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Case report

A rare case of positional changes of carotid artery depicted within a single MR study and a wandering carotid artery depicted on a serial MR studies ☆

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ABSTRACT

The retropharyngeal carotid artery (RCA) is a relatively rare anatomical malposition, and positional changes in the RCA is also extremely rare. In addition, there are some reports of "wandering carotid artery" which means that the carotid artery reciprocate positional changes (wandering) between its normal position and retropharyngeal regions, during follow-up evaluations. A male patient in his 50s with a chief complaint of globus pharyngeus. A pulsatile swelling of the posterior pharyngeal wall of the right side was found on clinical examination. In this case, the right carotid artery showed the clinical course of a wandering carotid artery, which reciprocated between its normal position and the retropharyngeal space during three serial MR investigations. Interestingly, both the most recent MR study and the MR study performed 4 years ago showed that the carotid artery at the level of the hyoid bone moved laterally (positional normalization) during the single MR investigation. This is a first case which showed a rare clinical course of a wandering carotid artery on serial follow-up MR studies and positional changes of carotid artery within a single MR study. It is important for clinicians to be aware of these phenomena, in order to avoid fatal and unexpected complications during clinical procedures.

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Introduction

The retropharyngeal carotid artery (RCA) is a relatively rare anatomical malposition, and positional changes in the RCA is also extremely rare [1,2]. These anatomical variations could cause fatal complications during biopsies and surgeries of the head and neck region, including the pharynx, and should be known by all clinicians. Several case studies reported that the position of the carotid artery changed from its normal position to the retropharyngeal space (RPS) or vice versa [1,2,3]. In addition, there are some reports of "wandering carotid artery" which means that the carotid artery reciprocate positional changes (wandering) between its normal position and retropharyngeal regions, during follow-up evaluations [4,5]. This is a first case which showed a rare clinical course of a wandering carotid artery on serial follow-up MR studies and positional changes of carotid artery within a single MR study.

Case presentation

A male patient in his 50s who presented himself with a chief complaint of globus pharyngeus, 4 years ago. A pulsatile swelling on the right posterior pharyngeal wall was found on clinical examination. The patient underwent MRI which depicted RCA. His past medical history was unremarkable. The patient then underwent 2 follow-up MR studies, with intervals of 2 years. The most recent follow-up MR study, that was taken 4 years after the first MR investigation, depicted right RCA at suprahyoid bone and at hyoid bone level on TOF-MRA at the beginning of the scan. However, the T2-weighted image obtained 6 minutes later and the MR-DSA image obtained 20 minutes later showed that the common carotid artery at the level of hyoid bone had moved laterally (normalized), without any displacement of the internal carotid artery at the suprahyoid bone level (Fig. 1). Retrospective evaluation of MR study taken 2 years ago revealed that the carotid artery at both suprahyoid bone and hyoid bone level was displaced medially (RCA) without any positional changes during the investigation (Fig. 2). Retrospective evaluation of MR study taken 4 years ago revealed that the carotid artery at the level of suprahyoid bone and the hyoid bone had displaced medially (RCA) on the T2-weighted axial image obtained at the beginning of the scan, which had moved laterally at the level of the hyoid bone as shown on the TOF-MRA, which was obtained 10 minutes later (Fig. 3).

Discussion

In this case, the right carotid artery showed the clinical course of a wandering carotid artery, which reciprocated between its normal position and the retropharyngeal space during three serial MR investigations. Interestingly, both the most recent MR study and the MR study performed 4 years ago showed that the carotid artery at the level of the hyoid bone moved laterally (positional normalization) during the single MR in-

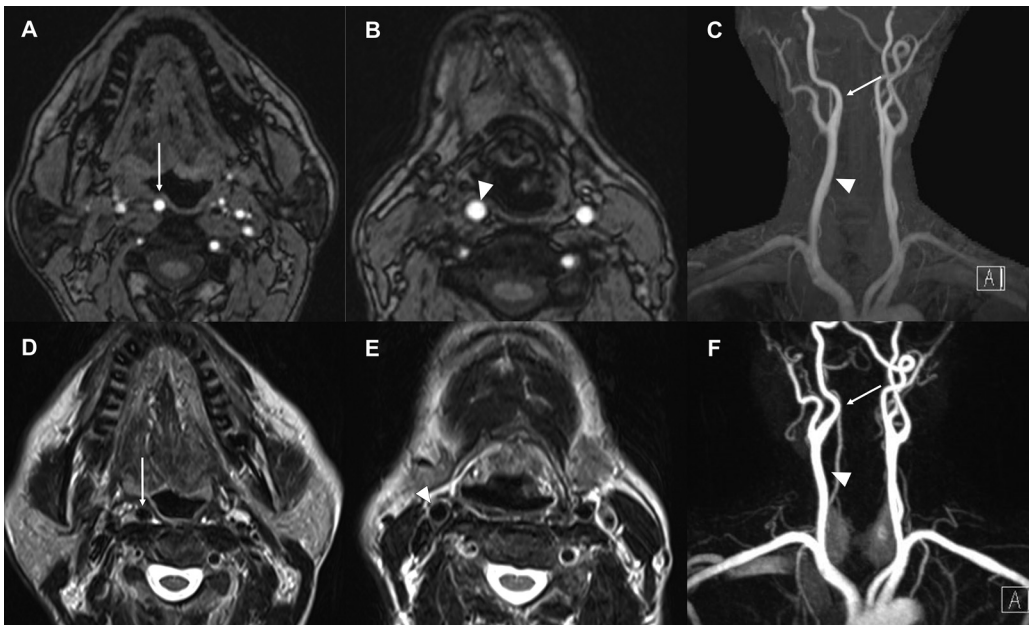

Fig. 1 – Most recent MR study (4 y after the first MR study). Original 3D TOF MRA images at the level of suprahyoid bone (A), at the level of hyoid bone (B), and 3D TOF MRA MIP images (C), which were taken at the beginning of MR study, showed that the right internal carotid artery (arrow) and the right common carotid artery (arrowhead) were displaced medially. T2-weighted axial image at the level of the suprahyoid bone taken 6 minutes after the first sequence, showed that the right internal carotid artery (arrow) remained unchanged, whereas T2-weighted axial image at the level of the hyoid bone (E) showed that the right common carotid artery (arrowhead) had moved laterally to its normal position. In the MR-DSA MIP image (F) taken 20 min after the first sequence, the right internal carotid artery (arrow) is located medially and the right common carotid artery (arrowhead) is located laterally, which coincide with the findings of T2-weighted images (D, E).

Fig. 2 – MR study taken 2 y ago. 3D TOF MRA MIP image showed that the right internal carotid artery (arrow) and right common carotid artery (arrowhead) were displaced medially. The position was the same in all sequences.

vestigation. There has not been a previous report of carotid migration during a single MR investigation.

RCA was first reported as an anatomical variant in 1925 [6]. This anatomical variant is seen as medialization of unilateral or bilateral carotid arteries to the RPS, with a prevalence of 2.6~15.5% [3,7]. Congenital factors, age-related changes, arteriosclerosis, hypertension, and being female have been considered as probable causes [3,8]. This variant is clinically important because of the risk of bleeding and injury during surgical operations such as palatine tonsillectomy, adenoidectomy, peritonsillar abscess drainage, transoral tumor resection, and glossopharyngeal nerve block in the transoral approach [6,9]. Especially in this case, a positional change of the carotid artery was observed within a single MR study. During MRI, patients are in the supine position for relatively long periods of time (at least 15 minutes). Therefore, when performing surgical procedures that require relatively long time in the supine position of the patients, the potential complications caused by this phenomenon should be carefully noted.

There have been 8 cases of carotid artery position changes reported so far [1–5]. The incidence of positional changes of carotid artery in RCA is estimated to be 6.3% [3]. Some causes of this positional changes are speculated to include atherosclerosis, gender (female), hypertension, advanced age, vascular tortuosity [5], inadequacy of the carotid sheath fascia [1,4,5], respiratory movement [1], swallowing [2], neck extension during scanning [5], decreased carotid artery tension and increased body mass index [5]. However, there is not enough evidence for any of these factors, and the detailed pathogenesis is remains unknown.

Wandering carotid artery is a rare condition in which reciprocal positional changes of carotid artery is observed on serial contrast-enhanced CT examinations, with only three previous cases including this case [4,5]. In our case, the right common carotid artery moved between medial and lateral (normal) position on three MR studies, and was considered as a

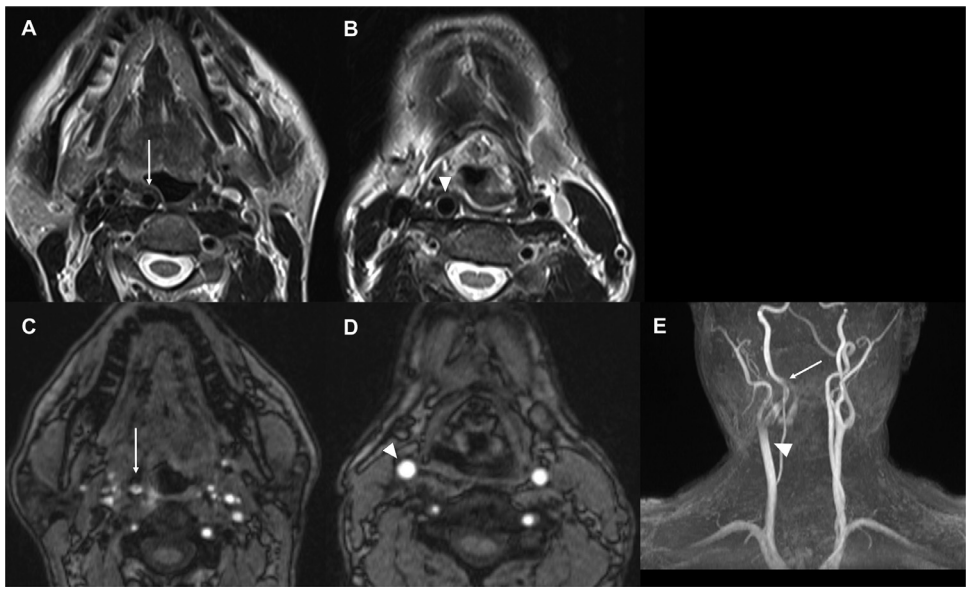

Fig. 3 – MR study taken 4 y ago. The right internal carotid artery (arrow) and the right common carotid artery (arrowhead) were displaced medially in the T2-weighted axial images at the level of the suprahyoid bone (A) and the level of the hyoid bone (B) that were obtained at the beginning of the MR study. Original 3D TOF MRA image at the level of the suprahyoid bone (C) obtained 10 min after the first sequence showed that the right internal carotid artery (arrow) remained unchanged with its medial position, whereas the original 3D TOF MRA image at the level of the hyoid bone (D) and 3D TOF MRA MIP images (E) showed that the common carotid artery (arrowhead) had shifted laterally and returned to its normal position.

wandering carotid artery. The detailed cause of this condition has not been clarified. Previous reported cases were confirmed by serial CT scans, but this case was confirmed by MR studies, suggesting that it is not affected by the imaging modality.

In this case, the carotid artery moved its position from RPS to the lateral (normal) position within a single MR study. However, this case was a male patient, with unremarkable medical history and a normal body mass index, and his neck was fixed in a normal supine position during the MR scan, which is inconsistent with the previously mentioned confounding factors. There is a possibility that this phenomenon is caused by the gravitational force of larynx pushing the carotid artery laterally, when maintaining supine position of the neck. Nonetheless, the definitive cause of this phenomenon remains unconfirmed. In the eight cases reported so far, positional change was confirmed at the level from the hyoid bone to the suprahyoid bone [1–5], which is consistent with our case. It has been previously suggested that the position of the hyoid bone may be related to changes in the position of the carotid artery [1]. These phenomena might be related to changes in the position of the hyoid bone and the carotid artery, which are moved by the contraction of the pharynx when swallowing saliva. The anatomical features of the common carotid artery below the hyoid bone and the internal carotid artery above the hyoid bone, as well as the inconsistency of the strength of the connective tissue around the internal carotid artery may also contribute to this phenomenon. Nevertheless, there have been no previous report of positional changes of carotid artery within a same imaging examination, therefore this case represents an extremely valuable finding that allows visualization of a relatively swift positional changes of carotid artery by a MR study. In order to clarify the cause of this condition, it is necessary to accumulate more cases in the future.

Conclusion

We described a first case of a carotid artery that moved laterally (positional normalization) at the level of the hyoid bone during a single MR study. The present case also showed a very rare course of wandering carotid artery. Since there is not enough evidence to explain the cause of this positional change, further accumulation of cases is required. It is important for clinicians to be aware of these phenomena in order to avoid fatal and unexpected complications during surgical procedures.

Patient consent

Patient consent was obtained from the patient.

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