Journal of the Neurological Sciences 381 (2017) 245–249

Contents lists available at ScienceDirect

Journal of the Neurological Sciences

journal homepage: www.elsevier.com/locate/jns

Management of hypertrophied dural lesions: Is surgery a better option?

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ARTICLE INFO

Keywords:
Dural lesions with hypertrophy
Biopsy
Histopathology
Surgical strategy

ABSTRACT

It is often difficult to definitively diagnose dural lesions with hypertrophy as they exhibit nonspecific imaging findings and clinical symptoms. Most cases require histopathological evaluation with surgical intervention (such as biopsy). However, complications related to surgical interventions remain as matter of concern. Herein, we analyzed and verified the significance of surgery in 39 patients with hypertrophic dural lesions who were histopathologically diagnosed with surgical interventions. Specimens of dural lesions were obtained successfully, and it was possible to make a definitive diagnosis for each case based on histopathological findings. All patients tolerate the procedures well, and there were no evidences of surgery-related complications during surgical approach to the dura mater. Preoperative and pathological diagnoses varied in eight cases. Our results indicate that histopathological evaluation is important for distinguishing diseases showing dural hypertrophy even if surgical invasiveness is concerned. Neurosurgeons should not hesitate to perform surgery for management of dural lesions with hypertrophy in order to achieve accurate diagnosis.

1. Introduction

Dural hypertrophy with well gadolinium enhancement is observed in various diseases, including idiopathic hypertrophic pachymeningitis, cerebrospinal fluid hypovolemia, autoimmune diseases, dural infiltration caused by malignant tumors, and brain tumors such as meningiomas [1,2]. However, because of the nonspecific imaging findings and clinical symptoms associated with these conditions, it is difficult to make a correct diagnosis on the basis of clinical symptoms and imaging findings in many cases. In such lesions, surgical intervention including biopsy is necessary to obtain specimens for histopathological evaluation. However, any surgical interventions might have risks of complications that make neurosurgeons or patients hesitate to accept surgery [2–4]. In this study, we retrospectively analyzed our results and investigated the significance of surgery for hypertrophied dural lesions.

2. Material and methods

We retrospectively analyzed our consecutive 39 patients (16 men and 23 women) who underwent surgery for dural lesions with hypertrophy between April 2011 and March 2017 at Shinshu University Hospital. Cases with spinal dural lesions or who had not definitive histopathological findings were excluded from this study. The patients ranged in age from 18 to 80 (mean, 59.1) years. The specimen site was the calvarial dura mater in 16 cases and the dura mater of skull base in 23 cases. Preoperative diagnoses were brain tumor in 29 cases, inflammatory disease in five, dural invasion or metastasis of malignant carcinoma in three, and other in two (Table 1). We evaluated surgical outcome including procedure selection, differences between preoperative and histopathological diagnoses, and surgical complications.

3. Results

In all cases, specimens of hypertrophied dural lesions were successfully obtained, and the definitive diagnoses (on the basis of histopathological findings) were achieved. Surgical procedures were craniotomy in 30 (76.9%) cases, burr-hole surgery in four (10.3%), transsphenoidal surgery in four (10.3%), and transnasal-transcranial combined approach in one (2.5%). Craniotomy was performed frequently in patients who underwent resections of their lesions. Less-invasive burr-hole surgery tended to be selected for cases who underwent only biopsy of the dura mater. In cases with skull base lesions, endonasal transsphenoidal approach was conducted for all patients. In terms of surgical complications, a single case with left hemiparesis attributed to cerebral infarction caused by arterial injury during sphenoid ridge meningioma resection was observed (case 20). Transient cerebrospinal fluid leakage (case 14), facial sensory disturbance (case 4), left hemiparesis (case 25) and visual impairment (case 36) were

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http://dx.doi.org/10.1016/j.jns.2017.08.3268
Received 1 June 2017; Received in revised form 4 August 2017; Accepted 31 August 2017
Available online 01 September 2017
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Table 1
Clinical characteristics of cases with mismatched pre- and postoperative diagnoses (case 1–8) and with matched pre- and postoperative diagnoses (case 9–39).

Case	Age[a]/sex	Preoperative diagnosis	location	Approach	Procedure	Histopathological diagnosis	Complication
1	38/F	Wegener granulomatosis	Skull base	TSS	Biopsy	Meningioma	No
2	74/F	Metastatic brain tumor	Calvarial	Burr-hole	Biopsy	Post-craniotomy	No
3	78/F	Unclear	Skull base	Craniotomy	Removal	Meningioma	No
4	18/F	Meningioma	Skull base	Craniotomy	Removal	Neurinoma	Transient facial numbness
5	51/F	Hypothalamic glioma	Skull base	TSS	Biopsy	Lymphocytic hypophysitis	No
6	38/M	Meningitis	Calvarial	Burr-hole	Biopsy	Hcp	No
7	56/M	Meningioma	Calvarial	Craniotomy	Removal	Squamous cell carcinoma	No
8	60/M	HCP, CSF hypovolemia	Calvarial	Burr-hole	Biopsy	Meningitis	No
9	63/M	Meningioma	Skull base	Craniotomy	Removal	Meningioma	No
10	72/M	dAVF	calvarial	Craniotomy	Biopsy	dAVF	No
11	48/F	Meningioma	Calvarial	Craniotomy	Removal	Meningioma	No
12	75/F	Meningioma	Skull base	Craniotomy	Removal	Meningioma	No
13	38/F	Meningioma	Skull base	Craniotomy	Removal	Meningioma	No
14	41/M	Meningioma	Calvarial	Craniotomy	Removal	Meningioma	Transient CSF leakage
15	69/M	HCP	Calvarial	Burr-hole	Biopsy	HCP	No
16	66/F	Meningioma	Skull base	Craniotomy	Removal	Meningioma	No
17	72/F	Meningioma	Calvarial	Craniotomy	Removal	Meningioma	No
18	48/F	Meningioma	Skull base	Craniotomy	Removal	Meningioma	No
19	71/M	Meningioma	Calvarial	Craniotomy	Removal	Meningioma	No
20	59/F	Meningioma	Skull base	Craniotomy	Removal	Meningioma	Hemiparesis
21	65/M	Meningioma	Skull base	Craniotomy	Removal	Meningioma	No
22	49/F	Meningioma	Skull base	Craniotomy	Removal	Meningioma	No
23	68/M	Meningioma	Skull base	Craniotomy	Removal	Meningioma	No
24	39/M	Meningioma	Skull base	Craniotomy	Removal	Meningioma	No
25	68/F	Meningioma	Skull base	Craniotomy	Removal	Meningioma	Transient hemiparesis
26	56/F	Meningioma	Skull base	Craniotomy	Removal	Meningioma	No
27	68/M	Glioblastoma	Calvarial	Craniotomy	Biopsy	Glioblastoma	No
28	67/F	Meningioma	Skull base	Craniotomy	Removal	Meningioma	No
29	44/F	PA	Skull base	Tss	Removal	PA	No
30	68/F	PA	Skull base	Tss	Removal	PA	No
31	75/F	Meningioma	Skull base	Craniotomy	Removal	Meningioma	No
32	53/F	Metastatic brain tumor	Skull base	Craniotomy	Removal	Metastatic brain tumor	No
33	62/M	Infection	Calvarial	Craniotomy	Biopsy	Infection	No
34	66/F	Meningioma	Calvarial	Craniotomy	Removal	Meningioma	No
35	55/M	dAVF	Calvarial	Craniotomy	Removal	Davf	No
36	69/M	Olfactory neuroblastoma	Skull base	TSS, craniotiomy	Removal	Olfactory neuroblastoma	Transient visual impairment
37	45/F	Meningioma	Calvarial	Craniotomy	Removal	Meningioma	No
38	71/M	Meningioma	Skull base	Craniotomy	Removal	Meningioma	No
39	80/F	Meningioma	Calvarial	Craniotomy	Removal	Meningioma	No

Abbreviations: F: female, M: male, TSS: transsphenoidal surgery, HCP: hypertrophic cranial pachymeningitis, CSF: cerebrospinal fluid, dAVF: dural arteriovenous fistula, PA: pituitary adenoma, CSF: cerebrospinal fluid.
[a] Age in years.

observed in one case each. Cause of these transient symptom was insufficient dural closure, trigeminal nerve injury, postoperative brain swelling and optic nerve injury, respectively. All these complications were attributed to intracranial lesionectomy. No complications were observed as a result of the surgical approach or biopsy for dural lesions. The final diagnosis was changed/modified from preoperative diagnosis according to histopathological findings in eight cases (20.5%) (Table 1).

4. Illustrative cases

4.1. Case 2

A 74-year-old woman, who has a past history of clipping surgery for a ruptured cerebral aneurysm, and ovarian carcinoma, suffered from worsening of her left hemiparesis for one-week duration. Magnetic resonance imaging (MRI) revealed two masses at the right frontal lobe and basal ganglia that appeared hyperintense on T1-weighted images associated with perifocal edema, and bilateral extensive hypertrophied calvarial dural lesion extending to the skull base (Fig. 1A–D). Preoperatively, the possibility of intratumoral hemorrhage from a metastatic brain lesion or dural metastasis were considered based on the correlation between her past history (with ovarian cancer) and the neuroimaging findings. For histopathological evaluation, biopsy of the hypertrophied dural lesion and removal of the intracerebral frontal lesion were performed via less-invasive burr-hole approach. A burr-hole was made at the right frontal bone under general anesthesia. With the dura mater opened, the lesion was resected for biopsy (Fig. 1E). Then, an endoscopic translucent sheath was inserted as usual to access the intracerebral lesion from the burr-hole, and the lesion was removed with neuroendoscope [9]. The procedure was completed without any complications. Histopathological examination disclosed that the dura mater was found to be normal, containing no inflammatory or epithelial cells. In terms of the intracerebral lesion, only hemosiderin sedimentation and organized hematoma were observed. No epithelial components, including atypical cells suggesting metastatic brain tumor of ovarian cancer, were observed. Postoperatively, the intracranial lesion was diagnosed as idiopathic intracranial bleeding and the dural lesion with hypertrophy was diagnosed as post-craniotomy changes based on histopathological findings (Fig. 1F).

4.2. Case 5

A 51-year-old woman, who has a past history of systemic lupus erythematosus, suffered from progressive visual impairment over one-month duration. MRI revealed a sellar/suprasellar gadolinium enhanced lesion involving the pituitary gland with optic chiasma compression (Fig. 2A, B). No abnormalities were noted on laboratory evaluation including hormonal examination. As clinical symptoms and neuroimaging findings were suggestive of hypothalamic glioma, transsphenoidal surgery was selected. Under general anesthesia, the

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