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Paraplegia Following Pneumonectomy and Descending Thoracic Aorta Mass Resection

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Comments
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Paraplegia Following Pneumonectomy and Descending Thoracic Aorta Mass Resection

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Discussion

The major intra-operative challenge of this case was the conflicting goals in fluid management for concomitant pneumonectomy and thoracic aorta resection. A conservative approach was taken to fluid management. Although it is difficult to be certain, low-normal intravascular volume and hypotension around the time of aortic clamping and release may have contributed to renal injury and SCI. Conversely, the perioperative issues:

- En bloc resection of lung mass with left pneumonectomy, resection of least in part, to the conservative fluid strategy.
- Fluid management for pneumonectomy
  - Pneumonectomy has a high 30-day mortality rate, with incidences reaching 25%. 1
  - Cross clamp time = 30 minutes; Operative duration of 8 hours; IVF: 1800 mL crystalloid and 200 mL colloid; UO: 260 mL; EBL: 700 mL.

- Acute lung injury (ALI) is a major predictor of mortality in pneumonectomy. 1 Clinical data

- Continued fluid management decisions in the setting of recent pneumonectomy

- Spinal cord ischemia (SCI): SCI is a devastating complication of surgical repair of the thoracic aorta. The incidence of SCI with surgical repair of the thoracic aorta has been reported to be as high as 14% and thoracotomy has an estimated SCI incidence of 0.08%. 3,4 SCI may present with lower extremity weakness ranging from paraparesis to paraplegia. Moreover, clinical onset of SCI may be immediate or as late as months after the surgery. Prevention of SCI and neurologic deficit is not only important in ensuring a better quality of life but also in improving the survival rate.5,6

- The incidence of SCI with surgical repair of the thoracic aorta may be up to 14%. 3 Maintenance of adequate mean arterial pressure, and thus SCI perfusion pressure, is paramount in limiting SCI. Typically, first-line management for maintenance of MAP in fluid administration, then vasopressors. As discussed above, aggressive IV fluids were avoided; thus, vasopressors were used for elevated blood pressure goals. Furthermore, we chose CSF drainage for additional SCI treatment as this combination was felt to be the most evidence-based approach of the SCI prevention described in the literature.

Spinal Cord Ischemia Prevention & Management

- Spinal Cord Ischemic insult

- Improvement of spinal cord perfusion pressure: Minimize aortic clamp time, increase MAP, Distal aortic perfusion, Reimplantation of intercostal arteries, CSF Drainage

- Suppression of spinal cord metabolism: Moderate passive hypothermia (32 to 34°C), profound hypothermic circulatory arrest (14-16°C), infusion of cold saline into the intrathecal space

- Prevention of steal from collateral arterial networks during aortic cross clamping and opening of aorta

- Early detection and intervention of SCI: Intensive monitoring of somatosensory evoked potentials and motor evoked potentials

- Pharmacologic neuro-protection of spinal cord

- Intravenous papaverine, mannitol, naloxone, intrathecal papaverine

- Prevention of ischemic injury, prevention of pharmacologically induced arteriovenous shunting which occurs from use of drugs such as lidocaine

- Spinal Artery Perfusion

- SCI Pressure

- DAP, Distal Aortic Perfusion; D/C, Discharge/Discontinue; EBL, Estimated Blood Loss; MAP, Mean Arterial Pressure; PF/DF, Plantar Flexion/Dorsiflexion; POD, Post-Operative Day; SC, Spinal Cord; SCI, Spinal Cord Injury; SF, Somatosensory; TF, Thalamic evoked potentials

- Follow-Up visit

- CSF prior to 2nd operation: Note left peri-hilar mass.

References


Abbreviations

ALI: Acute Lung Injury; ATN: Acute Tubular Necrosis; CSFD: Cerebral Spinal Fluid Drain; D/C: Discharge/Discontinue; DAP: Distal Aortic Perfusion; EBL: Estimated Blood Loss; LPM: Liter Per Minute; MAP: Mean Arterial Pressure; RA: able to generate 1000 mL; SC, Spinal Cord; SCI, Spinal Cord Injury; SF, Somatosensory; TF, Thalamic evoked potentials

Discussion

The major intra-operative challenge of this case was the conflicting goals in fluid management for concomitant pneumonectomy and thoracic aorta resection. A conservative approach was taken to fluid management. Although it is difficult to be certain, low-normal intravascular volume and hypotension around the time of aortic clamping and release may have contributed to renal injury and SCI. Conversely, the patient’s favorable post-operative pulmonary function may have been attributable, at least in part, to the conservative fluid strategy.

Continued fluid management decisions in the setting of recent pneumonectomy and acute kidney injury posed a post-operative challenge. The incidence of renal failure related to thoracic aorta surgery is as high as 14%. 1,7 Indeed, this patient developed post-operative AKI. Intravascular volume maintenance is thought to reduce the risk of kidney injury. In the ICU, the patient was given little maintenance IV fluids and intermittent post-operative diuresis was treated with colloid infusions in order to strike a balance between conservative fluid management for optimal pulmonary function and aggressive fluid administration aimed at minimizing any further renal injury. Urine output was maintained and renal function returned without need for dialysis.

Figure 1. CSF prior to 2nd operation: Note left peri-hilar mass.