

CLINICAL INFORMATION

Hemicorporectomy anesthesia: case report



Cynthia de Oliveira Rego, Rose Betânia Costa Feio, Bruno Mendes Carmona *

Hospital Ophir Loyola, Belém, PA, Brazil

Received 8 September 2019; accepted 9 December 2019
Available online 10 February 2020

KEYWORDS

Intraoperative complications;
Amputation;
Hemorrhagic shock

Abstract

Introduction: Hemicorporectomy progresses with hemodynamic and ventilatory repercussions that make anesthesia management definitive to patient outcome.

Objective: Report anesthesia approach for a patient with squamous cell carcinoma submitted to urgent hemicorporectomy after an episode of hypovolemic shock.

Case report: After lesion bleeding, the patient presented hypovolemic shock class 3, and was submitted to urgent procedure under general inhalation anesthesia and intravenous multimodal analgesia, presenting hemodynamic instability requiring massive blood transfusion after spinal cord transection and removal of surgical specimen.

Conclusion: Anesthetic management is essential in scenarios such as the one reported to assure patient survival.

© 2020 Sociedade Brasileira de Anestesiologia. Published by Elsevier Editora Ltda. This is an open access article under the CC BY-NC-ND license (<http://creativecommons.org/licenses/by-nc-nd/4.0/>).

PALAVRAS-CHAVE

Complicações
intraoperatórias;
Amputação;
Choque hemorrágico

Anestesia para hemicorporectomia: relato de caso

Resumo

Introdução: A hemicorporectomia cursa com repercussões hemodinâmicas e ventilatórias que fazem o manejo anestésico ser definitivo para o desfecho do paciente.

Objetivo: Relatar a condução anestésica em um portador de carcinoma espinocelular submetido à hemicorporectomia de urgência após episódio de choque hipovolêmico.

Relato de caso: Após sangramento pela lesão, paciente apresentou choque hipovolêmico classe 3, sendo submetido à abordagem de urgência sob anestesia geral inalatória e analgesia multimodal endovenosa, apresentando instabilidade hemodinâmica com necessidade de transfusão sanguínea maciça após secção medular e retirada da peça cirúrgica.

Conclusão: O manejo pelo anestesista se faz fundamental em situações como a relatada para assegurar a sobrevivência do paciente.

© 2020 Sociedade Brasileira de Anestesiologia. Publicado por Elsevier Editora Ltda. Este é um artigo Open Access sob uma licença CC BY-NC-ND (<http://creativecommons.org/licenses/by-nc-nd/4.0/>).

* Corresponding author.

E-mail: bcarmona.carmona@gmail.com (B.M. Carmona).

Introduction

Hemicorporectomy, defined as disarticulation at the level of the lumbar spine and transection of the spinal cord to remove the lower extremity of the body, is indicated in cases of locally advanced pelvic and perineal neoplasms.¹ It is a rare procedure, not frequently described, whose extension and repercussions (hemodynamic and ventilatory) determine patient morbidity and survival.

At the critical initial time, ligation of the distal aorta artery or iliac arteries generates increased afterload, and therefore, volume overload to the left ventricle which will need increasingly higher filling pressures to overcome post-clamping increasing systemic vascular resistance. This is reflected in increased pulmonary capillary hydrostatic pressure, leading to fluid transudation to alveoli, and higher risk of acute pulmonary edema.² Following, the vena cava is also ligated, reducing venous return and maintaining high intravascular volume in the body area to be reduced by half, that is, a major blood loss through the surgical specimen, therefore requiring transfusion.^{3,4}

Another major time is spinal cord transection followed by neurogenic shock, causing tachyarrhythmias and severe hypotension, possibly leading to cardiorespiratory arrest.⁵ However, response to volume resuscitation, given hypotension is also generated or worsened by bleeding; blood transfusion is then initiated, according to hemodynamic monitoring available.³

Another relevant factor relates to pain stimulation when, during surgical maneuvers, prolonged handling of tissue enables activated nociceptors to stimulate the central nervous system, triggering inflammatory response, which may enhance autonomic response, decreasing activation threshold of these receptors and increasing response to supraliminal stimuli, defined as peripheral sensitization.⁶

Following, these stimuli generate somatic and autonomic reflexes, increasing the risk of myocardial ischemia, heart failure, thromboembolism, reduction in lung volume and capacity and reflex spasm of abdominal muscles that, in turn, make deep breathing and coughing difficult, retaining secretions and facilitating emergence of atelectasis and lower airway infections.⁷

Thus, the present article describes the case of a patient presenting Squamous Cell Carcinoma (SCC) submitted to hemicorporectomy after hemorrhagic shock, progressing with a further episode of intraoperative shock, and anesthesia approach for patient maintenance.

Case report

A 31 year-old, 50 kg, 1.55 m male, ASA P3 physical status was programmed for hemicorporectomy due to sacral squamous cell carcinoma stage TNM T3N1M0, presenting non-dialysis-prone chronic renal failure (4 mg.dL⁻¹ creatinine), chronic anemia treated specifically with erythropoietin (baseline hemoglobin 7 g.dL⁻¹) and spina bifida. Before surgery, the patient was in hypovolemic shock class III due to lesion bleeding; the bleeding vessel was clamped and blood was transfused; once stable, surgery preparation was initiated. Already on mandatory monitoring and venous access, the patient was induced with 150 mcg of fentanyl, 15 mg eto-

midate and 7.5 mg cisatracurium. Orotracheal intubation was performed, and volume-controlled mechanical ventilation, central venous access puncture of right internal jugular vein and invasive blood pressure monitoring on the left radial artery established. Counterindication of neuraxial block, due to recent hemodynamic instability, required analgesia with 15 mg ketamine and 2 g magnesium sulfate. Target-dose controlled continuous infusion pump propofol and remifentanyl were used for anesthesia maintenance. Upon excision of the surgical specimen, severe hypotension and tachycardia occurred, requiring vasoactive drug and blood transfusion, which improved hemodynamics reflected by intermittent blood gases and monitoring parameters. The patient received a total of ten bags of packed red blood cells, ten of fresh plasma, ten units of cryoprecipitate and 1,500 mL of crystalloid. After 14 hours of anesthesia, the patient was taken to the ICU with vasoactive drug and stable monitoring parameters, having remained on scheduled controlled analgesia with tramadol and gabapentin. After 48 hours post-operative, the patient was extubated without pain and without ventilatory discomfort, although receiving vasoactive drug.

Discussion

There are two crucial outcome-related moments during hemicorporectomy, ligation of major vessels and disarticulation of the lumbar spine with transection of the spinal cord, due to major blood loss and neurogenic hypotension.

After aorta ligation, elevating lower limbs has been suggested to facilitate venous return and work as self-transfusion, reducing need for allogenic transfusion.⁸ However, Elliot and Alexander (1982) did not observe increase in central venous pressure in their patient with this technique, therefore not reflecting a benefit to improve volemia, and they used a total of two liters of crystalloids and three units of Packed Red Blood Cells (PRBC) to resuscitate the patient.³

Still regarding volume resuscitation, Shafir et al. (1984) chose transfusion from the beginning of surgery, totaling six units of PRBC and 6.4 liters of crystalloids, apparently without significant benefit, given severity of neurogenic hypotension did not decrease and the risk of acute pulmonary edema increased, although it was not reported in the case. Conversely, most authors underscore the importance of fluid therapy based on the new weight of the patient, which also did not occur in our case.⁹

Another time for potential bleeding with major hemodynamic repercussion is the ligation of the vena cava, with a higher risk of accidental lesion of the Batson plexus due to ingurgitation, which can be avoided by initially choosing the anterior approach to separate vertebral structures and for transection of the spinal cord, as observed in a literature review by Barnett Jr et al. (2008).⁵

Regarding ventilatory repercussions in our case, acute pulmonary edema was not observed, although there have been reports of the complication both in the late postoperative and in a 19 year post-surgery period.¹⁰ Moreover, as the postoperative period progressed, reduction in total pulmonary capacity, vital capacity, residual functional volume

and ventilation-perfusion ratio in both lung bases (generating increase in oxygen consumption) were observed.¹¹

Regarding spinal cord transection, Elliot and Alexander (1982) observed increased heart rate up to 150 bpm associated with two episodes of supraventricular tachycardia and systolic pressure below 60 mmHg, responsive to fluid resuscitation,³ such as in our case, and in the case of Shafir et al. (1984) in which mean blood pressure reached 25–30 mmHg, also responsive to volume.⁹ In order to avoid neurogenic shock, several authors defend intradural injection of local anesthetics.⁵

Another concern during anesthesia is analgesia. In our case analgesia was venous, without pain in the post-operative, which, however may have changed due to strict scheduled prescription of post-operative analgesics. The same option was made by Shafir et al. (1984), whose patient received pre-operative 10 mg of pantopon and 5 mg of droperidol and induction with 200 mg of ketamine, 45 mg of non-specific neuromuscular blocker and maintenance with nitrous oxide and enflurane; and, in the immediate post-operative, maintained with morphine on continuous infusion (reducing dose gradually). However, the patient progressed with tremors, hyperthermia and variable level of awareness, probably due to withdrawal syndrome to opioids also jeopardizing assessment of the technique chosen.⁹

In Elliott and Alexander's case (1982), the patient was pre-medicated with oral diazepam, followed by T6–T7 epidural anesthesia with insertion of specific catheter and injection of 2 mg of morphine diluted in 10 mL of saline and, then induced with thiopental, fentanyl, droperidol and pancuronium, with anesthesia maintained with nitrous oxide, which did not prevent the patient from referring "phantom limb" pain during recovery.³

Due to scarcity of reports on anesthesia for hemicorporectomy, we suggest the comparison with hemipelvectomy, another equal size procedure, with similar hemodynamic changes and techniques that in a systematic review showed high likelihood of blood loss with mean requirement of resuscitation with seven units of PRBC and 3,500–8,500 L of crystalloid. The anesthesia of choice was general associated with epidural block, with significant superiority of neuraxial analgesia over total venous, although 31.4% of patients presented severe postoperative pain, 30% developed persistent pain (more than two months after surgery), and 90% might have progressed with "phantom limb" pain.¹²

Intraoperative hemodynamic control is based on monitoring and is maintained throughout the procedure. Nonetheless, it is highly important during the ligation of major pelvic vessels and spinal cord transection. At these times, careful use of vasoactive drugs and volume resuscitation by the anesthetist is required, and may lead to

hemodynamic complications, mainly in the post-operative, determining patient survival. Thus, pain control strategy, such as neuroaxis blocks with local anesthetics or only using opioids (as could have been chosen in our case), peripheral blocks and venous analgesia, is also important. Currently, there is no definitive best technique, and given it depends on patient status, it should be tailored, and there are no series studies that allow testing different techniques.

Thus, appropriate planning and management of anesthesia are essential to case outcome. Rare and complex procedures should be described, also detailing techniques used, any complications, and clinical progress of patients in order to guide future approaches. In our case, the experience and knowledge gained by the medical team, based on other major procedures in critical patients and individuals with a variety of co-morbidities concurred to the favorable outcome of the anesthetic-surgical procedure.

Conflicts of interest

The authors declare no conflicts of interest.

References

1. Weaver JM, Flynn MB. Hemicorporectomy: review article. *J Surg Oncol.* 2000;73:117–24.
2. MacIver DH, Clark AL. The vital role of the right ventricle in the pathogenesis of acute pulmonary edema. *Am J Cardiol.* 2015;115:992–1000.
3. Elliott P, Alexander JP. Translumbar amputation. *Anaesthesia.* 1982;37:576–81.
4. Saint Maurice JPC, Kahn M, Riniezki M, et al. Anesthésie-reanimation pour une hemicorporectomie. *Cahiers Anesthesiol.* 1971;4:397–413.
5. Barnett CC Jr, Ahmad J, Janis JE, et al. Hemicorporectomy: back to front. *Am J Surg.* 2008;196:1000–2.
6. Henriques AA, Mesquita AC, Santos AP, et al. *Dor e cuidados paliativos.* 1^a ed. Rio de Janeiro: Sociedade Brasileira de Anestesiologia/SBA; 2018.
7. Hui D, dos Santos R, Chisholm G, et al. Clinical signs of impending death in cancer patients. *Oncologist.* 2014;19:681–7.
8. Miller TR, Mackenzie AR, Randall HT. Translumbar amputation for advanced cancer: indications and physiologic alterations in four cases. *Ann Surg.* 1966;164:514–21.
9. Shafir M, Abel M, Tausk H, et al. Hemicorporectomy perioperative management: A case presentation and review of literature. *J Surg Oncol.* 1984;6:79–82.
10. Ferrara BE. Hemicorporectomy: the contribution of Frederick E. Kredel. *J S C Med Assoc.* 1988;84, 83–83.
11. Ferrara BE. Hemicorporectomy: a collective review. *J Surg Oncol.* 1990;45:270–8.
12. Couto AGH, Fonseca CO, Renni MJP, et al. Taxa de sobrevivência e dados perioperatórios de pacientes submetidos à hemipelvectomy: série retrospectiva. *Mundo J Surg Oncol.* 2016;14:255.