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Short Communication

Anaesthesia considerations for robotic splenectomy: A short communication

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Abstract

Robotic splenectomy has emerged as an advanced minimally invasive technique, offering superior surgical precision, reduced intraoperative blood loss, and faster postoperative recovery compared to open or conventional laparoscopic approaches. In patients with hematological disorders such as beta thalassemia major, anesthetic management becomes particularly challenging due to the presence of chronic anemia, iron overload, potential cardiac dysfunction, and risks associated with repeated transfusions. Preoperative optimization is crucial and includes correction of anemia, evaluation of cardiac function, assessment of transfusion-related complications, and appropriate immunization against encapsulated organisms. Anticipation of blood loss necessitates preparation of cross-matched blood and platelets, with careful attention to iron chelation history and baseline organ function. Intraoperatively, general anesthesia with balanced agents ensures hemodynamic stability. The physiological consequences of pneumoperitoneum—including elevated intra-abdominal pressure, increased airway resistance, and reduced venous return—must be closely monitored and managed. Steep reverse Trendelenburg positioning, commonly used for splenic exposure, can further compromise respiratory and cardiovascular parameters. Additionally, robotic docking restricts access to the patient's airway and intravenous lines, necessitating pre-docking verification of all monitoring and access points. Invasive arterial pressure monitoring and extended IV lines are recommended. Positioning-related nerve injuries are avoided with adequate padding and limb protection. Postoperative care focuses on effective analgesia through multimodal approaches, such as intravenous paracetamol, opioids, and local anesthetic infiltration at port sites. Early initiation of thromboprophylaxis with low molecular weight heparin is advised once hemostasis is ensured. Close monitoring for infection, thrombosis, and pulmonary complications is essential, especially in asplenic individuals. Robotic splenectomy in patients with beta thalassemia major demands a comprehensive anesthetic strategy encompassing preoperative optimization, intraoperative vigilance, and postoperative support. Multidisciplinary coordination is key to ensuring safe outcomes in this high-risk population undergoing robotic-assisted procedures.

Keywords: Robotic splenectomy, Beta thalassemia major, Anaesthesia considerations, Pneumoperitoneum, Patient positioning, Minimally invasive surgery

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1. Introduction

Robotic splenectomy has become an increasingly adopted surgical technique in the management of haematological disorders such as beta thalassemia major, immune thrombocytopenic purpura, and hereditary spherocytosis. Its advantages over conventional open and laparoscopic approaches include improved surgical precision, reduced intraoperative blood loss, enhanced visualization, and quicker recovery. However, the anaesthetic management of these patients is complex and multifactorial, influenced by the patient's underlying haematologic condition, the physiological changes induced by pneumoperitoneum, and the steep patient positioning required for robotic access.

2. Anaesthetic Considerations and Intraoperative Management

Preoperatively, a thorough evaluation is essential, especially in patients with chronic anaemia or transfusion dependence, such as those with beta thalassemia major. These patients often present with hepatosplenomegaly, iron overload, and compromised cardiopulmonary reserve. Investigations should include a complete blood count, liver and renal function tests, serum ferritin, coagulation profile, and echocardiography to evaluate myocardial function, which may be affected due to siderotic cardiomyopathy. Ensuring the availability of cross-matched blood and blood components is vital, given the possibility of intraoperative bleeding, especially in cases of massive splenomegaly or adhesions. Vaccination history must be reviewed and updated

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preoperatively to prevent post-splenectomy infections from encapsulated organisms such as Streptococcus pneumoniae, Haemophilus influenzae, and Neisseria meningitides.[1]

Intraoperatively, general anaesthesia with endotracheal intubation is the standard. Anaesthetic induction can be achieved using intravenous agents like propofol, fentanyl, and rocuronium, with maintenance using sevoflurane or desflurane in a mixture of oxygen and air. A balanced anaesthesia approach with adjuncts like dexmedetomidine infusion can reduce opioid requirements and provide better haemodynamic stability.[2] Wide-bore peripheral intravenous access is mandatory, and invasive arterial pressure monitoring is advisable for beat-to-beat monitoring and frequent blood sampling, especially in anaemic patients or those with compromised cardiac function. Intraoperative challenges include the physiological alterations associated with pneumoperitoneum and steep reverse Trendelenburg positioning and restricted patient access.

Restricted patient access is a significant concern in robotic surgery. Once the robot is docked, access to the patient—particularly the airway and central torso—is severely limited. Therefore, all monitoring, intravenous lines, airway securing devices, and emergency drugs must be thoroughly checked and secured before docking. A long ventilator circuit and extensions for IV lines are recommended. Clear communication between the surgical and anaesthesia teams is crucial, especially for undocking protocols in emergencies.

Patient positioning for robotic splenectomy usually involves a steep reverse Trendelenburg with the left side elevated. This position facilitates splenic access but also shifts abdominal contents cephalad, reducing pulmonary compliance and venous return. Increased intra-abdominal pressure can reduce venous return, elevate systemic vascular resistance, and impair ventilation. These changes necessitate careful ventilation management with low tidal volumes, adequate PEEP, and end-tidal CO_2 monitoring. Intra-abdominal pressures should be limited to 10–12 mmHg to minimize haemodynamic compromise.

Positioning-related injuries can occur due to the extreme tilt and prolonged operative time. All pressure points, including occiput, shoulders, elbows, sacrum, and heels, must be well-padded. The arms should be tucked and supported to prevent brachial plexus injuries. Careful use of gel pads, anti-skid supports, and head stabilisers is essential. Periodic reassessment is not possible during docking, so utmost attention must be paid during the initial setup.

Robotic splenectomy is associated with less blood loss than open procedures, but in cases of splenic trauma, portal hypertension, or thalassemia-related splenomegaly, the risk remains significant. Hence, readiness with blood products is essential. Temperature management using forced-air warming devices and warmed IV fluids helps avoid perioperative hypothermia. Careful attention to neuromuscular blockade and complete reversal prior to extubation is critical, particularly since abdominal insufflation may splint the diaphragm and impair ventilation.

Postoperative analgesia is best achieved using multimodal strategies. Intravenous paracetamol and opioids such as tramadol or morphine are commonly used. Nonsteroidal anti-inflammatory drugs should be used with caution, especially in thrombocytopenic patients. Infiltration of local anaesthetic at port sites or ultrasound-guided transversus abdominis plane (TAP) blocks can provide effective somatic pain relief and reduce systemic analgesic requirements.[3] Early ambulation, respiratory physiotherapy, and thromboprophylaxis with low molecular weight heparin should be considered in appropriate patients to prevent venous thromboembolism, especially given the post-splenectomy reactive thrombocytosis and hypercoagulable state.[4]

In conclusion, robotic splenectomy, while offering significant advantages over traditional techniques, demands careful perioperative anaesthetic planning. The anaesthesiologist must anticipate and address challenges posed by pneumoperitoneum, positioning, transfusion needs, and comorbid haematological conditions. A multimodal approach to analgesia, early mobilization, and continued postoperative vigilance are key to ensuring optimal outcomes in these patients.

3. Conclusion

Robotic splenectomy marks a major advancement in minimally invasive surgery, offering precise dissection, reduced blood loss, and faster recovery. However, optimal outcomes depend on tailored anaesthetic management—addressing challenges like pneumoperitoneum-induced cardiopulmonary changes, steep reverse Trendelenburg positioning, limited patient access after docking, and underlying haematological issues such as anaemia and iron overload in beta thalassemia major. Key considerations include thorough preoperative optimization, secure airway and vascular access, vigilant haemodynamic monitoring, careful positioning to prevent nerve injuries, and a multimodal analgesia plan. Anaesthesiologists must anticipate complications and collaborate closely with surgical teams to ensure safe, efficient perioperative care.

4. Source of Funding

None.

5. Conflict of Interest

None.

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