

The biopsychosocial considerations in wound healing: a case report

KEY WORDS

- ▶ Drug addiction
- ▶ Poverty
- ▶ Anxiety
- ▶ Pathology
- ▶ Biopsychosocial
- ▶ Diabetic foot

Background: Wound healing is complex and multifactorial. Patients often present with multiple comorbidities as well as complicated biopsychosocial histories. Neglecting patients’ psychological and social state can impede efforts to prevent amputation.

Content: This case report involves a patient with a history of intravenous drug use and diabetes, and whose GP referred him to the podiatry service for claudication symptoms. During the following 18 months, the patient neither attended appointments nor engaged with therapeutic programmes, and his symptoms deteriorated. The patient was eventually hospitalised after treatment failed to prevent autoamputation of his left fifth toe.

Conclusion: This report poses the question of whether the podiatry service could have prevented amputation if they had accounted for the patient’s biopsychosocial situation. The authors discuss the potential of colour flags for highlighting biopsychosocial factors.

The biopsychosocial approach to healthcare refers to the interaction between physical, psychological and social factors in a person’s experience of a disease (Covic et al, 2003). Clinicians often primarily focus on the physical aspects of a patient’s disease rather than the whole biopsychosocial picture, and this may have a detrimental impact on patient care. The following case report highlights the need for a holistic understanding of the biopsychosocial barriers to optimal wound healing.

PATIENT INFORMATION

Gary is a 56-year-old white British male. His GP referred him to the podiatry vascular triage service as he reported pain in the back of both legs that came on during walking and eased with rest. His GP suggested this pain could have a vascular aetiology. The referral stated that Gary had been experiencing pain for several months, and that it was limiting his daily activities; the referral described a claudication tolerance of approximately 50 metres. Gary’s GP could have used the highly specific (91%) and sensitive (99%) Edinburgh Questionnaire to confirm the diagnosis of claudication (Leng and Fowkes, 1992).

EARLY CLINICAL FINDINGS, INTERVENTIONS AND FOLLOW-UPS

Podiatry triage: initial assessment and diagnosis
The podiatry vascular triage service charted the

patient’s past medical history (see *Box 1*) and his medications (see *Box 2*). The vascular service sought to confirm the GP’s initial diagnosis of claudication resulting from peripheral artery disease (PAD). Clinical assessment involving pulse palpation is often the first line for diagnosing PAD (Armstrong et al, 2010). However, if there is concern, further assessment using noninvasive vascular studies, including the use of the ankle brachial pressure index (ABPI), is recommended (The National Institute for Health and Care Excellence

Box 1. The patient’s past medical history

- History of intravenous drug use
- Deep vein thrombosis in left calf: 18 months prior
- Body mass index: >25 kg/m²
- Bilateral pitting oedema: below both knees
- Peripheral neuropathy
- Hypertension: 145/84 mmHg
- Smoker: 30 cigarettes per day
- Diabetes mellitus: noninsulin-dependent

Box 2. The patient’s medications

- Metformin 1000 mg bi-daily
- Olanzapine 10 mg once daily
- Simvastatin 40 mg once daily
- Citalopram 10 mg once daily

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Table 1. Interpretation of the patient's ankle brachial index measurement (ABPI) results (Lipsky et al, 2013)

>1.30	Poorly compressible vessels, arterial calcification
0.90–1.30	Normal
0.60–0.89	Mild arterial obstruction
0.40–0.59	Moderate obstruction
<0.40	Severe obstruction

[NICE], 2012a). Deep vein thrombosis (DVT) can be a contraindication for measuring ABPI; however, as the patient's DVT occurred 18 months prior to ABPI measurement, it was no longer contraindicated.

The patient's calves were soft and non-tender, and his feet were warm and intact. The patient's initial resting ABPI measurements taken by the podiatry triage service were 0.65 for the right leg and 0.52 for the left. His resting blood pressure (BP) was 145/84 mmHg. The results of the patient's examination indicated he had moderate PAD, see *Table 1* (Lipsky et al, 2013). The triage service also offered to arrange regular podiatry appointments but the patient declined.

Podiatry triage: initial therapeutic intervention

The authors wrote to the patient's GP to request a review of his cardiovascular medication. The resulting recommendation was that the patient should commence taking an anti-hypertensive, an antiplatelet and a 3–6 month course of naftidrofuryl 200 mg *ter die sumendum* (TDS [three times per day]) to help increase his walking distance (NICE, 2012b). NICE specifies that patients diagnosed with PAD should: be offered 80 mg atorvastatin once daily; have their hypertension controlled; and commence an antiplatelet medication, e.g. aspirin or clopidogrel (75–300 mg once daily), unless contraindicated, to prevent secondary cardiovascular events (NICE, 2012b). Naftidrofuryl should be reviewed at 3–6 months (NICE, 2012b).

The associated cardiovascular risks of PAD and all treatment options, including surgery, were explained to the patient (NICE, 2012b). Gary received smoking cessation advice but declined referral to a structured support service as he wished to try to stop smoking on his own. Patients are much more likely to stop smoking and relapse less with structured support and nicotine replacement therapy (Stead and Lancaster, 2012).

The patient agreed to be referred to the physical

activity referral scheme (PARS) for a structured exercise programme. The triage service emphasised to the patient the importance of continuing to walk through his leg symptoms and briefly explained angiogenesis. Studies have shown that supervised exercise therapy delivers statistically significant improvements in maximal treadmill walking distance compared with nonsupervised exercise regimens (Fokkenrood et al, 2013). Cardiovascular death-free figures with exercise are 79.9% *versus* 58.4% without exercise at ten years (Sakamoto et al, 2009).

Six to eighteen months after podiatry triage

Gary was invited for a follow-up appointment six months after his initial podiatry triage assessment but he did not to attend. He had also not engaged with the structured exercise programme.

The patient attended a GP appointment after his symptoms deteriorated over the following 18 months. Based on the podiatry service's initial correspondence, his GP referred him to the local vascular surgeon. The patient underwent a left femoral tibioperoneal trunk bypass graft using a harvested vein.

On discharge from hospital, Gary was referred back to the podiatry service; however, this time he was referred to the community high-risk foot protection team due to the development of an ulceration to his left fifth toe. This toe had become necrotic and infected, and was rated D2 on the University of Texas Diabetic Wound Classification (Lavery et al, 1996; Armstrong et al, 1998).

First presentation to the community podiatry high-risk clinic

The patient attended the podiatry service's high-risk clinic, which arranged for him to receive antibiotics via his GP for a moderate infection (Lipsky et al, 2013). While Gary had been an inpatient with the vascular team, he had an x-ray taken that had shown he had osteomyelitis. However, the vascular team's referral to the podiatry service did not mention this x-ray and the podiatry team were unaware of it. Therefore, the podiatry service immediately referred the patient to a multidisciplinary team for an x-ray and further investigations.

Patients with diabetes who have new ulcerations should be referred to a multidisciplinary team within 24hours (NICE, 2004). However, Gary did not attend any of his follow-up appointments or respond to

written communication. As Gary did not have a telephone, the podiatry service had to wait for him to contact them.

Gary presented at his local hospital's accident and emergency (A&E) department six weeks after being re-referred to the high-risk podiatry clinic. He presented with a partly auto-amputated, wet gangrenous left fifth toe. The infection was classified as moderate, the patient was prescribed flucloxacillin 1g *quater die sumendus* (QDS [four times a day]), and his wound was dressed with a dry dressing prior to discharge from hospital.

On discharge, the hospital updated the patient's demographic details and re-referred him to podiatry. He was seen in the podiatry service's high-risk clinic four days later. The patient had recently engaged with the community drug and alcohol team after a referral from his GP due to a relapse in his substance dependency. He had started methadone treatment for his opioid dependence and had started to re-engage with his care.

The patient's second presentation to the community podiatry high-risk clinic

Despite a continuous seven weeks of flucloxacillin 1g QDS prescribed by the patient's GP and A&E, Gary's infection was not improving and his pain continued to deteriorate. He complained of a severe, unremitting pain, which had been present for over two weeks around his toes and lower leg. The patient reported the pain to be worse at night and found some relief from hanging his leg out of bed. This pain is a classic sign of ischaemic rest pain (Rutherford et al, 1997; Smith et al, 2014).

A recent swab showed heavy growth of *Staphylococcus aureus* that was sensitive to flucloxacillin. Properly-obtained wound cultures, including samples of tissue, are useful in guiding antibiotic therapy for infected feet (Lipsky et al, 2013). It is important to note that oral antibiotics may not have been sufficient to treat the underlying infection as antibiotic delivery is impaired by the presence of arterial occlusive disease (Chang et al, 1996). The patient scored his pain at 10/10 on a visual analogue scale, indicating maximal severity. Visual analogue scores are reliable, accurate, repeatable and easy to use (Hawker et al, 2011).

Within four days the patient's left fifth toe had completely auto-amputated and bone was now exposed; a 35mm by 40mm and 20mm deep ulcer was present. The wound had approximately 80% thick slough, 10% bone and 10% necrotic tissue present. Tough, fibrous, necrotic slough prevented accurate

assessment of the underlying structures.

The wound had deteriorated significantly since the podiatry service saw the patient seven weeks earlier, and it was now classed as D3 on the University of Texas Diabetic Wound Classification. The North West Podiatry Services Diabetes Clinical Effectiveness Group (CEG) has recently updated its guidance for classifying diabetic foot ulcerations and now recommends using the site, ischaemia, neuropathy, bacterial infection, and depth (SINBAD) classification system (North West Podiatry Services Diabetes CEG, 2008).

At this stage, the patient had a moderate to large quantity of golden brown serous exudate, malodour, and an area of cellulitis greater than 2cm² with associated lymphangitis. The tissue surrounding the wound periphery was 'boggy'. Crepitus and bubbles within the exudate indicated the possibility of gas within the tissues. The increased quantity and golden tinge to the exudate concurred with the swab result, as *S. aureus* is a fibrinolysin-producing bacteria (Expert working group; Satellite expert working group, 2008), and this along with the cellulitis with crepitus indicated that Gary had an imminently limb-threatening infection (Lipsky et al, 2013).

The earlier x-ray showed osteomyelitis in the fifth distal and proximal phalanges, which had now auto amputated. While it was unclear from the vascular surgery and A&E notes whether the patient's osteomyelitis had been actively treated, the long course of uninterrupted antibiotics implied it had been. However, the deteriorating wound and uncontrolled infection raised suspicion that there might be a continuing, progressive, underlying osteomyelitis in the fifth metatarsal and possibly in neighbouring structures.

The patient's clinical presentation was enough to re-admit him to hospital but the patient's complex health issues posed the question of which specialism it would be best to admit him under. Triaging in this way ensures the best possible care for patients and prevents time being wasted by referring them to an inappropriate specialism. Basic clinical vascular assessments and ABPI measurements were repeated. A deep tissue swab was also taken.

The patient had no palpable pedal pulses and, while his right popliteal pulse was palpable his left popliteal pulse was not. Reassuringly, both of the patient's femoral pulses were palpable. Both of the patient's feet were cold, with a reactive hyperaemia that faded with elevation, producing a pallor in which the cellulitis did

Figure 1. The flag system (adapted from Nicholas et al, 2011)

Flag	Nature of issue	Action
Red	Serious pathology, e.g. diabetes, ischaemia, infection	Triage for specialist medical opinion
Yellow	Psychosocial factors, depression, negative beliefs about the condition	Biopsychosocial management. Removal of perceived obstacles to recovery. Motivational interviewing, patient education, counselling
Blue	Individual's perception of care	Identify modifiable perceptions. Develop a cooperative approach where the patient feels empowered to make decisions
Black	Conditions that inhibit rehabilitation, such as lack of access to transport, inappropriate pressure relief, poor home environment, type of work	Appraise the significance to stop rehabilitation. Reset patient's expectations. Motivational interviewing to overcome obstacles
Orange	Abnormal psychological processes or drug abuse	Refer to an appropriate specialist service

not fade but was clearly visible. The patient's feet were hairless, anhidrotic, he had tapering of the toes and a circulatory return greater than 20 seconds. The patient was apyrexia with a temperature of 36.5°C and an Hb(a)1c of 93 mmol/mol.

THE PATIENT'S PERSPECTIVE

The podiatry service was keen to establish why Gary had chosen not to engage with his care and to see whether the service could improve the situation. Gary explained that he was addicted to heroin and didn't enjoy coming to health centres. He reported feeling judged and felt health workers thought he was only after drugs. Gary said that seeing different people each time made attending appointments harder as he was embarrassed about his past and his addiction; explaining his situation to a new face each time terrified him.

As the pain in Gary's legs became more severe around the time he presented at A&E, Gary reported that only heroin relieved it. Gary explained that his GP would only prescribe him paracetamol due to his history of substance abuse. When Gary wanted to attend, he reported not being able to afford the taxi fare and, due to the pain, was unable to ambulate sufficiently to use public transport. Gary lives in one of the poorest areas of the country and an increased incidence of drug dependence is directly linked with socioeconomic deprivation (Kendler et al, 2014).

LATER DIAGNOSTIC ASSESSMENT

In this complex case, the podiatry service made a preliminary diagnosis of critical limb ischaemia of the left leg on the basis of the patient's ABPI (*Table 2*)

and pressures, as well as the presence of an ulceration and uncontrolled rest pain for two weeks (Smith et al, 2014). The presence of diabetes means that artificially elevated pressure readings caused by medial artery calcification could not be ruled out. In such instances, it is preferable to refer the patient for a type of imaging that is less affected by arterial calcification, e.g. duplex imaging.

The patient's critical limb ischaemia had resulted from deterioration of his antecedent PAD. The wound had a severe, intractable infection, with probable osteomyelitis with or without gas in the tissues. The patient's ischaemia and diabetes may have prevented him experiencing systemic inflammatory response syndrome (SIRS) as an intact nervous and peripheral vascular system are necessary for the manifestation of inflammatory signs (Edmonds and Foster, 2004).

Table 2. The patient's ankle-brachial index measurements (ABPI)

Left	Right
Brachial: 138 mmHg (triphasic)	Brachial: 150 mmHg (biphasic)
Anterior tibial: 48 mmHg (monophasic)	Anterior tibial: 70 mmHg (monophasic)
Posterior tibial: 60 mmHg (monophasic)	Post tibial: 80 mmHg (monophasic)
Peroneal: (inaudible)	Peroneal: inaudible
Popliteal: not palpable (monophasic)	Popliteal: palpable (monophasic)
Femoral: palpable (biphasic)	Femoral: palpable (biphasic)
ABPI: 0.4	ABPI: 0.53

On hospitalisation, the patient was diagnosed with osteomyelitis of the fifth metatarsal. The presence of gas within his tissues was confirmed and angiography verified that he had critical limb ischaemia and calcification of the medial artery.

LATER THERAPEUTIC INTERVENTION

Although this was a moderate infection, the presence of ischaemia necessitated the patient's hospitalisation under the vascular surgery team. It was important to address the patient's vascular supply as limited supply would result in insufficient bioavailability or perfusion of oral antibiotics to where they were needed (Chang et al, 1996). Patients with an infected limb that appears to be ischaemic should be referred to a surgeon with vascular expertise (Lipsky et al, 2013).

The patient was treated with intravenous antibiotics prior to undergoing a repeat femoral tibio-peroneal trunk bypass graft using his right, reversed, long saphenous vein. He returned to theatre one week later for debridement and amputation of his left fifth metatarsal.

The patient continued with intravenous antibiotics for two weeks and opioid analgesia to control his pain post-operatively. Topical negative pressure was applied to the wound for two weeks to aid wound closure. Gary mobilised on the ward and recovered well. He was referred back to the podiatry high-risk clinic upon discharge to await endovascular surgery of his right leg.

CONCLUSION

This case study raises the question of whether amputation could have been avoided if the podiatry service had accounted for the patient's whole biopsychosocial picture. While it's hard to say whether amputation could have been avoided, use of the 'flag tool' (see *Figure 1*) could have highlighted the areas where further support could have been offered. While the flag tool was primarily designed for lower back pain (Nicholas et al, 2011), it could easily have been transcribed for use in this clinical situation.

If the fact the patient couldn't ambulate sufficiently to use public transport and lacked the funds for a taxi had been noted as black flags, an ambulance could have been arranged for his hospital appointments. If the podiatry service had noted the patient's feelings of shame and yellow flagged them, the service could have arranged for him to see the same clinician on each visit.

Ischaemic pain can be tortuous and should be controlled with paracetamol or the appropriate strength of opioids (NICE, 2004). Patients who are recovering from drug addiction sometimes reject analgesia but this should be their choice. The patient's drug addiction and risk of relapse could have been orange flagged to enable a specialist team to deal with this issue sooner. Drug addicts are often prejudged as seeking medication. However, an open-minded approach and a case-by-case assessment is needed.

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