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In Reply:

We thank Drs. Bowdle and Sheu for their interest and thoughtful comments on our recent article,[1] which reported a low risk of complications from intraarterial brachial pressure monitoring during cardiac surgery.

Although use of ultrasound is increasing, we typically use direct palpation of the brachial arterial pulse for our first attempt at arterial catheter insertion. Ultrasound for vascular cannulation was not available during the early years of our study period, and our current practice reserves this technology for difficult arterial cannulation. It is possible, however, that increasing use of ultrasound may lower the rate of complications even further than our initial report.

We follow guidelines established by the Centers for Disease Control[2] to prevent intravascular catheter-related infections. Our standard practice includes proper hand hygiene and aseptic technique, preparation of clean skin with a more than 0.5% chlorhexidine preparation with alcohol, use of sterile gloves and drape, and a sterile, transparent, semipermeable dressing to cover the catheter site. Appropriate sterile dressing regimens are continued postoperatively by the nursing staff. Nonetheless, our low incidence of infection was likely overestimated because we conservatively reported bloodstream infections as "possibly associated" with brachial arterial catheterization, although the more likely cause was an infection related to a coexisting central venous catheter.[3]

We appreciate the suggestion from Drs. Bowdle and Sheu that an adequate collateral circulation may explain the low rate of brachial artery complications leading to hand ischemia and that embolic phenomena may have impaired the collateral circulation causing ischemia of the upper limb. Certainly, evidence of a collateral arterial network around the elbow exists,[4] but whether this network is sufficient to adequately perfuse the hand after complete brachial artery occlusion in all patients is uncertain. It is possible that an adequate collateral circulation may have allowed a brachial arterial injury to remain undetected in some patients. However, multiple reports document hand ischemia as a result of reduced brachial arterial flow with inadequate collateral circulation, including patients suffering from supracondylar fracture with brachial arterial injury[5] and after creation of a brachial-cephalic/basilic fistula,[6,7] thus providing evidence that collateral circulation is not adequate in all patients. Later development of adequate collaterals in patients with arteriovenous fistulas explains why some patients tolerate brachial arterial ligation,[8,9] although similar conditions do not occur in most elective cardiac surgical patients.

Although injury to the arterial wall during cannulation may create conditions conducive to thrombus formation,[10] acute occlusion of the brachial artery may occur as a result of thrombus or emboli. It is thus unclear whether the collateral circulation was compromised in patients with an ischemic upper limb due to multiple emboli or whether its anatomical distribution was insufficient. Nevertheless, our data document that a thrombectomy of an occluded brachial artery restored perfusion to the hand and that the collateral circulation was inadequate in 18 patients.[1]

Competing Interests

The authors declare no competing interests.

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Effect of Spinal *versus* General Anesthesia in Study Comparing Three Methods of Using Local Anesthetics to Achieve Post–knee Arthroplasty Pain

To the Editor:

The authors of a recently published study[1] comparing three local anesthetic methods of reducing post–knee arthroplasty pain recommended spinal anesthesia, but 23% of patients apparently still received general anesthesia. Would the authors be kind enough to share the postoperative pain score data for these two patient groups (*i.e.*, spinal *vs.* general anesthesia)?

Competing Interests

The author declares no competing interests.

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In Reply:

We thank Dr. Riopelle for his question. In the article,[1] table 2 contains the results of unadjusted comparisons across study arms for all pain endpoints. In addition to these unadjusted comparisons, for the study's primary endpoint an analysis was performed to assess differences across study arms after adjusting for sex, American Society of Anesthesiologists status, and type of anesthesia. In all cases, the results of the unadjusted and adjusted comparisons across treatment groups were consistent.

Regarding Dr. Riopelle's request for clarification of postoperative pain score data by anesthesia type, table 1 summarizes postoperative pain scores in each treatment arm for patients who received general *versus* spinal anesthesia.

Table 1. Postoperative Pain According to Study Arm and Type of Anesthetic

Pain Assessment* (Numeric Rating Scale)	Regional	Ropivacaine	Liposomal Bupivacaine
Number of subjects			
General	14	8	14
Spinal	36†	47†	38†
Primary endpoint			
POD 1 (06:00 – 12:00) max pain			
General	3 (1, 4)	3 (2, 5)	5 (3, 5)
Spinal	3 (1, 6)	4 (3, 6)	4 (3, 6)
Secondary endpoints			
POD 0, post-PACU			
Average			
General	0.3 (0.0, 2.4)	2.0 (1.3, 2.7)	3.3 (1.3, 4.1)
Spinal	0.6 (0.0, 2.0)	1.6 (0.7, 2.5)	2.3 (1.0, 2.8)
Maximum			
General	1 (0, 5)	5 (4, 6)	5 (3, 6)
Spinal	2 (0, 4)	4 (2, 6)	5 (4, 6)
POD 1			
Average			
General	2.1 (1.5, 3.3)	2.7 (1.9, 3.5)	4.4 (3.2, 4.8)
Spinal	2.8 (1.2, 4.5)	3.5 (2.6, 4.4)	3.7 (2.9, 4.4)
Maximum			
General	5 (3, 7)	6 (5, 7)	7 (6, 8)
Spinal	6 (3, 8)	6 (5, 7)	6 (5, 8)
POD 2			
Average			
General	2.7 (2.0, 4.0)	2.6 (1.9, 3.9)	3.5 (2.8, 4.2)
Spinal	3.4 (2.0, 4.3)	3.2 (2.5, 4.0)	3.5 (2.6, 4.3)
Maximum			
General	4 (3, 7)	6 (4, 7)	6 (5, 6)
Spinal	6 (4, 7)	6 (4, 7)	5 (4, 7)

*Data are presented as median (25th, 75th). † For POD 2, data are missing for five subjects (one regional group with spinal anesthesia, one ropivacaine group with spinal anesthesia, three liposomal bupivacaine groups with spinal anesthesia).
PACU = postanesthesia care unit; POD = postoperative day.

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Competing Interests

The authors declare no competing interests.