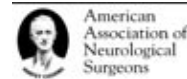


Neurotrauma & Critical Care NEWS



Spring 2005

AANS/CNS Section on Neurotrauma & Critical Care

Editor: Jack I. Jallo, MD

In This Issue...

2

Meetings and Awards

3

In Focus: ICU Fluid
Management in Head
Trauma

4

In Focus:
The Shortage of
Neurotrauma Coverage

6

Clinical Update: Traumatic
Brain Injury

7

Membership Application

8

Leadership Listing

From the Chair



Alex B. Valadka, MD

The Trauma Section has been busy.

Socioeconomic and regulatory affairs have occupied much of our attention lately. The AANS/CNS Washington office and the Trauma Section continue to receive many inquiries from

neurosurgeons asking about emergency and trauma care. Many of these calls, letters, and e-mails seek information about on-call stipends, EMTALA regulations, the frequency with which call must be taken, the increasing workload associated with covering emergency rooms, and similar issues.

We've all heard lots of anecdotes, but it was impossible to get reliable data about these questions. Last fall, the Washington Committee decided to survey the active members of the CNS and AANS about these issues. The Trauma Section worked closely with the Washington Committee on this project.

Some of the results were reported in the most recent *AANS Bulletin*, which featured detailed coverage of the crisis in neurosurgical emergency care. As chair of the Trauma Section, I was asked to write the cover story for the *Bulletin*. It's important to note that many people provided help, including Jim Bean, MD, editor of the *AANS Bulletin* and immediate past chair of the Washington Committee; Katie Orrico, director of the AANS/CNS Washington office; and Manda Seaver, staff editor of the *Bulletin*. This breadth of support reflects the priority that organized neurosurgery places on finding ways to keep neurosurgeons involved in the provision of emergency care. In fact, one of the few good things to emerge from the current crisis is a strengthening of the already solid relationship between the Trauma Section and the Washington Committee.

Another area in which the CNS, AANS, Washington Committee, and Trauma Section have pulled together is in preparing material for the Institute of Medicine's project committee

on the future of emergency care in this country. The potential impact of this report cannot be overestimated. Remember the 1999 IOM report that claimed that as many as 98,000 hospitalized patients die every year from medical errors? That report has been strongly criticized, but the fact that we all suddenly became inundated with talk about medical errors testifies to the impact that the IOM's recommendations may have. The way we take care of patients has been forever changed. Unfortunately, even though no emergency medical system can function without neurosurgical involvement, no neurosurgeons were included on any of the subcommittees for this IOM project. This apparent lack of awareness of neurosurgery's role in emergency care made it even more important for us to prepare a white paper and to provide supporting documentation that describes the problems and recommendations from neurosurgery's perspective.

Exactly what are the solutions that we are working for? Unfortunately, there won't be any quick fix. Instead, we need to attack the problem from all sides; liability reform, stipends and other ways to offset the financial losses often associated with the provision of emergency neurosurgical care, continued refinement of EMTALA to allow neurosurgeons in a given region to maximize their efficiency in covering their emergency rooms, and exploration of regionalization of neurotrauma care. While the Trauma Section and Washington Committee continue to push ahead on proposals like these, we are also working with other specialty societies to explore additional solutions.

Working on all these projects also reminded me that the work of the Trauma Section, perhaps more than that of any other section, directly affects the day-to-day practice of almost all neurosurgeons.

The socioeconomics of neurosurgical emergency care may be a grim topic, but progress is also occurring on happier fronts. At each AANS and CNS annual meeting, Synthes awards are presented for resident research in spine and cra-

continued on page 8

Meetings and Awards

Neurotrauma and Critical Care at the 2005 AANS Annual Meeting

The 2005 Annual Meeting of the American Association of Neurological Surgeons, themed "Education and Innovation in Neurosurgery," will be held April 16-21 in New Orleans. The most up-to-date meeting information is available online at www.AANS.org/annual/2005.

Saturday, April 16

8:00 am-5:00 pm

Practical Clinic: 011 Head Trauma: Current Treatments and Controversies With Hands-on Practical Session in Brain Monitoring Techniques

Codirectors: *Geoffrey T. Manley and Shelly D. Timmons*

The clinic features an afternoon session with hands-on instruction in techniques and devices for intracranial pressure monitoring, parenchymal O₂ monitoring and decompressive craniectomy.

Monday, April 18

2:45-5:15 PM

SCIENTIFIC SESSION VI: NEUROTRAUMA AND CRITICAL CARE

Moderator: *Jaime S. Ullman*

This session will focus on innovations in the diagnosis, management and treatment of neurotrauma and critical care neurosurgery.

Wednesday, April 20

2:45-5:30 pm

AANS/CNS Section on Neurotrauma and Critical Care

Moderators: *William T. Monacci, James M. Ecklund, Geoffrey T. Manley, Shelly D. Timmons*

This session will serve as a forum for the presentation of topics related to neurotrauma and critical care neurological surgery.

2:45-4:00 PM

Combat Neurosurgery: Neurorescue on the Battlefield

Speakers: *Leon E. Moores, Glen Jeffrey Poffenbarger, Richard J. Teff, Rocco A. Armonda, Lisa P. Mulligan*

827 4:00-4:15 PM

Early Abnormalities of Regional Brain Metabolism Following Human TBI: FDG and O-15 PET Studies of Hyperglycolysis, Metabolic Depression, and Ischemia in 65 Patients

828 4:15-4:30 PM

Measurement of Increased Pentose Phosphate Cycle Flux Following Severe Human Traumatic Brain Injury: 13C-Labeling Study

829 4:30-4:45 PM

Iatrogenic Spinal Cord Injury in the Pediatric Population: Evaluation of Contributing Factors and Outcomes

830 4:45-5:00 PM

Extravascular Blood Is Toxic to the Brain: A PET Study of Pericontusional Edematous Brain Early After Traumatic Brain Injury (TBI)

831 5:00-5:15 PM

Risk Factors for Progression of Traumatic Intraparenchymal Hematomas in the Early Post-Injury Period

832 5:15-5:30 PM

Uncoupling of Glial and Neuronal Metabolism Following Traumatic Brain Injury

Neurotrauma and Critical Care Awards

The AANS/CNS Section on Neurotrauma and Critical Care promotes neurosurgical research by offering several fellowships and awards every year. A brief summary of each award follows, and updates to the information are made available on the section's Web page at www.neurosurgery.org/trauma.

The contact for information on awards and submission of applications is Michael G. Fehlings, Michael.Fehlings@uhn.on.ca.

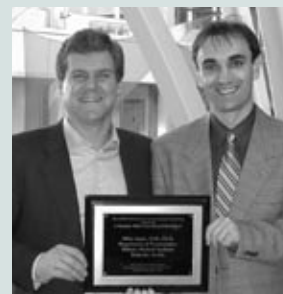
The Codman Fellowship in Neurotrauma and Critical Care

is an annual grant of \$40,000 for basic or applied clinical research in the field of neurotrauma and/or critical care.

Deadline: Dec. 1.

The J. Douglas Miller Traveling Fellowship

awards \$10,000 annually to a neurosurgeon from Eastern Europe, Asia, Africa or Latin America to visit one or more neurotrauma centers in the United States or Canada for advanced education and/or research training, generally for a period of three months. Deadline: Dec. 1.



Milan Spaic, MD, right, from the Department of Neurosurgery Military Medical Academy, Belgrade, Serbia, receives the J. Douglas Miller Traveling Fellowship award from Michael Fehlings, MD, of Toronto, Canada.

Two Synthes Awards, one for Resident Research in Spinal Cord and Spinal Column Injury and one for Resident Research in Brain and Craniofacial Injury, are awarded at both the AANS and CNS

annual meetings. The prize is \$1,000 to the winning resident and \$1,000 to the resident's laboratory or department. Deadlines are the AANS and CNS annual meeting abstract submission deadlines.

2003-2004 Codman Research Fellowship Report

Jason H. Huang, MD

The Trauma Section's Codman award allowed me to successfully investigate the ability of adult rat dorsal root ganglion cells to undergo elongation under continuous mechanical tension and also to successfully investigate the ability of human DRG cells to undergo elongation under continuous mechanical tension. I additionally completed transplantation of the elongated nerves to an animal model of sciatic nerve injury.

Three manuscripts are currently in various stages of preparation for publication, and eight abstracts/presentations and two papers in clinical neurosurgery resulted from my fellowship.

The Codman fellowship enabled me to learn the fundamentals in the design, execution, and analysis for scientific experiments and provided me an excellent opportunity for gaining important research training in the field of neurotransplantation and tissue engineering. This experience was invaluable for a future academic neurosurgeon who hopes to push the frontiers of neurotrauma research.

ICU Fluid Management in Head Trauma: Still No Consensus

Geoffrey Manley, MD, PhD, and Claude Hemphill, MD

In an age of stem cells and gene chips, it is surprising and disappointing that there is still no consensus regarding fluid management in head trauma. Despite the seemingly simple nature of the question of what type of fluid to use and how much should be given, there are few outcome studies to address this fundamental issue. As a result, clinical practices of fluid management in the intensive care unit vary around the world. This article summarizes a point-counterpoint discussion of ICU fluid management in head trauma presented at the 54th Annual Meeting of the Congress of Neurological Surgeons held in San Francisco. The lectures encompassed a range of topics, from fluid resuscitation with colloids versus crystalloids, to the use of hypertonic fluids for the treatment of elevated intracranial pressure.

The primary goal of fluid management in the neurointensive care unit is to ensure adequate substrate delivery (oxygen and glucose) to the injured brain while minimizing brain edema that could potentially increase ICP. There are two distinct but interrelated aspects of general fluid management: resuscitation and maintenance. Resuscitation fluids are generally used to target specific physiological endpoints, such as blood pressure, central venous pressure, and pulmonary capillary wedge pressure. Maintenance fluids are generally used to target a euvolemic state and balance urinary and insensible losses. By maintaining adequate circulating intravascular volume, renal perfusion is also ensured, and the use of vasopressors is minimized. A recent prevalence survey of 3,147 patients from 200 ICUs found that the primary factor that influenced outcome was fluid balance. Thus, careful management of fluid and electrolyte balance is critical.

Crystalloids and Colloids

Standard fluids are typically divided into two categories: crystalloids and colloids. Crystalloids can be thought of as electrolyte solutions containing sodium and are the mainstay of fluid therapy. They are effective but inefficient volume expanders because they distribute throughout the entire extracellular space. They are also inexpensive (a liter bag of sodium solution costs our hospital 78 cents) and they do not transport oxygen. Colloids contain larger molecules with low vascular permeability. Hence, they are better oncotic agents, sustaining intravascular volume better than crystalloids. While albumin is the most commonly used colloid, hydroxyethyl starch, dextran, and blood are also colloids. With the exception of blood, they do not transport oxygen. Potential problems include anaphylaxis and coagulopathy. A 250 ml bottle of 5 percent albumin costs our hospital \$16. There also is a growing number of hybrid fluids, such as the hemoglobin-based oxygen carrier solutions and saline/dextran solutions.

SAFE Study: Saline vs. Albumin Certainly, the types of fluid used for maintenance and resuscitation may be the same. Often, colloids (specifically albumin) have been used instead of crystalloids in the ongoing resuscitation of patients with head trauma and aneurysmal subarachnoid hemorrhage. However, new data suggests that this practice may be of no benefit, or perhaps or it may even be harmful. Despite a Cochrane Review and meta-analysis that suggested that colloids (except blood) might actually increase risk of death in critically ill patients, colloids continue to be widely used in the ICU.

It is in the context of this ongoing controversy about the best resus-

citation fluid that the SAFE (Saline versus Albumin Fluid Evaluation) Study was undertaken. This multicenter, blinded, randomized trial compared the effects of saline or albumin on mortality in a heterogeneous population of critically ill patients. In this study, maintenance fluids, blood transfusions, and other aspects of care were left to treating physicians. Specially designed masking cartons and infusion sets were used so that caregivers were blinded as to the nature of the resuscitation fluid to which their patient was randomized. Of the 6,997 patients randomized into the study, 1,186 were primary trauma patients and 492 patients had head injuries, making this the largest study (or sub-study) of fluid management in head trauma. Outcome was considered to be mortality within 28 days of randomization.

Overall, there was no benefit to albumin (relative risk of death 0.99, 95 percent confidence interval 0.91-1.09, $p=0.87$). However, in the prespecified analysis of trauma patients, there was an increased risk of death in the albumin group (RR 1.36 [0.99-1.86], $p=0.06$). Remarkably, this was entirely due to a dramatically increased risk of death in patients with head injury (RR 1.62 [1.12-2.34], $p=0.009$). Interestingly, patients in the albumin group required less resuscitation fluid and had lower heart rates and higher central venous pressures than those in the saline group.

The results of the SAFE study demonstrate that, indeed, albumin is a better volume expander than saline in the resuscitation of critically ill patients. However, it does not improve outcome and may potentially be harmful. The fact that it was associated with a 62 percent increased risk of death in patients with head injury should be of major concern to those who would consider using it in this context. Unfortunately, the SAFE study (as currently published) did not include information on baseline factors pertinent to head injury prognosis (such as Glasgow coma scores). Additionally, the cause of death in head trauma patients is not detailed. Thus, the putative mechanism by which albumin worsens head injury outcome remains unclear. However, even if these issues were able to be factored in, it seems unlikely that albumin would actually be found to be beneficial. We believe the results of the SAFE study and no longer use albumin for resuscitation in our patients with head trauma.

Mannitol and Hypertonic Saline Hypertonic intravenous solutions, first introduced by Weed and McKibben in 1919, have been the mainstay of treatment for elevated ICP and also have been promoted as a resuscitation fluid for some time. There is substantial evidence that hypertonic saline at lower concentrations has desirable effects on patients' hemodynamics. Rapid infusion of a small volume of hypertonic solution, originally designed for the prehospital treatment of hemorrhagic shock, leads to an osmotic gradient that draws water into the intravascular compartment with a rapid mobilization of parenchymal fluid. This fluid shift results in hemodilution, endothelial shrinkage, and improved microvascular flow. Additionally, resuscitation with a small-volume hypertonic solution has been shown to increase cardiac output. The improved cardiac output and reduced microcirculatory resistance combine to improve blood flow through capillary beds and thus lead to metabolic improvement. Because higher cardiac output is likely to protect against hypotension while patients are undergoing fluid resuscitation, the effects of hypertonic

continued on page 6

The Shortage of Neurotrauma Coverage: The “Canary in the Mine” of U.S. Trauma Care

William F. Ganz, MD, FACS

As a member of the American College of Surgeons Committee on Trauma and as a neurosurgeon in private practice, I have been confronted on a number of occasions by general surgeons who complain of inadequate neurosurgical coverage at their trauma centers in different parts of the country. I have heard stories of occasions when there was no neurosurgeon, or one or two neurosurgeons were responsible for the neurotrauma coverage at busy neurotrauma centers. I also have heard stories of trauma centers that have a surplus of neurosurgeons in the community but are unable to obtain consistent neurosurgical coverage that complies with the neurotrauma guidelines published by the American Association of Neurological Surgeons and the Brain Trauma Foundation in 1995. The problem with inadequate neurosurgical coverage is widespread across this country, but highly variable within states and even within individual communities where one trauma center will have adequate neurosurgical coverage and another in the same community will have inadequate or unreliable neurosurgical coverage.

I submit that neurosurgical coverage is a real problem in certain communities, and this must be admitted up front by the neurosurgical community. The coverage of trauma is a widespread problem across all the specialties which cover trauma, but because neurosurgery is the specialty with the fewest numbers, the workforce shortage is identified earlier and often “takes the blame” when the trauma center fails accreditation. In any case, the shortage of adequate neurosurgical coverage in some communities must be constructively addressed by the neurosurgical community lest we risk the loss of our privilege to care for neurotrauma patients, for whom we are the best-qualified providers.

The reasons for inadequate neurosurgical coverage in certain communities are manifold, but generally fall into three general categories. First, there is a reduced neurosurgical workforce. Neurosurgeons are the smallest core specialty necessary to provide lifesaving care to trauma patients. In 2001, for the first time in more than 10 years, there were barely 3,000 board-certified practicing neurosurgeons in the United States. The number of neurosurgeons seeking early retirement has increased steeply for a number of reasons, including increasingly uncontrolled medical malpractice liability and annually decreasing reimbursement for neurosurgical services. There truly is an evolving workforce shortage occurring in the specialty of neurosurgery.

Second, neurosurgeons in some communities are forced by hospital bylaws to take trauma call simultaneously at multiple hospitals if they wish to maintain their privileges. This has resulted in neurosurgeons on call every night or every other night, resulting in burnout and in neurosurgeons leaving communities or voluntarily withdrawing from trauma call schedules.

Third, a rapidly growing phenomenon in this country is the problem of qualified neurosurgeons in certain communities who are unwilling to provide neurotrauma coverage in their communities. The reasons most often cited are perceived increased malpractice liability caring for trauma patients and the inconvenience of taking trauma call, which often interferes with elective neurosurgical practice and significantly adds stress and uncertainty to a neurosurgeon’s schedule.

In some communities neurosurgeons are restricting their practice to elective neurosurgical care, designating themselves as spine surgeons, functional neurosurgeons, pediatric neurosurgeons, etc., and choosing not to provide neurotrauma coverage. Hospitals have responded in certain communities by providing monetary stipends for the provision of trauma coverage, and in some centers this has been a successful remedy since the stipend has offset the inconvenience and poor reimbursement associated with the care of trauma patients. In other communities the demand for stipends has been abused by neurosurgeons and other trauma specialists demanding unreasonably large stipends, and they have been perceived as holding their trauma programs hostage because of these unreasonable demands. There are also disturbing reports from some communities that even with stipends, neurosurgical care is provided only reluctantly and falls below the standards set by the severe head injury guidelines.

I believe that neurosurgeons are the most qualified specialists to care for neurotrauma patients. All residency programs in the United States are required to teach neurosurgery residents to provide neurotrauma care. A full understanding of surgical and medical care of neurotrauma patients is a requirement of the American Board of Neurological Surgery. Both of the major organizations of neurosurgery, the AANS and the CNS, provide ongoing neurotrauma continuing medical education for practicing neurosurgeons. Neurotrauma research is an active branch of research in neurosurgery at this time. Clearly our neurosurgical leadership supports and strongly advocates that neurosurgeons participate in neurotrauma care, but they have been slow to recognize the legitimate problems experienced by nonacademic practicing neurosurgeons in the provision of neurotrauma care.

Is the problem of inadequate trauma coverage exclusive to neurosurgeons? I propose that the answer is no. Because of the relatively limited number of neurosurgeons in this country, the effect is amplified in our specialty. I propose that neurosurgery is the “canary in the mine,” signaling a sick trauma delivery system on the verge of crisis. Unfortunately, because of decreased reimbursement and a widely held belief among all physicians that medical reimbursement is unfair, that is, that for many procedures the risk of a procedure exceeds the reimbursement received for that procedure, there is in medicine an ascendant attitude that medicine is becoming more of a business and less of a profession. Of course it has always been both, but there has been a definite emphasis on profitability and a de-emphasis on the obligation to provide all of the care that we are trained to provide. This attitude has resulted in a shift of practice patterns from the less lucrative, inconvenient procedures such as trauma, to procedures which are better reimbursed and less work-intensive, such as spine. This attitude affects all specialties, not just neurosurgery.

There is also a legitimate complaint by many neurosurgeons that the process of verification of level 1 and level 2 trauma centers is biased toward general surgeons and often places excessive, unnecessary requirements on neurosurgeons. There is the perception by neurosurgeons that criteria requirements are punitive and held over them by the administrators of their hospitals and by general surgeons; in

particular, the required backup call schedule significantly increases the call load of covering neurosurgeons.

The problem of provision of neurotrauma care is complex, but it must be faced, and solutions must be entertained and implemented to assure the best neurotrauma care for patients. In the short term, I believe that “fair” stipends are reasonable to reimburse neurosurgeons in busy neurotrauma centers for lost elective surgery and for the inconvenience and decreased quality of life which is associated with provision of neurotrauma care. On the other hand, neurotrauma care should be provided at the level of the standard of care as outlined in the Guidelines for the Management of Severe Head Injury. I believe that the reluctance that many neurosurgeons have for providing neurotrauma care would be corrected if the American College of Surgeons Committee on Trauma’s Verification Review Committee would abolish its requirement for a backup neurosurgery call schedule. Instead, the onus for neurotrauma coverage when two concurrent neurotrauma cases occur at the hospital should be on the neurosurgical group which covers that hospital. I believe that the American College of Surgeons should base its verification of trauma centers not simply on specific criteria which must be met, but also on the creative solutions that individual trauma centers devise to provide optimal trauma care even if certain criterion deficiencies are not able to be addressed. The American College of Surgeons should recognize and reward trauma centers for providing the standard of care for its trauma patients, and not simply base its verification on a rigid set of criteria.

The ideal long-term solution to revitalizing this country’s sick trauma system is regionalization of trauma care, probably at the state level. The designation of certain centers as neurotrauma centers would eliminate redundancy. Further, the designation of trauma centers should be based on state and community needs rather than on advantageous marketing for ambitious hospital administrators. This would eliminate hospitals that do not really want to provide trauma care in the first place but feel they need to compete with other hospitals in their community. Regionalization also would attract and keep neurosurgeons who want to care for these patients. Federal and state funds should be extended to these medical centers for providing this essential community service, including stipends for practicing trauma specialists.

I do not believe that training more neurosurgeons, which has been advocated by some in the general surgery and neurosurgical community, will solve the problem of improving neurosurgical trauma coverage in communities across the country. If all the practicing neurosurgeons in this country actively participated in neurotrauma care, there would be little or no shortage; however, it must be recognized that certain neurosurgeons have a distinct interest in the care of neurotrauma patients, and others do not.

In the short term, and even in the future, if regionalization of trauma care does occur, there will be certain communities where there is no neurosurgical coverage. In these cases we must consider the best interests of our neurotrauma patients and train dedicated general surgeons to help provide neurotrauma care in these communities. If the neurosurgical community continues to deny that there is a problem with neurosurgical care in these communities, then we

lose credibility, and our general surgery colleagues will begin training their residents to treat neurotrauma problems. This model is not without precedent, as it is well known that general surgeons in many countries are trained to deal with all trauma problems, whether they be general surgical, orthopedic, maxillofacial, or neurosurgical.

In this country, I do not believe it is in anyone’s best interest to train “trauma surgeons” to provide neurotrauma care when a better-organized trauma delivery system can take advantage of neurosurgeons’ expertise in this area. I believe that neurosurgery leadership, perhaps through the representatives on the American College of Surgeons Committee on Trauma, as well as the AANS/CNS Section on Neurotrauma and Critical Care, can form a working relationship with our trauma colleagues to help solve these problems which weaken this country’s trauma delivery system.

I think it is reasonable for communities that do not have adequate neurotrauma coverage to train willing general surgeons to place intracranial pressure monitors, to provide intensive care for neurotrauma patients according to the Guidelines for the Management of Severe Head Injury, and also to teach the placement of burr holes in certain emergency situations when a patient does not have immediate access to neurosurgical intervention, such as with an expanding epidural hematoma. There are already courses being offered to general surgeons, for example at Wayne State University in Detroit, Mich., where continuing medical education courses are teaching general surgeons to place intracranial pressure monitors and burr holes.

The neurosurgical community needs to be involved in these training programs and help develop indications and criteria for the implementation of these neurosurgical procedures by general surgeons. Otherwise, we will lose this area of neurosurgical turf even though we are the most knowledgeable and best-trained to provide care for these patients.

Today, neurosurgeons do face daunting economic challenges as competition for the continually shrinking medical reimbursement dollar intensifies and medical liability risk increases. It might be easier to simply withdraw from the provision of neurotrauma call, which is inconvenient and poorly reimbursed. However, I believe we would do this at significant risk. We risk losing our stature and credibility with our medical colleagues and communities if we choose not to provide the care which we are the most qualified to provide. We all sought careers in medicine and neurosurgery to care for people in need, and our neurotrauma patients need us. I believe we have an ethical obligation to care for these patients. Additionally, we risk losing the personal satisfaction of providing care to people who have no way to compensate us...which is the ultimate gift any person can give another.

Neurosurgeons are selected and trained to solve difficult problems for our sickest patients. We must apply our formidable collective cognitive abilities and tenacity to provide neurotrauma care for these needy patients while we work to reform our disproportionate medical liability exposure and obtain fair reimbursement for the vital services we provide to neurotrauma patients. ■

Traumatic Brain Injury

Jack I. Jallo, MD, PhD

Several recent studies may impact best practices for management of traumatic brain injury. Summaries of five studies follow in this issue's Clinical Update.

1. Prehospital Hypertonic Saline Resuscitation of Patients With Hypotension and Severe Traumatic Brain Injury: A Randomized Controlled Trial

Journal of the American Medical Association 2004; 291:1350-1357
Cooper DJ, et al. for the HTS Study Investigators (Alfred Hospital, Melbourne, Victoria, Australia)

Conclusion: The administration of out-of-hospital hypertonic saline solution for out-of-hospital resuscitation in patients with hypotension and severe traumatic brain injury provided nearly identical neurological function at six months after injury compared with fluid resuscitation with an equivalent volume of normal saline. However, a better trial design may have used equimolar volumes of the two solutions, which would have resulted in use of more conventional volumes of standard resuscitation fluids in the control group.

2. Reduction in Mortality From Severe Head Injury Following Introduction of a Protocol for Intensive Care Management.

British Journal of Anaesthesia 2004 93(6):761-767

T. J. Clayton, R. J. Nelson and A. R. Manara

Conclusion: The introduction of an evidence-based protocol to guide the ICU management of patients with severe head injury has been associated with a significant reduction in both ICU and hospital mortality.

3. Effect of Intravenous Corticosteroids on Death Within 14 Days in 10,008 Adults With Clinically Significant Head Injury (MRC CRASH Trial): Randomized Placebo-Controlled Trial.

Lancet 2004 Oct 9; 364(9442): 1321-8

Roberts I. et al.

Conclusion: Compared with placebo, the risk of death from all causes within 2 weeks was higher in the group allocated corticosteroids (1,052 [21.1 percent] vs. 893 [17.9 percent] deaths; relative risk 1.18 [95 percent confidence interval 1.09-1.27]; $p=0.0001$).

The relative increase in deaths due to corticosteroids did not differ by injury severity ($p=0.22$) or time since injury ($p=0.05$).

INTERPRETATION: The results show there is no reduction in mortality with methylprednisolone in the two weeks after head injury; in fact, mortality was significantly higher in the methylprednisolone group. The cause of the rise in risk of death within two weeks was unclear.

4. A Comparison of Albumin and Saline for Fluid Resuscitation in the Intensive Care Unit.

New England Journal of Medicine 2004;350:2247-56.

Finfer S, Bellomo R, Boyce N, French J, Myburgh J, Norton R; SAFE (Saline versus Albumin Fluid Evaluation) Study Investigators

Conclusion: The use of albumin or saline results in similar clinical outcomes at 28 days. It is important to note that the analyses of deaths from various causes were not predefined; the results therefore should be interpreted with caution. Although albumin appears to be safe, its lack of incremental efficacy and its significantly increased cost provide compelling reasons against its routine use for fluid resuscitation of most critically ill patients.

5. Dexanabinol (HU-211) in the Treatment of Severe Closed Head Injury: A Randomized, Placebo-Controlled, Phase III Clinical Trial (preliminary)

Conclusion: No benefit.

ICU Fluid Management in Head Trauma *continued from page 3*

saline may be desirable therapy for many patients after head injury.

Mannitol is currently the recommended treatment for acute brain swelling and elevated ICP in most patients with head injury. Although mannitol frequently is effective in reducing ICP, multiple administrations introduce a risk of kidney failure and mannitol accumulation in brain parenchyma, with consequent worsening of cerebral edema. Mannitol also works as a systemic diuretic and under certain circumstances may contribute to systemic hypotension. Thus, mannitol may be contraindicated for patients who are hypotensive or are undergoing fluid resuscitation. In stark contrast to its widespread use, there is still limited data on the appropriate use of mannitol. Surprisingly for such an important therapeutic agent, there is no established dose-response curve. A Cochrane Review of mannitol, last updated in 2003, found few eligible randomized trials to evaluate. In the preoperative management of head-injured patients with acute intracranial hematoma, high-dose mannitol (1.4 g/kg) appears to be preferable to "conventional-dose" mannitol. However, there is little evidence about the use of mannitol as a continuous infusion in patients with elevated ICP who do not have an operable hematoma. Clearly, more studies are needed to better define the clinical use and

beneficial effects of mannitol.

Hypertonic saline administration has also been shown to lower ICP in a number of animal models. Thus, one might expect hypertonic saline to work well in the hospital setting by both reducing ICP and improving blood flow. A recent prospective randomized study showed that a 7.5 percent hypertonic saline solution given as a 2 ml/kg bolus was more effective in treating intracranial hypertension than was 20 percent mannitol given as a 2 ml/kg bolus in head-injured patients with intracranial hypertension that was refractory to sedation, cerebrospinal fluid drainage, and hyperventilation. Our group has also explored the use of 23.4 percent hypertonic saline and found this to be safe and effective in reducing ICP. This study and others suggest that hypertonic saline administration may be useful in the treatment of elevated ICP.

Despite the overwhelming clinical importance of fluid management for head injury, there is still no consensus. It is difficult to imagine how the treatment and outcome of patients with head injury can improve without first understanding the fundamental issues of what type of fluid to use, when it should be used, and how much should be given. Well-funded and carefully designed clinical trials are urgently needed to address these fundamental questions. ■



Application for Membership



AANS/CNS Section on Neurotrauma and Critical Care

Eligibility: Members of the AANS and/or CNS who are actively interested in Neurotrauma.
Note: Adjunct Membership is available to non-neurosurgeons who are not members of the AANS or CNS. Please contact 847-566-AANS, ext. 508, for more information.

I. Biographical:

- (A) Name: _____
- (B) Home Address: _____
- (C) Office Address: _____

- Phone: _____ Fax: _____
- (D) E-Mail: _____

II. Category of Membership Requested:

- Active Associate International Resident*

* Membership dues are waived for applicants currently enrolled in a neurosurgical residency program.

III. Membership, Certification and Practice:

- (A) Are you certified by the American Board of Neurological Surgery? Yes No
- (B) For Resident Applicants-Expected Residency Completion Date (month/year) _____
- (C) Are you a member of
 - 1. The American Medical Association? Yes No
 - 2. A Local or Regional Medical Society? Yes No
 - 3. A State or Provincial Medical Society? Yes No
Name: _____
 - 4. American Association of Neurological Surgeons? Yes No
 - 5. Congress of Neurological Surgeons? Yes No

- (D) I would like to support  with my donation of
 - \$50.00 (Recommended) Other amount \$ _____

Signature of Applicant

Date

**Please return completed application with your membership fee of \$50 and any donations to:
AANS/CNS Section on Neurotrauma and Critical Care
Dept. 77-7550
Chicago, Illinois 60678-7550**

AANS/CNS Section on Neurotrauma and Critical Care

5550 Meadowbrook Drive

Rolling Meadows, Illinois 60008-3852

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Washington Committee:

Jack E. Wilberger, MD

Committees

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Traumatic Brain Injury

William F. Ganz, MD

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Domenic P. Esposito, MD

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From the Chair *continued from front page*

niocerebral injury. The quality of the winning abstracts continues to get better every year. Also, Codman has agreed to continue to fund its annual research fellowship in neurotrauma and critical care. Our only regret is that only one winner could be selected from among the many outstanding applications that were received this year.

Another major area of emphasis of the Trauma Section is education for those at all levels of neurosurgical practice. Again this year, the Pittsburgh Synthes course for residents was an overwhelming success. At the upcoming AANS meeting, the always-popular weekend practical course in neurotrauma and critical care will be offered on Saturday, April 16. In addition, the AANS meeting will feature a special session, "Combat Neurosurgery: Neurorescue on the Battlefield," which, organized by our military neurosurgeons, will feature presentations from those who have served in the Middle East. Topics will range from clinical science to such logistical issues as how to care for neurosurgical emergencies in the middle of a desert.

This newsletter includes several items relevant to the issues that I have mentioned. Bill Ganz, MD, has written a thoughtful article about neurosurgical emergency coverage, and other stories summarize some recent clinical research.

As always, you are welcome to participate in all of the Trauma Section's activities. If you have any questions, or if there is any way that the section can help you take care of your emergency and critical care patients, please do not hesitate to let us know. ■