Thrombolytic Therapy Saves Frostbitten Limbs

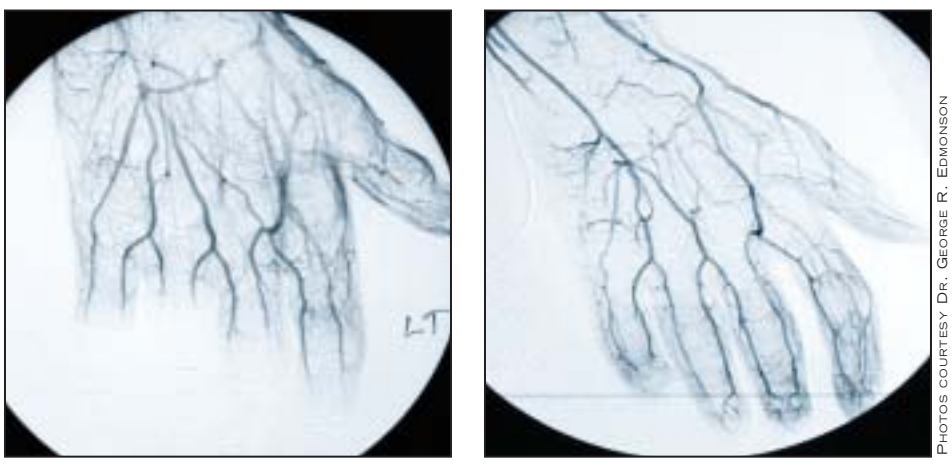
BY MIRIAM E. TUCKER
Senior Writer

WASHINGTON — Thrombolytic therapy resulted in limb salvage among 18 patients with severe frostbite treated at one Minnesota hospital in the last few years.

Thrombolytic therapy has been available for management of frostbite for 10 years and has the potential to reduce the need for some amputations. However, its use has not extended to rural northern areas.

Severe frostbite results in ischemia and blistering with subsequent demarcation and loss of tissue. Arterial thrombosis results from injury to endothelial cells that retract to expose subintimal collagen, subsequently triggering acute thrombosis after rewarming, according to Dr. George R. Edmonson of St. Paul (Minn.) Radiology.

At the annual meeting of the Society of Interventional Radiology, Dr. Edmonson described the patient care process at Regions Hospital, also in St. Paul. Patients are admitted from the emergency department to the burn unit, where surgeons assess the affected limb for severity of injury and blood flow. Diagnostic arteriography is done to assess small vessel occlusion and loss of "distal tuft blush" at the tips of digits. Catheters are positioned for simultaneous infusion of treatment drugs into each affected limb. Blisters and wounds are managed with debridement or amputation.



PHOTOS COURTESY DR. GEORGE R. EDMONSON

A regimen of intra-arterial tenecteplase infusions, coaxial papaverine, and IV heparin for up to 72 hours can reduce the need for some amputation in frostbite.

Since the mid-1990s, Dr. Edmonson and his associates have been treating frostbite of the extremities with a variety of combined antithrombotic, antiplatelet, and vasodilating agents. Initially, they used urokinase along with heparin and papaverine, then switched to reteplase, and now have moved to using tenecteplase (TNK) because of its superior plasma stability and higher fibrin specificity compared with reteplase. Tenecteplase is degraded more slowly in the bloodstream during infusion, and binds more firmly to the clot at the target than do similar agents. Because it also affects the normal clotting proteins to a lesser degree, it may therefore reduce the risk of bleeding, he explained.

Six patients aged 18-65 years with severe frostbite at risk for amputation were treated for up to 72 hours with intra-arterial TNK infusions at 0.25 mg/hour per limb, with coaxial papaverine at 30 mg/hour per limb, and intravenous heparin at 500 mcg/hour. They were managed in the burn unit with arteriography.

Of the 6 patients, 3 who had 16 involved digits responded well and required no amputations. The other 3 (6 limbs, 30 digits) had incomplete angiographic responses. Of those, 2 (with 4 limbs, 20 involved digits) improved noticeably following TNK infusion, but then developed infections and required partial amputations. One patient—who needed intubation for alcohol withdrawal—failed to respond and lost 8 fingers, but his thumbs were saved. There were no major bleeds or other periprocedural complications.

Those results were compared with data from 10 surviving patients (14-77 years) of 12 who were treated with the same protocol using various doses of reteplase and papaverine over a 2-year period. Six of the patients recovered with no amputations, 4 had lost 31 digits at 45 days, and 2 had amputations but more distally than would have been anticipated without treatment.

More recently, six more frostbite patients were treated with TNK. Five of these patients had complete response and one had no response. To date, 8 out of 12 TNK-treated patients have been saved from amputation.

These data are part of an ongoing FDA-approved prospective trial undertaken by Dr. Edmonson. The hope was that more scientific results might encourage others to use this type of treatment. ■

Decompression Within 24 Hours Improved Spine Injury Outcomes

BY PATRICE WENDLING
Chicago Bureau

CHICAGO — Decompression of the spinal cord within 24 hours of injury is safe and is associated with improved neurologic recovery, results from an ongoing, prospective, multicenter study suggest.

"Certainly we're not going to be getting a home run with early surgery, but the concept here is to try for the best outcome we can," Dr. Michael G. Fehlings said of the 1-year results of the Surgical Treatment of Acute Spinal Cord Injury Study (STASCIS).

The study included 170 patients who had a subaxial cervical spinal cord injury (SCI) and evidence of spinal cord or canal compression on MRI or CT. Of these, 44% were defined as an American Spinal Injury Association (ASIA) Impairment grade A with no motor or sensory function preserved; 22% were rated as grade B, 16% as grade C, and 18% as grade D.

Patients received decompression by surgery or traction within 7 days of SCI, and were stratified as "early" if it was within 24 hours of injury or "delayed" if it was after 24 hours.

A total of 94 patients, mean age 40 years, had early decompression surgery, and 76 patients, mean age 42 years, underwent delayed decompression. The investigators assessed outcomes in 108 patients at 6 months, and in 64 patients at 1 year.

At 6 months, 24% of early decompression patients had a 2-grade or greater improvement on the ASIA scale, compared with 4% who had delayed decompression, said Dr. Fehlings, head of the Krembil Neuroscience Centre at the University Health Network in Toronto. There weren't enough patients at 1 year to segregate the data by ASIA grade, but significantly more patients in the early group had a combined 1- and 2-grade improvement on the ASIA scale, compared with those in the delayed-compression group.

Complications, particularly respiratory complications and length of stay in the ICU, were reduced by about 15% in the early decompression group versus the delayed-treatment group (37% vs. 49%).

Dr. Fehlings and coinvestigators hypothesized that traction would be one of the primary means of achieving decompression, but it was used in only 29% of the early group and in 21% of the delayed group. Traction was also not as successful as was anticipated, with only a 50% success rate.

The Spine Study Trauma Group, a group of the world's top 40 spine surgeons, will publish in the next year consensus-based recommendations that patients with acute spinal cord injury without other life-threatening conditions should have early decompression surgery within 24 hours, Dr. Fehlings said in an interview at the annual meeting of the American Association of Neurological Surgeons.

Presentation discussant Christopher Shields of the Kentucky Spinal Cord Injury Research Center in Louisville suggested 8-12 hours may have been a more appropriate cutoff point for early intervention. Dr. Fehlings said that animal studies suggest the time window for optimal decompression after spinal cord injury occurs within 8-24 hours after SCI. Based on the differences in metabolic rate between rats and humans, an 8- to 12-hour window roughly translates into 24 hours for humans. Also, the logistics are substantial in terms of transferring a patient to an SCI treatment facility, and getting that patient medically optimized, imaged, taken to surgery, and decompressed.

"The Spine Trauma Study Group has deemed that 24 hours is the cutoff for early surgical intervention, although my colleagues and I try hard in every case to minimize this time," said Dr. Fehlings, professor of neurosurgery at the University of Toronto. ■

Spine Injury Criteria for Children Being Challenged

CORONADO, CALIF. — Reports are challenging the validity of the five National Emergency X-Radiography Utilization Study criteria to diagnose spine injury in children.

The criteria (posterior midline cervical tenderness; no evidence of intoxication; normal level of alertness; no focal neurologic deficit; and no painful, distracting injury) were established in a study of 34,069 trauma victims (N. Engl. J. Med. 2000;343:94-9). Of these, 818 (2.4%) had cervical spine injury.

The researchers reported the criteria were 99% sensitive for cervical spine injury and 99.6% sensitive for clinically significant cervical spine injury in adults. Specificity was 12.9% in both groups.

In a subset analysis of 3,065 children from the National Emergency X-Radiography Utilization Study (NEXUS) study, 30 had cervical spine injuries (Pediatrics 2001;108:E20). The NEXUS criteria for detecting cervical spine injury were 100% sensitive and only 19.9% specific. However, none of the children studied were less than 2 years old and only 817 (27%) were younger than age 8 years.

"Until we come up with pediatric-specific criteria, it's reasonable to apply the NEXUS criteria to awake and alert patients," Dr. Julie C. Leonard said at a meeting sponsored by the American College of Emergency Physicians. "However, if you have a high index of suspicion by either mechanism or self-reported pain, you should use your clinical acumen."

A recent 20-year review that applied the NEXUS criteria to 190 children with cervical spine injury found the criteria were 94% sensitive among children aged less than 8 and 100% sensitive in those older than 8 (Neurosurgery 2008;62:700-8). A Pediatric Emergency Care Applied Research Network study found the NEXUS criteria were 83% sensitive among 539 children with spinal injury who presented to the emergency department. Of the 90 children missed by the NEXUS criteria, 58 (64%) were younger than 8 years of age.

Dr. Leonard, of Washington University, St. Louis, said a risk-stratification system is needed. High-risk populations also must be considered, like those with Down syndrome or juvenile idiopathic arthritis.

Dr. Leonard disclosed no conflicts.

—Doug Brunk