Editorial

Indian Journal of Neurotrauma (IJNT)
2005, Vol. 2, No. 2, pp. 63-65

Preventing Head Injury: A Project Tiger for Neurosciences

Harjinder Singh Bhatoe M Ch
Department of Neurosurgery
Army Hospital (R & R), Delhi Cantt 110010

There have been rapid progress in the early pre-hospital phase as well as in the post-hospitalization phase of head injury management, largely because of availability of imaging techniques and consequently the decision making for operative intervention. Advances in molecular biology in the nineties aroused expectations that better understanding of molecular events will lead to better outcome in head injuries[1]. These expectations continue to be held and the search for a magic bullet that will awaken the partially damaged neurons from traumatic slumber, continues. There are volumes of neurosurgical texts and proceedings dedicated to the understanding of and analyzing the outcome from the largely preventable catastrophe, the head injury. Compared to the voluminous literature available on the head injury pathophysiology and management, there is miniscule volume concerning preventive aspects. If such volume correlates with the comparative efforts on ground to prevent head injury, then it is clearly a cause for concern. The old adage that *"an ounce of prevention is better than a pound of cure"* is could not be more true in the context of head injuries.

***Case study**: A 20-year-old-college student traveling at night on a two-wheeler with two more friends sustained head injury. She was not wearing a helmet. She was initially admitted to a private nursing home in altered state of consciousness, where overnight treatment of observation, CT scan, consultants' fee and medical treatment worked out to nearly Rs 20,000. After she was shifted to a major teaching hospital, she remained neurologically disabled and was discharged a month later. Total expenses were Rs 125,000. Now she is bed-ridden with spasticity of all four limbs and requires full-time assistance and recurring expenditure.*

***Case study**: A 28-year-old soldier riding a two-wheeler, in habit of cutting across to the right of oncoming traffic and negotiating nearly fifty metres of heavy oncoming traffic head-on so as to avoid taking a U-turn of about a kilometer, was not so lucky one morning when he was knocked down by an oncoming roadways bus. The helmet, loosely strapped proved to be of no use. The sole breadwinner of the family of six, was operated for bilateral brain contusion and subdural hematoma nearly four hours later. He died of aspiration pneumonia after six days.*

Such cases can be presented as an unending chronicle, whether as a case of an unattended child falling from a balcony, or of an adolescent flying kite on a rooftop without a parapet wall, or that of a teenager gifted a motorbike by indulgent parents (the types who often promptly defend the non-use of helmets as "its not compulsory here") before he had acquired a driving licence, The common factor in all these instances is that each of these injuries was preventable.

Neurologic trauma represents the final common pathway for about half of all trauma-related mortality in developed countries. In the United States, someone suffers a head injury approximately every 15 seconds; every 5 minutes one of these individuals dies and another is disabled[2]. Majority of these injured individuals are young, and trauma-related death and disability account for a large economic burden to the society and health care services than do many other neurologic diseases. Mild head injuries and concussion can cause loss of productive work time. The 2003 report to the Congress by the Centers for Disease Control (CDC) describes these injuries as a "silent epidemic" because their symptoms (e.g., fatigability, forgetfulness, irritability, inability to concentrate at work, etc) may pass unnoticed, dampening their public health importance and their impact on the productivity (CDC 2003)[3]. Unlike neurologic disease, most neurologic trauma is a consequence of well-defined human behavior, related to use of motor vehicles, firearms, certain professional and sports activities. To prevent head injury, not only there is requirement for modification of risky behavior, but also that of the trauma ecology. Current management of TBI cannot guarantee good functional outcome or even survival in large proportion of the severely injured patients. The imaging studies are expensive and not yet widely available in government hospitals across India. Each of these patients needs management in a specialized center, which often entails shifting him/her by some mode of transport, during which the vital functions may require support. Such state of the art system needs massive capital

Address for correspondence: Harjinder Singh Bhatoe M Ch
Department of Neurosurgery, Army Hospital (Research & Referral)
Delhi Cantt. 110010. New Delhi, E-mail: hsbhatoe@indiatimes.com
Tel: 91-11-25668095, 25668096, Fax: 91-11-25681893,

outlay, and in private setup, the motive would be early recovery of such an investment. Treatment even in a government hospital is expensive, taking into consideration the intensive care management, surgical procedure(s), disposables and medicines. The hidden expenditure is the by way dislocation of the family, living in alien city where the family members have to shell out money for existence. Anything other than full recovery translates into recurring expenditure. The net burden on the society due to TBI is substantial. For the organization, it is loss of trained human resource and for the government organizations, the compensation, disability allowance and disability pension together with the compulsion of retaining such individuals till superannuation means substantial burden on the exchequer. It is thus not difficult to visualize the importance of prevention of head injury, especially in the Indian scenario. While the need for prevention of head injury is universally recognized, there appears to be a lack of methodology and the ultimate goal. It is important to consider TBI as a part of trauma syndrome, the origin of which may be dependent on the personality and upbringing of the patient, the facilitatory factors and the environment leading to the episode. More than half the victims of TBI will have an additional major injury, which will have a compounding effect on the severity and outcome. Thus, a number of factors have to be addressed to while considering prevention of head injury, so as to create an environment of awareness of the head injury and its sequelae.

Project Tiger: Alarmed by the dwindling tiger population due to indiscriminate hunting and poaching, Government of India headed by Mrs Indira Gandhi launched Project Tiger in 1972. While the ultimate goal was to stem the decline tiger population,a concerted effort was made to preserve and expand the natural habitat of the wild animals, where environmental degradation was stopped, villages were relocated, poachers were arrested and encroachments were cleared. This resulted in gradual rise in tiger population and improvement of forest cover and preservation of other forms of wildlife.

Same analogy applied to preventing head injury, an environment of awareness has to be created, wherein the target is protection of brain from injury and reduction in mortality and disability from TBI, brought about by a series of well-coordinated measures. Hadden[4] outlined ten logically distinct strategies for injury control, most of which are applicable to prevention of head injury:

Table 1

1.	Prevent the creation of the hazard in the first place. (Ban on the plying of rickety, unroadworthy vehicles).
2.	Reduce the amount of the hazard brought into being. (Enforce speed limit of vehicles).
3.	Prevent the release of already existing hazards. (Firearms to be stored away from the home).
4.	Modify the rate of spatial distribution of the release of the hazard from its source. (seat belts).
5.	Separate, in time or space, the hazard and that which is to be protected. (Bicycle paths separate from roads).
6.	Separate the hazard and that which is to be protected using a material barrier (Helmets).
7.	Modify basic relevant qualities of the hazard. (Breakway utility poles along the highways).
8.	Strengthen the target (Neck strengthening exercises for pilots of high-performance aircraft to prevent cervical strain).
9.	Begin to counter damage already done by an environmental hazard. (trauma systems research).
10.	Stabilize, repair and rehabilitate the object of the damage. (hospital-based head injury treatment & rehabilitation).

The approach to tackle the rising problem of neurotrauma has to be holistic; focusing only on helmets, speed limits and seat belts would be a self-defeating exercise. Studies in injury prevention are usually directed at a particular identified behavioural or situational risk factor, and measures of success may include observations of the risky behaviour (e.g., helmet usage by motor cycle riders) or actual measurements of injury (e.g., mortality in motor cycle riders with/without helmet). Elimination of one type of risky behaviour could conceivably be followed by an unintended increase in another equally risky behaviour. The theory 'risk compensation' (also called risk budgeting or risk homeostasis) predicts that individuals have a certain fixed risk tolerance, so that if one risky behaviour is prohibited or prevented through a protective mechanism, of which the individual is aware, there will be compensatory increase in an offsetting risky behaviour. An example would be an increase in speeding among drivers constrained to wear seat belts or helmets.

Injury prevention efforts usually depend upon either education or law to reduce risky behaviour. Laws are more successful if the behaviour is directly observable (e.g., helmet usage) than if other tests are required for enforcement (e.g., breath analyzer). Injury prevention programs are as varied and complex as human behaviour associated with

injuries. Some important aspects of injury control are motor vehicle safety, targeting youth, alcohol usage, restraints and helmets, driving habits, road conditions, pedestrian injuries.

Motor Vehicle safety

Youth: Young drivers are at highest risk for crashes. The combination of lack of driving experience (novice driver effect) and liability to impulsive behaviour appears to be the cause. Graduated licensure programs, requirement of adult escort, appear to be effective. Alcohol appears to be disproportionately risky for young drivers, higher minimum drinking age and laws that prescribe lower legal blood alcohol levels for young drivers are effective in reducing injury.

Alcohol: The most important sobering effect is the realization by the driver of the hazards of drunken driving. Random stopping of drivers for breath testing and fixed "sobriety checkpoints" appear to reduce the total and alcohol-related fatalities. Reducing blood alcohol levels to 0.08% would be an effective strategy. Other effective measures are penal action including imprisonment, license suspension and ignition interlock device that tests driver performance before allowing a car to be started.

Restraints and helmets

Legislation is very effective in promoting seat belt and helmet use. Increases in seat belt use is high when the police stop cars solely because restraints are not being used rather than only if another violation is committed. Education and incentive programs have little or short effect. Helmet use is high (>90%) after legislation. Thai students of industrial engineering have designed an electronic safety helmet, which links the operating system to the motor cycle's electric control unit; motor cyclists cannot switch on their motor bike engines unless they put on the helmet[5]. Resistance to its use comes from the youth under various pretexts (being uncomfortable, hot weather, partial cutoff of auditory input, a fast rider without helmet looks "cool", etc). Educational status appears to have not much correlation to helmet use, and many of the violators in the city have been college going students. Parental encouragement to minors to drive a car or ride a two wheeler is high.

Cycle tracks and foot paths

A large metropolis like Delhi has paid no attention to segregate the slow-moving and fast moving vehicles, and cyclist are often seen to be riding on the extreme right, close to the central verge. Smaller cities where number outcome cyclists is high, there are no ways to segregate them from rest of the traffic. Little respect is shown to traffic signals by the cyclists and wearing of bicycle helmet is alien to them. No wonder, that cyclists constitute a high proportion of victims of road-traffic injuries, especially in the smaller cities and townships. Educating them about safety, traffic sense etc. will be an uphill task. Road safety measures are effective if the people agree to follow them. For instance, a subway in Connaught Place may not be used much, with pedestrians prefering to cross a busy road. Provision of escalators at the entrance to subways may encourage their use.

Overall approach has to be aimed at creating awareness that head injury is crippling, affecting the psyche if not the physical functions, that the brain has a limited capacity for regeneration, and that the treatment of head injury is expensive, when one is racing the biological clock and facilities are not uniformly available. Awareness is to be followed by acceptance of the preventive measures, whether these are in the form of protective helmets or speed limits. School children form a very large group that is in an impressionable age and the right conduct on the road can be inculcated in them by school bus drivers who follow the traffic rules. Law enactment by the executive, respect for law by the citizenry and law enforcement by the police provide the right environs for prevention of neurotrauma.

REFERENCES

1. Tandon PN. Head injury: a relentless enemy. *Ind J Neurotrauma 2004; 1: 61-2.*
2. Barker Fred G, Jr. Traumatic brain injury. In, Batchelor T, Cudkowicz ME (eds). Principles of Neuroepidemiology. Butterworth Heinemann, Boston. 2001, pp 237-63.
3. National Center for Injury Prevention and Control, Centers for Disease Control and Prevention: Report to Congress on Mild Traumatic Brain Injuryin the United States: Steps to prevent a serious Public Health Problem. Atlanta, Centers for Disease Control and Prevention, 2003. Available at www.cdc.gov/ncipc/pub-res/mtbi/report.htm
4. Hadden W Jr. On the escape of tigers: an ecologic note. *Tech Rev 1970; 71: 44.*
5. Hindustan Times (Delhi), 21 Oct 2005.