

Management of Patients with Neurotrauma by Trauma Surgeons: Need of the Hour

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Indian J Neurotrauma 2019;16:82–85

Abstract

Trauma-related deaths in excess of 1 million occur annually in India, more than half of which are attributable to head injury. There are just 1,400 certified neurosurgeons in India, and only 300 new trainees are inducted every year. More than 80% of India's specialist doctors live in urban India. There is evidence that patients travel hundreds of kilometers to seek a neurosurgeon; needless to say, golden hour of trauma is surely lost in this time. Scarcity of neurosurgeons is a problem in the developed world too. Government of India is building a national network of trauma centers for better trauma care. However, neurosurgeon availability at these centers remains a cause of concern. In dire need of neurotrauma management and scarcity of neurosurgeons, management of neurotrauma by trauma and general surgeons is the best available option. Such management policies have already been tested successfully in both developed (Germany, Sweden) and developing world (Nepal). There is evidence on patient safety and good outcome in neurotrauma management by trauma surgeons. Refresher training of 1 week every 2 years has been recommended to prevent skill attrition after 2-week neurotrauma training led by a neurosurgeon. Uninterrupted run of 3-year trauma surgery residency program at JPN Apex Trauma Center, All India Institute of Medical Sciences, New Delhi, India, incorporating in-house neurotrauma training is a testimony to need and utility of this approach. A "readily available neurosurgeon when needed" is a scarce resource in most parts of world. Therefore, trauma surgeon is best suited to deliver timely care in neurotrauma and tackle this "hidden epidemic."

Keywords

- ▶ neurotrauma
- ▶ trauma surgeon
- ▶ emergency neurosurgery
- ▶ neurosurgeon scarcity
- ▶ general surgeon neurotrauma

Introduction

Neurotrauma is a global public health problem.¹ In India alone, more than 1 million trauma-related deaths occur annually, of which more than half are attributable to head injury.² In fact, neurologic disability has been called as "hidden epidemic of India."³ However, accurate head injury statistics in India are lacking and only estimates can be made by extrapolating individual studies.⁴ Even with conservative estimates, approximately 10 million moderate to severe traumatic brain injuries occur annually in India.²

Neurosurgeon: A Scarce Resource

There are just 1,400 certified neurosurgeons in India, and only 300 new trainees are inducted every year with

varying pass percentage.^{5,6} Scarcity of neurosurgeons get compounded by the fact that more than 80% of India's specialist doctors live in urban India.⁷ A study by Neurological Society of India found that there was not a single neurosciences specialist living in a geographical area covering nearly 934.88 million people.⁷ Therefore, patients of neurotrauma often have to travel hundreds of kilometers to have an expert opinion and management thereof; needless to say, golden hour of trauma is surely lost in this time.⁷

Scarcity of neurosurgeons is not limited to developing world; it is a problem in developed world too. It is a scarcely available resource even in the United States, where only 20% of population has direct access to a specialist, with one neurosurgeon per 70,000 population.⁸ Traveling time

received
September 15, 2019
accepted
September 16, 2019

DOI <https://doi.org/10.1055/s-0039-3400331>
ISSN 0973-0508.

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for a review by neurospecialist is universally long, ranging from few hours in U.S. up to a day in India.^{7,9} A survey of neurotrauma management practices in Japan revealed that less than one-third of specialty centers had neurosurgeons in emergency department; 10% surgeries and 24% postoperative care were provided by non-neurosurgeons.¹⁰ Lack of neurosurgeons even in specialist centers was acknowledged as a limiting factor for implementation of recent guidelines in patient care.

With increasing trauma burden and dubious distinction of maximum road traffic injury mortality in world, Government of India has come up with a plan of building a network of trauma centers across India.¹¹ Two hundred and fifteen trauma centers including 15 to 20 level 1 and 50 level 2 centers are proposed and will be requiring 150 to 200 neurosurgeons. Preference of specialists to concentrate in Tier 1 cities may prove to be an impediment in achieving desired results. Hence, provision of trauma surgeons and general surgeons trained in neurotrauma is an important component of building an effective trauma center network.¹¹

Neurotrauma Management by Trauma Surgeon

In such dire need of neurotrauma management and scarcity of neurosurgeons, management of neurotrauma by trauma and general surgeons is the best available option. Management of neurotrauma by non-neurosurgeons is not a new concept. It was recognized as long as 25 years ago that management of neurotrauma does not necessarily require expertise of a neurosurgeon.¹² A National Trauma Data Bank study found that just 1% of all trauma patients and 3.6% of all head injury patients required a craniotomy.¹³ Nonavailability of neurosurgeon in civilian setting must allow a trauma surgeon to do a lifesaving decompressive craniotomy.¹⁴ Polytrauma patients with associated head injury are preferentially managed by trauma surgeons worldwide, with as-needed and pre-discharge consultation by neurosurgeons.¹⁵ In military and warfare settings, availability of neurosurgeon is considered a luxury. In such circumstances, trauma or general surgeon must operate on neurotrauma patients to save a life.¹⁵ Damage control neurosurgery, a concept forwarded by Rosenfeld, also includes management of neurotrauma by non-neurosurgeons.¹⁶ Refresher training of just 1 week every 2 years has been recommended to prevent skill attrition and to maintain knowledge abreast with latest developments.¹⁵ Tele-neurotrauma (management of neurotrauma at remote locations in consultation with experts) is being actively studied with promising results in developed countries.¹⁷ Besides documented benefits of decreasing unnecessary transfers and increased access to specialist opinion, it is a potential tool for taking neurotrauma services to remote areas by trained trauma and general surgeons with tele-neurosurgery consultations as and when required. Need of "virtual neurosciences care" is also realized in India and has been proposed as a means

to offset the heterogeneous distribution of neurospecialist in country.⁷

The possibility of neurotrauma operative management by non-neurosurgeons as a lifesaving measure in austere circumstances has been acknowledged by the Advanced Trauma Life Support program as well.¹⁸

Learning Curve and Patient Safety

To be able to safely perform lifesaving surgeries in emergency situations or in austere environment, non-neurosurgeons must acquire sufficient experience in such procedures in civilian setting during peace time. In fact, safety of decompressive craniotomy in the hands of general and orthopaedic surgeons, after attending the neurosurgeon-directed courses, have been proven in many countries.^{15,19} According to the published reports, participants were able to manage warfare neurotrauma operatively after 1 week of intensive course followed by 1-week in-house residency, which included clinical rounds, neurocritical care, and participation in planned and emergency neurosurgical procedures. Safe placement of intracranial pressure (ICP) monitors and ventricular catheters by non-neurosurgeons after training have also been shown by Ko and Conforti with results similar to neurosurgeons.²⁰ With regard to learning curve, it has been documented that observation and assistance in five ICP catheter insertion procedures followed by five successful independently performed supervised procedures are adequate to certify a non-neurosurgeon for safe ICP placement.²⁰ Techniques for emergency burr hole by non-neurosurgeons, a skill getting obsolete, are still published citing requirement even in developed countries.²¹ There are published reports of successful management of neurotrauma by general surgeons, telementored by the neurosurgeon remotely. Subsequent drop in neurosurgical tele-referrals from telemedicine-enabled centers were attributed to increased confidence among general surgeons in managing neurotrauma independently.⁷ Learning curve for operative procedures of neurotrauma management has been published.

There is enough evidence to support nonoperative management of neurotrauma by general surgeons in other developing countries as well.²² Ghimire et al reported operative rate of 2% in 1,847 neurotrauma patients over 4 years with a mortality of 2.8%, establishing the safety of neurotrauma management by general surgeons in their regional hospital with no neurosurgeon.²³ A recent study from Swedish counties reiterated the safety of their "regional policy" of operative management of neurotrauma by general surgeons citing good postoperative clinical and long-term outcomes.²⁴

Indian Scenario

Operative management of neurotrauma by trauma surgeons is not a new concept in India; Fellow of National Board trainees in trauma surgery are known to have performed sufficient number of craniotomies during training period.²⁵ As noted, number and distribution of neurosurgeons in India is not enough to cater majority of the population effectively.⁷ Jai Prakash Narayan Apex Trauma Center under aegis of All India Institute of Medical Sciences, New

Delhi, India, has taken a lead in this direction and started a 3-year Master of Chirurgic program in trauma surgery and critical care with integrated training in orthopaedic, neurosurgery, plastic surgery, and cardiothoracic trauma in addition to general surgical trauma. Trainees are trained in ICP insertion, neurocritical care, and emergency neurosurgical procedures during their training in neurotrauma for a period of 6 months. This is followed by an exit written examination bearing a question from the subject and viva voce of 20 marks conducted by neurosurgeon. This dedicated and uninterrupted academic program in trauma surgery since 2016 is a testimony to its utility and appeal of this much needed initiative.²⁶

Another initiative in pipeline is a proposal for 6-month neurotrauma course for general surgeons, to enable them to provide neurotrauma services at their respective hospitals in tier 2 and 3 cities. Director General of Health Services operational guidelines on capacity building in trauma care in India mandates level 2 trauma centers to be staffed with general surgeons with 6-months neurotrauma training.¹¹

Conclusion

A “readily available neurosurgeon when needed” is a scarce resource in mainland India, barring metropolitan cities.⁷ In such circumstances, natural savior of neurotrauma patients is the trauma surgeon, who has seamless understanding of multisystem trauma care and is best suited to take call on competing priorities. Skills required for successful neurotrauma management, operative or nonoperative, are essentially those learnt in general surgical residency programs.¹⁵ Efficacy and safety of this approach has been proved in published literature.²²⁻²⁴ Unless we have a prehospital system that can take the “right patient to right place at right time,” trauma surgeon is best suited and will have to wear the robes of neurosurgeon to deliver timely care and tackle this “hidden epidemic.”²³

Disclosure

A.R. joined the first batch of M.Ch. in Trauma Surgery and Critical Care program at JPNATC. After completing his training, he is currently affiliated to another upcoming level 1 trauma care facility at AIIMS, Rishikesh.

Funding

None.

Statement of Approval from All Authors

All authors certify that they have made substantial contributions to conception, design, analysis, and interpretation of data, drafted the article and revised it critically for important intellectual content, and approve the final version to be published.

Conflict of Interest

All authors declare that there is no conflict of interest.

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