Onyx embolization

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Ethylene vinyl alcohol copolymer in dimethyl sulfoxide (Onyx, eV3 Inc.) was introduced and approved several years ago for the preoperative embolization of parenchymal arteriovenous malformations (AVMs). This newer embolic material has since been utilized to treat a variety of other intra- and extracranial lesions, including tumors. The rationale for extending the use of Onyx to lesions other than AVMs and fistulas is often dubious and at times driven by urges to quickly expand indications for new and "fancy" materials.

In the Journal of Neurosurgery, Gaynor and colleagues describe their experience with Onyx embolization in 11 patients with glomus jugulare tumors treated between 2006 and 2012.4 In other reports,1–3 these authors have already detailed their technique and the results of tumor embolization with Onyx, and the specific report that follows this editorial, as they recognize, is not the first account of Onyx embolization for these tumors. However, the significance of this report is to alert physicians to the potential pitfalls and serious dangers of Onyx when used for such tumors. Two (18%) of their 11 patients suffered severe and permanent cranial nerve complications from preoperative tumor embolization, before any surgical manipulation has even started, is too high a price to pay and not justified by the theoretical benefits of the agent in question.2,10 The use of Onyx for embolizing tumors of any kind is difficult to justify given that the advantages of Onyx over more traditional embolic agents for this indication are only theoretical, whereas the risks are real and potentially serious.

Preoperative tumor embolization may indeed facilitate surgery in selected cases, although its value has not been convincingly proven.5,11 Onyx embolization of tumors, especially glomus jugulare tumors, definitely carries significant, increased costs (both financial and in terms of potentially serious complications) compared with cheaper and safer (when properly utilized) more traditional embolic materials (that is, polyvinyl alcohol [PVA]). Because of its characteristics, Onyx, as a liquid embolic agent, easily penetrates (through either antegrade flow or retrograde reflux) the smallest branches, which provide blood supply to cranial nerves or which are part of “dangerous” anastomosis.4 This can happen, as was the case in the present series, even when the formal postembolization angiography does not “demonstrate” any migration of material beyond the intended target, as the ability to visualize Onyx in these tiny branches may be beyond the resolution of modern angiography.

We commend the authors for bringing this issue to our attention in an eloquent fashion. We hope that their report will serve as a major cautionary note to halt the use of Onyx for preoperative tumor embolization, especially in situations in which other established materials can be used to reduce blood supply to different types of tumors. Extensive experience with particles and PVA in particular has shown us that safe tumor devascularization can be achieved with the use of larger particles (> 150 μm in diameter). Our group, as correctly referenced by Gaynor et al., reported embolization of a large number of glomus tumors using PVA without any permanent complications.12 Unfortunately, since the technique applied in that report involved very “boring,” cheap, and “old-fashioned” PVA particles, we were only able to publish it in a low-impact journal that has since been discontinued.

Glomus jugulare tumors represent challenging lesions, and cranial nerve morbidity is the main complication in modern microsurgery series.9 A substantial rate of severe permanent cranial nerve morbidity due to preoperative embolization, before any surgical manipulation has even started, is too high a price to pay and not justified by the theoretical benefits of the agent in question.

(See the corresponding article in this issue, pp 377–381.)
Disclosure

The authors report no conflict of interest.

References


Response

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We thank Dr. Lanzino and colleagues for their thoughtful and careful analysis of our work. We agree that our paper was intended to serve as a cautionary note, although previous publications, including our own, have touted the versatility and safety of Onyx embolization. Indeed, it was disappointing and unexpected to observe a high rate of major complications in our modest series despite the fact that the Onyx cast remained within the confines of the tumor parenchyma in each case. The ability of Onyx to achieve vascular penetration requires caution and respect, as it can migrate into small but important vasa nervosa, which are below angiographic resolution. As the authors noted, our 2 cases of cranial nerve palsy occurred late in our series and therefore are probably not attributable to operator inexperience or learning curve.

We agree with Dr. Lanzino et al. that based on the high complication rate in our current study and the safe track record of PVA, embolization with Onyx is not justified in glomus jugulare tumors.6–8 However, we do not believe that the results of our study support abandoning Onyx embolization for all tumors. We have reported excellent angiographic devascularization without complications using Onyx for carotid body tumors, glomus vagale tumors, and nasopharyngeal angiofibromas.6–8 We believe that in such tumors, in which there is less overlapping blood supply with critical structures, embolization with Onyx may have some advantages over PVA. In our experience, embolization with PVA is more time consuming, requires a higher overall contrast load given PVA’s radiolucency, and generally results in a lower degree of devascularization compared with Onyx. A clinical benefit that justifies the higher cost of Onyx remains to be seen.

In conclusion, the proximity of and the frequently shared blood supply between glomus jugulare tumors and the lower cranial nerves may contribute to a high incidence of cranial neuropathy following Onyx embolization. However, Onyx continues to be a valuable tool in our embolic armamentarium. We hope that our readership will avoid the pitfalls that we have experienced. Again, we thank Lanzino and colleagues for their kind and thorough review of our paper.

References


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