

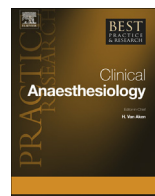


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### Postoperative management



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Most patients undergoing major aortic surgery have multiple comorbidities and are at high risk of postoperative complications that affect multiple organ systems. Different aortic pathologies and surgical repair techniques have specific impact on the postoperative course. Ischemia–reperfusion injury is the common denominator in aortic surgery and influences the integrity of end-organ function. Common postoperative problems include hemodynamic instability due to the immediate inflammatory response, renal impairment, spinal cord ischemia, respiratory failure with prolonged mechanical ventilation, and gastrointestinal symptoms such as ileus or mesenteric ischemia. Focused care bundles to establish homeostasis and a team working toward an early functional recovery determine the success of effective rehabilitation and outcomes after aortic surgery.

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### Introduction

Postoperative management after major aortic surgery represents a pivotal component in the patient pathway. The quality of postoperative care can undoubtedly influence and determine success or failure in this high-risk patient population. This overview will focus on recent developments in key components of postoperative care.

The following care principles are of significance after aortic surgery:

1. Assessment and optimization of microcirculation following ischemia–reperfusion injury and surgery-induced inflammatory response
2. Adequate fluid resuscitation in the context of inflammation, endothelial cell damage, and activation of coagulation

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3. Establishment of a balanced aerobic metabolic state, stable blood glucose level, and maintenance of satisfactory oxygen delivery
4. Flow-directed hemodynamic support and guided application of vasodilators and vasoconstrictors
5. Early neurological assessment and fostering enhanced neurocognitive rehabilitation
6. Effective introduction of organ support concepts for renal and cardiopulmonary failure

## Principles of postoperative management

In 2014, Crimi and Hill published an excellent overview of the postoperative management of patients undergoing major vascular surgery [1]. In their review, they highlight the importance of proactively managing hemodynamic, pulmonary, renal, neurological, hematologic, and gastrointestinal complications (Fig. 1). Many of the organ-specific deteriorations seen in patients after aortic surgery are a result of systemic response mechanisms and mainly related to the ischemia–reperfusion injury. Thus, the main focus in the early postoperative phase is to achieve homeostasis in the vital organ systems and to control systemic inflammation to regain functional capacity.

The pattern of complications can vary depending on the pattern of disease, urgency, and choice of surgical or endovascular intervention. However, postoperative complications and their relevance are usually driven by the underlying patient condition and degree of comorbidity. Table 1 describes the most relevant domains of postoperative issues after aortic surgery.

The majority of high-risk patients following major aortic surgery are admitted to a standard intensive care unit (ICU) environment, but local practice may vary due to logistics and setup of the service. The surgical intervention, duration of surgery, and patient condition at the end of the procedure will determine the immediate postoperative model of care. Although there is a well-founded trend to achieve early tracheal extubation and functional recovery even after a complex surgery such as cardiac and major vascular surgery [2], a large observational study found less morbidity and better outcomes in patients following abdominal aortic surgery when early elective extubation was achieved in the ICU and managed by a comprehensive team similar to a cardiac postoperative recovery unit, rather than in a general recovery room environment [3,4]. They state that organizational characteristics of ICUs are related to outcomes in high-risk patients. Nevertheless, modern practice should actively adopt elements of enhanced recovery even in high-risk patients, which has been shown to be safe [5,6]. The critical care team ideally works along procedure-adapted protocols and checklists that are informed by critically reviewed guidelines within the organization [7].

One of these procedural standards is a formal handover from the surgeon and anesthesiologist to the ICU team on arrival of the patient in a structured SBAR format (Situation, Background, Assessment, and Recommendation) to pass on relevant information, ideally in a traceable electronic format. In Table 2, a typical admission checklist is shown.

## Immediate postoperative care in the ICU

The following issues and interventions during the admission and stabilization phase (first 24 h) frequently occur after aortic surgery and should be managed proactively:

- *Hemodynamic instability*: Various forms of hemodynamic instability can occur after aortic surgery, mainly after more complex surgeries such as open thoracoabdominal aortic aneurysm (TAAA) repair or after cardiopulmonary bypass. The desired scenario in most situations is to avoid hypertension while providing adequate organ perfusion. Thus, any hemodynamic intervention should be guided by these principles. Often some form of vasodilators, such as glyceroltrinitrate or labetalol, is combined with an inodilator such as dobutamine. Occasionally, patients are vasoplegic and hyperdynamic and require additional vasoconstriction in the form of noradrenaline or vasopressin analogs. In general, the choice and dose of hemodynamic support agents should be guided by comprehensive monitoring of the cardiovascular system. This can best be achieved with continuous cardiac output monitoring, with pulmonary artery catheter and other dilution techniques being

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