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The omohyoid muscle entrapment of the internal jugular vein. A still unclear pathogenetic mechanism

Sergio Giancesini¹, Erica Menegatti¹, Francesco Mascoli²,
 Fabrizio Salvi³, Stefano Bastianello⁴ and Paolo Zamboni¹

Abstract

Objectives: To evaluate the role of the omohyoid muscle anatomic variants as a possible reversible cause of internal jugular vein extrinsic compression.

Method: We describe a chronic cerebro-spinal venous insufficiency patient, who presented a omohyoid muscle entrapment of the internal jugular vein, confirmed by both magnetic resonance venography and ultrasound investigation. A omohyoid muscle surgical transection together with a patch angioplasty was performed.

Results: The surgical procedure led to both IJV flow restoration and neurological improvement.

Conclusions: The omohyoid muscle compression on the internal jugular vein seems to be a possible cause of venous obstruction, but several anatomical and patho-physiological aspects need further investigations. Such picture might cause balloon venous angioplasty inefficacy and needs to be preoperatively considered.

Keywords

Omohyoid muscle, jugular entrapment, chronic cerebro-spinal venous insufficiency

Background

Chronic cerebro-spinal venous insufficiency (CCSVI) is mainly linked to intraluminal defects.¹ The therapeutic approach is based on the percutaneous angioplasty (PTA).²

Nevertheless, the PTA recurrences present high rates for unexplained reasons.^{1,2}

External compressions of the internal jugular vein (IJV) by aberrant muscular elements were already reported.³

We report a case of IJV entrapment by the OM in a multiple sclerosis (MS) patient, who underwent a magnetic resonance venography assessment to find correspondence with the echo-color-Doppler (ECD) findings.

Case report

A 41-year-old-woman, diagnosed with relapsing-remitting MS, underwent ECD and phlebographic evaluation three years ago.

The pre-assessment disability score (EDSS) was 3.

The investigation revealed a CCSVI-related left IJV stenosis, associated with an ECD detectable blocked

outflow and linked to an M-mode evident fixed valve apparatus.

A PTA was performed leading to an effective IJV widening at six-month follow up. At the same time the EDSS decreased to two and the patient referred a clinical improvement of the pre-assessment reported paresthesia and fatigue.

At one-year follow up the EDSS recurred to three and the patient reported recurrent fatigue for some months.

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Further investigation revealed a CCSVI-related left IJV tandem obstruction. At mid cervical level B-mode demonstrated an IJV obstruction mirrored by the MRV imaging, both demonstrating a tip pencil sign (Figure 1). The ECD assessment highlighted a left IJV dynamic flow obstacle caused by an extrinsic compression, constantly relieved at the time of the patient yawning (Figure 2).

At caudal level an ECD-detectable blocked outflow was demonstrated (Figure 1). The flow abnormality

was linked to an M-mode evident fixed valve leaflet (Figure 2).

Considering a further PTA pointless, an open surgical access was placed. The macroscopic evidence of the extrinsic stricture, caused by a fibrotic and short OM intermediate tendon on the IJV, led to the surgical transection of the two muscular bellies.

In addition, endophlebectomy of the terminal IJV permitted to remove the fibrotic septum. The procedure

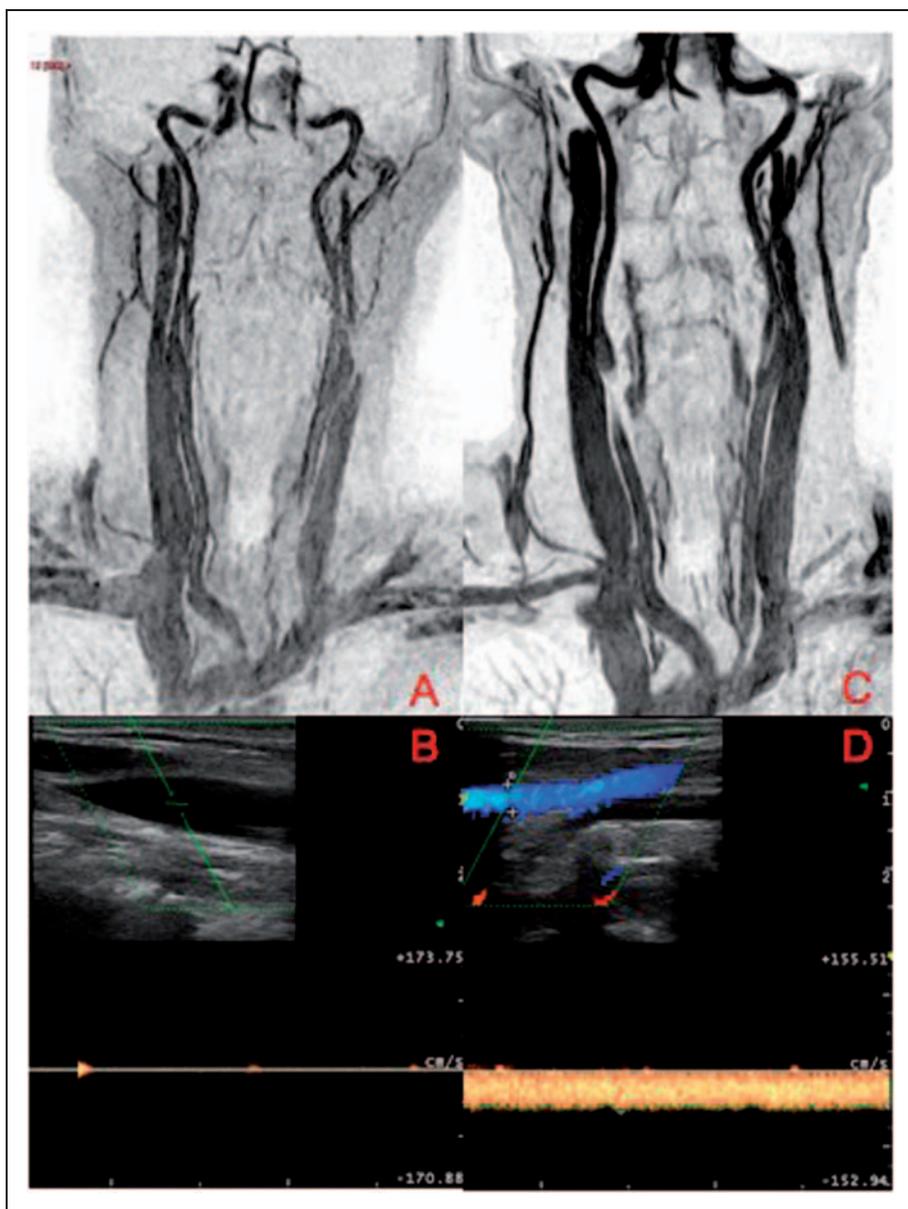


Figure 1. (A) Preoperative tip pencil sign at MRV investigation demonstrating an extrinsic obstruction of the IJV at mid cervical level. (B) Duplex demonstrating either the tip pencil sign in B-mode, or the absence of flow at PW Doppler. (C) Postoperative repair of the IJV demonstrated at one year MRV. (D) Triplex demonstrating the flow recovery in the IJV at one year. Doppler flow was assessed at 300 ml/min.

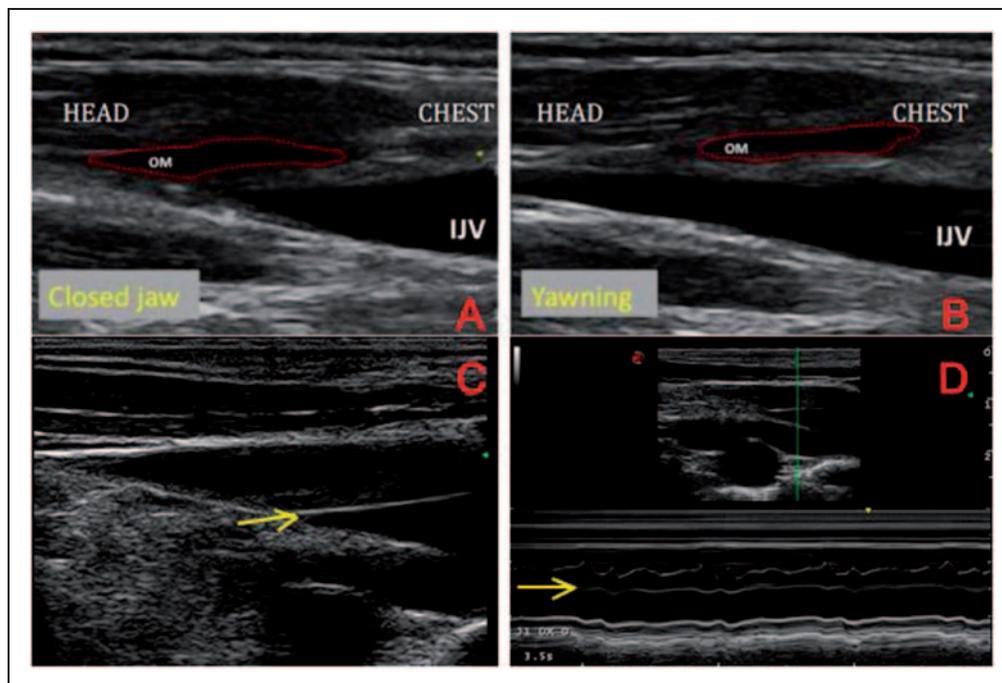


Figure 2. Tandem obstructive lesion of the IJV determined by muscular compression at mid-cervical level plus abnormal valve apparatus at the junction level. (A) Omohyoid muscle (OM) compression on the internal jugular vein (IJV) during patient's jaw closed positioning and (B) IJV widening during yawning. (C) High-resolution B-mode imaging of a hyper-echogenic leaflet at the level of the IJV junction valve. (D) M-mode demonstrating that the lower leaflet of the IJV valve is not mobile, whereas the upper leaflet is fluctuating. The lumen is never opened to the flow.

was completed by a patch angioplasty in autologous great saphenous vein.

The patient well tolerated the procedure and neither major nor minor complications were reported.

At two years' follow up after the surgical operation, the ECD assessment detected a persistent and mono-directional physiologic IJV flow, which moved from the pre-operative absence to the post-procedural 300 ml/min (Figure 1).

The neurologist scored an EDSS value of 1 and did not report any other MS relapses. The patient self-reported absence of paresthesia and chronic fatigue.

Discussion

The possible pathogenetic role of muscular compression in determining a clinically significant IJV obstruction is still controversial and open in literature.³

ECD permits to verify that closing the jaw increases this external compression. At the same time ECD demonstrates how a prolonged yawning can restore the lumen patency, so suggesting a possible open procedure to re-establish the brain venous outflow.⁴

Subsequently, this observation was confirmed by Simka.⁵

Both in our case report and in Simka's one,⁵ the OM contraction (yawning and opening the mouth,

respectively), which means an IJV compression, led to an unexpected vein widening. In addition, in our patient we documented collateral circles activation, not yet observed in the Simka's case.⁵

Different from previous reports, the ultrasound finding was confirmed by MRV (Figure 1).

Surely these reports highlight the importance of an accurate ECD evaluation before proceeding with a potentially pointless PTA.

The hemodynamic resolution after the surgical muscular transection opens new questions:

- In case of anatomical variants (intermediate tendon shortening and/or hypotrophy) does the OM contraction cause a sliding effect of the muscle itself over the IJV, so freeing the vessel from its constriction?
- Is the dynamic nature of the occlusion a possible explanation for the collateral circles lack?
- Which are the OM echographic landmarks?
- Should we define new real-time sonographic manoeuvres to detect dynamic flow obstacles?
- Should the CCSVI assessment protocols include also the MRV in specific cases?
- Which is the hemodynamic impact of intraluminal defects in forcing the eventually present extrinsic compressions?

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Conflicts of interest statement

The authors declare that there are no conflicts of interest.

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