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# MR Appearance of Postoperative Foreign Body Granuloma: Case Report with Pathologic Confirmation

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The MR findings in two patients with postoperative foreign body granulomas are presented. Such lesions can simulate recurrent tumor on postcontrast T1-weighted images; however, their hypointense signal on T2-weighted images serves to distinguish them from neoplasm.

## Case Reports

### Case 1

A 6½-year-old girl originally presented with a history of neck pain and unsteadiness of gait when turning her head to one side. There was no history of nausea or vomiting. Investigations at that time revealed a posterior fossa tumor, and surgery was performed. Details of the operative procedure are not available. Postoperatively, her symptoms improved and imaging studies 1 year after surgery reportedly revealed complete resection of the tumor (films were not available for our review).

Initial follow-up at our institution showed the child to be neurologically normal. A postcontrast T1-weighted MR image demonstrated nodular enhancement at the posterior margin of the surgical resection (Fig. 1A). This area of nodular enhancement also demonstrated hypointense signal on a T2-weighted image (Fig. 1B). The preoperative differential diagnosis was residual or recurrent astrocytoma.

Moderate adherence of the cerebellum to the overlying dura was noted at the second operation. The nodule of suspected tumor was located to the right of midline, approximately 1 cm below the cortical surface. Dissection through the gliotic surface scar lead to a firm, grayish to red nodule of tissue, which was well defined. Histologic evaluation of the nodule showed a gliotic scar and hemosiderin staining in the superficial part of the cyst wall, but no residual tumor. Pathologic examination of the nodule revealed features consistent with a giant-cell foreign body reaction (Fig. 2). Evidence of residual juvenile pilocytic astrocytoma was noted separate from the nodule.

Postoperative CT and MR scans confirmed gross total resection of the previously enhancing nodule. The patient was discharged in good neurologic condition on the fifth postoperative day.

### Case 2

A 56-year-old man presented with a history of neck pain and progressive quadriparesis. Neurologic examination revealed spastic

quadriparesis and reduced sensation below C2. A laminectomy was performed from the foramen magnum to C4, with subtotal resection of a low-grade cervical spinal cord astrocytoma. At surgery the dura could not be closed, and Gelfoam was placed over the exposed dorsal aspect of the cervical spinal cord. One month later neurologic deterioration required the insertion of a syringoperitoneal shunt. He was treated thereafter with a hyperfractionated course of radiation therapy to a total dose of 6700 cGy.

Two years later the patient's spastic quadriparesis worsened. A repeat postcontrast MR scan of the cervical spine revealed an enhancing upper cervical spinal cord tumor with a cystic component inferiorly. In addition, an enhancing nodule was present posterior to the cord in the region of the duroplasty. This nodule was hypointense on sagittal T2-weighted images (Fig. 3). Transdural sonography, performed during the second operation, revealed a solid intramedullary tumor in the C1–C3 region and a cyst at the C3–C4 level located posterior to the cord. Myelotomy was carried out from C2 to C4, with subtotal resection of the tumor. Pathology was consistent with recurrent/residual anaplastic astrocytoma. The enhancing nodule from the region of the duroplasty was also excised, and on gross inspection was seen to be composed of a fibrous tissue fragment. Histologically, it represented an extradural foreign body granuloma.

## Discussion

Postoperative CT scans may demonstrate contrast enhancement at the operative site that may be misinterpreted as residual tumor. This contrast enhancement begins as early as 3 to 5 days after surgery, is most intense at 2 weeks, and persists for several months [1–4]. By comparison, the MR appearance during the postoperative period, especially following contrast enhancement, is not well documented. Sze et al. [5] reported that contrast-enhanced MR imaging was more sensitive than contrast-enhanced CT in the examination of normal and abnormal meninges. However, contrast enhancement of the meninges on MR is nonspecific and may be a normal reaction during the postoperative period. Meningeal enhancement may not always prove to be diagnostically significant.

Foreign body granulomas that arise after intracranial sur-

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Fig. 1.—Enhancing postoperative foreign body granuloma mimicking tumor.

A, Postcontrast T1-weighted (600/20/4) MR image. An enhancing nodule (open arrow) is noted at posterior margin of surgical site (solid arrows) adjacent to fourth ventricle.

B, Axial T2-weighted (2800/80) MR image. Surgical site appears as an area of high signal intensity (solid arrows) but enhancing nodule is markedly hypointense (open arrow).

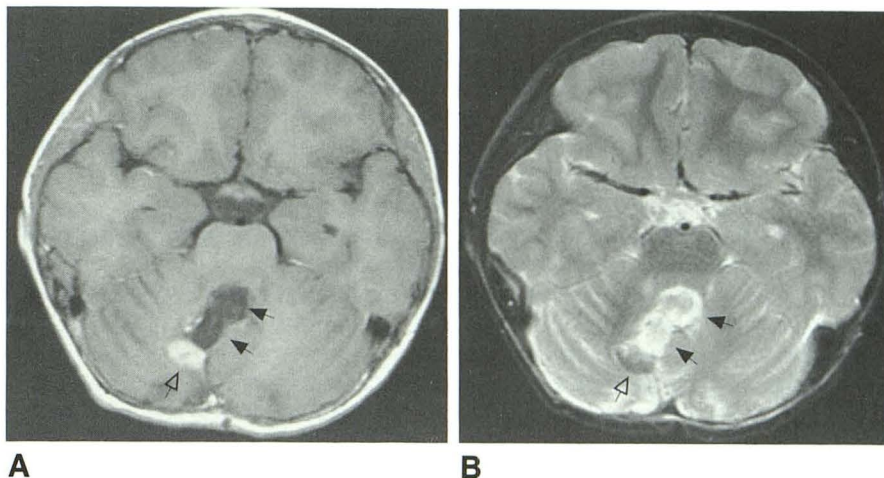


Fig. 2.—Histologic evaluation of postoperative foreign body granuloma.

A, Fibrillar foreign material (arrows) with foreign body giant cells and abundant capillaries. (H and E,  $\times 250$ )

B, Polarized light image clearly shows fibrillar foreign material (same field as A). (H and E,  $\times 250$ )

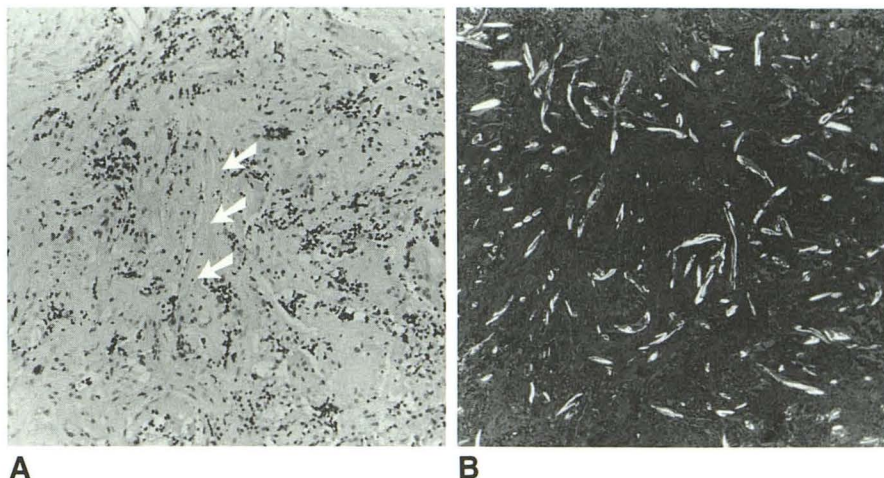
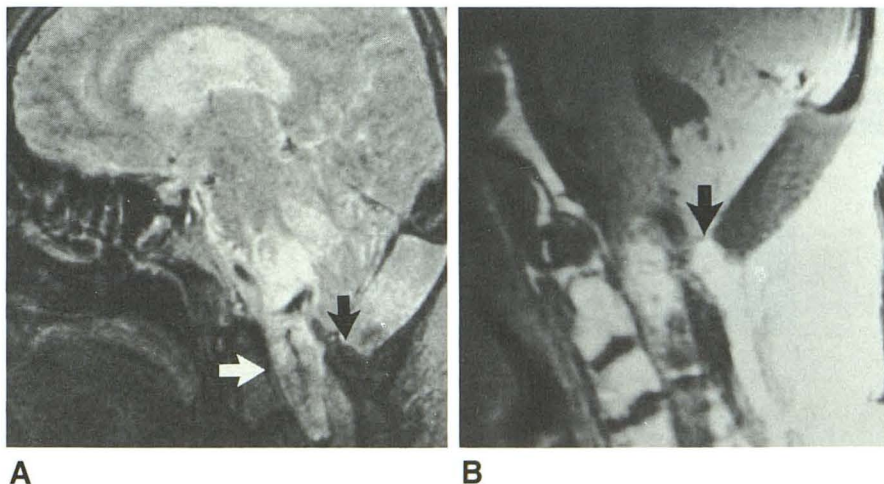


Fig. 3.—Enhancing foreign body granuloma seen within pseudomeningocele.

A, Sagittal T2-weighted (2000/80) MR image. Residual brainstem and cervical cord astrocytoma (white arrow) is hyperintense relative to normal brain parenchyma. A well-defined extradural hypointense abnormality (black arrow) is seen within postoperative pseudomeningocele defect.

B, Postcontrast sagittal T1-weighted (600/20) MR image. Hypointense focus seen in A within pseudomeningocele defect is enhanced (arrow). This is a surgically proved foreign body granuloma.



gery are rare [6]. The diagnosis is usually made postoperatively at histologic examination, as their CT appearance is quite nonspecific [7]. Only a few reports discuss the CT appearance of these unusual complications. Djindjian et al. [6] reported a foreign body reaction to surgical swabs left intracranially after removal of a large intracerebral hematoma.

A follow-up CT scan 6 months after surgery showed a round enhancing lesion. At repeat surgery a foreign body granuloma was removed with histologic confirmation of the presence of cotton fibers, giant cells, macrophages, lymphocytes, plasma cells, and polymorphonuclear neutrophil leukocytes. Another case report of persistent ring enhancement 3 months after



surgical resection of a meningioma was described by Tanaka et al. [8]. Their differential diagnosis included residual/recurrent tumor, abscess, granulation tissue, or foreign body granuloma. Upon reoperation cotton pledgets were found. Shimosaka and Waga [9] likewise reported an enhancing lesion on CT 1½ years after resection of a meningioma. Giant cells and cotton fibers were seen histologically after repeat surgery. Surgical glove starch, hair, and shunt tubes were also listed as materials associated with foreign body granulomas. Sutures [7], needles or wooden plugs used for hemostasis [10], and subdural peritoneal shunts [11] have also been implicated in the formations of foreign body granulomas.

Nabors et al. [12] reported a spinal abscess caused by a retained surgical sponge, which was demonstrated by MR. This retained foreign body was hypointense on relatively T2-weighted images, similar to the findings in our two cases. No contrast enhancement was used. Hueftle et al. [13] reported the MR appearance of granulation tissue following lumbar surgery. The enhancement of scar tissue was related to increased vascularity. Once inside the scar tissue, the contrast medium becomes trapped. Enhancement of extradural foreign body granulomas may be related to a similar mechanism. However, intracranial foreign body granulomas have not demonstrated similar increased vascularity [6]. Their enhancement is therefore more likely a result of blood-brain barrier breakdown related to the inflammatory response.

Foreign body granulomas usually demonstrate encapsulation by dense fibrous connective tissue on histologic review [6]. In both our cases the foreign body demonstrated enhancement on postcontrast MR, but was hypointense on T2-weighted images. This low signal intensity is compatible with dense fibrous tissue and/or foreign body material without mobile hydrogen protons. The enhancement may represent the inflammatory reaction and/or resultant blood-brain barrier defect. In case 1 the residual juvenile pilocytic astrocytoma would be expected to enhance markedly, possibly due to increased tumor vascularity. These tumors rarely calcify and usually demonstrate high signal intensity on T2-weighted images [14]. In case 2 the residual nonenhancing astrocytoma demonstrated high signal intensity on T2-weighted images.

Thus, the MR appearance of an enhancing lesion in the surgical bed that demonstrates low signal intensity on T2-weighted images should suggest the possibility of postoperative changes, among which should be included a foreign body granuloma.

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