Extradural and subdural hematomas

Changing patterns and requirements of treatment in Australia

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The pattern of head injuries due to traffic accidents has changed markedly in Australia in the period since 1935. A review of autopsy cases of extradural and acute subdural hematomas shows a startling shift toward inoperable lesions. The author points out that accident prevention must now be considered the chief means of reversing man's trend toward self-destruction on the highway.

Key Words • head injury • extradural hematoma • subdural hematoma • accident prevention • Australia

Head injury is a very old subject, and I believe that we, as neurosurgeons, have long recognized that the major responsibility for planning, organization, and conduct of care of patients with head injury rests squarely on our specialty. In contemplating what contribution I could offer on this subject, at the request of the president of the American Association of Neurological Surgeons, brief reflection suggested that my Australian environment may have provided experiences that are different from those of most of this audience, and that some of my reactions might offer another perspective to this universal problem. Thus, although extradural and subdural hematomas provide the orientation of my remarks, I will not attempt any systematic account of the total related problem but rather highlight those special facets that have commanded my particular attention.

In Brisbane, less than half-way up the Eastern seaboard of Australia, my department serves an area that extends 300 miles south, 1000 miles west, 1200 miles north on the Australian mainland, and 1500 miles to the territories of Papua and New Guinea, and east on occasion as far as New Caledonia in the Pacific. In all of these million-plus square miles there are no neurosurgeons outside of Brisbane, so that Brisbane has the major responsibility for head injury care of over 2 million mainland Australians and 2½ million in Papua and New Guinea. It is clear that this challenge can only be accepted directly for those patients whose condition permits transport to Brisbane on commercial air routes or by aerial ambulance networks including that magnificent umbrella of safety which is the Royal Flying Doctor Service of the Australian inland.

What of the remote patients living in areas where the scattered population cannot even support a general surgeon, or those whose lesions demand immediate surgical intervention without the inevitable delays imposed by transport? Our immediate aim must be to serve them both by teaching the principles
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and practice of head injury care to all doctors, of which I shall say more in relation to intracranial hematomas and to improved organization. Time permits only passing reference to the problems of organization over such distances, but I must state my view that surgeons have been slow indeed to recognize their responsibilities and opportunities in this field. As one student of these matters remarked: "The average surgeon knows less about the circumstances of arrival of his patient at hospital than his wife knows about the delivery of her groceries."

Yet even as we set out tardily to exploit the possibilities of better communication and transport, the whole tide of events is against us. The major portion of our head injuries come from collisions and other undesired eventualities on our roads, and the worst crashes and injuries are generated at speed on the open roads of rural areas. Thus, those most severely injured are likely to be afflicted where discovery is slowest, alarum most delayed, help most distant, transport most prolonged, and skills and facilities most limited, while their decreasing potential survival times permit none of these handicaps. Further, the hour of their need is likely to be during times of minimal hospital staffing and least availability of experienced surgeons and others necessary to their care, for an increasing number of crashes occur during the evening or at weekends. Clearly there are limitations to the benefit that may be derived from improved rescue and reception services, but this avenue must be explored to the full.

Since my department was opened in 1956 we have treated over 200 patients with extradural hematoma and over 600 with subdural hematoma, my own personal tally being well over half of these numbers in each group. In 1968, we reported our experience with 167 extradural hematomas;\(^2\) we are now preparing a matching analysis of 553 subdural hematomas seen during the same period. It is not my intention to present these analyses in detail now but rather to call your attention to certain outstanding features.

We reported an over-all mortality rate of 15.6% for extradural hematomas, which represented a satisfying decline from the disastrous and totally unacceptable 26% in our early less organized years to under 10% in our last 100 cases. The mortality rate was high, 27%, when intradural lesions coexisted, and low, 6%, when they did not, but the improvement occurred without significant change in the relative incidence of intradural lesions. This improvement we attributed to better organization, since the most significant factor conducive to a high mortality rate is undue or avoidable delay before operative intervention. Thus we agreed with Hooper\(^1\) who has stated that a mortality rate of over 25% is indicative of faulty organization and management, while the unavoidable rate is closer to 10%.

The elimination of delay depends first on the organization of rescue and reception services, but also on the training of medical and nursing staffs in the recognition of minimal changes in the state of consciousness, as early evidence of a neurosurgical emergency. It also depends on the use of the simplest, fastest, and most direct methods of diagnosis and treatment: clinical appraisal and exploratory burr-hole craniotomy at the site of cranial trauma, expanded to an appropriate craniectomy. The validity of this approach rests securely on the results achieved, quite apart from the consideration that it demands minimal special facilities and specialized technical skill and can be applied by those without neurosurgical training far from our special units. I admit that cerebral angiography has its advantages in the difficult and atypical case, and that osteoplastic flap craniotomy may occasionally offer valuable exposure not available by lesser means, but both procedures involve additional time and experience that may not be available in urgent cases. We shall continue to rely upon clinical judgment and simple techniques, and to teach them by precept and example, at least until better results are demonstrated by an alternative approach.

Our over-all mortality for 553 subdural hematomas was 35%. The group is a composite one which includes 249 patients with simple subdural hematomas, in whom there was no major cerebral laceration and for whom the mortality rate was 22%. The mortality rate for 224 patients with hematomas plus gross cerebral lacerations was over 50%, rising to 60% when the lacerations were multiple. Clearly, the outlook is much worse when there are underlying torn brain

or exploded temporal pole lesions which suggest a more severe acceleration-deceleration injury.

When the cases of subdural hematoma were subdivided to show the interval between injury and operation, the mortality rate was 76% in the first 12 hours, 38% in the next 36 hours, and 13% for all others. The rapidity of evolution of the lesion is thus a major determinant of the outcome, and the urgency of the need for decompression may in many cases be greater than that applying to extradural hematomas. If direct clinical appraisal (rather than neuroradiological investigation) and simple craniotomy techniques are mandatory in the presence of a critically symptomatic extradural hematoma, they are even more necessary with truly acute subdurs.

Our policy with acute subdural hematomas has been clinical appraisal, sometimes a burr hole at the site of cranial trauma to eliminate the possibility of an extradural hematoma, and then the performance of low temporal burr-hole craniotomy on one or both sides, expanded to a wide, low, anterior subtemporal decompression if this exploration is positive. Almost all supratentorial subdural hematomas will be detected by craniotomy at these sites. A craniectomy carried upward to the line of the temporal crest, forward to the external angular process, and downward to the floor of the middle fossa will expose well the temporal pole and the orbital surface of the frontal lobe, where 90% of all significant cerebral lacerations are to be found.

On the other hand, nearly half of our subdural hematomas came to surgery more than 48 hours after injury, representing a slower evolution to diagnosis than was the case with extradural hematomas where less than one-quarter presented later than 48 hours. In these 253 more slowly evolving cases, including many chronic subdural hematomas, recourse was had much more frequently to angiography, which was used in 40% of the total 553 patients. We have rarely used repeated cerebral angiography to monitor these patients, nor have we monitored intracranial pressure; we have relied upon observation by an intelligent nurse, checked by angiography when appropriate.

I do not advocate random woodpecker surgery but rather direct craniotomy at selected sites determined by our knowledge of the pathology of these lesions and the pattern of evolution of the picture of complication in the individual patient. This may well be aided by angiography and echoencephalography when facilities, time and expertise in these procedures are available, but not at the cost of delay in urgent situations.

I have referred previously to a significant and gratifying improvement in our mortality rates for extradural hematomas.

In the case of subdural hematomas, apart from a small improvement wrought by improved organization and discipline after the turmoil of our first formative years, there has been no change in our mortality rates despite all our endeavors, our accruing experience, and our ancillary aids and services. Even our increased awareness, understanding, and management of problems of airway, ventilation, and electrolyte and metabolic disturbance, for which we are greatly indebted to our anesthetist Dr. Tess Brophy, has had no effect on the crude mortality rate. Thus we have reached that place where, as with the Red Queen, it takes all the running we can do “merely to keep on the same spot.”

Why is this so? To find the answer I ask you to consider with me the major related changes that are occurring in the profile of head injury as a whole.

Our total head injury experience is colored by the particular characteristics imposed by the traffic crashes that are responsible for over half of all head injuries and 70% of the deaths. Man is ill equipped to contest road space with toughened glass and tempered steel, yet automobile design has distributed this hardware as to offer the maximal opportunity of insult to all portions of the human body and especially the relatively vulnerable ventral surfaces. Head injury remains the most common injury sustained in traffic crashes, but with increasing velocity and energy expenditure the frequency of associated injuries is increasing. In Brisbane, autopsy experience shows that the average traffic victim had 4.6 major injuries per death in 1935; this had increased to 6.9 major injuries per death in 1963.

Next, what is happening to head injury itself? Here in Australia we have quite indis-
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putable evidence of a trend away from remediable local injuries to the cerebral coverings toward irreparable multifocal or generalized brain damage. First, consider the relative frequency of extradural and subdural hematomas in traffic accidents in Brisbane. In 1935 the ratio of uncomplicated extradural hematomas to subdural hematomas as found at routine autopsy was 3:1. By 1963 this ratio had reversed itself to 1:30, for then there were 30 subdurals to every one extradural hematoma. It is conceded that some small portion of this 100 to 1 change in relative frequency at autopsy may be due to better neurosurgical care in the case of extradural hematomas, but the major portion of this dramatic change must be attributed to the increasing frequency of severe acceleration-deceleration injury. There has also been a steady rise in the proportion of autopsies that showed subdural hematomas, from 2.1% in 1935 to 12.6% in 1963, a sixfold increase. In studying the problems of prevention of traffic crashes to enable man to keep his brain safe from the hazards of the road, we must avoid the almost universal exercise of trying to apportion blame as to whether the human, the vehicle, or the road fails or is responsible. We must concentrate instead upon the concept that we originally set out to devise a safe transport system for man, and this system has failed all those whose injuries come under our care. The fact that man is here in conflict with an artificial environment of his own creation should make us the more willing to manipulate that environment for his safety, and this is the path that we must now urgently follow.

My final question for you is this: Is our vision wide enough for us to look beyond our parochial technical problems, and is our humanity great enough to take up the challenges and responsibilities involved in the task of accident prevention?

References

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