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Brain Magnetic Resonance Imaging in a Patient with Entrapped Echelon Microcatheter within Onyx Cast

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According to the Food and Drug Administration (FDA) website, between the years of 2005 and 2012, there have been 100 cases of catheters being embedded in Onyx cast (ev3, Irvine, California) [1]. Because these microcatheters have a metallic coil within the shaft, the safety of brain magnetic resonance imaging (MRI) is safe in this situation is not known. We report a patient in whom the MRI was performed in the presence of microcatheter imbedded within the intracranial arteries.

Case Report

A 37-year-old man was referred to our hospital for the treatment of a highly vascular right cerebellar hemangioblastoma (CHB).

The patient underwent preoperative embolization of the CHB. The single-lumen Echelon microcatheter (ev3, Irvine, California, USA) was advanced over a 0.010 inch microwire (Traxcess, MicroVention, Tustin, CA, USA) into the predominant arterial feeder from the right posterior inferior cerebellar artery (Fig. 1). After the microcatheter's position was confirmed, dimethyl sulfoxide (DMSO) was injected at 0.1 ml/min rate to a volume of 3 ml. Subsequently, Onyx was injected at a rate of 0.1 ml/min to a volume of 1.5 ml. The injection was discontinued after marked reflux of the Onyx was noted. However, several attempts at withdrawing the Echelon microcatheter using intermittent tension and relaxation were not successful over a 50 min period (Fig. 2). The hub of the microcatheter was cut and the guide catheter was withdrawn. During surgical resection, after a review of the microcatheter position within the feeding arterial branch, a decision was made not to remove the catheter surgically. The introducer sheath was removed, after the microcatheter was pushed completely into the intravascular compartment. Sagittal T1-weighted, axial FLAIR, and T2-weighted sequences were obtained without gadolinium. Axial GRE, axial, coronal, and sagittal T1-weighted images were obtained with intravenous gadolinium (20 ml Omniscan) using a 1.5 Tesla system (MAGNETOM Avanto; Siemens Healthcare; Erlangen, Germany). The MRI was completed successfully (Fig. 2) without any adverse consequence to the patient.

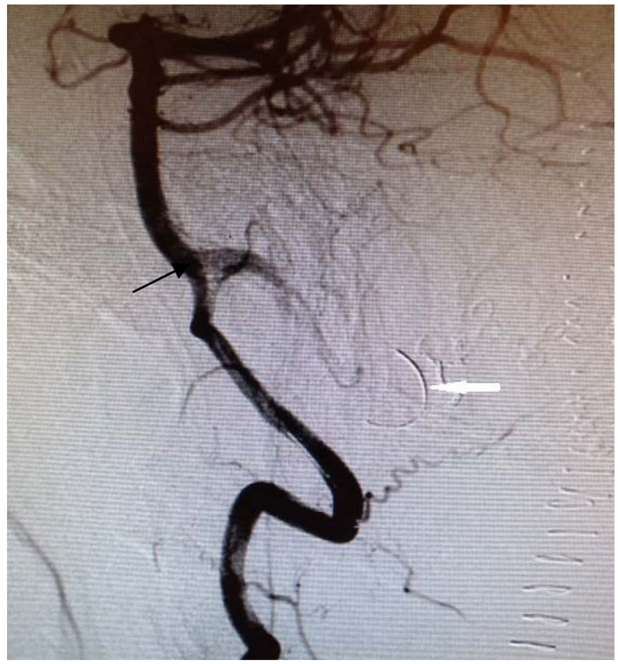

Figure 1. The microcatheter in the right PICA on digital subtraction angiography (lateral view)

The MRI demonstrated postoperative edema and microhemorrhages in the right cerebellar hemisphere and cerebellar vermis. The microcatheter was seen as a linear configuration on the axial T2-weighted sequence (arrows, Fig. 2). The patient did not report any new symptoms after MRI or during 1-month follow-up.

Discussion

The main concerns with the entrapment of the microcatheter were the magnetic effect on microcatheter and resultant heating from the radiofrequency. The Echelon

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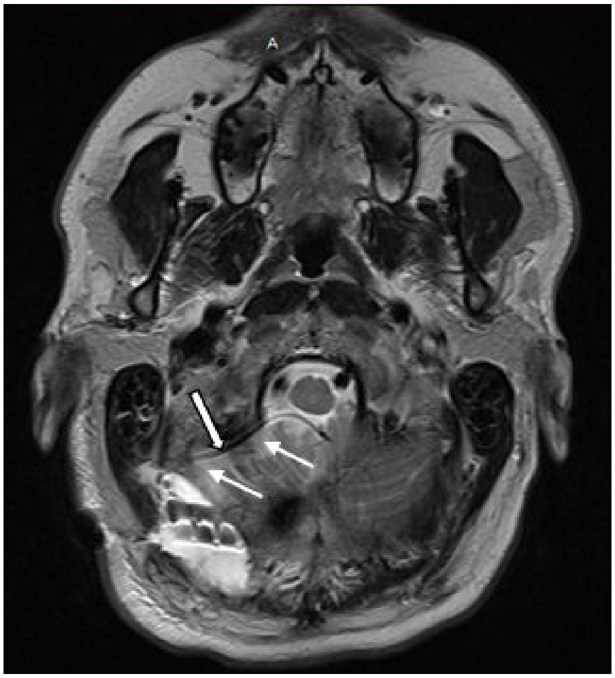

Figure 2. The thick arrow indicates the Echelon microcatheter in the right PICA on a T2-weighted image of an MRI brain. The narrow arrows show the edema in the right cerebellar hemisphere

microcatheter has a proprietary Nitinol-braided design with dual radiopaque markers at the distal end made of iridium and platinum.

Nitinol is nonferromagnetic alloy of nickel and titanium with a lower magnetic susceptibility than stainless steel. Nitinol implants and devices are nonferromagnetic or only weakly ferromagnetic and less likely to produce artifacts in MRI as compared to stainless steel [2]. However, the temperature change due to the radiofrequency remained a concern. There is up to 3°C change in the microcatheter temperature, depending on the length of the catheter, duration under MRI, and the strength of the MRI [3]. The temperature change in a nitinol microcatheter under 1.5 Tesla modified fast spin echo MRI *in vitro* was noted to be 4.0°C/minute, and the maximal rise was 2.32°C during a 2-min scan [4]. We did not observed any clinical consequences suggestive of any temperature increase related neurological injury. The period of temperature increase is perhaps too short, and there is no direct tissue contact to cause new neurological insult.

Conclusion

Our case demonstrates the safety and feasibility of brain MRI in a patient with imbedded microcatheter.

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