



# Neurosurgery in India: Perspective of a Veteran Neurosurgeon

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Indian J Neurosurg 2022;11:193–194

Neurosurgery is rapidly evolving specialty and neurosurgeons are passionate professionals in learning the complex procedures. Neurosurgery is a technically challenging branch, which has problems like prolonged learning curve, long working hours, and sacrifice of personal and social life. Women due to challenges of home, pregnancy, and child care may be dissuaded from neurosurgery career; however, studies report that women are equally adapted and naturally gifted for the stress related to the profession and neurosurgery specialty should not be any more gender biased.<sup>1</sup>

There are two super-specialty courses in neurosurgery, namely MCh. and DNBss. Neurosurgery training is either 3 years or 6 years duration that done is after MS or MBBS. I personally feel that 2 years posting should be mandatory instead of 1 year in general surgery in 6 years training program. Training in principles of general surgery is important as the candidates will be practicing whole life as a neurosurgeon with background knowledge of principles of general surgery that is the basis of any surgical branch.

Approximately, there are 3,700 neurosurgeons in India for a population of 1.35 billion that is much less than compared with developed countries like Japan and United States. Every year 482 students are being trained in neurosurgery in India. The number of seats has increased by 100% during the past 5 years, but this number is too small for increasing population per year. With increasing number of seats, there is no proportionate increase in infrastructure for practical learning especially for centers not well equipped. Cadaveric dissection, microsurgical anastomosis on variable sized diameter placental vessels, simulator trainings, and interinstitutional postings should be encouraged to bridge this gap.

According to head injury (HI) foundation (Indian Head Injury Foundation), HI is a leading cause of morbidity and mortality and economic losses. In India, one out of six victims

dies due to HI, while in United States 1 out of 200 victims. Secondary brain injury results in increased mortality and disability. Fatality rate is 7/10,000 vehicles and is 25 times higher than developed countries. Vulnerable group includes pedestrians, motor cyclists, four-wheel users, and cyclists in descending order. HI has become more of a social problem than confined to involved families. Of all the referred cases of HI, only 4% need operative intervention; so most of them can be managed by general surgeons that can reduce the burden on tertiary care centers so that referral resources will not be overstretched.

The number of deaths due to HI has decreased to 1,31,113 from 1,51,113 in 2019 that could be due to implementation of Motor Vehicle Act (MVA) 2019 that became effective in September 2019. Amended MVA provides stiff penalty for traffic violations, electronic monitoring of the same, and enhanced penalties for juveniles; hence, this act has provided the desired effect. Road accident deaths came down because of lockdown due to coronavirus disease 2019 pandemic. Global plan for 2011 to 2020 aimed at reducing fatalities by 50% by the year 2020.<sup>2</sup> Rather number of deaths in road accidents increased from 1,42,485 in 2011 to 1,51,113 in 2019. Nonusage of seat belt and alcohol consumption is common in HI cases. Other risk factors include human error, speeding, use of psychotropic drugs, distracted driving, and faulty road design. In India, only 1% victims reach trauma facility within 1 hour (golden hour), whereas in advanced countries 80% victims reach hospital within golden hour that is a great challenge for us to achieve best and effective care.

Spinal injury is a challenge to patient, family, and society at large. Severity of disability is more than HI. Cost of management is enormous. Incidence is likely to rise because of urbanization and industrialization. Secondary complications avoidance is more challenging than primary injury. Mobility, integration with society, and prevention of secondary

DOI <https://doi.org/10.1055/s-0042-1760341>  
ISSN 2277-954X

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complications mitigate the crippling nature. Rehabilitation should begin as early as possible. Complications indirectly indicate the care provided. Stem cell therapy appears to be promising but still in infancy. Hybrid assistive limb based on cyberunits offers advanced neurobotic rehabilitation and improves wearer's body functions by enhancing motor learning capacity.

Axonal injury is a strong predictor of clinical outcome. Graham et al validated neurofilament light (NFL) as a biomarker of axonal damage after moderate and severe traumatic brain injury. Plasma concentration of NFL is increased after injury in humans. NFL-derived markers correlate with magnetic resonance imaging (MRI)-derived markers and predicts white matter degeneration and functional outcome at 6 to 12 months.<sup>3</sup> Advanced neurosurgical facilities like Gamma knife radiosurgery, cyber knife, proton beam, and stem cell therapy, though costly, are available in some centers. Cost of these treatment is one-fifth of advanced countries and corporate hospitals advertise for medical tourism.

Tuberculosis and cysticercosis are quite common in India. Tuberculosis is still the major health problem. Early and prompt diagnosis is a must. Newly developed nanotechnology for the detection of causative and delivery of antitubercular drugs is most important in the targeted treatment of tuberculosis tried with success in animals and hope it will help clinicians save more lives. Usual diagnostic methods for neurocysticercosis include computed tomography, MRI, and blood/serum based immunological tests. Novel method of diagnosis includes fast imaging employing steady-state acquisition FIESTA.<sup>4</sup>

Molecular profiling of glioma has become mandatory and gene profiling is available in some hospitals only and day is not far off when glioma therapy will be replaced by gene therapy.<sup>5</sup>

Development of GDC coils, stents, and glue has significantly changed the management of aneurysms and arteriovenous malformations. The cost of endovascular treatment is prohibitive in the developing countries; however, it has its advantages in terms of short hospital stay and no open surgery of brain. Government may subsidize the coils and other endovascular hardware so that it becomes economical and affordable. I agree with article written by Wani and Bhat of creating hybrid neurosurgeon and is the demand of time.<sup>6</sup>

Artificial intelligence (AI) enhances clinical practice by quicker diagnosis, clinical decision, and prognostication.

In operating room, image guidance permits more accurate intervention. It helps to develop better algorithms. However, increased use of automation may produce deskilling of physicians due to over reliance, poor understanding, and over confidence, so one should be aware of negative side of AI as well.<sup>7</sup>

Lately we had to face challenges from coronavirus disease 2019. Surgical load came down by 70% and patient care suffered. Arora et al reported more than 25% cases of cranial surgery were rescheduled and adjuvant therapy following surgery in more than 90% got delayed during lockdown period.<sup>8</sup> Preventive use of personal protective equipment and use of Hudson brace was recommended over pneumatic drill to decrease aerosol. Online educational documents, grand rounds, webinar, and live interactive virtual visiting lessons mitigated the academic deficiency to some extent.

## Conclusions

Most of the challenges are due to poor infrastructures considering the population and lopsided distribution of medical facilities. Addressing these issues can make a change in neurosurgical practices in densely populated countries.

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