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FALX MENGIOMA: CASE REPORT AND REVIEW

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ABSTRACT

Meningiomas are tumors of the central nervous system that originate in the meninges and spinal cord. It is a benign, slow-growing neoplasm thought to originate from meningothelial cells. Meningiomas are typically oval lesions attached to the dura mater. They are most commonly located supratentorial to the calvaria or at the base of the meninges. Meningiomas can also be found in the tentorium, intraventricularly, or in the cerebellopontine region. Meningiomas arise from meningothelial cap cells that are normally distributed throughout the arachnoid trabeculation. The highest concentration of meningothelial cells is found in the arachnoid villi of the dural sinuses, cranial nerve foramina, middle cranial fossa, and cribriform plate. Additionally, meningiomas are commonly found over the convexity, along the falx, and at the base of the skull.

Keywords: Meningioma, tumor

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INTRODUCTION

Falx meningioma is a type of meningioma originating from the falx cerebri, a structure in the brain that separates the two cerebral hemispheres. This tumor is typically completely covered by overlying brain tissue, making it not directly visible and often described as not involving the superior sagittal sinus (SSS). However, involvement of the SSS may occur (Casali C et al, 2020). Falx meningioma can be classified based on its relationship with the SSS into anterior, middle, and posterior lesions (Quinones A, 2017).

Meningiomas are associated with chromosomal deletions and gene mutations. Meningiomas can occur in patients who have been exposed to radiation, with a high risk of exposure to high doses of radiation therapy, while other risk factors include hormones, head injury, breast cancer, dietary factors, allergies, and a family history of meningiomas. Genetic changes commonly found in meningiomas include the loss of chromosome 22 associated with mutations in the neurofibromatosis type 2 (NF2) gene located on chromosome 22 (Kemkes, 2019). Additionally, estrogen hormones can increase the risk of cancer due to their carcinogenic properties. Meningiomas are more common in women due to their association with hormone receptors in meningiomas. In a previous study, 30% of meningiomas showed estrogen receptors and 70% showed progesterone receptors (Kurnia TA et al, 2023).

Meningiomas account for 37.6% of all primary CNS tumors and 53.3% of all benign CNS tumors. The prevalence of primary brain tumors worldwide is 10.82 per 100,000 people per year (Kurnia TA et al, 2023). The incidence of meningioma increases with age, with an average age of 66 years. The incidence rate in patients over 40 years of age is 18.69 per 100,000, and for those aged 0–19 years, it is 0.16 per 100,000. In patients aged 40 years and older, meningioma accounts for 43.6% of all CNS tumors. For ages 15–39, meningiomas account for 15.6% of all CNS tumors, and for ages 0–14, meningiomas account for 1.7% of all CNS tumors (Ogasawara C et al, 2021). The incidence of falx meningioma is five to seven times less common than parasagittal meningioma and accounts for approximately

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20% of intracranial meningioma cases (Chung SB et al, 2007). This case report describes a falx meningioma in a 40-year-old male patient with impaired consciousness.

CASE

The patient presented to the emergency department of NTB Provincial General Hospital, referred from Dompu General Hospital, with complaints of decreased consciousness for 4 days prior to admission (August 19, 2024). The patient was found to have suddenly lost consciousness while sitting in front of his house. The patient had been complaining of headaches for the past two months. The headaches were felt throughout the head, characterized by a throbbing sensation and were intermittent. The patient had taken pain medication but the symptoms did not improve. Additionally, the patient had vomited five times before being brought to Dompu General Hospital, with the vomit being watery, containing food particles, and without blood.

According to the patient's wife, over the past two months, the patient had exhibited behavioral changes such as difficulty concentrating and appearing confused. The patient also experienced short-term memory loss, often forgetting recent events. Additionally, the patient complained of weakness in the left side of the body. These symptoms began approximately

7 months ago, but the patient was still able to move his limbs. The patient's wife stated that the patient had previously visited the neurology clinic in Dompu, but the symptoms did not improve despite the treatment provided.

At the time of examination, which was H+3 post-surgery, the patient was able to open his eyes and understand when spoken to. During the general status examination and physical examination, the patient's head was still wrapped in white gauze bandages, and a tracheostomy tube connected to a ventilator was in place. Neurological examination revealed a GCS of E4VxM6.

DISCUSSION

A 40-year-old male patient was referred from Dompu General Hospital to the emergency department with complaints of decreased consciousness. Decreased consciousness in patients with falx meningioma occurs due to pressure exerted by the tumor on the surrounding brain tissue. Pressure on the frontal lobe can cause changes in consciousness such as confusion, disorientation, or even decreased responsiveness. The growing tumor can also cause cerebral edema, which increases intracranial pressure (ICP) and, if

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uncontrolled, can lead to decreased consciousness (Wisnu L, 2021).

Other symptoms experienced by the patient include chronic

that has been present for the past two months. The headaches experienced by the patient are also caused by increased ICP, which compresses the brain tissue and surrounding blood vessels, triggering pain. Tumor growth near the falx cerebri can also irritate the dura mater, which is rich in pain receptors. This irritation can cause cephalgia in the patient (Wisnu L, 2021).

The patient also exhibits behavioral changes such as difficulty concentrating and appearing confused. The patient experiences short-term memory impairment, often forgetting recent events. Behavioral changes are often closely associated with the tumor's location on the falx cerebri, particularly if the meningioma is located in the anterior portion of the falx near the frontal lobe of the brain. Tumors growing in the anterior falx tend to compress the frontal lobe, which is the part of the brain responsible for executive function, emotional control, and personality. Meanwhile, the structure involved in short-term memory storage is the prefrontal cortex (Wisnu L, 2021).

Additionally, the patient also complained of weakness in the left side of the body

left side of the body, which began seven months ago. Weakness in the limbs in patients with falx meningioma is related to the location of the tumor, which compresses or invades the motor areas of the brain. Falx meningioma located in the middle of the falx cerebri usually involves areas near the motor cortex.

The primary motor cortex, which controls body movements, is located along the precentral gyrus in the frontal lobe. In addition to compressing the motor cortex, falx meningioma can also compress the motor fiber pathways that run from the cortex to the spinal cord, known as the corticospinal tract. If these pathways are disrupted, motor signals from the brain to the muscles of the limbs are impaired, leading to weakness or even paralysis of the limbs, particularly on the opposite side (contralateral) of the tumor. Since the motor pathways cross (decusatio) in the medulla oblongata, weakness in the limbs will occur on the opposite side (contralateral) to the tumor location (Wiyono et al., 2023). As in the patient in this case report, the falx meningioma was located on the right side, and the limb weakness experienced by the patient occurred on the left side of the body.

On CT scan, a solid isodense mass was identified in the right frontal lobe, adherent to the anterior falx cerebri, with the largest

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dimensions measuring 7.38 x 5.31 x 7.12 cm. On CT scans, meningiomas typically appear isodense, but may also appear hyperdense or slightly hypodense compared to brain tissue. Meningiomas are typically described as a lobulated mass with well-defined borders and a broad base attachment to the dura mater, showing homogeneous enhancement after contrast administration. CT scans are more sensitive than MRI in detecting hyperostosis, intratumoral calcification, and interosseous tumor growth (Ogasawara C et al, 2021).

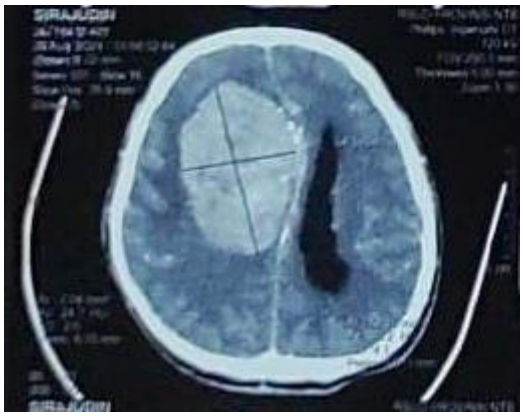

Figure 1. Axial CT scan of the head of the patient

From the CT scan results of this patient, a midline shift to the left by 1.88 cm can also be observed. The growth of the meningioma causes a mass effect, which is compression or displacement of the surrounding brain tissue. This mass effect increases as the tumor grows, eventually causing midline shift. The enlarging tumor can also irritate or disrupt blood vessels in the surrounding brain tissue, leading to vasogenic edema—brain swelling caused by fluid leakage from blood vessels. Other signs of cerebral edema visible on CT scans include narrowing of the sulcus sylvii and flattening of the gyrus in the right hemisphere. Additionally, there is minimal blurring of the white and gray matter around the lesion, as well as narrowing of the right ventricle due to pressure from the tumor mass (Ho ML, 2012).

Based on the medical history, physical examination, and supporting tests, the patient was diagnosed with a falx meningioma. The treatment option chosen for the patient was surgical therapy. This decision was made due to the tumor's diameter being ≥ 3 cm, accompanied by neurological symptoms such as headache, decreased consciousness, and behavioral changes. The surgical procedure performed on the patient was a craniotomy tumor excision, which involves removing the tumor along with surrounding healthy tissue to ensure that all tumor cells are removed. The ultimate goal of the surgical procedure is total tumor excision. Like other brain tumors, complete resection is determined through observation 72 hours post-surgery using CT scan or MRI (Ogasawara C et al, 2021).

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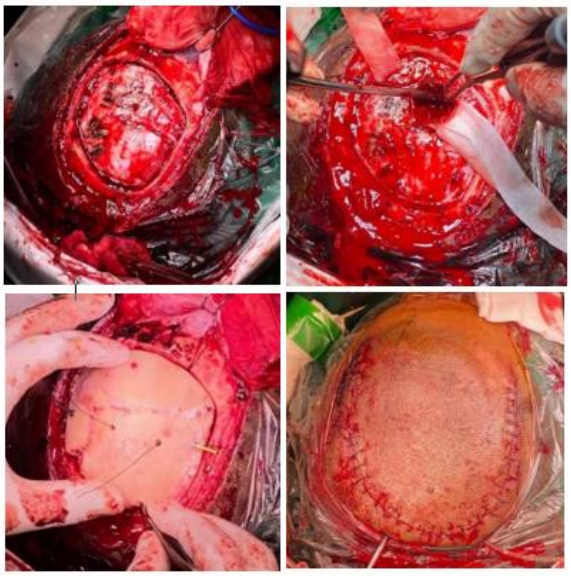

Figure 2. Craniotomy Tumor Resection Procedure

Following the surgical procedure, histopathological examination of the tumor tissue revealed spindle-shaped meningothelial cells with scant cellular whorls and focal meningothelial nests with round-oval morphology, some with prominent nucleoli. Based on the histopathological findings, the diagnosis was fibrous meningioma. According to the WHO classification (2016), the fibrous meningioma subtype is classified as WHO grade 1. The prevalence of meningiomas with the fibrous subtype is approximately 12% (Chung S-B et al, 2007).

Table 1. Prevalence of histopathological subtypes in falx meningioma (Chung S-B et al, 2007).

Histologic subtype	Number of case (%)
Transitional	26 (39%)
Meningothelial	20 (30%)
Fibrous	8 (12%)
Anaplastic	4 (6%)
Others	9 (12%)

The prognosis for meningioma is generally good, as complete tumor resection provides permanent cure (Rachman ME, Kaelan C, 2019). The prognosis for meningioma depends on the histopathological type and degree of tumor resection. The 5-year survival rate for patients with meningioma is 91.3%. The extent of tumor resection is the primary factor determining meningioma recurrence. Recurrence after gross total resection occurs in 11–15% of cases, and 29% of cases with incomplete resection. The average recurrence rate within 5 years after partial resection is 37%–85%. The overall recurrence rate over 20 years is 19%, and in other reports, it is 50%. Malignant meningiomas have a higher recurrence rate compared to others (Department of Neurosurgery, 2016)

CONCLUSION

Meningiomas are mostly benign tumors originating from meningothelial cells (MECs), accounting for 37.6% of all primary central nervous system (CNS) tumors. Meningiomas are more common in women, and incidence increases with age. Initial

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diagnosis is based on MRI or CT scans of the head with contrast. For small, asymptomatic tumors, a "wait-and-see" approach is considered, while total surgical excision is the best option for meningiomas causing symptoms. An integrated diagnostic protocol can improve accuracy in predicting recurrence and outcomes, as well as help tailor specific treatment plans for each patient.

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