sciendo

ARS Medica Tomitana - 2023; 3(29): pag. 202 - 206
doi: 10.2478/arsm-2023-0029

ANESTHETIC MANAGEMENT FOR FOREARM FRACTURE IN SEVERE AORTIC VALVE STENOSIS

Nida Bosnac[1,2], Ion Bordeianu[1], Alexandru Vicentiu Valcu[1,2], Iulian Catalin Bratu[3]

[1] Faculty of Medicine, University "Ovidius" of Constanta
[2] County Clinical Emergency Hospital of Constanta
[3] Faculty of Pharmacy, University "Ovidius" of Constanta

Nida Bosnac

email: nida_bosnac@yahoo.com:

ABSTRACT

Despite all the advances in anesthesia and surgical techniques, a significant incidence of morbidity and mortality in patients with severe aortic stenosis remains high. Anesthesia for severe aortic stenoses, characterized by a valve area of less than 1 cm², may present increased risks associated with patient mortality. These patients require surgical treatment for aortic stenosis before any surgery. It is important to determine which type of anesthetic technique carries the least risk for these patients in the absence of any cardiac intervention. On the other hand, orthopedic operations are the most frequently reported non-cardiac surgical interventions among patients with severe aortic stenosis. This case study shows how performing the peripheral nerve block technique in a patient with an increased risk of morbidity had a beneficial impact, contributing to the reduction of this risk of morbidity and mortality associated with severe aortic stenosis.

Keywords: aortic valve stenosis, axillary block, forearm fracture, surgery.

Introduction

Usually, the choice of the anesthetic method is influenced by the type of surgical intervention, the options expressed by the patient, concurrent comorbidities, and the medical skills of the anesthetist, an approach that conforms to the principles of personalized patient care, emphasizing the need for a complex assessment in the preoperative planning phase (1). The selection of the surgical procedure, the individual characteristics of the patient, and the experience of the anesthetist converge together to develop an optimized and personalized anesthetic strategy (2). When significant comorbidities are noted, the anesthetic approach option tends to be toward the use of regional or peripheral nerve block techniques to reduce the cardiovascular stress associated with general anesthesia (3). The emphasis on the personalized approach highlights the importance of the adaptability of anesthetic techniques to the specific requirements of each patient, especially in situations characterized by the presence of complex medical conditions. (4).

In the present study, a medical case characterized by severe and symptomatic aortic stenosis is presented. In this particular case, the patient underwent nerve block procedures as part of the anesthetic management strategy aimed at alleviating pain and facilitating osteosynthesis of

a forearm fracture. It was thus chosen to relieve pain while taking into account the patient's underlying cardiovascular status, highlighting the adaptability and efficacy of regional or peripheral nerve block techniques in such challenging clinical scenarios. The complex, multifaceted nature of the case underscores the importance of tailoring anesthetic interventions to individual patient needs and medical challenges.

A 65-year-old man, weighing 75 kg and 165 cm tall, was admitted to the medical unit with fractures to the radius and ulna. The patient was concurrently diagnosed with severe aortic stenosis, a previously unrecognized condition. This clinical presentation adds a level of complexity to fracture management, requiring a comprehensive and interdisciplinary approach to address both the orthopedic challenges and cardiovascular considerations associated with severe aortic stenosis.

Preoperative cardiology consultation revealed valvular disease, accompanied by a history of fainting episodes and occasional palpitations. It is noteworthy that the patient had no further hospital investigations related to these symptoms before the current admission.

An electrocardiogram (ECG) showed only left ventricular hypertrophy. Echocardiographic findings revealed a severely calcified aorta with a valve area of 0.75 cm^2, accompanied by an apex aortic valve pressure gradient of 80 mm Hg. In addition, concentric left ventricular hypertrophy, characterized by an ejection fraction of 55%, was noted along with mild mitral regurgitation. The cardiology consultation emphasized that the patient is in a scenario where surgery carries a notable level of risk.

Administration of general anesthesia in patients with severe aortic stenosis carries a particularly high risk of perioperative mortality, requiring careful assessment of the patient's cardiovascular status to minimize potential adverse consequences. (5), which is why it is contraindicated in chronic surgical cases (6). The only surgical modality identified as unique and viable in this context was regional anesthesia, primarily due to its ability to reduce cardiac stress and minimize the risks associated with general anesthesia in the presence of clinically complex conditions in a setting characterized by stenosis severe aortic (7).

The study presents a case in which anesthetic management of severe aortic stenosis was effectively performed in a patient undergoing surgery for a forearm fracture.

Figure 1 Radiography with the fracture

Figure 2 Radiograpy after osteosynthesis

Anesthesia Brachial axillary block

The frequent use of the axillary approach to the brachial plexus is due to its ease of applicability and minimal incidence of associated complications, making it preferred due to its practicality and safety profile (8-10). To ensure a precise localization of the brachial plexus, we implemented the neurostimulation technique, a method that involves the use of neurostimulation to increase the accuracy in identifying the anatomical landmarks associated with the brachial plexus (8, 11, 12). To ensure a successful anesthetic block, the local anesthetic solution must be injected directly into the nerve sheath (13). In the axillary region, the brachial plexus divides, giving rise to the median, radial, and ulnar nerves (8).

During the preoperative preparation phase of the patient, peripheral vascular access was established by inserting an 18-20 gauge catheter to facilitate intravenous interventions, and medication administration and ensure preparation for any potential requirements during the surgical procedure. For premedication, midazolam at a dose of 0.04 mg/kg and fentanyl at a dose of 1.5 mcg was administered intravenously, together with the appropriate antibiotic prophylaxis. Supplemental oxygen was also provided at a flow rate of 4 L/min via a face mask.

The affected, fractured arm is positioned in 90° abduction to the body, and the elbow is flexed at 90°. After sterilization and administration of local anesthesia, the axillary artery is identified and palpated in the axillary fossa. Just above the axillary artery, in the direction of the brachial plexus, using a peripheral nerve stimulator (Stimuplex HNS11; B.Braun Medical, Germany) and a 50 mm 22 G insulated needle (Stimuplex, DB Braun Medikal), a stimulation current was introduced at 1 mA, with a frequency of 2 Hz, for 0.1 ms. The purpose of this procedure was to locate the point where the combined distal motor response of the median and ulnar nerves occurs. an injection of ropivacaine 0.35% was administered, in a volume of 30 ml, with aspiration checked every 5 ml. Assessment of sensory block was performed at 10, 20, and 30-minute intervals.

• After establishing the anesthetic block, the patient was transferred to the operating room. Additionally, during surgery, 2 mg of midazolam was administered to ensure patient comfort.

• The operation lasted 100 minutes, with an estimated blood loss of approximately 50 ml, with no effect on the patient's blood pressure.

• For postoperative analgesia, the protocol included administration of paracetamol 1g every 6 hours, ketoprofen 100 mg every 12 hours, and nefopam 20 mg every 6 hours.

• The patient was satisfied with the anesthetic technique selected and the treatment applied, being discharged with a prescription for regular analgesics and a firm recommendation to undergo cardiac surgery within the next month.

Discussion

Severe aortic stenosis has been recognized as an independent risk factor for individuals undergoing noncardiac surgical procedures (14). Studies have shown that people diagnosed with severe aortic stenosis have a 17.7% incidence of cardiac complications and a 13% mortality rate when undergoing noncardiac surgery (15). An adverse outcome was recorded with a higher frequency in patients with advanced disease, 31% compared with 11% in cases where the valve area is less than 0.8 cm^2 and the transvalvular gradient exceeds 50 mmHg (16). The traditional symptoms associated with aortic stenosis, such as angina, syncope, and dyspnea, usually become apparent in the advanced stages of the disease, and once manifested, the prognosis is poor (17). So from the initiation of these symptoms, the mortality rate increases to approximately 75% in a three-year interval, being in the high-risk category (18).

Conclusion

To optimize perioperative cardiovascular stability, and increase patient safety during surgical procedures, resort to peripheral nerve blocks that use local anesthetic agents have a minimal impact on the patient's hemodynamics, significantly reducing the cardiac depression and vasodilatation typically associated with the administration of general anesthetics.

A critical point to note is that, under such circumstances, nerve blocks should be administered by anesthesiologists who possess specialized expertise in this technique to mitigate the risk of procedural failure and ensure the efficacy and safety of nerve block procedures in complex clinical scenarios.

Our case report highlights how the use of the peripheral nerve block technique in a high-risk patient likely contributed to reducing the risk of morbidity and mortality associated with severe aortic stenosis. This approach can be successfully considered in future interventions that lend themselves to this type of anesthesia, having the potential to improve the patient's quality of life.

The choice of anesthetic technique depends on the nature and extent of the surgical intervention, the patient's preferences, and the existence of comorbidities. The interplay between procedural requirements, patient preferences, and medical complexities dictates the choice of the most appropriate anesthetic strategy. The more comorbidities identified, the more inclined the anesthetist may be to opt for a regional or peripheral nerve block, considering minimizing the potential systemic effects and cardiovascular stress associated with general anesthesia, aligning with a patient-centered approach that prioritizes safety and tailors anesthetic strategy to the individual's unique medical profile.

References

1. Hwang SM, Lee JJ, Jang JS, Gim GH, Kim MC, Lim SY. Patient preference and satisfaction with their involvement in the selection of an anesthetic method for surgery. J Korean Med Sci. 2014 Feb;29(2):287-91.
2. van der Starre PJ, Guta C. Choice of anesthetics. Anesthesiol Clin North Am. 2004 Jun;22(2):251-64, vi.
3. Stundner O, Danninger T, Memtsoudis SG. Regional anesthesia in patients with significant comorbid disease. Minerva Anestesiol. 2013 Nov;79(11):1281-90.
4. Christ M, Sharkova Y, Geldner G, Maisch B. Preoperative and perioperative care for patients with suspected or established aortic stenosis facing noncardiac surgery. Chest. 2005;128(4):2944-53.
5. Tashiro T, Pislaru SV, Blustin JM, Nkomo VT, Abel MD, Scott CG, et al. Perioperative risk of major non-cardiac surgery in patients with severe aortic stenosis: a reappraisal in contemporary practice. Eur Heart J. 2014 Sep 14;35(35):2372-81.
6. Goel N, Kumar MG, Barwad P, Puri GD. Noncardiac surgery in two severe aortic stenosis patients: General or epidural anesthesia? Saudi J Anaesth. 2018 Apr-Jun;12(2):367-9.
7. Johansson S, Lind MN. Central regional anaesthesia in patients with aortic stenosis - a systematic review. Dan Med J. 2017 Sep;64(9).
8. Satapathy AR, Coventry DM. Axillary brachial plexus block. Anesthesiol Res Pract. 2011;2011:173796.
9. Coventry DM, Barker KF, Thomson M. Comparison of two neurostimulation techniques for axillary brachial plexus blockade. Br J Anaesth. 2001 Jan;86(1):80-3.
10. BayraktaroĞLu E, DenİZ MN, AyanoĞLu HÖ, Sertoz N. Çoklu sinir uyarı yöntemi ile uygulanan aksiller brakiyal pleksus bloğunun geriye dönük değerlendirilmesi. Türk Anestezi ve Reanimasyon Dergisi. 2010;38(4):254-61.
11. Neal JM, Gerancher JC, Hebl JR, Ilfeld BM, McCartney CJ, Franco CD, et al. Upper extremity regional anesthesia: essentials of our current understanding, 2008. Reg Anesth Pain Med. 2009 Mar-Apr;34(2):134-70.
12. Conceição DB, Helayel PE, Oliveira Filho GR. [A comparative study between ultrasound and neurostimulation guided axillary brachial plexus block]. Rev Bras Anestesiol. 2009 Sep-Oct;59(5):585-91.
13. Reed KL, Malamed SF, Fonner AM. Local anesthesia part 2: technical considerations. Anesth Prog. 2012 Fall;59(3):127-36; quiz 37.
14. Okuno T, Yahagi K, Horiuchi Y, Sato Y, Tanaka T, Koseki K, et al. The role of transcatheter aortic valve replacement in the patients with severe aortic stenosis requiring major non-cardiac surgery. Cardiovasc Interv Ther. 2019 Oct;34(4):345-51.

15. Stewart BF, Siscovick D, Lind BK, Gardin JM, Gottdiener JS, Smith VE, et al. Clinical factors associated with calcific aortic valve disease. Cardiovascular Health Study. J Am Coll Cardiol. 1997 Mar 1;29(3):630-4.
16. Lindroos M, Kupari M, Heikkilä J, Tilvis R. Prevalence of aortic valve abnormalities in the elderly: an echocardiographic study of a random population sample. J Am Coll Cardiol. 1993 Apr;21(5):1220-5.
17. Nishizaki Y, Daimon M, Miyazaki S, Suzuki H, Kawata T, Miyauchi K, et al. Clinical factors associated with classical symptoms of aortic valve stenosis. J Heart Valve Dis. 2013 May;22(3):287-94.
18. Tameem A. Peripheral nerve blocks for intramedullary nailing for fracture humerus in severe aortic stenosis2007.