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MR imaging of hydrogel scleral buckle as a late complication after retinal detachment surgery

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Abstract

MIRAgel is a hydrogel implant introduced as a scleral buckling material in 1979.[1] It is no longer used because of late complications involving its extrusion and intrusion. We report the MR imaging findings in two patients who developed late complications.

Key words: MIRAgel, hydrogel implant, scleral buckle, magnetic resonance imaging

Introduction

Retinal detachment is usually caused by a retinal tear. One of the most common surgical techniques in retinal detachment repair is vitrectomy. The scleral buckle procedure also has a role in retinal detachment repair. In scleral buckling, the eye wall is indented under the retinal tear with a silicone buckling element.[2]

MIRAgel is a hydrogel implant introduced as a scleral bucklin material in 1979. Hydrogels are low-molecular-weight substances that are permeable to water and can absorb and slowly release water-soluble substances such as antibiotics. This elastic buckling material was shown to be as effective as silicon rubber or sponge and believed to be superior as the result of its low risk of infection.[3] Recently, multiple studies have been published on several late complications of hydrogel scleral buckling.[3–9] The complications result from buckle swelling due to the hydrolytic degradation of the material. We report MR imaging findings in two patients who developed late complications.

Case Reports

Case 1

A 43-year-old woman was referred to our institution with suspected normal pressure glaucoma. She had undergone scleral buckling surgery for bilateral retinal detachment at another hospital 9 years previously. For screening of the orbit, MR imaging was performed with a commercially available 1.5T unit. A T2-weighted axial MR image showed a markedly expanded buckle element surrounding the right globe, which was hyperintense with a low signal intensity rim (Fig. 1). A STIR image showed a circumferential high-intensity mass surrounding the right globe (Fig. 2).

Case 2

A 29-year-old man was referred to our institution with a possible orbital tumor. The patient

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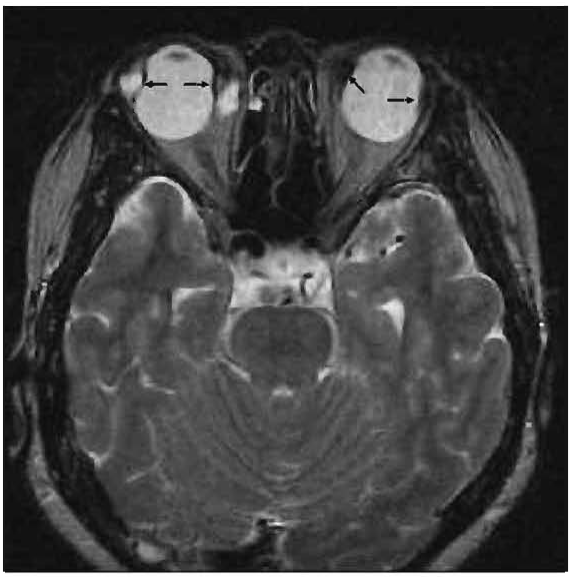

Fig. 1 T2-weighted axial MR image (TR/TE=3800/120 msec) shows a markedly expanded buckle element surrounding the right globe, which is hyperintense with a low signal intensity rim. Note the contour deformities of the medial and lateral surfaces of the bilateral globes secondary to the encircling scleral buckles (arrows). Retinal detachment in the contralateral eye treated with an encircling silicon band.

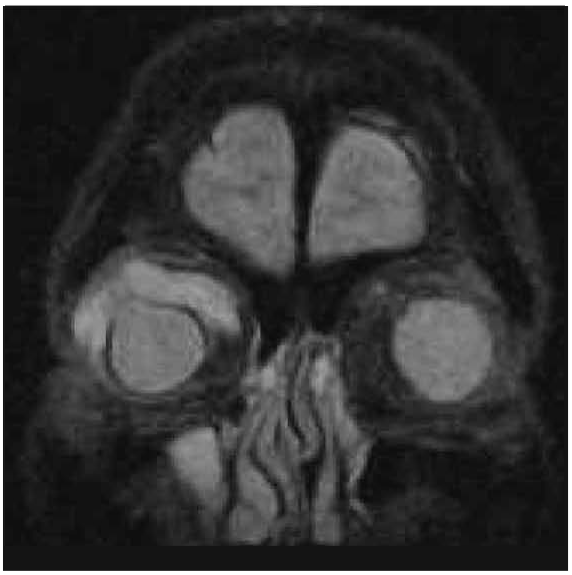

Fig. 2 Coronal STIR image (TR/TE/TI=3000/24/150 msec) shows a circumferential high-intensity mass surrounding the right globe.

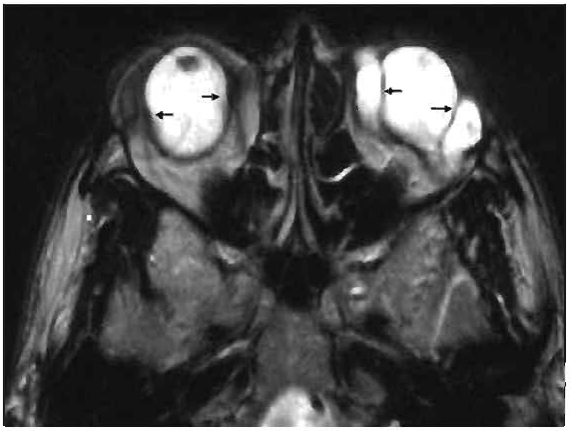

Fig. 3 T2-weighted axial MR image (TR/TE=3800/94 msec) shows a markedly expanded buckle element with a high intensity in the left orbit. Note the indentation of the bilateral globes secondary to the encircling scleral buckles (arrows).

Fig. 4 Noncontrast T1-weighted oblique sagittal (TR/TE=500/12 msec) image shows an isointense soft-tissue mass with the extraocular muscle in the left orbit.

complained of a 3-year history of left exophthalmus and impaired ocular motility. He had undergone scleral buckling surgery for left and right retinal detachment at another hospital 8 and 12 years ago, respectively. MRI was conducted to delineate the left orbital mass with a commercially available 1.5T unit, revealing a circumferential mass that was iso-intense with the extraocular muscles on the T1-weighted image and hyperintense on the T2-weighted image (Figs. 3, 4).

The two patients underwent scleral buckling surgery for bilateral retinal detachment. In the case 1, retinal detachment in the right eye was repaired with hydrogel band, and that in the left eye was repaired with a silicone band. In the case 2, retinal detachment in the right eye was repaired with a silicone band, and that in the left eye was repaired with hydrogel band. MR imag-

ing showed indentation of the bilateral globes secondary to an encircling silicone and hydrogel band (Figs. 1, 3). Therefore, they were diagnosed as swollen hydrogel scleral buckles, and these implants were removed.

Discussion

An orbital foreign body simulating an orbital tumor is uncommon. Additionally, the enlargement or growth of a foreign body, especially the commonly used silicone scleral buckling element, is very rare.[5] Swollen MIRAgel can resemble an orbital tumor. This is why some patients were suspected to have an orbital tumor or infection as the result of the new onset of an orbital mass.

MR imaging of this complication shows a circumferential mass surrounding the globe, presenting iso-intensity with extraocular muscles on T1-weighted images and hyperintensity on T2-weighted images due to the intrinsic swelling of the buckle with water. Lane, et al. reported that CT demonstrates dystrophic calcification within the mass, and contrast-enhanced CT and MR imaging demonstrate an enhanced capsule surrounding the mass.[6] Observation of the characteristic imaging features should prompt inquiries concerning the patient's previous surgical history.

Hydrogel scleral buckle can enlarge markedly over a period of 10 years. Hence, patients often do not recall details of the retinal surgery.[5] In our cases, MR imaging showed indentation of the bilateral globes secondary to encircling scleral buckling. This indentation of the eye suggests a past history of scleral buckling surgery, and provides a clue for the diagnosis. Brunstein, et al. described a degenerated hydrogel buckle that had expanded 4-fold in volume. There had also been an increase in the length of the element.[7] When the element markedly elongates, there may be no indentation of the eye.

The hyperintensity on T2-weighted images of the swollen hydrogel buckle resembles cystic mass lesion. Differential diagnostic considerations of orbital complications from scleral buckles would include clear or hematic orbital cysts.[5,8] In the case, there will be indentation of the globe secondary to encircling scleral buckles. However, the circumferential morphology will be inconsistent with this diagnosis.

Hydrogel products were taken off the market in 1995. In Japan, it will still used for the next few years.[9] Early related complications in the first 4 to 5 years were reportedly minimal.[5] However, long-term observations of hydrogel implants at approximately 7 to 20 years revealed some complications related to extensive swelling of the implants.[6,10] Many patients have this implant and are at risk of developing the problems seen in our cases. Patients with hydrogel buckling require long-term follow-up, and MRI is recommended for patients with a new-onset orbital mass.

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