Supplementary

Response to "The use of N-butyl cyanoacrylate for embolization of bleeding patients must be demystified regardless of the operator experience"

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First, we would like to sincerely thank Professor Loffroy for his careful reading of our study on the role of N-butyl cyanoacrylate (NBCA) in emergency embolization, published in *Quantitative Imaging in Medicine and Surgery*, as well as for his insightful comments (1,2). His long-standing expertise in this field brings valuable perspective to the ongoing discussion about the optimal use of NBCA, an embolic agent that still inspires both enthusiasm and hesitation within the interventional radiology (IR) community.

Despite its well-recognized efficacy, NBCA remains underused in daily practice, largely because of its enduring reputation as a "dangerous" or "difficult" material to handle. This perception explains why many IRs continue to favor coils or particles. As Professor Loffroy rightly emphasized, this reputation is largely unjustified when NBCA is correctly prepared and delivered.

We made the choice to familiarize our team with NBCA at an early stage, specifically for hemostatic embolization. From this experience, we have drawn the following lessons:

(I) NBCA is not more dangerous than other embolic agents, and is probably more effective (2);

(II) When the target artery cannot be reached due to arterial tortuosity, NBCA remains the only reliable embolic agent (3);

(III) NBCA, either alone or in combination with coils, should be recommended for the treatment of gastroduodenal peptic ulcer hemorrhage with active bleeding, in order to achieve distal embolization and prevent early recurrence from the pancreaticoduodenal arcades (4);

(IV) NBCA is the most effective embolic agent for percutaneous image-guided embolization of pseudoaneurysms, either as a first-line option or after endovascular technical failure (5,6).

We fully share Professor Loffroy's view on the essential role of supervision and training. NBCA should be introduced at the very beginning of emergency embolization practice under senior guidance. Early familiarization with preparation, and slow injection allow trainees to gain confidence and acquire the technical skills and procedural reflexes needed for safe and effective use in emergency settings.

Another important point concerns NBCA dilution. The NBCA/Lipiodol ratio must always be adapted to the clinical scenario. In high-flow arteries, a low-dilution mixture may be preferable to promote rapid polymerization and avoid non-target embolization. When the bleeding point is close to the microcatheter tip, particularly in low-flow or terminal arteries, a small volume of glue, at any dilution, may be sufficient, combining efficacy with safety. We also fully agree that when the target artery cannot be reached, a high dilution (≤1/3) should be prepared. This adaptation of dilution strategy to anatomy and hemodynamics is one of the most interesting aspects of NBCA embolization and should be systematically taught to trainees. Finally, we advise against using the 'sandwich' technique (dextrose-NBCA/Lipiodol mixture-dextrose), as it promotes non-target embolization and reduces the efficacy of glue.

In conclusion, we would like to once again thank Professor Loffroy for his constructive remarks and his support for the broader adoption of NBCA. The barriers limiting its use are psychological rather than technical. By standardizing its teaching and ensuring supervised training, NBCA can become a routine tool in emergency embolization. Democratizing the use of NBCA is not only

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desirable but also imperative to ensure optimal outcomes.

References

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