

Deep Tissue Injury: What, Why and When?



BY Cynthia A. Fleck

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While believed to be a contemporary occurrence, deep tissue injury (DTI) has been seen in the literature since the late 1800s.¹ Several pressure ulcer staging systems are frequently cited but none defined pressure-related injury under intact skin until recently.² In the past, 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. Since their Consensus Meeting and NPUAP Biennial Conference: Charting the Course for Pressure Ulcer Prevention & Treatment, held in San Antonio, Texas, in February 2007, the definition has been updated to reflect accuracy, clarity, succinctness, utility and discrimination. The new definition is as follows:

Suspected Deep Tissue Injury: “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: 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.”³

DTI may herald the subsequent development of a Stage III-IV pressure ulcer.⁴ The incidence and prevalence of these ulcers is unknown due to the mixture of reporting styles.⁵ Deep tissue injury is really a developing

expression that articulates a deviation of pressure ulcers that emerges primarily as bruised or dark tissue.⁶ Previously these wounds have been described as “malignant lesions,” closed pressure ulcers and purple pressure ulcers in the literature.⁷

Case Study

Ms. DZ is a 58-year-old female with progressive multiple sclerosis. She lives alone in an apartment with her support dog, Simone, a black standard poodle. She is able to get around with her power wheelchair and Simone’s assistance. She also has a home health attendant who visits twice a week to help with bathing, cooking, laundry and cleaning.

Ms. DZ’s neighbour hears Simone barking for most of the evening but doesn’t go to check in on her. The home health attendant arrives the next morning to find Ms. DZ on the kitchen floor, lying on her back. She is exhausted from trying to get up and she has a large purple “bruise” on her buttocks. The home health attendant immediately attempts to get her up and then calls 9-1-1 for assistance. In the meantime, Ms. DZ complains of deep pain at her tailbone. When the emergency medical technicians arrive, they ask her how long she was on the floor, and she states “most of the night.”

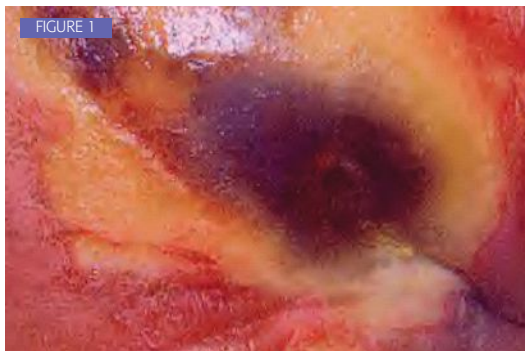
Assessment, Cause and Etiology

These wounds tend to occur on bony prominences and may arise especially when a patient has spent a length of time in one particular physical position. These internal wounds are also known to deteriorate quickly, which differentiates them from Stage I ulcers that can sometimes resolve to normalcy and do not necessarily deteriorate. Unlike a Stage II pressure ulcer that presents as a regular blister or skin tear that 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 a DTI leads to purple colour changes (see Figure 1), with the common occurrence of a thin blister roof on the surface. The frequently understood causes of DTIs include¹

- 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
- injury or damage to the fascia (the membrane that covers all organs, muscles, bones, blood vessels and nerves)
- shearing injury or torsion of the perforating vessels.

Co-morbid states, which may contribute to the development of DTI, include ischemic diseases such as arterial disease, peripheral vascular disease and neuropathic diseases, including diabetes.⁵



Example of Deep Tissue Injury of the Sacrum.

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 (see Figure 2). Frequently, this condition may be mistaken as a blood blister. DTIs associated with heels occur after prolonged



Example of Deep Tissue Injury of the Heel.

pressure to the skin and soft tissue around the heels with resulting ischemia, possibly connected with shear and friction from agitation, pain or spasm of the lower extremities. A major question remains, “Are all heel ulcers, deep tissue injury?”

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 patient who has diabetes or is arterially compromised. The clinician should note any foot deformities, improper footwear, or feet that are covered for long periods of time, which includes the use of T.E.D. 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, which can prevent movement and/or inspection, can also contribute to the development of DTI.

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-to-benefit ratio.

Differential Diagnosis

Not everything that looks like a DTI represents deep tissue injury. Usually DTIs occur over bony prominences, and the patients that display these wounds have a history of time spent in one particular position. These wounds also deteriorate rapidly, which may indicate that the wound being evaluated is a DTI. Additionally, sometimes the skin over and around a DTI site is cooler than surrounding skin and tissue. The usual assessment includes boggy, non-blanchable tissue that is deep purple in colour, 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 a bruise, calciphylaxis, hematoma, Fournier’s gangrene, and perirectal abscesses. A bruise is the extravasation of blood in the tissues as a result of blunt force or 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, which usually present on the lower extremities, may have a violet hue and 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 cellulitis. 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.

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 protection of vulnerable areas with products containing zinc oxide, 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 is crucial with these ulcers since ischemia and infarction of nutrient supply is thought to be a cause.

Consider using dressings that are non-adhesive and atraumatic to discourage further damage, such as silicone-faced foams. Experts also recommend against debriding too quickly and/or aggressively. Products such as polyacrylate-based moist therapy provide a safe and gentle^{8,9} debridement method that could be utilized if removal of necrotic tissue is the goal. 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, odour, pain and/or fever.

High-risk Populations

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

Intensive care (IC). Many IC patients are on ventilators and/or have 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 patients' chances of developing a DTI. T.E.D. hose and other devices that restrict blood flow and inspection can cause problems. Furthermore, heel ulcers are reported in 66 per cent of patients following hip fracture.¹⁰

Long-term care. These residents often have their feet covered for long periods of time, predisposing them to the development of DTIs. Moreover, foot 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 eminent death will have the tendency to develop new skin breakdown (i.e., skin failure) as other organs fail.¹¹ This includes DTI.

Documentation

Documentation should always include a narrative, full description with suspected DTI mentioned. 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 preventing and managing DTIs. Do not hesitate to refer to another practitioner if the wound/condition is outside your scope. The first hint of a suspected DTI should increase awareness and consequent treatment. Informing the patient and family about risk of deterioration due to deep damage is recommended. DTI can decline even when prudent care is rendered.

Outlook

There is no reliable research on outcomes; however, clinical data indicate that DTI can heal without permanent injury or loss of limb or life. We still don't fully understand the etiology of these deep pressure ulcers, prevalence and incidence, costs to treat and diagnostic measures to 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.⁵ Both the NPUAP and the Wound, Ostomy and Continence Nurses Society (WOCN) agree that DTI should be the object of intense education.^{4,11} Research into this phenomenon is needed.

Revisiting Ms. DZ's Case

Ms. DZ is taken to the emergency room where she is evaluated for broken bones and other problems. She continues to complain of pain around her tailbone. When performing a head-to-toe skin assessment, the emergency nurse notices the large purple bruise and alerts the wound-care specialist. The wound-care specialist diagnoses the ulcer as a suspected DTI and begins measures to offload the area, ordering Ms. DZ to remain off her back. She prescribes a low-air-loss mattress to decrease pressure and shear to Ms. DZ's vulnerable tissue. She orders lab tests, including a pre-albumin to check her protein levels and her ability to heal nutritionally.

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