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CONTENTS

US STUDY IN BLUNT ABDOMINAL TRAUMA AT VACHIRA PHUKET HOSPITAL

Rutchanee PAISUWAN MD.[1]

ABSTRACT

Purpose: To evaluate the accuracy of abdominal ultrasonography (US) in patients having been injured by blunt abdominal trauma.

Material and methods: A retrospective reviews of medical record and imaging of 115 patients with blunt abdominal trauma who were sent to be investigated by abdominal ultrasonography at Vachira phuket hospital from 2000 to 2005. The abdomen and pelvis were scanned for free fluid while the visceral organs were assessed for heterogeneity. Empty bladder was filled with 200-300 ml of sterile saline through a Foley catheter. U/S findings were considered positive if free fluid was presented or if parenchymal abnormalities that could be consistent with trauma were detected. US results were compared with those of the diagnostic peritoneal lavage findings, repeated US, computed tomography (CT), cystography, surgery, and/or following of the clinical courses.

Results: Findings from 115 US examinations were evaluated with the results of being positive 82 of 90 patients regarding injuries (sensitivity 91 %). False negative findings were bowel injury, retroperitoneal injury, and intraperitoneal solid organ injury without hemoperitoneum. No patients with false-negative findings died from intraabdominal injury. Specificity of US was 68 % (17 of 25 patients). Positive predictive value was 91 % (82 of 90 patients), and negative predictive value was 68 % (17 of 25 patients)

Conclusion: Abdominal US is noninvasive procedure and useful in detection of damages in patients confronted with blunt abdominal trauma.

INTRODUCTION

Rapid diagnosis and treatment of abdominal injury is an important factor for decreasing preventable death in patients with blunt abdominal trauma. Physical examination is frequently unreliable in the early cases after the on set of acute trauma.[1] Since its description, diagnostic peritoneal lavage has successfully been used as a useful aid in both the diagnosis of abdominal injury and the determination of the need for laparatomy.[2]

More recently, computed tomography (CT) became an equally important diagnostic tool and made nonsurgical treatment possible in many patients who would have undergone laparotomy on the basis of diagnostic peritoneal lavage findings.[3-7]

Ultrasonographic (US) evaluation of patients with blunt abdominal trauma had been described more than 30 years ago,[8] and US is now the primary

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examination used in several trauma centers in Europe and Asia, as well as in selected centers in the United States.[9-17] Advantages of using US as diagnostic procedure are those for its fast, portable and easily to be integrated with other means of first aids and resuscitation of patients with trauma without a delay of therapeutic measures.

These features particularly facilitate its uses in the evaluation of patients who are hemodynamically unstable. Unlike diagnostic lavage, US is noninvasive and has no associated morbidity. The purpose of the present study was to evaluate the accuracy of abdominal US used in patients with blunt abdominal trauma.

MATERIAL AND METHODS

Reports of US performed and medical records for the evaluation of suspected blunt abdominal trauma from January 2000 through December 2005 were reviewed retrospectively.

Technique

All US examinations were performed by radiologists. The US trauma protocol consisted of evaluation of the right and left upper quadrants of the abdomen, epigastrium, paracolic gutter, retroperitoneal spaces, and pelvis. Empty bladders were filled with 200-300 ml of sterile saline through a Foley catheter if there was no contraindication to catheterization, such as suspected urethral injury.

Definitions

For statistical analysis US findings were considered positive if free fluid was present or if a parenchymal abnormality that could be consistent with trauma was identified. Free fluid in the presence of a known medical course was considered a positive US finding because hemoperitoneum could not be excluded, also the further investigation was necessary to rule out injury. Non-traumatic lesions, such as well visualized simple cysts, that allowed definite diagnosis at US were considered negative findings. For the purposes of the study, pleural and pericardial effusion was considered negative findings for abdominal injury.

A positive finding was considered true positive if CT, repeated US, cystography, laparotomy or clinical follow up also revealed evidence of abdominal injury. Positive US findings were considered false positive if injury was not confirmed at subsequent studies or good clinical outcome after follow up.

Negative US findings were considered true negative if all other findings were negative and/or if the patient had an uneventful clinical course. US findings were considered false negative if a subsequent study revealed free fluid, hemoperitoneum, or any visceral abdominal injury. Such the studies including laparotomy, CT, repeated US, or cystography that performed during the initial hospitalization or later on.

RESULTS

Of 115 patients included in this study, 25 underwent ultrasound abdominal study with findings interpreted as negative, while 90 underwent ultrasound abdominal study, were interpreted as positive. In the minority of ultrasound examination 22 % (25 of 115 patients), the findings were interpreted as negative. Of those, being followed up, 16 were performed with serial physical examinations and determination of hematocrit levels without further abdominal imaging. All of these patients had an uneventful course without clinical evidence of a delayed complication from a missed diagnosis of injury. One of the cases, the finding was interpreted as negative, developed hypovolumic shock from massive hemothorax and found to be death at the end, then abdominal tapping was performed but showed no hemoperitoneum. Two patients with negative US findings underwent CT and US studies performed for having clinical indications. One patient,

a second US study was repeated and a minimal free fluid at the lelf lower quadrant on the 2nd day, underwent laparotomy and found to have a minimal tear of the descending and sigmoid colon. A repair was done and followed up with a good clinical outcome. Another patient, having a repeated CT study, was found to have free air in the abdominal cavity. An operation was done and found to have a tear off the small bowel.(Fig.1) A repair was done with also a followed up of good clinical outcome. Six patients underwent laparotomy due to various clinical suspicious clinical signs of abdominal organs injuries (e.g. seatbelt sign), transient hypotension, unexplained decrease in the hematocrit level, or persistent abdominal pain. Four patients had small bowel injury, one patient had blunt liver injury and ruptured diaphragm, one patient had retroperitoneal hematoma.

Of 90 patients with positive US findings, 77 directly underwent laparotomy. Injuries were found in 76 (Fig.2,3,4) whereas the remaining 1, no intraabdominal injury was found. Two patients died from nonabdominal injury and DPL were performed, and found to be positive for hemoperitoneum. One patient underwent subsequent CT study and found to have rectal sheath hematoma without other intraabdominal organ injury. Six patients were observed clinically and conservative treatment with good clinical outcome. The remaining four patients underwent CT, repeated US, and IVP were found to have positive abdominal organ injury but conservative treatment were given with good clinical outcome.

DPL = Direct Peritoneal Larvage

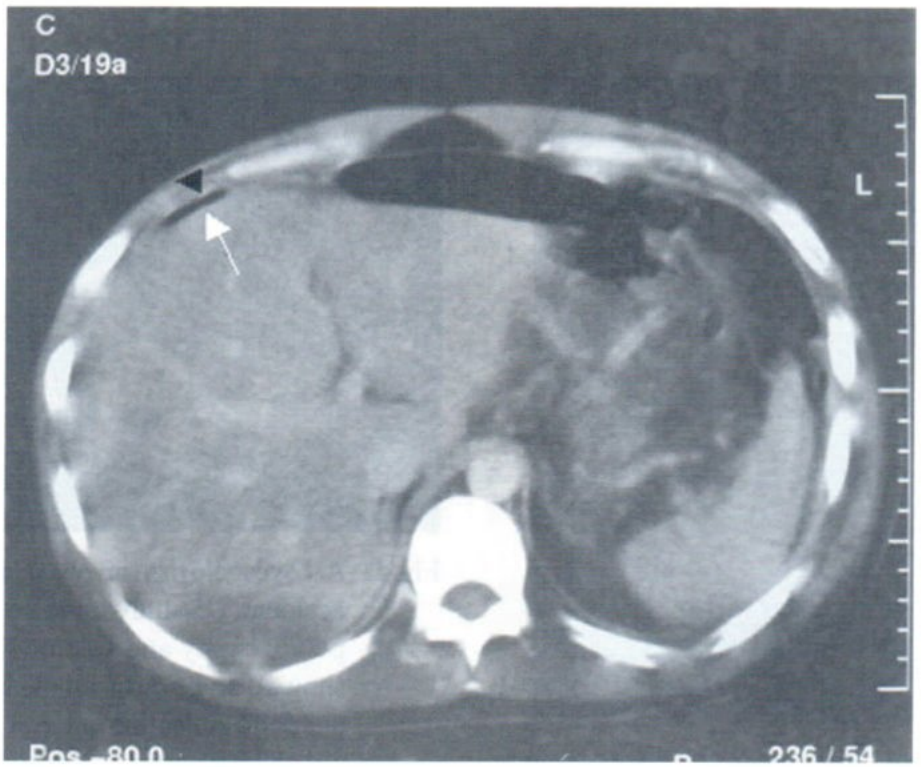
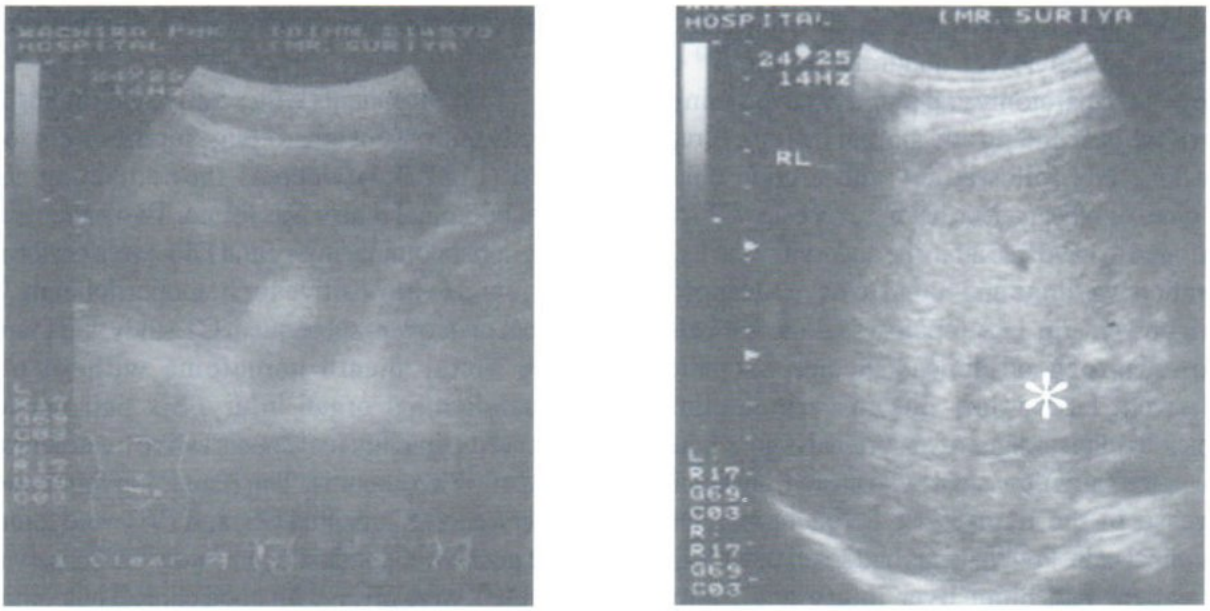


Fig.1 A 24- year man involved in an automobile accident was sent to be investigated by US study and found no free fluid or parenchymal abnormality. CT study revealed free air at anterior surface of liver (arrow). Operative note found a small bowel injury.



2A 2B

Fig.2 Transverse ultrasound image in a 32-year man involved in a motor vehicle accident. (a) US image shows free fluid in pelvic cavity (b) US image of right upper quadrant shows heterogeneity of the liver (*). Operative note found to have a rupture of the liver.

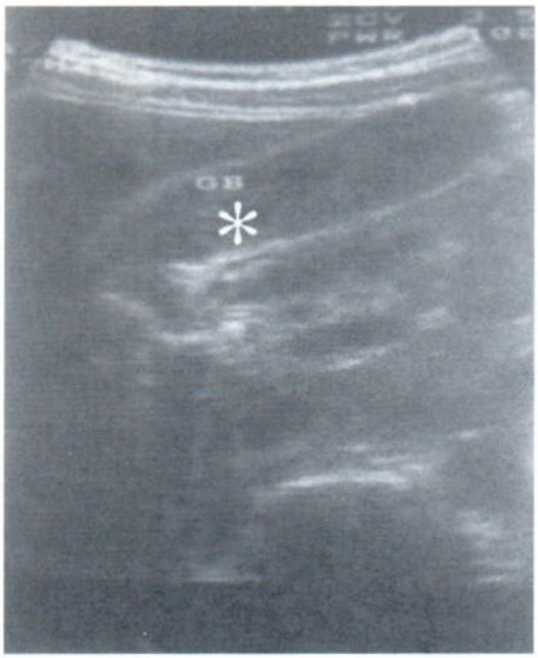


Fig.3 A 13 years old girl involved in a motor vehicle accident. US image of left upper quadrant shows hyperechoic lesion filled in GB (*) and free fluid. Operative note found to have rupture GB.

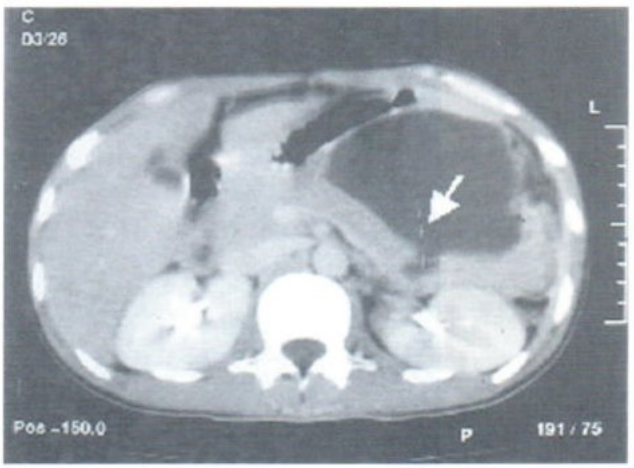


Fig.4 A 32 year old man involved in a motor vehicle accident, US study revealed free fluid at the pelvic cavity and splenic fossa. CT study shows disruption at tail of pancreas (arrow) and fluid collection anterior to the body and tail of the pancreas. Operative note found to have a laceration of the pancreatic tail.

False negative findings

Injuries were missed at US studies in 8 patients (shown in Table1)

Table 1 False negative US findings.

Site of injury	No. of missed	Total
Enteric	6	30
Liver or spleen	1	42
Isolated extraperitoneal	1	9
Total	8	81

Eight patients underwent laparotomy while seven patients underwent surgical repair of injuries. Six patients with false negative US findings underwent laparotomy for bowel injury, one patient underwent laparotomy for liver repair, and one underwent laparotomy, found to have an unexplained retroperitoneal hematoma with no action taken. All those 8 patients included other six patients from thirty patients who had bowel or mesenteric injuries. US finding was also negative in only one of 42 patients with injuries involving liver or spleen. In addition, one of 9 patients was found to have retroperitoneal hematoma. No patient with false negative screening US findings, died from abdominal injury.

False-positive findings

There were 8 false positive findings (shown in Table2). The most common false positive US was physiologic pelvic fluid (Fig 5). At US, many women had fluid in the pelvis, in which it was ultimately believed to be physiologic. Free pelvic fluid in reproductive women was thought to represent a positive US finding because a traumatic cause could not entirely be excluded on the basis of US findings alone. If subsequent CT findings or the clinical course were otherwise unremarkable, US findings were considered to be false positive. This findings accounted for 4 of 8 false positive findings. One patient had false positive US findings and resulted in nontherapeutic laparotomy.

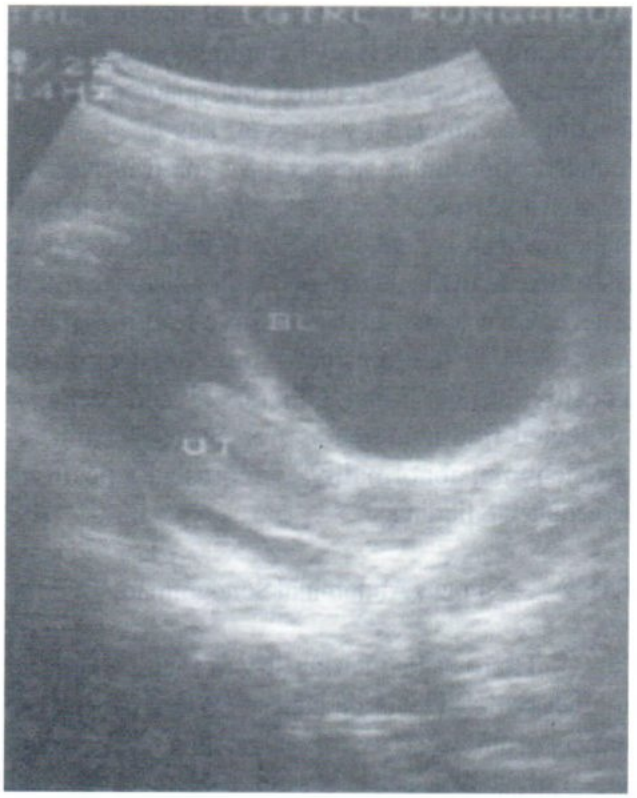


Fig.5 Transverse image in a 22- year woman involved in a motor vehicle accident found anechoic lesion in pelvic cavity suggestive of free fluid. Follow up clinical course were otherwise unremarkable with no surgery.

Table 2 False positive findings.

CT finding or clinical follow up	No. of findings.
Normal (fluid suspected at US)	3
Physiologic pelvic fluid	4
Rectal sheath hematoma	1
Total	8

DISCUSSION

In several recent articles[12-17, 18-24] in the trauma literatures, the benefits and limitations of US following blunt abdominal trauma have been cited. Techniques and methods vary among studies, and in many, US were performed by surgeons. The examination may consist of a brief survey for free fluid[25] or a more complete abdominal study including assessment of organ parenchyma.[12,24] A brief four-quadrant survey for fluid conducted by surgeon has been called focused abdominal sonography for trauma[21] or focused assessment for the sonographic examination of the traumatic patient,[16,17] or FAST. Published studies also differ as to the degree of bladder distension and criteria what constitutes a positive finding. Many authors[13-17, 18-22] use free fluid as the only criterion for a positive study finding. Others[11,12,24] consider any suspected finding, such as free fluid, free air, or parenchymal abnormality, to represent a positive screening US finding.

FAST = Focus Abdominal Sonogram for Trauma

There is also variability as to the standard against which US is measured. When available, surgery or autopsy is used. In other clinical follow up, non of which have perfect sensitivity. Because of cost and practicality prohibit the performance of routine CT in all patients undergoing US at most institutions, the standard can not always be consistent among patients.

In this study, US studies were totally performed by radiologists and there are only three radiologists in our hospital. Furthermore, ER room was covered by rotating staffs who are specialized in different specialties such as EYE, ENT,GP, then can not performed the screening of all cases of blunt abdominal trauma using US. Suspected blunt abdominal trauma cases were sent for US, would be determined by surgeon or physician at ER room. Thus, there were more positive US findings than negative US findings. The most common cause of false positive finding is physiologic, which may be assumed that the woman with isolated pelvic fluid did not require further evaluation in the appropriate clinical situation.[25] The false positive criteria described previously served to maximize the number of false positive findings, which decreased the specificity and positive predictive value.

Initial US images did not depict injuries in 8 patients in our series. Six of these patients had bowel injuries, which had been known as diagnostically challenging with US or CT.[26] Another limitation of US lies in the depiction of the retroperitoneal space.[27,28] One isolated retroperitoneal injury was missed at US. In one patient with false negative findings, US demonstrated without free fluid. Clinical follow up, the patient was still having abdominal pain in the area of right upper quadrant and a serial hematocrit drop. Exploratory laparotomy found to have a blunt liver injury grade IV and also a rupture

of diaphragm. Screening ultrasound study to detect abdominal injury in patients with blunt abdominal trauma is highly useful. With the limitation of a number of radiologists who can not covered totally in 24 hours and no emergency physician in the ER room, thus training of sonographers for screening US at Vachira Phuket hospital is a challenging to be organized to perform this useful job in the future.

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RESULTS OF PREPARED DILUTE BARIUM SULPHATE FORMULA SUSPENSION USED IN CONVENTIONAL CT OF ABDOMEN

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Rawat Tiasakul,M.Pharm.[2]

ABSTRACT

PURPOSE:

To produce well or acceptable barium sulphate formula suspension for CT of abdomen and pelvis using barium sulphate for conventional GI radiology.

MATERIALS and METHODS:

the patients undergone CT of the abdomen and the pelvis in Pranangklao Hospital during September 1, 2005 to April 12, 2006 were randomized to receive three types of contrast media: two dilute barium sulphate suspensions (one was hospital made, P.K contrast) and one water soluble iodine contrast media, and were studied by conventional CT to observe the data of the quality of bowel opacification, contrast related artifact, contrast palatability, early side effect and cost, by 3 radiologists independently and 1 CT technician. The data were tabulated and analysed using chi-square test, exact test, and percentage.

RESULT:

134 patients, for the acceptability of the patients, there were no statistic significant differences between the three contrast media in the drinking and vomiting but showed significant differences in the tastes, swallowing difficulty and nauseatic effects, whereas water soluble iodine contrast media was a little better. There were no statistic significances in the bowel opacification except at the stomach. Also there were no differences in the disturb artifacts. The P.K contrast was the cheapest, 4-10 times lower, than the other two contrasts used in this study.

CONCLUSION:

Barium sulphate for conventional GI radiology with proper suspension agent and formula can be used well in bowel opacification for CT of abdomen and pelvis and is the accepted agent for patients because of its safety and low cost.

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INTRODUCTION

In routine abdominal or pelvic computed tomography (CT) usually requires adequate opacification of the gastrointestinal tract (GI) with positive or negative contrast agents, because unopacified or improper bowel preparation, especially small bowel may simulate pathologic abnormalities as bowel masses or nodes.[1-8] The two commonly used opaque media are diluted barium sulphate and diluted water soluble iodinated contrast media. Barium sulphate suspension is the agent of choice for conventional gastrointestinal radiology because of its inert property, no peristaltic stimulation, no osmotic effect and no bowel absorption.[2] It seems logical to use barium sulphate in CT of the abdomen in general patients, asthmatic patients, iodinated allergic patients and patients with history of drug or seafood allergy. Barium sulphate suspension is easy to be improved in flavors or tastes but it has some disadvantages in sedimentation or flocculation within the stomach causing disturbing artifacts and loss of distal bowel opacification.[3] The price of commercial diluted barium sulphate suspension is rather expensive.[6] Diluted water soluble iodinated contrast media is easy to be prepared without sedimentation property in bowel but some patients find it is difficult to be swallowed because of its taste and can be absorbed causing allergy in some patients.[3]

The study is conducted to produce well or acceptable barium sulphate formula suspension for CT of abdomen and pelvis using barium sulphate for conventional GI radiology.

OBJECTIVE

To prepare an acceptable diluted barium sulphate formula suspension used in CT of abdomen and pelvis comparing with other two positive contrast media; 1. commercial dilute barium sulphate and 2. water soluble iodinated contrast, in quality of bowel opacification, contrast in relation to artifacts, palatability, early side effect and costs.

MATERIAL AND MATHODS

Ethics committees of our hospital, The Pranangklao Hospital, have granted an approval for this study.

PATIENTS

The patients undergone CT of the abdomen and the pelvis in Pranangklao Hospital, Thailand during September 1, 2005 to Apri l2, 2006, excluding children and the suspected bowel perforation cases.

TECHNIQUE

Conventional CT were used, Elscint, exel 2400 ELECT. (slice thickness 10 mm, scanning time 2.1 sec and using routine scan technique in the most cases)

CONTRAST MEDIA

Three types of contrast media were used, there are two dilute barium sulphate suspensions and one water soluble iodine contrast media.

1. In house (hospital made) prepared dilute barium sulphate formula suspension, 1.8% w/v barium sulphate contrast media (P.K. contrast), contains barium sulphate, suspending agent and the other ingredients such as vegetable gum, sorbitol, artificial sweetener and artificial sala Hale's blue boy-flavoured syrup by researcher and the pharmacist of Productive Pharmaceutical Department, Pranangklao Hospital.

2. Commercial barium sulphate formula suspension, 2.2% MedeSCAN

3. Dilute water soluble iodinated contrast media, telebrix 35, ultravist 370, xenetric 350 or omnipaque

METHOD OF INTERVENTION (preparation of contrasts to patients)

All patients were NPO for at least 8 hours prior to CT studies.

1. P.K. contrast:

1.1 Upper abdomen study: 375 ml of the solution was given orally in 20-30 min before the scan and 125 ml was given immediately before the scanning (total = 500 ml).

1.2 Whole or lower abdomen study: three 250 ml were given orally in 20 min intervals (750 ml) and 250 ml was given per rectal enema, immediately before the scan (total = 1000 ml).

2. MedeSCAN:

2.1 Upper abdomen study: 375 ml was given orally in 20-30 min before the scan and 125 ml was given immediately before the scanning (total = 500 ml).

2.2 Whole or lower abdomen study; three 250 ml were given orally in 20 min intervals (750 ml) and 250 ml was given per rectal enema, immediately before scannig. (total = 1000 ml).

3. Water-soluble contrast:

3.1 Upper abdomen study: 375 ml was given orally in 20-30 min before the scan and 125 ml was given immediately before the scanning (total = 500ml, using 15 ml contrast media mixed with water to 500 ml).

NPO = Nothing per Oral

3.2 Whole or lower abdomen study; three 250 ml were given orally in 20 min intervals (750 ml) and 250 ml was given per rectal enema, immediately before scannig (total = 1000 ml, using contrast 30 ml mixed with water to 1000 ml)

Bowel opacification (good, poor) in eight regions were observed by three radiologists independently without knowing what type of the contrast media was used and judging from at least 2 similar opinions. Disturbed artifact were classified into 3 grades (none, artifacts not effecting diagnostic information (weak), and artifacts impairing diagnostic information (marked)). The records along with patients' compliance such as flavor, difficulty in swallowing and nauseating effects were recorded by CT technician who was the only person aware of the type of the contrast agent used. Compliance was rated by the acceptability of patients to the contrast media as regarding to ability to drink (all, volume left over or residual contrast media), taste or flavor (good, acceptable, disagreeable), difficulty in swallowing (yes, no), Nauseating effect (yes, no) and vomiting (yes, no). The data were tabulated and analysed using chi-square test, exact test, and percentage.

RESULTS

Conventional CT examination of the abdomen and the pelvis were performed on 134 patients (70 men, 64 women; aged 16-85 years; mean = 54 years using three contrast media: P.K contrast, MedeSCAN, water soluble iodinated contrast) which were divided into 3 groups.

Table 1 Contrast media used.

Contrast media	Frequency (cases)	Percent
MedeSCAN	33	24.63
P.K contrast	46	34.33
Water-soluble contrast	55	41.04
Total	134	100.00

Form table 1, the water soluble contrast media was the most contrast media used, 55 cases (41.04%) and the least was MedeScan, 33 cases (24.63%).

Table 2 Acceptability to patients of the contrast media in drinking.

Contrast drinking	Contrast media						Total	
	MedeSCAN		P.K contrast		Water-soluble			
	cases	%	cases	%	cases	%	cases	%
Total	29	87.9	38	82.6	45	81.8	112	83.6
Left over	4	12.1	8	17.4	10	18.2	22	16.4
Total	33	100.0	46	100.0	55	100.0	134	100.0

Chi-squared value = .600, P = .741, α<0.05. .

From table 2, the patients drank the total contrast media about 83.6% and had the residual contrast media about 16.4 %, so the residual contrasts media were approximately 100-250 ml. There is no statistic significance differences in the drinking between the three contrast media.

Table 3 Acceptability of the patients of the contrast media in tastes.

Taste	Contrast media						Total	
	MedeSCAN		P.K contrast		Water-soluble			
	cases	%	cases	%	cases	%	cases	%
Good	11	33.3	5	10.9	31	58.5	47	35.6
Acceptable	21	63.6	35	76.1	21	39.6	77	58.3
Disagreeable	1	3.0	6	13.0	1	1.9	8	6.1
Total	33	100.0	46	100.0	53	100.3	132	100.0

Chi-squared value = 27.298, P = .000 (Exact sig., 2-sides), α<0.05. .

From table 3, there is statistic significance in taste between the contrast media, which P.K contrast was prominently in disagreeable, 6 case (13%) whereas MedeSCAN 1 case (3%) and Water- soluble contrast 1 case (1.9%).

Table 4 Acceptability to patients of the contrast media in the difficulties in swallowing.

Difficulties in swallowing	Contrast media						Total	
	MedeSCAN		P.K contrast		Water-soluble			
	cases	%	cases	%	cases	%	cases	%
Yes	5	15.2	8	17.4	8	1.9	14	10.6
No	28	84.8	38	82.6	52	98.1	118	89.4
Total	33	100.0	46	100.0	53	100.0	132	100.0

Chi-squared value = 7.203, P = .024 (Exact sig., 2-sides), α<0.05. .

From table 4, there is statistic significance in the difficulties of swallowing between the contrast media, MedeSCAN and P.K contrast were prominently in 5 cases (15.2%) and 8 cases (17.4%), respectively. The water soluble contrast media was acceptable in the swallowing.

Table 5 Acceptability to patients of the contrasts in nauseating effect.

Nauseating effect	Contrast media						Total	
	MedeSCAN		P.K contrast		Water-soluble			
	cases	%	cases	%	cases	%	cases	%
Yes	10	30.3	16	34.8	3	5.7	29	22.0
No	23	69.7	30	65.2	50	94.3	103	78.0
Total	33	100.0	46	100.0	53	100.0	132	100.0

Chi-squared value = 13.966, P = .001, α<0.05.

From table 5, there is statistic significance in nauseating effect between the contrast media, MedeSCAN and P.K contrast were prominently in 10 cases (30.3%) and 16 cases (34.8%), respectively.

Table 6 Acceptability to patients of the contrasts in vomiting

Vomiting	Contrast media						Total	
	MedeSCAN		P.K contrast		Water-soluble			
	cases	%	cases	%	cases	%	cases	%
Yes	3	9.1	1	2.2	2	3.8	6	4.5
No	30	90.9	45	97.8	51	96.2	123	95.5
Total	33	100.0	46	100.0	53	100.0	132	100.0

Chi-squared value = 2.240, P = .383 (Exact sig., 2-sides), α<0.05.

From table 6, there is no statistic significance in vomiting between the contrast media.

Table 7 Study

Study	Frequency (cases)	Percent
Upper abdomen	72	53.7
Lower abdomen	5	3.7
Whole abdomen	57	42.5
Total	134	100.0

The main studies were upper abdominal CT, 72 cases (53.7%) and a few cases were lower abdominal CT, 5 cases (3.7%)

Table 8 Degree of filling opacity of different gastrointestinal regions

Gastrointestinal regions (Cases,%)	Contrasts								
	MedeSCAN		P.K		Water-soluble		chi-squared		
	good	poor	good	poor	good	poor	values	p	Sig.
Stomach	22 68.8	10 31.3	41 93.2	3 6.8	48 88.9	6 11.1	9.771	.008	S
Duodenum	19 59.4	13 40.6	34 77.3	10 22.7	44 81.5	10 18.5	5.432	.066	NS
Jejunum	29 90.6	3 9.4	33 75.0	11 25.0	47 87.0	7 13.0	4.034	.133	NS
Ileum	14 100.0	0 0	17 89.5	2 10.5	25 89.3	3 10.7	1.623	.592 (E)	NS
Ascending colon	7 50.0	7 50.0	13 68.4	6 31.6	20 71.4	8 28.6	1.998	.368	NS
Transverse colon	8 57.1	6 42.9	14 73.7	5 26.3	15 53.6	13 46.4	2.013	.366	NS
Descending colon	9 64.3	5 35.7	16 84.2	3 15.8	21 75.0	7 25.0	1.730	.444 (E)	NS
Sigmoid colon	12 85.7	2 14.3	17 89.5	2 10.5	21 75.0	7 25.0	1.777	.481 (E)	NS
Rectum	13 92.9	1 7.1	18 94.7	1 5.3	26 92.9	2 7.1	0.075	1.000 (E)	NS

(E)= exact test.

From table 8, only the stomach region shows statistical significance in filling opacity of the three contrast media, MedeSCANs were rather poor opacification, 10 cases (31.3%) followed by water-soluble contrast media, 6 cases (11.1%) and the best were P.K. contrasts whereas the rest of different GI regions were no statistical significant.

Table 9 Occurrence of contrast-related artifacts

Contrast media	Imaging artifact					
	None	%	Weak	%	Marked	%
MedeSCAN	32	97.0	1	3.0	0	0
P.K contrast	37	80.4	8	17.4	1	2.2
Water-soluble	50	90.9	5	9.1	0	0
total	119	88.8	14	10.4	1	0.7

Chi-squared value = 6.509, P = .114 (Exact sig., 2-sides), $\alpha < 0.05$.

From table 9, the imaging artifacts were infrequent occurrence, seen only 1 case (2.2%) of P.K contrast in marked or disturb diagnostic information. No statistic significance in artifact occurrence between the contrast media.

Table 10 Cost of the contrast media.

contrasts	Cost of contrast (Bahts)	
	Upper abdomen study	Whole abdomen study
MedeSCAN	160	320
P.K. contrast	19	38
Water-soluble, ionic	84	168
Water-soluble, non-ionic	195	390

From table 10, the water- soluble iodinated contrast media had two agents as ionic and non-ionic, which non-ionic agent cost was two times more expensive than ionic agent and was slightly higher than MedeScan. The P.K contrast was lowerest, 4-10 times lower.

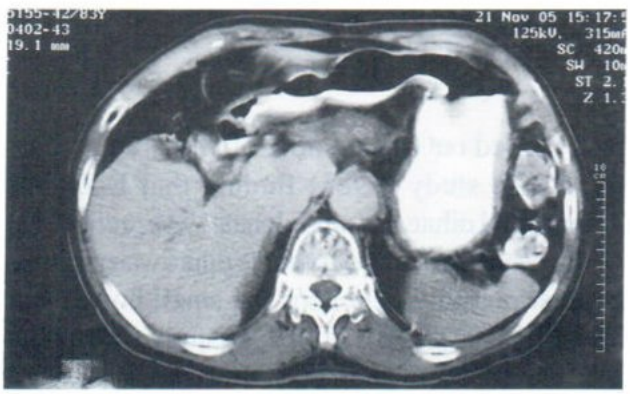

Fig. 1

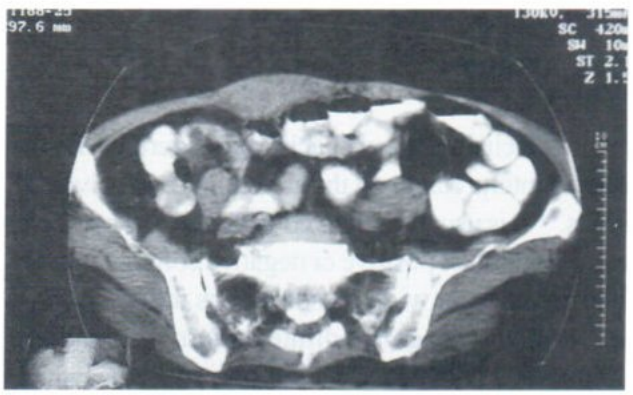

Fig. 2

Fig. 1,2 Water-soluble contrast

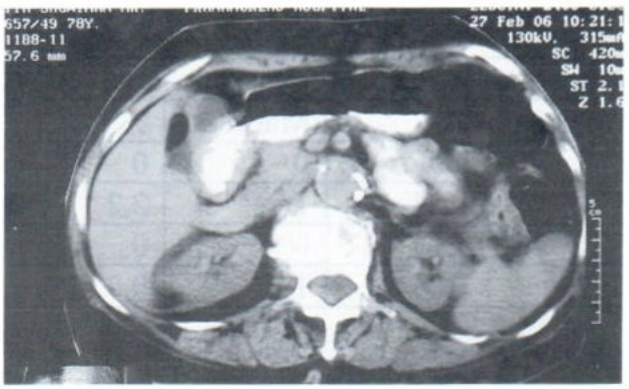

Fig. 3

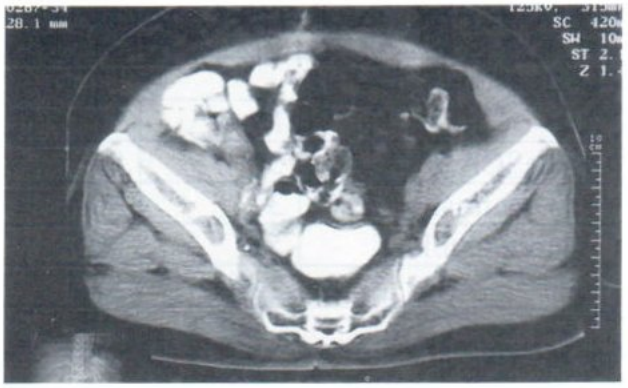

Fig. 4

Fig. 3,4 Mediscan contrast

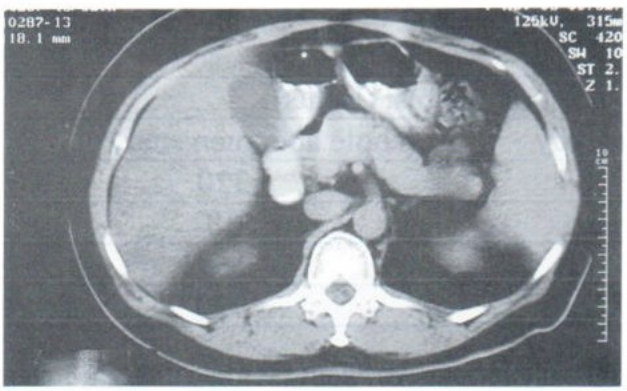

Fig. 5

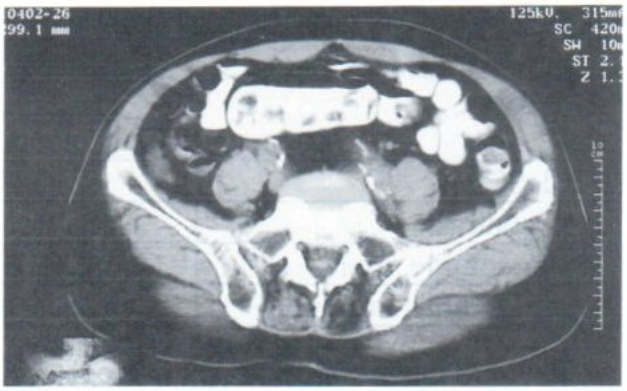

Fig. 6

Fig. 5,6 P.K. contrast

DISCUSSION

Reliable bowel opacification is critical for the correct interpretation of the abdominal and pelvic CT scans.[1-8] It is usually achieved with oral and per rectal administation of positive or negative contrast agents.[4] The common or widely used agents for GI contrast are the positive agents: dilute barium sulphate and dilute water soluble iodinated contrast media, which have both ionic and non-ionic contrast agents. The negative contrast agents: water,[9] oil emulsion, milk[10] or simethicone-coated cellulose[11] are less in favor. The comparison of dilute barium sulphate with dilute water soluble iodinated contrast media in bowel opacification, artifact, patient side effect and cost had been carried out in a number of research by Carr and Banks study (1985) finding that E-Z-CAT (commercial dilute barium sulphate) was preferred in the duodenal label[5] and diatrizoate dilute water soluble contrast possibly better for the small bowel, but CHAMBERS and BEST (1984) study showed no differences.[1] Dilute barium contrast media prefered to water soluble contrast media in Megibow and Bosniak study (1980),[2] Nyman and Andersson study (1984),[3] Hatfield et al study (1980),[4] or Kivisaari and Kormano study (1982).[12] A study by Matsuoka et al (2000)[8] used both positive (dilute iodinated solution) for pelvic CT and followed by negative (water) oral

contrast agent for upper abdominal CT.

The barium sulphate contrast media is good in inert property, no bowel absorption and hypersensitivity,[2] but has disadvantage in sedimentation or flocculation causing artifact in the stomach and decrease contrast in the distal bowel.[3] We can reduce this disadvantage by using suspending agent to prevent over-rapid sedimentation.[2] The water soluble contrast media is good in opacification and preparation, but has some disadvantage in taste and is absorbed into the circulation (Johensen 1978),[13] which may increase the risk of allergic reactions especially in the patient with a history of hypersensitivity. We can improve these disadvantages with non-ionic contrast media, but the cost is also increasing.[3]

The GI tract has a capacity in excess of 4 litres which lead to the dilution of high-density contrast agents. Therefore, at least 800 ml to 1 litre of these agents is needed for abdominal CT. A bolus of oral contrast agent exits the stomach in 30 minutes. It reaches and exits the duodenum in 15-40 minutes, the jejunum in 30- 90 minutes, the ileum in 45 -150 minutes and the colon in 90 minutes to 16 hours, respectively, so well opacification need proper large amount of contrast.[7]

Now, there is low density barium sulphate suspension (VoLumen) for oral contrast in Multidetector CT (MDCT)[14] and PET/CT15 studies provided improved or excellent distention and visualization of bowel wall, good for bowel wall pathology diagnosis.

In this study, 134 cases in CT abdomen and pelvis with three contrasts 24.63% of medeSCAN, 34.33% of P.K contrast and 41.04% of water- soluble contrast (table 1).

The main studies were upper abdominal studies, 53.7% and a few cases in lower or pelvic abdomen (table 7). The acceptability of the patients in drinking and vomiting were no significant difference (tables 2 and 6) but the differences in taste or flavor, difficulties in swallowing and nauseating effect were significant differences (tables 3, 4 and 5), prominently in dilute barium sulphate contrast media as P.K. contrast and medSCAN, may be from rather high concentration, stickiness and large amount of the contrasts. Degree of filling opacity of different GI sections (table 8), only stomach is statistically significant differences, the other are not , the same as in the previous studies.[2-5,12] The differences of stomach opacity may be caused by the delay studies, so some costrast medias has passed downward into the distal bowel already. There were a few artifacts occurred in the three contrast medias but no significant differences, the same as in the other studies. The costs of each contrast media were difference, the P.K. contrast media of our hospital preparation as the dilute barium sulphate formula was the cheapest, 4-10 times lower, than the others.

There are many factors in the selection of the contrasts for bowel opacification such as age (children or elderly), for medical or surgical interventions (suspected bowel perforation or post bowel anastomosis), patients status (history of hypersensitivity or had problems of difficulties in swallowing), CT machinery (conventional CT, MDCT or PET/CT) or costs. Final choice will be on the relative importance of these factors.

CONCLUSION

Barium sulphate for conventional GI radiology with proper suspension agent and formula can be used well in bowel opacification for CT of abdomen and pelvis but the preferred agent for the patients will be for their safety, diagnostics and low costs.

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LARGE EXOPHYTIC RENAL ANGIOMYOLIPOMA

Anchalee WISITWONG , M.D.[1]

ABSTRACT

A case of large exophytic renal angiomyolipoma in a 24-year-old female patient is presented. Abdominal CT scans showed the characteristic findings: a large exophytic well-demarcated fat density mass with sharp defect in renal parenchyma, enlarged intratumoral blood vessels and presence of additional intrarenal angiomyolipomas.CT is an accurate and clinically useful method to evaluate renal angiomyolipoma and provide the differential diagnostic information.

INTRODUCTION

Angiomyolipoma is a benign renal neoplasm that consist of varying amounts of mature adipose tissue, smooth muscles and thick-walled blood vessels. This tumor may grow to be large and bulky, extending into the perirenal space and represent retroperitoneal mass that contain fatty element. A large predominately exophytic angiomyolipoma may be difficult to be distinguished from a well-differentiated perirenal liposarcoma because both are large fat -containing lesions and their CT appearances may be so similar. Their differentiation are important because the prognosis and treatment are different.[1]

A case of large exophytic renal angiomyolipoma with the imaging findings and CT characteristics that lead to accurate distinction from retroperitoneal perirenal liposarcoma is presented.

CASE REPORT

A 24-year-old female patient who had a history of exploratary laparotomy due to rupture of ectopic pregnancy about 1 month ago, presented with left upper quadrant pain for 2 months. Physical examination revealed large abdominal mass size about 10x20 cm. at left upper abdomen with mild tenderness. The rest of the physical examination were normal. Routine laboratory values were within normal limits.

An abdominal CT study was performed. It demonstrated a large well demarcated homogeneously fatty tumor in left retroperitoneum, measuring 25x18x10 cm., surrounding and displacing left kidney upward and anteriorly with sharp defect in the lower pole of left kidney. Multiple small fatty tumors, size about 0.5-1 cm. at the lower pole of left kidney are also seen.(Fig.1) Post contrast study reveals enhancement of intratumoral enlarged vessels. (Fig. 2-3) The CT findings are suggestive of a large predominately exophytic renal angiomyolipoma at the lower pole of left kidney with additional multiple small renal angiomyolipoma in the ipsilateral kidney.

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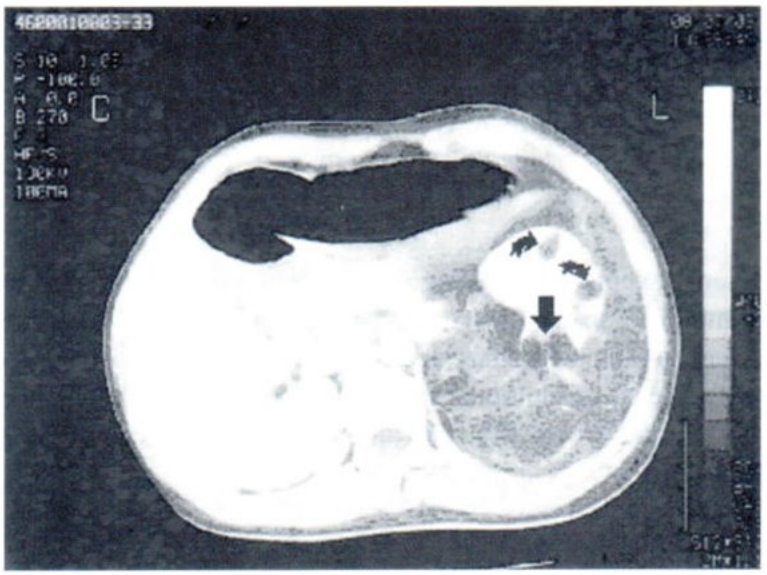

Fig.1 Contrast-enhanced CT scan of the abdomen shows a large well demarcated fatty tumor in the left retroperitoneum, surrounding and displacing left kidney upward and anteriorly with sharp defects in the renal parenchyma (arrow) and additional multiple small fatty tumors at lower pole of left kidney.(curve arrows)

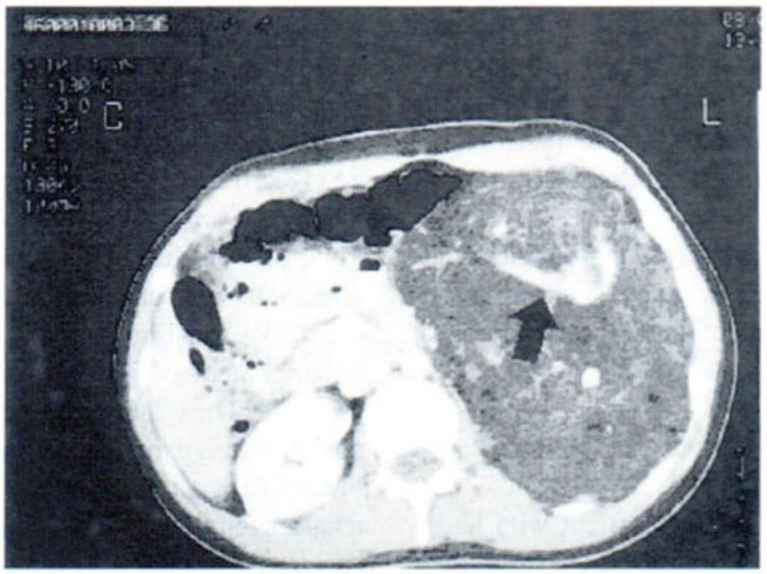

Fig.2 Contrast-enhanced CT scan presented inferior to the left kidney shows associated with enlarged vessels. (arrow)

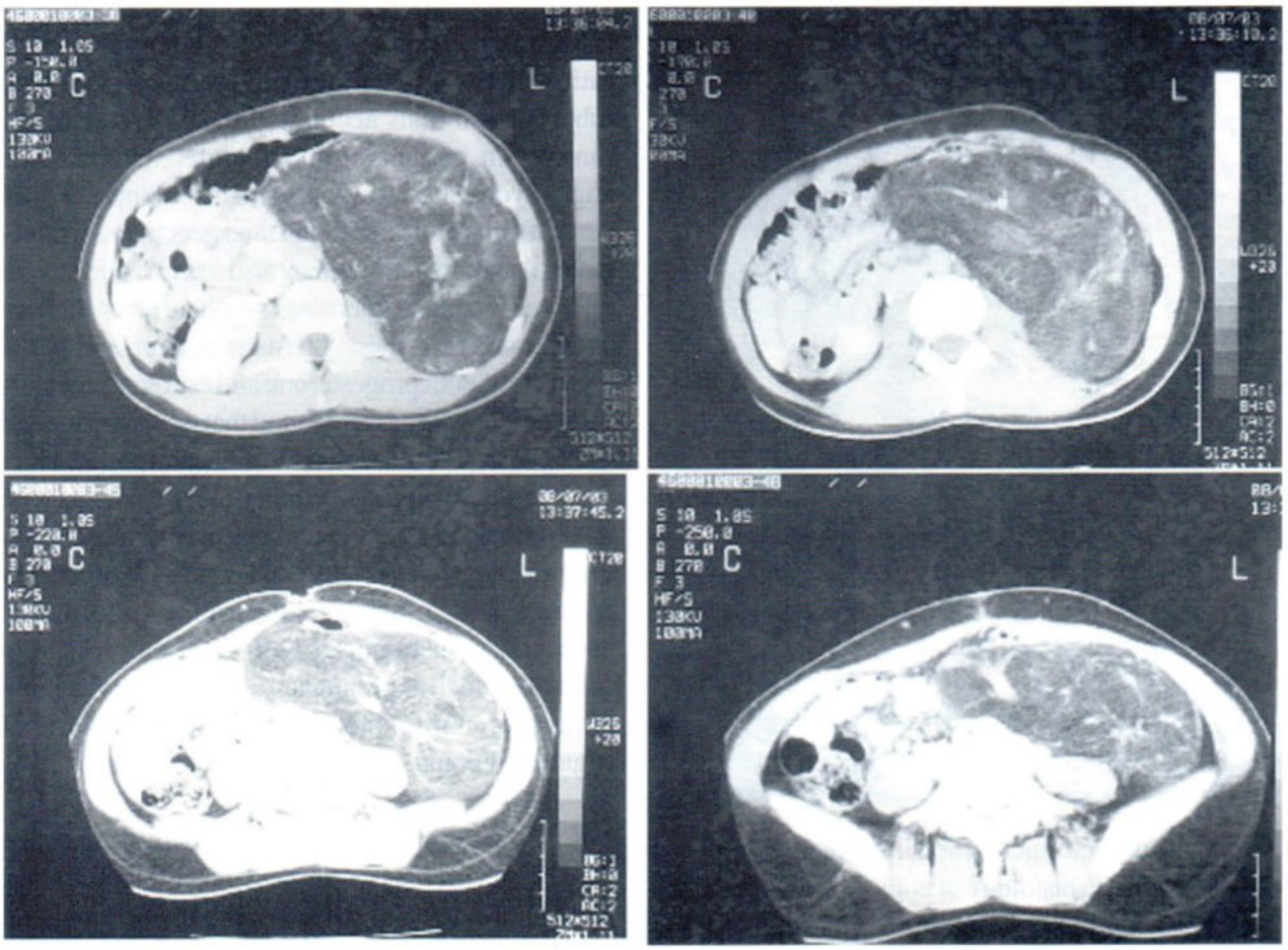

Fig.3 Contrast-enhanced CT scan obtained inferior to Figure 2 shows further extension of the lesion into the pelvic cavity.

On exploratory laparotomy, a large well -capsulated yellow-whitish mass size about 30x20x10 cm. and weighed 2300 g. was found arising from the lower pole of left kidney and located in the left retroperitoneal space. The tumor was removed completely.

The histopathologic study revealed the triphasic appearance, with smooth muscle,adipose tissue and thick-walled blood vessels.(Fig.4) The histopathologic diagnosis was angiomyolipoma.

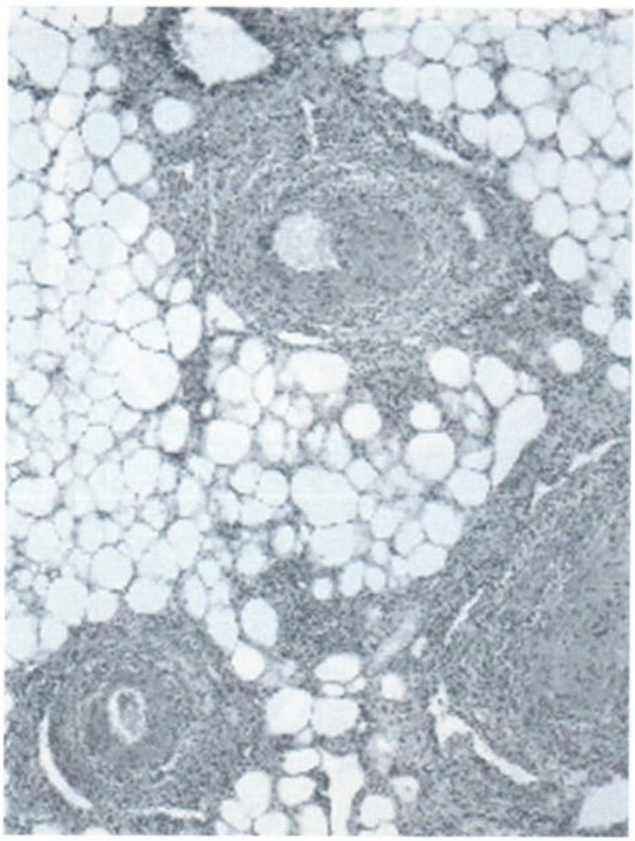

Fig.4 This photomicrograph illustrated the typical triphasic histology of angiomyolipoma, with smooth muscle, adipose tissue and thick walled blood vessels.

DISCUSSION

The first histologic description of an angiomyolipoma appeared in the literature in 1911 reported by Fischer.[2] The term hamartoma (a benign mass composed of disorganized tissues normally found in an organ) is sometimes used, but choriostoma (a benign mass composed of disorganized tissues not normally found in the organ) is a more appropriate term because smooth muscle is not normally found in renal parenchyma.[3] Two types of angiomyolipoma are described: isolated angiomyolipoma and angiomyolipoma associated with tuberous sclerosis. Isolated angiomyolipoma occurs sporadically and accounts for 80 percent of the tumors.[4] In symptomatic patient without tuberous sclerosis, the tumors are usually large, solitary lesions occurring in women between the ages of 30 and 60 years, with a female to male ratio of 2.6 to 1. Angiomyolipoma associated with tuberous sclerosis accounts for 20 percent of the tumors. In patients with tuberous sclerosis, the angiomyolipoma are usually small, multiple (13 to 30 percent), bilateral (15 percent) and generally asymptomatic. Angiomyolipoma may also seen in patients with pulmonary lymphangiomatosis without other stigmata of tuberous sclerosis.[5] L'Hostis et al observed the presence of both progesterone and estrogen receptors in angiomyolipomas and found that progesterone and estrogen immunoreactive angiomyolipomas were predominantly found in women and in patients with tuberous sclerosis. These findings may further explain the more aggressive nature of the disease process in patients with tuberous sclerosis, the hormonal potentiation of tumor growth and hemorrhage in conditions such as pregnancy and the overwhelming female predominance in the sporadic form of angiomyolipoma without tuberous sclerosis.[7]

Angiomyolipoma is a round or oval tumor that arise in both the renal cortex and medulla and elevates the renal capsule. It grows by expansion and local invasion. In about 25 percent, the tumor has a predominantly exrarenal growth pattern that extends to or even through the renal capsule into the perirenal compartment.[2] It is considered benign, but rare cases extension into renal vein and/or inferior vena cava and deposits in the renal lymphnodes are reported. Most small lesions are asymptomatic and incidental findings on images are detected. As many as 40 percent are symptomatic, manifestation with symptoms of abdominal and flank pain, nausea, vomiting and fever may be detected. Common findings described include a palpable mass, abdominal tenderness, hematuria, anemia, shock, hypertension, UTI and renal failure. These signs and symptoms are usually a result of mass effect and hemorrhage.

Accurate diagnosis of angiomyolipoma can be made in virtually all cases using CT, which is very sensitive to the low attenuation of fatty tissue within

the tumor, typically less than -20 HU at nonenhanced CT.[8] Angiomyolipoma typically join the normal renal tissue at an acute angle, rarely obstruct the calyceal system, and range in size from less than 2 cm. to more than 8 cm., when detected. After contrast medium injection, portions of tumor may be enhanced, but fatty tissue do not increase in density. Angiomyolipoma commonly contains enlarged vessels that can be seen on contrast-enhanced CT.

Large exophytic renal angiomyolipoma represents a retroperitoneal mass that contain fatty element, with CT appearances similar to retroperitoneal liposarcoma. Liposarcoma which occur slightly more frequently in men than in women, are among the most common primary retroperitoneal malignancies, with the perirenal region as a frequent location. Their differentiation is important because the prognosis and treatment are different. Gary M. Israel et.al retrospectively analyzed CT images of exophytic renal angiomyolipomas and well-differentiated retroperitoneal liposarcoma and described the important imaging findings; sharp defect in the renal parenchyma, the presence of enlarged vessels and associated angiomyolipomas that enable accurate differentiation angiomyolipoma from retroperitoneal perirenal liposarcoma.[1]

Renal angiomyolipoma arise from the kidney, a defect will be present in the renal parenchyma at its origin and commonly contains enlarged vessel. Liposarcoma do not cause a defect in renal parenchyma and the interface of the lesion with the kidney is smooth.

Well-differentiated liposarcoma is relatively avascular, and its vessels are not usually enlarged. The presence of enlarged vessels in renal angiomyolipoma is not as important in diagnosis as the presence of a defect in renal parenchyma but it is a significant ancillary finding. Renal angiomyolipoma may be multiple, even without associated tuberous sclerosis. The presence of other fatty lesions in the ipsilateral or contralateral kidney, independent of the dominate lesion is a strong indicator of renal angiomyolipoma.

In this case, the large exophytic fatty tumor of the left kidney had all three distinctive CT findings as previously mentioned, allows the differential diagnosis of this condition from well-differentiated retroperitoneal liposarcoma quite clearly.

CONCLUSION

Large exophytic renal angiomyolipoma is a large benign renal tumor that extend to perirenal space. It has a characteristic fat component that can clearly be demonstrated by CT. CT accurately depicted the presence, location and size of the tumor, provided information about its relation to adjacent structures and showed the important findings that lead to accurate distinction of large exophytic renal angiomyolipoma from retroperitoneal perirenal liposarcoma.

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ENDOVASCULAR TREATMENT OF CRANIAL DURAL ARTERIOVENOUS FISTULAS(DAVFS) IN THAILAND: THE SIRIRAJ HOSPITAL EXPERIENCE

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PURPOSE

To summarize the clinical results of our management of DAVFs related to clinical presentation and angioarchitectural classification of DAVFs.

METHODS

This retrospective analysis concerns 56 patients, including 22 Male and 34 female (range from 19-80 years, mean age is 52.4 years), who were clinically and radiologically assessed and were received diagnosis and treatment of DAVF by embolization in our Siriraj Hospital Faculty of Medicine, Mahidol University during July 2002-June 2005. Analyzed data includes patient clinical presentation, topographic and angioarchitectural classification of DAVFs as a benign and aggressive type correlated to the Borden and the Cognard classification (Table 1), Strategies of endovascular treatment emphasis in aggressive DAVF and results are reviewed. Embolization procedures were classified into complete and partial treatment related to shunt disconnection. Follow-up information was obtained for 53 patients (95%) after diagnosis or treatment with a mean follow-up period of 10 months. During the follow-up period, the clinical status of patients and angiography was schedule evaluated in our weekly neurovascular clinic.

TABLE 1 Classification of Cranial Dural Arteriovenous Fistulas (DAVFs)

Type (Borden/Cognard)	Number (%)
1/IA	28 (50%)
1/IB	1 (1.75%)
1/IIA	5 (8.9%)
2/IIB	4 (7.1%)
2/IIA+B	16 (28.6%)
3/III	1 (1.75%)
3/IV	1 (1.75%)

RESULTS

We detected 22 aggressive DAVFs and 34 benign DAVFs in ours patients. Location of the fistulas were at the cavernous sinus (CS) in 31 (55.4%), transverse-sigmoid sinus (TS-SS) in 16 (28.5%), superior sagittal sinus (SSS) in 2 (3.6%) and the others (included at torcular, inferior petrosal sinus (IPS), and posterior fossa vein) in 7 (12.5%) of the patients.

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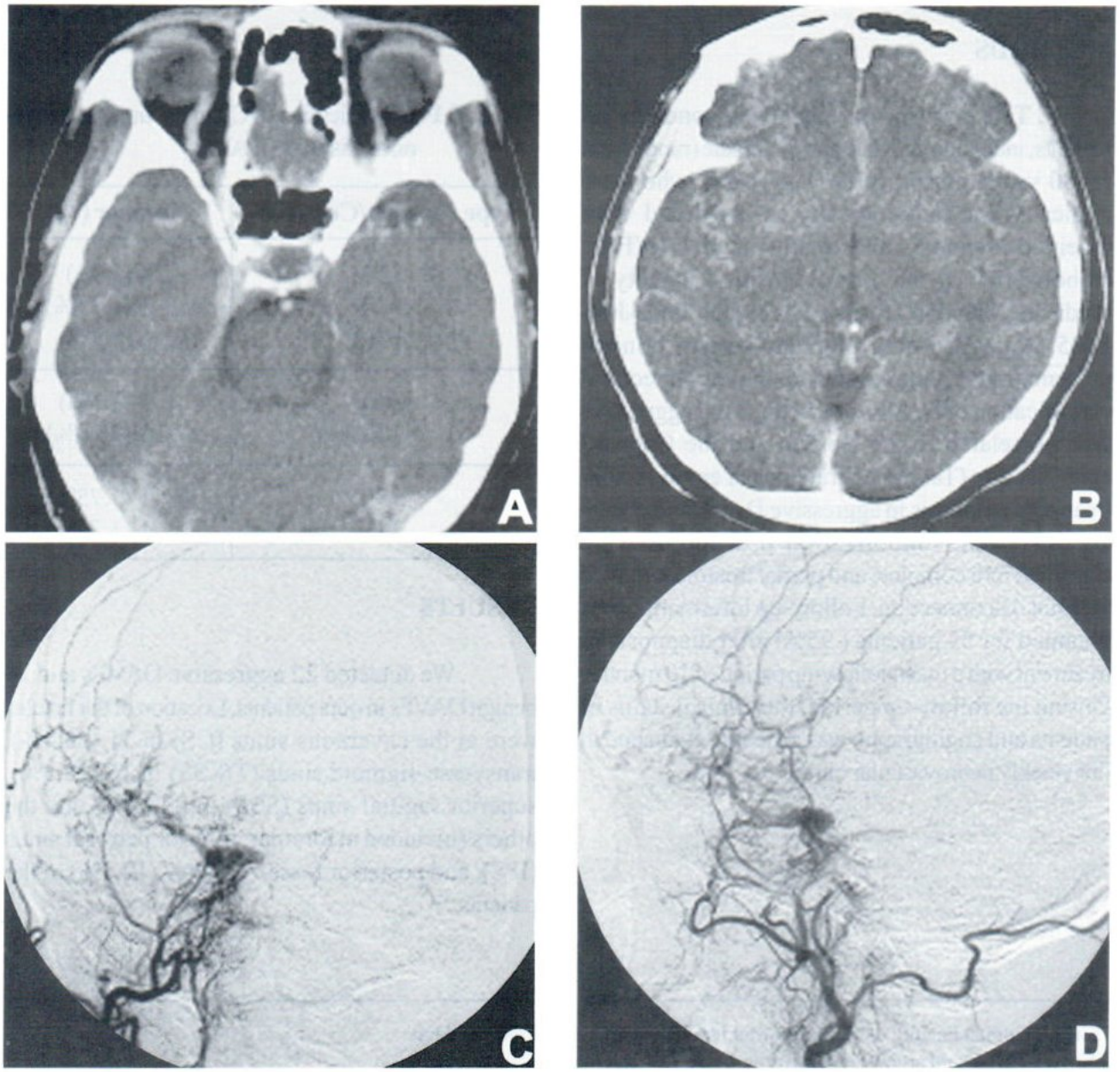
Key words: Dural arteriovenous fistula, embolization Dittason@hotmail.com

Among patients with aggressive DAVF lesions (Table 2&3), there were varieties of presenting symptoms (neurological symptoms 50%, eye symptoms 61%, hemorrhage 5.5%, tinnitus 17%). Most of these patients were treated by transarterial embolization with NBCA and/or Polyvinyl alcohol (47%), treated by transvenous embolization with coils (32%) and treated by combined transarterial-transvenous embolization (21%) that resulted in 41% complete shunt closure and 59% partial successful resulted with reduction of cortical venous reflux. For group of patients treated by transvenous embolization, there is 1 patient whom transvenous access to the cavernous sinus were not successful due to failure to cannulate of small inferior petrosal sinus (IPS). However, this patient was successfully treated by transfacial catheterization through the superior ophthalmic vein (Fig 1). One patient was decided to wait and see due to old age and improper medical condition for embolization procedure. Almost all of ours patients were clinical improvement on clinical follow up.



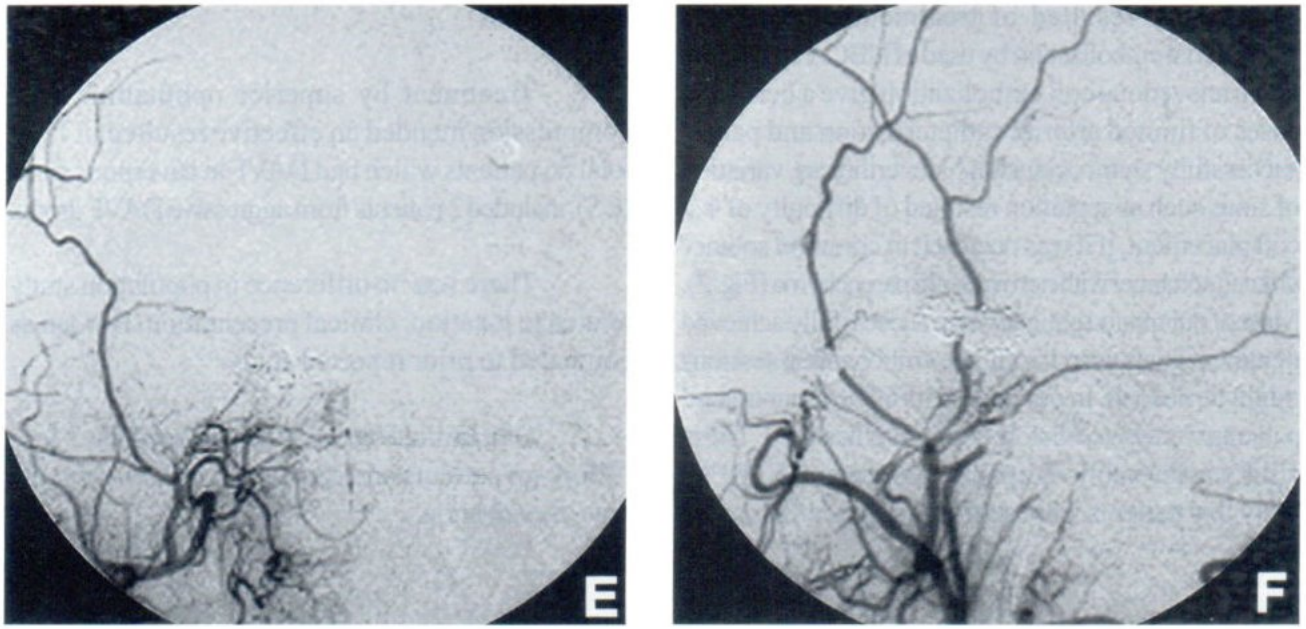


Fig.1 Successful transvenous coil embolization via Rt. Facial vein.
A 56-year-old female patient presented with headache and blurred vision of Rt.eye. CT brain(A,B) revealed dilated Rt.superior ophthalmic vein and enlarged Rt.cavenous sinus with some venous congestion at Rt.frontotemperal region. Preembolization angiogram(C,D) revealed dural arteriovenous shunts at Rt. Cavenous sinus fed by branches of Rt.external carotid artery and major drained via superior ophthalmic vein and sphenoparietal vein. Control angiogram(E,F) showed immediately complete obliterated shunts.

Among patients with benign DAVF lesions (Table 4&5), 3 patients were lost to follow-up before having treatment or post manual compression (8.8%). Patients were treated if they presented with intractable symptoms. Most of ours patient presented with eye symptoms and tinnitus. Some of ours patients have spontaneous thrombosis of shunts especially by manual compression of superior ophthalmic vein (26.4%). 22 patients (64.7%) were submitted to endovascular therapy. Most of our treated patients were clinically improved during interval follow up and some patients were angiographic cured.

DISCUSSION

Cranial DAVFs with cortical venous reflux (CVR) should be considered aggressive lesions and mandated prompt diagnosis and subsequent endovascular or surgical treatment because they proved to carry a high risk for neurological sequelae or death at presentation and in their disease course. Disconnection of the CVR along may enough because lesions without CVR have been shown to follow a benign course.[1-3]

Our endovascular treatment strategies were disconnected the arteriovenous shunt and CVR for reducing of cerebral venous congestive encephalopathy as much as possible by alleviating some conditions concerning patient's risk, for examples, unintended occlusion of dangerous anastomotic pathways to ophthalmic artery or arterial feeder for cranial nerves such as inferolateral trunk. Disconnection of the CVR along might enough because lesions without CVR have been shown to follow a benign course. We also didn't attempt to occlude the affected dural venous sinus if it wasn't necessary. We selected the safest way for each patient by precise angiographic analysis. We found

satisfactory resulted of treatment by selective transarterial embolization by used of NBCA and agreed that transvenous coil embolization give a benefit in cases of limited arterial catheterization and partial successfully shunt occlusion.[5] Nevertheless, variation of sinus such as septation resulted of difficulty of last coil placement, if it was occurred in common solitary drainage channel with normal brain parenchyma (Fig. 2). Most of our treated patients were successfully achieved treatment goals even if multiple embolization sessions might be needed. In our series, 50-60% of our treated patients were immediately angiographic cured. These result was favorably with published reports of 50-70%.[4] Only few patients were sent for surgery after partial embolization.

Treatment by superior ophthalmic vein compression mended an effective resulted in 11 of total 56 patients which had DAVF at cavernous sinus (CS), included 2 patients from aggressive DAVF group.

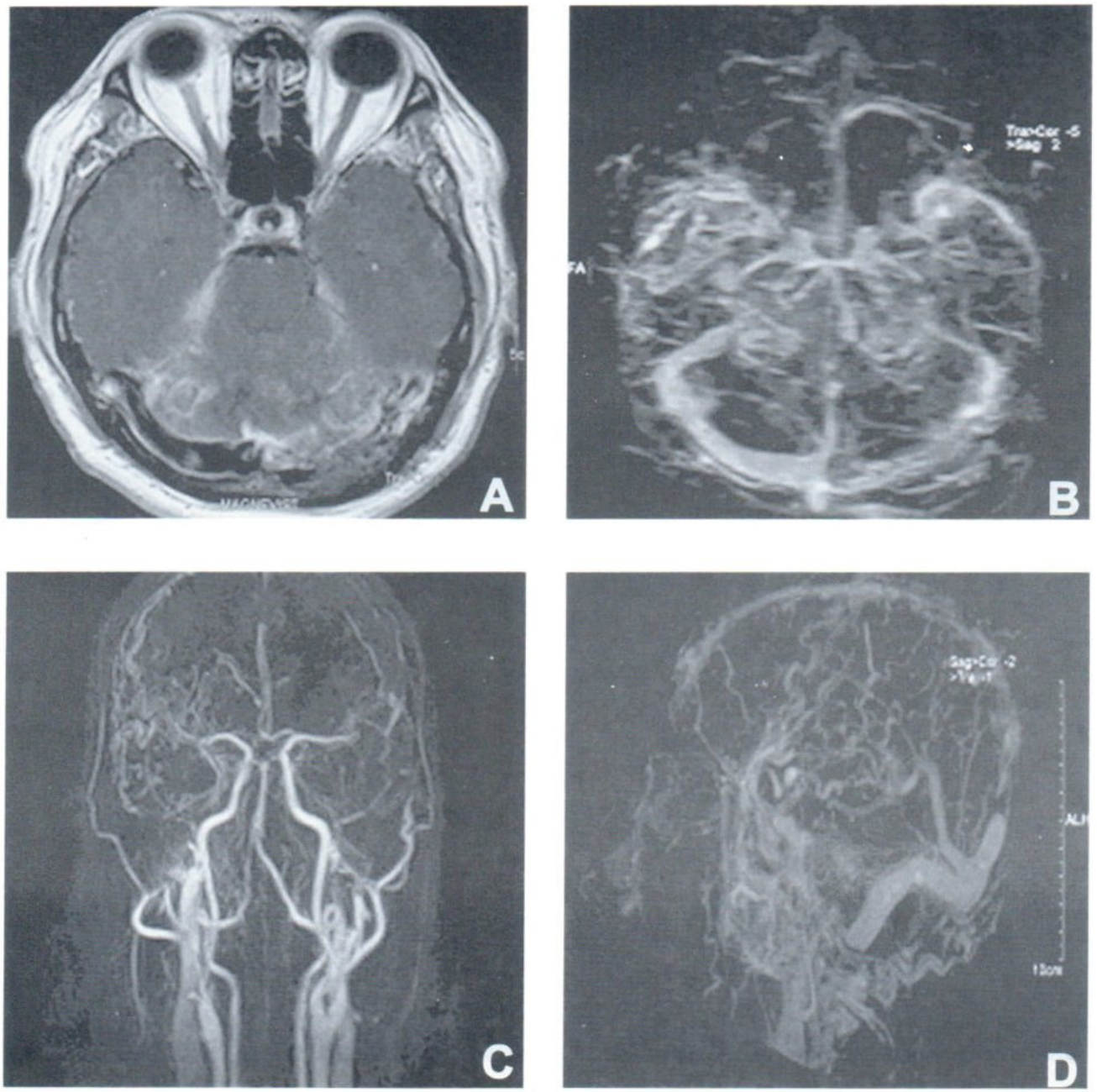
There was no difference in population study related to location, clinical presentation, Borden as compared to prior reported study.[1-3]

Our limitations of study caused by 3 loss follow-up patients and a too short follow-up at the time of evaluation.

TABLE 3 Summary of Type and Treatment Results in Patients with Aggressive DAVF

Procedure	**Number (%) (total of 22 patients)**	**Results**
Embolization TAE TVE TAE+TVE	20(90.1%) 11(50%) 5(22.7%) 4(18.2%)	Improved symptoms (35%) Cured by angiography (60%) Stable (5%)
Manual compression of superior ophthalmic vein(SOV)	2(9.1%)	Improved symptoms (100%) Cured by angiography (50%)

TAE = Transarterial embolization, **TVE** = transvenous embolization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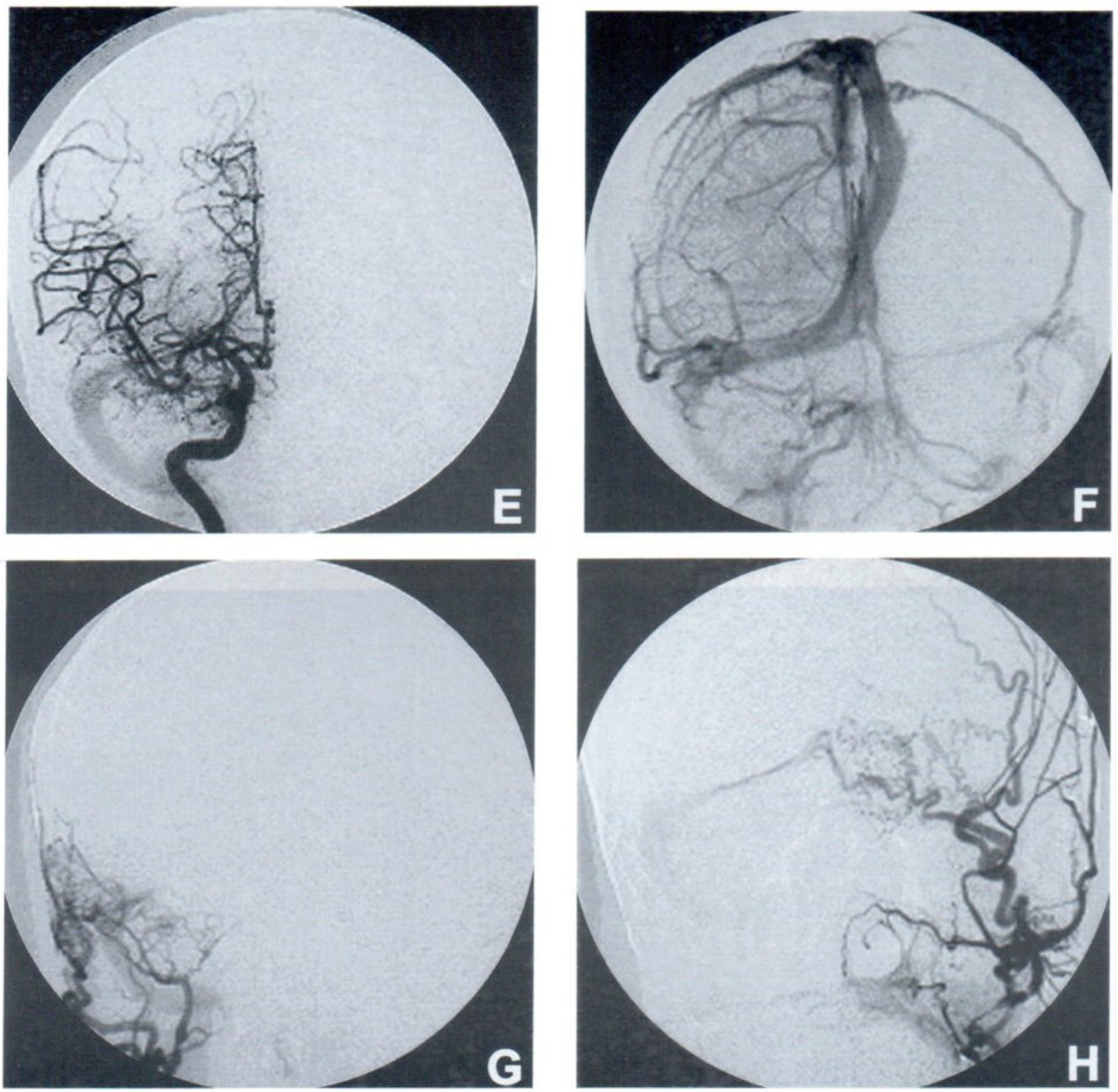
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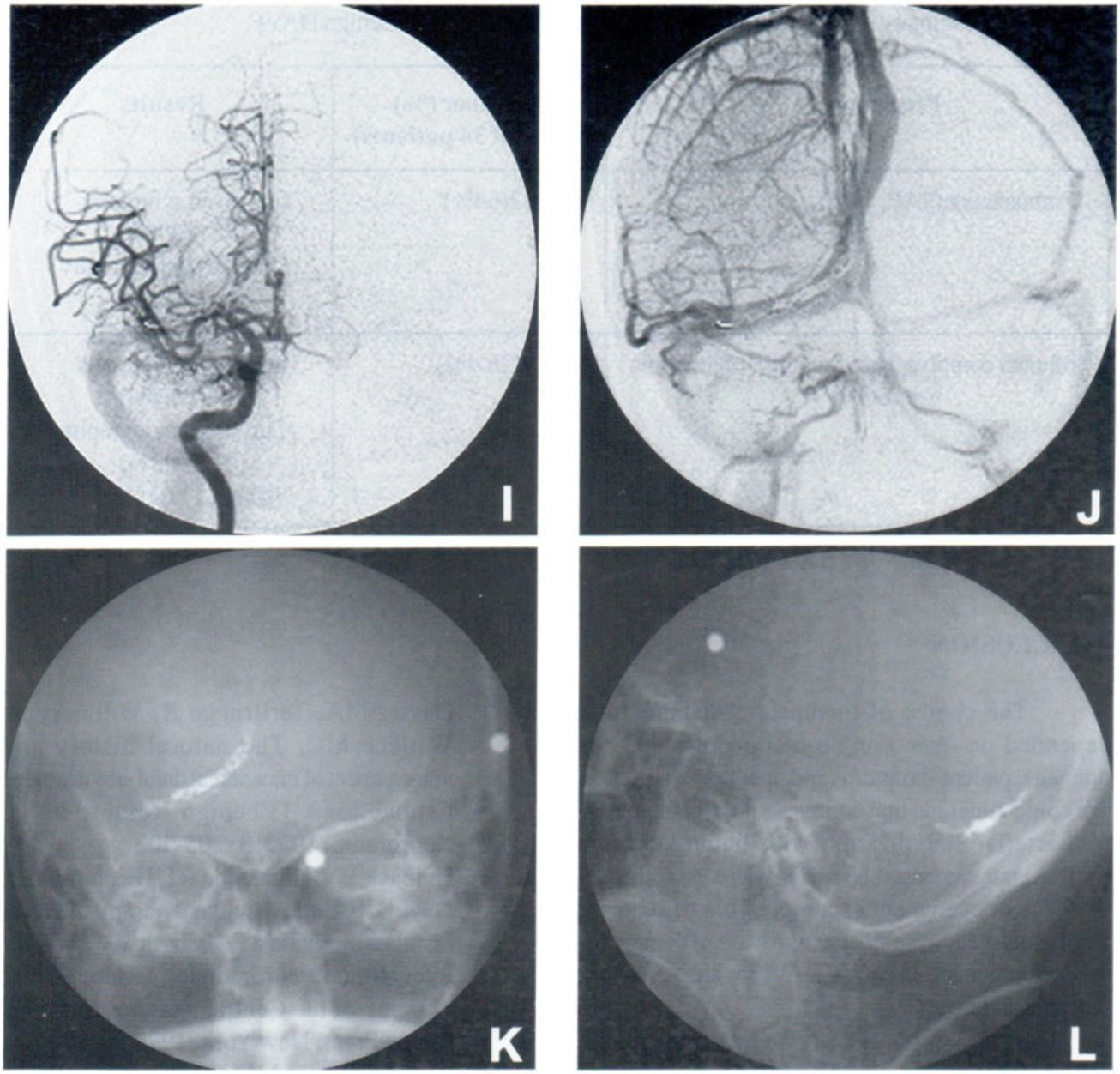

Fig. 2 Successful transvenous coil embolization into septated portion of Rt.transverse sinus. A 49-year-old man with history of Rt.hemiplegia and cognitive impairment and blurred vision. Prior MRI& MRA (A-D) is suspicious of vascular shunts at Rt.transverse sinus with Lt. transverse sinus thrombosis and diffuse cortical venous reflux, Dural AV fistula is likely, with white matter infarction at left periventricular white matter and centrum semiovale(not shown). Pretreatment Cerebral angiography(E-H) shows Dural AVF at Rt. transverse-sigmoid sinus, at septated portion(arrow), supplied from dural branches of Rt ECA, Lt.ECA and Rt.ICA and thrombosis of Lt. transverse sinus. Control cerebral angiography of Rt.ICA after coil embolization(I,J) and Skull radiograph(K,L) showed position of coils placed only in pathologic septated sinus. Immediate decreased cortical reflux in both supra-and infratentorial systems are apparent. However, complete closure of other shunts at this transverse-sigmoid sinus of this patient is obtained after combined glue(NBCA) embolization into few branches of Rt.ECA afterward.

TABLE 5 Summary of Type and Treatment Results in Patients with Benign DAVF.

Procedure	Number (%) (total of 34 patients)	Results
Embolization(TAE, TVE)	22(64%)	Improved symptoms (100%) Cured by angiography (50%)
Manual compression of superior ophthalmic vein(SOV)	9(26.4%)	Improved symptoms (88.9%) Cured by angiography (33.3%) Stable (11.1%)

Note: Loss follow-up 3 patients(8.8%)

CONCLUSION

The choice of therapeutic methods was depended on lesion angio-architecture, venous drainage, patient symptoms and operator experience. We could conclude that endovascular treatments by transarterial embolization with liquid adhesive (NBCA), transvenous embolization with coils, combined methods or even manual compression of superior ophthalmic vein were all effective ways of therapy for selected patients with cranial DAVFs with satisfactory clinical outcomes.

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CT OF GIANT MESENTERIC LIPOMA: A case report

Anchalee WISITWONG, M.D.[1]

ABSTRACT

Mesenteric lipoma is a benign tumor of mature fat cells which is extremely rare and very few cases have been reported in children. Asymptomatic abdominal mass, progressive abdominal distention and intraperitoneal fat density mass on computed tomography are the main diagnostic criteria.Differential diagnosis is lipoblastoma.As an unusual case,a 3-year-old boy with a giant mesenteric lipoma is presented in this report.

INTRODUCTION

Lipoma is a tumor that is composed of mature fat and represents the most common soft tissue tumor. It is a slow growing benign tumor of fatty tissue that form a lobulated soft tissue mass enclosed by a thin fibrous capsule.Mature lipomas in children have a predilection site for the trunk. Deep lipoma were reported in thorax,mediastinum, chest wall, pelvis, retroperitoneum and paratesticular region. Intraperitoneal lipoma is extremely rare in children and very few lipomas of the mesentery have been reported.[1] As an unusual case, a 3-year-old boy with a giant mesenteric lipoma is presented in this report.

CASE REPORT

A 3-year-old boy was admitted with a large abdominal mass and progressive abdominal distention within the last 2 years. The physical examination showed marked abdominal distention with a soft, ill-defined round mass at mid abdomen, size about 10 cm. Laboratory findings were normal. Computed tomography of the abdomen showed a large nonenhanced,sharply marginated,uniform fat density mass with internal septations, size about 9.5x19 cm. at mid abdomen. The lesion extended nearly entire peritoneal cavity, displacing bowel loops posterolaterally.(Fig 1A-D)

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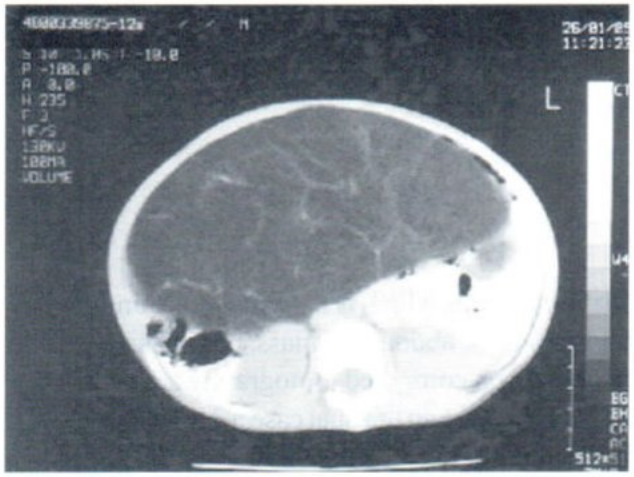
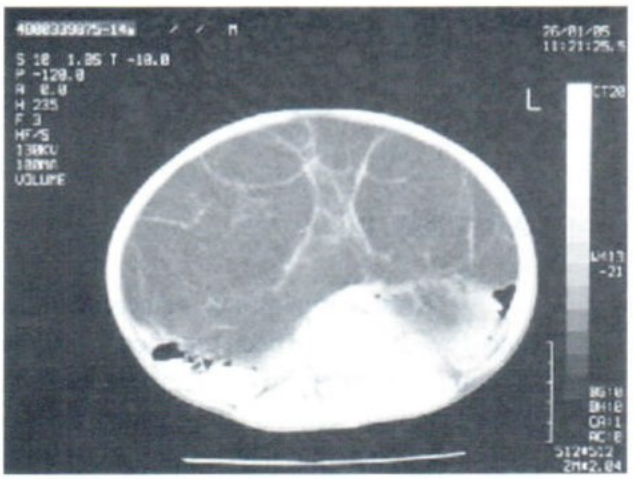


Fig.1A



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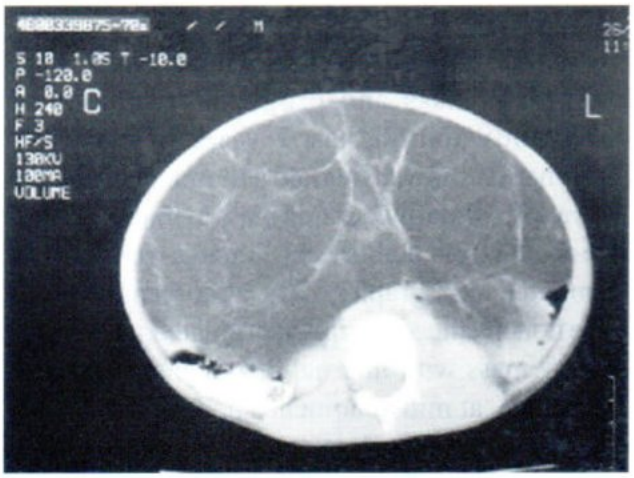

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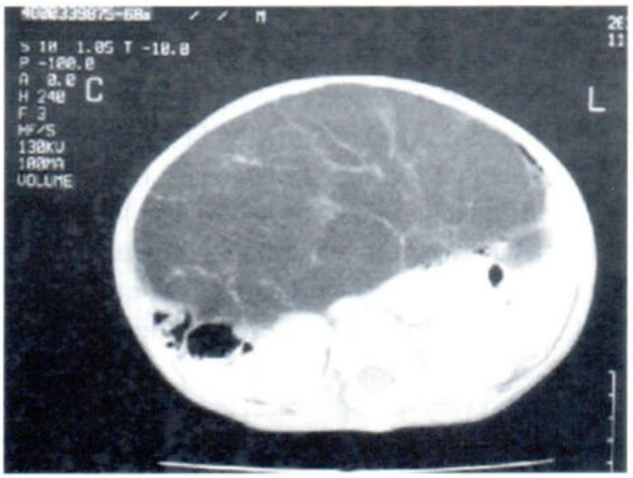

Fig.1D

Fig.1 Nonenhanced (A,B) and contrast-enhanced(C,D) CT scan of the abdomen show a large nonenhanced, sharply marginated,uniform fat density mass with internal septations,displacing bowel loops posterolaterally.

At laparotomy, a smooth, well-encapsulated mass diameter about 21 X 19.5 X8 cm. weighing 1800 g. was found at the mesentery of the colon (mesocolon). Complete resection was performed. The macroscopic examination showed the encapsulated lipomatous mass with an irregular lobular pattern and a pale yellow appearance on cross section. (Fig.2 A-B)

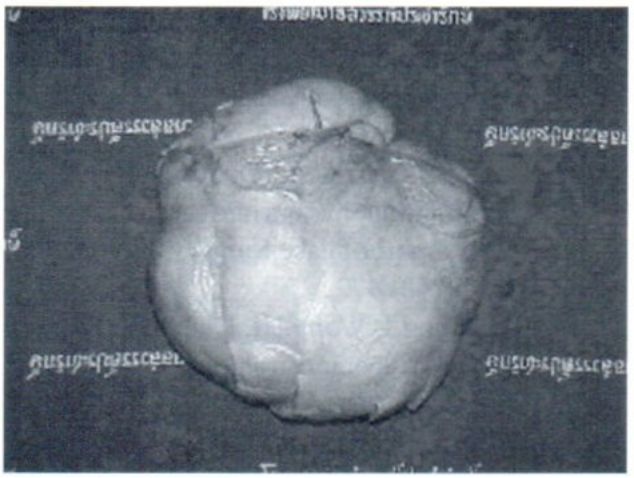

Fig.2A

Fig.2B

Fig.2A-B Gross specimen reveals encapsulated lipomatous mass with irregular lobular pattern (Fig.2A) and a pale yellow appearance of cross section.(Fig.2B)

The microscopic examination showed a well -formed capsule with interior mature fat cells showing only slightly variation in cellular size and shape.(Fig.3) Pathologically, the tumor was diagnosed as lipoma.

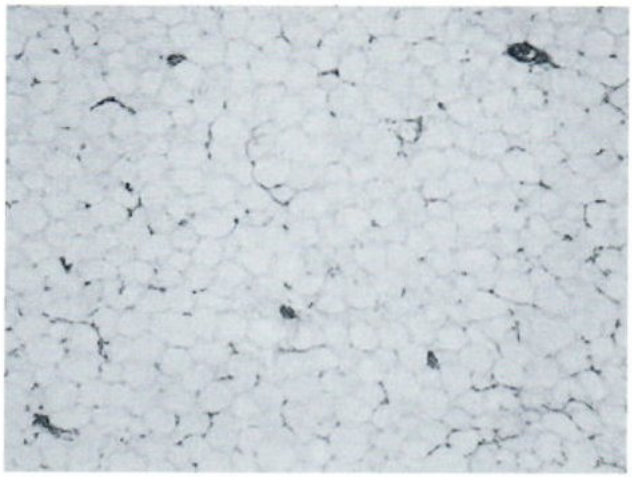

Fig.3 Photomicrograph of lipoma consisting of mature fat cells shows slight variation in cellular size and shape.

DISCUSSION

Most peritoneal tumors in childhood are benign and cystic, the most common is cystic lymphangioma. Lipomatous tumors are very uncommon in childhood. They arise less often in the peritoneum and omentum than in the retroperitoneum. Mesenteric lipoma is a rare benign tumor of mature fat cells.[2] Characteristic of the clinical history of lipoma is asymptomatic, slow growing, rounded mass having a soft consistency with a good mobility. It is generally asymptomatic but occasionally causes abdominal pain, ileus and small bowel volvulus depending on its location and size.[3,4,5]

CT plays a critical role in achieving an accurate diagnosis of mesenteric lipoma. Lipomas typically demonstrate homogeneous fatty attenuation at CT. Thin fibrous septa may traverse the lesion.[6] CT scan of the abdomen in this patient delineated a homogeneous nonenhanced and sharply marginated

fat density mass with internal septations. Lipomas differ little in microscopic appearance from the surrounding fat. Like fat, they are composed of mature fat cells but the cells vary slightly in size and shape. The major differential diagnosis is lipoblastoma. Lipoblastomas are rare soft tissue mesenchymal tumors of embryonic white fat that occur during infancy and early childhood. More than 90% of cases are diagnosed in children less than 3 years of age with nearly 75% occurring before the age of 12 months. Lipoblastoma typically occur in the extemities (70% of cases) with the remainder of cases in mediastinal,retroperitoneal or paravertebral areas. These tumors are divided into two categories, the more common superficial well -defined mass is known simply as lipoblastoma. The second form is a deep, uncapsulated infiltrative lesion known as lipoblastomatosis. A few cases of mesenteric lipoblastoma have been reported. CT do not permit differential diagnosis from lipoma. Microscopically this lesion differs from lipoma by its cellular immaturity and close resemblance to the myxoid form of liposarcoma.[7]

Lipoma may recur locally,but after local excision the recurrence rate is less than 5%.

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I would like to thank Dr.Chaninya Patanasakpinyo for pathologic information of this case.

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LESION SIZE EVALUATION BY STATISTICAL PARAMETRIC MAPPING PROGRAM IN SIMULATED EPILEPTIC BRAIN.

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ABSTRACT

Several simulations of SPECT ictal and inter-ictal studies were performed in order to test the ability of SPM program for detection of brain lesion size and to determine the effect of site for size detection. Three cylindrical artificial lesions of diameters and length of 14x7 mm., 9x5 mm., and 4x5 mm. were positioned in 3 different regions [anterior cingulate cortex, posterior cingulate cortex, deep gray matter (basal ganglia)] in the brain phantom. Triple-headed SPECT acquisition of simulated ictal and inter-ictal states were carried out. All data were transferred to SPM2 program, which detected cluster volumes for each size and site were compared to actual lesion volumes. SPM could detect 14 mm lesion sizes at all sites. The 9 mm lesions were detected at anterior and basal ganglia sites. The 4 mm lesion was only detected at the anterior and basal ganglia site and the volume detected by SPM is larger than the true volume. In conclusion, size detected by SPM is much larger than the actual size. Sites of lesions may affect size detection.

INTRODUCTION

Nowadays Single Photon Emission Computed Tomography (SPECT) imaging is widely accepted as a study to confirm epileptogenic focus in intractable epilepsy. Traditional side by side visual interpretation of ictal and inter-ictal SPECT scan may sometimes be difficult in identifying the epileptogenic focus, particularly in patients with extratemporal or otherwise unlocalized intractable epilepsy by MRI.

Computer-aided subtraction ictal SPECT co-registration to MRI (SISCOM) was known to be more sensitive than visual analysis. Furthermore, concordance between SISCOM localization (site and size) and site of surgery is predictive of postoperative seizure outcome irrespective of MRI finding.[1] Thus, accuracy of size detection is a major concerned if SISCOM-guided surgery is to be performed. Statistical parametric mapping (SPM) is a software program that is increasingly used as an objective whole-brain analysis technique for functional neuroimaging. SPM was designed mainly to visualize the statistically significant region on data sets obtained from PET or SPECT during various kinds of activation. It has the capability of co-registration by mutual informations, re-aligments, spatial transformations into a template space, and contrast define giving a result of voxel values constituted a statistical parametric map of t-test. A few studies had been

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performed to validate the size detection by SPM.[2,3,4] Those studies simulated on neuroactivated brain compared to normal baseline of brain study. Therefore the studies cannot properly be applied in epilepsy patients who have hypoperfusion at the lesion interictally. Accuracy of size detection by SPM is important to identify the actual activation zone, in order to aid to define the surgical margin. In this study, we performed several simulations of SPECT ictal and interictal studies in order to test the ability of SPM2 for detection of brain lesion of various sizes and to determine the effect of site on size detection.

MATERIAL AND METHOD

Brain phantom

Brain phantom used in this study is locally made in elliptical shape (figure 1). The brain dimension is 2.5 cm thick, 13 cm wide and 18 cm high. The inner volume is 300 cc. It simulates the ^{99m}Tc-ECD activity distribution in the human brain. The ratio of count density of the gray matter, white matter and ventricles is 4: 1: 0 , respectively.

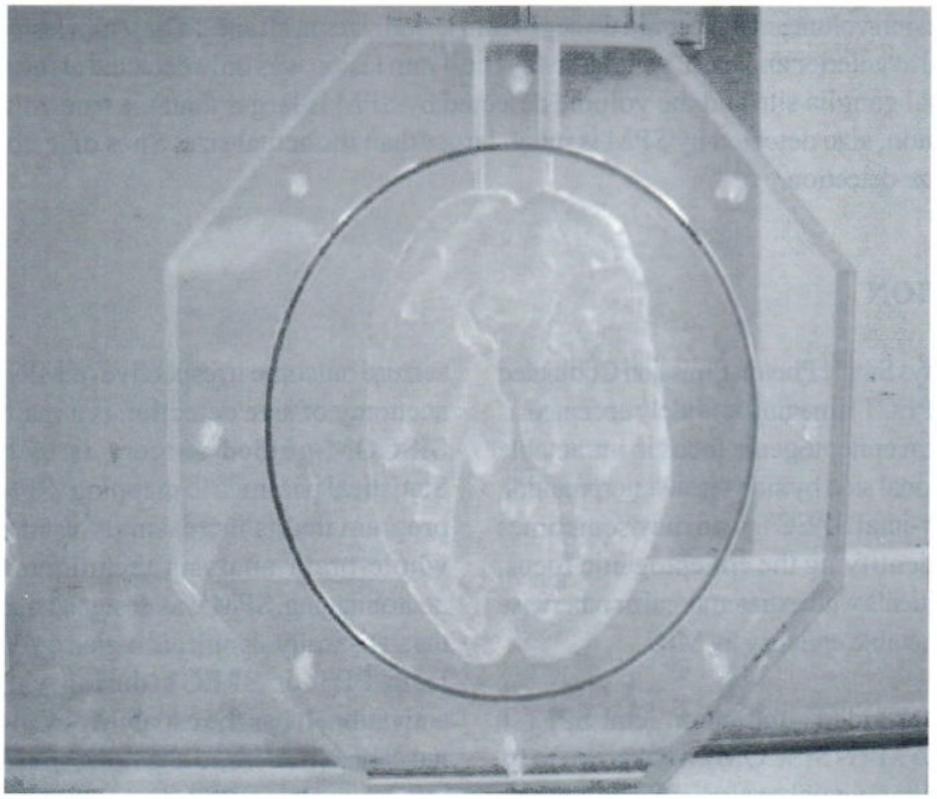

Fig.1 brain phantom

Artificial lesions

There were three sizes of cylindrical-shaped lesions used in this study. (figure 2)

1. Large size : diameter 14 mm., length 7 mm., volume1.5 cc
2. Medium size : diameter 9 mm., length 5 mm., volume 0.4 cc
3. Small size : diameter 4 mm., length 5 mm., volume 0.1 cc

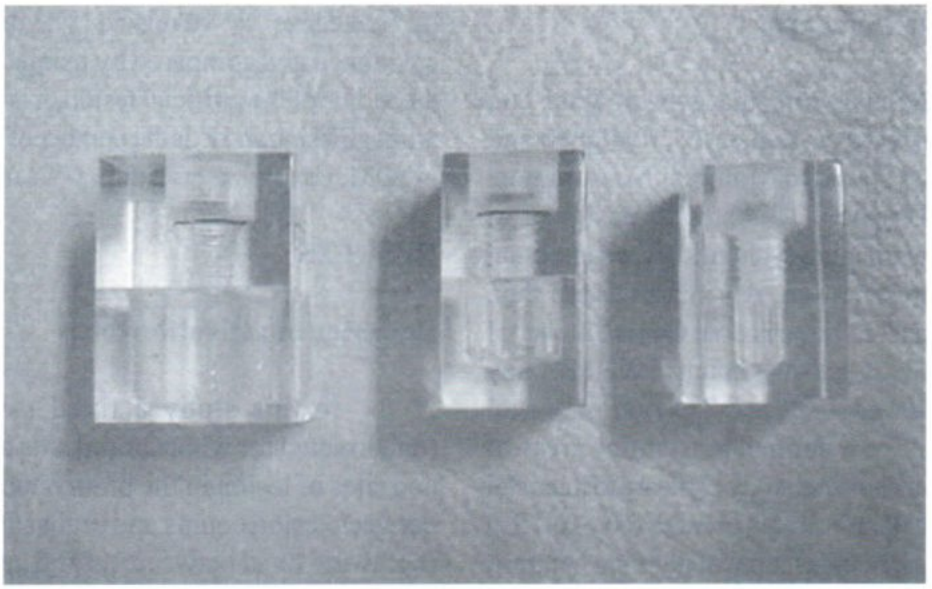

Fig.2 Artificial lesions

Data Collection

Three artificial lesions of three diameters (14 mm, 9 mm, 4 mm) were positioned in 3 different regions [anterior cingulate cortex and posterior cingulate cortex , deep gray matter (basal ganglia) in the brain phantom.

In the interictal state, the lesions in the phantom were not filled with radioactivity, while the surrounding brain was filled with 20 μCi/ml of $^{99m}TcO^{4-}$. For ictal study, the lesions were filled with radioactivity about 70-150 μCi in each lesions. The three sizes of lesions were placed in 3 regions of the brain phantom. For each data set, acquisition were performed 3 times by a triple head SPECT (Trionix Research lab, Model Triad 20T Twinsberg OH, USA), which two sites (anterior, posterior) of the same size were performed simultaneously and basal ganglia separately. Identical acquisition parameters were used for all interictal and ictal images which were as followed; LEUR (low energy ultra high resolution) collimators, matrix size 128x128, zoom 1.6, pixel size 2.8 mm., acquisition time 40 sec/view in 40 views.

Data Analysis

The acquisition data were reconstructed and activation ratio of lesion to normal brain in reconstructed images of each lesion size were collected. The reconstruction of data sets followed the protocol commonly used in our section for brain scanning with cut-off frequency 0.7, order 5 and Butterworth filter. Four-points attenuation

compensation were applied.

After reconstruction, the images of all sites and sizes were displayed on screen in order to assure that all lesions were visualized. The data were then exported to interfile format within the SUN workstation. The interfile files were transferred to personnel computer, and converted to Analyze Format by MRIcro program.

By SPM program, the data of ictal and interictal states were co-registered, realigned and transformed into standard Montreal Neurological Institute (MNI) space. This step is designed to co-register a series of image volumes of the same brain to a single representative. All images were then smoothed with a three-dimensional Gaussian filter of 16 mm. full-width-at-half-maximum (FWHM). Gray matter threshold were fixed at 0.8.[4] Contrast of ictal minus interictal were defined to examine areas of higher tracer uptake in ictal study compare to interictal study. The result demonstrated number of voxels (k_e) in activated focus. For each time of defining contrast, parameter of height threshold which is *p*-value uncorrected for whole brain were adjusted to find the best cut-off level at each size and site of experiment. This type of *p*-value was used because this is a study in a phantom which the lesions location were already known.

The true volume of artificial lesions ($V = \pi r^2 h$) and the volume of voxels detected by SPM (k_e*voxelsize_x* voxelsize_y* voxelsize_z) were calculated and compared by using t-test. Where r is the radius of the artificial lesion, h is the length of the artificial lesion and k_e is the number of voxels presented in SPM, voxel size x = 2 mm, y = 2 m, z = 2 mm.

RESULTS

Detection of activation focus

In this study a fixed p-value = 0.001 (uncorrected for whole brain) was used for all sizes and sites of lesion in the brain phantom. The ratios between lesion counts and brain soft tissues counts (bg.) were fixed between 1.4 and 2.6 (Table 1). The reconstructed SPECT images are shown in figure 3.

Table 1 SPM visualization of lesion at various sites and sizes (p=0.001)

Lesion site/size	Lesion : bg ratio	Visualization by SPM
Anterior cortex		
4 mm	1.4	None
9 mm	2.4	Cluster
14 mm	2.6	Cluster
Posterior cortex		
4 mm	1.4	None
9 mm	1.7	None
14 mm	1.8	Cluster
Basal ganglia		
4 mm	2.4	Cluster
9 mm	2.2	Cluster
14 mm	1.8	Cluster

All lesions of ictal and inter-ictal simulated SPECT images of all sizes can be visualized clearly. (Figure 3)

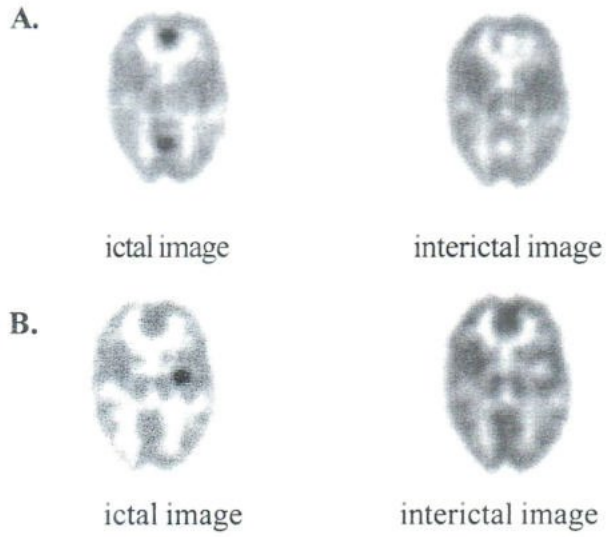

Fig.3 A. Reconstructed SPECT brain image with lesions placed at anterior and posterior cingulate cortex., B. Lesion placed at basal ganglia

By SPM program, the activation foci were detected in some sites and sizes. Projecting on the glass brain as shown in figure 4 shows the lesions detected by SPM.

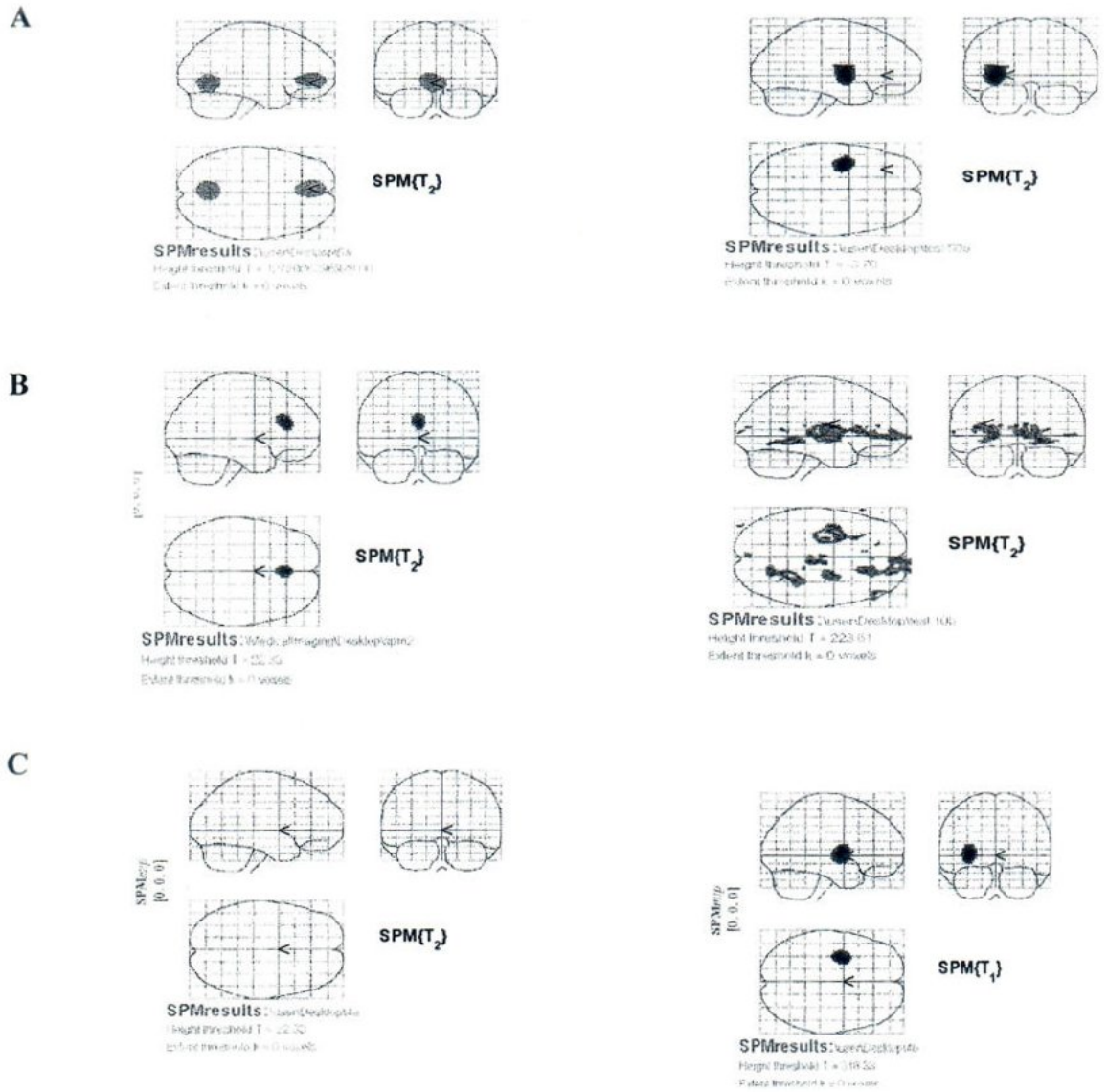

Fig.4 Activation foci detected by SPM; A. lesion size 14 mm. at anterior and posterior cingulate cortex (left), at basal ganglia (right) ; B. lesion size 9 mm. at anterior and posterior cingulate cortex (left), at basal ganglia (right) ; C. lesion size 4 mm. at anterior and posterior cingulate cortex (left), and at basal ganglia (right).

For the lesions not detected by SPM (4 mm. at anterior and posterior, 9 mm at posterior), varying threshold was attempted first. There was no lesion detected by varying the threshold. Afterward varying the lesion:background ratio were tried ranging from 2.1-2.5. These could not generate the lesions visualization by SPM as well.

Numbers of voxels (k_e) detected by SPM program for each size were calculated to transfer to term of the volume detected by SPM (k_e* voxelsize_x* voxelsize_y* voxelsize_z) and compare it against the true volume of artificial lesions ($V = \pi r^2 h$). The comparison between two volumes is shown in Table 2.

Table 2 The volume of the brain lesion size 14, 9, 4 mm. determined by SPM compared to the actual volume at different sites.

Lesion site/size	No.of voxel (k_e)	SPM volume(mm^3) [(k_e). 2x2x2]	True volume(mm^3) ($\pi r^2 h$)	Volume ratio (SPM : True)
Anterior cortex				
14 mm	1144	9152	1077	8.4
9 mm	368	2944	317	9.2
4 mm	None	None	62.8	-
Posterior cortex				
14 mm	1052	8416	1077	7.8
9 mm	None	None	317	-
4 mm	None	None	62.8	-
Basal ganglia				
14 mm	978	7896	1077	7.2
9 mm	314	2512	317	7.9
4 mm	110	880	62.8	14.0

DISCUSSION AND CONCLUSION

In this study, several simulations of SPECT ictal and inter-ictal studies were performed in order to test ability of SPM program (version 2) for the detection of the size of brain lesion and to determine effect of site on size detection. The detection of activation focus was achieved for brain phantom with 14 mm lesion size at all 3 sites. The 9 mm lesions were detected at anterior and basal ganglia sites except at posterior cortex site and the 4 mm lesions were absolutely not detected at anterior and posterior sites, but only at the basal ganglia in the brain phantom. If compare to previous study by Stamatakis, et al,[4] the study was found that, for the smallest lesion they used (20 voxel = 160 ml), the intensity of lesion should be 30% or more than the brain background. In our study, we used smaller volume of lesion (63 ml), so the intensity should be more than 30% by theory. Increasing intensity of the lesion not previously visualized (anterior cingulate cortex of 4 mm lesion and posterior cingulate cortex of 4 mm and 9 mm lesions) up to 150% more than the brain background did not produce visualization. This might be the effect of SPM software itself, which new advanced version such as SPM5 may allow future studies in SPM analysis activation detectability.

We found that the sites also may affect the size detection; all lesions were detected more efficiently at the basal ganglia sites. Results are not in agreement with the previous publish studies.[1,3,4]

From the result of this study, the calculated volume detected by SPM was 7-14 times larger than the real volume. This can be assumed that SPM process resulted in error in size detection, which might be due to statistical variation in nuclear medicine imaging. All images are normally blurred and have less resolution compare with other modalities. Furthermore, the resulted image from SPM is a contrast between ictal simulated and inter-ictal simulated images. This might produce differences between images that is more than the real lesion boundary. Thus the apparent volume of activation in an SPM program does not represent the real volume of activated focus as stated before.[6] However, we did not take lesion intensity to count on the effect of intensity on size detection.

The limitations of this study are : 1.) The inability of SPM program to detect the exact volume of the lesion:bg count 1.4-2.6 and 2.) The small sample size, thus, only the trend of relation can be observed. Positive correlation of volume detected by SPM and true volume were found.

In conclusion SPM program is able to detect large hyperintensity size and might be helpful for further clinical use. However, the size detected by SPM is much larger than the actual size. Sites of the lesion may affect the sizes detection.

ACKNOWLEDGEMENT

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MELIOIDOSIS: VERTEBRAL OSTEOMYELITIS: CASE REPORT

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INTRODUCTION

Melioidosis is caused by a free-living gram negative, aerobic bacillus Burkholderia Pseudomallei that is widespread in southeast Asia and northern Australia. It is characterized by abscess formation in the lung, liver, spleen and skeletal muscle with the lung being the most commonly involved organ. The clinical features are variable from rapidly progressing septicemia to chronic debilitating abscess-forming disease. Osteomyelitis,especially vertebral osteomyelitis, is a relatively rare manifestation of melioidosis. We report a case of melioidosis presenting as vertebral osteomyelitis .

CASE REPORT

A 70 year-old woman, who is a farmer,lived in Noanboonnag district, Nakon-Ratchasima province, with type 2 diabetes mellitus, complained of Low back pain with radiated to both thighs and low grade fever for 3 months. She visited and was admitted in the hospital for several times where spinal stenosis was diagnosed and she was treated conservatively. She had associated malaise and weight loss of 6 kg over three months and fever which was worse during the night. There were no respiratory symptoms. On physical examination: Motor power: upper limbs grade V/V, lower limbs III/V, motor weakness involved proximal and distal group equally. The others are unremarkable.

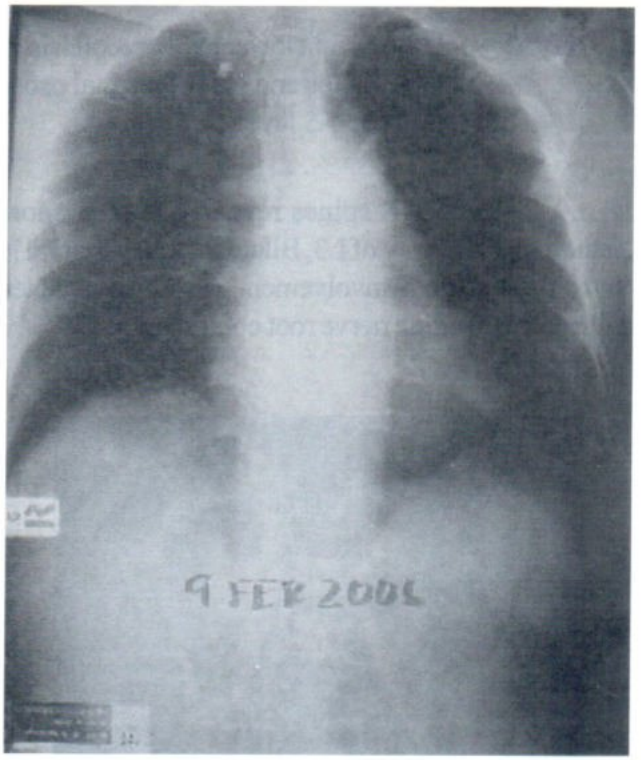

Fig. 1 Initial CXR showed few small RUL nodules and larger one at LLL.

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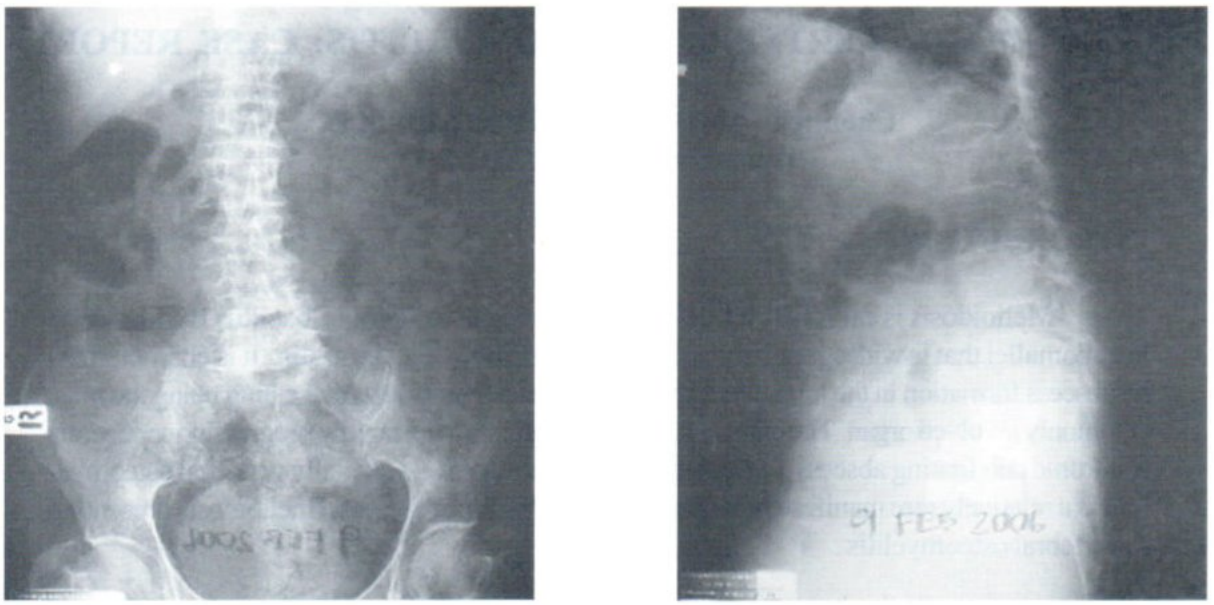

Fig. 2 L-S film: Right lower lumbar scoliosis,irregular endplates with vacuum phenomenon of L 4-5, intact pedicles and loss of normal psoas shadows. All lumbar disc space narrowings,most severe at L 4-5 level.

MRI of L-S spines revealed lumbar spondylosis, L3-S1 Herniated Disc, most severe at L4-5, pathological fracture of L3, Bilateral para-vertebral lesions, Rt. > Lt. , with extension to right ilio-psoas muscle and ilio-sacral bony involvement. Also seen small lesion at T11 body. Extra-dural lesion at L2-3 & L3-4 levels with corresponding nerve root compression.

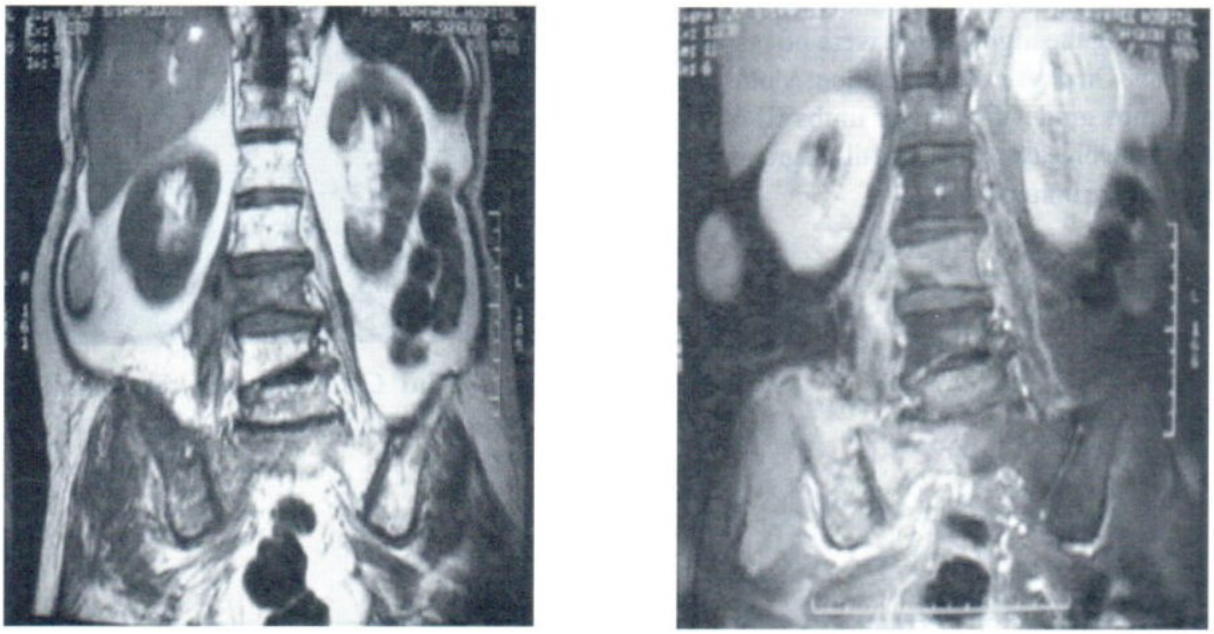

Fig.3 Coronal Sequence Imaging T1W without and with gadolinium

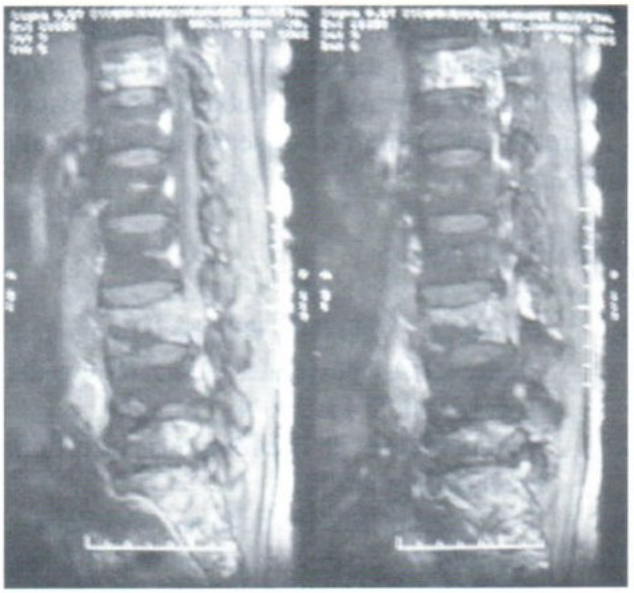

Fig. 4 Sagittal / Axial Sequence ImagingT1W with gadolinium.

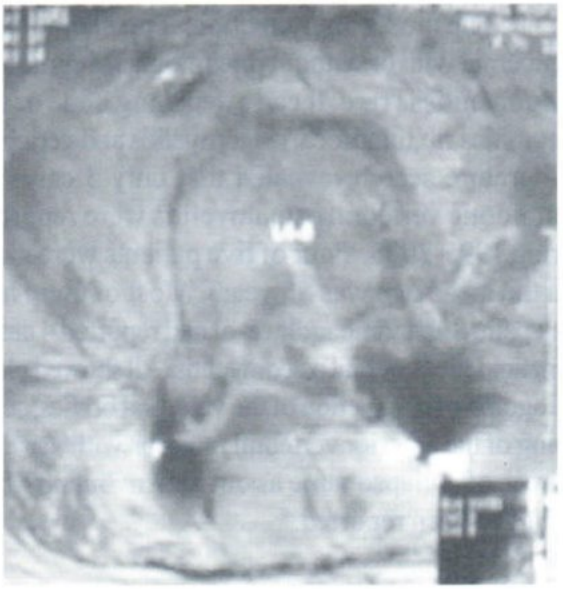

Fig. 5 Ultrasonography of upper abdomen: Normal.

Laboratory finding : WBC count of 10900/ul, **Hb** = 9.2g/dL. Liver Function Test & Renal Function were normal.

The initial diagnosis was tuberculosis of spines and anti-tuberculous agents and antibiotic drugs for septicemia. She had still suffered, then laminectomy + Pedicular Plate Screwing + Posterior Larmina Fixation + Dissectomy were done. Intra-operatively, subperiosteal collection was found at the vertebral body with extension into the bones. Histology of friable tissue revealed acute and chronic inflammatory cell infiltration, multi-nucleated giant cell and noncaseating granuloma. The special stain of acid fast showed negative result, but Gram stain demonstrated rare Gram negative bacilli. No malignant cells were seen.

The tissue culture grew Burkholderia pseudomallei. The patient was treated with IV metropenem for 6 weeks and followed by cotrimoxazole. Her fever settled after operation and with this post-operative treatment, her appetite improved markedly. The patient recovered well and was discharged with oral co-trimoxazole to be taken at home.

DISCUSSION

Burkholderia pseudomallei is a saprophyte organism found mainly in soil and water from endemic area such as in northeastern Thailand. The risk factors commonly associated with melioidosis include diabetes mellitus, alcohol abuse, chronic lung disease and chronic kidney disease. It has a wide spectrum of presentations, ranging from chronic constitutional symptoms to acute fulminating septicemia. The patient can be classified into four clinical groups; **disseminated septicemic melioidosis** is defined as positive blood culture and more than one organ involved, **non-disseminated septicemic melioidosis** is defined as positive blood culture and only one focus or no apparent focus of infection, **localised melioidosis** is defined as only single focus of infection whereas negative blood culture and **multifocal localised melioidosis** is defined as multiple organs involvement but negative blood culture.

The most common clinical presentation is septicemia with or without pneumonia. Melioidotic osteomyelitis is rare. It can affect long bone of the extremities,rib,multifocal osteomyelitis and vertebra. A literature search revealed that only 5 cases of melioidotic vertebral osteomyelitis were reported during 1995-2005. Four of five patients were male and the mean age was 55 years. Most of them had back pain. Subhadrabandhu et al had reported 4 cases of melioidotic vertebral osteomyelitis. All showed plain radiograph of destruction of the vertebral bodies, scalloping of the anterior vertebral margins with varying degrees of collapse same as out patient but no MRI result had been reported.

Melioidotic osseous lesions usually involve the metaphyseal of long bone and the vertebral bodies,in which the radiograph appearance can not be differentiated from that of tuberculous lesion. Diagnostic confusion with tuberculosis can occur,especially in the area with a high incidence of both disease,such as in northeastern region of Thailand. The histopathology of the granuloma in our case was indistinguishable from that induced by tuberculosis, and therefore bacteriological study is the mainstay of diagnosis.

Extensive debridgement of the infected bone and appropriate antibiotic therapy are essential for successful treatment. In tuberculosis endemic areas, it is important to understand melioidosis and differentiate this disease from tuberculosis because the treatment of the two disease is completely different.

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COMPARISON OF ABSORBED DOSE FOR HIGH ENERGY PHOTON BEAMS DETERMINATION BY IAEA TRS 398 AND IAEA TRS 277 FOR 8 HOSPITALS IN BANGKOK

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ABSTRACT

Absorbed dose to water is of great important in radiation therapy. The IAEA TRS 277 protocol using an ionization chamber calibrated in air in term of air kerma has been used for absorbed doses determination in all therapy centers in Thailand. In recent year, a new code of practice IAEA TRS 398 based on chamber calibration in term of absorbed doses to water was introduced to reduce uncertainties arising from calculation of absorbed dose to water using air kerma calibration factor. To implement this new protocol into a clinic, a comparison of the two protocols should be studied. The study was undertaken for 8 hospitals in Bangkok with 6, 10 and 18 MV x-ray beams from linear accelerators and gamma beams from Co-60 machines. The measurements were made in a water phantom at the reference depth as specified in the protocols with two types of dosemeter system, one was the control dosemeter and the other was the hospital dosemeters. The results showed that the absorbed dose determined by TRS 398 and TRS 277 were agreeable within 1% for all energies of photon beams in 8 hospitals. The result is consistent with other studies. The hospital dosemeters showed a maximum discrepancy of 0.7%, 0.7%, 0.5% and 0.5% for 6, 10 and 18 MV x-ray beams and Co-60 beams, respectively, The absorbed doses measured from the control dosemeter were comparable to the hospital dosemeters within 1.8%. Agreement between control dosemeter and hospital dosemeter with TRS 398 is slightly better than the agreement with TRS 277. A transition from TRS 277 to TRS 398 would not significantly change the absorbed dose values of high energy photon beams. The new protocol could be implemented to all of the hospitals in this project with confidence.

INTRODUCTION

Implementation the new International Atomic Energy Agency (IAEA) code of practice of Technical Reports Series No.398[1] in Thailand was encouraged by the Secondary Standard Dosimetry Laboratory (SSDL), Division of Radiation and Medical Devices, Department of Medical Sciences, Ministry of Public Health. The calibration factor in term of absorbed dose to water was provided for the requested chamber. During preparing to implement the new code of practice, the SSDL supplied both the absorbed dose to water calibration factor (ND,W) and the air kerma calibration factor (NK) for the hospitals that

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interested to use new code of practice. The aim of this study is to compare the dose determined by the new code of practice (TRS 398) with the dose determined by the old code of practice (TRS-277)[2] which has been used previously in all therapy center in Thailand.

MATERIALS AND METHODS

This study was undertaken at eight hospitals in Bangkok. The beams were 6, 10 and 15 MV x-rays and Cobalt-60 gamma rays. The types of the beams and machines which were employed in this study are shown in Table 1. The types of all dosemeter system and their calibration factors for photon beams are shown in Table 2. All chamber were calibrated at SSDL in term of N_K and $N_{D,W}$. All the chambers are NE 2571 cylindrical chamber. The ratio of $N_{D,W}$ and N_K showed less variation for the same type of chamber, the difference was less than 0.4%. The dosemete of Hospital. A which was belong to the authors was used as a control, it measured the dose for all beams in this study together with the own dosemeter of the hospitals.

The measurements were performed for field size 10x10 cm^2 at 100 cm SSD for linear accelerator and 80 cm SSD for Co-60 machine. Types and dimension of the water phantoms and beam directions for all hospitals are shown in Table 3. The IAEA TRS 277 protocol recommended the measurement at the effective point which is displaced from the middle of the chamber equals to 0.6 times of the middle of the radius of the chamber. The reference depths are 5 cm for 6 MV photon beams and Co-60 beams and 10 cm for 10 MV and 18 MV photon beams. The TRS 398 recommended the measurement at the center of the chamber, the reference depths are 5 cm and 10 cm for Co-60 beams and photon beam of all energies, respectively. The absorbed dose to water was calculated by following equation.

TRS 277	$D_W(P_{eff})$	=	$M_Q N_{D,air}(S_{w,air})P_Q$	....(1)
TRS 398	$D_{W,Qo}$	=	$M_Q N_{D,W,Qo} k_{Q,Qo}$	....(2)

M_Q is ionization charge reading from electrometer that already corrects to yield the influence corresponding to the reference condition. $N_{D,air}$ is the absorbed dose to air chamber factor base on air kerma, $(S_{w,air})_Q$ is the stopping power ratio water to air at the user's quality at the point of interest and P_Q is the perturbation correction factor. $N_{D,W,Qo}$ is the calibration factor in term of absorbed dose to water at reference beam quality Q_0 and $k_{Q,Qo}$ is a chamber specific which corrects for differences between the reference beam quality Q_0 and the actual beam quality Q.

The absorbed dose to water at the depth of maximum dose was calculated by percent depth dose at the depth which chamber was placed after the absorbed dose to water at the reference depth was measured and calculated.

Table 1 Types of the linear accelerator machines with photon beam energies and types of Co-60 machines.

Hospital	Linear Accelerator	X-ray beams			Co-60 Machine
		6 MV	10 MV	18 MV	
A	Clinac 1800	✓	✓	-	Theratron 80Elite
B	Clinac 2100C	-	✓	-	Theratron 780C
C	Clinac 23EX	✓	✓	-	Theratron 780C
D	Philips SL20	✓	-	✓	-
E	Philips SL20	✓	-	✓	-
F	Philips SL15	✓	✓	-	-
G	Philips SL15	✓	✓	-	-
H	-	-	-	-	Theratron Pheonix

Table 2 Types of ionization chamber and electrometer of eight hospitals (A-H) for photon beam measurements with the calibration factors that supplied by SSDL both in N_K and $N_{D,W}$ and the ratio of $N_{D,W}$ /N_K.

Hospital	Chamber	Dosemeter	N_k(Gy/C)	$N_{d,w}$(Gy/C)	$N_{D,W}$ / N_k
A	NE2571, SN1633	NE2590A, SN 223	4.155×10^7	4.527×10^7	1.0895
B	NE2571,	NE2590E, SN2289	4.170×10^7 SN360	4.556×10^7	1.0926
C	NE2571, SN3197	NE2670A, SN321	4.134×10^7	4.522×10^7	1.0939
D	NE2571, SN2697	NE2570/1, SN1133	4.120×10^7	4.050×10^7	1.0934
E	NE2571, SN2378	NE2570/1, SN1135	4.073×10^7	4.448×10^7	1.0921
F	NE2571, SN2784	NE2570/1B, SN1134	4.112×10^7	4.494×10^7	1.0929
G	NE2571, SN2472	NE2570/1B, SN1145	4.177×10^7	4.555×10^7	1.0904
H	NE2571, SN1465	NE2570/1B, SN 767	4.148×10^7	4.532×10^7	1.0924

Table 3 Types of the water phantom, their dimension and beam direction to the phantom for eight hospitals.

Hospital	Phantom	Dimension (cm^3)	Beam direction
A	NE model 2545/3A	30x30x25	Vertical
B	Radiation product design model 692/000D	35x37x40	Horizontal
C	Med-Tec model 150	40x40x40	Vertical
D	Med-Tec model 150	40x40x40	Vertical
E	NE model 2545/3A	30x30x25	Vertical
F	NE model 2545/3A	30x30x25	Vertical
G	Home made	40x40x40	Vertical
H	PTW model T41014	20x20x10	Vertical

RESULTS AND DISCUSSION

A. The comparison of the absorbed doses to water between IAEA TRS 398 and TRS 277

The comparison of absorbed doses to water measured by hospital dosemeter at depth of maximum doses for 6, 10, 18 MV x-ray beams and Co-60 gamma beams of eight hospitals in Bangkok, Thailand are presented in table 4 (a-d). Dose ratios are presented for the discrepancies between the two protocols.

The ratios of the absorbed dose to water at depth of maximum dose between IAEA TRS 398 and TRS 277 showed the maximum difference of less than 1% for all energies of x-ray beams in eight hospitals. The maximum difference were 0.7%, 0.7%, 0.5%, and 0.5% for 6, 10, 18 MV x-ray beams and Cobalt-60 gamma beams, respectively. Most of the results showed the higher dose for TRS 398 than TRS 277. These are agreeable with Huq[4] who concluded the differences of about 1% between these two protocols. The differences arise due to inaccuracies in the numerical factors and expressions (for example k_m, P_{wall}, etc.) in the N_k based method and, to a lesser extent, in IAEA TRS 398. The other cause of differences is the primary standard to which the calibrations in term of air kerma and absorbed dose to water are traceable.[1]

In addition, the new code of practice is more practical to be used than the old code of practice. The parameters used in the new code of practice are simple and more accurate, these reduce the possibility of errors in the determination of absorbed doses to water in the radiation beam.

Table 4 (a-d). Comparison of the absorbed dose to water between TRS 398 and TRS 277 at the depth of maximum dose

(a) 6 MV x-ray beams

Machine	$TPR_{20,10}$	IAEA TRS 277 D_{max} (cGy/min)	IAEA TRS 398 D_{max} (cGy/min)	Ratio of TRS 398/277
Clinac 1800	0.6748	0.999	1.003	1.004
Clinac 23EX	0.6719	1.004	1.011	1.007
Philips SL20	0.6800	0.999	0.998	0.999
Philips SL20	0.6826	1.005	1.003	0.998
Philips SL15	0.6830	1.006	1.001	0.995
Philips SL15	0.6733	0.992	0.991	0.999

(b) 10 MV x-ray beams

Machine	$TPR_{20,10}$	IAEA TRS 277 D_{max} (cGy/min)	IAEA TRS 398 D_{max} (cGy/min)	Ratio of TRS 398/277
Clinac 1800	0.7380	1.009	1.010	1.001
Clinac 2100C	0.7356	0.991	0.998	1.007
Clinac 23EX	0.7401	1.005	1.012	1.007
Philips SL15	0.7352	0.959	0.965	1.006
Philips SL15	0.7369	0.989	0.990	1.001

(c) 18 MV x-ray beams

Machine	$TPR_{20,10}$	IAEA TRS 277 D_{max} (cGy/min)	IAEA TRS 398 D_{max} (cGy/min)	Ratio of TRS 398/27
Philips SL20	0.7800	0.997	1.002	1.005
Philips SL20	0.7805	1.010	1.015	1.005

(d) Cobalt-60 gamma beams

Machine	IAEA TRS 277 D_{max} (cGy/min)	IAEA TRS 398 D_{max} (cGy/min)	Ratio of TRS 398/277
Theratron 80Elite	156.50	156.25	0.998
Theratron 780 C	83.62	83.84	1.003
Theratron 780 C	286.45	287.83	1.005
Theratron Phoenix	230.42	230.81	1.002

D_{max} = Absorbed dose at the maximum dose

B. The comparison of the absorbed dose to water between control dosemeter and hospital dosemeter

The comparison of the absorbed doses at depth of maximum dose using the control dosemeter and hospital dosemeter determined by IAEA TRS 277 and TRS 398 are shown in table 5(a-d) for 6, 10, 18 MV x-ray beams and cobalt-60 gamma beams, respectively. The absorbed doses at depth of maximum dose between the control dosemeter and the hospital dosemeter for TRS 277 showed the agreeable with the maximum differences of 0.7%, 1.5%, 0.6% and 1.8% for 6, 10, 18 MV x-ray beams and Cobalt-60 gamma beams, respectively, while using TRS 398, the maximum differences were 0.7%, 1.1%, 0.3% and 1.4% for 6, 10, 18 MV x-ray beams and Cobalt-60 beams, respectively. Agreement between control dosemeter and hospital dosemeter with TRS 398 is slightly better than the agreement with TRS 277. All of the control values were higher than hospital values.

The differences of beam output measured by control and hospital dosemeter were due to many factors such as differences of dosemeter, phantom type and beam orientation. Because of the variety of auxiliary dosimetry equipments such as phantoms, waterproofing sleeves and buildup foils, it is important that the measurement setup between two sets of equipment should be identical as close as possible. However, the types of water phantom affect the output reading. The small phantom (20x20x10 cm^3) made lower charge readings than phantom of standard size (30x30x25 cm^3). The stability of the dosemeter system should be arranged before making the measurement. The leakage current should be measured. The leakage current should not exceed 0.5% of minimum input current to be measured.

The mechanical QA check of linear accelerator and Co-60 machine need to be performed before the dose measurements. Many machines showed the shift of laser beams in the lateral wall and it caused the difficulties in the set up of the chambers, took long time and may cause error in the chamber position. The dose measurement is a work that needs an experienced physicist, good quality of instruments and protocol.

Table 5 (a-d). Compariso of the absorbed dose to water at depth of maximum dose (cGy/min for x-ray beams and cGy/min for gamma beams) between control dosemeter and hospital dosemeter following to IAEA TRS 277 and TRS 398 for 6, 10, 18 MV x-ray beams and Cobalt-60 gamma beams.

(a) 6 MV x-ray beams

Machine	IAEA TRS 277			IAEA TRS 398		
	Control (C) dosemeter	Hospital (H) dosemeter	Ratio C/H	Control dosemeter	Hospital dosemeter	Ratio C/H
Clinac 1800	0.999	0.999	1.000	1.003	1.003	1.000
Clinac 23EX	1.011	1.004	1.007	1.012	1.011	1.001
Philips SL20	0.999	0.992	1.007	0.998	0.991	1.007
Philips SL20	1.010	1.005	1.004	1.006	1.003	1.003
Philips SL15	1.010	1.006	1.004	1.003	1.001	1.002
Philips SL15	0.995	0.992	1.003	0.990	0.991	0.999

(b) 10 MV x-ray beams

Machine	IAEA TRS 277			IAEA TRS 398		
	Control (C) dosemeter	Hospital (H) dosemeter	Ratio C/H	Control (C) dosemeter	Hospital (H) dosemeter	Ratio C/H
Clinac 1800	1.009	1.009	1.000	1.010	1.010	1.000
Clinac 2100C	1.006	0.991	1.015	1.009	0.998	1.011
Clinac 23EX	1.009	1.005	1.004	1.012	1.012	1.000
Philips SL15	0.963	0.959	1.004	0.966	0.965	1.001
Philips SL15	0.990	0.989	1.001	0.988	0.990	0.998

(c) 18 MV x-ray beams

Machine	IAEA TRS 277			IAEA TRS 398		
	Control (C) dosemeter	Hospital (H) dosemeter	Ratio C/H	Control (C) dosemeter	Hospital (H) dosemeter	Ratio C/H
Philips SL20	0.997	0.996	1.001	1.002	0.999	1.003
Philips SL20	1.016	1.010	1.006	1.018	1.015	1.003

(d) Cobalt-60 beams x-ray beams

Machine	IAEA TRS 277			IAEA TRS 398		
	Control (C) dosemeter	Hospital (H) dosemeter	Ratio C/H	Control (C) dosemeter	Hospital (H) dosemeter	Ratio C/H
Theratron 80 Elite	156.50	156.50	1.000	156.25	156.25	1.000
Theratron 780 C	85.14	83.62	1.018	84.70	83.84	1.010
Theratron 780 C	289.75	286.45	1.011	290.26	287.83	1.005
Theratron Phoenix	233.85	230.42	1.015	233.99	230.81	1.014

CONCLUSIONS

It is concluded from the results of this experiment that :

(1) The absorbed doses to water determined by the IAEA TRS 398 protocol in comparison with the IAEA TRS 277 for all hospitals showed a variation of less than 1% with all beam energies. Most of the absorbed doses to water determined by the TRS 398 were slightly higher than the absorbed doses

determined by the TRS 277. The results are similar to that obtained from the Huq[4,5] and Andreo[6] studies.

(2) The absorbed doses measured by the control dosemeter showed agreement with the hospital dosemeters with the maximum differences of 1.8%. Most of the doses measured by control dosemeter were higher than the doses measured by hospital dosemeters.

(3) TRS 398 relied on ion chamber calibration in a water phantom with Co-60 gamma beams; as a result, photon beam calibrations with different chambers were slightly better agreement using TRS 398 than using TRS 277.

(4) The consistencies of the experimental studies indicate the potential to implement the new protocol, TRS 398 to determine the absorbed dose of the photon beams in Thailand.

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HALF-FILLED BLADDER FOR PELVIC SONOGRAMS

Dr. M. A. Taher[1]

Since 1981, we have been performing pelvic sonograms, but we never used enema or frusemide tablet or injection to fill the urinary bladder, however, we encouraged the patients to drink water prior to pevic sonogram and in many occasions. We perform pelvic sonograms before and after micturition to avoid confusions regarding any cyst or placenta previa. Therefore, we do agree with Benacerraf [1,2] however, many of our centres do not have transvaginal sonography or Doppler imaging. Benacerraf et al. studied 206 patients undergoing pevic sonography and found that transvaginal scans alone were sufficient to visualize all findings in 172 patients (83.5 %). An additional transabdominal component through an empty bladder was necessary to fully evaluate another 31 patients (15.1 %). The full-bladder technique was beneficial to only 3 patients (1.5 %). However, whether these 3 patients benefited from the full bladder scan was debatable, because the only additional finding was a normal ovary. Their studies showed that the transabdominal scan with the empty bladder was indeed important particularly for evaluating enlarged uteri and masses high in the pelvis. These organs were easily visualized by transabdominal approach with mild pressure applied by the sonographer or sonologist. Tessler et al. also showed that in patients undergoing transvaginal scans, the transabdominal full-bladder technique only resulted in the identification of normal ovaries, thus not altering patient outcome.[3] Hill and Breckle[4] suggested that the post-voiding transabdominal scan of the pelvis is helpful in visualizing a high-riding ovary, which may have been pushed out of view by the full bladder.

Wayne Persutte and Roger Lenke wrote an article on filling of the bladder for pelvic sonograms and it was presented at the Society of Perinatal Obstetricians meeting in 1988. Their original study was performed after a questionnaire showed that compared with having amniocentesis, most patients said that the full bladder were more uncomfortable.[5]

Lenke of Indiana Center for Prenatal Diagnosis (USA) reviewed a case in which the full bladder approach resulted in the death of both the mother and her fetus. The patient was admitted with undiagnosed severe preeclampsia, ultrasonography was ordered, she was given several glasses of water and her intravenous line was opened. Because she was in renal shutdown, her bladder would not fill, but pulmonary edema developed, and both she and the fetus died. Lenke now tells patients going to other offices not to fill their bladder but, rather than argue with the sonographers, they should just tell them that their bladder is full.[6]

For prostate exam we like to have sonograms both before and after micturition to know post -voiding residue.

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