ADRENOCORTICAL CARCINOMA IN INFANT WITH IVC EXTENSION

Laddawan VAJRAGUPTA M.D.[1]
Tanya JEERASOMBOONYING M.D.[1]
Suttipong WACHARASINDHU M.D.[2]

ABSTRACT

Primary adrenocortical carcinoma is a relatively rare malignancy in infancy and childhood. It is a highly malignant and locally invasive tumor. Local extension can occur by vascular and visceral invasion. There has been a few isolated cases of adrenocortical carcinoma with vena caval involvement in infancy and childhood. We report one case of a 10 month- old infant of an adrenocortical carcinoma with vena caval involvement. The diagnosis is depicted by ultrasonography, computed tomography and pathologic correlation.

INTRODUCTION

Adrenocortical carcinoma is a relatively rare neoplasm in infancy and childhood, accounting for less than 0.2% of all pediatric cancer.[1,2] The annual incidence has been calculated as three per million in children under 20 years.[1] Seventy five percent of children who develop adrenocortical carcinoma are less than 5 years old at diagnosis[3]. The median age at diagnosis is 4.3 years (3days-15.8 years). The tumor is more common in girl. Greater than 75% of adrenocortical carcinomas are functional, secreting one or more hormones (androgen, cortisol, aldosterone or estrogen).[3] It is a highly malignant tumor which tends to make a rapid extension locally by vascular and visceral invasion with distant metastasis to lung, bone and brain. Inferior vena caval invasion can occur in 25- 35% of cases[4] but there has been a few isolated cases of adrenocortical carcinoma with vena caval involvement in infancy and childhood. One case of childhood adrenocortical carcinoma of right adrenal gland with IVC extension diagnosed by venography was reported in 1983[5] and three cases of childhood adrenocortical carcinoma with extension into IVC and right atrium diagnosed by ultrasound, CT and MRI were reported in 1990.[6] We report a 10-month-old infant boy of adrenocortical carcinoma with vena caval involvement depicted by ultrasound and CT scan.

CASE REPORT

A 10 month-old infant boy presented in1998 with a 4-month history of rapid gaining of weight. Examination revealed Cushinoid features, facial acne, hirsutism, hypertrophy of penis and mild pubic hair (Fig.1). The patient had moderate to severe hypertension. Bone age was normal. No abdominal mass was palpable.

Cushing's syndrome was diagnosed on the basis of an elevated mean serum cortisol with lack of cortisol circadian rhythm and absence of suppression on LDST. The 24-hour urinary ketosteriod was increased.

[1] Department of Radiology, Faculty of Medicine, Chulalongkorn University, Bangkok, Thailand.
[2] Department of Pediatric, Faculty of Medicine, Chulalongkorn University, Bangkok, Thailand.

Ultrasound examination showed a 3.6x3.2 centimeter inhomogeneous hypoechoic mass at the left adrenal region. Evidence of the internal echo in IVC and left renal vein represent tumor thrombus was noted (Fig.2).

Abdominal CT showed a 4 centimeter well-defined rounded soft tissue density mass in the left adrenal region with homogeneously enhancement. Evidence of dilated left adrenal vein, containing thrombus and also thrombus in left renal vein and IVC were demonstrated (Fig.3). The contralateral adrenal gland appeared normal. The left renal stone was seen (Fig.4). There are abundant of subcutaneous fat of the whole body.

At surgery, the left adrenal gland contained a 3.4 cm.-sized, well- circumscribed tumor with thrombus in the left adrenal vein (Fig.5). Left adrenalectomy and tumor thrombus removal were performed. Histologically, the tumor consisted of nets of round cells containing vesicular nuclei and small nucleoli which compressed the normal structure. Evidence of moderate nuclear pleomorphism, abnormal mitosis, tumor necrosis and capsular invasion were demonstrated. The diagnosis was that of adrenocortical carcinoma. The patient died on day 20th after operation due to sepsis and adrenal insufficiency.

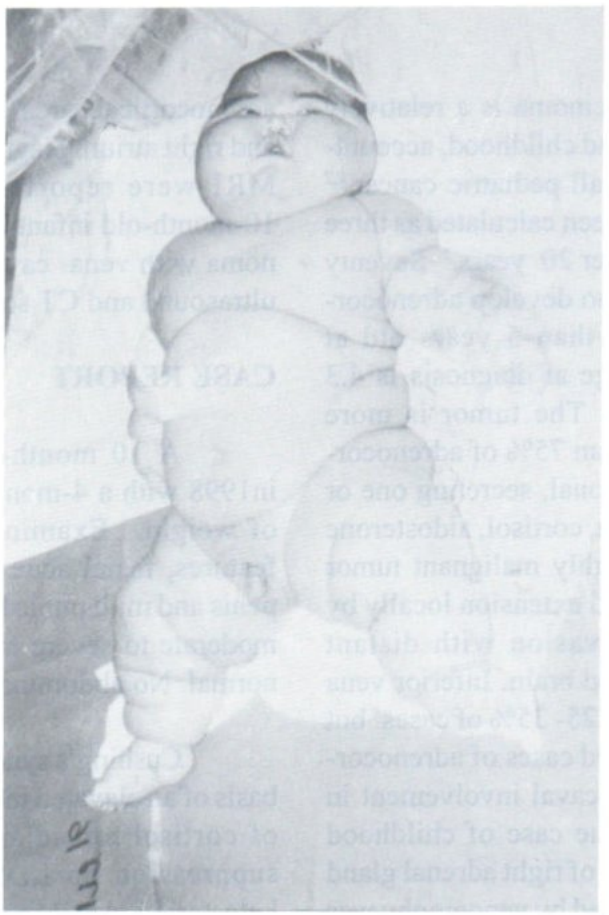
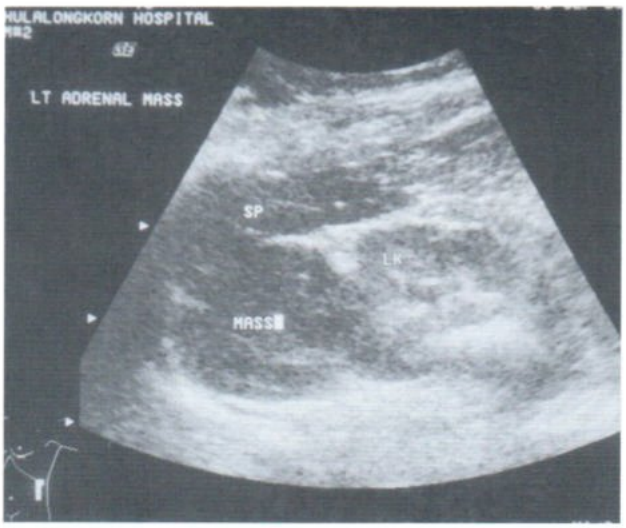
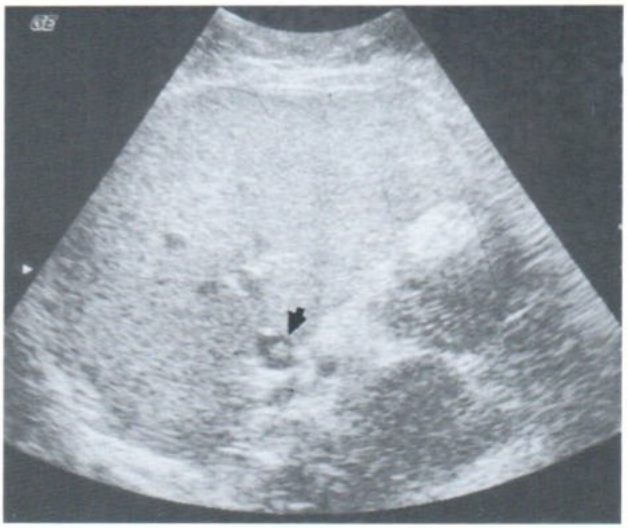


Fig. 1. A 10 month-old infant boy with Cushinoid features.



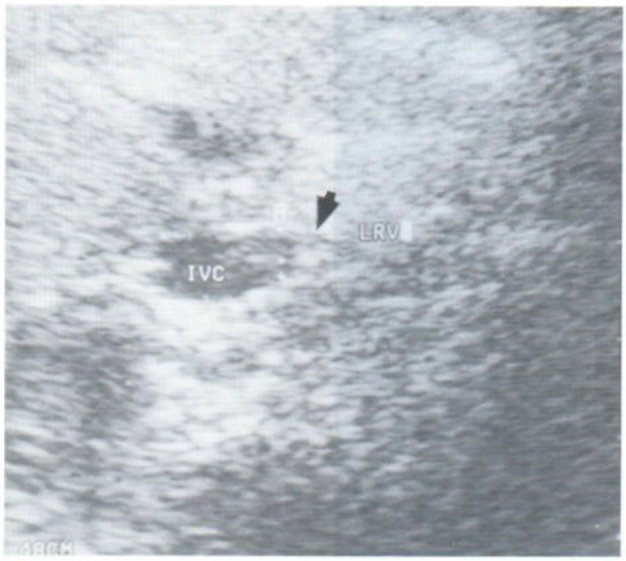
2A

Fig. 2A. Longitudinal subcostal sonogram of left upper quadrant demonstrates a 3 cm. inhomogeneous hypoechoic mass at the left adrenal region. (LK = left kidney, SP = spleen)



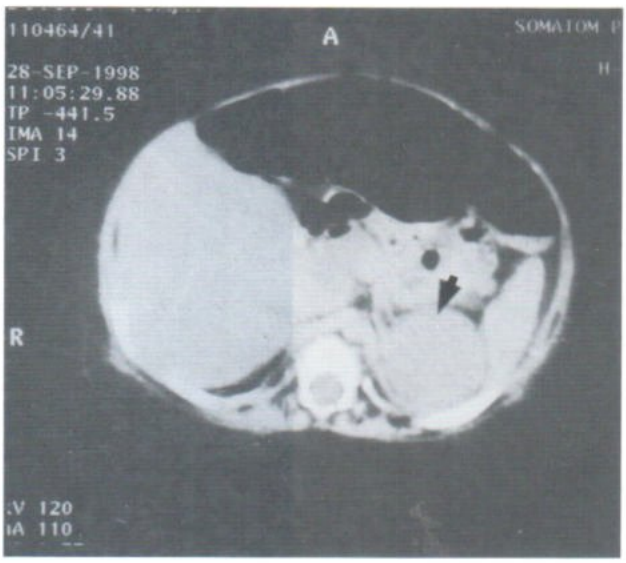
2B

Fig. 2B. Transverse sonogram shows intraluminal echogenic thrombus within IVC (arrowhead).



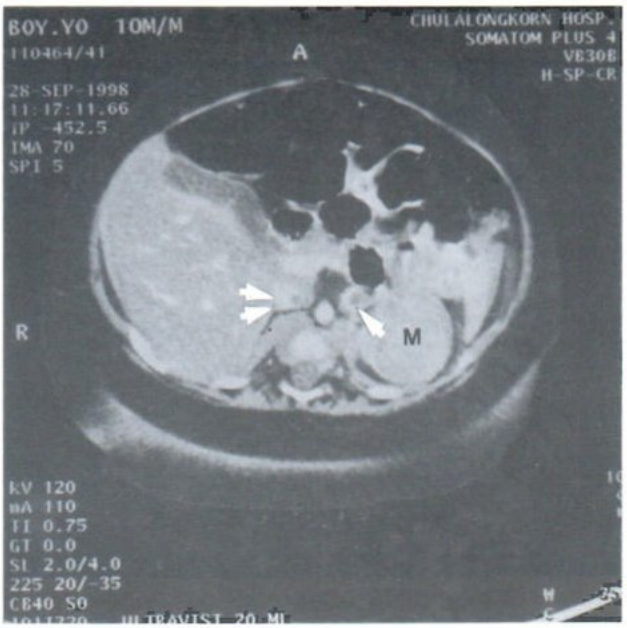
2C

Fig. 2C. Transverse sonogram shows echogenic thrombus in left renal vein (arrowhead). (IVC = inferior vena cava, LRV = left renal vein)



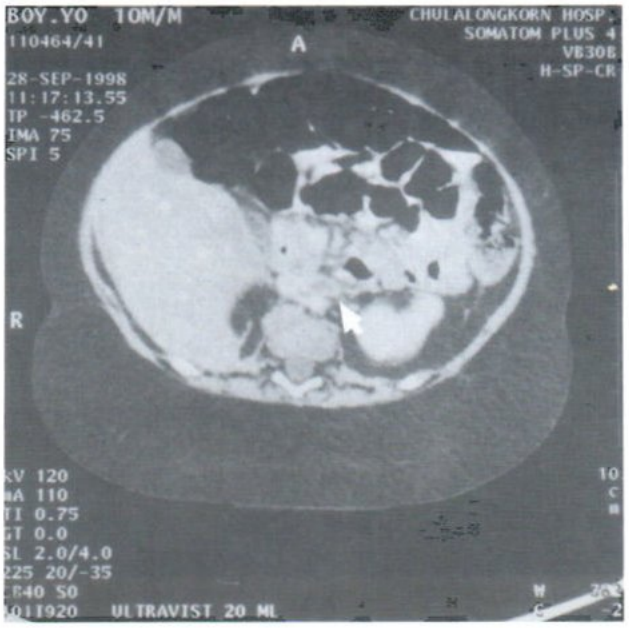
3A

Fig. 3A. Unenhanced CT scan shows a well-defined rounded left adrenal soft tissue density mass (arrowhead).



3B

Fig. 3B. Enhanced CT scan shows homogeneous enhancement of the left adrenal mass (m). Dilated left adrenal vein, containing thrombus. (arrow head). Thrombus in IVC (double arrowheads).



3C

Fig.3C. Enhanced CT scan shows thrombus in left renal vein (arrowhead).

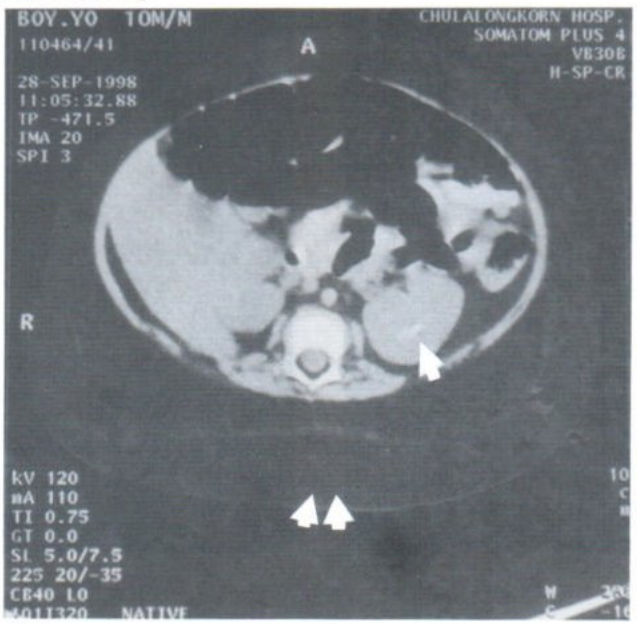


Fig. 4. Unenhanced CT scan shows stone in the left kidney (arrowhead). Abundant of subcutaneous fat (double arrowheads).

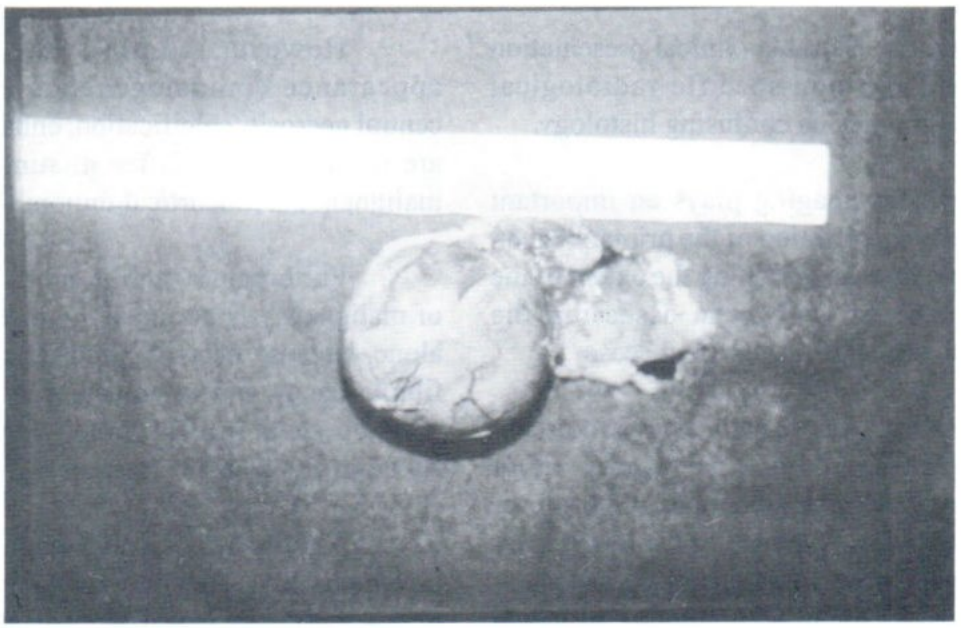


Fig. 5. Gross specimen, removed at surgery, was an adrenocortical carcinoma.

DISCUSSION

Primary adrenocortical carcinoma is a rare malignancy in infancy and childhood. Although childhood adrenocortical carcinoma extremely uncommon, it is still the most common tumor occurring in the adrenal cortex.[7] It is much less common than neuroblastoma but slightly more common than pheochromocytoma. Most pediatric patients with adrenocortical carcinoma have hormonally active tumors. The most common manifestation being either virilism or a mixture of virilism and Cushing's syndrome.[2] Adrenocortical carcinoma with cortisol production is the most common cause of Cushing's disease in children. Cushing's syndrome refers to the manifestation of glucocorticoid excess and it is a presenting symptom in our patient. On CT scan, evidence of left renal calculi was detected in our patient. The renal calculi occur approximately 15% of the patients of Cushing's syndrome, and renal colic may occasionally be a presenting complaint.[7] These calculi are a consequence of glucocorticoid-induced hypercalciuria. Serum calcium and phosphorus concentrations are normal; however hypercalciuria occur in 40% of these patients.

The diagnosis of the non-functioning tumor is often delayed until the mass become huge or systemic symptoms arise. Adrenocortical carcinoma has been found to be associated with Beckwith-Wiedemann syndrome, hemihypertrophy and Li-Fraumeni syndrome.[1]

It is a highly malignant and locally invasive tumor. Extensive local tumor invasion being present in just over 50% of the carcinomas in the present series[5]. Distant metastasis to lungs, bone and brain occurs in many cases. Inferior vena caval, adrenal vein or renal vein invasion are found in 25 to 35% of cases.[4] Extension into the right atrium may be found.[6]

Adrenocortical carcinoma in childhood may be a considerable diagnostic problem by

virture of its rarity, variable clinical presentation and biochemistry, non-specific radiological findings and, at times its confusing histology.

Diagnostic imaging plays an important role in the early localization of the primary lesion of the adrenal gland and defining the extent of the primary tumor as well as in assessing the presence or absence of metastatic disease.

Sonography can usually reveal the separation between the adrenal mass and a tumor arising in the liver or the upper pole of the kidney by characteristic displacement of the retroperitoneal fat planes. Sonographic appearance of pheochromocytoma, adrenal adenoma or carcinoma may be similar. While still small, most lesions present with a homogeneous echo pattern that usually becomes complex as the lesion grow, reflecting areas of necrosis or hemorrhage.[9]

On sonography the primary tumor of adrenocortical carcinomas are usually large and the complex echo pattern correlates with the central necrosis, hemorrhage and calcification. Radiating septa or an echogenic, capsule-like rim can be seen. Occasionally the entire mass may be either hypoechoic or hyperechoic.[9] Color Doppler imaging is a non-invasive method to evaluate vascular extension of tumor, especially in acute thrombosis. It is particularly effective in demonstrating a partially patent lumen when standard gray scale examination suggests total occlusion. Intrinsic obstruction of the IVC related to thrombosis can be either partial or complete.[10]

The CT appearance of adrenocortical carcinoma is non-specific. It may be heterogeneous with inhomogeneous contrast enhancement. In our patient, the sonographic appearance of the primary tumor showed an inhomogeneous hypoechoic mass and abdominal CT scan revealed homogeneously enhanced soft tissue mass.

However criteria related to size and appearance (inhomogeneous enhancement, central necrosis, calcification, enhancing capsule) are not reliable in differentiating benign from malignant adrenocortical tumors.

Furthermore, unlike adults, the diagnosis of malignancy is not made by histologic criteria alone, because necrosis, nuclear pleomorphism, fibrous bands, and vascular and capsular invasion may be seen in childhood adrenal cortical adenomas as well as carcinomas.

Although differential diagnosis of adrenal carcinoma from adenoma may be difficult, MRI plays a role in the differentiation between malignant tumor and adenoma. More recently, chemical shift MR imaging technique has been used to detect lipid within an adrenal mass. Because significant amount of lipid often present in adrenal adenomas and typically absent in most metastases and other nonadenomatous adrenal masses. Using breathhold opposed- phase gradient echo imaging, Mitchell et al showed a relative loss of signal intensity of adrenal masses in 95% of adenomas and in none of their nonadenomas.[12]

IVC extension can occur at four different levels[4] : level 1, tumor thrombus occurring only at the entry of the renal vein (left-sided tumors); level 2, tumor thrombus extending up to the IVC but remaining below the entry of the most inferior hepatic vein; level 3, refers to tumor thrombus extending into intrahepatic vena cava but below the diaphragm; and level 4, refers to tumor thrombus extending above the diaphragm or into the right atrium. All these four levels of IVC tumor thrombus require different surgical approaches. Therefore, when tumor thrombus is found, the exact extent, that is infrahepatic, intrahepatic, suprahepatic, or supradiaphragmatic, must be identified.

If the tumor thrombus is infrahepatic, the cardiothoracic bypass is usually unnecessary, and the tumor thrombus can be directly extracted from the vena cava after obtaining local control of the vena cava. Cardiothoracic by pass is the preferred method for the tumor thrombus at any of the other levels.

CT scan is the accented standard for evaluation of the primary tumor and involvement of the structures. Both CT scan and ultrasound are helpful in evaluating involvement of adrenal, renal and vena caval structure. MRI scanning can add to the precision of the evaluation because of the ability to display images of the IVC in coronal, sagittal and axial planes.

In our patient, evidence of tumor thrombus was demonstrated in left renal vein and infrahepatic IVC by both ultrasound and CT scan. The tumor thrombus in left adrenal vein was seen on CT scan.

Surgery is the main stay of treatment, since no effective adjuvant treatment is available. The prognosis is poor as most tumors which are locally invasive or having distant metastases at the time of presentation.

In conclusion, adrenocortical carcinoma is rare but is a highly malignant neoplasm in infancy and childhood. Local invasion with visceral and vascular involvement and distant metastases are common. Accurate preoperative assessment of local extension and IVC invasion is helpful in preparing for the surgical extirpation.

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