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Anaesthetic Challenges In A Patient With Takayasu Arteritis And Bilateral Renal Artery Stenosis Undergoing Left Laparoscopic Nephrectomy: A Case Report

Dr. Sarankumar M[1*], Dr. Venkatesh S[2], Dr. Aravindan M[3]
[1*]Postgraduate, Department of Anaesthesiology, Sri Ramachandra Institute of Higher Education and Research
[2]Professor, Department of Anaesthesiology, Sri Ramachandra Institute of Higher Education and Research
[3]Assistant Professor, Department of Anaesthesiology, Sri Ramachandra Institute of Higher Education and Research

***Corresponding Author:** Dr. Sarankumar M*
**SRMC, Chennai, Tamil Nadu, India Email: sarankumar931997@gmail.com*

Abstract

3a Introduction: What is unique about this case and what does it add to the scientific literature?

Takayasu arteritis is a rare, chronic, granulomatous vasculitis involving the aorta and its major branches. Anaesthetic management in these patients is particularly challenging when complicated with bilateral renal artery stenosis, severe hypertension, altered hemodynamics, and end-organ hypoperfusion. Laparoscopic surgery further increases the risk because of pneumoperitoneum-induced hemodynamic changes.

3b Main symptoms and important clinical findings:

A 23-year-old female patient came with c/o headache, palpitations and significant clinical findings included absent bilateral lower limb pulsation.

3c Main diagnoses, therapeutic interventions and outcome:

A 23-year-old female diagnosed with Takayasu arteritis and severe hypertension secondary to bilateral renal artery stenosis (complete occlusion of the left renal artery and 50% stenosis of the right renal artery) was posted for elective laparoscopic left nephrectomy. Anaesthetic management included general anaesthesia with invasive arterial pressure monitoring, BIS monitoring and ultrasound-guided bilateral quadratus lumborum blocks for analgesia. Intraoperatively, Low-pressure pneumoperitoneum and careful hemodynamic management were done to maintain organ perfusion. However, during renal pedicle handling, hypertensive crises (systolic BP >240 mmHg, Diastolic BP>110 mmHg) with transient ST changes occurred and it was managed with titrated nitroglycerin infusion. The perioperative course was managed successfully, and the patient had a stable postoperative recovery.

3d Conclusion:

Patients with takayasu arteritis and bilateral renal artery stenosis undergoing laparoscopic surgery require meticulous perioperative planning, invasive monitoring, and individualized hemodynamic management to prevent catastrophic complications. Regional analgesia, stress-dose steroid supplementation, and multidisciplinary coordination plays a pivotal role in optimizing outcomes.

***2 Key words:** Takayasu arteritis, renal artery stenosis, laparoscopic nephrectomy, quadratus lumborum block, case report.*

4 Why this case is unique?

Takayasu arteritis is a rare, chronic large-vessel vasculitis characterized by progressive inflammation of the aorta and its major branches, leading to stenosis and ischemic complications [1]. It is most prevalent among young females in India, with a peak incidence in the second and third decades of life [2]. Anaesthetic challenges arise from unreliable non-invasive blood pressure (NIBP) measurement, risk of myocardial and cerebral ischemia, refractory renovascular hypertension and complications of chronic steroid therapy [3,4]. Laparoscopic surgery adds to these challenges by inducing pneumoperitoneum, which further increases systemic vascular resistance and compromises venous return [5].

5a Patient specific information:

A 23-year old female with weight of 73kgs who was a known case of Takayasu arteritis for 5 years on medical therapy.

5b Primary concerns and symptoms of the patient:

Headache and palpitations due to renovascular hypertension.

5c Medical, family, and psycho-social history:
Diagnosed with takayasu arteritis and bilateral renal artery stenosis. She had uncontrolled hypertension (BP-220/130 mmHg) despite on T.Nicardipine 20mg and T.Metoprolol 25mg therapy and was on oral immunosuppressants (T.Prednisolone 40 mg/day, T.Mycophenolate mofetil 500 mg/day). Unremarkable family and pyschosocial history.

5d Relevant past interventions with outcomes:
No significant past history other than takayasu arteritis.

6 Physical examination and important clinical findings:
No pallor, icterus, cyanosis, clubbing, lymphadenopathy or pedal edema
Vital Signs:
Blood Pressure: Pre-op ~220/130 mmHg, Heart Rate: 98 bpm SpO2: 99% on RA
Peripheral Pulses
Upper limbs: Pulses palpable but weak
Lower limbs: Absent femoral, popliteal, dorsalis pedis, and posterior tibial pulses bilaterally
Radial-femoral delay: Present
Blood pressure disparity: Suspected due to vascular stenosis

Airway Examination
Mallampati Class II, Mouth opening -4cm
Thyromental distance >6.5 cm
Neck movements -Normal, No restriction

7 Timeline:

Time	Event Details
5 years prior	Diagnosed with Takayasu arteritis
6 months prior	Headache, Persistent uncontrolled hypertension
Preoperative workup	On immunosuppressants and antihypertensives. CT Brain and CT angiogram of brain and neck vessels-Normal CT thoraco-abdominal and Renal angiogram -features of Takayasu arteritis. ECG, 2D ECHO, Chest X-ray-Done Airway-Normal Labs -Normal
Day of surgery	Left laparoscopic nephrectomy performed under general anaesthesia and bilateral QL block with invasive blood pressure and BIS monitoring
Intraoperatively	One episode of hypertensive crises- managed with NTG infusion
Immediate postoperative period	Shifted to ICU with mechanical ventilation and infusions After evaluating cardiac status, patient was extubated on POD 1
Discharge	Observed in ward, discharged on POD6

8a Diagnostic testing:
A 23-year-old female (73 kg) with a five-year history of Takayasu arteritis presented with a non-functioning left kidney (GFR 3.76 mL/min). Her laboratory investigations revealed mild anemia (Hb 10.9 g/dL) with normal renal function (creatinine 0.6 mg/ dL). Echocardiography revealed concentric left ventricle hypertrophy with preserved EF (62%) and chest X-ray showed cardiomegaly with a scalloped aortic contour. CT thoracoabdominal and renal angiography showed diffuse aortic wall thickening, abdominal aortic narrowing, complete occlusion of the left renal artery with collateral perfusion insufficient, 50% stenosis of the right renal artery and irregular 70% narrowing of infrarenal abdominal aorta. Diagnosis was based on clinical findings, laboratory investigations, CT angiography, and fulfillment of ACR criteria for TA [6].

8b Diagnostic Challenges:
No specific diagnostic challenges encountered.

8c Diagnosis:
Takayasu arteritis and bilateral renal artery stenosis
Renovascular hypertension

8d Prognosis:
Depends on BP control and disease progression.

9 Therapeutic intervention:
In the operating room, ECG (leads I, II and V5), temperature, Spo2 and capnography, BIS monitoring were all monitored. Due to unreliable NIBP from arterial stenosis, an invasive arterial line was placed under ultrasound guidance. General anaesthesia was induced using Fentanyl, Lidocaine, and Propofol. To facilitate muscle relaxation, Vecuronium was used. A video laryngoscope was used to attenuate the pressor response during intubation. Anaesthesia was maintained with oxygen-air mixture (FiO_2 0.4) and inhalational agents under pressure-controlled volume guarantee ventilation.
Bilateral ultrasound-guided quadratus lumborum block were performed. (20 mL of 0.25% bupivacaine on each side) for analgesia. Based on preoperative evaluation, we predicted the possibility of significant hemodynamic changes, myocardial ischemia, cerebral ischemia, and acute adrenal insufficiency as a result of longterm steroid administration. Therefore stress-dose steroid was given with IV HYDROCORTISONE 100 mg. Low-pressure pneumoperitoneum and lung-protective ventilation were employed to avoid further hemodynamic stress. During renal pedicle manipulation, severe hypertension (systolic BP >240 mmHg, diastolic BP>110 mmHg) with transient ST depression occurred, which necessitating titrated nitroglycerin infusion to maintain MAP within 20% of baseline. The procedure was completed successfully.

10 Follow-up and outcomes:
After surgery, the patient was transferred to the intensive care unit on mechanical ventilation for continued monitoring. Postoperatively, 2D echocardiography was done and it showed no regional wall motion abnormality with EF-62%. She remained hemodynamically stable, with no further ischemic changes or complications. Steroid therapy was continued, and she had no signs of renal deterioration, cerebral events, adrenal insufficiency. Postoperatively, pain was well controlled with regional block and multimodal analgesia. The recovery was uneventful; she was discharged to home after routine observation.

11 DISCUSSION:
Takayasu arteritis presents unique anesthetic challenges due to its diffuse vascular involvement. Patients with takayasu arteritis frequently exhibit renovascular hypertension due to renal artery involvement [2]. Severe hypertension in this case posed a high risk of myocardial and cerebral ischemia during perioperative stress [4]. Therefore, invasive blood pressure monitoring using ultrasound guidance and vasodilator readiness were critical [7]. In this case, the patient's blood pressure frequently exceeded 240 mmHg systolic with ST segment changes occurred in ECG which signifies acute transient ischemia from hypertensive spikes. We counteracted each surge with nitroglycerin infusion and it was titrated to reduce the afterload.
The efficacy of quadratus lumborum block (QLB) in nephrectomy is supported by multiple studies: patients receiving QLB have lower pain scores and opioid use compared to controls.[8] Adequate pain control is vital to avoid sympathetic responses. So we gave bilateral quadratus lumborum block for intraoperative and postoperative analgesia.
Chronic steroid therapy is common in takayasu arteritis to suppress vascular inflammation. But it will suppress the hypothalamic-pituitary-adrenal axis, so additional "stress-dose" steroids are usually administered perioperatively to prevent adrenal crisis [9].
During laparoscopic surgery, Insufflating the abdomen raises intra-abdominal pressure, which compresses abdominal vessels. This typically increases systemic vascular resistance and arterial blood pressure while decreasing venous return and cardiac output. [5] In a patient with fixed arterial stenoses, these changes can further compromise organ perfusion. We mitigated these effects by using low pneumoperitoneum pressures and

lung protective ventilation. [10] We also closely monitored $EtCO_2$ (to adjust ventilation) and urine output as crude markers of perfusion. Managing Takayasu arteritis patients requires a multidisciplinary approach. We involved cardiology (for blood pressure optimization), nephrology, and the surgical team in preoperative planning. A detailed vascular assessment (angiography, echocardiography) guided our anesthetic plan.

CONCLUSION:

Takayasu arteritis with bilateral renal artery stenosis presents a unique anaesthetic challenge, particularly during laparoscopic interventions. Individualized anaesthetic plans, which involves General anaesthesia, invasive blood pressure monitoring, precise BP control, regional analgesia, and steroid coverage can significantly improve the patient safety and surgical outcomes.

12 Patient Perspective

The caregiver expressed satisfaction with the surgical and anaesthetic management, highlighting effective pain control and a smooth recovery.

13 Informed Consent

Written informed consent for publication was obtained from the patient.

Ethical disclosures

- **Ethics committee approval -** Not required for single-patient case reports.
- **Protection of human and animal subjects -** Procedures adhered to the Declaration of Helsinki.
- **Confidentiality of data -** Confidentiality maintained and followed the protocols of the work center on the publication of patient data.

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Authors' contributions:

- Author 1 (Dr. Sarankumar M) - Case assessment, OT preparation,

Intraoperative monitoring and management, initial writing of the manuscript.

- Author 2 (Dr. Venkatesh S) - Case assessment, initial writing of the manuscript, intraoperative monitoring and management, final writing and approval of the manuscript.
- Author 3 (Dr. Aravindan M) - Case assessment, OT preparation,

Intraoperative monitoring and management, initial writing of the manuscript.

Conflict of Interest

The authors declare no conflicts of interest.

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