



# Unusual Metastasis of Neuroblastoma to the Liver Capsule and Peritoneum

## *Nöroblastomun Karaciğer Kapsülü ve Peritona Nadir Görülen Metastazı*

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### Abstract

Neuroblastoma is one of the most common solid tumors in childhood, particularly in the first year of life. Distant metastases play an important part in the staging of this disorder. Metastatic liver disease in cases of neuroblastoma is considered to be a sign of advanced disease. We describe liver capsule and peritoneal involvement in a 3-year-old female with adrenal gland neuroblastoma. To the best of our knowledge, this involvement is the first reported case in the English literature. (*The Medical Bulletin of Haseki 2013; 51: 18-20*)

**Key Words:** Neuroblastoma, liver capsule metastasis, peritoneal involvement, abdominal imaging

### Özet

Nöroblastom çocukluk çağında, özellikle de hayatın ilk yılında en sık görülen solid tümörlerdendir. Uzak metastazlar bu hastalığın evrelemede önemli rol oynar. Metastatik karaciğer hastalığı nöroblastom vakalarında ilerlemiş hastalığın bir bulgusudur. Biz bu olguda adrenal nöroblastomlu üç yaşında kız çocuğunda karaciğer kapsülü ve periton tutulumunu tanımladık. (*Haseki Tıp Bülteni 2013; 51: 18-20*)

**Anahtar Kelimeler:** Nöroblastom, karaciğer kapsül metastazı, peritoneal tutulum, abdominal görüntüleme

### Introduction

Neuroblastoma is the second most common abdominal neoplasm in children. It is responsible for approximately 15% of cancer-related deaths in childhood because of its aggressive nature and tendency to metastasize (1). Rarely, the primary tumor is not discovered despite the presence of metastatic disease (2,3). The liver is one of the organs that is affected by metastatic neuroblastoma (2,3). Distant metastases of the liver are considered to signify the advanced stage of neuroblastoma, and the prognosis for patients (particularly those with stage-4 disease) is poor (4). Hepatic involvement usually manifests as discrete lesions or diffuse involvement of the liver parenchyma. We describe unusual abdominal spread of metastatic neuroblastoma in a 3-year-old female.

### Case Report

A one-month-old female with the history of abdominal solid masses discovered at routine ultrasound examination was admitted to our hospital. The tumor size was 3.5 cm in dimension arising from the left adrenal gland. 24-hour urine collection found high level vanillylmandelic acid (VMA) and urinary homovanillic acid (HVA) (19 mg/g creatinine and 46 mg/g creatinine, respectively). Blood neuron-specific enolase (NSE) was markedly elevated (450 ng/mL). Bone scintigraphy did not reveal metastases relating to the skeletal system. Chest X-ray was unremarkable. There were no additional findings in the abdomen on contrast-enhanced magnetic resonance imaging (MRI). She underwent surgery and the tumor was removed. Pathological investigation revealed neuroblastoma arising from the adrenal gland. Bone marrow aspiration

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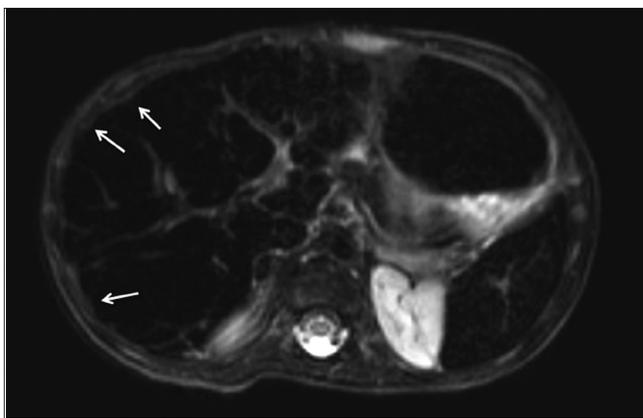
Haseki Tıp Bülteni,  
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revealed high amplification of the transcription factor N-MYC. This was highly suspicious for neuroblastoma involvement, thus, postoperative chemotherapy was considered.

The patient's condition was unremarkable in the interval. There were no mass lesions in the operation site of the adrenal gland on control contrast-enhanced MRI performed two years later on a 1.5-T MRI scanner (Symphony, Siemens Medical Systems, Erlangen, Germany). Liver size was normal (craniocaudal dimension, 77 mm) whereas the spleen was moderately enlarged (craniocaudal dimension, 110 mm). Involvement of the liver capsule and peritoneum was irregular and difficult to detect on T2\* weighted images (Figure 1). There were multiple parenchymal liver metastases and irregular, poorly defined, fine liver capsule and peritoneal enhancement was detected throughout the liver; this was more visible in the late arterial phase and venous phase (Figure 2a, 2b). Blood NSE was 45.73 ng/mL, urinary VMA was 12.35 µg/mg, and urinary HVA was 6.75 µg/mg. Bone scintigraphy did not reveal metastases relating to the skeletal system. Taking into account laboratory findings, high-resolution ultrasound-guided fine-needle aspiration biopsy from the liver capsule was performed. Pathological investigation revealed a neuroblastoma metastasis to the liver capsule and peritoneum. Chemotherapy was considered. The disease did not respond to chemotherapy and, because of high fever (39.5°C) and lung infection, chemotherapy was stopped. Contrast-enhanced computed tomography (CT) performed five months later because of severe abdominal pain demonstrated solid lesions in the liver parenchyma with marked capsular metastasis and multiple mass lesions in the paraaortic area (Figure 3). She died from ongoing respiratory infections and septicemia three month later.

## Discussion

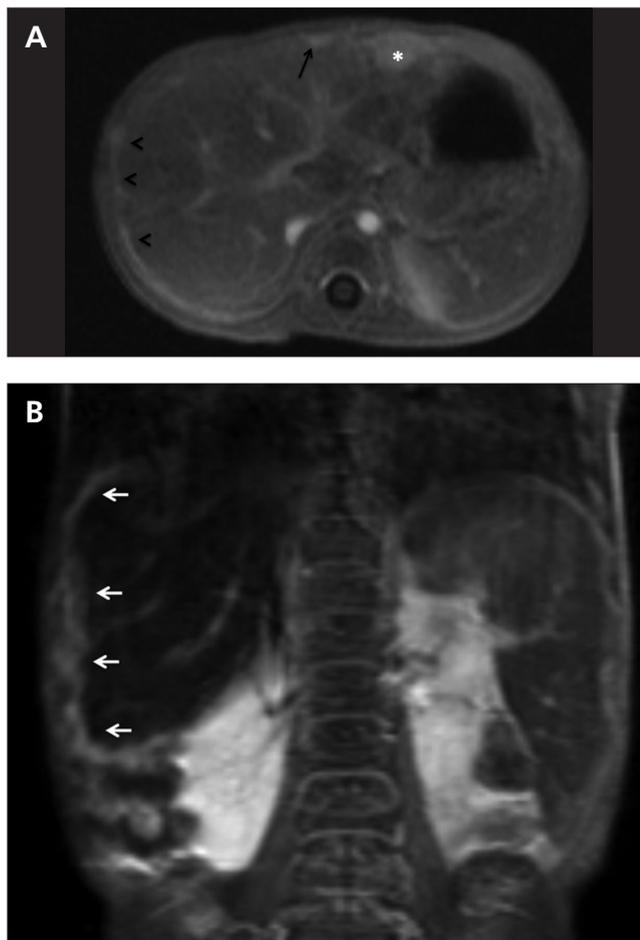
Neuroblastoma is the most common extracranial malignant tumor in children. Although it can occur anywhere along the



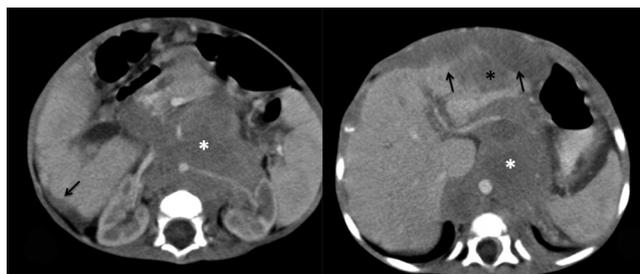
**Figure 1.** Axial T2\* weighted fat suppressed image demonstrate irregular high signal intensity throughout the liver capsule (arrows)

sympathetic chain, the abdomen is the most common primary site. In the abdomen, the adrenal gland or paravertebral sympathetic ganglia are usually involved (5,6).

The behavior of neuroblastoma is very broad, ranging from spontaneous regression of tumors to maturation to progression, despite intensive multimodal treatment (5,6). There are



**Figure 2.** (A) Axial turbo flash post gadolinium MR image and (B) coronal fat suppressed T1 spin echo post gadolinium MR image shows irregular, poorly defined, fine capsular enhancement (arrows) and liver metastasis (asterisks)



**Figure 3.** Computer tomography of the abdomen demonstrates scalloped indentation of the surface of the liver due to capsular metastasis (arrows). Also note liver metastasis (black asterisks) and multiple mass lesions in the paraaortic area (white asterisks)

prognostic factors such as histologic findings, amplification of the N-MYC oncogene, and chromosomal aberrations. Imaging is one of the most important methods for assessing prognosis, and is used in staging of neuroblastoma (5,6).

Although imaging findings of the local extent or spread to an adjacent organ may influence the strategy for resection of neuroblastoma, distant metastasis indicating stage-4 disease significantly affects outcome more than local spread of neuroblastoma (4,6). MRI is useful for evaluating the primary tumor and metastasis, including extension into the neural canal and invasion of adjacent organs such as the liver (7). MRI is more important in babies and children because of high intrinsic soft-tissue contrast resolution, which is beneficial in patients with low body fat (7).

Thickening of the liver capsule should be differentiated from various non-malignant capsule and peritoneal involvement. The liver capsule and subcapsular area can be affected by various pathologic conditions such as infections (perihepatitis, parasitic diseases), infiltrative (lymphoma, extramedullary hematopoiesis), and metastatic diseases (8). Tumor cells can reach this site by seeded metastasis, invasion via the perihepatic ligaments, and direct invasion by malignancy from an adjacent organ (8). Metastatic lesions involving the liver capsule are usually much less well-defined than true parenchymal metastases, and are not surrounded by the liver parenchyma (8). In our case, histologically proven neuroblastoma metastasis was shown as poorly defined non-mass-like capsular enhancement and thickening throughout the liver.

Capsule-based metastases can be frequently seen in ovarian cancer followed by colon cancer. Metastases from pancreatic ductal adenocarcinoma and synovial sarcoma can also occur in capsular and subcapsular areas (7). In the pediatric population, capsular liver metastases in Burkitt's lymphoma and inflammatory myofibroblastic tumors have been reported (9, 10). Several imaging appearances of metastatic liver neuroblastoma such as multiple discrete focal lesions, infiltrative lesions, or both have been reported (11). MRI features of such metastasis are typically hypointense on T1-weighted and in homogeneously hyperintense on T2-weighted sequences.

Contrast-enhanced T1-weighted sequences show varying heterogeneous peripheral and central enhancement (11). In our case, contrast enhanced MRI demonstrated multiple parenchymal metastases with indistinct involvement of the liver capsule and peritoneum which was marked five months later on contrast enhanced CT scan of the abdomen.

In conclusion, a metastatic neuroblastoma can also present with liver capsule and peritoneum involvement. In neuroblastoma cases, enhancement of the liver capsule and peritoneum with irregular thickening should be considered suspicious for metastasis and biopsy should be performed for the final diagnosis.

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