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Case Report
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Isolated hemorrhagic contusion of an incidental meningioma

İnsidental menenjiyomda izole hemorajik kontüzyon

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The authors present an unusual case of isolated hemorrhagic contusion of an incidental meningioma showing radiological findings similar to those of a hemorrhagic cerebral contusion on computed tomography (CT) in a female patient who presented to our hospital for head trauma. This case has two characteristics. First, although the meningioma had a hemorrhagic contusion due to head trauma, most of the brain tissue was intact. Second, there was a possibility that the hemorrhagic contusion of the incidental meningioma on CT was misdiagnosed as a cerebral hemorrhagic contusion. In this case, we propose a possible mechanism to explain this rare phenomenon.

Key Words: Head injury; hemorrhagic contusion; incidental meningioma.

Bu yazıda, kafa travması nedeniyle hastanemize başvuran bir kadın hastanın bilgisayarlı tomografisinde (BT) hemorajik serebral kontüzyon benzeri radyolojik bulgular gösteren, insidental menenjiyoma eşlik eden nadir bir izole hemorajik kontüzyon olgusu sunuldu. Olgunun iki özelliği vardı. Birincisi, menenjiyom kafa travmasına bağlı hemorajik kontüzyona neden olmakla birlikte beyin dokusunun bütünlüğü bozulmamıştı. İkincisi, BT'de rastlantı sonucu fark edilen menenjiyomaya ilişkin hemorajik kontüzyonun serebral bir hemorajik kontüzyon olarak yanlış tanı konulmuş olması söz konusuydu. Bu olguda, bu nadir fenomeni açıklamaya yönelik olası bir mekanizma önerdik.

Anahtar Sözcükler: Kafa yaralanması; hemorajik kontüzyon; rastlantısal menenjiyom.

Head injuries can occur as a result of specific types of mechanical forces. Observation of the characteristics of the mechanical force, such as its amplitude, velocity, contact duration, direction, and application rate, can help to determine the type, range, and severity of the head injury.[1]

Here, we present a unique case of isolated hemorrhagic contusion of an incidental meningioma showing radiological findings similar to those of a hemorrhagic cerebral contusion on computed tomography (CT) in a female patient who presented to our hospital for head trauma. We also propose a possible mechanism to explain this rare phenomenon.

CASE REPORT

A 75-year-old woman was admitted to our emergency room after having suffered blunt trauma associated with a pedestrian traffic accident. On presentation, the patient was in a stuporous mental state and had a Glasgow Coma Scale score of 6 (E3, V1, M2). Physical examination revealed scalp bruising and a swelling in the left frontal area suggesting scalp contusion, and a closed fracture in the left proximal tibia. Her medical and surgical histories were unremarkable. A non-enhanced CT scan of the head revealed a 4.5 x 5.3 x 5.2-cm round, relatively well-defined lesion in the left frontal lobe that appeared as multiple diffuse high-signal intensities with a broad base on the frontal convexity.

There was a midline shift to the right, a small acute subdural hematoma at the margin of the lesion, and an intraventricular hematoma in the right lateral ventricle. There was no definitive edema around the lesion or any bone changes. After contrast injection, partial minimal enhancement was observed (Fig. 1). The authors considered two possible diagnoses, i.e., an extra-axial mass or hemorrhagic contusion of the left frontal lobe. Because of the patient's serious condition (she was in a state of mental stupor) and the marked mass effect on the CT images, we performed an emergency decompressive surgery. After frontoparietal craniotomy, we confirmed the extra-axial tumor base on the dura mater. The mass was relatively hard, well circumscribed, and bloody due to severe contusion (Fig.

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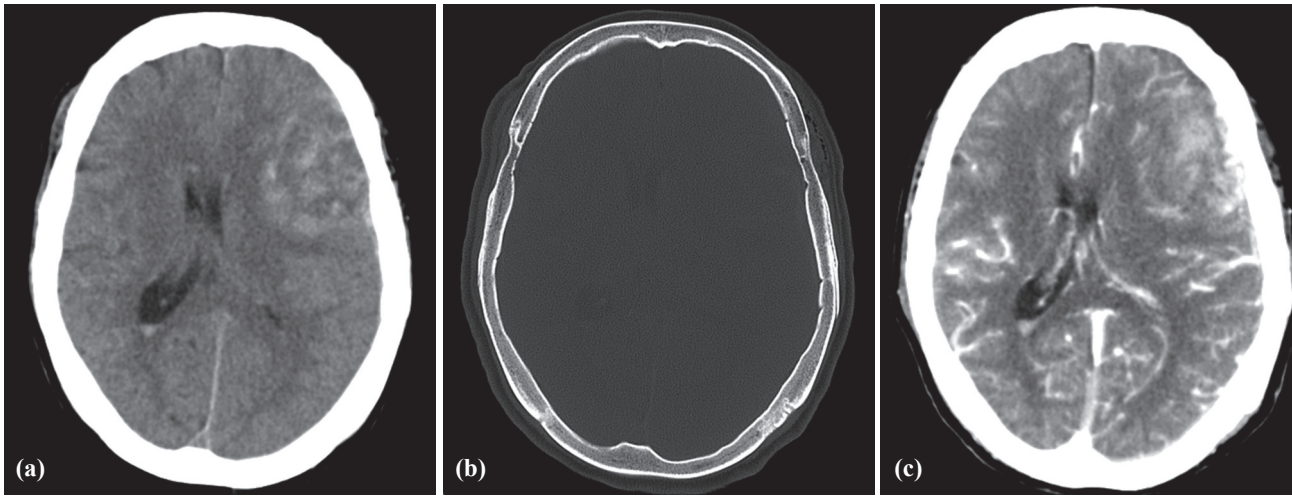

Fig. 1. **(a)** A non-enhanced CT scan of the head showing a round, relatively well-defined lesion in the left frontal lobe appearing as multiple diffuse high-signal intensities with a broad base on the frontal convexity with moderate mass effect; there is a small acute subdural hematoma at the margin of the lesion and an intraventricular hematoma in the right lateral ventricle. **(b)** A CT scan with bone window settings showing no bone changes. **(c)** An enhanced CT scan showing partial minimal enhancement.

2a). Although there were multiple small hematomas around the tumor, the brain cortex was intact (Fig. 2b). The tumor was completely removed microscopically. The histological diagnosis was meningothelial meningioma associated with multiple hemorrhages and an acute inflammatory reaction (Fig. 3). On postoperative day 2, the patient's consciousness had not improved, and she was still in a stuporous mental state. Cranial magnetic resonance images (MRI) with susceptibility-weighted imaging (SWI) on postoperative day 2 revealed multiple small hemorrhagic shearing injuries in the midbrain, corpus callosum, and right subcortical white matter, a typical finding of diffuse axonal injury (Fig. 4). The patient's level of consciousness showed no improvement, and she was referred to another hospital at one month after surgery.

DISCUSSION

The type, direction, intensity, and duration of mechanical forces collectively contribute to the characteristics and severity of the head injury caused by them.[1] The mechanisms of traumatic head injury can be classified as dynamic loading and static loading.[1,2] The precise duration of the loading force is a critical factor that determines the type of head injury produced. Static loading refers to a force that is applied to the head slowly, typically over periods >200 ms, whereas dynamic loading, the more common type, is characterized by a force that is applied to the head rapidly, typically over durations <50 ms.[1,3] Dynamic loading can be of two types, i.e., impulsive or impact. Impulsive loading occurs when the head is set into motion or when the moving head is arrested without

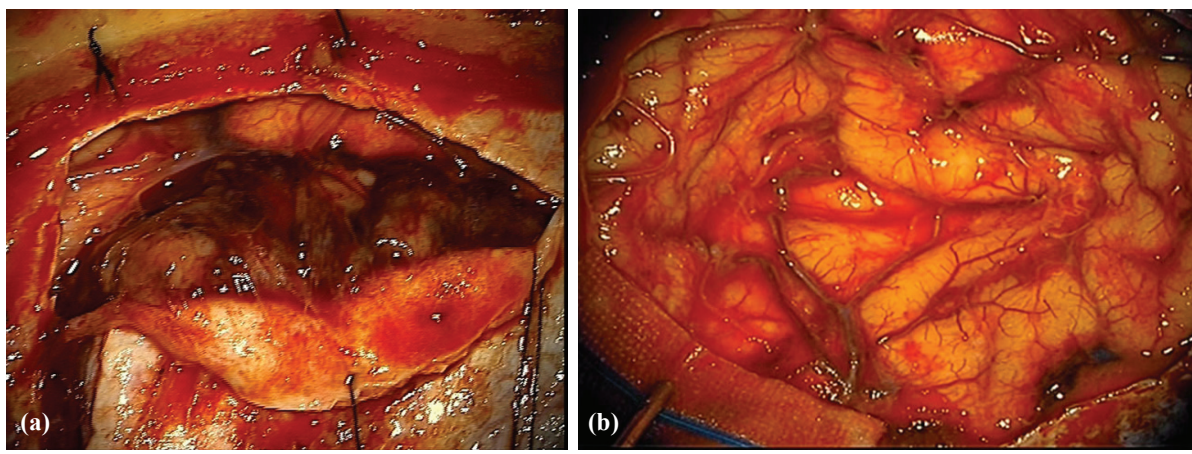

Fig. 2. **(a)** Intraoperative photograph showing the extra-axial tumor base on the dura mater. The mass is relatively well circumscribed and bloody due to severe contusion. **(b)** After complete removal of the tumor, intact brain cortex can be seen.

(Color figures can be viewed in the online issue, which is available at www.tjtes.org).

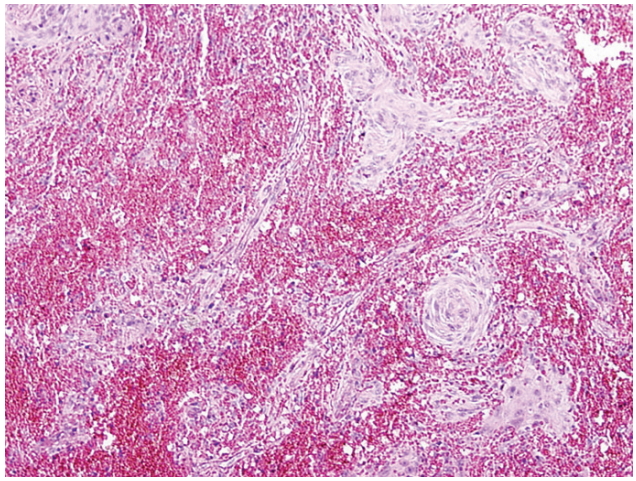

Fig. 3. Histological examination of the surgical specimen showing a meningothelial meningioma associated with multiple hemorrhages and an acute inflammatory reaction (H&E, x100).
(Color figure can be viewed in the online issue, which is available at www.tjtes.org).

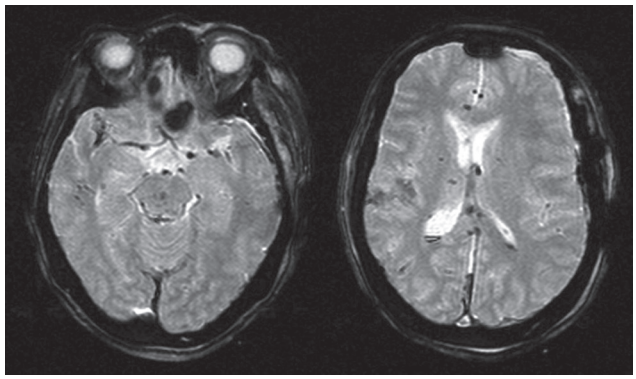

Fig. 4. Cranial magnetic resonance images (MRI) with susceptibility-weighted imaging (SWI) on postoperative day 2 showing multiple small hemorrhagic shearing injuries in the midbrain, corpus callosum, and right subcortical white matter, a typical finding of diffuse axonal injury.

its being struck or impacted. Therefore, there is no impact to the cranium, and thus no contact phenomena occur. The resulting head injuries are caused solely by the inertial load that is produced by the way in which the head moves. Impact loading is the more frequent type of dynamic loading and generally results in a combination of contact phenomena and inertial load that eventually contribute to damaging the skull and brain by distorting or straining the bony or soft tissues beyond functional or structural tolerance.[2] In general, strain can be considered as the extent of deformation that a tissue undergoes as a result of an applied mechanical force. Strain, considered the primary cause of tissue damage, can be compressive, tensile, or shear in nature. The three principal tissues involved in head injury (bone, vascular structures, and brain tissue) vary considerably in their tolerances to compression, tension, and shear.[1,2]

This case has two characteristics. First, although the meningioma had a hemorrhagic contusion due to head trauma, most of the brain tissue was intact. The dynamic load (duration, <50 ms) caused by the pedestrian traffic accident damaged the patient's head. The left frontal scalp contusion indicated the point of impact, and an incidental meningioma that lay just below the scalp contusion appeared to have suffered a combination injury of contact phenomena and inertial load due to coup injury. Since meningiomas are relatively hard, their density differentiates them from the soft brain tissue; in our case, the meningioma appeared to strongly protect the brain tissue from the impact load, which finally caused strain to the meningioma itself. After the meningioma had absorbed most of the impact load, only impulsive loading occurred in the brain tissue, and this appears to have caused diffuse axonal injury. Second, there was a possibility that the hemorrhagic contusion of the incidental meningioma on CT was misdiagnosed as a cerebral hemorrhagic contusion. Generally, 25% of meningiomas are observed as isodense lesions on non-contrast CT, and the enhancement sometimes is only modest.[4] In this case, ascertaining the origin of the enhancement on CT as the isolated hemorrhagic contusion of the incidental meningioma was difficult. Since there is no peritumoral edema or bone changes around the meningioma, such cases may be misdiagnosed as cases of hemorrhagic cerebral contusion.

Although the exact pathogenic mechanism of isolated hemorrhagic contusion of an incidental meningioma remains unclear, this report is worthwhile, considering the possibility of misdiagnosis of this condition as a hemorrhagic cerebral contusion on CT. Such misdiagnosis can lead to inadequacies in the investigations and preparation required before tumor surgery. Surgeons should always pay close attention to the radiographic findings and the patient's clinical symptoms, despite the critical state of the patient in such emergencies.

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