

Management of complex pressure ulcer affecting paraplegic patient: a case study

KEY WORDS

- ▶ Osteomyelitis
- ▶ Pressure ulcer
- ▶ Topical negative pressure therapy (TNPT)
- ▶ Paraplegic

Background: Pressure damage in paraplegic patients is difficult to manage due to their limited mobility. Topical Negative Pressure Therapy (TNPT) has successfully been used for different types of wounds, including cavity wounds, leg ulceration and pressure ulcers (PU). The introduction of TNPT with instillation (TNPTi) has increased the categories of wounds that can be treated. **Aim:** To describe the wound management of an unstageable pressure damage with underlying osteomyelitis. **Methods:** Observation of the care provided to a patient presenting with an unstageable pressure damage on admission. On further investigation osteomyelitis was found. **Results:** Following 3 months of the application of TNPTi, the wound size had reduced significantly, making it suitable for flap surgery. The benefits of undertaking flap surgery after an overall short time thanks to this treatment includes also the psychological and social aspects of the patient's life. This also reflected in a positive impact on the patient's wellbeing and reduced length of hospitalisation. **Conclusions:** The use of TNPTi positively affected the healing process of an unstageable PU presenting with osteomyelitis. Further studies are needed to validate the effectiveness this treatment regimen.

A pressure ulcer (PU) is a localised damage to the skin and/or underlying tissue caused by pressure or pressure in combination with shear. PUs usually occur over a bony prominence but may also be related to a medical device or other object (EPUAP et al, 2019). According to Kaka et al (2019), one-third of category IV PUs may develop osteomyelitis. Osteomyelitis is an acute or chronic bone infection (Uckay et al, 2012). Hogan et al (2013) stated that the standard diagnostic sequence for acute osteomyelitis is: medical history, x-ray and C-reactive protein levels (CRP). Furthermore, diagnosis of chronic cases can be confirmed with MRI, CT, scintigraphy, positron emission tomography (PET), PET-computed tomography (PET-CT) and bone biopsy. The primary cause of osteomyelitis is a bacterial infection that causes loss of bone mass (Lio et al, 2012). Management of osteomyelitis includes treatment with antibiotics and surgical intervention (Espejo et al, 2018). Johnson-Kunjukutty (2019) highlights how osteomyelitis impacts on patients' quality of life, especially in relation to delayed wound

healing. Paraplegic patients present a higher risk of developing pressure damage due to reduced mobilisation and sensibility (Palayer et al, 2014). Also, a documented complication in paraplegic patients is the frequent recurrence of pressure damage (Kruger et al, 2013) related to patient behaviour ie non-adherence to the care plan (De Laat et al, 2017). Furthermore, to optimise patient's adherence to a care plan, it is important to set realistic expectations (Jeffcoate, 2012).

In recent years topical negative pressure therapy (TNPT) has successfully been used to treat different types of wounds, including cavity wounds, diabetic foot ulcers (DFU), leg ulceration and PUs (Malahisia et al, 2012). However, this advanced therapy still presents limitations in specific clinical cases. According to Bovill et al (2008) it is not advisable to apply negative pressure over: active bleeding or exposed blood vessels, exposed undermining structures, devitalised tissues or extended systemic infections. Also, the treatment is excluded due to malignancy (Velnuri et al, 2005).

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The introduction of TNPT with instillation (TNPTi) has expanded the category of wounds that can benefit from this therapy, although the contraindication for exposed organs or vessels, active bleeding and malignancy remains. The TNPTi alternates negative pressure to periods of soaking the wound, usually with saline solution. The operator can modify the length of soaking and application of negative pressure to optimise the therapy. These actions actively soften the slough tissue and perform a wound debridement each time that topical negative pressure restarts (Gupta, 2016). Also, according to a literature review by Back et al (2013), TNPTi is a suitable dressing for acute or chronic infected wounds. However, it is advised to change the irrigation solution to an antimicrobial.

METHODS

This is a case study of a young patient who underwent TNPTi to treat a significant unstageable PU that was community acquired. The patient presented with a complex past medical history (PMH) including paraplegia, a previous category four PU on a different body area, and underlying osteomyelitis on different anatomical sites.

The multidisciplinary team (MDT) who treated the patient comprised of tissue viability team (TVT), ward's medical team, plastic team, bone infection team, physiotherapist team and dietetics team. TNPTi was set on three hours of negative pressure application and 8 minutes of wound soaking. The negative pressure was set at -125mmHg . The quantity of fluids used for the irrigation was different at each dressing depending on the wound dimensions and the quantity of foam used. However, the manufacture indication for use have been followed. The foam used during the treatment was a foam specific for debridement. TNPTi and TNPT dressing were changed using sterile technique every Monday, Wednesday and Friday. An adhesive removal solution was suggested to avoid damage to the area surrounding the wound. The suggested method for dressing change was to soak the wound for 15 minutes with sterile gauze and a polyhexamethylene biguanide (PHMB) solution and barrier cream over the wound's edge. It was recommended to frame the wound with a hydrocolloid dressing to improve dressing sealing and protect the skin. A bridging technique was used

to reduce risk of pressure damage related to tubing lying underneath the patient. Also, this would favour a more effective adherence of the connector to the dressing to avoid losing the pressure.

RESULTS

On the day of admission, the patient was reviewed by the TVT (*Figure 1*). The initial wound dimensions were 9cm width and 7cm length. It wasn't possible to assess full depth due to thick necrotic tissue. Therefore, the ulcer is classified as an unstageable PU on ischial tuberosity. The surrounding area showed signs of infection including, extended erythema and increased temperature. It wasn't possible to assess level of pain from the wound due to the underlying patient's medical history. An initial sharp debridement was undertaken by a tissue viability nurse consultant removing loose necrosis. However, it was only possible to remove a small superficial area, therefore, a referral was made to the plastic surgery team for surgical debridement. Meanwhile a care plan of repositioning was started, and the mattress was upgraded to dynamic mattress to meet the patient's needs. The interim treatment was based on current wound assessment and dressings were chosen to based on the wound characteristics (National Institute for Health and



Figure 1. Wound presentation (admission day)



Figure 2. Wound presentation postoperative debridement



Figure 3. Wound presentation following first topical negative pressure therapy with instillation (TNPTi) dressing change (day 2 of application)

Care Excellence, 2016). The TVT's advice was to use Manuka Honey to soften the devitalised tissue and reduce the bacterial burden. Following surgical debridement, the necrotic tissue had been completely removed. However, the wound bed remained partially covered by thick slough tissue, (Figure 2). At this stage, the patient was referred to the TVT for ongoing wound management. A new wound assessment was performed by a TVN. After removal of necrotic tissue, the PU was reclassified to category IV PU with exposed undermining structures. The wound's dimensions

were 9x7x8cm (length, width, depth) with a wound bed covered for the 10% by healthy granulation tissue, 80% slough tissue and 10% bone. Also, a persistent malodour was added to the previously acknowledged signs of infection. In consideration of the patient's PMH of osteomyelitis and current wound's presentation, a MRI scan was requested to rule out the presence of underlying active osteomyelitis of the ischial tuberosity.

The scan confirmed presence of osteomyelitis on ischial tuberosity. The medical team decided to continue previous antibiotic therapy with co-amoxiclav (amoxicillin/clavulanic acid) and started treatment with gentamicin. The decision was also made to include the bone infection team in the MDT. The wound management was then reviewed to determine the new wounds treatment plan. The decision was to commence TNPTi using PHMB as instillation solution. At the first TNPTi dressing change it was already possible to appreciate an improvement in the wound bed (Figure 3). The wound's dimensions were 8x6x8cm with the wound bed covered by 20% healthy granulation tissue, 70% slough tissue and 10% bone. The slough tissue appeared to start detaching from wound bed. There was no change in the presentation of signs for infection. The surrounding skin started to appear dry. A new blue discolouration of the wound bed was acknowledged during this dressing change (Figure 4). No obvious explanation was found. Therefore, the decision was made to stop the treatment with PHMB solution and use saline solution in the TNPTi cycles. The wound's presentation was reassessed: 8x5.5x6cm with a wound bed covered for the 55% by healthy granulation tissue, 40% slough tissue and 5% bone. The signs of infection were considerably attenuated and only the malodour remained. The wound bed returned to a normal colour presentation. After the third dressing change (Figure 5) the wound's dimensions were 8x5x6cm with a wound bed covered for the 70% by healthy granulation tissue, 15% slough tissue and 5% bone. The slough tissue appeared more detached from the wound bed and there were no obvious sign of infection. At this stage, as there was no concerns about the wound and it was beginning to heal, wound management was handed over to ward nurses. The TNPTi continued for another week. Once the slough



Figure 4. Wound presentation at day 5 of treatment with negative pressure therapy with instillation



Figure 5. Wound presentation at day 7 of treatment with negative pressure therapy with instillation

tissue was almost removed, the management plan was reviewed. The ultimate aim was for plastic surgery to close the wound. This required further reduction in the wound size before the patient could be considered suitable for surgery. Therefore, the wound management was changed to standard TNPT. This therapy was continued with three dressing changes per week for a further two months. At this stage the wound was reviewed by

plastic surgery team. The wound presentation was 4x4.5x4.5cm, it was covered for 10% by epithelial tissue, 85% healthy granulation tissue and 5% slough tissue. Given the considerable improvements using TNPT, it was then decided to continue with a conservative management using TNPT avoiding a surgical intervention.

While the patient was in hospital (three months) he has been treated with TNPTi and TNPT; the wound size has reduced by nearly 54% compared with initial dimensions. This made the wound suitable for further flap surgery. However, the surgical team decided to proceed with a conservative management to avoid further distress for patient. Opting for a conservative management also allowed the patient to be discharged and return to a more familiar environment surrounded by his loved ones. However, this discharge was delayed due to a long waiting list for a Council house suitable for his needs. The TNPT treatment was continued also in community. This continued to facilitate wound healing.

DISCUSSION

In this study, the use of TNPTi had a clear positive impact on wound's healing trajectory. The wound dimensions have reduced. Also, the wound bed presentation has consistently improved. The slough tissue presentation has decreased from 80%, at the beginning of the TNPTi use, to 5% during the last dressing change. In this case study the length of hospitalisation was affected by the availability of a Council house to meet patient's needs. Otherwise, after one month of treatment the wound was classified as suitable for community treatment and, consequentially, for discharge. The possible reduction of hospitalisation length reduces the costs compared with traditional dressing (Stannard et al. 2010; Khalil et al, 2016). Dowsett et al (2012) highlight the cost-effectiveness of TNPT with a potential saving on average of £16,000 per patient, if patients are discharged to community. Also, the patients' perspective should be considered, the potential reduction of hospitalisation time allows patients to return to their home environment earlier and be closer to their loved ones. This it is also proved to improve patient's wellbeing (Muroma-Karttunen, 2013). However, in order to support a healing process, the mere dressing management is not sufficient. In fact, a holistic plan with MDT

approach had to be made (Spitilli et al, 2014). In the management of pressure damage, the first objective is to remove the cause for the PUs development (Fuijwara et al, 2020). This wound was mainly related to the prolonged time spent on wheelchair with an inadequate pressure relieving cushion. Therefore, patient was referred to occupational therapy and physiotherapist team (PT) to recommend and request a pressure relieving cushion suitable for his needs. The PT provided exercises and a strategy to improve patient's mobility. A key part of this successful management is the joint follow-up with the TVT and plastic team or BIU team to update and coordinate the care plan in collaboration. Also, PU prevention information was provided, patient's self-repositioning technique for wheelchair were taught and patient's package of care was increased to four times a day.

CONCLUSION

The treatment with TNPTi followed by standard TNPT, resulted to be a safe and time saving treatment to support the healing process for a category 4 PU with underlying osteomyelitis. This treatment has improved different aspects such as wound healing and the patient's psychological, social, self-confidence. The resolution of the PU facilitates patient's independence. This case study suggests that collaboration in the MDT and the application of TNPT can positively affect the management of complex PU with exposed undermining structures affected by osteomyelitis. However, four months after discharge the patient had been readmitted with a new unstageable pressure damage on the right ischial tuberosity. Further studies should be undertaken to validate strategies to avoid recurrence of pressure damage after discharge.

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Declaration of interest:

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