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Craniotomy for Tumor Resection in a Patient with Severe Aortic Stenosis.

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Introduction

The dual goals in a patient with severe aortic stenosis who is presenting for intracranial tumor resection are to avoid increase in intracranial pressure and to maintain ideal hemodynamic goals of severe aortic stenosis.

Case Description

A 75-year-old female with recently diagnosed severe aortic stenosis with a valve area of 0.7 cm^2 presented for a frontal craniotomy for resection of high-grade glioblastoma tumor. An arterial line was inserted and phenylephrine infusion started prior to induction and continued intraoperatively. Induction was performed with fentanyl, sevoflurane and rocuronium. During intubation patient developed brief supraventricular tachycardia which resolved spontaneously. In order to prevent tachycardia response to Mayfield pin insertion, a bolus dose of remifentanil was administered in titration and remifentanil infusion was continued throughout the intraoperative period. Anesthesia was maintained with sevoflurane less than 1 minimum alveolar concentration (MAC). Patient was extubated uneventfully.

Case Discussion

Critical periods during craniotomy in a patient with aortic stenosis:

1) Induction
2) Intubation
3) Mayfield pin insertion
4) Incision
5) Valsalva maneuver surgical hemostasis
6) Extubation

Hemodynamic goals in aortic stenosis:

a) Maintain normal sinus rhythm
b) Avoid tachycardia
c) Avoid extreme bradycardia
d) Avoid decreases in systemic vascular resistance (SVR)

Pathophysiology of aortic stenosis

Ventricular filling occurs during the diastolic period. Shortening of the diastolic period due to tachycardia or abnormal rhythm will lead to hemodynamic compromise. Since a normal heart is essential to adequate cardiac output, extreme bradycardia will decrease cardiac output. As patients with severe aortic stenosis aren't able to increase stroke volume due to severe restriction of aortic valve area, they are unable to compensate for a decrease in SVR.

Anesthesia technique to achieve dual goals in a patient with severe aortic stenosis presenting for craniotomy for tumor resection[1]

1. Pre-procedure arterial line insertion
2. Pre-oxygenation
3. Start phenylephrine infusion pre-induction and titrate to maintain MAP above 70mm Hg and systolic arterial pressure of 120-140 mm Hg throughout the surgical procedure.[2, 3]
4. Fentanyl/inhalational induction/rocuronium
5. Hyperventilation to produce mild hypercarbia prior to intubation
6. Intubation with laryngotracheal spray with topical lidocaine.
7. Remifentanil bolus in titration for Mayfield pin insertion
8. Maintenance of anesthesia with sevoflurane less than 1 MAC with remifentanil infusion
9. Ventilation goal is to maintain PaCO2 @ 35-40 mm Hg
10. Perform an arterial blood gas, identify PaCO2- End tidal CO2 gradient, and manage the ventilation to achieve target end-tidal CO2

CONCLUSION

We preferred inhalational induction over intravenous induction with propofol to prevent afterload reduction. We maintained anesthesia with inhalational agents less than 1 MAC and preferred this technique over total intravenous anesthesia with propofol to prevent SVR reduction. Remifentanil was used to avoid tachycardia or supraventricular tachycardia during Mayfield pin insertion. The remifentanil bolus was given in titration to avoid bradycardia. Remifentanil was continued throughout the procedure to prevent tachycardia response to surgical stimulation. Phenylephrine infusion was started at induction and was titrated to achieve target blood pressure throughout the procedure.

References

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