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TRAUMA ROUNDS

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UPMC TRAUMA CARE SYSTEM

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UPMC Mercy Burn Center Offers New Laser Therapy for Burn Scars

by Jenny Ziembicki, MD

Improved survival after burn injury is now possible secondary to improvements in critical care management, topical antibiotics, and early burn wound excision. After healing has occurred, however, many patients continue to have burn scars that produce significant morbidity and impair quality of life. Burn scars may cause contractures, hypertrophic changes, chronic folliculitis, pruritus, persistent hyperemia, and chronic pain. Traditional treatment for burn scars includes pressure garments, silicone sheeting, scar massage, and topical and intralesional steroids.[1]

Despite compliance with traditional therapies, many burn injuries require surgical scar revision. Even with all these modalities, burn scars remain difficult to treat and recurrence is common. UPMC Mercy Burn Center now offers newly emerging laser- and light-based therapies that allow for targeted manipulation of the burn scar, yielding results not previously thought possible.[1,2]

Effects of Laser- and Light-Based Therapies on Hypertrophic Scars

Hypertrophic scars result from alterations in normal wound healing processes such as inflammation, proliferation, and remodeling. These scars may form two to six months after injury, resulting in both cosmetic and functional deformity.[4] Hypertrophic scars contain type III collagen oriented parallel to the epidermal surface and are generally elevated, firm, and red (see Figure 1).[4] Race, age, and genetics play a role in the development of hypertrophic scars, which commonly develop in areas of high skin tension such as the chest wall, shoulders, and arms.[4]

Figure 1. Hypertrophic scarring and burn scar contracture six months after 80% total body surface area (TBSA) injury.

(Continued on Page 4)

Advanced Practice Providers Play a Critical Role in the Care of Injured Patients

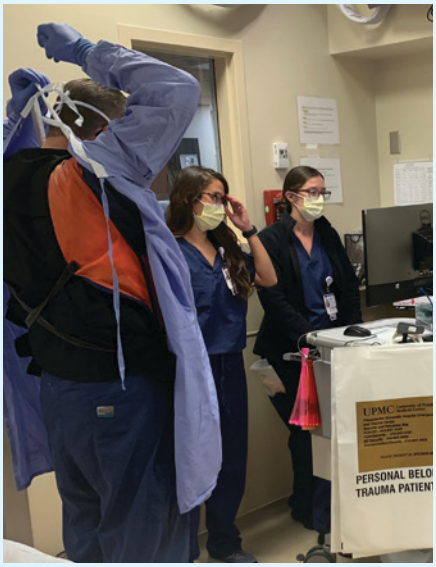
by Eric Bridenbaugh, PA-C; Amanda Lombardi, MSN, ACNP-BC; and Benjamin R. Reynolds, MSPAS, PA-C, DFAAPA

Over the past decade, as the number of trauma centers across the United States has surged, there has been an increasing need for qualified trauma care providers. Trauma surgeons can be a scarce resource, so many trauma centers have turned to advanced practice providers (APPs) to fill the void. APPs are typically either physician assistants or nurse practitioners and have the extensive education and training needed to diagnose and treat illness. Multiple studies have proven the efficacy in terms of cost-effectiveness and patient outcomes when APPs are included on the trauma team.[1-4] Trauma surgery APPs have been practicing for decades and have earned their place as important and valuable members of the trauma care delivery team.

Nurse Practitioners and Physician Assistants at UPMC

Nurse practitioners (NPs) are registered nurses who have attended a graduate academic nursing program where they receive training to diagnose and treat illness. Most nurse practitioners who practice trauma surgery are nationally certified as "adult gerontologic acute care" NPs. Acute care certified NPs have training focused in the management and treatment of conditions that are acute in nature and include extensive inpatient hospitalist and critical care medicine exposure. NPs practicing at UPMC hospitals in Pennsylvania are licensed under the Pennsylvania State Board of Nursing.

Physician assistants (PAs) are licensed under either the Pennsylvania State Board of (allopathic) Medicine or Osteopathic Medicine and, like NPs, are trained to diagnose and treat illness. PAs attend either an undergraduate or graduate physician assistant training program where they receive broad training and exposure in multiple medical specialties, which include internal medicine, emergency medicine, psychiatry, ob-gyn, pediatrics, and surgery. They are then nationally certified as PAs, which qualifies them for licensure.



APPs at UPMC Presbyterian reviewing a case. *From left to right:* Benjamin R. Reynolds, MSPAS, PA-C, DFAAPA; Samantha Bickers, PA-C; Jacey Grant, PA-C.

Certifications for Trauma Surgery APPs

Trauma surgery APPs typically receive intensive clinical orientation, but also can receive formal postgraduate training through a one-year surgical or trauma/critical care advanced practice provider residency or fellowship program. Such programs are not mandatory to work as a trauma surgery APP but may be helpful, particularly for the new graduate. Intensive clinical orientation consists of bolstering medical knowledge about trauma care, surgical critical care fundamentals, management of multisystem injuries, mastering procedural skills, surgical assisting, and gaining a general knowledge of how trauma care is delivered.

Additional educational certifications, such as Advanced Trauma Life Support® (ATLS®), Advanced Cardiac Life Support (ACLS), and Pediatric Advanced Life Support (PALS) are typically required. Courses such as Fundamentals of Critical Care Support (FCCS) and Advanced Burn Life Support (ABLS) also can be very useful for most trauma surgery APPs.

APP Responsibilities: Eyes and Ears of the Trauma Care Team

The everyday lives of trauma surgery APPs may vary from institution to institution, but generally will contain an element of morning handoff of patients under the care of the night shift team, daily rounds, patient discharges, follow-up clinic coverage, operating room first-assist responsibilities, new trauma activation or consult coverage, and a handoff to the night shift team. The trauma surgery APPs responsible for night shift are often tasked with covering all of the trauma patients including those in the ICU. They also are first call for new consults and oversee overnight correspondence from the hospital staff to the trauma team.

During a trauma resuscitation, the trauma surgery APPs can be tasked with performing the primary and secondary survey when a patient arrives. The primary survey during a trauma resuscitation seeks to identify and treat immediate threats to life following the "airway, breathing, circulation" method of evaluation. Examples of injuries that must be identified in the primary survey include airway obstruction and tension pneumothorax. In the secondary survey, the provider looks to identify anatomic injury and less immediate threats to life that may be obvious on the physical examination like fractures, open wounds, and dislocated joints. Once the primary and secondary surveys have been completed, crucial decisions must be made about what happens next. This can include immediate transport to the operating room or further imaging with CT scanning and x-rays.

APPs also must be prepared to lead the resuscitation in the event of simultaneous patient arrivals, which is especially common during the summer months. Trauma surgery by its very nature is a procedurally heavy specialty. Trauma surgery APPs must be skilled and competent in the performance of multiple bedside interventions such as external hemorrhage control, chest tubes, central venous lines, diagnostic peritoneal lavage, and focused abdominal sonography for trauma (known as FAST), to evaluate for internal injuries.

Regardless of the shift or the clinical situation, the trauma surgery APPs are the eyes and ears of the trauma service to allow for immediate diagnosis, initiation of treatment, and effective communication with the many consulting services, like neurosurgery or orthopaedics, who may also be treating the patient. The trauma surgery APP also performs the important function of providing education to patients, families, and staff, at the same time acting as a clinical boots-on-the-ground liaison between these groups and the rest of the trauma team.

In addition to providing extensive inpatient care, trauma surgery APPs also see discharged patients in the trauma clinic. Trauma clinic duties consist of managing wounds, screening for posttraumatic stress disorder, evaluating for further rehabilitative services, and ensuring that appropriate outpatient follow-up has been established among the consulting services.

Conclusion

Trauma surgery APPs are important members of the trauma team. Many individuals aspire to become either an NP or a PA. If you would like more information about PAs in trauma surgery, visit the American Association of Physician Assistants in Surgery's trauma website: **https://www.aaspa.com/surgical-pa-specialties/trauma-caucus**.

If you are interested in a career as an NP in trauma surgery, you can find information on the Society of Trauma Nurses' website: **https://www.traumanurses.org/about/stn-special-interest-groups/advanced-practice-nursing-sig**.

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UPMC Mercy Burn Center *(Continued from Page 1)*

New laser- and light-based therapies have resulted in a paradigm shift in the management of burn scars. Intense pulsed light (IPL) therapy may improve burn scar hyperemia and alleviate folliculitis, while ablative fractional CO_2 laser resurfacing may improve the texture, thickness, and stiffness of the burn scar.[1]

Intense Pulsed Light Therapy

IPL delivers focused, controlled light energy to the burn scar to remove unwanted pigment and decrease vascularity of the wound.[1] IPL targets hemoglobin in red blood cells within vessels in the scar area to close them, reducing blood supply that would otherwise contribute to the growth of scar tissue. IPL can improve color, texture, and pliability of scars by reducing the pigmentation, vascularity, and bulk of scar tissue.[2] Treatment can begin soon after wound healing and is performed in the outpatient setting without anesthesia. It works well in combination with laser therapy (see Figure 2). Multiple treatments may be necessary. Caution should be used in treating dark-skinned individuals, as there is increased risk of changes in pigmentation.

Ablative Fractional Lasers

Fractional lasers generate thermal energy that is deposited in columns through the epidermis and into the dermis.[3] Ablative fractional lasers vaporize tissue within the microscopic treatment zones, which later fill with new epidermal cells. Histologically, scars treated with fractional lasers have increased similarity to normal unaffected skin months after treatment.[3,4] Ablative lasers may decrease scar contracture and improve texture, pain, and pruritus. Early treatment with lasers may mitigate the trajectory of scar formation and decrease the need for revisional surgery. Laser therapy for burn scars may begin several months after healing of the wound or even years after wound closure. Procedures are usually done in the operating room with sedation. Patients may require multiple treatments, but will quickly see improvements in scar contracture, skin texture, and pliability.

Figure 2. Immediate postoperative improvement in contracture. Patient has planned multiple IPL and fractional laser therapies.

Conclusion

Laser- and light-based therapies are well tolerated by most patients. Complications include pain, erythema, edema, infection, ecchymoses, blistering, pigment changes, and new scar formation.[1-4] However, most adverse effects are transient and severe adverse effects are uncommon.

Anyone who is concerned about burn scarring may call UPMC Mercy Burn Center's hydrotherapy division at **412-232-8794** to be evaluated and started on an individualized treatment plan.

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Introducing New Director of Trauma and Injury Prevention at UPMC Children's Hospital of Pittsburgh: Ward M. Richardson, MD

Dr. Richardson earned his medical degree at the University of Pittsburgh School of Medicine and completed his residency in general surgery at UPMC. He also completed his fellowship in pediatric surgery at UPMC Children's Hospital of Pittsburgh, where he has served as associate trauma medical director since 2016. Dr. Richardson is passionate about pediatric trauma care and injury prevention, and has been actively involved in a number of trauma initiatives. Most notably, he is the surgical advisor for the youth violence prevention program at UPMC, the ***Flipside***, working monthly with at-risk youth from the Pittsburgh community and surrounding areas. In addition, Dr. Richardson leads the development of the trauma simulation program at UPMC Children's Hospital and is actively involved in trauma process improvement initiatives. Dr. Richardson is an active member of the Pediatric Trauma Society.

Treating Early Posttraumatic Seizures as a Result of Traumatic Brain Injury

by Ian Wilhelm, MD

Traumatic brain injury (TBI) is a leading cause of morbidity and mortality in young adults, with more than 1.7 million patients sustaining one every year. A known complication of TBI is early posttraumatic seizures, or EPTS, defined as seizures that occur within seven days of sustaining a traumatic brain injury. Known risk factors for EPTS include a decreased Glasgow Coma Scale (GCS); subdural, epidural, and intracerebral hematoma; cortical contusion; depressed skull fractures; and penetrating injuries.

Recent Brain Trauma Foundation guidelines include chronic alcoholism and patient age of less than or equal to 65 years old as additional risk factors.[1] Of note, isolated subarachnoid hemorrhage (SAH) has not been listed as a risk factor for EPTS, though the prospective observational study conducted by Inaba et al. had three patients experiencing EPTS with isolated SAH in 2013.[2]

Determining Reduction Rates of EPTS Via Randomized Control Trials

The first randomized control trial (RCT) showing a reduction in EPTS was conducted by Temkin et al. in 1990.[3] This study looked at 404 patients with head trauma randomized to treatment by phenytoin versus a placebo, with 208 patients receiving phenytoin and 106 patients receiving the placebo. They found a reduction of 14.2% and 3.6% in EPTS at the end of the first week in patients treated by phenytoin versus placebo, respectively.[3] However, at the end of the first and second years of the study, the gap in reduction rates of EPTS in those treated by phenytoin versus placebo closed significantly, suggesting that phenytoin produces a beneficial effect only during the first seven days after sustaining a TBI.[3] Inclusion criteria from this study largely formed the risk factors for EPTS.

Initially, it was hypothesized that by decreasing EPTS we could improve morbidity and cognitive outcomes in patients with TBI. Nevertheless, multiple studies have failed to show improved cognitive outcomes using EPTS prophylaxis. Dikmen et al. reviewed outcomes of patients treated with phenytoin and found decreased cognitive evaluation at one month, but no difference at one year.[4] Bhullar et al. also found decreased functional outcomes in patients with severe TBI treated with phenytoin.[5]

Treatment for EPTS Prevention: Phenytoin Versus Levetiracetam

The Brain Trauma Foundation currently recommends treatment with phenytoin for seven days for prevention of EPTS. Early studies in the prevention of EPTS used phenytoin as the drug of choice while monitoring for therapeutic levels.[1] Phenytoin has been proven in RCTs to decrease EPTS rates.[3] However, there has been a trend toward levetiracetam as the first choice for EPTS prevention. Inaba et al. performed a comparison of levetiracetam versus phenytoin in patients with severe blunt TBI, defined by GCS < 8 or GCS > 8 with CT finding consistent with TBI.[2] They found no difference in the seizure rates between the groups (1.5% versus 1.5%). Overall, levetiracetam is an attractive option for treatment because it does not require monitoring and is thought to have fewer negative interactions.

Conclusion

EPTS is a known complication of TBI. Treatment for seven days after injury decreases the rate of EPTS. Despite this decrease in rate over seven days, there is a lack of data supporting improved cognitive outcomes/morbidity with the prevention of EPTS over a longer period of time. Consequently, current recommendations call for treatment when the benefit of treatment outweighs potential complications.

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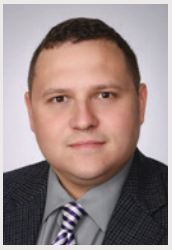

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UPMC Children's Hospital of Pittsburgh Trauma Team. *Front row, left to right:* Barbara Gaines, MD, George Gittes, MD, Paul Waltz, MD. *Middle row, left to right:* Christopher Behr, MD, Geoff Bond, MD, Kelly Austin, MD, Joseph Fusco, MD. *Back row, left to right:* Marcus Malek, MD, Kevin Mollen, MD, Stefan Scholz, MD.

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