

Device related pressure ulcers

made
easy

Introduction

Pressure ulcers remain a common complication of health care despite intensive prevention strategies and growing strategic interest. In addition to patient pain and discomfort, there is a risk of developing further complications such as infection with increased morbidity and mortality. It is known that a significant proportion of pressure ulcers in critically ill or immobile patients are related to the use of medical devices (Black et al, 2010). These are not always avoidable and require new techniques to help reduce or prevent skin damage beneath medical devices.

Author: *Fletcher J*

PRESSURE ULCERS – EXTENT OF THE PROBLEM

Pressure ulcers occur in all age groups and across all care settings. Their frequency has been described extensively at local, within speciality (Kottner et al, 2010), national (VanGilder et al, 2009) and international (Vanderwee et al, 2006) levels. In the UK, guidelines for pressure ulcer prevention have been in existence for several years (CREST, 1998; NICE, 2003, 2005; All Wales Tissue Viability Nurses Forum, 2011) and the majority of organisations base their own guidelines on these or, more recently, on the revised EPUAP/NPUAP (2009) guidelines, for example, the All Wales Guidance (2011).

There is a large volume of literature focused on the prevention of pressure ulcers using specialist beds, mattresses, cushions and repositioning. This is because the majority of pressure ulcers occur over bony prominences, most typically on the sacrum and heels. However, very little of the literature or sets of guidance specifically identify the problem of pressure ulcers related to the use of medical devices, which are becoming increasingly prevalent (see Table 1). It is therefore important to raise the level of awareness among staff on the correct placement and fixation of devices.

WHY DO DEVICE RELATED PRESSURE ULCERS OCCUR?

Medical devices including nasogastric tubes and ventilation masks are made of rigid materials such as plastic, rubber or silicone, which can cause rubbing or create pressure on the

soft tissues (Jaul, 2010). In addition, adhesive tapes used to secure the device may irritate susceptible skin, especially if oedema then develops around the device (Black et al, 2010). The insertion site of a device (Moreiras-Plaza, 2010) or the location of the device placement are most susceptible to tissue damage (Ong, 2009; Hogeling et al, 2012).

Preventing device related pressure ulcers is often much more complex than preventing pressure ulcers over the usual anatomical sites, such as the heels, sacrum or trochanter. This is because the device causing the damage often forms an essential part of the patient's treatment – for example, the use of a facemask in delivering non-invasive ventilation (Figures 1-3). In addition, there may be a number of predisposing factors such as incontinence, malnutrition and altered levels of consciousness or sensation (Coulborn and Verrall, 2010). Paediatric patients in particular may be at risk of tissue damage due such their inability to sense devices properly (Schlüer et al, 2009).

However, many device related pressure ulcers occur because of poor positioning or fixation of the equipment (Mulgrew et al, 2011), poor selection of equipment (Ong, 2009) or simply because of a failure to check that the tubing (eg from a

Table 1 Published frequency of device related pressure ulcers

Reference	Type of device	Frequency
Davies et al (1995)	Cervical collars	33% up to 5 days 44% over 5 days
Wille et al (2000)	Pulse oximetry	5%
Jones et al (1994)	NIPPV masks	17% 55% experienced discomfort
Boesch et al (2012)	Tracheostomy	8.1% pre-intervention 0.3% post-intervention
Jaul (2011)	Various (tubes, catheters and fixation tape)	6/26 hospital acquired pressure ulcers
Weng (2008)	Non-invasive ventilation	96.7% in control group 53.3% in intervention group
VanGilder et al (2009)	Not specified	10%
Apold et al (2012)	Various, including stabilisation collars and other immobilisers, respiratory equipment, orthotics and tubing	29%
Black et al (2010)	Not specified	34.5%

urinary catheter) is repositioned correctly when patients are moved (VanGilder et al, 2009).

Many device related pressure ulcers occur on the head or neck and are less frequently associated with a bony prominence, unlike non-device related pressure ulcers, which occur more frequently below the waist (Apold and Rydrych, 2012) (Table 2).

Tissue damage may mimic the shape of the device and deteriorate rapidly, for example when located in an area where there is a lack of adipose tissue. To avoid pressure ulcers from occurring in any location of the body, it is important to inspect all external tubing and devices. This may involve ensuring the tubing is not placed under the body and is completely visible (Jaul, 2011).

ARE ALL DEVICE RELATED PRESSURE ULCERS AVOIDABLE?

On some occasions pressure damage is unavoidable as a consequence of saving the patient's life (BHTVNF, 2010; NHS Midlands and East, 2012). For example, a continuous positive airway pressure (CPAP) mask must have a tight and complete seal to maintain the patient's breathing. While actions may be taken to reduce potential damage, it is vital that the seal is not compromised. This can become very difficult to manage, especially if the patient develops oedema from fluid resuscitation, which makes the skin increasingly susceptible to damage (Black et al, 2010).

CLASSIFYING SEVERITY OF TISSUE DAMAGE

In a review by Apold and Rydrych (2012), the tissue damage related to medical devices was primarily graded as a category 3, 4 or unstageable pressure ulcer, with 74% of lesions not identified until they had become more advanced. A detailed prospective study by Black et al (2010) found that the majority of device related pressure ulcers (35%) were category 1, with 32% being category 2, 3% category 3 and 24% unstageable. It must be noted however that in the head and neck region, for example, the bridge of the nose or on the ears, there is very little tissue and therefore it is more likely that full thickness damage can occur.

Table 2 Pressure ulcer location from information on 255 hospital acquired category 3, 4 or unstageable pressure ulcers (Apold and Rydrych, 2012)

Body location	Device related PU n (%)	Non-device related pressure ulcers n (%)
Head/face/neck	45 (70.3)	12 (7.8)
Other/multiple	14 (21.9)	9 (5.8)
Heel/ankle/foot	13 (20.3)	26 (16.9)
Coccyx/buttocks	5 (7.8)	104 (67.5)
Sacrum	1 (1.6)	26 (16.9)

PREVENTING DEVICE RELATED PRESSURE ULCERS

A variety of strategies have been proposed to prevent device related pressure ulcers, including:

- Correct positioning and care of the equipment. This includes appropriate fixation and stabilisation of the device (Apold and Rydrych, 2012; Boesch et al, 2012)
- Use of thin hydrocolloids, film dressings or barrier products underneath the device to reduce moisture, friction and shear (Weng, 2008; Huang et al, 2009; Jaul, 2011; Iwai et al, 2011; Boesch et al, 2012)
- Use of pressure reducing dermal gel pads, eg ADERMA^Δ (Smith & Nephew) (Large, 2011).

These interventions should be used in combination, with the priority placed on the correct positioning and care of the equipment (Minnesota Hospital Association, 2011). If it is then identified that the device is likely to cause damage, consideration should be given to the use of protective dressings (Table 3) and/or dermal gel pads to ameliorate the effects of the device wherever possible.

Preventative care should include thorough and repeated assessments of the skin underneath and around devices. Vulnerable patients with, or at risk of oedema, should be identified as well as patients with sensory deficits (Black, 2010). To help prevent damage, the device should be loosened at least once per shift (if compatible with the medical condition) to allow for a thorough skin assessment.



Figure 1: Placing a dermal gel strip under a tracheostomy tube to prevent tissue damage



Figure 2: Dermal gel strip in situ. The gel pad sits comfortably under the device and does not add to the overall bulk.



Figure 3: Tissue damage due to pressure from an external splint.

Table 3 Evidence for the use of dressings to reduce device related pressure damage

Study	Method	Findings
Apold and Rydrych (2012)	Data collection for hospital-acquired pressure ulcers, focusing on the use of cervical collars and respiratory equipment	A variety of devices can be used to prevent pressure damage, including: <ul style="list-style-type: none"> ■ Foam tracheostomy straps to hold oxygen cannula in place and away from the ears ■ Specialist fabrics that may help manage the skin microclimate (Wollina et al. 2003)
Huang (2009)	Initial intubation of four pigs to study nasal-ala pressure ulcers caused by nasotracheal intubation and the effects of the cushioning materials to prevent tissue damage. Procedure repeated in 10 patients and compared with a control group consisting of eight patients.	Control group patients who did develop pressure damage had much smaller pressure ulcers (8.0mm ² as compared to 35.2mm ² without dressing) and about 40% of the patients did not develop pressure ulcers at all. The use of a soft denture liner and a thin hydrocolloid dressing reduced the size and severity of nasal-ala pressure ulcers
Iwai et al (2011)	Review of the use of a thin hydrocolloid in their practice in patients with nasal pressure ulcers after nasotracheal intubation	Thin hydrocolloids are easy to cut, shape and apply around the nasal area and prevents friction under the tubing
Weng (2008)	A prospective study to compare the efficacy of protective dressings or using no materials in patients undergoing non-invasive treatment via a face mask	The patients in the dressings groups had fewer pressure ulcers than the control group (p<0.01)
Boesch et al (2012)	Study to test intervention model including frequent skin assessment and a 'lite' silicone-based foam product to reduce moisture and pressure at the device interface in 834 children with tracheostomy	Significant decrease in the rate of patients of developed a tracheostomy-related pressure ulcer

USING DERMAL GEL PADS FOR DEVICE RELATED PRESSURE ULCERS

Dermal gel pads (eg ADERMA[®]) can be used in conjunction with pressure relieving devices and barrier creams and films to reduce and redistribute pressure away from critical areas while also reducing friction. The pads are 'similar to fatty tissue', can be placed under the device to protect vulnerable skin and be used in a range of anatomical areas, including the head, ears, nose, neck and shoulders, as well as the sacrum and heels. They are non-adhesive to allow for regular inspection and can be held in place under the device or using the patient's own garments. They

are for single patient use, but can be washed and re-used for the same patient.

Dermal pads have been shown to reduce hospital-acquired pressure ulcers by 87% and have contributed to a 75% decline in the overall number of pressure ulcers (Leonard, 2008). When used as part of a community-based prevention programme in patients with incontinence and at risk of pressure ulceration, the incidence of pressure ulcers was eliminated during the study period. This also led to a reduction in costs for ongoing wound care (Large, 2011).

IMPROVING OUTCOMES

Dermal gel pads (eg ADERMA[®]) are not recommended for use on open wounds. However, the illustrations below show areas where pressure damage may have been prevented if appropriate pressure reduction strategies had been initiated.



Figure 4: Pressure ulcers occur on ears where several devices are squeezed into a tight space. In this example, the patient was a spectacle wearer and also required oxygen therapy via a nasal speculae, which were secured over the ears. Dermal gel strips could have been secured either to the ear or if more comfortable around the tubing/arms of the glasses to minimise the risk of pressure damage.



Figure 5: This patient had polio as a child and was wearing an old fashioned calliper with a rolled leather top. Due to other medical problems, the leg had become oedematous and friction and pressure had been caused by the leather. The use of a thin (3mm) dermal gel pad may have prevented this damage from occurring without significantly increasing the overall size of the limb.



Figure 6: Pressure ulcers on the head occur in patients who need to be nursed without pillows. The skull has no fatty (adipose) covering so the bone is almost directly in contact with the skin. In this instance a thicker dermal gel pad (12mm) would be recommended. The thickness of the pad is not sufficient to change the patient's position and cause destabilisation, but is thick enough to support the head and distribute significant pressure.

SUMMARY

It is known that the occurrence of a pressure ulcer causes the patient pain and discomfort and can increase length of stay in hospital or requirement for care if managed in the community. For those patients with medical devices in situ, it is essential to implement strategies that minimise risk for the patient and offer a high standard of care. This will include regular inspection of the skin, the use of an appropriate support surface and dressings or dermal gel pads to reduce or prevent tissue damage.

AUTHOR DETAILS

Fletcher J

*Wound Healing Research Unit, School of Medicine,
University of Cardiff, Wales*

REFERENCES

All Wales Tissue Viability Nurses Forum (2011) Essential Elements of Pressure Ulcer Prevention All Wales Guidance. Available from: http://www.welshwoundnetwork.org/dmddocuments/all_wales_guidance_for_the_prevention_and_management_of_pressure_ulcers.pdf

Apold J, Rydrych D (2012) Preventing device related pressure ulcers. Using data to guide statewide change. *J Nurs Care Qual* 27(1): 28–34

BHTVNF (2010) Regional round up, definition of Unavoidable. *Wounds UK* 6(4):198 Available from: http://www.wounds-uk.com/pdf/content_9714.pdf

Black JM, Cuddigan JE, Walko MA, et al (2010) Medical device related pressure ulcers in hospitalised patients. *Int Wound J* 7(5): 358–65

Boesch RP, Myers C, Garrett T, et al (2012) Prevention of tracheostomy-related pressure ulcers in children. *Pediatrics* 129(3): 792–97

CREST (1998) Guidelines for the prevention of pressure sores: recommendations for practice <http://www.gain-ni.org/Publications/Guidelines/wound-management-pressure-sores.pdf>

Coulborn A, Verrall (2010). Report on clinical evaluation: Aderma Dermal Pads in prevention and reduction of pressure injuries. Available from: <http://www.focuspd.com/tissue%20viability%20consultancy%20services%20ltd%20-%20pilot%20study.pdf>

Davis JW, Parks SN, Dettlefs CL, et al (1995) Clearing the cervical spine in obtunded patients: the use of dynamic fluoroscopy. *J Trauma* 39(3): 435–8

EPUAP / NPUAP (2009) Treatment of pressure ulcers: Quick Reference Guide. http://www.epuap.org/guidelines/Final_Quick_Treatment.pdf

Hogeling M, Fardin SR, Frieden IJ, Wargon O (2012) Forehead pressure necrosis in neonates following continuous positive airway pressure. *Pediatr Dermatol* 29(1): 45–48

Huang TT, Tseng CE, Lee TM, et al (2009) Preventing pressure sores of the nasal ala after nasotracheal tube intubation: from animal model to clinical application. *J Oral Maxillofac Surg* 67: 543–51

Iwai T, Goto T, Maegawa J, Tohnai I (2011) Use of a hydrocolloid dressing to prevent nasal pressure sores after nasotracheal intubation. *Br J Oral Maxillofac Surg* 49: e65–e66

Jaul E (2011) A prospective pilot study of atypical pressure ulcer presentation in a skilled geriatric unit. *OstomyWound Manage* 57(2): 49–54

Kottner J, Wilborn D, Dassen T (2010) Frequency of pressure ulcers in the paediatric population: A literature review and new empirical data. *Int J Nurs Stud* 47(10): 1330–40

Large J (2011) A cost-effective pressure damage prevention strategy. *Br J Nurs* 20(6 Suppl): 22–25

Leonard S, Ormond K (2008) An evaluation of a shaped dermal pad and their influences on pressure ulcers in an acute foundation trust, poster presentation, Wounds UK conference Harrogate.

Minnesota Hospital Association (2011) Device-Related Pressure Ulcer Prevention — Respiratory Devices Recommendations and Guidance. Available from: <http://www.mnhospitals.org/index/tools-app/tool.353?view=detail>

Moreiras-Plaza M (2010) Abdominal wall skin pressure ulcer due to a peritoneal catheter. *Perit Dialysis Int* 30(2): 257–58

Mulgrew S, Khoo A, Newton RM, Kumar K (2011) Pressure necrosis secondary to negative pressure dressing. *Ann R Coll Surg Engl* 93(5): e27–8

NHS Midlands and East (2012) Definition of unavoidable pressure ulcer. Available from: <http://www.stopthepressure.com/path/docs/Definition%20unavoidable%20PU.pdf>

NICE (2003) CG7 Pressure ulcer prevention: Pressure ulcer risk assessment and prevention, including the use of pressure-relieving devices (beds, mattresses and overlays) for the prevention of pressure ulcers in primary and secondary care. Available from: <http://publications.nice.org.uk/pressure-ulcer-prevention-cg7/appendix-b-the-guideline-development-groups#pressure-ulcer-risk-assessment-and-prevention-2>

NICE (2005) CG29 Pressure ulcers: The management of pressure ulcers in primary and secondary care. Available from: <http://publications.nice.org.uk/pressure-ulcers-cg29>

Schluer AB, Cignacco E, Müller M, Halfens RJ (2009) The prevalence of pressure ulcers in four paediatric institutions. *J Clin Nurs* 18:3244–52

Ong JC, Chan FC, McCann J (2011) Pressure ulcers of the popliteal fossae caused by thromboembolic deterrent stockings (TEDS). *Ir J Med Sci* 180(2): 601–2

Vanderwee K, Clark M, Dealey C, Gunningberg L, Defloor T (2006) Pressure ulcer prevalence in Europe: a pilot study. *J Eval Clin Pract* 13(2): 227–35

VanGilder C, Amlung S, Harrison, Myers S (2009) Results of the 2008–2009 International Pressure Ulcer Prevalence Survey and a 3-year, acute care, unit-specific analysis. *Ostomy Wound Manage* 55(11): 39–45

Weng MH (2008) The effect of protective treatment in reducing pressure ulcers for non invasive ventilation patients. *Intensive Crit Care Nurs* 24(5): 295–9

Wille J, Braams R, van Harren W, van derWerken C (2000) Pulse oximeter-induced digital injury: frequency rate and possible causative factors. *Crit Care Med* 28(10): 3555–7

Woolina U, Heidi M, Müller-Litz W, Obenauf D, Ash J (2003) Functional textiles in prevention of chronic wounds, wound healing and tissue engineering. In: Elsner P, Hatch K, Wigger-Alberti W (Eds): *Textiles and the Skin*. *Curr Probl Dermatol* 31: 82–97

Content prepared and submitted by author. Financial support for publication provided by Smith & Nephew
To cite this document: Fletcher J (2012) Device related pressure ulcers made easy. *Wounds UK* 8(2).
Available from www.wounds-uk.com