Intracranial dermoid tumors are rare and represent about 0.04-0.6% of primary intracranial tumors. An intracranial dermoid tumor in a 45-year-old woman is reported. The patient presented with headache, vomiting, drowsiness and the right hemiparesis for one day prior to admission. Plain skull radiographs and cranial computed tomography revealed characteristic appearances of dermoid tumors. The clinical presentation, pathology, radiologic manifestations and differential diagnosis are discussed as well as reviewing the relevant literatures. Chiang Mai Med Bull 2003;42(4):161-167.

Key words: dermoid tumor, brain tumor
resis one day before admission. She had been previously diagnosed as epileptic with a transient right side weakness. Her epilepsy had since been controlled by another hospital and she made a complete recovery from the right side weakness 8 years ago. Physical examination revealed a normal body temperature and high blood pressure (BP 170/110). The heart, lungs and abdomen were normal. Neurological examination showed confusion, a mild degree of the right hemiparesis (grade IV), negative Babinski sign and clonus, and intact sensation. Routine laboratory investigations such as CBC, BUN, creatinine and electrolytes were normal limits. The initial diagnosis was cerebral thrombosis.

Plain skull radiographs showed a 7 cm round shaped radiolucent lesion with rim calcifications at the mid frontal region (Fig. 1A, B). A plain cranial computed tomography (CT) scan demonstrated a large, well-defined lobulated inhomogeneous fat density of 9 cm mass with rim calcifications at the mid frontobasal area. Multiple small fat droplets were observed bilaterally along the cerebral cortical sulci (Fig. 2 A, B). After contrast administration, there was no abnormal enhancement (Fig. 3).

In the operation, the tumor contained a white oily content in the ruptured white capsule located at the mid frontal lobes, which spread into the subarachnoid spaces. The patient had a convulsion, fell into coma and finally died on the 4th day after surgical intervention. The final diagnosis was a ruptured intracranial dermoid cyst.

**Figure 1.** Skull films (A: AP and B: lateral) show a round shaped radiolucent lesion with rim calcifications (arrow) at the mid frontal region.
Intracranial dermoid tumor

Discussion

Intracranial dermoids are rare congenital benign tumors. Their slow growth rate often leads to a delay in clinical presentation until the third or fourth decades. There is a slight male predilection. The tumor typically occurs in or near the midline, at the parasellar, frontobasal and posterior fossa areas. Although the tumors are located at the midline of occipital or nasofrontal regions, some of them have a sinus tract connecting to skin surfaces (dermal sinus). The associated midline anomalies, such as collosal hypogenesis are common. In this report, the patient had a characteristic in age of clinical onset, clinical presentation of seizure and headache, and midline located tumor.
A tumor rupture can be spontaneous, either during or following surgery, or after head trauma. Its contents can disseminate widely throughout the subarachnoid spaces and ventricles with CSF seeding and implantation.\(^{(4,8)}\) The results are chemical meningitis, seizure, hydrocephalus, vasospasm with transient ischemic attack and infarctions, and death.\(^{(1,2,4,9,10)}\)

The gross pathology shows that the tumor is a well-defined lobulated cystic mass, containing a thick viscous oily fluid, with lipid metabolites and lipid cholesterol, which derives from decomposed epithelial cells. If it is ruptured, its fatty content spreads into the ventricle and subarachnoid spaces, inciting an intense meningeal inflammatory response. Regarding the microscopic appearance, the outer cyst is composed of a dense fibrous capsule, while the interior is lined with squamous epithelium, hair and dermal appendages (hair follicles, sebaceous and sweat glands). Desquamated debris-containing cholesterol and keratin are common. Liquid secretion and breakdown products of these dermal appendages result in an oily mixture that contains lipid metabolites. Calcifications are common in representing dystrophic changes or dental enamel, which is another ectodermal derivative.

Plain skull film reveals a well defined lucent lesion with peripheral ringlike or eggshell calcifications. A bony defect may appear from an associated or intra-diploic component of dermoids.\(^{(4,11)}\)

Cerebral angiography is typically normal or demonstrates an avascular mass effect.\(^{(1,4)}\) Acutely ruptured dermoids can cause chemical meningitis, while they may induce vasospasm and cerebral ischemia. An association with intracranial aneurysm has been reported.\(^{(1,12)}\)

The plain cranial CT image shows a round shaped, well defined inhomogeneous attenuation mass, due to areas of fat (-20 to -120 HU) and soft tissue (hair ball) inside.\(^{(1,2,4)}\) Capsular calcifications are common. Rupture of the dermoid may show low density fatty droplets in the subarachnoid spaces and intraventricular fat-CSF levels. These are almost pathognomonic.\(^{(3,13)}\) A contrast enhanced CT (CECT) image shows no abnormal enhancement. However, hyperdense dermoid and enhancement following the contrast administration are uncommon.\(^{(1,14)}\) In this case, plain skull radiographs and cranial CT revealed characteristics and pathognomonic appearances of dermoid tumors.

The dermoid shows high signal intensity on a T1 weighted image, and variable signals on a T2 weighted image that ranges from hypointense to inhomogeneously hyperintense, and no gadolinium contrast enhancement on Magnetic Resonance Images (MRI).\(^{(1,4)}\) Characteristically, the tumor is often inhomogeneous, due to its mixed composition.\(^{(15)}\) Ruptured dermoids typically have high signal fat droplets within the subarachnoid spaces and intraventricular fat/CSF levels.\(^{(1,2,4)}\)
The advent of CT and MR images have significantly increased the preoperative detection of tumors and their complications. Between the MRI and CT image, the MRI is superior in detecting a lesion, because of its advantage of contrast resolution, ease of multiplanar views and lack of bone artifacts. The value of the MRI over CT image in the examination of ruptured dermoids is the conspicuousness of the subarachnoid spread, involvement of the extraaxial structures and evidence of vascular compromise, which can obviate angiography.

Surgical removal of the tumor should be carefully performed to avoid spilling the internal contents. Although tumors are not truly invasive, they are often adherent to the adjacent brain and causing difficulty in completing resection. The prognosis of patients diagnosed with ruptured intracranial dermoid depends on the spread of contents and the period after rupture. As in this case, the tumor was very large and showed evidence of a rupture producing a poor outcome. The motility and morbidity from a complication, such as chemical arachnoiditis, can be significantly reduced in these patients if the imaging is carried out early.

The differential diagnosis of intracranial tumor with fat density includes dermoid, epidermoid, teratoma, lipoma, craniopharyngioma, pituitary adenoma and lipomatous/lipoblastic meningioma. They can be excluded by their CT features. Epidermoid commonly occurs off-midline with an irregular margin and CSF density, but is not commonly calcified and rarely ruptured. Teratoma is usually found in the newborn or childhood periods and shows a heterogeneous attenuation mass with calcification and enhancement. Lipoma is a sharply margined, homogeneous fat density tumor in the midline or paramedian, and it is associated with the partial genesis of corpus callosum. The remaining tumors have enhancement of capsule and a soft tissue component on CECT scans.

Conclusion

Intracranial dermoid tumor is rare in adults. Seizure and headache are the most common symptoms of the uncomplicated dermoid. In the case of new episodes or recurrent seizure, an imaging evaluation for the underlying pathology is required. Radiographic features of a fat containing mass and calcification, with a mass effect or bone destruction, are helpful for the diagnosis of dermoid tumor. The CT scan and MRI play an important role in accurate diagnosis. However, the MRI is superior to the CT scan in detecting the ruptured dermoid. Radiologists should be familiar with these characteristic findings, because the mortality and morbidity are reduced with early diagnosis and proper management.

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เนื้องอกเดอร์มอยด์ในช่องกระโหลกศีรษะ: รายงานผู้ป่วยและทบทวนบทความ
สุนทรี มูลรินตะ, พ.บ.
กลุ่มงานรังสีวิทยา โรงพยาบาลนครพิงค์ อาเภอแม่ริม จังหวัดเชียงใหม่

เนื้องอกเดอร์มอยด์ในช่องกระโหลกพบประมาณร้อยละ 0.04-0.6 ของเนื้องอกชนิดปฐมภูมิที่พบในช่องกระโหลกศีรษะ รายงานนี้นำเสนอเนื้องอกเดอร์มอยด์ในผู้ป่วยหญิงอายุ 45 ปี ซึ่งมีอาการปวดศีรษะ อาเจียน ซึมอ่อนแรงแขนและขาข้างขวา 1 วันก่อนมาโรงพยาบาล ภาพถ่ายรังสีของศีรษะและเอกซเรย์คอมพิวเตอร์สมอง ให้ลักษณะเฉพาะของเนื้องอกเดอร์มอยด์พร้อมกับมีอาการปวดทางอาการ ทางไขคิด และลักษณะทางร่างสี ตลอดจนการวินิจฉัยแยกโรคจากบทความที่เกี่ยวข้อง เชิงไทยสาขาวารสาร 2546; 42(4): 161-167.

คำสำคัญ: เนื้องอกเดอร์มอยด์ เนื้องอกของสมอง