

Hello Everyone;

Our last Wound Care Essential (WCE) email was on documentation of unavoidable pressure ulcers. Continuing with that theme, here is a short article on predicting pressure ulcer risk.

This material can be used in multiple ways: For example, treatment nurses are encouraged to read the emailed documents and discuss any questions they may have with the rounding staff from ASWC. Another approach would be for the DON/charge nurses to discuss the article(s) with the treatment nurses and encourage group participation on the topic of interest.

If you would like to add your colleague(s) to the email list please visit www.advantagewoundcare.org and on the left hand margin you will see “subscribe to our mailing list”. This is an evolving platform, with time we will add other useful features to facilitate continuing education.

Sincerely;

G.S. Dhillon MD PhD



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Suspected Deep Tissue Injury

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History and Definition

While believed to be a contemporary issue, deep tissue injury (DTI) has been noted in the literature since the late 1800s. DTI due to pressure exists as a form of pressure ulcer and is not well captured by the current staging system. Several pressure ulcer staging systems are frequently cited, but none defines pressure-related injury under intact skin. The National Pressure Ulcer Advisory Panel (NPUAP) recommended using the terms ‘pressure-related deep tissue injury under intact skin’ or ‘deep tissue injury under intact skin’ for describing these lesions. In 2002, the NPUAP defined deep tissue injury as “a pressure-related injury to subcutaneous tissue under intact skin.” Initially, these lesions have the appearance of a deep bruise. They may herald the subsequent development of a stage 3–4 pressure ulcer even with optimal treatment.

Since their February 2007 Consensus Meeting and NPUAP Biennial Conference: Charting the Course for Pressure Ulcer Prevention and Treatment, held in San Antonio, Texas, on February 9–10, 2007, the definition has been updated to reflect accuracy, clarity, succinctness, utility, and discrimination.⁴ The new definition of suspected DTI is: “Purple or maroon localized area of discolored intact skin or blood-filled blister due to damage of underlying soft tissue from pressure and/or shear. The area may be preceded by tissue that is painful, firm, mushy, boggy, warmer or cooler as compared to adjacent tissue.” Further description is also given: “Deep tissue injury may be difficult to detect in individuals with dark skin tones. Evolution may include a thin blister over a dark wound bed. The wound may further evolve and become covered by thin eschar. Evolution may be rapid exposing additional layers of tissue even with optimal treatment.” The incidence and prevalence of these ulcers is unknown due to the mixture of reporting styles. DTI is really a developing expression that articulates a deviation of pressure ulcers emerging primarily as bruised or dark tissue. Previously, these wounds were described in the literature as ‘malignant lesions,’ closed pressure ulcers, and purple pressure ulcers. Sussman and Swanson described a type of ‘hemorrhagic’ or purple ecchymosis of wound tissue or surrounding skin in their categorical variables and wound tissue attributes in the Sussman Wound Healing Tool.

Assessment and Cause

These wounds tend to occur on bony prominences, similar to pressure ulcers, and may arise in particular when a patient has spent a length of time in one particular physical position. These internal wounds are also known to deteriorate quickly, differentiating them from stage I ulcers, which can sometimes resolve to normalcy and do not necessarily deteriorate. Unlike a stage II pressure ulcer, which presents as a regular blister or skin tear and heals in a usual progression, a DTI does not resolve quickly and the blister or skin tear that appears cannot be repaired. The initial skin condition of DTIs leads to purple color changes, with the common occurrence of a thin blister roof on the surface. The frequently understood causes of DTIs include:

- direct pressure to the skin and soft tissue, with resulting ischemia;
- muscle injury, associated with a fall in the level of nutrients to the arterioles that feed the muscles; and
- injury or damage to the fascia (the membrane that covers all organs, muscles, bones, blood vessels, and nerves), and shearing injury or torsion of the perforating vessels.

Hemorrhage and clotting occur as a consequence of an acute injury, such as trauma from pressure, bumping, or shearing, as well as trauma to new granulation tissue and venous leakage from venous insufficiency. Clotting cuts off oxygen to the tissues, with subsequent hypoxia and ischemia. Rapid deterioration of the tissue following injury, with subsequent hypoxia and ischemia, can be a combination of “direct ischemic injury and reperfusion injury from oxygen free radicals, cytokines and neutrophilic adhesion to microvascular endothelium.” When hypoxia is prolonged, the initial damage can be due to ischemia. However, a short period of ischemia followed by reperfusion can result in damage that is more severe than the injury itself. Typically, stage I pressure ulcers are considered minor wounds that are most likely to heal with pressure redistribution. A suspected DTI potentially caused by reperfusion injury may not respond to offloading to prevent further deterioration. If the blood is not reabsorbed into the tissue in a timely manner, necrosis will occur. It is not known exactly how long clotted blood can remain in the tissue before cellular death occurs. In most cases, these ulcers are not reversible.

Comorbid states that may contribute to the development of DTI include: ischemic diseases such as arterial disease, peripheral vascular disease, and neuropathic diseases, including diabetes. Heels present an especially common area for DTIs to develop. The skin of these ulcers tends to present with a purple or 'bruised' look to them. Frequently, this condition may be mistaken for a blood blister. DTIs associated with heels occur after prolonged pressure to the skin and soft tissue around the heels with resulting ischemia, possibly connected to shear and friction from agitation, pain, or spasm of the lower extremities. A major question remains: are all heel ulcers DTI? To prevent DTI from occurring, it is important for the clinician to perform daily skin assessments, particularly checking for any changes in the skin's appearance. This is of utmost significance in the diabetic or arterially

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Compromised patient. The clinician should note any foot deformities, improper footwear, or feet that are covered for long periods of time - this includes thromboembolic disease (TED) hose and other compression garments. Special attention to those individuals who self-propel in wheelchairs is also recommended. Devices such as traction boots, casts, and abduction pillows that can prevent movement and/or inspection can also contribute to the development of DTI.

Differential Diagnosis

Not everything that looks like a DTI is actually DTI. Usually, DTIs occur over bony prominences, and the patients who display these wounds have a history of time spent in one particular position. Rapid deterioration may be an indication that the wound being evaluated is a DTI. Additionally, sometimes the skin over and around a DTI site is cooler than the surrounding skin and tissue. The usual assessment includes boggy, non-blanchable tissue that is deep purple in color (see *Figure 1*), may be painful, has a blistered top layer, and may present with a mirror image bilaterally. DTIs can be confused with other wounds and conditions, and should therefore be differentially diagnosed from similar-looking lesions such as bruises, hematomas, calciphylaxis, Fournier's gangrene, and perirectal abscesses. A bruise is the extravasation of blood in the tissues as a result of blunt force, impact, or trauma to the soft tissue, which usually resolves on its own in a matter of two weeks. Calciphylaxis is a vascular calcification and resulting skin necrosis that is seen in patients with a long-standing history of chronic renal failure. These lesions usually present on the lower extremities, may have a violet hue, and may be extremely tender and firm. Fournier's gangrene is an intensely painful necrotizing fasciitis of the perineum and/or groin that may present initially as cellulites. Perirectal abscesses commonly present as dull, aching, or throbbing pain that increases when sitting and prior to a bowel movement in the perianal area. They can open to reveal large cavities. Hematomas are lesions usually associated with trauma and appear as deep-seated purple or burgundy raised nodules that form as a result of clotted blood.

Figure 1: Example of Deep Tissue Injury of the Heel



Diagnostics

Diagnosis is still vague at best. Laser Doppler blood flow studies and ultrasound showing damaged reticular dermis and subcutaneous tissue under intact epidermis are two proposed diagnostic evaluations for DTI. A tissue biopsy, however, is the only true measure to date, but it has a low risk–benefit ratio. Biopsy specimens of purple ulcers show hemorrhage and early gangrenous changes.

Treatment

Treatment should include measures instituted for any pressure ulcer such as frequent turning and repositioning off the site of injury, good skin care—soap-free, pH-balanced cleansing, high-quality moisturizers, and protecting vulnerable areas with products containing zinc oxide,

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dimethicone, and some of the newer silicone combinations—proper support surface selection, and supportive care to the individual, including correcting any systemic issues and/or nutritional deficiencies. Offloading and avoidance of shearing forces with appropriate support surfaces is crucial with these ulcers since ischemia and infarction of nutrient supply is thought to be a major contributor or cause. However, if reperfusion injury is involved, offloading may not prevent further deterioration. Consider utilizing dressings that are non-adhesive and atraumatic to discourage further damage, such as silicone-faced foams. Experts also

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recommend against debriding too quickly and/or aggressively. Products such as polyacrylate-based moist therapy provide a safe and gentle debridement method that could be utilized if the goal is to remove necrotic tissue. Skin beneath the thin blister should be left in place if the area is stable. Monitor these lesions carefully before beginning forceful removal of any tissue that appears to be necrotic. Check the skin for any breach or opening, paying special attention to bed linens and clothing for any drainage. As with any wound, watch for signs and symptoms of deterioration such as erythema, odor, pain, and/or fever.

Patients who reside in the following facilities can be at high risk for the development of DTI:

- Intensive care unit (ICU)—many ICU patients are on ventilators and/or have many tubes and wires connected to their body, restricting movement. Additionally, the use of vasopressors is common, which can decrease peripheral blood flow and increase susceptibility for DTIs.
- Acute care—devices such as traction boots, casts, abduction pillows, and the like can prevent movement, increasing the patient’s chance of developing a DTI. TED hose and other devices that restrict blood flow and inspection can cause problems. Furthermore, heel ulcers are reported in 66% of patients following hip fracture.
- Long-term care—these residents often have their feet covered for long periods of time, precluding them to the development of DTIs. Moreover, feet deformities, improper shoe wear, and propelling themselves in a wheelchair can increase the chance of developing a DTI.
- Hospice—terminal status and those who are experiencing imminent death will have the tendency to develop new skin breakdown (i.e. skin failure), including DTI, as other organs fail.

Documentation

Documentation should always include a narrative, full description with suspected DTI mentioned. In long-term care, the minimum data set requires that the term ‘unstageable’ be used to describe a DTI. The speed of deterioration makes DTI conditions prone to litigation. The pace and extensive decline that a DTI follows can be disastrous. Meticulous documentation of skin condition upon admission and at regular intervals is the key to prevention and management of DTIs. Do not hesitate to refer to another practitioner if the wound/condition is outside your scope. The first hint of a DTI should increase awareness and consequent treatment. Informing the patient and family about the risk of deterioration due to deep damage is recommended. DTI can decline even when good, prudent care is rendered.

Future

There is no reliable research on outcomes; however, clinical data indicate that DTIs can heal without permanent injury or loss of limb or life. We still do not fully understand the etiology of these deep pressure ulcers, their prevalence and incidence, costs to treat, and diagnostic measures to

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assess. We do know, however, that ischemic disease with delayed reperfusion may increase the damage due to lack of recovery, and that neuropathic disease may increase the time of exposure to pressure. Both the NPUAP and the Wound, Ostomy and Continence Nurses Society (WOCN) agree that DTI should be the object of intense education. Further research and investigation into this phenomenon is needed. ■