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Case Report

Anaesthesia Section

Combined General and Caudal Anaesthesia for Splenectomy in a Child with Thalassaemia Major: A Case Report

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ABSTRACT

Thalassaemia major is a chronic haemolytic disorder necessitating frequent transfusions of blood with ultimate iron toxicity and organ impairment. Splenectomy in such patients usually becomes necessary for the management of hypersplenism and repeated requirement of transfusion. Complications like cardiopulmonary deterioration, haemodynamic instability, and intraoperative bleeding add to the anaesthetic challenges in such a scenario. We present an uneventful elective splenectomy in a five-year-old child with thalassaemia major, splenomegaly, and mild cardiac dysfunction under combined general and caudal anaesthesia. Preoperative evaluation included haematological evaluation, iron level, and echocardiogram revealing mild mitral and tricuspid regurgitation, left atrial and ventricular dilatation, and normal ejection fraction. Induction of anaesthesia was achieved with standard intravenous anaesthetics and atracurium, and following induction of anaesthesia and tracheal intubation, a single-dose caudal block was administered, with correct placement confirmed using the loss-of-resistance technique and the 'whoosh test. A single-unit transfusion of a packed red blood cell unit, judicious intraoperative fluid resuscitation, and active haemodynamic monitoring were performed. The operation was uneventful and smooth, and the postoperative course was uneventful with proper pain control and early mobilisation. The case is helpful to bring to light the importance of careful perioperative preparation, judicious selection of anaesthesia, and close postoperative monitoring to obtain safe outcomes in children with thalassaemia major who are subjected to splenectomy.

Keywords: Anaemia, Blood transfusion, Cardiomyopathy, Iron overload, Splenomegaly

CASE REPORT

A five-year-old male with a weight of 15 kg and height of 100 cm {Body Mass Index (BMI) 15 kg/m^2} came with a history of dull, intermittent epigastric pain of moderate severity for one month. It was exertional in character and not radiating. He was a documented case of thalassaemia major with a history of serial blood transfusions since birth. Blood transfusion was done monthly earlier and since four months every 15 days transfusion was done, last transfusion was done seven days prior to surgery. He was on iron tablets (250 mg/day) and folic acid (5 mg/day). There was no sign of bleeding disorder, jaundice, respiratory distress, or cardiovascular manifestation. Developmental milestones were appropriate for age.

Physical examination of the child revealed stable haemodynamics. On examination, heart rate was 120 beats per minute, blood pressure was 110/60 mmHg, SpO_2 was 100% on room air and respiratory rate of 20 per minute. General examination was normal for icterus, cyanosis, oedema, or pallor. Systemic examination was normal except that a palpable spleen was found below the costal margin. Airway examination was normal with Mallampati Grade I, good mouth opening, and normal neck mobility. Laboratory findings are depicted in [Table/Fig-1]. Echocardiogram showed mild mitral regurgitation, trace tricuspid regurgitation, mild dilatation of the left atrium and the left ventricle, and a normal left ventricular ejection fraction. Ultrasonography showed splenomegaly without other abnormalities. The patient was classified as American Society of Anaesthesiologists (ASA) Grade II and was planned for an elective splenectomy.

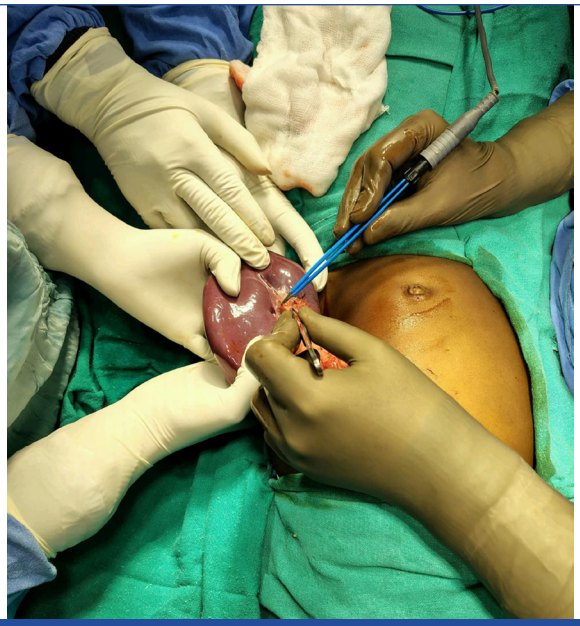
After being nil per os for six hours, he was shifted to the operating room, intravenous access was established, and routine ASA monitoring was used. Induction of anaesthesia was achieved with intravenous glycopyrrolate 0.06 mg, midazolam 0.75 mg, fentanyl 30 µg, and ketamine 15 mg, and then atracurium10mg to facilitate endotracheal intubation. Tracheal intubation was done using an uncuffed endotracheal tube of 5.0 mm size and confirmation by capnography and bilateral air entry was done.

Parameter	Result	Interpretation
Haemoglobin (g/dL)	10.2	Consistent with chronic anaemia
Foetal haemoglobin (HbF, %)	16	Elevated
Haemoglobin A2 (HbA2, %)	1.6	Within the expected range
Serum ferritin (ng/mL)	1200	Mild iron overload
Serum iron (µg/dL)	180	Elevated
Total iron-binding capacity (µg/dL)	280	Within normal limits
Platelet count (×10^9/L)	320	Within normal limits
Prothrombin time (seconds)	12.4	Normal
International normalised ratio	1.02	Normal
Activated partial thromboplastin time (seconds)	31	Normal
Fasting blood glucose (mg/dL)	92	Euglycaemic
Thyroid-stimulating hormone (TSH, µIU/mL)	2.1	Euthyroid status

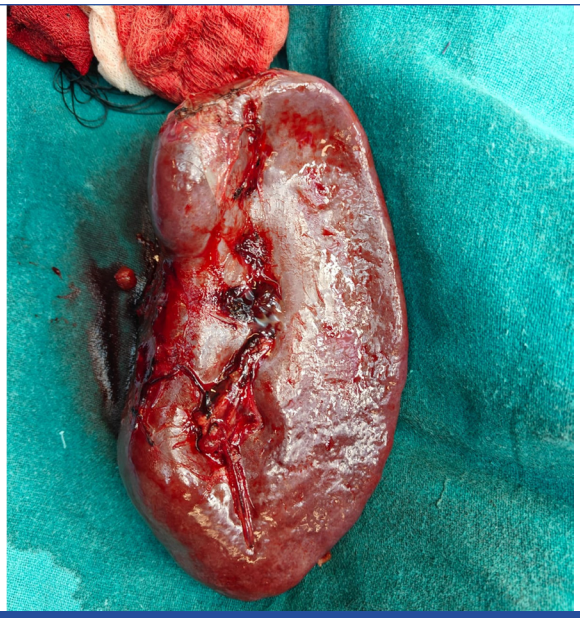
[Table/Fig-1]: Preoperative laboratory values: baseline haematological, iron profile, coagulation, metabolic and thyroid parameters.

After induction, a one-shot caudal block was given with a 22-gauge short-bevel caudal needle. Caudal space was delineated by loss of resistance, and appropriate placement was confirmed using the whoosh test, which involved hearing a small volume of saline in the caudal space over the lumbar area with the stethoscope. Following aspiration of blood or cerebrospinal fluid, 7.5 mL of 0.25% bupivacaine was administered slowly in incremental doses, resulting in a sensory block extending up to the T8-T10 dermatomal level and providing effective postoperative analgesia for approximately 6-8 hours.

The surgical procedure was initiated following this. The intraoperative image and specimen image are depicted in [Table/Fig-2,3]. Intraoperative anaesthesia was maintained with sevoflurane, oxygen, and air in sufficient concentration. The patient's haemodynamic stability was ensured during the procedure. Intraoperative fluids used were Ringer's lactate and normal saline, each at 500 mL. One pack



[Table/Fig-2]: Intraoperative image - which shows the surgical team mobilising the spleen and ligating its vascular attachment in a case of splenectomy.



[Table/Fig-3]: Image showing gross specimen of an excised spleen following a total splenectomy.

of red cells was transfused. Urine output was 80 mL, and estimated blood loss was 250 mL. Reversal of neuromuscular blockade at the conclusion of surgery was achieved by administering neostigmine 0.75 mg and glycopyrrolate 0.15 mg, and tracheal extubation was performed only after ensuring adequate spontaneous respiration and airway reflexes. The child was transferred to the paediatric intensive care unit for postoperative recovery, where he stayed for two days. He was then transferred to the paediatric ward with tolerance of oral analgesics, oral feeds, and independent ambulation, and was discharged on postoperative day nine. In one-week and one-month postoperative follow-up visits, the child was asymptomatic, had normal appetite and activity, and was free from infection or other complications.

DISCUSSION

Anaesthetic management of thalassaemia major patients who are being splenectomised is made challenging by a variety of problems that require extensive preoperative work-up, scrupulous intraoperative management, and careful postoperative observation. The patients typically have a history of repeated transfusions of blood with potential for iron overload of the heart, liver, and endocrine organs. They are also complicated by chronic anaemia and splenomegaly, which lead to perioperative haemodynamic instability and intraoperative blood loss. Preoperative evaluation should thus consider not only haematological indices, such as haemoglobin, transfusion history, and iron stores, but also cardiopulmonary status, coagulation profile, and endocrine status. Airway anatomy and growth evaluation are helpful, but these typically fall within the normal range in children unless another condition is present [1,2]. Intraoperative care is a balance between administering appropriate amounts of anaesthesia and analgesia and maintaining haemodynamic stability. General anaesthesia is the preferred approach, with pharmacological titration possible in such a manner as not to cause hypotension or arrhythmias in children with subclinical cardiomyopathy due to iron overload [2,3].

Regional anaesthetic methods like single-shot caudal block offer perioperative analgesia, decrease systemic use of opioids, and maintain intraoperative haemodynamics. Proper caudal placement is ensured by techniques such as loss of resistance and the whoosh test, which are used to evaluate effectiveness and safety. Smaller size uncuffed endotracheal tube was used as on laryngoscopic view, vocal cord distance was adequate for 5.0 mm uncuffed endotracheal tube, also by the formula adequate tube size for the age was 5.0 mm uncuffed and 4.5 mm cuffed. Intraoperative fluid resuscitation should be tailored to achieve optimal perfusion, urine output, and estimated blood loss. Judicious transfusions should be regulated based on the preoperative haemoglobin level and ongoing losses. Tightly monitoring for adverse intraoperative events, including excessive rapid blood loss, haemodynamic instability, or arrhythmias, intraoperatively is imperative [4-6].

Practitioners should consider certain potential complications when administering regional anaesthesia to patients diagnosed with thalassaemia major. Chronic anaemia and multiple transfusions may lead to a higher likelihood of having coagulopathy, such as thrombocytopenia and other alterations of coagulation profiles. These can create a higher risk for developing bleeding complications from a neuraxial block. Due to enlargement of the marrow space in many cases of thalassaemia major, bones become altered from their previous normal shape. Distortion of the anatomical landmarks for placement of neuraxial blocks may occur. Children with limited cardiovascular reserve due to iron-overload cardiomyopathy are especially vulnerable to experiencing the special effects of neuraxial blocks on their autonomic nervous systems. They may develop hypotension due to decreased blood volume or a drop in blood pressure. Thus, patients should be carefully selected, and normal coagulation parameters should be verified; close intraoperative monitoring should occur whenever regional anaesthesia techniques are employed [2,7].

Intensive care unit or high-dependency unit admission after surgery for a minimum of 24 to 48 hours is recommended to permit strict haemodynamic monitoring, pain management, and complications like infection or thrombosis. Multimodal analgesia, which includes regional blocks supplemented with systemic agents, supports early mobilisation, improves respiratory function, and uneventful discharge. With proper planning and rigorously controlled perioperative management, anaesthetic courses can be kept stable with minimal haemodynamic disturbance, maximum pain relief, and early recovery with good outcomes and rapid return to regular activity. It requires multidisciplinary collaboration, proper planning, and anaesthetic planning synchronised with the individual needs of thalassaemia major children undergoing splenectomy [2,8].

In this setting, alternative anaesthetic options, including general anaesthesia with systemic opioid analgesia alone, continuous epidural analgesia, and total intravenous anaesthesia, could be considered. However, we avoided using just systemic opioids to minimise the chance of postoperative respiratory depression, delayed recovery, and impaired pulmonary mechanics in chronically anaemic children. While continuous epidurals would have provided

Author	Case	Anaesthetic Management	Takeaway Points	Complications
Current case	5-year-old male with thalassaemia major	General anaesthesia with intravenous induction, sevoflurane maintenance, and tracheal intubation. A single-shot caudal block provided perioperative analgesia. Careful fluid and transfusion management maintained haemodynamic stability. Postoperative recovery was smooth with adequate analgesia.	Combined general and caudal anaesthesia provided stable haemodynamics and good analgesia. Preoperative cardiac evaluation is essential due to iron overload. Close monitoring supports early recovery.	Case was uneventful and no complications were noted.
Praneeth R and Venkatraj K [9]	3-year-old female with Gaucher's disease type III	Inhalational induction followed by endotracheal intubation. Central and arterial lines were placed under ultrasound guidance. Regional anaesthesia was avoided due to thrombocytopenia. Blood transfusion delayed until after splenic artery ligation. Postoperative analgesia was provided with intravenous morphine.	Multisystem involvement in Gaucher's disease requires a tailored anaesthetic approach. Avoid regional blocks if the risk of bleeding is high. Delay transfusions to minimise sequestration.	No complications were noted.
Kitoh T et al., [10]	37-year-old male with beta-thalassaemia intermedia	General anaesthesia using low-dose isoflurane and fentanyl to maintain cardiovascular stability in the setting of chronic anaemia and hyperdynamic circulation. Haemodynamics are closely monitored with a pulmonary artery catheter. Intraoperative course remained stable.	Chronic anaemia leads to compensatory cardiovascular changes; careful monitoring and gentle anaesthetic techniques prevent decompensation.	No complications were noted.
Govil N et al., [7]	18-year-old male with beta-thalassaemia intermedia and gallstones	Combined epidural and general anaesthesia was used. An epidural was placed despite moderate thrombocytopenia. Induction with intravenous agents and uneventful intubation despite anticipated airway difficulty. Invasive lines secured for fluid and transfusion management. Surgery lasted three hours with significant blood loss.	Epidural can be safely used with precautions in thrombocytopenic patients. Anticipate a difficult airway and cardiac compromise. Combined anaesthesia improves recovery and pain control.	No complications were noted.

[Table/Fig-4]: Anaesthetic management of splenectomy in similar cases [7,9,10].

additional analgesia, they were not chosen because of the possibility of catheter-related infections, coagulation problems, and the need for prolonged postoperative supervision. Although total intravenous anaesthesia would not cause respiratory depression, the risk of haemodynamic instability and arrhythmias associated with subclinical iron-induced cardiomyopathy precluded its consideration as well. Ultimately, a balanced anaesthetic regimen combining general anaesthesia with a one-time caudal block was determined to be optimal for providing effective analgesia while minimising exposure to other systemic medications and maintaining cardiovascular stability [2,4,7].

Anaesthetic management of splenectomy in similar cases is discussed in [Table/Fig-4] [7,9,10].

CONCLUSION(S)

Comprehensive preoperative evaluation, strict intraoperative monitoring, and optimal multimodal pain control are the best methods to attain anaesthetic care for a thalassaemia major child patient undergoing splenectomy. Rigorous monitoring of haematologic status, iron overload, and cardiac status enables the prediction of complications. General and regional techniques, such as caudal block, provide stable intraoperative haemodynamics and adequate postoperative pain relief. Careful fluid and blood management also averts perioperative complications. Close postoperative monitoring enables early recognition of complications, allows for an uneventful recovery, and leads to good outcomes with the early resumption of everyday activities.

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