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MAC Pearls for a Patient with Critical Aortic Stenosis with a Valve Area of 0.44 cm².

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Introduction

Monitored anesthesia care (MAC) in a patient with critical aortic stenosis (AS) who presented with congestive heart failure (CHF) is a challenge to the anesthesiologist. The goals of MAC in this patient are to maintain sinus rhythm and avoid hypotension, tachycardia and bradycardia.

Case Description

An 81-year-old woman with critical AS presented for urgent esophago-duodenoscopy and colonoscopy for gastrointestinal bleeding. She was recently admitted to the hospital with CHF and scheduled for transcatheter aortic valve placement. The hemodynamic goals were successfully achieved with intermittent boli of ketamine and midazolam. Phenylephrine infusion was started pre-induction and titrated to maintain mean arterial pressure at baseline pre-induction levels. Perioperative course was uneventful.

Case Discussion

Left ventricular filling occurs during the diastolic period. Patient has limited cardiac output and cannot increase it due to critical AS. Left ventricular hypertrophy occurs which leads to decreased left ventricular compliance. Of the left ventricular end diastolic volume, 40% (instead of the normal 20%) depends on left atrial contraction or atrial kick. Abnormal rhythm or sinus tachycardia reduces diastolic time, left ventricular end diastolic volume and left ventricular filling. Atrial fibrillation abolishes the atrial kick and reduces the critical left ventricular filling. These patients cannot tolerate extreme bradycardia as they cannot increase their cardiac output as a compensatory mechanism.

Clinical features of aortic stenosis:

- 1) Increased tiredness
- 2) Chest pain or angina
- 3) Syncope
- 4) Exertional dyspnea
- 5) Orthopnea
- 6) Paroxysmal nocturnal dyspnea
- 7) CHF and pulmonary edema

Hemodynamic Goals in a patient presenting with critical AS:

1. Maintain normal sinus rhythm
2. Avoid tachycardia
3. Avoid extreme bradycardia
4. Avoid decrease in systemic vascular resistance from anesthetic agents

Why is this MAC a mega-challenge? (1) Emergency procedure secondary to acute gastrointestinal bleeding. (2) Critical AS with a valve area of 0.44cm². (3) Patient presenting with CHF indicates the patient is critically ill from AS.

References

1. Brown J, Morgan-Hughes NJ: Aortic stenosis and non cardiac surgery. *Continuing Education in Anaesthesia Critical Care & Pain* 2005;5:1-4.
2. Khalil M, Al-Agaty A, Asaad O, Mahmoud M, Omar AS, Abdelrazik A, Mostafa M: A comparative study between propofol and dexmedetomidine as sedative agents during performing transcatheter aortic valve implantation. *J Clin Anesth.* 2016;32:242-7.

Anesthetic agents for MAC in critically ill patients

Drug	Effect
Propofol	Causes significant hypotension
Dexmedetomidine	Causes more hypotension and bradycardia than propofol in a patient with critical aortic stenosis ²
Fentanyl	Causes less hypotension
Midazolam	Causes less hypotension
Ketamine	Large doses should be avoided as they may cause tachycardia. Small doses are well tolerated.

Our MAC pearls for critical AS for gastroduodenoscopy and colonoscopy

1. Topicalization of oropharynx with viscous lidocaine.
2. Phenylephrine infusion to prevent reduction in afterload from anesthetic agents.
3. Adequate oxygenation through nasal cannula and high flow oxygen administration when patient is sedated.
4. Intermittent boli of ketamine and midazolam.
5. Maintain mean arterial pressure to pre-induction levels.

CONCLUSION

Based on our experience in this case, we recommend our technique of topicalization of oropharynx to minimize stimulation from the gastroscope. We suggest starting phenylephrine infusion before administering anesthetic agents. One should select the agent which has more hemodynamic stability in terms of maintenance of mean arterial pressure and least effect on heart rate. We recommend the use of small doses ketamine, midazolam, and fentanyl based on our successful outcome experience.