

Title : DELIBERATE HYPOTENSION FOR SCOLIOSIS FUSION

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**Introduction.** Deliberate hypotension has been advocated to reduce blood loss during operative treatment of scoliosis. However, patients having spine fusion with Harrington rod instrumentation may suffer damage to the spinal cord, presumably due to ischemia. Effects of hypotension and direct pressure on the cord are additive in producing neurologic impairment.<sup>3</sup> Somatosensory cortical-evoked potentials (SCEPs) can be used to monitor spinal cord function during operations on the spine.<sup>4</sup> We asked the following questions about induced hypotension (systolic pressure 80-90 torr) during operative treatment of scoliosis with Harrington rod instrumentation:

- 1) Is blood loss reduced?
- 2) Is operating time reduced?
- 3) Is spinal cord function impaired?

**Method.** Subjects are otherwise healthy patients 12-30 years of age scheduled for operative treatment of idiopathic scoliosis. They are assigned to the hypotensive (H) group or nonhypotensive (NH) group by drawing lots. Surgeons are not told whether a patient is H or NH until after operation. Baseline SCEPs are recorded. After morphine 0.075 mg/kg and secobarbital 1.5 mg/kg, anesthesia is induced with thiopental and morphine, accompanied by atropine 0.01 mg/kg. Pancuronium 0.1 mg/kg is given before tracheal intubation. Maintenance is with N<sub>2</sub>O 60-70% in O<sub>2</sub> and incremental doses of thiopental, morphine, fentanyl and pancuronium. Patients are positioned on a 4-poster frame and 200-400cc of epinephrine 1:500,000 are injected into the subcutaneous tissues. Hypotension is produced with sodium nitroprusside (SNP), propranolol and/or tremethaphan being added if SNP up to 10 µg/kg/min is inadequate. A sham SNP infusion is used in NH patients. Monitoring included ECG, arterial pressure, CVP, temperature, urine output, half-hourly blood gases and hematocrits, ear oximetry and SCEPs. If SCEP changes after distraction of the spine are marked or fail to resolve after 10 minutes, hypotension and hemodilution, if present, are reversed. If SCEP changes still persist, a wake-up test is performed. In the face of an abnormal wake-up test distraction would be reduced or instrumentation removed.

**Results.** Thirteen of the projected 30 patients have been studied: 9 H and 4 NH. H patients did not differ significantly from

NH patients with respect to age, weight, preoperative hematocrit, lowest intraoperative hematocrit, volume of crystalloid given during operation, lowest intrapneumotric or operating time. H patients had less blood loss ( $586 \pm 132$  cc, vs.  $1145 \pm 399$  cc,  $p < .005$ ) and received less blood intraoperatively ( $1.67 \pm .47$  units vs.  $2.25 \pm .43$  units,  $p < .05$ ) -- mean values,  $\pm$  one standard deviation -- than did NH patients. Two H patients and one NH patient required wake-up tests; all 3 were normal. The surgeon correctly distinguished between H and NH in 12 of 13 cases. All patients had normal neurologic function postoperatively.

**Discussion.** In view of the additive effects of directly pressure and ischemia in impairing spinal cord function,<sup>3</sup> deliberate hypotension during correction of scoliosis seems warranted only if (a) benefit can be demonstrated and (b) spinal cord function can be monitored. In contrast to the wake-up test, SCEPs can be monitored continuously and pose no risk. However, the degree of SCEP change predicting neurologic impairment is not fully defined. We use qualitative SCEP changes to determine the need for a wake-up test.

**Conclusions.** Deliberate hypotension during operative treatment to scoliosis:

- a) modestly reduced blood loss;
- b) improves operating conditions;
- c) does not reduce operating time; and
- d) is unlikely to produce neurologic deficit, provided spinal cord function is monitored.

#### References.

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