Military orthopedic surgeons were talking between sessions of the December 2008 meeting of the Society of Military Orthopaedic Surgeons (SOMOS) in Las Vegas. Their topic was trauma. “I’d rather get shot with a bullet than take a hit from a blast device and shrapnel,” said one to his companions.

His friend nodded. “In Iraq, while the insurgents use some artillery, it’s mostly projectiles and improvised explosive devices. They put glass and nails and stuff like that in it. There are more blast injuries now. The soft tissue gets all mangled.”

A third added, “The wound has to be debrided. Preventing infection is the first goal of the surgeon because once you get an infection you can lose the whole battle. Bone is the easiest thing to deal with. Once you lose your soft tissue coverage—once it gets infected—the bone surgery is basically compromised. If you have a clean environment you can do almost anything orthopedic.”

The men reliving their experiences included Colonel John F. Kragh, Jr., M.D., of the U.S. Army Institute of Surgical Research, Bone and Soft Tissue Trauma Research Program, Brooke Army Medical Center; Col. (Retired) Allan Bucknell, M.D., Professor of Orthopaedic Surgery, University of Colorado and Chief of the Orthopaedic Surgery Section and Col. (Retired) John A. Feagin, M.D., Associate Professor Emeritus, Duke University. Bucknell and Feagin are both retired military surgeons and officers.

Joining them was Walter Eisner, senior writer for Orthopedics This Week. Eisner wanted to know how surgical practices change under the stresses of war. Do the experiences of dealing with new kinds of trauma bring about new learning, new techniques, new insights, and new leaps forward for orthopedics? Eisner had come to the right place to learn how orthopedic practice has changed under the stresses of war.

S.O.M.O.S.

SOMOS was founded in 1958 at a meeting of the American Academy of Orthopaedic Surgeons by military surgeons talking over their unique perspectives in a bar. The
organizational meeting was held in Biloxi, Mississippi five years later and the association was off and running. The 1970's were formative years for the association, marked by the conflict in Southeast Asia and the publication of the *Orthopaedic History of Vietnam*.

**Orthopedics in War**

Wars have always had a major impact on surgeons. In the Civil War, which is an American baseline, surgeons reported a 50% infection rate. Even so, that war provided a great impetus for the treatment of wounds and fractures. According to Dr. Bucknell, those who survived were so maimed that Mississippi allotted 68% of its state budget in 1867-69 for prosthetics. In the North, a similar situation led to the founding of the DePuy Company in Warsaw, Indiana.

It was Napoleon who recognized the value of transporting injured soldiers to a medical facility as quickly as possible and the British, in World War I, copied his example.

Nevertheless, soldiers with broken bones were experiencing a 90% mortality rate from being transported over the rutted roads of France to field hospitals until the British surgeon, Robert Jones, devised a series of braces and splints to immobilize the fractures. The wounded didn't bleed to death because the fractures were stabilized. When that system was put into practice, mortality dropped to around 25%.

Enter World War II and antibiotics were utilized.

Joseph Trueta was the first surgeon to really use them as tools in the Spanish Civil War. “He developed a system of staged wound management which became the ultimate mantra of my residency with Bill Burkhalter and his generation. Surgeons had great ideas for centuries, they just did not have the technology,” said Dr. Bucknell. Pioneers in vascular surgery lowered the amputation rate from 50% to 25%. When Norm Rich developed the Vietnam vascular registry amputation rates continued to drop.

Col. Earnest Dehne is remembered as one of the true military orthopedic geniuses. He repaired over 500 cases of broken tibias with a device called Lotte's Nail.

Dr. Bucknell noted, “He, like everybody else in the military, knew that when you get 30 to 40 casualties in all at once you can’t stop what you are doing to fix one guy's tibia. You have to do the best you can for the greatest number of people, given the resources that you have. I got to Fitzsimmons in 1972 where we had 800 orthopedic patients in the wards. Brooke Medical Center had 1,200.”

**Stabilize and Evacuate**

The surgeons agreed that the best practice was still what Napoleon tried to do which was to stabilize the injured soldiers and evacuate them to a clean medical facility as quickly as possible.

Dr. Feagin observed, “I have great doubts about putting plates on fractures in filthy environments in a combat zone. I think a soldier is better treated by stabilizing him, keeping him alive. Imagine doing an operation through subnormal tissue to a mangled extremity, putting implants on. All the antibiotics aren't going to reduce the infection rate there. If you admit your evacuation system is so rapid, why not just ship the soldier instead of trying to prove how good a surgeon you are—after primary wound care and debridement, of course. If provisional fracture stabilization is necessary, then it should be done.”

**Wound Care Is More Important Than Antibiotics**

‘Wound care is more important than antibiotics,” the surgeons agreed. “Wounds
are more extensive in this war. There is still resistance to some of the practices that allow the wound to stabilize. A lot of people want to operate while the area is still inflamed."

Fatalities in the Iraq War went down after every soldier was trained in the use of tourniquets and pressure dressings.

Contrary to World War II, all of the soldiers in Iraq can start an IV, they can even do chest tubes, stop the extremity bleeding, maintain the airway, maintain respirations, provide acute trauma life support. These medics are very good at it and get better with experience. "This system comes from the Israelis. They’re the ones that promote that. We’re taking a page out of their book."

Tourniquets Return

A major change in wound treatment technology from the Vietnam War is the return—and new design—of the tourniquet. For a time doctors prohibited putting tourniquets on wounded soldiers.

One surgeon explained that the problem with tourniquets in the past was if you put a tourniquet on a patient and shipped him down the road for who knows how long and he’s still got that tourniquet on his leg, he could lose his entire limb from the surgeon putting that tourniquet on. "We were taught to put a big ‘T’ on their chests to indicate there was a tourniquet on under that mess of bloody clothes," said Dr. Bucknell.

Given the tourniquets’ new, more effective design, the types of soft-tissue wounds soldiers are experiencing and the ability to transfer the wounded quickly, tourniquets are back.

Wound Vacuums

Wound vacuums to cleanse the wound and reduce swelling have also changed. Vacuums used to be so heavy they could hardly be lifted onto a bed and were too large to be put on the plane with the patients. Now they are so small “a handful will fit in a woman’s purse.”

It started with a company called KCI in San Antonio that made surgical beds which were post-operative pressure reducing beds.

The surgeons noted, “They got into this negative pressure suction thing—little sponges hooked up to a suction device that attendants place directly on the wounds. For transporting a soldier in an airplane across the ocean you need small devices that are nurse-friendly, fairly cheap, easy to fix if they break. A saying in military circles is bullets, beans and band-aids. Bullets first, beans for food for the soldiers and medicine always comes last.”

Major Advances

Key advances in orthopedics in Iraq are the new tourniquets, the new wound vacuums to help reduce swelling, fasciotomy procedures to control limb swelling and external fixation to hold limbs in place.

Surgeons are no longer using plaster to immobilize injuries. External fixation, which was resisted for a time by orthopedists, said one surgeon, is one of the major advances. Surgeons’ resistance, or hesitation, has diminished as data supports the use of external fixation.

There is also some new hardware such as locking plates where the screw actually locks into place as it goes into bone; better wound irrigation systems and better antibiotics.

Another advance is, what one surgeon described as, “the ultimate lavage instrument,” called the FirstJet and made by Smith & Nephew, it can take the paint off a wall if the pressure is put up high enough.

Finally, wound dressings salted with nano particles of silver are controlling bacteria.

Orthoplasty

Dr. Feagin told us that because of the destructive nature of blast injuries, orthopedic surgeons are having to deal with extensive soft tissue damage and perform repairs that call for the skills
of a plastic surgeon. He said that Dr. Scott Levin, at Duke University, calls this joining of treatment of both bones and soft tissue “Orthoplasty.”

**Linking Defense and the V.A.**

The Iraq Wars have illuminated a glaring problem for veterans: the Defense Department and the Veterans Administration do not communicate because the computers in the two agencies cannot talk to each other.

As one surgeon explained, “You can’t find out what type of injury patients had originally. You know that patients were injured, probably bone involved, it’s obvious that they’ve had some soft tissue damage, but you don’t know what happened to them and that data is not retrievable at this point by the V.A.”

A useful development that has come out of the two Iraq conflicts is a data base on hospitalized veterans. From this we know that 29% of all injuries in this war are associated with fractures and that, historically, at least 50% of all survivors in a war will eventually become orthopedic patients. Vietnam registered 72% to 73% and the present Iraq War may be up to nearer 80%.

Dr. Bucknell observed, “To figure that out, all you had to do is visit the wards of the military hospitals in the 70’s, when I did my residency. They were full of young soldiers, airmen and sailors with musculoskeletal injuries. You did not see the guys who were shot in the head, heart, lungs or liver, because they were dead.”

**Funding and Lessons Learned**

This generation of doctors has done a good job getting money for necessary research.

“We had great help from our civilian counterparts in the American Orthopaedic Association, American Academy and the Orthopaedic Trauma Association in helping us get this through Congress. It is a political thing and they did a great job. We could not have made it without them because we do not have the political expertise to get funds from Congress. In our day I could not imagine Congress giving military orthopedics $66 million for research. I’d have been lucky to get $66 for research,” said Dr. Feagin.

The surgeons believe the combination of the Orthopaedic Trauma Association with military medicine makes an excellent team. “As peace returns and we deal with highway injuries and everyday trauma we will be much better as a result of what has been and will be learned in wartime.”