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CASE SERIES ANESTHESIA & CONCURRENT DISEASE

Navigating anesthetic complexity: lower limb amputation in high-risk patients - a case series

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ABSTRACT

Lower limb amputation in high-risk patients presents with numerous anesthetic concerns because of the patient's multimorbidity and poor physiological state. This case series aims to discuss the ways of performing regional anesthesia (RA) techniques as a safer alternative to general anesthesia. We report five high-risk patients for lower limb amputations with individual RA techniques applied, such as sciatic nerve blockade, femoral nerve blockade, ankle blockade, epidural catheter, and caudal epidural anesthesia. Comorbidities were acute severe cardiac diseases, diabetes, chronic kidney disease, and other significant illnesses. Perioperative hemodynamics were evaluated, intraoperative complications encountered, and postoperative results observed. All the patients were in a stable hemodynamic state, and the number of intraoperative complications was rather low. The study established that RA offered acceptable blood loss of about 200 mL and adequate analgesia. 51 of the cases had favorable postoperative results, with 48 percent recurrent ischemia requiring additional surgery. RA approaches were found to be beneficial in anesthesia management of leg amputation in high-risk patients, improving cardiovascular stability, more site-directed analgesia, and fewer generalized adverse effects. The present study provides evidence for adopting a patient-specific RA approach to facilitate improved outcomes in similar high-risk surgical cohorts.

Abbreviations: GA: General anesthesia, LEA: Lower extremity amputation, RA: regional anesthesia, SMWA: Segmental Wall Motion Abnormalities

Keywords: Lower Limb Amputation; High-Risk Patients; Regional Anesthesia; Sciatic Nerve Block; Femoral Nerve Block; Individualized Care; Perioperative Management

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1. INTRODUCTION

Lower extremity amputation (LEA) means the surgical operation whereby part or whole of lower limb or specific area of the leg or foot is removed. Around 150000 patients in the United States need LEA annually because of diabetes mellitus, peripheral vascular disease (PVD), neuropathy and trauma.[1] The use of anesthetic agents and techniques in high-risk surgical patients is complex across the preoperative, intraoperative and postoperative phases of the surgical process. Successfully managing its prevention and complications thus involves risk-stratifying, closely monitoring, and creating an individual patient anesthesia plan.[2]

Patients who receive LEA are often elderly with other comorbidities, including diabetes, end-stage renal disease, and coronary artery disease, which compromise the quality of surgical anesthesia and are considered to be at high risk of anesthesia-related complications.[3] Postoperative complications are common in this

population and there is a persistent high mortality rate despite improvements in the perioperative care and management and enhanced rehabilitation.[4]

LEA can be either performed under general anesthesia (GA), in most cases this is not recommended due to the increase in postoperative complication rate or under RA. GA puts the patient to sleep and controls pain, while RA involves giving analgesics close to nerves, through methods such as spinal/epidural or nerve blocks.[5] It is vital to pay much attention to the choice of anesthesia type in order to decrease the risk of complications and improve the level of patient safety for clients with risk factors.[6]

For management of such risk factors the role of patient history and intra operative monitoring cannot be undermined. Methods such as ankle block, epidural, sciatic and femoral nerve blocks did not cause changes in the patient's blood pressure. These nerve blocks have offered anesthesia and analgesia and improving cardiovascular steadiness in very high-risk individuals.[7]

The reason of employing regional anesthesia (RA) in the high-risk patients is wise due to targeted analgesia, reduced impact on other body systems and general complications that can be elicited by general anesthesia. This approach aims at enhancing the usability of a surgical period and patient safety, based on specific anesthetic plan depending on corresponding intricacy of the medical condition of a specific patient.

The objective of this study was to evaluate the application of RA techniques to address anesthetic complexity in high-risk patients with lower limb amputation and to assess the effectiveness of these methods in patient's perioperative period and their safety profile compared to GA and overall outcomes.

2. Case Series

2.1. Case 1:

A 76-year-old female with diabetes, hypertension, breast cancer, ischemic heart disease, and stroke (ASA class III) presented with a non-healing right foot wound requiring multiple debridements. She was scheduled for trans metatarsal amputation and was on dual antiplatelet therapy.

Her laboratory investigations revealed hemoglobin of 10.3 g/dL, platelet count of 244 × 10^3/µL, total leukocyte count of 21 × 10^3/µL and normal electrolyte levels excluding sodium, 127 mmol/L and bicarbonate, 21 mmol/L. PT was 13.1 sec INR 1.3 and HbA1c was 9.0%. Echocardiogram showed multiple Segmental Wall Motion Abnormalities (SWMA), mild reduction in ejection fraction 25% and increased PASP 45 mmHg.

For an anxiolytic effect in the patient, 1mg midazolam was administered intravenously and for the ankle block, 2% lidocaine and 0.5% bupivacaine were used. The surgery began 30 min later and was successful afterward the patient was transfer to the post anesthesia care unit.

2.2. Case 2:

A 60-year-old man with hypertension, diabetes and ischemic heart disease had a chronic ulcer for over six months on the dorsum of his left foot. After coronary angiography showing the presence of non-stent able lesion, below-knee amputation was done.

The patient exhibited tachycardia and basal lung crepitations but remained hemodynamically stable with good oxygen levels. Labs showed hemoglobin of 9.5 g/dL, leukocytes at 13,960/µL and platelets at 492 × 10^3/µL. Urea and creatinine increased from 96 mg/dL and 0.9 mg/dL to 1.5 mg/dL during admission. Echocardiography indicated an ejection fraction of 25%.

ASA monitoring was started and an epidural catheter was inserted at L4-L5 with local infiltration of 2% lidocaine with adrenaline for sensory block. The surgical duration lasted 1.5 hr and the patient was shifted to the HDU for post-surgery management.

2.3. Case 3:

A 60-year-old hypertensive diabetic female with ST-elevation myocardial infarction (STEMI), chronic kidney disease, stroke, hyperkalemia and gangrenous right foot ulcer, for which a right below-knee amputation was advised.

Laboratory results showed hemoglobin of 10 g/dL, leukocytes at 15,730/µL, platelets at 342 × 10^3/µL, urea - 204 mg/dL, and creatinine - 4.4 mg/dL. Electrolyte abnormalities included sodium 132 mmol/L, potassium 5.1 mmol/L, chloride 94 mmol/L, and bicarbonate 22 mmol/L. Echocardiogram revealed an ejection fraction of 20% with global hypokinesia. The cardiology team adjusted diuretics, and the patient was deemed high-risk for non-cardiac surgery.

The patient received a subgluteal sciatic and femoral nerve block using 0.5% of ropivacaine. The procedure was uneventful; total blood loss was approximately 200 mL, and the patient was shifted to the ICU.

2.4. Case 4:

A 15-year-old male with history of rheumatic disease and epilepsy was suffering from fever 20 days. He had pain in his left lower limb for 20 days and swelling and discoloration for 3 days. The orthopedic team recommended for right above-knee amputation.

History and preoperative investigations had the patient being an ASA class 3; functional class 2. Other investigation results comprised; hemoglobin - 9.3 g/dL, platelet count -373 × 10^3/µL, LFTs with normal range and INR - 1.5, for which 2 units of FFP were ordered before surgery.

Echocardiography revealed mitral stenosis with mean gradient of 10 mmHg, pulmonary hypertension and LVEF of 25-30 %. Consent was obtained and then ASA monitoring and a radial arterial line were undertaken. Caudal epidural was confirmed with 10 mL bupivacaine used and the surgery which lasted 1.5 hours had minor complications. The patient was prescribed 1 unit of blood and was yet transferred to the High Dependency Unit (HDU) to rest.

2.5. Case 5:

A 69-year-old patient complicated with hypertension, chronic atrial fibrillation and atrophic left kidney presented to the hospital via outpatient department complaining leg pain, foot discoloration and fever. Blood tests performed in the laboratory showed hemoglobin of 9.6 g/dL, total leukocyte count of 10,260/µL platelet count of 557 × 10 ^ 3/µL, urea 50 mg/dL, creatinine 1.0 mg/dL and coagulation profile containing PT 12.4 seconds and INR 1.24.

The patient had atrial fibrillation, syncope without mechanisms, ejection fraction > 55% and isolated severe arterial stenosis. ASA IV-E, they had DSA followed by embolectomy GA and required two days in the HDU with heparin infusion. Surgery for removal of the fingers was done after two days with spinal anesthesia; phenylephrine infusion was started and then admitted to the ward.

3. RESULTS

In this case series, 5 high-risk patients experienced lower limb amputations with RA. Despite low ejection fractions (20-25%), all remained hemodynamically stable showing minimal complications and controlled bleeding (max 200 mL). 4 patients had successful outcomes while one experienced postoperative ischemic progression.

4. DISCUSSION

The present case adds to the peculiarities of anesthesia management in patients with high risk of developing peripheral artery disease and, potentially, of lower limb amputation. This case series was designed to investigate how RA techniques could help manage these issues and offer a safer solution to GA when the patient's cardiovascular profile remains stable and systemic adverse effects are minimized.

Patients with ejection fractions 20–25% also did not experience major cardiovascular events and studies supporting that RA normalizes hemodynamic status in high-risk surgeries.[1] Gentle procedures such as sciatic and femoral nerve blocks permitted localized anesthesia avoiding of usage of systemic drugs and possible dangerous consequences including respiratory depression and hypotonia.[2]

RA was characterized by insignificant blood loss with none of the patients losing more than 200 mL in the patients with cardiovascular or renal disease. The literature is consistent with its use in managing bleeding and managing hemodynamics in the at-risk population.[3] This is in agreement with the consensus of the literature that regional techniques lower the postoperative complications and provide steadier intraoperative conditions than the GA.[4]

The patients had better outcomes because anesthesia management strategies were compatible with an individual patient clinical plan. Complication rate and recovery improved when compared to earlier methods due to patient specificity which has become a hallmark of current health scenario.[5] Hyping the benefit of individual approach in managing postoperative patients, all but one case in this series was resolved to the patient's benefit.

The need of repeat surgery because of progressive ischemia demonstrates the inherent difficulties of managing NSC high-risk patients irrespective of the applied strategies. It highlights the acute and chronic severe multiple comorbidities and care should be provided by a team of different specialists.[6] Constant monitoring and vigilance post-procedure are essential for managing risks and optimizing outcomes in high-risk patients.[7]

The outcomes demonstrated with this case series support the role of RA for patients at high risk in the process of lower limb amputation. Regional anesthetic techniques took advantage of administering pain relief focusing on restricted areas, sparing general effects on the rest of the body and supporting stable cardiovascular state and therefore being an effective tool for organizing the anesthesia of cats with complex underlying pathologies.

5. CONCLUSION

This case series proved the effectiveness and benefits of regional anesthesia techniques for management of lower limb amputation in high-risk surgical patients for stable hemodynamic control and perioperative complications. Patient specific approaches towards administering

anesthesia given each patient's medical history were instrumental in improving the results and the duration of patient recovery period. The conclusion of these studies reassures the acceptance of regional anesthesia in similar patients so as to reduce risks and enhance surgery results.

6. Data availability

The numerical data generated during this research is available with the authors.

7. Conflict of interest

All authors declare that there was no conflict of interest.

8. Ethical issues

The study was approved by the institutional ethical committee. Written informed consent was obtained from each patient to use their data for academic purposes. The personal identification of the patients has been concealed according to the Declaration of Helsinki.

9. Authors' contribution

MAZ : Concept

PA: Literature Review

SJ and AK: Proof Reading

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