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Existence of Cotton Granuloma After Removal of a Parasagittal Meningioma: Clinical and Radiological Evaluation -A Case Report-

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Hemostatic agents, routinely used in neurosurgery to achieve intraoperative hemostasis may cause foreign body reaction. These may produce clinically symptomatic and radiologically apparent mass lesions. It should be kept in mind that retained cotton or rayon materials may mimic the appearance of a tumor or an abscess on MRI scan, especially at sides of previous craniotomies. Here we report a case of intracranial foreign body granuloma which occurred due to remained cottonoid after removal of a parasagittal meningioma. This entity was also documented by MR imaging technics included diffusion weighted, flair and ADC mapping.

Cotton and other hemostatic agents are widely used in neurosurgery to aid hemostasis. These agents may cause a foreign body reaction which appears on magnetic resonance images to be indistinguishable from recurrent tumors. This has been reported after cranial and also spinal operations (1). After treatment of a neoplasm, if unexpected clinical or imaging evidence of recurrence is present, it may be a foreign body reaction to hemostatic material used during the initial surgery.

Here we report such a case operated previously due to a meningioma and admitted later with postoperative seizure.

CASE REPORT

A 30-year-old male had undergone resection of a right parasagittal frontoparietal meningioma at another institution (Fig. 1a). One month later, he was referred to our hospital with complaint of generalized tonic-clonic seizure. MRI revealed anterior frontal mass lesion with well defined capsule which was very hypointense on all sequences (Fig. 1b and 1c). Postoperative axial FLAIR image revealed slightly hyperintense mass lesion with hypointense capsule (Fig. 1d). DWI showed hyperintense content of the mass (Fig. 1e) however ADC map demonstrated that fluid was of non-infected type (Fig. 1f). Hypointense capsule reflected fibrous capsule of the mass. Contrast enhanced imaging displayed peripheral intense enhancement of the lesion. MRI findings were consistent with a postoperative collection which had a viscous material inside. The patient was operated via a frontoparietal craniotomy. The mass lesion was easily dissected and removed. The postoperative histopathological examination revealed cotton fibers surrounded by a granulomatous foreign body reaction (Fig. 2 a and b). The patient did well after the operation.

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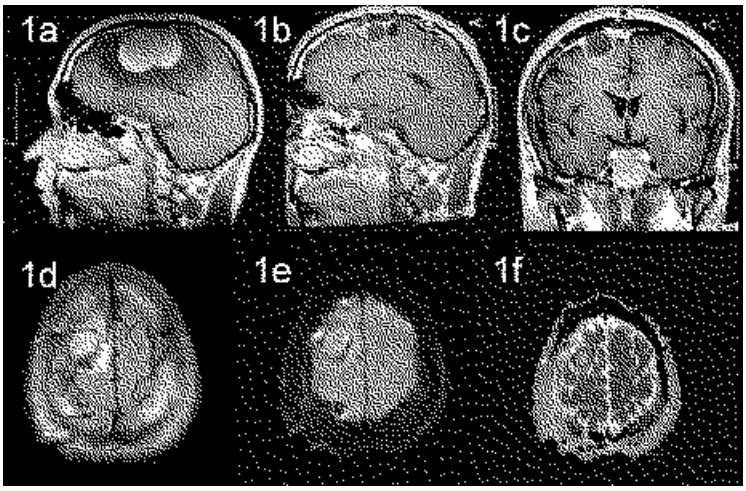

Figure 1: (a) Preoperative sagittal contrast enhanced T1 weighted images showing homogeneously enhanced right parasagittal frontal meningioma with surrounding hypointense edema. Contrast enhanced sagittal (b) and coronal (c) T1 weighted images showing peripheral intense enhancement of the lesion. (d) Postoperative axial FLAIR (TR/TE/TI; 7800/115/2500 ms) image revealed slightly hyperintense mass lesion with hypointense capsule. (e) DWI (TR/TE; 3400/94 ms, B value of 1000) demonstrated hyperintense content of the mass. (f) ADC map of DWI showing that fluid content was of non-infected type with hypointense fibrous capsule.

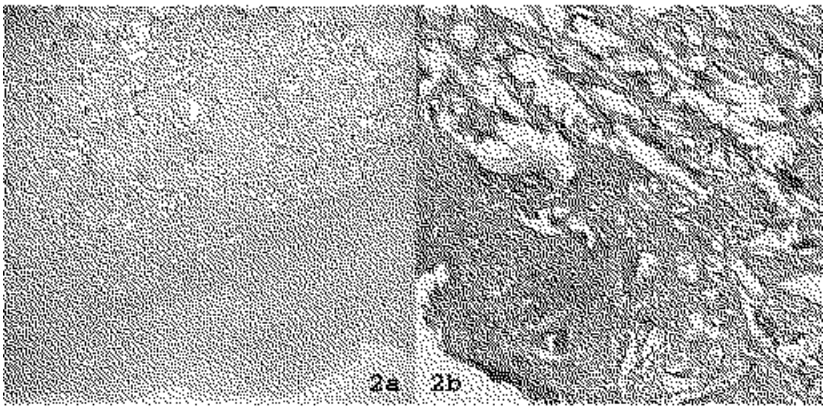

Figure 2: The granuloma showed numerous macrophages and giant multinucleated cells containing cotton fibers. The mass was encapsulated by dense fibrous connective tissue infiltrated with lymphocytes, plasma cells, neutrophilic granulocytes and macrophages. (a) low-power view. (b) high-power view.

DISCUSSION

Hemostatic materials are routinely used during neurosurgical operations. Gelatin sponges were introduced into surgical practice more than 50 years ago. Oxidized cellulose and oxidized regenerated cellulose are also used frequently. Granulomatous reactions to oxidized cellulose that mimic infection or tumor recurrence have been reported. Microfibrillar collagen which not only exerts a local matrix-forming effect to induce hemostasis but actively promotes coagulation and platelet aggregation is also used in neurosurgical practice. The majority of reports about granulomas that look like a recurrent tumor or an abscess on MRI, refer to cotton and rayon as the source of these reactions. This has been reported experimentally as well as after cranial and spinal operations (1). Studies on human tissue reaction to sutures have revealed constant inflammatory reactions, which are most marked with silk and cotton, less so with Dacron and minimal with nylon (2). Muslin is a cotton fabric that is used to provide reinforcement of an aneurysmal wall in unclippable or partially clippable intracranial aneurysms (3). A wide variety of other synthetic materials may be left in place during intracranial procedures. For example, silicone-coated synthetic sheets are used as a dura mater substitute for the repair of dural defects. Mills and Lininger (4) reported a case of intracranial “myospherulosis” after instillation of antibiotic ointment into a posttraumatic brain abscess. These agents and other foreign substances that are deliberately introduced into the central nervous system may induce an excessive inflammatory reaction in the vicinity of the surgical site, which produces a clinically symptomatic and/or radiologically apparent mass lesion that is often indistinguishable from recurrent tumor on clinical and neuroimaging studies (1). Such excessive inflammatory reaction may be misdiagnosed as recurrent tumor, radiation necrosis, abscess, resolving infarction or hematoma, or even unrelated primary or metastatic neoplasms, depending on the particular clinical history of each patient.

Cotton and related materials are suspected to cause a granulomatous foreign body reaction over time. Clinically, suture granulomas have been reported several months to 18 years after a variety of procedures (2). Dzenitis et al. reported that foreign bodies may cause granulomas or brain abscesses as late as 31 years after their introduction (5). Suture granuloma mimicking a recurrent lumber disc herniation was also reported by Ziyal et al (2).

Following placement of a resorbable hemostatic agent, a physiologic inflammatory responce develops around the hemostat until complete absorption is achieved. In the majority of patients this process is asymptomatic. However, an exuberant inflammatory reaction directed against the foreign material sometimes produces a space-occupying mass.

Previous reports of the MR imaging appearance of cotton granuloma are limited, and none have included diffusion weighted imaging and ADC mapping (6,7,8). The MRI findings may include a rim-enhancing collection, which can not be easily distinguished from an abscess as well as other ring-enhancing lesions (8,9). It has been suggested that relatively solid hypointensity on T2-weighted images may be helpful for distinguishing muslinoma from abscess (7), however predominantly high signal on T2 weighted images was also reported (8).

Differential diagnosis of ring-enhancing cerebral lesions is difficult and even impossible with conventional MR imaging. However, recent reports suggest that brain abscess can be differentiated from cystic or necrotic brain tumors with diffusion-weighted MR imaging (10,11). Ebisu et al (10) were the first to describe high signal intensity on diffusion weighted images (DWI) and a low apparent diffusion coefficient (ADC) value in brain abscess, in contrary to low signal intensity on DWI and a high ADC value in most tumors or high signal intensity for necrotic or cystic tumors due to T2 shine-through. In our case, MRI revealed a

well-defined mass with peripheral enhancement consistent with an active inflammatory process. There was surrounding high signal intensity on FLAIR images, indicating edema. Although abscess could not be entirely excluded, there were clinical and imaging features that made abscess less likely. The hypointensity of the mass on all sequences was atypical for abscess on conventional MR imaging. The mass showed increased intensity on DWI, however high ADC value was inconsistent with a brain abscess. It was significant that the well-defined capsule was hyperintense on DWI and had a low ADC value, for which the explanation may be restricted water movement as a result of an inflammatory reaction.

The differential diagnosis consisted of cotton granuloma versus recurrent tumor, with the elicited history of previous tumor resection was critical for proper diagnosis. Histopathological diagnosis of the primary tumor was a meningioma and preoperative MR images were obtained. The solid hypointensity of the current mass on all sequences and rim-like enhancement did not resemble the primary tumor showing iso-intensity relative to gray matter on all sequences and dense homogeneous enhancement (Fig. 1a). Thus imaging features were more likely to support cotton granuloma versus recurrent tumor.

Our case and those reported previously indicate that reaction to hemostatic agents may produce significant space occupying mass lesions that are clinically and/or radiologically apparent. In our case the persistence of ring enhancement was obtained on MRI scan one month after the first operation. The histological findings in our case were concordant with the radiological changes. The granuloma was well encapsulated by dense fibrous connective tissue. It is interesting that the reaction in present case appeared one month after the operation**.** This can be related to the amount of cotton retained in the tissue. This complication can only be prevented with marking and following the cottonoid by a tied suture.

CONCLUSION

In patients with a history of craniotomy, cotton granuloma should be considered in the differential diagnosis. We believe that in addition to solid hypointensity on T2-weighted images which has been reported (7), diffusion-weighted images in combination with ADC mapping is also helpful for distinguishing cotton granuloma from abscess. Differential diagnosis of a rim-enhancing mass with the lack of low ADC value indicating restriction of water movement should be more likely to be cotton granuloma rather than abscess. Finally, the well-defined rim-enhancing capsule of the cotton granuloma may be hyperintense on DWI and may have a low ADC value for which the explanation is restricted water movement as a result of an inflammatory reaction.

REFERENCES

1. **Kothbauer KF, Jallo GI, Siffert J, Jimenez E, Allen JC, Epstein FJ.** 2001. Foreign body reaction to hemostatic materials mimicking recurrent brain tumor: report of three cases. J Neurosurg. **95**: 503-506.
2. **Ziyal IM, Aydın Y, Bejjani GK.** 1997. Suture granuloma mimicking a lumbar disc recurrence. J Neurosurg. **87(3)**:473.
3. **Haisa T, Matsumiya K, Yoshimasu N, Kuribayashi N.** 1990. Foreign-body granuloma as a complication of wrapping and coating an intracranial aneurysm. J Neurosurg. **72**: 292-294.
4. **Mills SE, Lininger JR.** 1982. Intracranial myospherulosis. Hum pathol. **13**: 596-597.
5. **Dzenitis AJ, Kalsbeck EJ.** 1965. Chronic brain abscess discovered 31 years after

intracranial injury by missile. J Neurosurg. **22**: 169-171.
6. Felsberg GJ, Tien RD, Haplea S, Osumi AK. 1993. Muslin-induced optic arachnoiditis ("gauzoma"): findings of CT and MR. J Comput Assist Tomogr. **17**: 485-487.
7. **Bhatti MT, Holder CA, Newman NJ, Hudgins PA.** 2000. MR characteristics of muslin-induced optic neuropathy: report of two cases and review of the literature. AJNR Am J Neuroradiol. **21**: 346-352.
8. **Brochert A, Reynolds T, Baker R.** 2003. MRI in a case of muslin-induced granuloma. Neuroradiol. **45**: 82-84.
9. **Epstein AJ, Russell EJ, Berlin L.** 1982. Suture granuloma: an unusual case of an enhancing ring lesion in the postoperative brain. J Comput Assist Tomogr. **6**: 815-817.
10. **Ebisu T, Tanaka C, Umeda M, et al.** 1996. Discrimination of brain abscess from necrotic or cystic tumors by diffusion-weighted echo planar imaging. Magn Reson Imaging. **14**: 1113-1116.
11. **Desprechins B, Stadnik T, Koerts G, Shabana W, Breucq C, Osteux M.** 1999. Use of diffusion-weighted MR imaging in the differential diagnosis between intracerebral necrotic tumors and cerebral abscesses. AJNR Am J Neuroradiol. **20**: 1252-1257.