

of the resistance arteries decrease with age.³ It has been suggested that endothelium-dependent dilatation of the resistance coronary arteries evoked by acetylcholine may decrease with age in humans.⁴

The mechanisms underlying the age-associated reduction in the ability of the coronary microvasculature to dilate in response to acetylcholine are controversial. With advancing age, nitrous oxide-dependent mechanical and agonist-mediated endothelial vasodilatation is reduced in humans and animals.⁵ Coronary microvascular dysfunction due to aging should not be underestimated. Although pharmacologic treatment has been shown to restore coronary blood reserve in endothelial dysfunction due to aging, its effect on the clinical outcome remains to be determined.

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THE AUTHORS REPLY: We agree with Duran and Taffet that coronary microvascular function changes significantly with aging. Indeed, we stated, "In healthy persons, however, coronary flow reserve varies according to age and sex. Therefore, it is essential to compare data on coronary flow reserve in patients with data obtained in age-matched and sex-matched control subjects." Using positron-emission tomography, Uren et al.¹ and Chareonthaitawee et al.² have shown that resting and hyperemic myocardial blood flow remain unchanged in persons up to 60 years of age. After 60 years of age, there is a significant increase in resting myocardial blood flow, associated with an increase in systolic blood pressure. After 70 years of age, there is a significant reduction in hyperemic myocardial blood flow and in coronary flow reserve. There are probably multiple causes of these age-related changes, and they remain incompletely understood.

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Perioperative Stroke

TO THE EDITOR: In his review of perioperative stroke, Selim (Feb. 15 issue)¹ states that regional anesthesia may pose less risk of perioperative complications than general anesthesia and that "isoflurane and thiopentone may provide neuroprotection." However, the references that he cites^{2,3} do not provide support for these contentions. Breen and Park's² review of the literature showed that no conclusions could be drawn about the risk of stroke associated with general as compared with regional anesthesia for carotid endarterectomy. In fact, the results of the randomized trials reviewed indicated that postoperative hypo-

tension was more likely after regional anesthesia. The differences that have been identified may not have a great clinical impact and require further study.

Turner et al.³ reviewed the literature on agents for induction of general anesthesia and conclude that thiopental, propofol, and etomidate have similar effects on intracranial pressure, cerebral blood flow, and cerebral oxygen consumption, so the selection of an agent should be based on other considerations. They did not discuss isoflurane. The most one can conclude from the extant literature is that there are a number of hypotheses

to test with robust methods before clinical recommendations can be made.

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TO THE EDITOR: Selim emphasizes that atrial fibrillation is an important cause of perioperative stroke, and he outlines its predictors. The current literature, however, does not provide support for including high magnesium levels among the risk factors for postoperative atrial fibrillation, as Selim does in Table 5 of his review. In fact, magnesium supplementation has been shown to have varying degrees of benefit in reducing the incidence of postoperative atrial fibrillation.¹⁻⁴ Selim notes that beta-blockers and amiodarone are effective as prophylaxis against the development of postoperative atrial fibrillation. Magnesium supplementation may also have a role.

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TO THE EDITOR: With regard to the article by Selim, the unique anatomy of the vertebral arteries and their vulnerability to mechanical compression at the atlantoaxial and atlanto-occipital junction during neck angulation and hyperextension constitute an overlooked cause of perioperative stroke.^{1,2} We designed a study to simulate tracheal intuba-

tion in 160 consecutive high-risk patients (mean age, 66 years) who were scheduled for surgery with dynamic magnetic resonance angiography and flow analysis. Unsuspected hypoplastic vertebral-artery flow of less than 50 ml per second was present in 40 patients (25%). Reduced basilar-artery flow was noted with increased microinfarctions on magnetic resonance imaging (77% vs. 38% in patients with normal basilar-artery flow). Patients with unsuspected carotid occlusion (six patients) and those with vertebral-artery occlusion (two patients) also had reduced basilar-artery flow.

Carotid ultrasonography, although less costly, is also less accurate, with incomplete imaging of the vertebral arteries. Flow velocities and vessel diameters tend to be lower on the right side, with lower net flow volume, and they are significantly lower in women than in men.³ Ultrasonography is 80% as accurate as angiography in detecting vertebral-artery size and only 90% as accurate in determining the direction of flow.⁴

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THE AUTHOR REPLIES: When I chose the references for this review, my intent was not to highlight the specific results of a particular study but rather to direct the reader to a balanced discussion of the topic, given the limited space for the article. With regard to local as compared with general anesthesia, various studies have had mixed results. A Cochrane meta-analysis of 41 nonrandomized and 7 small randomized studies showed that the use of local anesthesia was associated

with significant reductions in the odds of death and stroke within 30 days after carotid surgery in the nonrandomized studies.¹ In the randomized studies, the use of local anesthesia was associated with a significant reduction in hemorrhagic complications, but there was insufficient evidence of a reduction in perioperative stroke. Therefore, my statement that “regional anesthesia is less likely than general anesthesia to result in perioperative complications” is not inconsistent with the literature.

Kettler points to postoperative hypotension as a complication of regional anesthesia. I reiterate that most perioperative strokes are embolic. Hypoperfusion is responsible for only a small number of such strokes. Regional anesthesia facilitates neurologic assessments during surgery, thus permitting timely detection and treatment of stroke, and it is associated with less blood loss and shorter hospital stays,² thereby decreasing postoperative thromboembolic complications. A quick literature search (www.pubmed.com) shows several reports that provide support for the neuroprotective properties of isoflurane,³ but I concur that the choice of the anesthetic agent should not be based solely on its putative neuroprotective properties.

Parashar questions whether a high level of magnesium is a risk factor for postoperative atrial fibrillation. Although several studies suggest that hypomagnesemia is associated with postoperative atrial fibrillation, there are conflicting data in the literature.⁴ Therefore, it would have been more

appropriate to point to “disturbances of serum magnesium” instead of high magnesium levels. He also correctly suggests that magnesium supplementation may be beneficial in reducing the incidence of atrial fibrillation. The effects of magnesium seem to be independent of serum magnesium concentrations, and they are probably mediated through its direct effects on sinoatrial-node conduction. Most guidelines for the management of postoperative atrial fibrillation provide level A evidence of the efficacy of beta-blockers and amiodarone, in contrast to level B evidence for magnesium.⁵

Finally, I thank Weintraub and Khoury for sharing their findings on the pathophysiological basis of some perioperative strokes.

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Medical Mystery: Skin Discolorations — The Answer

TO THE EDITOR: The medical mystery in the April 5 issue¹ involved a 34-year-old bank employee who presented with black discolorations of the skin (Fig. 1A) on all her fingers. The discolorations had developed in the evening after work. A skin-biopsy specimen of the black spots revealed brownish deposits of elemental silver in the corneal layer (Fig. 1B), with a fluorescent aspect on the dark-field microscopical examination (Fig. 1C), which is typical of elemental silver. Infrared spectroscopy

and microanalysis with x-rays showed that some of the bills the patient had been counting (Fig. 1D) were prepared with a combination of silver nitrate and petroleum jelly, a method often used to find a thief. Silver nitrate diffuses into the epidermis and reacts with chloride from sweat to form silver chloride, which is photochemically reduced by ultraviolet light to form colloidal particles of metallic silver; these appear black and persist in the epidermis. An advantage of this method of trap-