

DISCUSSION

DR. HARRIS B. SHUMACKER, JR. (Indianapolis, Indiana): One can hardly digest in this short time all of the material that Dr. Mattox has brought to us from that fabulous trauma center in Houston.

Rather than ask the many questions that come to mind, I would like to point out the contribution that his center and others, many in the South, are making to education. We would all agree that no phase of education needs more support than that of trauma.

Learning about the care of the injured is particularly important for the students in our national military medical academy with which I have been associated for some years. We are very grateful to Ben Traub and other centers for giving our students a chance to learn something about the management of the injured patient, an opportunity that could not be provided by the military hospitals in the Washington area. We are grateful, too, that the men in training at Walter Reed are able to spend some months working at the busy and beautifully run trauma center in Washington.

Although civilian injuries differ in many respects from those incurred in warfare, they provide the only means today by which young men and women can prepare themselves for dealing with problems they will meet should we have another war.

A few days ago I learned that more injuries and deaths from guns and other deadly weapons occur each year in Washington than in all the years of fighting in Northern Ireland and its borderland since the Irish Republican Army and the North Irish began battling each other.

Unfortunately, one need walk only a few blocks in Washington to purchase any weapon, from a handgun to a machine gun. As long as this free access to weapons exists and crime continues at a growing pace, we can expect more rather than less trauma. Fortunately places such as Ben Traub handle it superbly.

Reading the numerous articles that have come from that institution over the past 30 years is like reading the account of a miracle. They mirror, for example, all the advances that have been made during this time in the care of vascular and cardiac injuries.

I wish that Dr. Mattox had had the time to talk about other matters such as the benefit derived from improved facilities for dealing with some injuries in the emergency room that formerly could only be handled in the regular operating rooms.

DR. MORRIS KERSTEIN (New Orleans, Louisiana): The group at Baylor College of Medicine has not only continued to demonstrate academic excellence, but supports its contentions with sufficient numbers to be of significance, established guidelines for all of us, and allow for comparison.

We can all learn that although data are often available, if not compiled, they benefit no one.

The value of a registry computerized in this day and age should be the standard by which we all live.

My first question, Dr. Mattox, is: What is the cost of start-up and maintenance of such a registry? Who did all of the work to collect the data that you have so capably reviewed and analyzed?

Also, are your larger numbers, larger in fact than we see even in combat, a reflection of data collection or of the dangers of living in Houston?

Significant differences exist when we compare the civilian and military vascular trauma experience; yet, similarities abound. Extremity vascular wounds predominate in the military. Truncal vascular wounds are certainly more common in the civilian arena. The difference could be flak jackets or muzzle velocity. Truncal wounds are more lethal in the military setting. Multiple vascular injuries (your report states that more than a thousand patients had two or more concurrent injuries) are typical of the civilian vascular trauma experience.

The military environs more often produce a single major complex vascular injury—limb loss or death. This issue is best exemplified by our own work at Tulane concerning vein injury. Veins have often been ligated and are not repaired in the civilian vascular trauma setting. Limbs are not lost and major disability is not necessarily incurred.

This does not apply *carte blanche* to the military in which multiple veins are often damaged at one time and a laceration cannot be equated with major trauma.

There are lessons yet to be learned. With my strong interest and support of the military, I would like to ask why those well-known and well-established trauma centers—yours—do not establish a position for mil-

itary surgeons who, while at war, may have certainly gained significant experience, but during peacetime may have limited experience, particularly in penetrating trauma.

Muzzle velocity and weapons may differ, but I propose that the principles may be similar. My question then is: Why not establish military trauma fellowships? Why not redefine and expand ATLS from a focus or emphasis on blunt trauma to a shift toward penetrating trauma?

Major civilian catastrophes should be supported by the civilian mass-casualty disaster team and military-medical casualty assist teams.

I suggest that practice with the real thing is more appropriate than practice with mock casualties.

Third, my question is: Why not develop a coordinated effort with local, military, and civilian centers so that we cooperate in the real thing?

On a different track, now that data are available, the real cost of care of trauma (often indigent) patients should be available. The Federal Government, while assessing the virtues of cognitive medicine, *via* the Relative Value Scale, had best assess the cognitive efforts of trauma-care management.

My last question is: How do you define the cost of people, care, and supplies in vascular trauma to help educate those who seem to set fees, but who do not care for the trauma patient?

DR. CARL W. HUGHES (Bethesda, Maryland): We collected more than 300 vascular repairs from the Korean War and more than 7500 Vietnam vascular injuries of which the amputation rate was 13% in both wars.

Dr. Spencer contributed considerably to the repairs in the Korean War, but we had more than 400 surgeons contributing to the repairs in the Vietnam War.

I certainly agree that civilian vascular injuries differ from military vascular injuries. In the military, with more sophisticated, high-velocity missiles, there is, as they have as pointed out, a higher percentage of lower-limb injuries.

My feeling is that while military personnel have a number of truncal injuries, many of them die before they are evacuated. They die because of the severe wounding and soft-tissue injuries from these high-velocity missiles.

I also suspect that we have many more concomitant vein, nerve, and bone injuries in military personnel than were seen in this series, because of the type of missiles.

We feel very strongly about the repair of veins, particularly major veins. That is particularly true of the popliteal vein when there is injury to the popliteal artery.

There have been a couple of papers recently from civilian groups on repair of the popliteal artery in which the authors felt that repair of the popliteal vein is not indicated. My feeling is that it is probably because of the severity of the wound we see in the military that we feel so strongly that the popliteal vein should be repaired along with the popliteal artery.

I would like to ask Dr. Mattox his feeling about repairing the popliteal vein, along with the popliteal artery repair because the popliteal artery is a very critical artery.

I would like to ask also if they do a prophylactic fasciotomy in the extremities after arterial repair.

We ran into a problem in Vietnam after a study was done that showed microscopic intimal damage in the resected portions of the artery. The authors suggested that an extra centimeter beyond the visible damage should be resected. Although our recommendation has been that one resect only the visibly damaged portion of the artery and then do an anastomosis, if possible (the word got out that one should resect an extra centimeter and many patients had an extra centimeter resected beyond the visibly damaged portion). As a result, an anastomosis could not be done and more grafts were performed. More complications occurred and it took more time for surgery.

I would like to ask Dr. Mattox if they resect extra vessel.

My last question is, with bone damage, do you repair the artery or fix the bone first, and what type of fixation is used.

DR. DAVID ROOT (San Antonio, Texas): One can't be but overwhelmed by the enormity of the loss, almost a certain sense of indignation that such losses could occur in one city, and yet it is not unique to the city of Houston, I rise not to discuss so much the technique and the science of the repair of these vascular injuries, but to ask Dr. Mattox if he could

not extend his work to bring to attention to the city of Houston these terrible losses. After all, this is a tax-supported institution. Bring this to the fore by means of exchanging information with the police and with the mayor. Is there some way that you could now, having collected this data, begin some means of prevention, some means of analyzing the epidemiology, the sociology, and so forth? It seems difficult to accept an ongoing loss such as this not only of medical care costs, but also in terms of the disability and loss of life. Is there something that can be done with this enormous amount of data that you have so nicely prepared and presented to us? It is almost overwhelming, and I wonder if some approach to prevention with Mayor Whitmire may be possible?

DR. GEORGE WATKINS (Easton, Pennsylvania): There are two items that need to be added. First, there is a difference between mine or shrapnel injuries and the usual penetrating injuries. Everyone thinks about it but forgets that, as opposed to civilian injuries, mines and shrapnel are a considerable component of a proportionally higher number of lower and upper extremity wounds. I do not believe that in Houston that mines and shrapnel wounds are found in the day-to-day affairs of penetrating trauma.

The second item applies to chest wounds. Dr. Mattox will affirm that the ratio of chest-to-abdominal wounds appear lower in his series because less significant cardiovascular injuries occur per wound of the chest than of the abdomen.

I wonder if he has any data to support the fact that the chest is actually injured more than is the abdomen by total gunshot wound, not just by cardiovascular wounds.

Is there any data showing the increase or lack thereof in proportion of high-velocity or automatic missile injuries?

Finally, there was some discussion of cognitive and social issues as far as long-term follow-up. I think that the Ben Taub Hospital faculty who attend these patients have given an enormous amount of free medical care to Texas. The attending physicians are not commended enough for the amount of donated service that they perform, not only on Friday nights but every night of the week.

DR. HENRY L. LAWS (Birmingham, Alabama): Gee, what an experience! And I have the same sense of indignation that Dr. Root does. We need to do something about prevention of this terrible group of injuries.

I would like to ask Dr. Mattox these questions. At the outset of your study, there was no systematic effort to keep victims alive in the ambulance by cardiac massage, controlled ventilation, and the like. Now, that is a big thing as you documented so well on your slides. These lifeless patients have gotten to be a big problem, I suspect, for you, and I would like to know how do you decide when to proceed with left thoracotomy, resuscitation, and so forth in chest trauma and in abdominal trauma?

Do you still keep a heart-lung pump in the emergency room, and is this often used?

One small item. Do you think the increase in knife injuries has anything to do with the large number of aliens that are entering the country?

DR. KENNETH LEON MATTOX (Closing discussion): Dr. Norman Rich was prevented from leading the discussion of this paper due to an unexpected emergency. He sends his apologies.

Dr. Shumaker and Dr. Kerstein, I would agree that one of the most important missions of military medicine is preparedness for injury treatment. The trauma research unit developed at Baylor in 1949 was a link between the U.S. Army, a civilian medical school, and a public hospital. This literally became the first specifically organized trauma center in the United States. During peacetime, other such links need to be strongly

encouraged and supported. At least 15 such programs are now possible. The utility of such programs for rapid military emergencies as well as for natural disasters is very apparent.

Dr. Shumaker and Dr. Root, any tabulation of violent injuries begs the issue of prevention and social controls. Such actions are long overdue but still will require both general public and legislative mandates. Such controls must be a war against drugs, control of the driver who consumes alcohol or drugs, hand gun controls, and a realistic and timely disposition of recalcitrant and incorrigible criminals. Without such a judicial, legislative, and social consciousness on the part of our elected and appointed representatives, anarchy and vigilante tactics are the potential risks. Although a very different social system, crime is almost nonexistent in Saudi Arabia where justice is sure, swift, and inescapable, despite the availability of lethal weapons. To escape punishment because of legal loopholes begs the issue of protecting the criminal more than the victim. As just presented, each of our American cities has a similar incidence of injuries per population base. Houston is not alone in its high frequency of injury.

A database software with a multiuser computer, backup drives, and a printer can be purchased for under \$10,000. Data entry must be constant, directed, methodical, and detailed. Creation of the database format and weekly entry of data for the information in this paper were performed by the first author of this paper. I would underscore that Houston does not necessarily have a greater incidence of trauma per unit population, but rather most major trauma has been brought to a single trauma center with a long-standing methodical data-preservation system. I cannot answer the question concerning the cost of these injuries. Dr. Ronald Fischer and I are now involved in the development of such a study.

Dr. Hughes, I did not intend to discuss the specifics of individual vascular injuries. However, we do frequently perform fasciotomy and just recently we began to measure compartment pressures. The newer devices, however, do not appreciably add much to our clinical judgment. We repair venous injuries if possible when they are discovered. We do not excessively debride or resect normal arterial tissue. Most of the missile injuries were from low-velocity bullets. We are quick to use external fixators for concomitant fractures.

Dr. Laws, we have been impressed with your continuing and sustained reporting of injuries from Birmingham, Alabama. As I analyze your population- and organ-injury statistics, trauma in Birmingham does not appreciably differ from that in Houston. The sustained, useless, and numbing carnage of our youth in all American cities and towns far exceeds that occurring during wars. The placard-driven protests of the Vietnam era are nowhere to be seen during this, our much larger social and domestic war.

Dr. Watkins, we did have a slightly greater incidence of abdominal wounds than thoracic wounds, but the overall truncal area still significantly predominates. We do not see any more high-velocity and large-caliber wounds currently or during the last 10 years than we did in the 1960s. With increased incidence in the number of illegal aliens and decreased economy, the incidence of stab wounds has increased.

Dr. Laws, we have taken a hard look at the EMS system. Cardiopulmonary resuscitation (CPR) for patients with truncal trauma and who require CPR for more than five minutes before arrival to the hospital has not resulted in a single survivor in Houston. One new definition of death might be related to the length of time CPR is required in such patients. We no longer keep our portable battery-operated heart-lung machine in the emergency center. It is more cost-effective and utilitarian to keep this device in the operating room.

Whereas I would welcome the admonition in Dr. Polk's presidential address to eliminate trauma, I anticipate that the issues raised by this paper and the discussants will lead to many other discussions at the Southern Surgical Association. Vascular-trauma in particular will not disappear in the near future.