Silicone oil has been used for years for intraocular tamponade treating of complicated retinal detachment due to its high surface tension. The known complications of intraocular tamponade include keratopathy, glaucoma, cataract, and subretinal migration of the oil. Intracranial migration of the oil is rare but has been reported. Over the next 6 years she underwent 2 non–contrast-enhanced brain CT studies and 1 MRI study for evaluation of her symptoms. On CT scan, extension of the intraocular silicone along the optic nerve was evident. Two hyperdense nodules were observed freely floating in the right lateral and fourth ventricles, remaining in the nondependent portion of ventricles in both supine and prone positions. On T2-weighted MRI, the left orbital content and the intraventricular nodules all demonstrated chemical shift artifacts typically associated with silicone. The imaging findings were characteristic for intraventricular silicone after silicone oil tamponade. The patient’s dizziness and headache were treated symptomatically and she was followed up at the outpatient department.

Migration of intravitreous silicone oil into the cerebral ventricles is a rare complication. Intraventricular silicone oil can mimic intraventricular hemorrhage. Radiographically, intraventricular silicone oil can be distinguished from hemorrhage as silicone oil tends to stay in the nondependent portion of the ventricle. Chemical shift artifacts on MRI may help establishing the diagnosis of intraventricular silicone oil. Currently, there is no consensus on surgical removal of intraventricular silicone oil, and in the majority of cases reported in the literature, the patients were asymptomatic.

Key Words: • computed tomography • intraocular tamponade • intraventricular silicone • magnetic resonance imaging

Silicone oil has been used for years for intraocular tamponade treating of complicated retinal detachment due to its high surface tension. The known complications of intraocular tamponade include keratopathy, glaucoma, cataract, and subretinal migration of the oil. Intracranial migration of the oil is rare but has been reported. Silicone oil is hyperdense on CT and hyperintense on T1-weighted MRI compared with CSF. Therefore, intraventricular silicone could be misdiagnosed as hemorrhage, which has a similar imaging presentation. To the best of our knowledge, the free-floating imaging feature of the intraventricular silicone demonstrated with supine and prone position CT has not previously been reported. Furthermore, the imaging evidence of active migration of the silicone oil from the intraocular compartment into the periorbital subarachnoid space has never been reported.

Case Report

History and Presentation. This 58-year-old woman had a history of Type II diabetic mellitus, chronic renal failure, and retinal detachment resulting from diabetic retinopathy. She had been treated with intravitreous injection of silicone in 1995. Because of the dizziness and headache, she was admitted to the hospital 3 times and underwent 2 noncontrast head CT studies and 1 brain MRI study between March 2005 and February 2011.

Imaging Studies. The first head CT scan, performed in 2005, revealed hyperdense substance in the left eye globe with an average HU of 108. This finding is a typical feature of intravitreous silicone tamponade. In addition, tubular hyperdensity was seen extending from the left eyeball and spreading along the left optic nerve (Fig. 1A). Hyperdense round nodules were seen in the nondependent portion of the fourth ventricle and right anterior horn and fourth ventricle (Fig. 1B and 1C). On a subsequent CT scan, 6 years later, the tubular hyperdensity was no longer evident along the left optic nerve, and the intraventricular hyperdense substance had slightly enlarged in size. The intraventricular nodules were freely floating and stayed in nondependent parts of the ventricles when the patient’s position changed from supine to prone (Fig. 1D). The radiodensity of the intraventricular silicone was 86 HU.

On MRI, performed in 2011, the intraventricular nodules demonstrated similar signal intensity on all pulse sequences as the left orbital intravitreous silicone oil. They were hyperintense on T1-weighted images and slightly
hypointense with prominent chemical shift artifacts along the frequency-encoding direction on T2-weighted images (Fig. 2). The above findings suggested that the intraventricular nodules were free-floating silicone oil that had migrated from the left orbit.

**Treatment.** The patient did not undergo any surgical intervention. She received symptomatic treatment and was followed up regularly at the outpatient department.

**Discussion**

The migration of intravitreous silicone oil into the cerebral ventricles is a rare complication. Only 4 cases have previously been reported, primarily in the ophthalmological literature. The patients in 3 of the 4 cases had retinal detachment resulting from diabetic retinopathy, and the patient in the remaining case had retinal detachment resulting from cytomegalovirus retinitis. In our case, retinal detachment was attributed to diabetic retinopathy.

In 2 of the case reports, the radiodensity of the intraocular silicone was reported. In the first, it was reported as ranging from 106 to 139 HU (mean 115 ± 4.5 HU), and in the second it was reported as 90 HU. In our case, the radiodensity of the intraventricular silicone was 86 HU, which is relatively low compared with intraocular silicone. This may be attributed to the dilution of the silicone with CSF. However, intraventricular silicone can still be distinguished from blood, which has a CT number of approximately 30–60 HU.

In previous reports, intraocular silicone oil was hypointense on T1-weighted images, but had variable signal intensity on T2-weighted images. The prominent chemical shift artifact associated with the intraocular silicone was similar to that of breast silicone implants. It appears that silicone oil, regardless of its location, demonstrates similar signal intensity on MRI.

Owing to the high surface tension of silicone oil, the configuration is usually spherical, whereas intraventricular hemorrhage usually presents as fluid-fluid level. The free-floating nature of intraventricular silicone oil is due to its lower specific gravity as compared with CSF. In contrast, intraventricular hemorrhage tends to present in the dependent portion of the ventricle. This imaging feature is helpful in distinguishing between intraventricular hemorrhage and intraventricular silicone oil.

Anatomically, there is no normal communication between the vitreous body and subarachnoid space of optic nerve. Communication between the subarachnoid space of the optic nerve and the intracranial subarachnoid space can allow the silicone to enter into the ventricles. A few hypotheses have been published by way of explanation. Shields and colleague proposed that increased intraocular pressure lead to cavernous degeneration of the optic nerve and communication of silicone oil with the subarachnoid space eventually. Fangtian and colleagues proposed that deep cupping of the optic disk may allow the silicone oil to enter the subarachnoid space by breaking through the cerebral pia. In this case, a snapshot of active migration of the silicone oil from the vitreous space into the perioptic subarachnoid space of the left optic nerve was recorded. To the best of our knowledge, the present report is the first radiological evidence demonstrating active migration of intravitreous silicone into the intracranial compartment via the perioptic subarachnoid space of the optic nerve.

In previous reports, patients with intraventricular silicone were described as presenting with nonspecific headache and dizziness. The mechanism of their symptoms was uncertain. There was no strong evidence to relate their clinical symptoms to the intraventricular silicone oil. There is no clear consensus on surgical removal of the intraventricular silicone oil, and the patients were typically treated conservatively.
In conclusion, the intraventricular silicone oil demonstrates high attenuation on CT and hyperintensity on T1-weighted MR images, which could mimic intraventricular hemorrhage. However, recognizing the free-floating nature and the chemical shift artifacts typically associated with silicone oil allows the diagnosis to be established with a high degree of confidence.

Disclosure

The authors report no conflict of interest concerning the materials or methods used in this study or the findings specified in this paper.

Author contributions to the study and manuscript preparation include the following. Conception and design: CC Chang. Acquisition of data: Toh. Analysis and interpretation of data: Toh. Drafting the article: CC Chang. Critically revising the article: Toh. Administrative/technical/material support: HS Chang. Study supervision: HS Chang.

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