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Managing complex anesthesia in total elbow replacement: A case study in limited emergency care setup

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Abstract

Total elbow replacement, though less common than other joint replacements, presents unique challenges, especially when performed in settings lacking emergency and critical care backup. We describe the anesthesia management of a 68-year-old morbidly obese female with type 2 diabetes, hypertension, and obstructive sleep apnea undergoing TER in a tertiary care teaching institute without immediate access to emergency and critical care in the surgical wing. The preoperative assessment identified a challenging airway and high-risk profile. General anesthesia with endotracheal intubation was chosen to secure the airway, supplemented by supraclavicular brachial plexus block to minimize opioid use and enhance postoperative pain control. Despite the absence of immediate access to critical care facilities, the surgery was completed with a favorable outcome, owing to meticulous preoperative planning and strategic anesthesia management. We highlight the significance of individualized anesthesia management and stringent protocols when conducting complex surgeries in environments lacking immediate access to emergency backup and critical care support.

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Introduction

Total Elbow Replacement (TER) surgery, while less common than hip or knee replacements, requires specific anesthesia considerations to minimize complications [1]. By understanding and addressing these anesthesia considerations, healthcare providers can improve the safety and efficacy of TER. These surgeries may need to be conducted in setups lacking emergency and critical care backup or separated from the main hospital establishment, which poses significant challenges [2]. This necessitates meticulous preoperative planning, stringent protocols, careful patient selection, careful anesthetic techniques, and vigilant intraoperative and postoperative management to ensure patient safety [2]. We report a geriatric patient with multiple comorbidities undergoing TER in a setup lacking emergency and critical care facilities.

Case report

The patient was a 68-year-old female, morbidly obese, with Type 2 Diabetes and hypertension, controlled with oral hypoglycemic agents and angiotensin receptor blockers, respectively. She was diagnosed with post-traumatic arthritis of the right elbow with intractable pain (Figure 1). On pre-anesthetic evaluation, the patient gives a significant history of Obstructive Sleep Apnea (OSA), as indicated by a STOP-BANG score of 6, placing her in the high-risk category for OSA-related perioperative complications. She is noted to have Class II obesity, with a Body Mass Index (BMI) of 36 kg/m², along with a heavy abdomen and large breasts (Figure 2).

Her functional capacity is estimated to be less than 4 METs, suggesting limited cardiopulmonary reserve. Airway assessment revealed features indicative of anticipated difficult airway,

including potential difficulty with both Bag-Mask Ventilation (BMV) and endotracheal intubation. Specific findings included, Mallampati Class IV, Short, thick neck and Micrognathia (Figure 3).

She was posted for Total elbow replacement on the right side in a tertiary teaching government institute with a separate wing for orthopedic surgeries, which did not have immediate access to emergency and critical care services located in the main institute. Access to the critical care unit in the main institute was time-consuming, as it required an ambulance commute arranged and dispatched from the main institute. We planned for general anesthesia with endotracheal intubation and controlled ventilation. Operation Theatre preparation included checking for the adequacy of equipment for difficult airway management, including laryngoscope with Macintosh size 3 and 4 blades, Mc Coy blade, Proseal LMA in adult sizes, stylet, Gum Elastic Bougie, and their functioning. However, video laryngoscopes and fibreoptic bronchoscopes were not available. The patient was taken as a first case after confirming adequate nil per oral status and taking written informed consent after being fully informed about the risks associated with the lack of immediate access to emergency backup. After placing ASA standard monitors, the patient was preoxygenated with 100% oxygen, initially at 10 L/min, and adjusted to match the minute ventilation. This was done for 3 minutes with the patient positioned in a Rapid Airway Management Positioner (RAMP) with a 15-degree head elevation. Nasal cannulas were also applied with oxygen at 5 L/min during preoxygenation. Intravenous fentanyl 2 mcg/kg of ideal body weight was given. 2 minutes later, 60 mg of Propofol was slowly administered as the intravenous induction agent in titrated doses. BMV proved challenging, necessitating an oropharyngeal airway and a two-person BMV technique. Succinylcholine 75 mg was administered intravenously. First attempt of endotracheal intubation by a senior resident with direct laryngoscopy, optimal external laryngeal manipulation and use of styletted endotracheal tube failed. It was susscessful on the second attempt with a change in airway provider to an experienced senior consultant. During the intubation attempts, the anesthetic depth was maintained with sevoflurane with 100% oxygen, supplemented by boluses of propofol as needed to attenuate the pressor response during laryngoscopy attempts. Para-oxygenation was maintained with nasal cannula with oxygen flow increased to 15 L/min. After securing the airway, a single-shot supraclavicular brachial plexus block was performed under strict aseptic conditions using ultrasonographic guidance. The block was achieved with 20 ml of 0.25% bupivacaine combined with 4 mg of dexamethasone as an adjuvant. The patient was taken into lateral decubitus position, and pressure points were carefully padded. Surgeons took a posteromedial incision over the right elbow, retracted the triceps muscle, and transposed the ulnar nerve anteriorly. Humeral and ulnar canals were prepared, and trail prostheses were fixed on the canals with bone cement (Figure 4). Prosthesis measurements were: ulnar stem with 15 degrees valgus and size 2/4 mm; humerus stem of size 3/5 mm (Figure 5). Surgery was carried out under a tourniquet, and the cuff was inflated to 250 mmHg. The cuff was deflated for 10-minute intervals after two hours and then reinflated for another hour. Intraoperatively, glycemia was monitored and managed with intravenous insulin infusion to maintain blood sugars between 150-200 mg /dL. The vitals monitored throughout anesthesia remained stable. After surgery, the patient was returned to the supine position and reversed after spontaneous respiratory efforts and extubated after the return of protective airway reflexes and obeying commands. The patient was provided Continuous Positive Airway Pressure (CPAP) at 10 cm of water for nearly 30 minutes since the patient had collapsed upper airway and paradoxical breathing. Once the patient demonstrated a regular breathing pattern without needing CPAP, was pain-free, and was fully awake, she was transferred to the Post-Anesthesia Care Unit. Due to the unavailability of non-invasive ventilation in the hospital, the patient was managed on the operating theatre table. She was subsequently managed in the ward and discharged seven days later, during which she received intravenous antibiotics for surgical site infection. On a 4-month follow-up, the patient was started on physiotherapy for the operated limb.

Discussion

Decision-making on the modality of anesthesia may be more challenging in some patients. Not only are patient factors, surgical factors, and anesthetic factors required to be factored in when deciding the mode of anesthesia, but also institutional factors. These surgeries may need to be conducted in setups lacking emergency and critical care backup or separated from the main hospital establishment [2]. This necessitates meticulous planning, stringent protocols, and careful patient selection and execution to mitigate risks and ensure patient safety. Some key considerations include thorough preoperative history and physical evaluation, including lab tests, imaging, and consultations, to identify potential risks. TER may be associated with several potential complications that anesthesia providers must be prepared to manage. These include blood loss, thromboembolic events, and bone cement implantation syndrome. Preoperative assessment should include evaluating the patient's risk factors for these complications and planning appropriate prophylactic measures. Patients should provide informed consent after being fully informed about the risks associated with the lack of emergency backup. Surgeons should have significant expertise. All team members should be well-trained in recognizing and managing intraoperative complications. Clear protocols for handling emergencies, including rapid stabilization and transfer plans should be established [2]. Ensuring the availability of equipment and medications for basic life support and difficult airway management equipment is crucial. Keeping crash carts and difficult airway carts up-to-date and organized is essential and should be confirmed before inducing a patient. Intraoperative monitoring, preparedness, and vigilance are necessary to manage intraoperative complications. Minimally invasive techniques may reduce recovery time and complication rates where possible. Detailed records of all procedures, complications, and patient outcomes should be maintained.

Associated risks and benefits must be carefully balanced when deciding between general and regional anesthesia techniques [3-5]. Considering that the surgery required lateral decubitus, which could be complicated by obesity and may have required managing the airway, which was anticipated to be difficult, the mode of anesthesia was chosen as general anesthesia with endotracheal intubation to secure the airway definitively [4]. General anesthesia also ensures patient comfort in surgical positions other than supine [5]. There is also an additional risk of cardiovascular instability in patients with long-standing diabetes. The brachial plexus nerve block was administered to supplement and minimize the requirement of general anesthetics and opioids intraoperatively, thus facilitating early recovery [3]. Additionally, it fosters effective pain control and decreased consumption of opioids with its associated adverse effects in

the postoperative recovery period [6]. Effective pain control mitigates physiological stress response, thereby attenuating hyperglycemic response and increase in myocardial workload. It also fosters earlier resumption of oral intake, thereby helping glycemic management. Peripheral Nerve Blocks (PNBs) improve outcomes that predict readiness for discharge: patients have less pain, require fewer opioids [6], and have a lower incidence of Postoperative nausea Vomiting (PONV) [5]. They further facilitate decreased neuromodulation, decreasing infections, including pneumonia [7]. However, once diabetes has progressed to involve the peripheral nervous system, the use of local anesthetics may have pathophysiological consequences, local anesthetic-induced neurotoxicity, and be more likely to suffer infection with continuous catheter and central neuraxial techniques [8]. Therefore, it requires thorough preoperative neurological assessments to document any pre-existing peripheral neuropathy in diabetes. Nerve blocks should be performed under strict aseptic precaution, using ultrasound guidance and a peripheral nerve stimulator to minimize the risk of complications. Lateral decubitus position affects respiratory mechanics, increase the risk of pressure-related injuries. Pressure points should be carefully padded to prevent nerve injuries and pressure sores, especially in obese patients [9]. Detailed documentation of discussions, procedures, and additional precautions are warranted. Close monitoring for signs of hypoxia, bleeding, or thromboembolic events [9]. Vigilant blood sugar monitoring and glycemic control should be observed with a target range of 150-200 mg/dL [10]. Patients should be monitored closely in the immediate postoperative period for any signs of complications. Vigilant monitoring for respiratory complications is essential, especially in patients with obstructive sleep apnea. In the immediate postoperative phase, wound dehiscence and surgical site infection are the primary concerns in TER, more so in obese and diabetic patients [9]. Thereby, making adequate perioperative blood sugar control imperative [10]. Establish and adhere to strict criteria for patient transfer from the postoperative recovery room. Have pre-established reliable and rapid transfer plans with nearby or affiliated hospitals to transfer patients for emergency and critical care services. Clear communication lines should be established with the receiving facility to ensure smooth transfers [2].

Conclusion

This case highlights the importance of individualized anesthesia management, considering patient-specific risks, surgical needs, and institutional constraints. Thorough preoperative assessment, strategic anesthesia planning, and vigilant postoperative care are instrumental in achieving a successful outcome despite the lack of emergency and critical care facilities in the immediate vicinity.

References

1. Lovy AJ, Keswani A, Dowdell J, Koehler S, Kim J, Hausman MR. Outcomes, complications, utilization trends, and risk factors for primary and revision total elbow replacement. J Shoulder Elbow Surg. 2016; 25: 1020-6.
2. Drummond S, O'Rourke M. Emergency Preparedness in Ambulatory Surgery Centers and Office-Based Anesthesia Practices. In: Rajan N, editor. Manual of Practice Management for Ambulatory Surgery Centers. Springer, Cham. 2020: 283-93.
3. Harsten A, Kehlet H, Toksvig-Larsen S. Recovery after total intravenous general anaesthesia or spinal anaesthesia for total knee arthroplasty: a randomized trial. Br J Anaesth. 2013; 111: 391-9.
4. Yap E, Wei J, Webb C, Ng K, Behrends M. Neuraxial and general anesthesia for outpatient total joint arthroplasty result in similarly low rates of major perioperative complications: a multicentered cohort study. Reg Anesth Pain Med. 2022; 47: 294-300.
5. Nin OC, Haller AS, Boezaart AP. Total elbow replacement. In: Anderson MR, Wilson SH, Rosenblatt MA, editors. Decision-Making in Orthopedic and Regional Anesthesiology: A Case-Based Approach. Cambridge: Cambridge University Press. 2015: 113-7.
6. Cunningham DJ, LaRose MA, Zhang GX, Au S, MacAlpine EM, Paniagua AR, Klifto CS, et al. Regional anesthesia reduces inpatient and outpatient perioperative opioid demand in periarticular elbow surgery. J Shoulder Elbow Surg. 2022; 31: 42-57.
7. Rodgers A, Walker N, Schug S, McKee A, Kehlet H, van Zundert A, et al. Reduction of postoperative mortality and morbidity with epidural or spinal anaesthesia: results from overview of randomised trials. BMJ. 2000; 321: 1493.
8. Levy N, Lirk P. Regional anaesthesia in patients with diabetes. Anaesthesia. 2021; 76: 127-35.
9. Brodsky JB, Lemmens HJM. Anesthesia, obesity and orthopedic surgery. In: Brodsky JB, Lemmens HJM, editors. Anesthetic Management of the Obese Surgical Patient. Cambridge: Cambridge University Press. 2011: 87-93.
10. Sreedharan R, Khanna S, Shaw A. Perioperative glycemic management in adults presenting for elective cardiac and non-cardiac surgery. Perioper Med (Lond). 2023; 12: 13.