

# Where to the diabetic foot ulcer?

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## Summary

The author contends that the use of the term 'diabetic foot ulcer' is misleading and may lead to confusion for clinicians or an assumption that all ulcers on the foot are homogeneous in their cause and treatment.

## Introduction

The author reviewed the use of the term 'diabetic foot ulcer' in the literature. The term could be interpreted as all encompassing to indicate that all ulcers on the foot are homogeneous in origin and so should merit the same treatment. This may mislead clinicians and foster misconceptions about foot ulcer management. Many authors in their research have specified the type of ulcer that has been studied, ie neuropathic, ischaemic or neuro-ischaemic. Others have defined their study parameters by using ulcer classification systems. In the same way that all leg ulcers are not the same and the distinction has been made between venous or arterial ulcers, so too should differences be made when dealing with ulcers on the diabetic foot.

## Methods

The author randomly reviewed a number of journal articles that discuss ulcers on the diabetic foot. These include but were not limited to ulcer interventions, economic studies and the use of ulcer classification systems.

## Literature review

Although the term 'diabetic foot ulcer' is widely used in the literature, there is no agreement as to what is meant by the term. Brill et al<sup>1</sup> may have summed up the situation accurately when they stated "The term 'diabetic foot' is a misnomer because it does not differentiate neuropathy from PVD (peripheral vascular disease) as the initiating problem.

A specific diagnosis of diabetic neuropathy or diabetic PVD results in more effective early prevention and treatment of injury".

In the same way that leg ulcers are separated into various categories depending upon their pathology, eg venous leg ulcers, the use of the more specific term not only describes the site of the ulcer but also the underlying aetiology or pathology. The phrase 'diabetic foot ulcer' emphasises the systemic disease of the patient but does not address the precipitating factors: neuropathy or ischaemia. The American Diabetes Association<sup>2</sup> state "The term 'diabetic foot wound' refers to a variety of pathological conditions". Perhaps Jeffcoate and Harding's<sup>3</sup> observation puts some perspective on the issue; "There is no widely accepted method for classifying or even describing foot ulcers. Non-specialists often refer to all ulcers as diabetic foot". Does this uncertainty affect the way in which wound care practitioners view or subsequently treat ulcers on the foot?

Controversy arose in 1996<sup>4,5,6</sup> when case histories reported that "diabetic foot ulcers" had worsened with the use of alginate dressings. Much discussion was made of selecting the correct dressing for the diabetic foot ulcer. No distinction appears to have been made as to the type of ulcer being treated and this may have contributed to the situation. Lazarus et al<sup>7</sup> contend that "...confusion about wounds and healing has lead to divergent initiatives and less productive approaches... definitions and guidelines for assessment of wounds and evaluation of healing are necessary to relieve this confusion". Treatment protocols should be based on the aetiology of the ulcer (neuropathy, ischaemia or a combination of the two)<sup>8</sup>.

## Wounds/Ulcers

In regard to ulcer/wound definitions, the literature is not any clearer. The terms 'ulcer' and 'wound' vary considerably and range from very general to specific..

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Given the diversity of definitions it is not surprising that some authors report the ulcer type or at least the associated pathology of the ulcer <sup>2,17,26-29</sup>, whilst some have not <sup>3,30-37</sup>. Coloplast's general wound management pocket guide <sup>39</sup> designed to "improve patient outcomes" refers to differences between neuropathic and ischaemic ulcers, but does not clearly define either. The guide makes clear mention of the Wagner and University of Texas Diabetic Wound Classification systems but does not appear to link them to the different ulcer types.

Again in research articles, some ulcer types are defined, generally as neuropathic foot ulcers (NFU), ischaemic foot ulcers (IFU) or neuro-ischaemic foot ulcers (NIFU) <sup>10,18,20,30,31,36,37,39-57</sup>. Other researchers <sup>58-63</sup> do not appear to have published them. Apelqvist et al <sup>8</sup> expressed their concern that many studies are hampered by "...inadequate description of the type of ulcer...".

## Wound Classification systems

Many attempts have been made to address the issue of consistency of terminology of chronic wounds by devising wound classification systems. Lavery et al <sup>64</sup> refer to Shea 1975, Meggitt 1976 and Wagner 1981. Frykberg <sup>65</sup> believes that "Classifications of ulcerations can facilitate a logical approach to treatment and aid in the prediction of outcome" Jeffcoate et al <sup>66</sup> go further by stating that "...a classification system has multiple purposes and its design depends upon its application".

A widely used wound classification system is the Wagner system <sup>58, 67-73</sup> based on six grades of wounds: from Grade 0; No open lesion but may have deformity or cellulitis to Grade 5; extensive gangrene. Smith <sup>74</sup> refers to it as a visual system as it relies upon a subjective assessment. Jeffcoate et al <sup>66</sup> feel that this was a major problem as the subjectivity may affect its reliability when used as a research tool.

A nursing driven system called the RYB Colour Classification was reported in 1988 <sup>75</sup>. This system is based on a colour scheme (R/Red = granulation tissue, Yellow/Y = slough and Black/B = desiccated eschar. Although easy to use it has no other considerations for depth or size <sup>76</sup>. Similarly the Coloplast pocket guide <sup>39</sup> has a colour chart of different wound beds to aid identification.

Another widely referred to foot ulcer classification system is the University of Texas Foot Wound Classification System (UT), first reported in 1996 by Lavery et al <sup>64</sup>. It uses a system of wound grading and staging to outline wound severity. Wound depth is graded from Grade 0 (superficial wounds) to Grade 3 (penetrating into bone and tendon). Staging ranges from A (non-ischaemic clean wounds) to D (infected ischaemic wounds). Lavery et al state that "The criteria for each stage are based on clinical and laboratory data". For example, clean ulcers are wounds without local infection or systemic infection. The authors conducted a validation study in 1998 <sup>77</sup> by evaluating 360 medical records of diabetic patients with foot ulcers. The results indicated that the higher the grade (> 2 or 3) combined with a higher stage (C or D) was indicative of a more serious wound and one that



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Table 1. Definitions of Wounds/Ulcers.

"...a disruption of normal anatomical structure and function which results from pathological processes beginning internally or externally to the involved organ."<sup>9a</sup>

"A disruption of the normal anatomical structure and function of a tissue and is a break in the skin, usually associated with physical injury."<sup>8a</sup>

"...a full thickness breach of the cutaneous tissues."<sup>10a</sup>

"A foot ulcer was defined as a full thickness skin defect present for at least two weeks."<sup>11a</sup>

"Chronic wounds : wounds that do not heal in a timely fashion."<sup>12a</sup>

"Chronic wounds have failed to proceed through an orderly and timely process to produce anatomic and functional integrity, or proceeded through the repair process without establishing a sustained anatomic and functional result."<sup>13a</sup>

"...An established area of discontinuity that is slow to heal is known as an ulcer..."<sup>14a</sup>

"Superficial ulcer : Full thickness lesion of the skin not extending through the subcutis ulcer: Full thickness lesion of the skin extending through the subcutis, which may involve muscle, tendon, bone and joint."<sup>15a</sup>

"Ulcer : Circumscribed area of skin loss extending through the epidermis may extend into the dermis (papillary)."<sup>16</sup>

"Diabetic Foot ulcers are chronic wounds that do not heal unless treated actively and in the case of plantar ulcers, offloaded".<sup>17</sup>

"Wounds were defined as neuropathic when they were present in an individual with adequate limb perfusion..."<sup>18</sup>

"...foot ulcers on individuals with diabetes who lack protective sensation and have adequate blood flow to their foot..."<sup>19</sup>

"Foot ulcers were defined as full-thickness neuropathic plantar or lateral forefoot (ulcerations) penetrating to the cutis and sub-cutis (*sic*)."<sup>20a</sup>

**Ulcer** "An open sore, marked by complete loss of the top layer of the skin (epidermis); which does not tend to heal quickly. (See arterial ulcer, diabetic ulcer etc)."<sup>21</sup>

**Diabetic ulcer** "An area of skin loss (see ulcer) resulting from poor blood supply and/or reduced nerve function in the lower limb caused by diabetes mellitus."<sup>21</sup>

"Neuropathic Ulcers...as those located at pressure points (under toes and metatarsal heads) in the presence of callus with a reduced vibration sense (in a warm foot with intact pedal pulses)."<sup>22</sup>

"...a breakdown in the skin caused by diabetic peripheral neuropathy or vascular disease."<sup>23a</sup>

Diabetic foot ulcer is "...a full thickness wound below the ankle in a diabetic patient, irrespective of duration".<sup>24</sup>

"A foot ulcer is defined as an open lesion located at or below the ankle, with or without necrosis through the full thickness of the skin."<sup>25a</sup>

is less likely to heal, with the patient more likely to require amputation.

The S(AD) System was published by Macfarlane and Jeffcoate in 1999<sup>78</sup>. They felt that their system had advantages over other systems in that it included degrees of ischaemia, categorised area as well as depth, was inclusive of neuropathy and was not a guide to management. Satterfield's comment on S(AD) was that this was too complicated and could cause confusion<sup>76</sup>.

For comparison Oyibo et al<sup>79</sup> applied both Wagner and the UT ulcer classification systems to new foot ulcers from two specialist diabetic foot centres. They concluded that regardless of grade, increasing stage is associated with increased risk of amputation and extended healing time. They felt that the UT, which included stage of the ulcer, made it a better predictor of outcome. Satterfield<sup>76</sup> reviewed a number of wound classification systems and felt that although the Wagner system may be simple and easy to remember it did not allow for neuropathy or the size of the lesion. This was important as "...these factors can have a pronounced effect on the treatment and potential outcome". Frykberg<sup>65</sup> added that the Wagner system was also deficient because it did not address the important areas of ischaemia and infection. Satterfield went on to point out the value of the UT system as it had been validated in other locations apart from its original source. Frykberg<sup>65</sup> believes that UT was generally better because it was more predictive of outcomes. So even many authors could not agree on what each wound classification system was trying to achieve.

DEPA was another, first published in 2004. Younes and Albsoul<sup>79</sup> report on a new scoring system to assist in predicting the outcomes of diabetic foot ulcers. D (depth), E (extent of bacterial colonisation), P (phase of ulcer), A (associated aetiology). Ascending scores of 1-3 are assigned for increasing levels of chronicity in each category. The higher the score the more likely an amputation. The PEDIS System was developed by the International Working Group on the Diabetic Foot as a system for the specific needs of research groups<sup>24</sup>: P (perfusion), E (extent/size), D (depth of tissue loss), I (infection), S (sensation). The different grades for each area are defined so there is clear separation of each level, eg perfusion has three levels. "Grade 1 is no symptoms or signs of peripheral arterial disease (PAD)" up to "Grade 3: Critical limb ischaemia as defined by

Systolic ankle BP <50 mmHg or  
Systolic toe blood pressure <30 mm Hg or  
tcpO<sub>2</sub> <30 mm Hg pressure. "

In regard to sensation, Schaper goes on to say that "The system (PEDIS) categorises patients as having present or absent protective sensation in the affected foot." This is categorised as "Grade 1: No loss of protective sensation" or "Grade 2: Loss of protective sensation" defined as the absence of perception of one of the following tests: "Absent pressure sensation determined with a 10 g monofilament on two out of three sites on the plantar side (*sic*) of the foot", absent vibration sensation (using a 128-Hz tuning fork or vibration threshold >25 V using semi-quantitative techniques, tested on both 1st toes.

## Comments

There is great challenge to accurately and adequately describe foot ulcers. There do not appear to be any studies comparing ulcers on the diabetic foot and similar ulcers on the non-diabetic foot. Are neuropathic ulcers in Hansen's disease the same as neuropathic ulcers on the diabetic patient? The American Diabetes Association postulates that "...it is less clear that chronic wounds differ in people with diabetes compared with non-diabetic patients"<sup>2</sup>.

Whilst different systems have been used to classify ulcers on the diabetic foot, none has gained widespread support. Perhaps McInnes<sup>81</sup> summed it up best when he said "There may not be a universal classification system that meets all our needs, but there are systems to select for the different processes of audit, research and clinical management".

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