CT Diagnosis of Adrenal Incidentaloma

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Abstract **Objective** To analyze and summarize misdiagnostic and differential diagnostic points of adrenal incidentaloma. **Methods** CT data of 35 patients with adrenal incidentaloma confirmed by operation and pathology were analyzed. **Results** Of 35 patients, 9 cases were pheochromocytomas, 7 cases were adenomas, 5 cases were myelolipomas, 5 cases were metastatic tumors, 3 cases were ganglineuromas, and the adenocarcinoma, the lipoma, the cyst, the neurofibroma, the neurilemoma, the mesenchymoma was 1 case respectively. Among them, 25 cases were benign tumors and 10 cases were malignant. 18 cases were identified definitely, 8 cases were misdiagnosed and 9 cases were given final diagnosis by CT. **Conclusion** ① Most of adrenal incidentaloma are benign. ②Almost all of adrenal myelolipoma, lipoma and cyst can be accurately diagnosed by CT. ③Most of adrenal metastasis, pheochromocytoma and adenocarcinoma can be diagnosed by CT. ④Most of rare adrenal incidentaloma are difficult to be diagnosed by CT. ⑤Adrenal adenoma, pheochromocytoma and unilateral metastasis are often misdiagnosed.

Key Words Adrenal gland; Neoplasms; Tomography, X-ray computer

With the widespread using of CT scanning in the diagnosis of abdominal diseases, The detection ratio of adrenal asymptomatic masses has been greatly increased[1]. 1h this paper 35 cases CT data of the patients with adrenal incidentalomas(hospitalized from April 1990 to January 2000)confirmed by operation and pathology were analyzed retrospectively combination with clinical and pathologic data.

MATERIAL AND METHODS

This population of 35 patients comprised 21 males and 14 females. The mean age was 48.6 years (range 29-67years). All cases underwent CT scanning because of the adrenal masses founded when physical examination or echography, CT and MRI scanning. Echography, CT and MRI detected 19 cases, 13 cases, and 3 cases, respectively. Patients detected by echography or MRI underwent CT scanning again. Of 35 cases, only 9 cases underwent plain scanning, and 26 cases underwent both plain and enhanced scanning; 23 cases had no symptoms or signs, 12 cases had symptoms including abdominal discomfort or hidden pain, lumbago, and abdominal masses. 2 cases were diagnosed primary hypertension according to blood pressure 20/14.5kpa and 23/16kpa respectively, 4 patients´ 24-hour urinary vanillylmandelic acid (VMA) were higher than normal, 1 case had an abnormal cortisol secreting diurnal rhythm, and 4 cases had a higher blood pressure when stimulating during operation.

Methods GE9800 CT scanner, Simens SOMATOM AR.C CT scanner and PQ6000 spiral CT scanner were used. Suprarenes first were localized with thick and index in 10mm, then underwent CT plain scanning or both plain and enhanced scanning with thick and index in 5mm until the whole kidney was scanned also. The size of masses is measured in the maximal diameter.

RESULTS

CT results 39 masses were identified from all 35 patients, with 27 in the right and 12 in the left. The diameters of masses ranged from 1cm×1.5cm to 10cm×11.5cm. Of these masses, 18 masses were less than 4cm in diameter(benign/malignant was 16:2), 16 masses were between 4cm and 6cm (benign/malignant was 10:6), 5 masses were more than 6cm (benign/malignant was 2:3). Of 35 cases, 29 cases had a clear border, and 19 cases had an equivalent density. Plain scanning CT value was -62Hu-123Hu. In 8 misdiagnosed cases, 1 mass wasn´t accurately localized, which being huge pheochromocytoma was misdiagnosed as hepatic hemangioma. 7 cases weren´t characterized correctly, in which 2 malig-

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nant pheochromocytomas were misdiagnosed as adenocarcinoma (Fig1), 1 case of pheochromocytoma was misdiagnosed as unilateral metastasis (Fig2), 1 case of pheochromocytoma was misdiagnosed as adenoma(Fig3), 2 cases of adenoma were misdiagnosed as pheochromocytoma,1 case of adenocarcinoma was misdiagnosed as pheochromocytoma (Fig4); 9 cases of masses couldn´t be diagnosed definitely by CT and could only be diagnosed as adrenal tumor.

Pathological findings Histopathologic features of 35 adrenal incidetalomas included 9 pheochromocytomas (4 malignant masses), 7 adenomas, 5 metastasis (3 cases from lung cancer, the other two cases from breast cancer and renal cancer, respectively), 5 myelipomas, 3 ganglineuromas, 1 adenocarcinoma, 1 1 lipoma, 1 cyst, 1 neurofibroma, 1 neurilemoma and 1 mesenchymoma. Of 35 cases, 25 benign cases (71%) had 28 masses, 10 malignant cases(29%) had 11 masses.

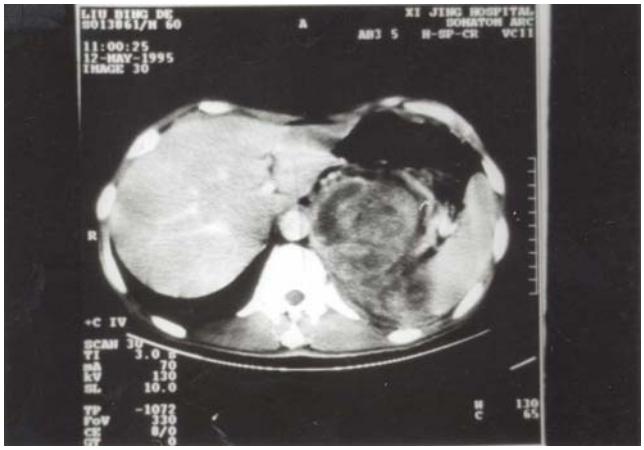

Fig1 Left adrenal huge malignant pheochromocytoma with unclear border and unevent density was misdiagnosed as adenocarcinoma

Fig2 Right adrenal pheochromocytoma with irregular enhancement and odds density was misdiagnosed as metastasis just because the patient has small–cell brochogenic carcinoma

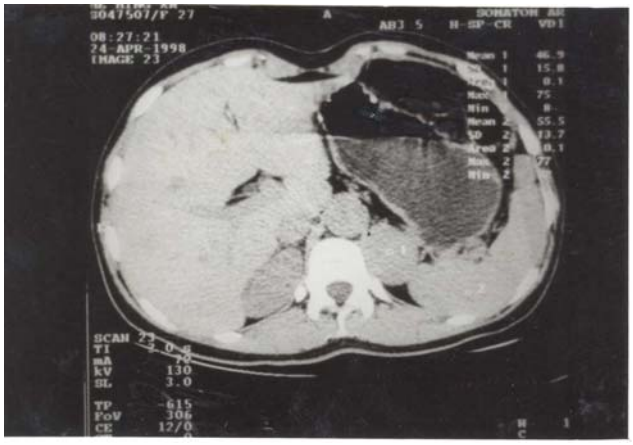

Fig3 Left adrenal pheochromocytoma with equivalent density but slight enhancement was misdiagnosed as adenoma

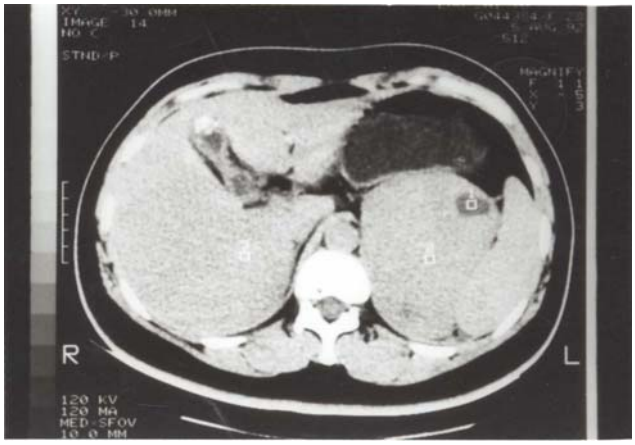

Fig4 Right adrenal adenocarcinoma with big size, necrosis and obvious enhancement was misdiagnosed as pheochromocytoma

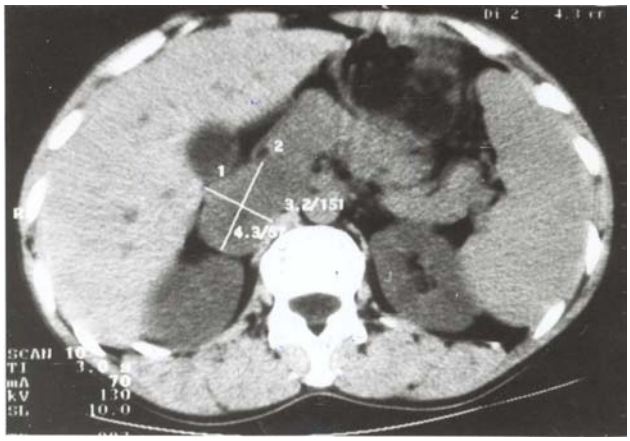

Fig5 Right adrenal neurilemoma with low density and necrosis was only diagnosed as adrenal tumor

DISCUSSION

Adrenal incidentaloma The definition of adrenal incidentaloma refers to an adrenal mass occasionally and unexpectedly be discovered without any symptoms or signs. These masses secrete no glucocorticoid or mineralocorticoid, and also have no catecholamine overproduction without stimulation. So it´s difficult to detect early because of clinical silence[2]. The majority of incidentalomas are nonfunction benign mass and mostly are adenomas. In our study, most benign masses were pheochromocytoma and adenoma. Incidentaloma can also be malignant or potential functioning ones, most of which are pheochromocytoma[3].

Adrenal incidentaloma identified definitely Three kinds of incidentaloma can be identified definitely by CT, they are myelolipoma, lipoma and cyst. Myelolipoma is one rare kind of benign nonfunctioning tumor, which is composed of fat and bone marrow in different proportion[4]. According to CT findings, myelolipoma is mostly comprise of fat with negative CT attenuations, mixed with a diffused slight strip-like or sheet-like bone marrow shadows, and has smooth border and pseudocapsule. Adrenal lipoma is also a rare kind of tumor with limited aggregated fat tissue and smooth border. Mass has an equivalent fat density with CT values from −50 to −120Hu without any mixing elements, which is easy to distinguish from myelolipoma. Adrenal cyst is seldom seen. which is cystic mass with equivalent aqueous density and clear and smooth border In CT. The wall of cyst is easily to be calcified, but there is 1 case in our study without calcification. Adrenal cyst is divided to four types: endothelial cyst, pseudo-cyst, epithelial cyst and parasitic cyst. Clinically, pseudo-cyst is the most common, the inner wall of which is fibrous tissue without endothelial or epithelial lining.

Incidentalomas easy to be diagnosed Three kinds of incidentaloma are comparatively easy to be diagnosed by CT: metastasis, pheochromocytoma and adenocarcinoma. Metastasis are often bilateral with a history of primary tumor. It exists with irregular edge and unevent density, unclear border and irregular enhancement. Other majority metastatic signs is retroperitoneal lymph nodes, so it can often be identified definitely by CT except unilateral metastasis. Pheochromocytoma is often be found, its CT appearance are usually typical: In plain scanning, it appears as oval mass and centrical or irregular necrosis and cystoid change can often be observed.In enhanced CT scanning, obvious enhancement can be seen in the positive part due to rich blood supplyment. Most of pheochromocytomas are functional or potentially functional tumors. In this study, 4 patients´ urinary VMA was higher than normal, 4 patients had higher blood pressure when touching masses during operation, but with no symptoms or signs clinically. Adenocarcinoma is a rare kind of adrenal malignant tumors. Nonfunctioning cortical adenocarcinoma amounts to 25%-50% with no clinical signs such as Cushing´s syndrome, female masculinization, Pubertas praecox, amenorrhea, hirsutism and so on[5]. The malignant CT findings of cortical adenocarcinoma is typical: huge masses with irregular density, an unclear border and irregular enhancement, necrosis often and calcification sometimes is observed.

Incidentalomas difficult to be diagnosed This kind of incidentaloma is highly rare, most of which is derived from adrenal mesenchymal, such as neurofibroma, neurilemoma, and mesenchymoma. Ganglioneuroma is also one rare kind of adrenal medullary tumors. CT appearance is atypical: when undergoing plain scanning, mass appears as big oval mass with even density, when undergoing enhanced CT scanning, no or only slight enhancement can be seen. Fine spread calcification are often observed in ganglioneuromas which is relatively typical[6] . Only 1 of 3 ganglioneuromas showed this sign. The diagnostic difficulties may be due to clinical silence, normal laboratory examination and exclusively rareness in itself. So it can only be finally diagnosed by pathological findings.

Incidentalomas easy to be misdiagnosed each other Incidentalomas are very easy to be misdiagnosed each other[7]. Among the adenoma, pheochromocytoma and unilateral metastasis are the most.① Adenoma and pheochromocytoma: cortical adenoma has a relatively high density and big size in 2-4cm, which is similar to small pheochromocytomas. No or slight enhancement is observed in adenoma, and necrosis is rare[8] , while pheochromocytoma is apt to necrosis. If pheochromocytoma is small in size and has no necrosis, obvious enhancement can be observed, which is conducive to distinguish from

adenoma. ②pheochromocytoma and adenocarcinoma: both are quite big in size, usually more than 4cm[9], apt to necrosis and have enhancement of the positive part. Malignant pheochromocytomas and adenocarcinomas are especially difficult to distinguish because of similar features such as unclear border, irregular enhancement, and should be diagnosed by laboratory and other examination. ③pheochromocytoma and unilateral metastasis: Metastasis is malignant and always has some malignant signs such as unclear border, uneven density, irregular enhancement, while generally pheochromocytoma has a relatively clear border, necrosis and the obvious enhancment can often be seen. In this study, The misdiagnosis of 1 case pheochromocytoma as metastasis was mainly due to the history of lung cancer. According to retrospective analysis, the mass had a clear border and no signs of invasion or metastasis even with necrosis. So we can conclude that adrenal tumors aren´t always metastasis when complicated with primary tumors, and should be carefully analyzed according to CT findings.

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