymal invasion[13-17] and it may be difficult to distinguish benign from malignant choroid tumors on imaging studies.

MRI:

On MRI, the tumors appear as an intraventricular lobulated mass isointense or hypointense on T1-weighted images and hypointnse, isointense or hyperintense on T2-weighted images. If hemorrhage is present, the MRI signal intensity will depend upon the age and degree of hemorrhage. After administration of Gd, there is marked homogeneous enhancement.

The differential diagnosis of intraventricular tumor in children includes choroid plexus papilloma, glioma, choroid cyst,ependymoma, teratoma, dermoid, epidermoid ,metastasis and tumors deposited by CSF seeding. Metastasis are unlikely in a young patient. Choroid cyst, epidermoid, dermoid, teratoma, and most craniopharyngiomas can be excluded by their CT and magnetic resonance features.[18-22] Supratentorial ependymomas usually have an intraventricular portion smaller than the component of the tumor mass invading the parenchyma. Choroid plexus papillomas and gliomas possess similar features and may be confused with each other radiographically.[23-25] Choroid plexus papillomas have a lobulated appearance and can be partially differentiated from intraventricular meningioma based on it appearance. Intraventricular meningiomas are round, well-circumscribed lesions, where as choroid plexus papillomas demonstrated a more lobulated appearance.[7]

SUMMERY

Choroid plexus papilloma is a rare tumor found in children which causes communucating hydrocephalus from the results of complex interaction of CSF overproduction and partial restriction of CSF flow as confirmed by previous literatures. The typical radiologic manifestations are intense enhancing lobulated intraventricular mass. The findings may be difficult to be differentiated from other intraventricular masses. Cranial ultrasound is the first image modality in fetus. CT and MRI also offer diagnostic tools to confirm the type of hydrocephalus and tumor evaluation.

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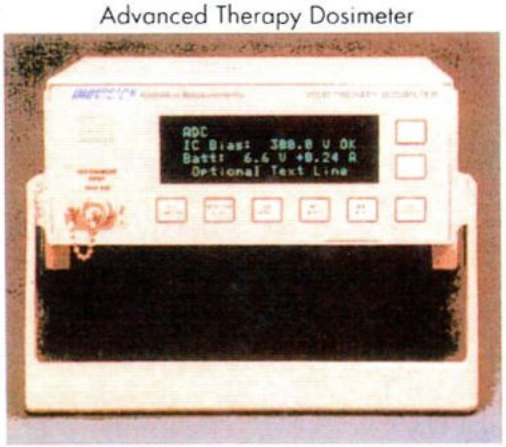

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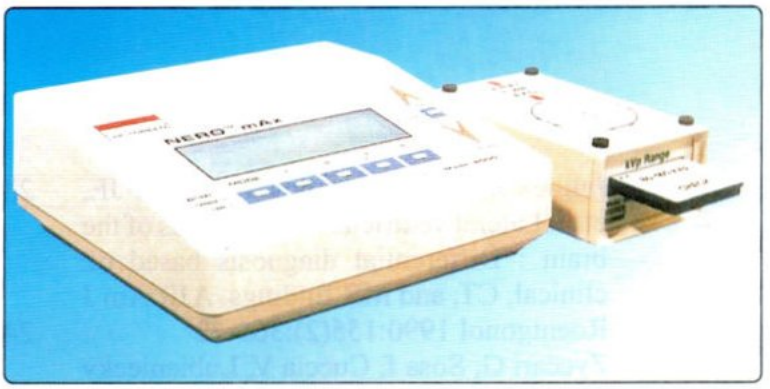

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SELECTIVE NON-OPERATIVE MANAGEMENT OF BLUNT ABDOMINAL TRAUMA USING COMPUTED TOMOGRAPHY

Nittaya CHAMADOL, MD.,[1] Siwanit OJONGPHIAN, MD.,[1]
Chaiyut THANAPISAN, MD.[2]

ABSTRACT

OBJECTIVE: To determine the accuracy of computed tomography (CT) scan in the evaluation and grading of the severity of blunt abdominal organ injury for the purpose of selecting patients who can be managed conservatively. To compare the CT grading system (using organ injury scaling of the American Association for Surgery of Trauma: AAST) with the trauma score : abbreviated injury score and injury severity score (AIS, ISS) and clinical outcome in patients who were treated by conservative and surgical management.

MATERIALS AND METHODS: Twenty-two patients suspected of intraabdominal organ injury who underwent complete CT scan study from January 1994 to October 1999 were analyzed and graded according to organ injury scale (OIS) grading system (Table 1-7). The clinical records of these patients were reviewed and correlated with the CT grading system, trauma score and clinical outcome.

RESULTS: Seven patients had liver injury, four of them (58%) received conservative treatment, mean OIS=II, mean ISS=12.25. Three patients (42%) were treated by surgery, mean OIS=III, and ISS=30. One of them was operated due to jejunal perforation that was missed on initial CT scan. Four patients had splenic injury, 1 case (25%) had successful conservative treatment, OIS=II, ISS=9, and 3 cases (75%) underwent surgery, OIS ranged from III-IV, ISS=21.3. Three patients had pancreatic injury, 2 in the three patients (67%) had conservative treatment, OIS range II-III, ISS=9, and in the remaining one patient (33%) underwent surgery due to duodenal perforation that was missed on CT scan, OIS=II, ISS=10.Two patients in renal injury group, mean OIS ranged from I-III, ISS=7.5, had successful conservative treatment. One patient who had bladder injury, OIS=IV, ISS=21 underwent surgical management without complication. One patient with clinical suspicion of renal injury had only abdominal wall hematoma, ISS=9. Two cases were negative CT scan, had very low ISS (ISS=1). One patient with retroperitoneal hematoma received percutaneous drainage with good result.

CONCLUSION: CT scan is the investigation of choice, having high accuracy in the diagnosis and grading of the severity of blunt abdominal trauma particularly in solid organ injury. There are difference of trauma score (OIS, ISS) between patients who underwent conservative and surgical management that can be used for prediction and evaluation in the selection of non-operative management of blunt abdominal trauma.

AIS = Abbreviated Injury Score, **ISS** = Injury Severity Score, **OIS** = Organ Injury Scale

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INTRODUCTION

CT scan can now provide rapid and accurate diagnosis of abdominal trauma in detection of hemoperitoneum and solid organ injury.[1] Non-operative approach is becoming the standard of practice for hemodynamically stable patients.

The purposes of this study were to determine the accuracy of CT scan in the evaluation and grading of the severity of blunt abdominal organ injury for the purpose of selecting patients who can be managed conservatively, and to compare the CT grading system using organ injury scale (OIS) with the trauma score (AIS, ISS) and the clinical outcome in patients who were managed by conservative and surgical treatment.

MATERIALS AND METHODS

The records of the patients suspected of intraabdominal organ injury admitted to Srinagarind Hospital from January 1994 to October 1999 were reviewed retrospectively. Forty two patients were examined with CT scan, but only 22 patients with complete study were included in this review. There were 16 male, and 6 female patients, age ranged from 3 to 50 years. All of them underwent abdominal CT scan for evaluation of their injury prior to any surgical intervention. They were considered hemodynamically stable, or were quickly and easily resuscitated on admission.

The examinations were performed with either conventional CT scanner (GE 9800 Quick, Milwaulkee), or spiral CT scanner (Toshiba, Exvision) taken at 60 seconds after starting a bolus of contrast medium (100 ml, 300% contrast medium) by mechanical injector at the rate of 3 ml/sec or bolus hand injection. All abdominal CT scans were reviewed by experienced radiologists. The serial section of the scans were evaluated with scoring system reported by the AAST known as organ injury scale (OIS) (Table 1-7) and correlated with trauma score (AIS, ISS).[15-17]

RESULTS

The patients were classified according to organs injury, such as liver injury (7 patients), splenic injury (4 patients), pancreatic injury (4 patients), renal injury (2 patients), bladder injury (1 patient) , retroperitoneal hematoma (1 patient), abdominal wall hematoma (1 patient), and negative study (2 patients).

The data of organ injury, CT grading system (OIS) compared with mean ISS and clinical outcome was shown in table 8.

In liver injury group, 4 of 7 patients (53%) were managed by conservative treatment successfully, OIS= II, and mean ISS=12.25 (Fig.1). Three patients (47%) were operated, OIS I-II, mean ISS=30. Jejunal injury was missed on initial CT scan in one patient. ISS in the surgical group is markedly higher than in the non-surgical group.

In splenic injury , the OIS in surgical group ranged from III to V, which was higher than in non-surgical group (OIS=2), and ISS was also higher (Fig.2,3).

In pancreatic injury, the OIS in non-surgical group ranged from II to IV, that was higher than in surgical group. However the patient in surgical group went to surgery because of associated duodenal perforation (Fig.4).

In renal injury, the OIS ranged from I-III, mean ISS=7.5 All of them had successful non-surgical management (Fig.5).

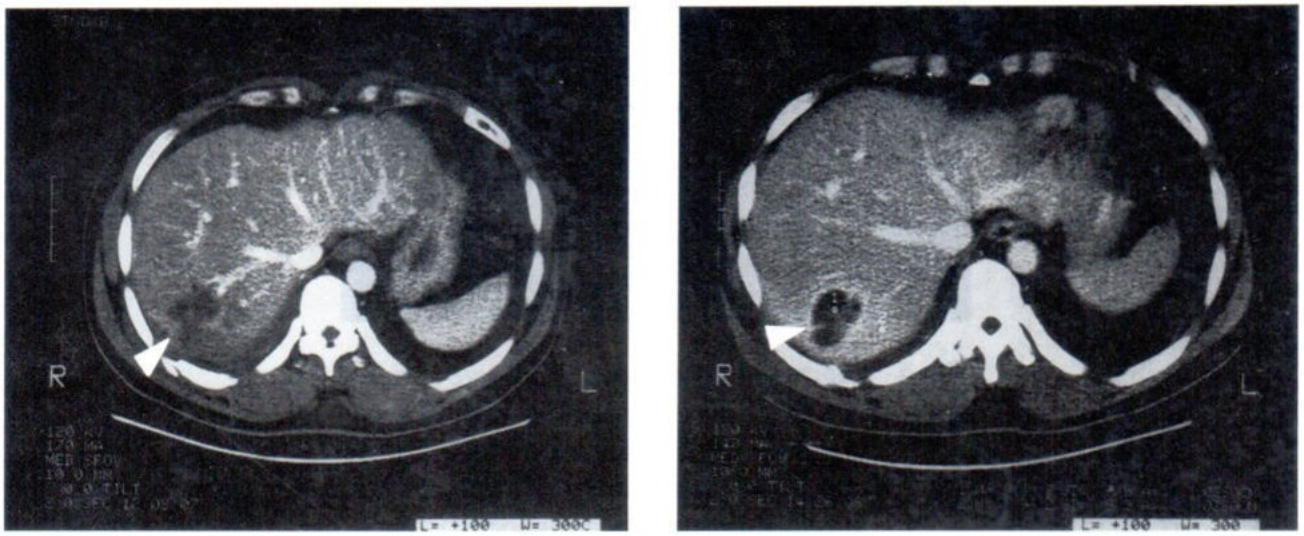
One patient with bladder injury had OIS grade IV, ISS=21, underwent surgical treatment without complication (Fig.6).

One patient with suspected renal injury had only abdominal wall hematoma, ISS=9. One patient with retroperitoneal hematoma without identifiable organ injury received percutaneous drainage with good results.

OIS = Organ Injury Scale, **AIS** = Abbreviated Injury Score, **ISS** = Injury Severity Score

Two cases with negative CT scan had very low ISS.

There was high accuracy in predicting solid organ injury by CT scan. The diagnosis was correct in all patients at surgery. But bowel injury was missed on initial evaluation.



1A 1B

Fig 1 Liver injury grade II. There is contusional hematoma at posterior segment of right lobe liver. (arrow)A The patient underwent conservative treatment and follow up CT scan shows resolved hematoma.(arrow) B.

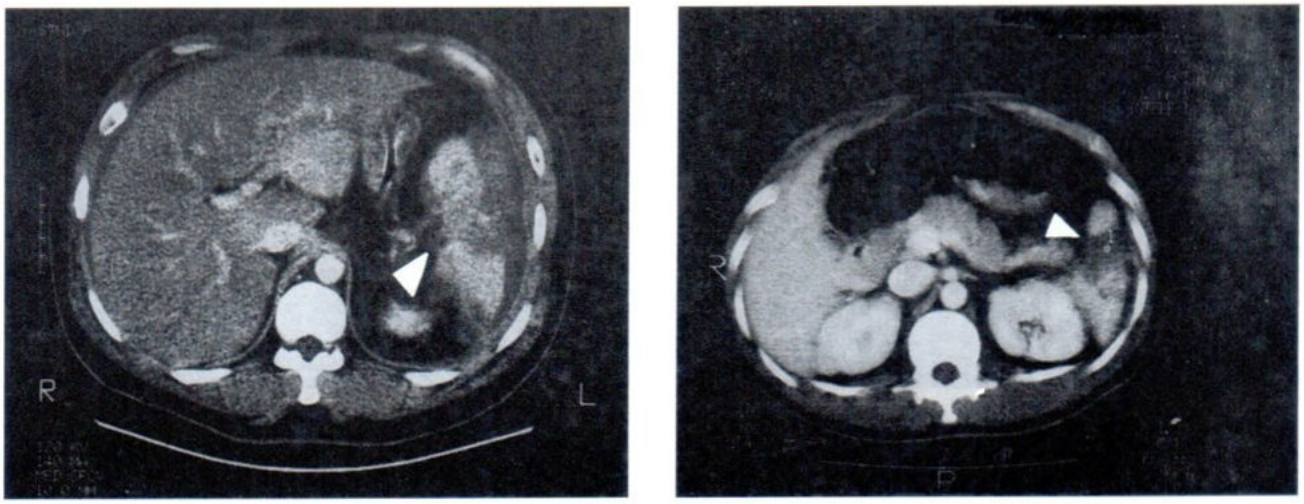


Fig 2 Splenic injury grade V. The CT image shows shattered spleen with hilar vessel injury. (arrow) He underwent splenectomy and no complication.

Fig 3 Splenic injury grade II. There is splenic laceration at lower pole of spleen (arrow) with intraparenchymal hematoma less than 5 cm. He received conservative management.

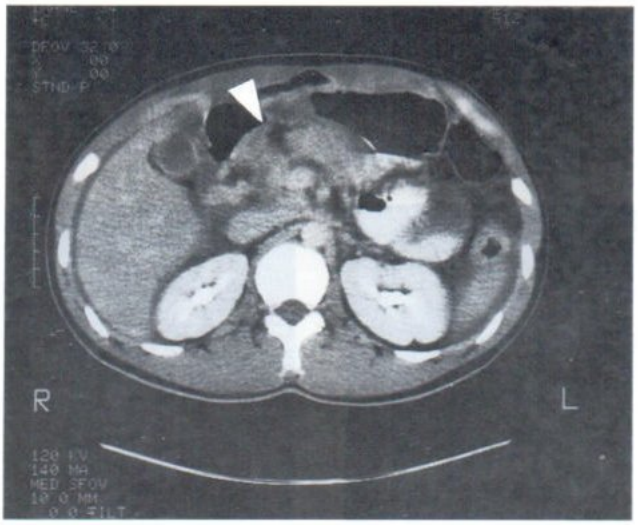
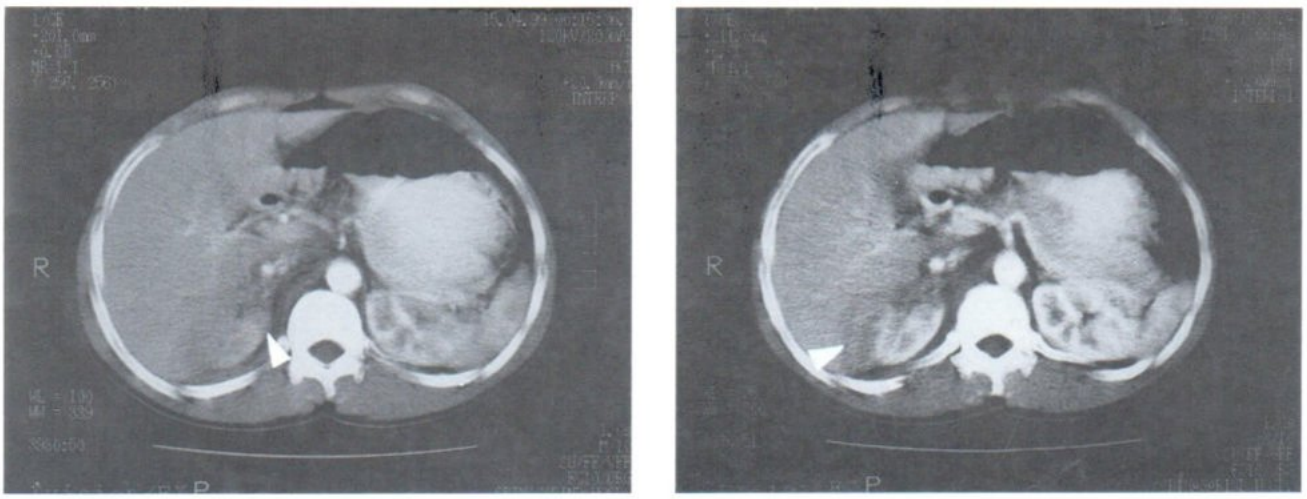


Fig 4 Pancreatic injury grade IV. There is fracture at the neck of pancreas with blurring of retroperitonea fat plane. (arrow) He underwent conservative treatment, l ater developed pancreatic pseudocyst.



5A **5B**

Fig. 5 Renal injury grade II. There is laceration at medial aspect of upper pole of right Kidney. (arrow) A Evidence of minimal subcapsular and perinephric hematoma as shown in B. (arrow) He underwent conservative treatment with good result.

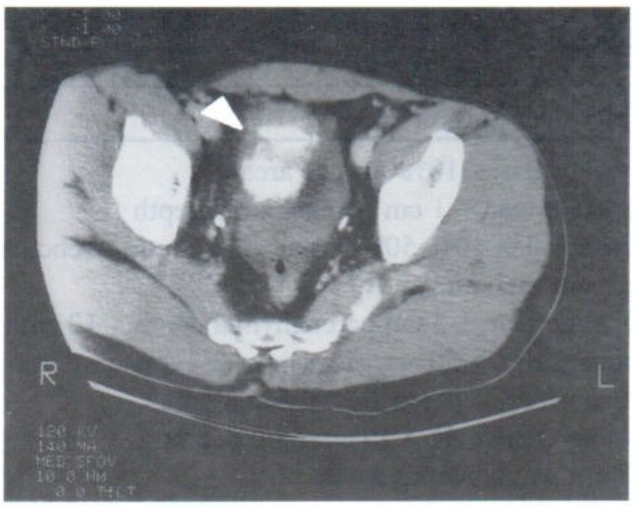


Fig. 6 Bladder injury grade IV. This image shows rupture bladder (intraperitoneal type). There is hematoma at dome of urinary bladder with intraperitoneal hematoma. He underwent surgery and without complication.

Table 1. Spleen injury scale

	Grade*	Injury Description	AIS
I	Hematoma	Subcapsular, < 10% surface area	2
	Laceration	Capsular tear, < 1 cm parenchymal depth	2
II	Hematoma	Subcapsular, 10%-50% surface area; intraparenchymal, < 5 cm in diameter	2
	Laceration	Capsular tear, 1-3 cm parenchymal depth which does not involve a trabecular vessel	2
III	Hematoma	Subcapsular, > 50% surface area or expanding; ruptured subcapsular or parenchymal hematoma; intraparenchymal, < 5 cm or expanding	3
	Laceration	> 3 cm parenchymal depth or involving trabecular vessel	3
IV	Laceration	Laceration involving segmental or hilar vessels producing major devascularization (>25% of spleen)	4
V	Laceration	Completely shattered spleen	5
	Vascular	Hilar vascular injury which devascularizes spleen	5

* Advance one grade for multiple injuries up to grade III.

Modified from journal of trauma: Moore EE, Cogbill TH, Jurkovich GJ, Shackford SR, Malangoni MA, Champion HR. Organ injury scaling: Spleen and Liver (1994 revision). J Trauma 1995;38:323 24.

AIS = Abbreviated Injury Score

Table 2. Liver injury scale

	Grade*	Injury Description	AIS
I	Hematoma	Subcapsular, < 10% surface area	2
	Laceration	Capsular tear, < 1 cm parenchymal depth	2
II	Hematoma	Subcapsular, 10%-50% surface area; intraparenchymal, < 10 cm in diameter	2
	Laceration	Capsular tear, 1-3 cm parenchymal depth < 10 cm in length	2
III	Hematoma	Subcapsular, > 50% surface area or expanding; ruptured subcapsular or parenchymal hematoma; intraparenchymal, > 10 cm or expanding	3
	Laceration	> 3 cm parenchymal depth	3
IV	Laceration	Parenchymal disruption involving 25%-75% of hepatic lobe or 1-3 Couinaud's segments within a single lobe	4
V	Laceration	Parenchymal disruption involving > 75% of hepatic lobe or > 3 Couinaud's segments within a single lobe	5
	Vascular	Juxtahepatic venous injuries; i.e., retrohepatic vena cava/central major hepatic veins	5
	Vascular	Hepatic avulsion	6

* Advance one grade for multiple injuries up to grade III.
Modified from journal of trauma: Moore EE, Cogbill TH, Jurkovich GJ, Shackford SR, Malangoni MA, Champion HR. Organ injury scaling: Spleen and Liver (1994 revision) 1995;38:323-24.

AIS = Abbreviated Injury Score

Table 3. Pancreatic injury scale

	Grade*	Injury Description +	AIS
I	Hematoma	Minor contusion without duct injury	2
	Laceration	Superficial laceration without duct injury	2
II	Hematoma	Major contusion without duct injury or tissue loss	2
	Laceration	Major laceration without duct injury or tissue loss	3
III	Laceration	Distal transection or parenchymal injury with duct injury	3
IV	Laceration	Proximal* transection or parenchymal injury involving ampulla	4
V	Laceration	Massive disruption of pancreatic head	5
.81, .91 = Head; .82, .92 = Body; .83, .93 = Tail			

* Proximal pancreas is to the patients' right of the superior mesenteric vein. * Advance on grade for multiple injuries to the same organ. + Based on most accurate assessment at autopsy, laparotomy, or radiologic study.

Table 4. Duodenal organ injury scale

	Grade*	Injury Description +	AIS
I	Hematoma	Involving single portion of doudenum	2
	Laceration	Partial thickness, no perforation	3
II	Hematoma	Involving more than one portion	2
		LacerationDisruption <50% of circumference	4
III	Laceration	Disruption 50-75% circumference of D2	4
		Disruption 50-100% circumference of D1, D3, D4	
IV	Laceration	Disruption > 75% circumference of D2	5
		Involving ampulla or distal common bile duct	
V	Laceration	Massive disruption of duodenopancreatic complex	5
	Vascular	Devascularization of duodenum	5

D1 = 1st portion duodenum, D2=2nd portion duodenum, D3=3rd portion duodenum, D4=4th portion duodenum.

* Advance on grade for multiple injuries to the same organ.

+ Based on most accurate assessment at autopsy, laparotomy, or radiologic study.

Note: Table3,4 modified from journal of trauma: Moore EE, Cogbill TH, Malangoni MA, Champion HR, Shackford SR, Pachter HL, et al: Organ injury scaling, II: Pancreas, Duodenum, Small bowel, Colon, and Rectum. J Trauma 1990;30:1427-9.

Table 5. Small bowel organ injury scale

	Grade*	Injury Description +	AIS
I	Hematoma	Concusion or hematoma withour devasculari zation	2
	Laceration	Partial thickness, no perforation	2
II	Laceration	Laceration < 20% of circumference	2
III	Laceration	Laceration ≥ 50% of circumference without transection	3
IV	Laceration	Transection of the small bowel	4
V	Laceration	Transection of the small bowel with segmemal tissue loss	4
	Vascular	Devascularization segment	4

* Advance on grade for multiple injuries to the same organ.

+ Based on most accurate assessment at autopsy, laparotomy, or radiologic study.

Modified from journal of trauma: Moore EE, Cogbill TH, Malangoni MA, Champion HR, Shackford SR, Pachter HL, et al: Organ injury scaling II: Pancreas, Duodenum, Small bowel, Colon, and Rectum. J Trauma 1990;30:1427-9.

Table 6. Renal injury scale

	Grade*	Injury Description +	AIS
I	Contusion:	Microscopic or gross hematuria; urologic studies normal	2
	Hematoma:	Subcapsular, nonexpanding without parenchymal laceration	2
II	Hematoma:	Nonexpanding perirenal hematoma confined to renal retroperitoneum	2
	Laceration:	<1.0 cm parenchymal depth of renal cortex without urinary extravasation	2
III	Laceration:	>1.0 cm parenchymal depth of renal cortex without collecting system rupture or urinary extravasation	3
IV	Laceration:	Parenchymal laceration extending through the renal cortex, medulla and collecting system	4
	Vascular:	Main renal artery or vein injury with contained hemorrhage	4
V	Laceration:	Completely shattered kidney	5
	Vascular:	Avulsion of renal hilum which devascularizes kidney	5

* Advance on grade for multiple injuries to the same organ.
+ Based on most accurate assessment at autopsy, laparotomy, or radiologic study.

Modified from journal of trauma: Moore EE, Shackford SR, Pachter HL, Champion HR, Malangoni MA, McAninch JW, et al: Organ injury scaling: Spleen, Liver and Kidney. J Trauma 1989;29:1664-6.

Table 7. Bladder organ injury scale

	Grade*	Injury Description	AIS
I	Hematoma	Contusion, intramural hematoma	2
	Laceration	Partial thickness	3
II	Hematoma	Extraperitoneal bladder wall laceration < 2 cm	4
III	Laceration	Extraperitoneal (> 2 cm) or intraperitoneal (<2 cm) bladder wall lacerations	4
IV	Laceration	Intraperitoneal bladder wall laceration > 2 cm	4
V	Laceration	Intra or extraperitoneal bladder wall laceration extending into the bladder neck or ureteral orifice (trigone)	4

* Advance on grade if multiple lesions exist.

Modified from journal of trauma: Moore EE, Cogbill TH, Jurkovich GJ, Champion HR, Malangoni, MA, Shackford SR, et al: Organ injury scaling III:Chest wall, Abdominal vascular, Ureter, Bladder, and Urethra. J Trauma 1992;33:337-9.

AIS = Abbreviated Injury Score

Table 8. Relationship between organ injury, CT grading (OIS), injury severity score (ISS),and management

Organ	Number of patient (n)	Non-Surgery			Surgery			Accuracy by CT Vs Surgery
		OIS	No(n)	mean ISS	OIS	NO(n)	mean ISS	
Liver	7	Gr II	4	12 .25	Gr I	1	30	correct
					Gr II	1		missed iejunal
perforation								
					Gr III	1		correct
spleen	4	Gr II	1	9	Gr III	1	21.3	correct
					Gr V	2		
Pancreas	4	Gr II	1	9	Gr II	1	10	missed duodenal
perforation								
		Gr III	2					
Renal	2	Gr II	2	7.5	-	-	-	
Bladder	1	-	-	-	Gr IV	1		correct
Abdominal wall hematoma	1	-	-	9	-	-	-	
Retroperitoneal hematoma	1	-	-	9	-	-	-	
Negative Study	2	-	-	1	-	-	-	

OIS = Organ Injury Scale, **ISS** = Injury Severity Score

DISCUSSION

CT scan is recommended for blunt abdominal trauma patients with clinical suspicion of intraabdominal organ injury who are hemodynamically stable. The procedure was reported as possessing great accuracy in the diagnosis of both hemoperitoneum and organ damage.[2-7] The CT scan is graded according to organ injury scale in the prediction of successful selective non-operative management of blunt abdominal organ injury. The previous study by Wing et al[9] reported 97.6% accuracy in the diagnosis of organ damage. In our study, the accuracy in the diagnosis of solid organ injury was 100%.

The study by Umlas et al[8], showed unclear severity of splenic injury as described by CT when compared to the clinical outcome, but our study found it to be completely accurate in grading the diagnosis of splenic injury.

In our study, the bowel injury was missed in 2 cases (duodenal and jejunal injury). The limitation of interpretation is probably caused by inappropiated technique for window width setting and bowel opacification. In one prospective study of blunt trauma, CT scan showed a sensitivity of only 25% in the detection of duodenal and small intestine injuries.[10]

There were many reports on CT grading in surgical and conservative management of solid organ injury.[11-14] The OIS grade I to III were treated with conservative treatment while OIS grade III to V had surgical treatment. Similar result was found by us. The patients with OIS grade III will go to surgery or not, depend on clinical evaluation and associated injury.

Our study showed that all patients in non-surgical group have ISS less than twenty, and in surgical group, most patients (91%) have ISS more than twenty, except in two patients who were operated because of bowel injury. Furthermore, patients with high grade OIS, also had high ISS, but patients with low grade OIS may had either low ISS or rather high ISS, depending on associated other organ injury. The negative study patients had very low ISS.

CONCLUSION

CT is the investigation of choice for the diagnosis of solid organ injury with high accuracy in evaluation and grading of severity of blunt abdominal trauma. The difference in OIS and ISS in patients who underwent conservative and surgical management can be used for prediction and evaluation in selective non-operative management of blunt abdominal trauma.

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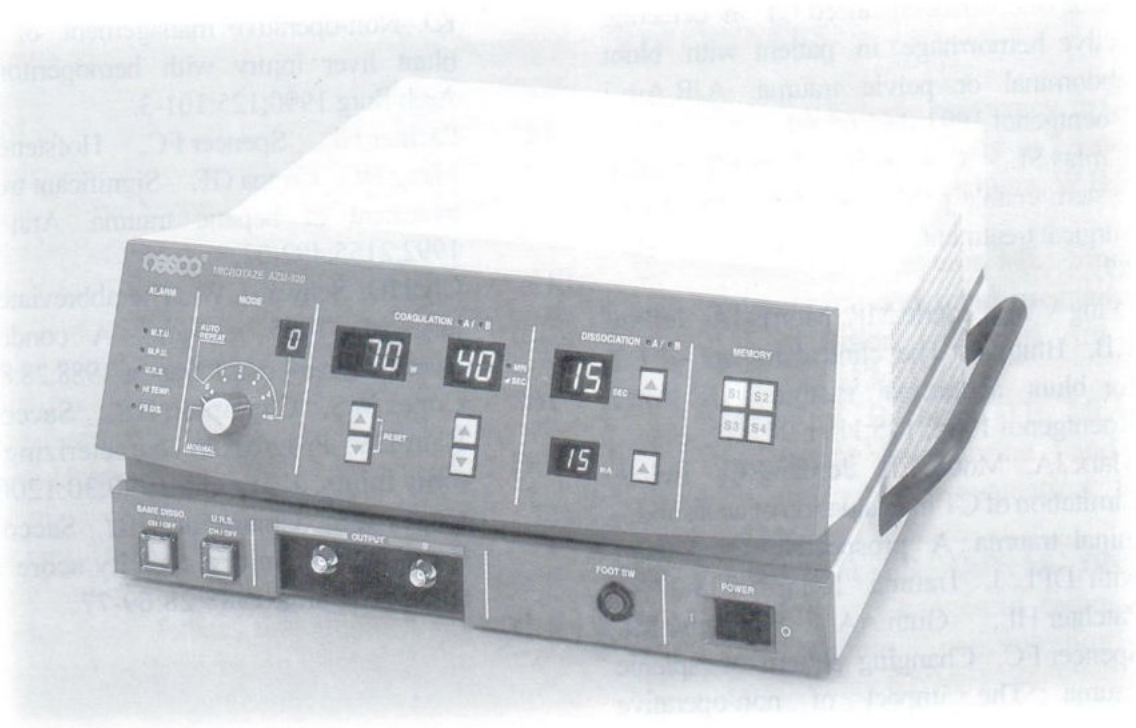

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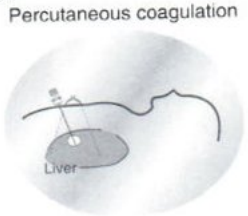

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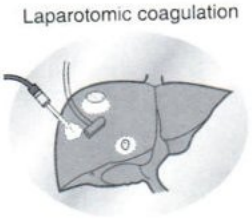

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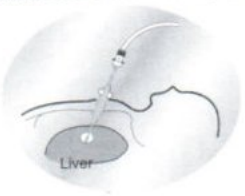

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PORTAL VEIN ANEURYSM: ULTRASOUND IDENTIFICATION.

Wannee OJARUSPORN, MD, and Chusak SIRIVANICHAI, MD

ABSTRACT

Portal vein aneurysm is a rare clinical entity with less than 50 published cases in the English literature. With the more frequent uses of radiological imaging modalities in the evaluation of abdominal complaints, this pathology will be more common than previously recognized. The radiologist must be aware of these aneurysms and their imaging features. We present two patients who were incidentally diagnosed with an extrahepatic portal vein aneurysm. The sonographic appearance of an anechoic saccular or fusiform vascular mass contiguous with the portal vein or its tributaries is diagnostic of a portal vein aneurysm. Etiology, clinical significance and management strategies for extrahepatic portal vein aneurysms are discussed.

Venous aneurysms seldom occur, secondary to the low velocity and low pressure flow state that exist in veins. They appear most frequently in the neck and in the lower limbs.[1] Aneurysm of the portal vein is the most common visceral venous aneurysm.[2] Because they occur so infrequently, they may be confused with arterial aneurysms, pancreatic or hepatic cysts. Color duplex sonography provides an excellent mean of definitively diagnosing portal vein aneurysms and can be used as a noninvasive means for follow-up evaluation.

We recently encountered two cases of extrahepatic portal vein aneurysm. Both lesions were incidentally detected by a routine sonographic examination.

CASE REPORTS

CASE 1

A 42-year-old man who had no major medical problems presented with chronic abdominal pain and dyspepsia. There was no previous or present history of liver, gallbladder, or pancreatic diseases, nor any signs of portal hypertension. Physical examination and liver function test were within normal limits. An abdominal sonogram demonstrated a fusiform dilatation of the extrahepatic portal vein about the confluence of the superior mesenteric vein and splenic vein with a maximum diameter of 4 cm. (Fig. 1). No other abdominal pathology was identified. Angiography was performed and confirmed the diagnosis.

CASE 2

A 57-year-old man was referred for an abdominal ultrasound examination to monitor the aortic dissection. The patient gave no history of underlying liver disease or pancreatitis. Stigmata of chronic liver disease and signs of portal hypertension were absent on physical examination.

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Laboratory analysis revealed mild elevation of liver- associated enzymes but was otherwise normal. Abdominal sonogram demonstrated a dilatation of the main portal vein at the junction of the splenic and superior mesenteric veins measuring 2.5cm in diameter (Fig. 2). The liver contour was smooth and the echogenicity was normal as well as the pancreas and spleen.

Fig. 1 Transverse ultrasound scan of epigastrium reveals fusiform dilatation of the extrahepatic portal vein (M) measuring 4x3.5x2.6 cm. GB= gallbladder

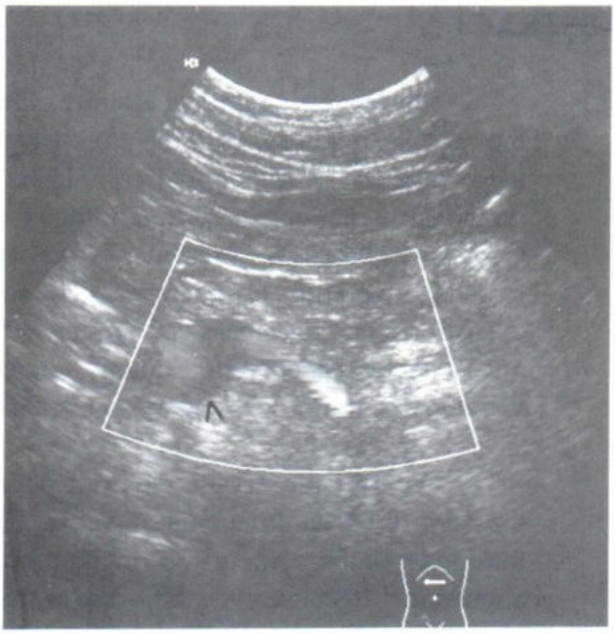

Fig. 2 Transverse color Doppler ultrasound scan of epigastrium shows color in the normal sized splenic vein and 2.5 cm portal vein aneurysm (arrowhead).

DISCUSSION

Portal vein size can show considerable individual variations; therefore, it is hard to define clearly a size at which the diagnosis of a portal vein aneurysm is appropriate.[3,4] The diameter of the main portal vein varies between 0.64 cm and 1.2 cm, with an average diameter of 0.89cm in patients without liver disease.[4-6] Doust and Pearce,[7] studied both normal and cirrhotic patients by ultrasound and the maximum anteroposterior diameter did not exceed 15 mm in normals and 19mm in cirrhotics. Thus, any dilatation of the main portal vein more than 2.0 cm with a saccular or fusiform shape may be termed an aneurysm.[4,5] The typical saccular aneurysmal appearance may be more important in making the diagnosis than the actual dimension of the vein.[8]

The exact etiology of portal vein aneurysm is still debated. All are true aneurysms involving all layers of the vessel wall and be either congenital or acquired.[5]

Two theories are given in the literature as probable causes for the congenital form: 1) failure of regression of the vitelline veins that form the portal vein during embryological development;[9] or 2) inherent weakness of the vein wall

and subsequent dilatation under normal portal pressure.[4,5]

Acquired aneurysms can result from injury to the vessel wall. This injury may be secondary to inflammation in the portal venous wall, blunt or direct trauma, or thrombus formation within the vessel, which irritates and causes disruption to the wall of the portal vein.[5] Portal vein aneurysm may result from infection in a remote site, such as the appendix, that is carried through the bloodstream and attacks the portal system. Inflammation or infection of adjacent structures, such as the gallbladder or pancreas, have also been shown to destroy or alter the integrity of the vessel wall, leading to aneurysm formation[4-6,10]

The most commonly reported cause of an acquired portal vein aneurysm is increased portal venous pressure or flow secondary to portal hypertension.[3-6,10] Some controversy exists as to whether these aneurysms are a result of or the cause of the portal hypertension.[11]

Glazer et al[5] reported 15 cases of portal vein aneurysm. Eighty-one percent had no predisposing cause and were believed to be of the congenital form. Many of these cases were totally asymptomatic. The ages ranged from 5-67 years, with the majority occuring in female patients (75%). Small aneurysms tend to be asymptomatic.[11] Large aneurysms may give rise to symptoms of compression of adjacent structures. Reported symptoms have included jaundice (caused by pressure on the bile ducts), compression of the duodenum, right upper quadrant or crampy abdominal pain, fever, portal hypertension, gastrointestinal bleeding from varices, and splenomegaly.[3-6,9,10]

Portal vein aneurysm may result in a variety of complications, including thrombus formation secondary to stasis, acute portal hypertension, and even vessel rupture.[3-6,9,10] The risk of complications appears to be low.[12] Patients are usually well with the aneurysm remaining stable in size during follow-up.[3,10,12-15] The prognosis depends on the complications and the underlying liver diseases.

Treatment varies depending on the clinical manifestations of each case. Surgical treatment should be considered only when the size of the aneurysm increases or a portal thrombus exists.[12,16] In the literature, operative interventions including aneurysmorrhaphy, porto-caval shunt, and mesocaval shunt were done.[5,11,13,17,18] Patients with small aneurysms without complications may be evaluated with sequential ultrasound examinations.[12,14,15,19,20]

Ultrasound is becoming a common modality for diagnosing and evaluating patients with portal venous aneurysms. Computed tomography and magnetic resonance imaging have been used to diagnose and confirm the presence of portal vein aneurysms.[3-6,10] In cases requiring surgical intervention, angiography may be used.[4]

In our cases, the portal vein aneurysm was found by chance and in the absence of hepatic or pancreatic lesions, it may be assumed that the etiology is congenital. The decision was made to follow the patients clinically and with serial sonography.

CONCLUSION

The sonographic appearance of a cystic mass freely communicating with the lumen of the portal, superior mesenteric, and splenic veins is diagnostic of a portal venous aneurysm. Ultrasonography provides the most cost-effective and noninvasive means of imaging portal vein aneurysms, both diagnosis and follow up evaluation to watch for any complications. Angiography being now considered as a complementary procedure necessary only in determining surgical approach.

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EFFECT OF INCOME ON FETAL BIOMETRY BY ULTRASOUND

Dr. M. A. Taher, Director,

ABSTRACT

Objective : To compare gestational age corrected fetal biometry among rich and poor women.

Methods : An ultrasound database from August 2000 to January 2001 was used for the purpose of this study. One hundred seventy five patients with certain menstrual history were included. Patient's income was assigned based on their report during the initial evaluation. There were 137 rich and 38 poor women. All data were entered into statistix 7.0 statistical package and analysed using appropriate statistical tests. Probability values less than 5% were considered significant.

Results : Multiple regression analysis using a 2nd-order model for gestational age as a function of fetal biometry, income, and fetal biometry-interaction did not show income to alter the relationship between gestational age and fetal biometry except for lengths. Ninety-five percent prediction intervals for gestational age did not show clinically significant difference between rich and poor.

Conclusion : We have shown that fetal biometry is similar in rich and poor mothers, except the femur length which is a bit less than expected in the poor group. These differences are small, yet the may influence the outcome of antenatal care. Further study is necessary to determine the significance of income on fetal biometry.*

Key words : Fetal biometry, ultrasound.

*Abstract accepted in the 11th World Congress of Ultrasound in Obstetrics and Gynecology, 23 – 27 October 2000, Melbourne, Australia, but I could not attend it, however, I presented it in XIV National Conference of Bangladesh Society of Ultrasonography (Dhaka. 7-8 Feb.2002).

INTRODUCTION

Fetal growth is influenced by many factors e.g. race, nutrition, antenatal care etc.[1,2] Effect of parent's income may also have some role, but we do not know about any report in this regard.

In a fetal structural survey at 15 to 20 weeks' gestation, the fetuses of Asian women had

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less-than-expected femur lengths (--0.66 ± 1.64 mm) and the fetuses of black women had greater-than-expected femur lengths (0.88 ± 1.57 mm) than the fetuses of white women in the second trimester.[1] The average length of the femur may even differ among various Asian sub-populations.[3] Parker and colleagues showed that the crown-rump length (CRL) and biparietal diameter (BPD) are similar for Asian and white fetuses up to 20 weeks. Lai and Yeo demonstrated slightly smaller BPD, head circumference, abdominal circumference and femur length (FL), more pronounced over the course of gestation, in Asian compared with white fetuses.[5] Fukada and colleagues showed that 7 of 549 fetuses (1.3%) of Japanese women had femur and humerus lengths that varied more than 1.5 SD from a growth curve determined from their study population, which had no abnormalities.[6] We sought to determine whether the fetal biometry varied with respect to income when evaluating mothers who are rich or poor.

MATERIAL AND METHODS

All women with certain menstrual history who had fetal structural surveys between 5 and 41 weeks' gestation during August/2000 to January/2001 were included in the study. Prospectively, maternal income was documented at the time of ultrasonographic examination and standard biometric data were routinely obtained. The fetal abdominal circumference was not obtained in all patients and therefore, could not be included in this study. All scans were done in accordance with the minimum standards of American Institute of Ultrasound in Medicine (AIUM) guidelines.[7]

Gravidas were divided into groups by maternal income: rich and poor (paying and non-paying).

All ultrasonographic examinations were performed transabdominally using 3.5 MHz linear/sector transducer with Siemens Sonoline SL2 ultrasonography system (Germany).

RESULTS

The study groups were composed of 137 rich and 38 poor mothers scanned during the study period. The mean values of the variance from the expected fetal femur length by biparietal diameter ± 1 SD for the various income groups were as follows: fetuses of poor mothers, --4.09 ± 1.11 mm; fetuses of rich mothers, 0.51 ± 1.51 mm ($P = .026$). Multiple regression analysis using a 2nd-order model for gestational age as a function of fetal biometry, income, and fetal biometry -income interaction did not show income to alter the relationship between gestational age and fetal biometry except for femur lengths. Ninety-five percent prediction intervals for gestational age did not show clinically significant difference between rich and poor.

DISCUSSION

We have shown that the fetuses of poor women gave less than expected femur lengths than the fetuses of rich women. Our population was a consecutive group of women who had fetal structural surveys at 5 to 41 weeks' gestation. None of the fetuses in our study had physical abnormalities or syndromes that would otherwise explain

our findings. A few limitations of this study deserve mention. It had been shown that the fetal femur length can be underestimated by obtaining oblique images of the femur or overestimated by including the non-ossified portions of the femur.[8] We do not think that there was a systematic bias with regard to measuring the femur length, because we included only the ossified portion of the femur shaft, and all the measurements were done in the same way on all patients. Second, the potential for bias can be increased by some patients' tendency to hide actual income. When we collected the data for this study, we assured the patients that their income will not be reported to the tax authority by us. The Hadlock weight estimating procedure, based on abdominal circumference (AC), head circumference (HC) and femur diaphysis length (FDL) is reported to be accurate, but data on the operating characteristics are scarce.[9] Both AC and estimated fetal weight (EFW) are better suited to confirm than to detect, exclude or predict intrauterine growth retardation (IUGR). Small AC and EFW may have greatest usefulness only when IUGR is clinically suspected.[10]

CONCLUSION

We have shown that fetal biometry is similar in rich and poor mothers, except the femur length which is a bit less than expected in the poor groups. These differences are small, yet they may influence the outcome of antenatal care. Further study is necessary to determine the significance of income on fetal biometry.

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AGENESIS OF RIGHT HEPATIC LOBE : A CASE REPORT

Dr. M. Reajul Islam, Medical officer and Dr. M. A. Taher, Director,

ABSTRACT

Abnormalities of hepatobiliary system are common like double or triple gall bladder,[1-4] absence of gall bladder,[5] situs inversus etc. Absence of right lobe of liver in a man of 70 years is a rare phenomenon which was confirmed by ultrsonography, CT scan & surgery.

INTRODUCTION

At 3 months of intrauterine life, the left lobe of liver is nearly as large as its right lobe and the liver almost fills the abdominal cavity. Later the relative development of the liver is less active, more especially that of the left lobe, but exception may occur as shown in the present case of agenesis of right hepatic lobe.

CASE REPORT

An old man of 70 years came in Nov., 2001 for abdominal ultrasonography with the complaints of frequent bowel habit, general weakness, indigestion for the last few years. Ultrasonography showed absence of right lobe, the gall bladder with calculi was hidden in the posterior aspect of left lobe. CT scan also was done, the report was same as of ultrasonography. Laparoscopic cholecystectomy was done in December, 2001. Operative findings were absence of right lobe of liver, gall bladder seen with multiple calculi. Cystic duct was long & the gall bladder was buried in left lobe of liver parenchyma. Laparoscopic operation was done successfully. No abnormality in other routine laboratory investigations was detected. Patient was alright for the last 4 months after operation.

DISCUSSION

Rare anomalies of congenital absence of either the right or left lobe have been described in other countries,[6-7] but not yet in Bangladesh as for as we know.

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GENDER DIFFERENCE IN UPPER ABDOMINAL SONOGRAPHY

Dr. M. A. Taher, Director,

ABSTRACT

Objective: To compare the sonography findings among male and female patients who came for chronic upper abdominal pain.

Methods: An ultrasound database of August/2000 was used for the purpose of this study. One hundred thirty nine patients with upper abdominal complaints were included (F81, M58, age range 25 days to 100 years).

Results: Among the females 42 were normal (53%), but among the males 22 were normal (35%). Fourteen women and 2 men had cholelithiasis, but hydronephrosis was found in 5 female and 5 male patients.

Conclusion: No significant gender difference was noted in upper abdominal sonographic findings except gallstone, which is more in women then in men.

Key words: Gender, upper abdomen, sonography.

INTRODUCTION

Chronic pain is defined by the International Association for the Study of Pain (IASP) as 'pain which has persisted beyond normal tissue healing time', usually taken to be three months.[1] Gender differences of pelvic structures are quite evident, but the upper abdominal organs are apparently similar, but may show subtle differences and variable disease patterns. Ultrasonography is a non-ionizing, non-invasive, safe and cheap imaging modality to evaluate various organs and therefore, we analyzed upper abdominal sonography to see gender-difference, if any.

METHODS

An ultrasound database of August/2000 was used for the purpose of this study. One hundred thirty nine patients with upper abdominal complaints were included (F81, M58, age range 25 days to 100 years). We used secter/linear transducer of Siemens sonoline real-time scanner (frequency 3.5 MHz).

RESULTS

Among the females 42 were normal (53%), but among the males 22 were normal (35%). Fourteen women and 2 men had cholelithiasis, but hydronephrosis was found in 5 female and 5 male patients.

DISCUSSION

Gureje et al. surveyed 5438 primary care attenders in 15 countries and found that 22% reported chronic pain, though this ranged from 5%

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(Nigeria) to 33% (Chile), indicating the need to extrapolate figures from one population to another only with caution. The prevalence among primary care attenders in Manchester, England was 21%. There was a higher overall prevalence among women, but again this varied considerably between centres. In Manchester, for example, there was no significant sex difference.[2,3] Elliott et al in a postal survey of a community sample of 5036 individuals in Scotland, estimated a population prevalence of 46% and found chronic pain to be associated with female sex, increasing age, inability to work and living in council rented accommodation.[4] They found that the reported cause of chronic pain was much less important than these socioeconomic factors in determining its impact-16% of cases reported severe highly disabling pain and 28% had sought treatment and professional advice recently and frequently. A recent functional magnetic resonance imaging (FMRI) study by Joseph T. Lurito MD PhD & Michael Phillips MD of Indiana University School of Medicine (USA) revealed that, because of differences in brain activity between the sexes, men and women do, in fact, listen differently.[5]

Women can speak and listen simultaneously. This female multitracking ability results from a thicker corpus callosum (the bundle of nerve fibres connecting the left and right brain) with 30% more nerve connections.[6] But the male brain has a clear advantage in spatial ability and navigation.[7] Research has demonstrated that there are at least 4 specific areas in the right hemisphere of the male brain and several other areas in the left that are dedicated to spatial ability [e.g. three dimensional (3D) perspective, navigation, movement, and geography]. Von Korff and colleagues showed that individuals with chronic pain have been shown to use the primary care services up to five times more frequently then the rest of the population with frequency of attendance related to persistence and severity of pain in the male sex.[8] In our small series, more women complained of pain than men.

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ECTOPIC GESTATION: UTILITY OF ULTRASONOGRAPHY.

Dr. M. A. Taher[1], & Dr. Akkas Ali Surkar[2],

INTRODUCTION

Estimates of the death rate from ectopic gestation are about one in 1000 cases.[1] The first documented autopsy performed in USA circa 1638 or 1639, identified an ectopic pregnancy as the cause of death. This disease can result in the death of young women of child-bearing age who are otherwise free of diseases and in whom eradication of the ectopic pregnancy ends their current risk. Ultrasound is utilized in diagnosing ectopic gestation as depicted in the case reported below.

Indexing words: Ectopic pregnancy, ultrasonography.

CASE REPORT

A young lady aged 25 years having regular menstrual cycle, came to the hospital with the complain of severe lower abdominal pain. On examination she was toxic with shrunken eye, pulse: thready, 120/minute, anemia: severe, B.P. 90/70 mm Hg in spite of blood transfusion, lower abdomen was tender with slight vaginal bleeding Progressively her condition deteriorated. On P/V examination, uterus was normal in size and on other abnormality could be detected. Ultrasonography revealed normal-sized uterus, uniform in echotype. There was a collection of fluid in the pouch of Douglas and also in the upper abdomen including Morrison's pouch and flanks raising the suspicion of ruptured ectopic (tubal) pregnancy. On laparotomy, left fallopian tube was seen ruptured and remnants of products of conception was present in it. Salpingectomy was done and consequently the patient improved. Of interest, the patient had no history of amenorrhoea. (Fig.1)

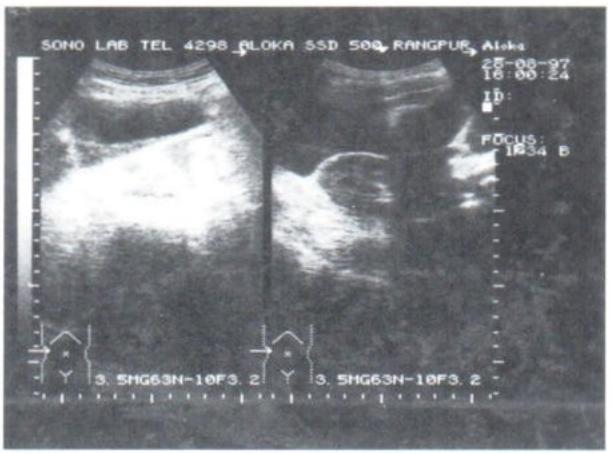

Fig.1 Ectopic gestation : Utility of ultrasonography

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DISCUSSION

Laparoscopy is the single-most accurate method of confirming ectopic gestation before surgery. However, routine use of laparoscopy in suspected ectopic pregnancy is impractical as it is highly invasive and not available everywhere, Culdocentesis, although less invasive, negative aspiration are unreliable for excluding an ectopic gestation. Concomitant intrauterine pregnancy and ectopic gestation occurs and the incidence is increasing due to ovulation induction procedures (e. g. Clomiphene therapy), the rate of concomitancy is quoted usually[2] as one per 30000 and in patients undergoing ovulation induction to be as high as one per 7000 pregnancy.[3] Sonography is useful non-invasive method as the menstrual history may be misleading as in the present case reported here. Ectopic pregnancies produce HCG (human chorionic gonadotropin) at a slower rate than normally implanted pregnancies.[4] The natural history of ectopic gestation almost certainly includes those fetuses that implant, die and are reabsorbed without being clinically recognized. But a clinician cannot count on this probability in any given case. Among women who have had an ectopic gestation, the subsequent overall conception rate is about 60%, of these 50% are intrauterine and 10% are repeat ectopic pregnancy, 97% of ectopic gestations are tubal in location.

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VALUE OF THE PCP STAIN ADDING TO THE CHEST X-RAY FOR THE DIAGNOSIS OF PNEUMOCYSTIS CARINII PNEUMONIA IN HIV SEROPOSITIVE PATIENTS

Viroj WIWANITKIT

ABSTRACT

Since the PCP is mainly diagnosed based on the clinical history and symptoms, therefore, there is a need to develop the accurate diagnostic test. Indeed, the most accurate test for PCP is the finding of the organism in the lung biopsy or bronchoalveolar lavage but these two methods are invasive. In this study, we tried to assess the value of the sputum PCP stain in the diagnosis of the disease. The stain can be done together with the sputum AFB test. Since the PCP stain is not invasive and may be a new diagnostic test, therefore, we have performed this study. Of the total 20 HIV seropositive patients (13 males and 7 females) in this study, all showed the pattern of interstitial pnuemonia without any sputum AFB positive specimen. The result of special stain (Giemsa) of their sputum for PCP in all cases were also negative. According to our study, the chest X ray combining with sputum postive for AFB can provide predictable rate of 100% while the sputum PCP stain provide predictable rate equal to 0%. So the addition of sputum PCP stain to the Chest X ray with sputum AFB stain did not increase any predictice value to the diagnosis.

INTRODUCTION

Pneumocystis carinii is a poorly understood organism capable of infecting many mammalian species including man and several laboratory animals. Clinical disease is generally restricted to immunocompromised hosts, in which a potentially lethal pneumonia may occur.[1] This infection becomes a common opportunistic infection among the HIV infected patients.[2] Although knowledge about the biology of P. carinii has increased in the last ten years, the epidemiology and physiopathology of P. carinii pneumonia remain poorly understood.

Due the increase of HIV infected patients, laboratories are receiving increasing numbers of requests for the diagnosis of P. carinii. Up to 60% of HIV infected patients with respiratory complaints are believed to have this infection.[2] A proper diagnosis of this infection is important because the suceesful use of specific chemotherapy is available. Since this organism cannot be cultivated in vitro, and reliable serological tests are not available,[3-4] the final diagnosis of infection can be established only by demonstration of the organism in brocholalveolar lavage (BAL) or pulmonary tissue.[5] Various staining methods have been developed to serve this purpose.[6-8]

However, the BAL fluid is difficult to be collected. The easier method to collect respiratory tract specimen is sputum. Here, we perform a study to assess the possibility of the sputum stain for PCP as a diagnostic tool.

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MATERIALS AND METHODS

This study was performed by retrospective study of the patients' record. We reviewed the laboratory results of 20 HIV seropositive patients who visited the out patient clinic of King Chulalongkorn Memorial Hospital with the final diagnosis of pneumocystis carinii pneunonia (PCP), which is made by the clinical improvement by specific drug treatment for PCP (better respiratory symptom and clearer chest X - ray).

RESULTS

Of the total 20 HIV seropositive patients (13 males and 7 females) in this study, all showed the pattern of interstitial pnuemonia without the finding of any sputum AFB positive specimen. The result of special stain (Giemsa) of their sputum for PCP in all cases were negative. All cases were treated with the cotrimoxazole regimen and were improved.

According to our study, the chest X ray combining with negative sputum AFB stain can provide predictable rate up to 100% while the sputum PCP stain provide predictable rate equal to 0%. The additional predictive rate of after the addition of sputum PCP stain to the Chest X ray with sputum AFB staining is 0%.

DISCUSSION

Since the PCP is mainly diagnosed based on the clinical history and symptoms,[2-4] therefore, there is a need to develop the accurate diagnostic test. Indeed, the most accurate test for PCP is the fining of the organism in the lung biopsy or bronchoalveolar lavage[5] but these two methods are invasive. In this study, we tried to assess the value of the sputum PCP stain in the diagnosis of the disease. The stain can be done altogether with the sputum AFB test. Since the PCP staining of the collected sputum is not invasive and may prove to be a new diagnostic test, therefore, we performed this study.

According to the study, the Chest X ray with the sputum AFB test can provide a favorable diagnostic value. The necessary of the sputum AFB test in case of the interstitial pneumonia pattern in chest X - ray in the HIV seropositive is confirmed. However, the very bad diagnostic value of the sputum with PCP staining was detected in this study. The possible explanation for this finding is that 1) the staining of the PCP require an expert and the slide interpretation of the PCP require an expert as well, 2) the low detection rate was according to the few subjects in our study and 3) the staining of the sputum is totally useless since the PCP mainly embeds in the alveolar membranes.

Therefore, the staining of the sputum of the PCP patient is not recommended as an additional test. The clinical diagnostic combining with the sputum AFB test to rule out the tuberculosis is still the favorable diagnostic test for PCP in the HIV seropositive patients.

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A NOTE ON THE QUALITY MANAGEMENT IN SPECIMEN COLLECTION FOR NUCLEAR MEDICINE

Viroj WIWANITKIT

ABSTRACT

Nuclear medicine physicians use radioactive pharmaceuticals to diagnose, and sometimes treat, a range of diseases. Nuclear medicine technologists may perform the following tasks: perform laboratory procedures including blood and specimen collection, quality control testing, ensure the safe handling, storage, disposal of radioactive materials, prepare and administer radiopharmaceuticals as tracers to demonstrate the function of organs in the body. Presently, quality control is the primary important task in the management of all laboratories. Due to the good governance concepts, accountability of the whole laboratory processes is the main focus of current concern in laboratory medicine. Due to the laboratory quality cycle, reliability cannot be achieved in a clinical laboratory through the control of accuracy in the analytical phase of testing process alone, but also the concern in the preanalytical phase including the specimen collection procedure, request form control, control of sample acceptance and sample holding, must be carefully practised with quality through the whole laboratory cycle.

INTRODUCTION

Nuclear medicine physicians use radioactive pharmaceuticals to diagnose, and sometimes treat, a range of diseases. Nuclear medicine technologists may perform the following tasks: perform laboratory procedures including blood and specimen collection, quality control testing, ensure the safe handling, storage and disposal of radioactive materials and prepare and administer radiopharmaceuticals as tracers to demonstrate the function of organs in the body.

Since the specimen collection is the early phase of laboratory test in nuclear medicine, therefore, the quality management of this phase is necessary.[1-7] In this article, we discuss the quality management in the blood specimen collection for nuclear medicine laboratory.

WHY WE MUST HAVE THE QUALITY MANAGEMENT IN THE BLOOD COLLECTION FOR NUCLEAR MEDICINE?

Presently, quality is the primary importance in the management of all laboratories. Due to the good governance concepts, accountability of the whole laboratory processes is the main focus of current concern in laboratory medicine. Due to the laboratory quality cycle, reliability cannot be achieved in a clinical laboratory through the control of accuracy in the analytical phase of the testing processes alone.[7] There should be a certification on the whole laboratory processes, but not on the single analytical process. Precision and accuracy of analyses are not only determined by the analytical procedures but also by preanalytical factors, such as contamination and loss during sampling and sample preparation. Under the broad umbrella of the preanalytical phase, the followings may be included, such as

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test requesting forms design, specimen collection, handling and processing before complete distribution of test samples to multiple work stations

As previously discussed, the specimen collection can be mentioned as the important component in the preanalytical phase of the laboratory analysis. According to the study of Wiwanitkit, the error in this phase is higher than in the other two phases (analytical and post analytical).[7] Since the error in any phase of the laboratory processes can result in the aberrant and unacceptable results, which can affect the quality of the health care. Therefore, the quality management for the specimen collection is needed. Although the quality management need a lot of time but it is better than no quality management.

WHAT ARE THE ASPECTS THAT QUALITY MANAGEMENT IS NEEDED IN THE BLOOD COLLECTION FOR NUCLEAR MEDICINE ?

1. SPECIMEN COLLECTION PROCEDURE

Specimen collection is the direct process in contact with the patients. The procedure must be based on the medical scientific principle and must be done gently. Since the Patient Right is proposed, the asking for the informed consent of the patients before every specimen collection is needed.[5] Nevertheless, since this procedure can bring the complication to both patients (such as fainting, hematoma) and practitioners (such as needle stick injury), the proper risk management is needed.[5-7]

Also, this process can be classified as an important service business, the application of such the quality system such as the 5S, the ISO and the HA is probable.[1-7]

2. REQUEST FORM CONTROL

The request form is the main way for communication between the physician and the laboratory technicians. The physicians should provide the full necessary data for the laboratory to be used as the basic data for validation of the analytical results. Such an improper request forms such as omission, incompleteness and hard-to-read hand writing should be rejected by the laboratory. Furthermore, presently the requests that are not rational and unnecessary should also be rejected by the clinical pathologists of the laboratory.[1]

To cope with the problem of the manual request, the laboratory information management system (LIS) becomes the new tool for this problem. Based on the LIS, the laboratory can directly receive the request from the physician without delay and can be used for the further validation of the result as the double check up system.[5]

3. CONTROL OF SAMPLE ACCEPTANCE

Considering the laboratory workflow, the service of the laboratory starts from the receptions of requests,specimens and request forms, to distribution of the laboratory results to the patients (for Out-Patient Division) and clinical wards (for In-Patient Division).

Based on the recommendations for ISO 9002 system for the hospital by the Technology Promotion Association (Thailand-Japan),[2] the laboratory quality committee should decided that the rate of preanalytical mistakes is a quality indicator of the laboratory. As previously described, the definition of the "mistake in the preanalytical phase" is any defect during the preanalytical phase, including all processes before complete distribution of test samples to multiple work stations, that influenced in failure of further laboratory processes.[7]

These preanalytical mistakes include physician's order missed, patient misidentification, specimen collected in insufficient

quantity, inappropriate container used, inappropriate quality of specimen, specimen lost in transit and etc.[7]

Briefly, all medical technologists in all units of the laboratory were asked to pay maximal critical attention to all received requests. These personnel were provided with a special notebook in which any "suspect" sample was recorded, together with all pertinent information. Then consultation to the head of medical technologist of the unit was done. The head of medical technologist rechecked and reviewed all reported cases before making final decision. In cases that the preanalytical mistakes were made from final decisions, they were recorded into the specific record form.[7]

4. SAMPLE HOLDING[1,5]

Since sometimes the transportation of the specimen from the collection unit to the laboratory cannot be immediately performed, therefore, the proper sample holding is necessary. The two factors to be concerned in sample holding are the holding time and conditions. Some analyses such as the hormone are too labile and cannot be kept for a long time in the room temperature. The decision to use the proper temperature refrigerator to keep it is necessary.[1] Indeed, the authors recommended the immediate transfer of the collected samples to the laboratory for analysis since any delay, the result of the analyses may be changed.

Another point to be concerned is the quality of the equipment used for the keeping of the sample. Refrigerator is an important equipment to be mentioned. This equipment should be subjected to regular maintenance and calibrated for the correct temperature. Sometimes the temperature in the refrigerator is not proper and the user doesn't know, it may result in the expiration of the collected samples.

CONCLUSION

Today, the quality system for clinical laboratories must include the promotion of accuracy in the analytical phase as well as the assurance of the reliability of preanalytical and postanalytical activities.

In order to reduce the preanalytical mistakes originated in the care units, a regular feedback system (such as distribution of protocol for proper specimen collection) to the clinicians and personnel outside the laboratory is also designed in our setting.

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ATYPICALLY LOCATED SINGLE HOT SPOT IN BONE SCINTIGRAPHY: HOW OFTEN IS IT A METASTASIS?

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ABSTRACT

OBJECTIVES: 1) To identify the frequency of bone metastases which appears as atypically located single hot spot on bone scan in patients with extraosseous malignancy but without current evidence of metastatic bone diseases. 2) To identify the common sites of metastasis with such findings.

MATERIALS AND METHODS: All bone scans of the patients with extraosseous malignancy but without current evidence of metastatic bone diseases performed at Ramathibodi Hospital during January 1996 to December 1997 were selected. A nuclear medicine physician blindly reviewed the selected scans and only the scans with atypically located single hot spot were included for clarification of their causes. The verification procedure includes histology, CT, MRI, progression of bone scan lesions, or a clinical follow-up of at least 2 years.

RESULTS: During the specified period, there were 100 patients (62 women, 38 men; age range 25-81 years; mean age 57.96 years) with atypically located single hot spot without known skeletal metastasis. Bone metastasis was confirmed in 8 patients (8%); 4 with breast cancer, 2 with cervical carcinoma, and 2 with head and neck cancer. Such findings were classified as benign lesions in 64 patients and as indeterminate in 28 patients. The frequency of a hot spot being a metastatic focus is 2 of 7 (28.57%) at the sternum, 1 of 28 (3.57%) at the ribs, 1 of 4 (25%) at the costovertebral junction, and 4 of 41 (9.76%) at the lower lumbar spine. None of such findings were proved to be malignant at the cervical spine, the scapula, the manubrium, the sacrum and the sacroiliac joint.

CONCLUSION: The frequency of bone metastasis which appears as atypically located single hot spot on bone scan in patients with extraosseous malignancy but without current evidence of metastatic bone disease was 8%. The most common site of such findings is the sternum, particularly in patients with breast cancer.

BACKGROUND AND RATIONALE

The high sensitivity of bone scan in determining the presence and the extent of metastatic disease makes it an extremely important tool in decision making, particularly since survival rates in patients with multiple distant osseous metastases from many tumors is worse than in those with isolated osseous disease.

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Finding metastases is frequently important to clinical decisions affecting quality of life. Serial bone scanning in patients with known metastases is valuable in therapeutic decision making, particularly if it is used in combination with other clinical information.

Approximately 80 percent of patients with known neoplasms and bone pain will have metastases documented by bone scan. The fact that 30-50 percent of patients with metastases do not have bone pain, a good case may be made for scanning such as asymptomatic patients with tumor that have a propensity to metastasize to bone (e.g., breast, lung, and prostate). However, for tumors with low rate of osseous metastases (e.g., cervix, head, and neck), the procedure is not cost-effective.[1]

Most metastases are multiple and relatively obvious. When a single lesion is identified, the false positive rate for attributing the finding to metastases is high. Overall, 43% of solitary lesions are malignant but this figure masks considerable variation according to the anatomical site of the lesion. Thus solitary spinal and skull hot spots are said to be malignant in up to 80% of cases, while solitary hot spots in ribs are said to be malignant in 10-17% of cases.[2-4]

OBJECTIVES

1. To identify the etiology of atypically located single hot spot on bone scan in patients who attended Ramathibodi hospital with extraosseous malignancy but without current evidence of metastatic bone disease.

2. To assess if malignancy of such findings differ among :

2.1 different tumor types

2.2 different location of the skeletal lesion

MATERIALS AND METHODS

Consecutive bone scans performed at Ramathibodi Hospital from January 1996 to December 1997 were reviewed by a nuclear medicine physician and those fullfilled all of the following criteria were included.

Inclusion criteria

1. Extraosseous malignancy
2. No pre-existing evidence of bone metastasis
3. Single hot spots in the skeleton not typical for bone metastasis such as a tiny round rib lesion

Exclusion criteria

The hot spots at the sites uncommon to have degenerative disease and, hence higher probability to be metastatic disease are excluded as follows:

-skull
-thoracic and L1-2 vertebrae
-appendicular skeleton
-pelvic bone, except for SI joints

Bone scintigraphy was performed 2 hours following an intravenous administration of 15 mCi of technetium-99m methylene diphosphonate (^{99m}Tc- MDP). Total body scinti-scans were obtained on each patient.

The lesion was classed as malignant based on one of the following criteria:[3]

1. Demonstration of bone destruction at the site of the hot spot by plain radiography, computed tomography scanning, or magnetic resonance imaging, either contemporaneously or on follow-up.

2. Progression of the abnormality with the development of other areas of increased uptake on subsequent bone scan.

The lesion was classed as benign based on one of the following criteria[3]:

1. No clinical manifestation suggesting bone metastasis after at least 2 years of follow up.
2. Normal radiographic appearances without evidence of metastatic disease after at least 2 years

of follow up.
3. Simple fracture demonstrated at plain radiography with healing evidence on subsequent radiographs.
4. Characteristic appearances of benign tumor on plain radiography or conditions with no change over at least 12 months of follow-up.
5. Post surgical changes demonstrated at the site of increased uptake.

Those with findings not falling into either benign or malignant criteria were categorized as indeterminate.

RESEARCH DESIGN

A descriptive study (Retrospective data collection)

RESULTS

There were 100 patients who fullfilled the selected criteria (62 women, 38 men; age range 25 - 81 years; mean age 57.96 years). The primary tumoral site was breast cancer in 47 patients (47%); carcinoma of the head and neck in 27 patients (27%); lung cancer in 8 patients (8%); cervical carcinoma in 5 patients (5%); esophageal cancer in 2 patients (2%); and uterine carcinoma in 1 patients (1%). The rest of the patients, 10 (10%), had other primary tumors including periampullary carcinoma, colonic carcinoma, rectal carcinoma, renal pelvis carcinoma, urinary bladder carcinoma, carcinoma of the prostate gland, and NHL (Table 1).

Table 1. Nature of Skeletal Hot Spots Correlated with Primary Tumor Site

Primary Tumor	Malignant*	Benign*	Indeterminate*	Total**
Breast	4 (8.5%)	40 (85.11%)	3 (6.38%)	47 (47%)
Head and neck	2 (7.41%)	12 (44.44%)	13 (48.15%)	27 (27%)
Lung	0 (0%)	4 (50%)	4 (50%)	8 (8%)
Cervix	2 (40%)	2 (40%)	1 (20%)	5 (5%)
Corpus	0 (0%)	1 (100%)	0 (0%)	1 (1%)
Esophagus	0 (0%)	0 (0%)	2 (100%)	2 (2%)
Others	0 (0%)	5 (50%)	5 (50%)	10 (10%)
Total	8 (8%)	64 (64%)	28 (28%)	100 (100%)

* Numbers in parentheses are percentages according to the primary tumor site subgroup.
** Numbers in parentheses are percentages according to 100 patients.

There were 64 patients (64%) negative for the diagnosis of bone metastasis. Twenty-eight patients were classified as indeterminate (28%), most were loss to follow up before 2 years. In the remaining 8 patients (8%), bone metastases were confirmed. This group included 4 of 47 patients with breast cancer (8.5%), 2 of 5 patients with cervical carcinoma (40%), and 2 of 27 patients with head and neck cancer (7.41%), each of which had carcinoma of pyriform sinus and the other had nasopharyngeal carcinoma.

Table 2. Nature of Skeletal Hot Spots Correlated with Locations

Hot spot location	Malignant*	Benign*	Indeterminate*	Total**
Sternum	2 (28.57%)	3 (42.86%)	2 (28.57%)	7 (7%)
Rib	1 (3.57%)	20 (71.43%)	7 (25%)	28 (28%)
Costovertebral junction	1 (25%)	1 (25%)	2 (50%)	4 (4%)
Lower lumbar	4 (9.76%)	23 (56.1%)	14 (34.14%)	41 (41%)
Others* **	0 (0%)	17 (85%)	3 (15%)	20 (20%)
Total	8 (8%)	64 (64%)	28 (28%)	100 (100%)

* Numbers in parentheses are percentage according to hot spot location subgroup.
** Numbers in parentheses are percentage according to all 100 patients.
***Including cervical spine, scapula, costochondral junction, manubriosternal junction, sternoclavicular joint, manubrium, sacrum, and sacroiliac joint

About the location (Table 2), no hot spots detected at the cervical spine, scapula, costochondral junction, sternoclavicular joint, manubriosternal junction, manubrium, sacrum, and sacroiliac joint were malignant. Two out of seven patients (28.57%) with a hot spot on the sternum, 1 out of 28 patients (3.57%) with a hot spot on the rib, 1 out of 4 patients (25%) with a hot spot on the costovertebral junction, and 4 of 41 patients (9.76%) with a hot spot on the lower lumbar spine did have bone metastases.

Of all 8 skeletal metastases, 4 were located at the lower lumbar vertebra, 2 at the sternum, and each of the rest at the rib and costovertebral junction. In patients with primary breast cancer, 2 (50%) skeletal metastases were located at the lower lumbar spine (from 16 cases) and the other two (50%) at the sternum (from 6 cases, Figure 1). In 2 patients with carcinoma of the cervix, one skeletal metastasis was located at the rib and the other at the lower lumbar region (Figure 2). In 2 patients with head and neck cancer, one metastasis which was seen at the lower lumbar spine and the other at costovertebral junction.

Table 3. Incidence of Positive Bone Scan in Different Malignancy Correlated with the Location

Sites / Diseases	Sternum	Rib	Costovertebral junction	Lower lumbar	Total
Breast	2 (50%)	0	0	2 (50%)	4 (50%)
Cervix	0	1 (50%)	0	1 (50%)	2 (25%)
H & N	0	0	1 (50 %)	1 (50%)	2 (25%)
Total	2 (25%)	1 (12.5%)	1 (12.5%)	4 (50%)	8 (100%)

Fig.1 Breast cancer with sternal metastasis

Fig. 2 cervical cancer with lower lumbar metastasis

DISCUSSION

Bone scintigraphy is a highly sensitive technique for detecting bone metastases in the absence of trauma, inflammation, or degenerative changes. Multiple lesions, especially in the vertebral column and skull, are strongly suggestive of the metastatic disease, whereas other solitary lesion poses the diagnostic problems in the patients with known malignancies. Any single or double hot spot in a patient with a history of malignant tumor indicates the need for further investigations, such as conventional radiography, CT, MRI, or biopsy, and will impose physical strain and distress on the patient and cause additional costs. Positive osseous tumor spread was 8 cases (8%) which was slightly lower than those in other reports (10-17%). It could be partly due to the fact that the collectable patients did not represent all known malignant patients with atypical solitary hot spot on bone scan during the studying period. Another reason was that the known malignant patients sent for bone scannings did not represent all known malignant patients in Ramathibodi hospital. Systemic treatment, chemotherapy, was probably to be a cause of no progression of the bone scans' findings that cause false negative in the results.

In this study, the primary breast cancer was the most common cause of osseous metastasis (4 cases, 50%) similar to the results of the study by Puig and coworkers[5] (4 in 15 cases, 26.67%). These findings may be explained by its propensity to spread to bone and by its relatively high incidence. Two of five cases (40%) with the cervical cancer were malignant lesion. This was probably because the patients with cervical cancer were sent for a bone scan only when they had advanced disease. One patient was in stage IIIB, presented with unimproved epigastrial pain, and a rib lesion was detected on bone scan. The other was in stage IVB (inguinal nodal metastasis), presented with low back pain and suspected

degenerative changes at the lower lumbar spines on bone scan, but metastasis was confirmed on CT. There were 2 cases (7.41%) of skeletal spreading from head and neck cancer. One, of which known case of carcinoma of the pyriform sinus T4N2CM0, had progression of the findings on the follow up bone scan (6 months interval) without any symptom. The other, known case of nasopharyngeal carcinoma T2N0M0, also had progression of the positive findings on bone scan.

The primary tumor failed to signify for the prediction of malignancy in atypically located hot spots. Two cases (50%) of the patients with breast cancer were located at the sternum (2 in 6 of sternal lesions, 33.33%). Although isolated sternal abnormalities are uncommon in patients with breast cancer, a high percentage of these lesions are due to a malignant etiology. Andrew and coworkers[6] showed 26 malignant lesions from all 34 solitary sternal abnormalities (76%). So the known breast cancer with sternal lesion should be further investigated.

None of the hot spots on the sternoclavicular joint, was caused by metastases. This finding agreed with the study by Puig and coworkers[5] in that hot spots in the sternoclavicular joint never indicated malignancy. The hot spots at the cervical spine, scapula, manubriosternal junction, manubrium, costochondral junction, and sacroiliac joint were not resulted from metastases in the study which was slightly different from Puig and coworkers' study, where metastases were located at transverse process of cervical vertebra, manubriosternal junction, and costal cartilage.

A single hot spot at the lower lumbar spine was frequently due to benign process, such as DJD. However, about 9.8% (4/41) were due to skeletal metastasis.

CONCLUSION

This study was limited in several ways; small population studied that were not representing all known malignant patients, unprompted data, or loss to follow up of the patients themselves. However, a single atypical hot spot in the skeleton in patients with extraosseous malignancy without evidence of metastatic bone disease should raise a high suspicion of metastases, especially in the appropriate clinical circumstance, and could be confirmed by further appropriate radiographic studies or invasive procedures to exclude incipient metastatic disease. Whether or not skeletal metastasis of such findings differs among different malignancy could not be established due to limited number of positive cases. Nevertheless it did pointed out that a sternal lesion in patients with carcinoma of the breast had a high probability of being malignant, and that a lower lumbar hot spot should not be regarded as benign.

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