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Use of electron microscopic evaluation for the diagnosis of adrenal cortical carcinoma in fine needle aspiration cytology: a case report and review of the literature

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Received: June 18, 2001 / Accepted: August 7, 2001

Abstract Bilateral adrenal tumors were detected in a 72-year-old man who had a history of hepatic inflammatory pseudotumor. Computed tomography (CT)-guided fine needle aspiration cytology (FNAC) of the adrenal glands was performed. The cytologic findings were similar to the previous diagnosis of “inflammatory pseudotumor” in the liver. However, the origin of some aggregated large atypical cells observed in the adrenal FNAC specimens was not known. Immunocytochemically, these large atypical cells were positive for vimentin and negative for cytokeratin and chromogranin A. An electron-microscopic study showed that these large atypical cells contained mitochondria with tubulovesicular cristae and smooth endoplasmic reticulum arranged in whorled and laminated patterns, and these findings confirmed diagnosis of primary adrenal cortical carcinoma. The histopathological diagnosis of the resected bilateral adrenal tumor was adrenal cortical carcinoma. The patient died 7 months after surgery, with recurrence of the bilateral adrenal cortical carcinoma and extensive metastases. A diagnosis of primary adrenal cortical carcinoma with extensive metastases was finally demonstrated by autopsy. Retrospectively, the previous liver tumor was determined to be a metastatic lesion.

Key words Adrenal cortical carcinoma · Fine needle aspiration cytology · Electron microscopy · Immunocytochemistry

Introduction

Adrenal cortical carcinoma is a very rare but highly malignant tumor in both children and adults, accounting for 0.02% to 0.04% of all cancers. The tumor affects all age groups, from 6 months to 72 years, with a median age at detection of 40 years, and a mean age of 37.6 years. Its diagnosis is often difficult and delayed. Liver metastasis is often involved and the condition continues to carry a poor prognosis.1–4 The mean or median survival time of the patients reported has ranged from 4 to 30 months.1,5

Computed tomography (CT)-guided fine needle aspiration cytology (FNAC) can localize a tumor accurately, and can thus help in the aspiratation of diagnostic material with minimal adverse effects; this technique is therefore being increasingly utilized in the diagnostic evaluation of superficial as well as deeply situated tumors.6,7 Therefore, FNAC has become the procedure of choice for the initial diagnosis of adrenal masses.6,12

We report here a case of primary adrenal cortical carcinoma in a 72-year-old man. FNAC of adrenal masses showed aggregation of large atypical cells in an inflammatory background, mimicking the previous diagnosis of inflammatory pseudotumor of the liver in the patient. However, FNAC confirmed the diagnosis of primary adrenal cortical carcinoma, and electron microscopic findings of portions of the aspirated material led to a demonstration of the diagnosis.

Case report

A 72-year-old man had a hepatic inflammatory pseudotumor in the right lobe that was resected in October, 1998. Six months after the operation, the patient had a relapse of fever and an elevated serum C-reactive protein (CRP) level (13.8 mg/dl). CT scan and magnetic resonance imaging (MRI) detected bilateral adrenal tumors; the left measured 4 cm and the right measured 7 cm in diameter
CT-guided FNAC was performed. The cytologic findings were similar to those that led to the previous diagnosis of hepatic inflammatory pseudotumor. However, the origin of some aggregated large atypical cells in the adrenal FNAC specimens was not known. An immunocytochemical examination of the FNAC material suggested adrenal cortical carcinoma and, electron microscopic observations confirmed a diagnosis of primary adrenal cortical carcinoma. The bilateral adrenal glands were then excised surgically. The pathological diagnosis was adrenal cortical carcinoma. Postoperatively, palliative chemotherapy with mitotane was instituted. The patient died 7 months after this surgery, with recurrence of the bilateral adrenal cortical carcinoma and extensive metastases to the liver, lungs, spleen, pancreas, kidneys, and periaortic lymph nodes. Autopsy was performed and primary adrenal cortical carcinoma with extensive metastases was demonstrated.

**Materials and methods**

In this patient, FNAC of the adrenal tumor was performed using an 18-gauge needle under CT guidance. Direct smears were immediately spray-fixed in 95% alcohol for Papanicolaou stain and air-dried for May-Grunwald-Giemsa (MGG) stain.

A portion of the aspirated material was then suspended in 0.8% normal saline (NACL), and prepared in a cytacentrifuge to make a cell block that was formalin-fixed and paraffin-embedded. The cell block sections were stained with hematoxylin and eosin (H&E).

The immunohistochemical examination was performed on the cell block sections, using the avidin-biotin-peroxidase complex (ABC) method. The primary antibodies used included cytokeratin (M0821, pankeratin; Dako, Tokyo, Japan), vimentin (M0725; Dako), S-100 protein (Z0311; Dako), chromogranin A (A0430; Dako), and leukocyte common antigen (LCA) (M0701; Dako).

For electron microscopic evaluation, another portion of the aspirated material was fixed in 2% glutaraldehyde and postfixed in 1% osmium tetroxide, and embedded in Epon 812. Ultrathin sections were mounted on copper grids, stained with uranyl acetate and lead citrate, and observed with a model H 7100 electron microscope (Hitachi, Tokyo, Japan).

**Results**

**Cytologic findings**

Papanicolaou-stained and May-Grunwald-Giemsa-stained smears showed large atypical cells in a background of in-