International Journal of Science and Research (IJSR)
ISSN: 2319-7064
Impact Factor 2025: 7.089

Anaesthetic Management of Cerebral Abscess Drainage in a Patient with Eisenmenger Syndrome Using USG Guided Scalp Block: A Case Report

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Abstract: ***Patients with Eisenmenger syndrome present significant anaesthetic challenges due to severe pulmonary hypertension and right-to-left intracardiac shunting leading to chronic hypoxaemia. Anaesthetic management in such patients requires meticulous planning to avoid factors that increase pulmonary vascular resistance or decrease systemic vascular resistance. We report the successful anaesthetic management of a 23-year-old male with Eisenmenger syndrome secondary to a large ventricular septal defect who presented with a left frontal cerebral abscess requiring burr hole aspiration. Considering the high risk associated with general anaesthesia, the procedure was performed under USG guided scalp block with monitored anaesthesia care. The patient remained haemodynamically stable throughout the procedure without major complications. This case highlights the role of regional anaesthetic techniques such as USG guided scalp block in high-risk cardiac patients undergoing neurosurgical procedures.***

Keywords: Eisenmenger syndrome, USG guided scalp block, cerebral abscess, pulmonary hypertension, congenital heart disease

1. Introduction

Eisenmenger syndrome is a late complication of unrepaired congenital heart disease characterised by severe pulmonary hypertension and reversal of left-to-right shunt to a right-to-left shunt. This leads to systemic hypoxaemia, polycythaemia, and increased perioperative morbidity and mortality. Anaesthetic management in such patients is particularly challenging as fluctuations in systemic vascular resistance (SVR) and pulmonary vascular resistance (PVR) can worsen shunting and cause severe hypoxaemia or cardiovascular collapse. Patients with cyanotic congenital heart disease are also predisposed to brain abscess due to chronic hypoxaemia, polycythaemia, and right-to-left shunting which bypasses pulmonary filtration of bacteria.

We report a case of successful burr hole drainage of cerebral abscess under USG guided scalp block in a patient with Eisenmenger syndrome.

2. Case Report

A 23-year-old male weighing approximately 60 kg presented with complaints of headache, fever and progressive breathlessness. He was a known case of ventricular septal defect (VSD) with Eisenmenger physiology diagnosed approximately 3 months prior. The patient had been advised VSD repair previously but surgery had not been performed.

Clinical Examination

a) On examination:
- Pulse rate: 115/min regularly regular
- Blood pressure: 101/61 mmHg
- Respiratory rate: 28/min
- Oxygen saturation: 89% on room air
- The patient appeared mildly cyanotic, no clubbing, no rise in JVP

b) Cardiovascular examination revealed:
- S1, S2 audible
- Cardiac murmur present

c) Respiratory examination was within normal limits.

d) Airway assessment showed:
- Mallampati grade II
- Adequate mouth opening
- Normal neck movements.

Investigations: Laboratory Findings

a) Hemoglobin: 17.3 g/dL
- Total leucocyte count: 5630/mm³
- Platelet count: 3.07 lakh/mm³

b) Serum creatinine: 0.8 mg/dL
- Urea: 30 mg/dL

c) Sodium: 132 mEq/L
- Potassium: 4.7 mEq/L
- PT/INR: 18.1 sec / 1.29

Neuroimaging: CT scan of brain revealed:
- Heterogeneous hypodense lesion (6.0 × 3.8 cm) in the left frontal region
- Significant perilesional oedema
- Midline shift of 11.2 mm towards right
- Mild compression of lateral ventricles

Findings were suggestive of cerebral abscess.

Cardiac Evaluation

2D Echocardiography revealed:
- Large ventricular septal defect (~36 mm)
- Bidirectional shunt (predominantly right-to-left)
- Severe pulmonary hypertension
- Pulmonary artery systolic pressure ~190 mmHg
- Dilated right atrium and right ventricle
- Left ventricular ejection fraction ~50%

The patient was diagnosed as Eisenmenger syndrome secondary to VSD

ECG: Right axis deviation with right ventricular hypertrophy

Anaesthetic Challenges
The major anaesthetic concerns included:
- Severe pulmonary hypertension
- Right-to-left shunting
- Risk of systemic hypoxia
- Risk of paradoxical embolism
- Risk of cardiovascular collapse with decrease in SVR

General anaesthesia with positive pressure ventilation could potentially increase pulmonary vascular resistance and worsen hypoxaemia. Hence a regional anaesthetic technique was considered.

Anaesthetic Management
The patient was classified as ASA physical status IV.
After obtaining informed high-risk consent, the patient was shifted to the operating room.

Standard monitoring was applied:
- ECG
- Non-invasive blood pressure
- Pulse oximetry

Oxygen was administered via face mask.

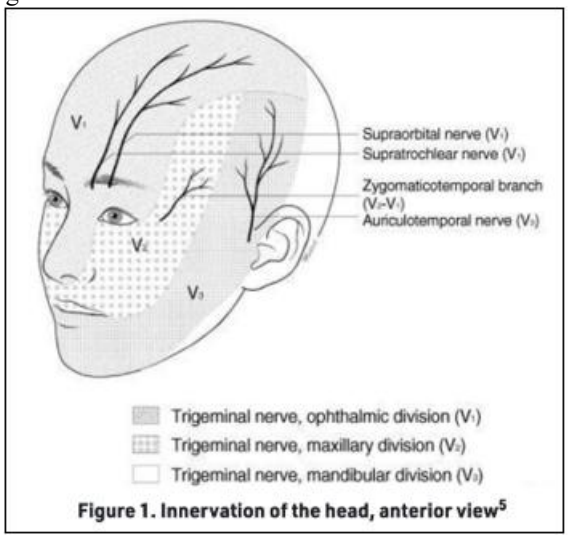
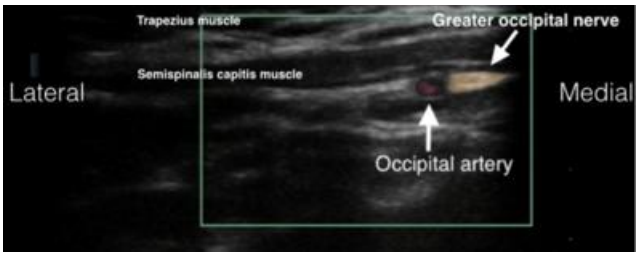


Figure 1. Innervation of the head, anterior view[5]

Scalp Block Technique
Technique: USG GUIDED using Liner probe (8-14 MHz)

A unilateral left side scalp block was performed using a mixture of 0.25% Ropivacaine with adjuvant dexamethasone 0.5ml 2ml for each nerve targeting the following nerves:

- Supraorbital nerve: probe placed at medial aspect of the supraorbital rim and supraorbital formane visulised, using in-plane technique 2ml drug injected superficial to supraorbital foramen.
- Supratrochlear nerve: Inject 2mL LA subcutaneously superomedial to the supraorbital foramen up to the midline.
- Zygomaticotemporal nerve: Block in plane- 2mL between temporal muscle and bone,
- Auriculotemporal nerve: Identify near the auriculotemporal artery (between lateral canthus and tragus) and inject 2mL LA.
- Greater auricular & lesser occipital nerve: Perform superficial cervical plexus block at SCM midpoint; inject 4 mL LA.
- Greater occipital nerve: Identify near occipital artery (mastoid to occipital protuberance line) and inject 2 mL
- Confirmed scalp anesthesia before incision; IV paracetamol 1 g was given for multimodal analgesia. Adequate analgesia was achieved prior to incision.



Intraoperative Course
The neurosurgical team performed burr hole aspiration of the frontal abscess.

During the procedure:
a) The patient remained conscious and cooperative.
b) Oxygen saturation remained between 94-98%.
c) Haemodynamic parameters remained stable.
d) No episodes of hypotension or desaturation occurred.
   - Fluid management: judicial fluid management done to avoid both dehydration (reducing preload) and overhydration
   - Vasopressor like Phenylephrine was kept ready to maintain SVR

The procedure lasted approximately 45 minutes.

No intraoperative complications occurred.

Postoperative Management
The patient was shifted to the neurosurgical intensive care unit for observation.
Postoperative analgesia was adequate due to the scalp block. The patient remained haemodynamically stable and recovered uneventfully.

3. Discussion

Eisenmenger syndrome is associated with high perioperative mortality (up to 30%) in non-cardiac surgeries.

Anaesthetic goals in these patients include:
a) Maintaining systemic vascular resistance
b) Avoiding increase in pulmonary vascular resistance

c) Preventing hypoxia, hypercarbia and acidosis
d) Avoiding air embolism
e) Maintaining adequate preload
   - Strict prevention of air bubbles in intravenous lines is essential to prevent paradoxical embolization
   - Placement of invasive monitoring in eisenmengers syndrome is controversial as these patients are polycythemic and intraaeterial catheterization may associated with higher incidences of post canulation thrombus formation

General anaesthesia may worsen pulmonary hypertension due to:
- Positive pressure ventilation
- Hypoxia
- Hypercarbia
- Anaesthetic-induced decrease in SVR
- High airway pressures (PEEP)

USG guided Scalp block is a valuable regional technique for neurosurgical procedures such as burr hole drainage.

Landmark-based scalp block requires large volumes of local anesthetic (40–50 mL), increasing the risk of systemic toxicity due to the scalp's high vascularity- especially in elderly patients[6]

Ultrasound guidance allows precise nerve targeting, reducing drug volume and complications like nerve palsy, ptosis, hematoma, and accidental injections. Although limited by cost and availability, ultrasound offers clear advantages, and proficiency can be achieved with practice. More comparative studies are needed to establish standard protocols.[6]

Other Advantages include:
- Avoidance of airway manipulation
- Maintenance of spontaneous ventilation
- Stable haemodynamics
- Effective analgesia

In this case, USG guided scalp block allowed the procedure to be completed safely without major haemodynamic fluctuations.

4. Conclusion

Patients with Eisenmenger syndrome present unique anaesthetic challenges due to severe pulmonary hypertension and right-to-left shunting. Careful planning and avoidance of general anaesthesia may reduce perioperative risks.

USG guided Scalp block with monitored anaesthesia care can be a safe and effective anaesthetic technique for selected neurosurgical procedures such as burr hole drainage in high-risk cardiac patients.

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