CASE REPORT

Successful embolisation of an intracranial meningioma via a right-sided aortic arch

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Accepted 4 December 2017

SUMMARY

Right aortic arch is an unusual arch variation. Supra-aortic neurointervention in such cases has been sparingly reported. This case highlights the unusual association of a left hemispheric convexity meningioma with a right aortic arch which was successfully navigated. Particle embolisation of the meningioma produced good results followed by complete surgical excision and gratifying overall final outcome in this challenging scenario.

BACKGROUND

Right-sided aortic arch represents a rare arch variation. Association of right aortic arch and intracranial meningioma has not been reported. Supra-aortic arch navigation and super-selective embolisation of tumour feeders in such cases is challenging, and there is lack of data regarding catheterisation techniques and procedural details. Literature search reveals only a single previous instance of Carotid Artery stenting in the setting of a right aortic arch. [8] This case represents the first instance where successful particle embolisation has been carried out for an intracranial meningioma via a right aortic arch. The case also highlights the various types of right aortic arch and their common associations and attempts to touch on relevant embryological aspects.

CASE PRESENTATION

A middle-aged right-handed woman attended the emergency department with progressive right-sided

paresis and language dysfunction for the last 6 months. Medical history was significant for a well-controlled hypertension. Clinical examination revealed a drowsy but arousable individual with grade 3 power in her right upper and lower limbs. She had difficulty in naming and recognising family members. Detailed neurocognitive assessment was not possible. Right-sided pyramidal signs were present. Funduscopy did not reveal any papilloedema.

INVESTIGATIONS

Contrast-enhanced cranial MRI revealed an enhancing left convexity space occupying lesion with a dural tail and mass effect suggestive of a meningioma (figure 1). Routine biochemical and haematological parameters were normal.

TREATMENT

Following a neurosurgical opinion, it was decided to undertake a preoperative embolisation of the tumour. An interval operative removal of the tumour was also planned, discussed and agreed on by the family members. After informed consent, the patient was taken up for endovascular embolisation under conscious sedation. Vascular access was obtained via standard right femoral artery approach. During diagnostic angiography, the course of the catheter did not conform to the standard vascular anatomy. Accidental venous catheterisation was ruled out by transducing the catheter to a pressure monitor which revealed normal arterial waveforms. Standard catheterisation techniques failed to navigate the arch and catheterisation of the left subclavian artery and vertebral artery was only possible. An arch injection was performed with a 5F pigtail catheter placing it at the highest accessible point of the arch. However, it was not significantly informative, and an uncommon arch configuration was evident, revealing an aberrant left subclavian and vertebral artery (figure 2). Various complex catheters (SIM 1, 2) were tried for navigation. Finally, a Mani catheter was successful in gaining access to a low-lying left common carotid artery. This catheter was exchanged and selective angiography of the left external carotid artery revealed a typical tumour blush conforming with the tumorous location (figure 3). The diagnostic catheter was next exchanged with a guiding catheter and super-selective microcatheterisation of the tumorous feeders was achieved (figures 4 and 5). Tumour embolisation was achieved with polyvinyl alcohol particles (300–550 microns) with preservation of normal surrounding vasculature (figure 6). The patient was started on

Figure 1 Meningioma with dural tail.

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To cite: Das D, Kanjilal R, Bhattacharya S. *BMJ Case Rep* Published Online First: [please include Day Month Year]. doi:10.1136/bcr-2017-222115

Figure 2 Arch angiogram.

intravenous dexamethasone and was taken up for surgery after 48 hours.

OUTCOME AND FOLLOW-UP

The patient underwent successful surgical removal of the tumour with minimal periprocedural blood loss. Initial postoperative period was complicated by a worsened limb paresis and diminished sensorium which was treated with osmolar agents and dexamethasone. Following extubation, she was provided with enteral feeding via a nasogastric tube and intensive physiotherapy. After about 2 weeks, she was taken off her feeding tube and became ambulatory with minimal residual paresis and

Figure 3 Placement of guiding catheter in left aberrant common carotid artery.

Figure 4 Left external carotid angiogram showing tumour blush.

dysarthria. PredischARGE CT arch angiography confirmed a type 2 right aortic arch configuration (figures 7 and 8). Histopathological examination revealed a WHO grade 2 meningioma.

DISCUSSION

Right aortic arch configuration is reported to occur in around 0.1% of population. It was first reported by Fioratti and Aglietti in the year 1763.¹ The right aortic arch has been classified into three subtypes based on their morphology and embryonic origin.² In type 1, or the mirror image arch, the three major arteries arising out of the aorta, in order, are, the left innominate artery, followed by the right common carotid and the right subclavian.^{3,4} Type 2 right aortic arch is found with aberrant left

Figure 5 Selective microcatheter injection pre-embolisation.

Figure 6 Selective microcatheter injection postembolisation.

subclavian artery in association with Kommerell's diverticulum as evidenced in the present case. In type 3, the left subclavian artery is isolated and does not attach to the aorta. Only about 2% of right arch are of type 3 variety.⁵ Type 2 arch is related to the persistence of the embryonic right fourth arch and regression of the left fourth arch between the left common carotid and the left subclavian artery.^{4 6 7} However, most of these arch types are asymptomatic and has been brought to medical attention due to coincidental changes of atherosclerosis, dissection or pressure symptoms on adjacent structures.

In most of the reported cases, the presence of such an arch variation is suspected due to presence of different symptoms like

Figure 8 CT arch angiography showing right aortic arch: posteroanterior view.

dyspnoea or dysphagia or picked up as a chance radiological finding. However, in the present scenario, it was encountered during an attempted invasive procedure raising some relevant clinical issues. Most of the neurointerventionists would not be prepared to face such an arch variation and thus might not be ready with the requisite hardware to negotiate them. It also increases significantly the procedural time and adds to the radiation exposure and risk of iatrogenic complications. However, when faced with such complex cases, a few points might be helpful. We should always keep in mind this unusual arch variation when the catheter does not follow the usual left arch configuration. Arch angiography when attempted should preferably be done at a lower level, raising better chances of proper arch delineation.

Learning points

- ▶ Right aortic arch is an uncommon and potentially difficult to navigate arch configuration.
- ▶ Unexpected course of catheter placement might be the first pointer towards this variant.
- ▶ Arch angiography in such cases should be tried with a lowly placed catheter to better delineate the anatomy.
- ▶ Complex catheters are usually required for effective navigation.

Contributors DD: the corresponding author, an interventional neurologist, has performed the embolisation procedure and has written the case report and collected data. RK has performed neurosurgical removal of the meningioma. SB is a radiologist who has been involved in performing diagnostic radiology for this patient.

Competing interests None declared.

Patient consent Obtained.

Provenance and peer review Not commissioned; externally peer reviewed.

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Figure 7 CT arch angiography showing right aortic arch: anteroposterior view.

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