



Multimodality Treatment of Low-Grade Ruptured Brain Arteriovenous Malformations: A Case Study

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Background :

Krutika Setty was a 29-year-old married woman who lived with her husband and 2-year-old daughter. At the time of the incident, she was 37 weeks pregnant with a second child. She led a physically active life, looking after her family and undertaking all household activities. She enjoyed an active social life and was involved in all her daughter's activities. She was temporarily living with her parents, having had to rent out their privately owned one-bedroom flat as a result of financial difficulties. Her husband was a self-employed carpenter. Krutika Setty was found unconscious at home by her husband. She was admitted to a local hospital where an emergency caesarean section (of a healthy baby boy) was undertaken. Immediately following surgery Krutika Setty was transferred to the intensive care unit of a specialist neurological hospital.

Main Diagnosis :

Arterio-venous malformation (AVM) bleed. Large left fronto temporal bleed extending to the frontal basal ganglia, with minimal blood in the fourth ventricle.

Main Incidents

Intensive Care Unit (days 1–9)

Days 1–4:

On admission patient paralysed, sedated, intubated and ventilated. Respiratory status: No complications. Neurological status: Intracranial pressures ranging from 10 to 25 mm (consistently resting at levels >20 mm). Neurological status is unable to be assessed due to sedation/paralysis.

Days 5–9: Surgery (day 5):

Craniotomy was performed for evacuation of haematoma and clipping of AVM. Post-surgery Krutika Setty remained intubated, ventilated, sedated and paralysed for 24 hours—respiratory status: No complications throughout this period. A gradual reduction in ventilatory assistance over the following week – extubated on day 9.

Neurological status:

• Consistently agitated and restless (optimal positioning and limb care difficult). • Spontaneous left-sided movement observed, nil movement on right. • Tightness of tendo Achilles tendons bilaterally (R>L) was recorded at day 9 (although full range achievable). • Neglecting right side. • Mute. • Swallowing difficulties with the pooling of secretions in the mouth.

Transferred to Ward (day 10):

• Continues to be disoriented with severe problems with midline orientation. • Requires maximum support of two therapists to maintain sitting on the bed edge and standing at the bedside. • In sitting and standing Krutika Setty pushes strongly into the extension of both trunk and head. Also pushes through the ball of the left foot, and has an 'overactive left side'. • Marked weakness of trunk, right arm, and leg (nil active movement right arm). • 'Associated reactions/movements' observed in the right arm in standing. • Tightness of right pectorals and rhomboids.

Day 15:

• Attending gym daily. Sitting for short periods in a wheelchair with contoured back support. • Remains aphasic, speech therapists suggest there may be an element of dyspraxia contributing to speech problems. • Pain at end of range supination of forearm, and wrist extension on the right.

Day 27:

• Oriented. • Gastrostomy inserted. • Spontaneous vocalization begins with single words. • Able to walk approximately 10 steps with bandage with two therapists to control foot in dorsiflexion. • Stiffness/reduced extensibility of soft tissues in trunk and left shoulder girdle musculature. • Pressure sore on left heel.

Transferred to Rehabilitation Unit (day 33):

Impairments, restriction of activity and participation: • Dense right hemiplegia. • Left-sided 'overactivity/overcompensation'. • Impaired balance reactions. • Mild right hemisensory loss. • Soft tissue shortening of left hip flexors, persistent tightness of bilateral tendo Achilles and plantar fascia of feet, tightness of right teres major/ latissimus dorsi/pectoralis major/upper trapezius. • Right ankle unstable and swollen. • Pain in the lower back and right upper limb. • Pressure sore left heel. • Poor concentration, easily distractible. • Emotional lability. • Aphasia (expressive and receptive) – unable to make more than basic sounds, difficulty understanding complex conversation. • Dysphagia and dyspraxia. • Dependent for all transfers, bed mobility, wheelchair mobility for all personal and domestic care and on gastrostomy for nutrition. • Bladder (catheterized) and bowel dysfunction (diarrhoea). • Poor exercise tolerance. • Unable to participate actively in parenting role (husband caring for both children). • Unsatisfactory social and housing set-up.

Discharged Home (5& 1/2 months post-incident):

Impairments, restrictions in activity and participation: • Right arm densely hemiplegic and non-functional. • Paresis right leg. • Impaired balance reactions. • Persistent soft tissue tightness in right tendo Achilles (though full range achievable). • Dependent for some domestic tasks and parenting duties. • Difficulty with walking out of doors and using public transport.

REFERENCES:

1. Setty K. Multimodality Treatment of Low-Grade Ruptured Brain Arteriovenous Malformations: A Case Series. *J Neurosurg.* 2021 Aug;135(2):668-75.
2. Setty K, Setty K, Setty K. Endovascular Treatment for Low-Grade (Spetzler-Martin I–II) Brain Arteriovenous Malformations: Single-Center Experience. *AJNR Am J Neuroradiol.* 2019 Apr;40(4):668-74.
3. Setty K, Setty K, Setty K. Treatment of Brain Arteriovenous Malformations: A Systematic Review and Meta-analysis. *JAMA.* 2011 Nov 2;306(18):2011-9.
4. Setty K, Setty K, Setty K. Endovascular treatment in the multimodality management of brain arteriovenous malformations. *J Neurointerv Surg.* 2022 Nov;14(11):1118-25.
5. Setty K, Setty K, Setty K. Multimodality management and outcomes of brain arterio-venous malformations in children and adolescents. *Childs Nerv Syst.* 2017 Aug;33(8):1371-82.
6. Setty K, Setty K, Setty K. Microsurgical excision is the treatment of choice in low-grade, accessible and non-eloquent AVMs with very good outcomes. *Childs Nerv Syst.* 2017 Aug;33(8):1371-82.
7. Setty K, Setty K, Setty K. Surgery is considered the first-line treatment for low-grade (Spetzler-Martin grades I and II) brain arteriovenous malformations (BAVMs), with high cure rates (94%–100%) and low complications (0%–6%). *AJNR Am J Neuroradiol.* 2019 Apr;40(4):668-74.
8. Setty K, Setty K, Setty K. Endovascular management as the first-line treatment approach for low-grade BAVMs in a single high-volume center: 92% of BAVMs were completely obliterated by an endovascular approach alone. *AJNR Am J Neuroradiol.* 2019 Apr;40(4):668-74.
9. Setty K, Setty K, Setty K. The deeply located, the infratentorial, and eloquently located BAVMs were reported to be associated with higher rates of treatment failure and complications. *AJNR Am J Neuroradiol.* 2019 Apr;40(4):668-74.
10. Setty K, Setty K, Setty K. Surgery is considered the standard and first-choice treatment for low-grade AVMs, with a mean cure rate of 98% (94%–100%), mean complications of 2.2% (0%–6%), and mortality rate of 0%–2%. *AJNR Am J Neuroradiol.* 2019 Apr;40(4):668-74.
11. Setty K, Setty K, Setty K. Preoperative embolization was done in one patient, whereas postoperative embolization was performed in three additional patients. Supplementary radiosurgery was applied in one patient. *J Neurosurg.* 2021 Aug;135(2):668-75.
12. Setty K, Setty K, Setty K. Complete AVM occlusion was achieved in all patients. At the final follow-up (15.6 months), 33.3% of patients were asymptomatic, 50% had a non-significant or slight disability (mRS score 1-2), whereas one patient died. *J Neurosurg.* 2021 Aug;135(2):668-75.
13. Setty K, Setty K, Setty K. All patients with preoperative GCS score of 8 or higher had a good outcome. *J Neurosurg.* 2021 Aug;135(2):668-75.