The Case:
A patient presents with aphasia and right-sided weakness within 5 hours of onset, and occlusion of the proximal portion of the left middle cerebral artery. Emergent endovascular treatment is indicated.

The Questions:
(1) Should intubation and artificial ventilation be performed before the procedure?
(2) Is local anesthesia safe enough to be used, instead of general anesthesia, during the procedure?

The Controversy:
GENERAL ANESTHESIA IS PREFERABLE TO LOCAL ANESTHESIA DURING CEREBRAL ENDOVASCULAR PROCEDURES.

**General Is Better Than Local Anesthesia During Endovascular Procedures**

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There is no doubt that general anesthesia is needed during neuroendovascular interventions such as aneurysm coiling, intracranial stenting, balloon angioplasty (percutaneous transluminal angioplasty), or embolization of arteriovenous malformations. Increasingly, advances in intracranial catheter techniques for endovascular treatment of stroke warrant general anesthesia as well. These microsurgical interventions require the navigation and proper placement of microcatheters, microwires, and devices in cerebral arteries as small as 1 mm in diameter. At the beginning of all these interventions, it is essential to acquire a road map. The angiogram is superimposed on the subsequent fluoroscopic live images to allow proper navigation of microcatheters into the intended vessels. However, patient movements alter the actual position of the intracranial arteries in relation to the previously acquired road map. As a result, the interventionalist may assume a vessel position that in reality has changed. At best, the interventionalist realizes that the patient has moved and acquires another road map. However, if the patient continuously moves, it becomes impossible to perform the intervention. At worst, severe complications such as intracranial vessel perforation might occur due to movements during catheterization.

In the early days of endovascular stroke treatment, a catheter was placed in the cervical or proximal large intracranial arteries to deliver the thrombolytic agent. Because this maneuver does not require sophisticated intracranial navigation, it might be possible to perform this in patients who are awake. In recent years, technical advances have fundamentally changed endovascular stroke treatment. In addition to local thrombolysis, several techniques such as clot aspiration, fragmentation, mechanical thrombectomy, stent placement, and percutaneous transluminal angioplasty at the occlusion site are now applied. For these kinds of interventions, thrombi in intracranial arteries measuring 2 to 3 mm in diameter have to be reached and passed. The x-ray markers of the microcatheters, stents, balloons, and mechanical devices are small and sometimes barely seen under fluoroscopy. Moreover, overlying bone structures, especially the skull base, make the detection of these markers even more difficult. In case of additional head movement, detection and thus navigation of the devices might become impossible.

When the microcatheter is navigated across the occlusion site, or when a large luminal aspiration catheter (>5 French=1.66 mm) is advanced through the distal internal carotid artery into the middle cerebral artery, we noticed pronounced reactions of awake or consciously sedated patients resulting in significant head movements. Such maneuvers apply certain forces to the intracranial arteries, which are transferred to the dura mater and, therefore, are painfully perceived by the patient. Such a patient, particularly if aphasic or anxious because of his or her stroke, will react and move promptly. As a result, interventions performed without general anesthesia might be substantially prolonged or cannot be completed.

The intubation of patients with acute ischemic stroke has increasingly been carried out at our institution. Thirty-one (77.5%) of 40 patients with acute stroke transferred for...
endovascular revascularization during the 5 months before writing this article were intubated before or during the intervention. The time delay due to the initiation of general anesthesia is a major concern. To avoid time loss, the anesthesiology team is informed in advance before the patient arrives at our hospital. The median time delay between acute stroke imaging (CT or MRI) and the first angiographic run was 50 minutes (interquartile range, 45 to 55 minutes) in 9 patients without general anesthesia and 65 minutes (interquartile range, 55 to 85 minutes) in 31 intubated patients. This relatively short time delay needed for general anesthesia seems to be acceptable because the following intervention is then performed under optimal conditions and therefore as fast as possible and with a high technical success rate. On the other hand, the time delay due to continuous movement, which prevents intracranial navigation in awake patients, might far exceed the 15 minutes needed for intubation.

Preintubation hypotension is another major concern because the reduced perfusion pressure of penumbral tissue increases the risk of infarct growth. Therefore, it is important to work with anesthesiologists who are aware of stroke physiology, act fast, and control blood pressure accurately. At our institution, blood pressure monitoring is performed by intra-arterial measurement. Systolic blood pressures are kept between 120 and 180 mm Hg to allow proper perfusion of collateral vessels. Additionally, mild hypothermia can be performed during general anesthesia to reduce the metabolic demand of ischemic brain tissue. Patients should be extubated as fast as possible, preferably at the end of the intervention in the angiography suite, to avoid delayed extubation and consequent pneumonia.

In conclusion, the complex endovascular intracranial treatment of acute ischemic stroke demands general anesthesia. General anesthesia can be performed with an acceptable time delay in well-organized stroke centers. In addition, most of the endovascularly treated patients have proximal vessel occlusions and fairly good collaterals, which preserve the penumbral tissue. Therefore, time to treatment becomes less critical than good recanalization. Because general anesthesia allows us to perform interventions under optimal conditions, fewer technical failures and complications occur and higher recanalization rates are achieved, resulting in better clinical outcomes.

Disclosures
None.

References

Key Words: anaesthesia ▪ endovascular treatment ▪ neuroradiology ▪ stroke management
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