Successful retrograde recanalization of internal jugular vein passing from omolateral external jugular vein

Tommaso Lupattelli,[1] Paolo Onorati,[1,2] Giovanni Bellagamba,[1] Ginevra Toma[1,2]

[1]Interventional Radiology Unit, Istituto Clinico e Cardiologico, GVM Sanità, Roma; [2]Department of Physiology and Pharmacology, University of Rome La Sapienza, Roma, Italy

Abstract

Severe stenosis and/or thrombosis of the internal jugular vein could be managed through a novel technique herein reported. Recanalization can be achieved passing through the omolateral external jugular vein.

Case Report

We report a case of a 46-year-old female patient who presented to our hospital with severe migraine and recurrent spontaneous attack of dizziness. She underwent clinical examination followed by brain MR. A moderate stenosis of the right left internal jugular vein (IJV) at the vein outlet and an high grade stenosis of the left IJV at J1 were seen at colour Doppler ultrasound. Following local anesteshia at the left groin, a femoral vein access using a 10 F, 20 cm long introducer sheath (Cordis, USA) was obtained. A 5 F, 120 cm long Multipurpose catheter (Boston Scientific, Watertown, MA, USA) was then advanced within the left anonimous vein. Unfortunately, several attempts at catheterizing the left internal JV in the anterograde fashion by using eithera 0.0035, 180 cm long hydrophilic guidewire (Radiofocus, Terumo, Watertown, Ma, USA) and two different highly flexible tipped, 0.014 guidewires (PT Graphix, Boston Scientific, Watertown, MA, USA). Choice PT, Boston Sientific, Watertown, MA, USA) were unsuccessful. We decided to place the Multipurpose catheter in the left external JV with subsequent selective phlebography which showed opacification of the proximal segment of the internal JV from a collateral of an enlarged thiroidal vein (Figure 1).

Further attempts at recanalization of the internal JV were made from the external JV using a 0.0035, 260 cm long, hydrophilic guidewire (Radiofocus, Terumo, Watertown, Ma, Usa) and a 5 F, 0.035 Berenstain catheter (Boston Scientific, Watertown, MA, Usa). Finally, retrograde crossing of the internal occlusion was obtained (Figure 2A) with subsequent snaring of the guidewire tip in the vena cava by means of a 6 F snare catheter (Goosneck, EV3, USA) inserted from the right femoral vein (Figure 2B). After retrieval of the guidewire tip out of the right femoral introducer sheath (Figure 3), 2500 unit of heparin were administered intravenously and a 0.035, 5x40 mm ordinary balloon (Evercross, EV3, USA) was inserted over the retrivied guidewire and advanced up to the left internal JV occlusion. Vein pre-dilation was then performed for 90 seconds with a pressure rate up to 10 atmosphere followed by stronger and larger dilation using a 0.035, 14x20 mm high pressure balloon (Atlas gold, Bard, Usa) (Figure 4). The high-pressure balloon was kept inflated for 60 second reaching a maximum pressure of 26 atmospheres, then progressively deflated and kept in place for further 180 seconds at a pressure of 2 atmospheres only. Confirmation phlebography showed complete recanalization of the left IJV with no evidence of IJV contrast extravasation (Figure 5). Also, evidence of a short clearance time of the contrast dye was noted. Procedure time and fluoroscopy time were 50 and 31 minutes, respectively. Neither complications nor contrast vein extravasation from the internal JV were observed at the end of the procedure.

Discussion and Conclusions

Percutaneous transluminal angioplasty (PTA) is a well-established method to reopeninternal jugular veins. Since Zamboni *et al.* described chronic cerebro-spinal venous insufficiency in 2007, several series have been published in the scientific literature reporting balloon dilatation of these vessels.[1-6] Particularly, a series of 1202 patients treated in one or both IJV with PTA alone was reported by an Italian group in 2013, whereas three further studies on feasibility and safety were reported by an American, Polish and Bulgarian group, respectively. All these studies concluded that IJV PTA is safe, provided it is performed by well-trained interventional radiologists or endovascular surgeons. Studies on IJV PTA have also been published reporting clinical outcome as well as restenosis rate.[7-14] The challenges of catheter advancement through an high grade stenosis are *legendary* and well known. An anterograde approach to such a stenosis may often result extremely difficult and for this reason this kind of lesions are not rarely mistaken for total occlusions or chronic thromboses as well. The catheter-guidewire system is moving from a large cylinder through a *pinhole* and, most of the time, lesion crossing may be tremendously demanding and time consuming. A retrograde approach to the IJV allowed us to advance the guidewire from the upper internal jugular vein up to the innominate vein using a *facilitated pathway* even though trackability and, most of all, pushability of the whole system resulted much reduced. However the use of a 0.035 hydrophilic wire combined with a 6 F catheter may give the required support to advanced the tip wire up to the stenosis and, finally, cross it out. Another possible option in such difficult vein recanalizations was to perform a retrograde puncture of the more distal jugular vein in the neck. However, to the present authors, minimally invasive maneuvers, as we did in the present case, should be ever preferred with the aim to avoid potential unfavourable damage of the target vessel. Dealing with tight IJV stenosis may also represent a problem for balloon catheter selection. Opposite to carotid arteries, which are normally dilated by using a 5 mm ordinary balloon, internal jugular veins may present with a wide range of calibers, thus requiring careful choice of the balloon size to be employed. From a technical point of view, ordinary balloons are often not capable to completely dilate a highly stenosed jugular vein either for the limited pressure they can reach (14 atmospheres at the most) either for the limited sizes currently avail-

Correspondence: Tommaso Lupattelli, Interventional Radiology Unit, Istituto Clinico Cardiologico, via Alessandro Magno 386, 00124 Roma, Italy.
Tel.: +39.06.50173411.
E-mail: lupattelli@gmail.com

Key words: Angioplasty; internal jugular vein; recanalization; vein stenosis; CCSVI.

Received for publication: 7 August 2018.
Revision received: 29 November 2018.
Accepted for publication: 4 December 2018.

Veins and Lymphatics 2018; 7:7745
doi:10.4081/vl.2018.7745

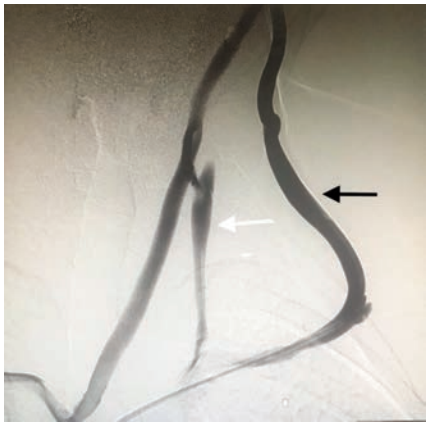
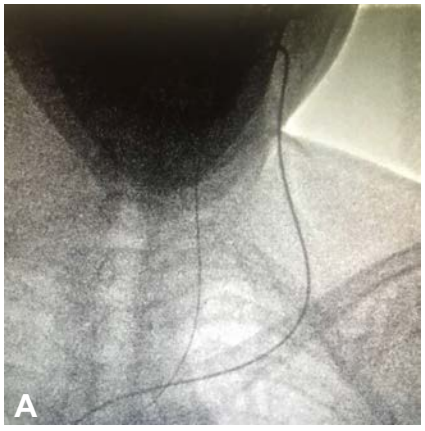


Figure 1. Selective phlebography performed with a 5 F multipurpose catheter placed in the external JV (black arrow) shows retrograde filling of the proximal portion of the internal jugular vein (white arrow).



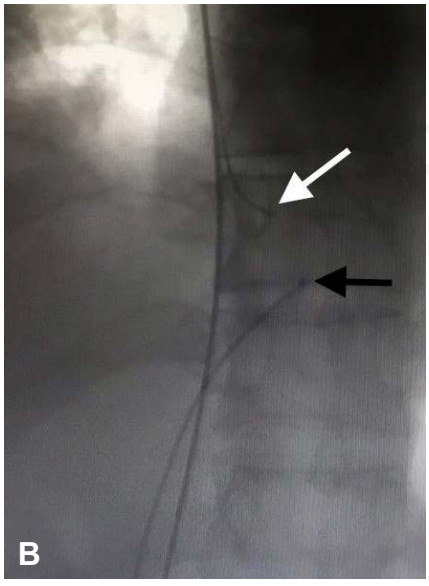


Figure 2. A) Retrograde recanalization of the internal JV using a 260 long, 0.035 hydrophilic guidewire. B) Evidence of a snare device (black arrow) and guidewire tip (white arrow) at the level of inferior vena cava following retrograde internal JV recanalization.

Figure 3. Hydrophilic guidewire tip out the 5 F right introducer sheath.

Figure 4. Ballon angioplasty of the internal JV using a 0.035, 14x20 mm high-pressure balloon.

Figure 5. Confirmation phlebography shows complete recanalization of the left internal JV.

able in the market. For this reason, IJVs are often treated using high-pressure balloons, which can reach up to 30 atmospheres as well as a diameter of 26 mm. However, in certain cases, like in the one we presently report, a combination of ordinary balloons and high pressure balloons can be strongly suggested. Indeed, in our patient we performed a pre-dilation of the occluded IJV using a 5 mm ordinary balloon (with the aim of opening a well defined channel troughout the vein stenosis) in order to allow subsequent advancement of an high pressure balloon up to the target. Unfortunately, high pressure balloons, particularly when they are bigger than 10 mm in size, carry limited trackability and crossability, thus preventing them from overcoming, at times, very tight stenoses or occlusions.[11] For this reason in such cases, a previous use of a smaller ordinary balloon with better crossing profile is often mandatory. Finally, following complete vein reopening, prolonged balloon dilation by using the same high-pressure balloon progressively deflated down to 2 atmospheres is highly reccomended, especially when dealing with very resistent and chronic occlusions. Indeed, given that high pressure PTAs may easily lead to one or even multiple transient tears in the vessel wall, low-pressure balloon inflation may prevent the occurrance of contrast extravasation from the IJV immediately after dilatation.

References

1. Zamboni P. The big idea: iron-dependent inflammation in venous disease and proposed parallels in multiple sclerosis. J R Soc Med 2006;99:589-93.
2. Zamboni P, Galeotti R, Menegatti E, et al. Chronic cerebrospinal venous insufficiency in patients with multiple sclerosis. J Neurol Neurosurg Psychiatry 2009;80:392-9.
3 Zamboni P, Consorti G, Galeotti R, et al. Venous collateral circulation of the extracranial cerebrospinal outflow routes. Curr Neurovasc Res 2009;6:204-12.
4. Bartolomei I, Salvi F, Galeotti R, et al. Hemodynamic pattern of chronic cerebrospinal venous insufficiency in multiple sclerosis. Correlation with symptoms at onset and clinical course. Int Angiol 2010;29:183-8.
5. Zamboni P, Galeotti R, Menegatti E, et al. A prospective open-label study of endovascular treatment of chronic cerebrospinal venous insufficiency. J Vasc Surg 2009;50:1348-58.

6. Zamboni P, How to objectively assess jugular primary venous obstruction. Veins and Lymphatics 2014;3:3.
7. Lupattelli T, Bellagamba G, Righi E, et al. Feasibility and safety of endovascular treatment for chronic cerebrospinal venous insufficiency in patients with multiple sclerosis. J Vasc Surg 2013;58:1609-18.
8. Ludyga T, Kazibudzki M, Simka M, et al. Endovascular treatment for chronic cerebrospinal venous insufficiency: is the procedure safe? Phlebology 2010;25:286-95.
9. Mandato KD, Hegener PF, Siskin GP, et al. Safety of endovascular treatment of chronic cerebrospinal venous insufficiency: a report of patients with multiple sclerosis. J Vasc Interv Radiol 2012;23:55-9.
10. Petrov I, Grozdinski L, Kaninski G, et al. Safety profile ofendovascular treatment for chronic cerebrospinal venous insufficiency in patients with multiple sclerosis. J Endovasc Ther 2011;18: 314-23.
11. Aftab SA, Tay KH, Irani FG, et al. Randomized clinical trial of cutting balloon angioplasty versus high-pressure balloon angioplasty in hemodialysis arteriovenous fistula stenosis resistant to conventional balloon angioplasty J Vasc Interv Radiol 2014;25:190-8.
12. Zamboni P, Zivadinov R. Extracranial veins in multiple sclerosis: is there a role for vascular surgery? Eur J Vasc Endovasc Surg 2018;56:618-21.
13. Zamboni P, Tesio L, Galimberti S, et al. Efficacy and safety of extracranial vein angioplasty in multiple sclerosis: a randomized clinical trial. JAMA Neurol 2018;75:35-43.
14. Juurlink B, Bavera P, Sclafani S, et al. Brave Dreams: An overestimated study, crippled by recruitment failure and misleading conclusions. Veins and Lymphatics 2018;7:2.