article were included in group 3. They were retrospectively compared (data not published). At 1-year follow-up, LV volumes were reduced in groups 2-3 (preoperative end-diastolic volumes: 166 ± 5, 170 ± 1 ml; postoperative: 155 ± 1, 154 ± 3 ml). In group 1, volume increased (168 ± 2 to 175 ± 3 ml) and LVEF declined over time. Persistence of pulmonary hypertension (PSAP > 40 mmHg at 1 year) was higher in group 1: 48.6 vs 32.5 and 23.2% ($p < 0.01$). Only a trend in improved outcomes was observed in group 3 with respect to group 2 and in 'posterior transposition' patients when compared with other patients in group 3.

(c) In Feikes technique the anterior leaflet is incised in the midline and two segments are turned backwards. In our technique, the leaflet is incised at its base, completely detached and implanted posteriorly as a large fibrotic-calcified patch (as a protective curtain of posterior atrioventricular groove).

(d) 'Natural position' is a fictitious term. Secondary chordae attach to the ventricular surface of the leaflet. Their 'natural position' is not the anterior annulus, they are moving across the mitral orifice. Moon et al. [3] published a sophisticated study in dogs comparing conventional MVR with anterior and posterior chordal-sparing techniques. Conventional MVR was associated with depression in systolic contractility. Certain parameters suggested that systolic function was better after anterior than after posterior MVR, but the relative changes did not attain statistical significance. Soga et al. [4] described a chordal-sparing technique using ePTFE chordae: one for the anterior papillary muscle is attached at the 9–10 o'clock position on the mitral annulus, and the other for the posterior papillary muscle at 5–6 o'clock. An 'oblique' direction enhanced systolic function with better results than anterior, posterior and counter directions [5]. A modification of our technique should be an 'oblique transposition': A1 segment reattached at 9 o'clock and A3 at 5–6 o'clock. Anyway, we agree with the comment by Moon and co-workers: '...in selecting which type of chordal-sparing technique to use, the choice should also be based on other factors, including the simplicity and reproducibility of the technique...'; an important consideration in rheumatic mitral valve disease.

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Letter to the Editor

Guided cerebral protection in cardiac surgery

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Papantchev et al. [1] have to be congratulated for providing clinicians valuable information based on their extensive anatomical examination of the main cerebral arteries (circle of Willis) in 112 cadavers. The results from this study show the need for reassessing the current perioperative care of cardiac patients in at least three areas: (1) demonstration of the high prevalence of anatomical variations in the circle of Willis (42%) stresses the need for preoperative CT-angiographic imaging of the cerebral vascular network; (2) a low-to-normal blood pressure and/or selective cerebral perfusion (SCP) could be blamed for increasing the risk of diffuse watershed strokes by preventing washout of small emboli and by limiting perfusion in brain areas with abnormal vascular supply; (3) with a broader understanding of the frequency and mechanisms of neurological injuries, we should be able to tailor personalised neuroprotective strategies that may considerably improve quality of life after cardiac surgery.

Several clinical investigations have demonstrated the usefulness of both the bispectral index (BIS) of the electroencephalogram and the transcranial Doppler (TCD) monitoring of the cerebral blood flow to detect neurological dysfunction in critically ill patients and in those undergoing cardiac surgical procedures [2,3]. For instance, sudden falls in BIS or near-infrared spectroscopy (NIRS) values are highly suggestive of ischaemic-induced cerebral events in patients with atheromatous vascular disease as a result of malposition of the arterial cannula or disruption of an atheromatous plaque (aortic cross-clamping and 'sandblasting effect' of the high-velocity pump flow). In contrast, progressive and sustained low BIS/NIRS values during cardiopulmonary bypass call for reassessing not only the depth of anaesthesia but also cerebral blood flow with TCD.

During moderate or deep hypothermia, BIS values decrease in parallel with the metabolic cerebral activity whereas changes in NIRS values poorly correlate with CT-imaging and histologic brain damages [2—4]. Accordingly, assessment of the cerebral blood flow with TCD through the temporal, ophthalmic and/or occipital windows is strongly advocated in high-risk cardiac procedures such as aortic root and arch reconstruction using deep hypothermic circulatory arrest, SCP or retrograde cerebral perfusion. Abnormal flow patterns (bilateral or unilateral) could be potentially reversed either by increasing pump flow, increasing systemic blood pressure or by cannulating the contralateral brachiocephalic trunk.

Given the high prevalence of cerebrovascular abnormalities, better knowledge of the mechanisms of brain injuries and the economic burden of postoperative neurological damages, outcome research studies are urgently required in this important area toward making the perioperative period and beyond, safer for all patients undergoing cardiac surgical procedures [4].

In line with the authors' proposals, we recommend the routine application of a stepwise multimodality neuroprotective approach (e.g., hypothermia, SCP unilateral vs bilateral, carotid endarterectomy) guided by preoperative radiological imaging (circle of Willis abnormality, carotid stenosis/occlusion) as well as by current intraoperative monitoring tools such as transoesophageal echocardiography (e.g., intra-cardiac thrombus, atheroma and calcification of the ascending aorta), TCD and brain activity monitors (e.g., NIRS, BIS) [5].

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Reply to the Letter to the Editor

Reply to Ellenberger et al.

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We would like to thank Ellenberger et al. [1] for their interest in our article [2]. The authors added some important comments that were not discussed in detail in our work [2]. We agree with the authors' opinion for stepwise multimodality neuroprotective strategy for each separate patient [1]. Such an approach will help to choose the most effective method for cerebral protection and will allow adequate intraoperative follow-up. Nevertheless we must always bear in mind that in some patients such profound preoperative examinations could not be possible, for example, some patients with aortic dissection diagnosed outside a specialized cardiac surgery center. We believe that in such cases bilateral selective cerebral perfusion should be the protective strategy of choice, since it will overcome the variations of circle of Willis, if such are present [2], and it could ensure adequate cerebral blood supply even in patients with uni- or bilateral internal carotid artery stenosis/occlusion.

Our work also stressed the fact that the results derived from animal models of selective cerebral perfusion must not be extrapolated to humans, since the cerebral blood supply of the animals' brain is quite different from that in humans, namely the absence of the anterior communicating artery in most of the domestic animals (for example, pigs), extensive anastomoses between extra- and intracranial arteries and presence of variations of the circle of Willis in all species [2].

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