Case Report: Use of the PiCCO system to guide intra-operative management during pheochromocytoma resection in a 10-year-old child

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SUMMARY
We describe the use of the PiCCO (pulse contour cardiac output) system to help guide the intra-operative management of a 10-year-old child during her pheochromocytoma resection. Continuous real-time hemodynamic monitoring using the PiCCO system provided a basis for early intra-operative therapeutic interventions and a hemodynamically stable anesthetic course.

CASE REPORT
A 10-year-old girl presented with progressive bilateral visual loss. She was found to be hypertensive and was referred for further investigations, which revealed a left sided infra-renal noradrenaline-secreting pheochromocytoma.

- Medical treatment included an α-blocker, a β-blocker and a calcium channel blocker. Her blood pressure was well controlled pre-operatively.
- Following induction and the placement of a thoracic epidural for analgesia, a central venous catheter (right internal jugular) and a femoral arterial catheter were placed under ultrasound guidance, and an epidural for analgesia, a central venous catheter (right internal jugular) and a femoral arterial catheter were placed under ultrasound guidance, and an epidural catheter was inserted into a proximal artery (femoral, brachial, axillary)
- Our patient was found to have reduced pulses in her right leg – a calcium channel blocker. Her blood pressure was well controlled pre-operatively.
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- Anesthesia for pheochromocytoma excision is known for its hemodynamically labile course.
- Induction of anesthesia, a tight-fitting face mask, tracheal intubation, surgical incision, creation of a pneumoperitoneum and tumor manipulation are all characterized by catecholamine release with vasoconstriction and profound hypertension.
- Once the tumor is removed, the abrupt reduction in the levels of circulating catecholamines causes hypotension, contributed to by relative intravascular volume depletion.

ANESTHESIA FOR PHEOCHROMOCYTOMA RESECTION

- The PiCCO system requires the use of a specialized thermistor-tipped catheter sited in a proximal artery (femoral, brachial, axillary)
- Recognized complications include vascular injury, hemorrhage, hematoma, pseudoaneurysm, arteriovenous fistula, compromised distal perfusion (including limb ischemia, pulse loss and thrombosis), nerve injury and infection
- Perfusion-related complications occur in 2.4 – 25% of children
- Complications are directly related to the duration of arterial catheterization
- Our patient was found to have reduced pulses in her right leg several hours after admission to ICU. There were no other clinical features of arterial insufficiency or on Doppler ultrasonography. The arterial catheter was removed and she was treated conservatively. Pulses returned within 12 hours and no further treatment was required

COMPLICATIONS OF ARTERIAL CANNULATION

- The PiCCO system uses the PiCCO system to help guide the intra-operative management of a 10-year-old child during her pheochromocytoma resection. Continuous real-time hemodynamic monitoring using the PiCCO system provided a basis for early intra-operative therapeutic interventions and a hemodynamically stable anesthetic course.

- The patient was extubated at the end of the procedure and transferred to intensive care for further monitoring and analgesia. The PiCCO system was left in place.
- She was discharged to the ward the following day and home on the seventh day postoperatively.

THE USE OF PULSE CONTOUR ANALYSIS

- The PiCCO is a minimally invasive cardiac output monitor that uses transpulmonary thermodilution calibration, making it more accurate than algorithm-based monitors.
- Transpulmonary thermodilution is considered the clinical gold standard for the measurement of cardiac output in children.
- Cardiac output is calculated and updated beat by beat: heart rate x stroke volume (SV = area under the systolic part of the pressure curve
- We found that the changes in SVR and SVRI with tumor manipulation preceded changes in BP and heart rate by several seconds, enabling us to intervene earlier, minimizing hypertensive episodes.

CONCLUSION
Continuous real-time hemodynamic monitoring using the PiCCO system provided a basis for early therapeutic interventions and a stable intraoperative course during pheochromocytoma resection. While arterial cannulation is not without risk, we propose that in this situation the benefit provided by the hemodynamic monitoring outweighs the risk.

Acknowledgements: The authors would like to thank Professor F. Paruk for her technical support and encouragement in the writing of this case report. Thanks to Tau medical systems for the loan of the monitor. And thank you to Operation Smile for the IAPA travel scholarship enabling me to be here.

References: