

CORRESPONDENCE

3. Gronert GA, Dotin LN, Ritchey CR, Mason AD: Succinylcholine hyperkalemia in burned patients: II. *Anesth Analg* 1969; 48:958-62
4. Viby-Mogensen J, Hanel HK, Hausen E, Graae J: Serum cholinesterase activity in burned patients: II. *Anesthesia Suxamethonium and hyperkalemia. Acta Anaesthesiol Scand* 1975; 19:169-79
5. Kim C, Martyn JAJ, Fuke N: Burn injury to trunk of rat causes denervation-like responses in the gastrocnemius muscle. *J Appl Physiol* 1988; 65:1745-51
6. Yanez P, Martyn JAJ: Prolonged D-tubocurarine infusion

and/or immobilization causes upregulation of acetylcholine receptors and hyperkalemia to succinylcholine. *ANESTHESIOLOGY* 1996; 84:384-91

7. Fung DL, White DA, Gronert GA, Disbrow E: The change in pharmacodynamic of metocurine identify the onset and offset of canine gastrocnemius disuse atrophy. *ANESTHESIOLOGY* 1995; 83:134-40

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Venous Access for Pediatric Liver Transplantation

To the Editor:—We read with interest the report by Henderson *et al.*¹ The authors attributed “spurious arterial blood gas findings and abnormal pulse oximetry readings” to distal arteriovenous connections caused by chronic liver failure. They site as evidence for this mechanism a venogram of the distal upper extremity and “experience with other children.”² We differ in our interpretation and would propose that two more important conclusions from this case be emphasized.

Arteriovenous shunting is a relatively common complication of chronic liver disease in adult patients, as manifested by cutaneous (“spider”) angioma and arterial hypoxemia caused by intrapulmonary venous admixture. However, this problem is infrequently encountered in children. In caring for approximately 300 infants and children undergoing liver transplantation, we have not observed evidence of this phenomenon in patients younger than 2 yr of age.

Henderson *et al.*¹ mentioned two alternative explanations for their clinical findings: (1) retrograde flow through capillary beds due to “extremely high venous pressures” caused by pressurized infusion of blood, and (2) relaxation of precapillary and postcapillary sphincters caused by general anesthesia. We find these explanations, particularly the former, far more likely to account for the localized arterial hypoxemia observed than the effects of endogenous vasodilators due to hepatic failure. The authors chose to cannulate distal peripheral veins at the base of each thumb for the purpose of intraoperative transfusion. We wonder whether blood transfusion under high pressure might result in the abnormalities in arterial oxygen tension and saturation observed even in patients without liver disease.

We believe that small distal veins should not be used for rapid transfusion except under extraordinary circumstances. More appropriate sites include antecubital and femoral veins, as well as internal and external jugular veins. That a fasciotomy was performed because of

swelling of the distal extremity serves to substantiate the inadvisability of reliance on more distal veins in this setting.

Another important conclusion relates to the administration of calcium chloride. Calcium chloride 10% causes severe tissue injury when injected subcutaneously. We have observed and reviewed cases of tissue injury that required skin grafting after administration of calcium chloride 10% through a peripherally placed intravenous catheter, even when no other overt signs of extravasation were present. Although there is no mention of whether the fasciotomy was performed on the same extremity in which it was administered, calcium chloride 10% should not be administered through distal, peripheral veins, especially when a central venous catheter is available.

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References

1. Henderson KH, Everts EA, Upton J: Upper extremity veno-arterial shunting during pediatric orthotopic liver transplantation. *ANESTHESIOLOGY* 1998; 89:1247-9
2. Upton J, Sampson C, Havlik R, Gorlin JB, Wayne A: Acquired arteriovenous fistulas in children. *J Hand Surg [Am]* 1994; 19:656-8

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