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ESICM Webinar – Cardiovascular Management After Surgery

In a webinar at the ESICM Congress, Dr Aretha and Dr Garcia-Alvarez spoke about cardiovascular management after surgery. More specifically, Dr Aretha spoke about the management of post-operative atrial fibrillation, and Dr Garcia-Alvarez spoke about the importance of early application of vasopressin in septic shock patients.

Management of Postoperative Atrial Fibrillation After Cardiac and Major Non-Cardiac Surgery

Post-operative atrial fibrillation (POAF) can be triggered by acute factors, including inflammation, atrial oxidative stress, high sympathetic tone, electrolyte changes and volume overload, to name a few. Incidences of POAF are as high as 62% in certain types of surgery (combined valve surgery and CABG). These incidences can lead to neurological events, including stroke, renal failure, prolonged ICU stays, increased mortality and consequently also increased costs for the hospital (Hindricks et al. 2021; Maesen et al. 2012; Steinberg et al. 2014; Yadava et al. 2016; Zafrir et al. 2018; Lomivorotov et al. 2017; Farmakis et al. 2014; Chyou et al. 2023).

Rate control vs rhythm control

The European Heart Rhythm Association (EHRA) recommends rate control over rhythm control in the acute management of newly diagnosed AF. Haemodynamically stable patients should be assessed for reversible triggers and further be treated with beta-blockers for rate control (Boriani et al. 2019). The 2020 ESC guidelines recommend using beta-blockers, diltiazem or verapamil as a first-choice treatment in AF patients with LVEF≥40% for rate control. It is also recommended that patients with LVEF<40% should be treated with beta-blockers and/or digoxin for rate control. Amiodarone can be used as a last resort when the heart rate cannot be controlled by first-choice drugs (Hindricks et al. 2020).

According to the EHRA, beta-blockers should be used for rate control in cases of newly onset AF. Specifically, rapid onset and short-acting beta-blockers are preferred if haemodynamic instability is a risk factor (Boriani et al. 2019). Rate control is the preferred approach for ICU and postoperative patients, as the majority will convert to normal sinus rhythm after the resolution of the acute illness. One study showed that 81% of patients with AF reverted to normal sinus rhythm with only rate control treatment (Jones et al. 2020).

Esmolol or Landiolol: Which is the better beta-blocker for treating AF?

While the common beta-blocker used in the post-operative setting is esmolol, esmolol has negative inotropic properties, making its use problematic in patients with haemodynamic instability (Shibata et al. 2012).

Landiolol, which was developed in Japan and has been approved in Europe, is a relatively new beta-blocker with a more favourable pharmacodynamic and pharmacokinetic profile compared to esmolol. While landiolol is also rapid onset and short-acting, it also offers high cardioselectivity – almost eight times higher than esmolol (Krumpl et al. 2017). This is a major advantage as landiolol reduces the heart rate while not interfering with blood pressure. With lower dosing, landiolol is also suitable for patients with impaired left ventricular ejection fraction (Rapibloc SPC, current version).

According to the proposed algorithm for rate and rhythm control in acute, critically ill or postoperative patients by the European Society of Cardiology (ESC) published in the European Heart Journal Supplements, Volume 24, Issue Supplement_D, in June 2022, esmolol or landiolol should be used for rapid heart rate control (Dan et al. 2022). However, if the patient is haemodynamically unstable, landiolol is the preferred drug due to its more appropriate profile (Johnston et al. 2022).

Early Application of Vasopressin in Septic Shock

Septic shock is mainly characterised by vasoplegia because of the release of inflammatory mediators. The identification of hypoperfusion is key for the survival of these patients to select the most appropriate treatment (Kattan et al. 2022; Ramasco et al. 2024).

Control studies show that early administration of norepinephrine was associated with improved outcomes when treating septic shock. The timing of initiation of norepinephrine should be individualised based on the severity of hypotension (Hamzaoui et al. 2023; Evans et al. 2021).

Norepinephrine or vasopressin?

While the SSC guidelines still recommend using norepinephrine as a first-line treat-

ment, as of 2021, these guidelines advocate adding vasopressin early on as second-line therapy rather than increasing the norepinephrine dose (Evans et al. 2021).

This second-line treatment is recommended because various circumstances in septic shock, including acidosis, hypoxia, hypocalcaemia, relative steroid deficiency and adrenergic receptors being less responsive, can decrease vasopressor effects in norepinephrine. In addition, patients with high levels of norepinephrine have an up to 80% risk of mortality due to the harmful effects of catecholamines (Martin et al. 2015). Furthermore, norepinephrine induces immunoparalysis, which is dysregulation of the immune response, compromising the host defence during sepsis (Stolk et al. 2020).

Dr Garcia-Alvarez suggests early multimodal vasopressors in the treatment of septic shock, which comprises a 'broad spectrum of vasopressors' with several therapeutic targets to achieve decatecholaminisation may be a new approach. With this method, the norepinephrine dose does not need to be increased thereby improving safety.

Why use vasopressin in septic shock?

Arginine vasopressin (AVP) is a vasoconstrictor with no inotropic effect, a non-catecholamine and has a short half-life (5-15 mins) (Garcia-Alvarez et al. 2023). In Dr Garcia-Alvarez's opinion, the use of vasopressin in septic shock is rationalised by:

1. The fact that there is an AVP deficiency in septic shock.
2. A multimodal strategy sparing catecholamines.
3. A potential nephroprotective effect.
4. The potential improvement of coagulation.

When is the optimal time to introduce AVP?

The SSC guidelines recommend starting vasopressin when the norepinephrine dose is between 0.25 and 0.5 µg/kg/min instead of escalating the norepinephrine dose (Evans et al. 2021). However, several recent studies showed significant benefits if vasopressin was started within three hours (Brask et al. 2023), at lactate levels <2,3 and/or at norepinephrine doses of <10 µg/kg/min (Sacha et al. 2023).

The response to vasopressin is potentially an indicator of the patient's prognosis. Patients responding to AVP showed lower mortality, more hospital-free days at day 28, and a lower rate of renal replacement therapy (Sacha et al. 2018).

Dr Garcia-Alvarez concludes that it is important to point out that vasopressin is not a rescue treatment but has to be initiated early in the treatment when norepinephrine is at ≥0,25 µg/kg/min to be most effective.

If you want to watch the whole webinar, please visit the webinar library on the ESICM website, or follow this link: https://mediatheque.cyim.com/mediatheque/media.aspx?mediaId=196721&channel=71460

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