

ORIGINAL ARTICLE

Cohort study of atypical pressure ulcers development

Efraim Jaul

Department of Skilled Geriatric Nursing, Herzog Hospital, Affiliated with the Hebrew University Hadassah Medical School, Jerusalem, Israel

Key words

Atypical pressure ulcer; Bony deformities; Iatrogenesis; Medical devices; Spasticity

Correspondence to

E Jaul, MD, MPH
Director, Department of Skilled Geriatric
Nursing
Herzog Hospital
PO Box 3900
Jerusalem 91035
Israel
E-mail: jaul@zahav.net.il

doi: 10.1111/iwj.12033

Jaul E. Cohort study of atypical pressure ulcers development. *Int Wound J* 2014; 11:696–700

Abstract

Atypical pressure ulcers (APU) are distinguished from common pressure ulcers (PU) with both unusual location and different aetiology. The occurrence and attempts to characterise APU remain unrecognised. The purpose of this cohort study was to analyse the occurrence of atypical location and the circumstances of the causation, and draw attention to the prevention and treatment by a multidisciplinary team. The cohort study spanned three and a half years totalling 174 patients. The unit incorporates two weekly combined staff meetings. One concentrates on wound assessment with treatment decisions made by the physician and nurse, and the other, a multidisciplinary team reviewing all patients and coordinating treatment. The main finding of this study identified APU occurrence rate of 21% within acquired PU over a three and a half year period. Severe spasticity constituted the largest group in this study and the most difficult to cure wounds, located in medial aspects of knees, elbows and palms. Medical devices caused the second largest occurrence of atypical wounds, located in the nape of the neck, penis and nostrils. Bony deformities were the third recognisable atypical wound group located in shoulder blades and upper spine. These three categories are definable and time observable. APU are important to be recognisable, and can be healed as well as being prevented. The prominent role of the multidisciplinary team is primary in identification, prevention and treatment.

Introduction

While pressure ulcers (PU) phenomenon continues to constitute a common health problem in various medical facilities and health framework is promoting awareness, the atypical ulcers remain unrecognised. Atypical pressure ulcers (APU) are different from the common PU. The difference is that wounds appear in neither common body locations nor the usual aetiology. The site is in unusual places, including the nape of the neck, penis, nostrils, helix of the ears, medial aspect of extremities, and not on the low back area of pelvis and lateral aspect of extremities. The aetiology for APU differs and is not the usual pressure caused by compression of bony prominence and hard surface while lying or sitting (1).

Medical literature has published isolated individual APU case reports but there is a notable absence of a sizable cohort study population of long duration. To date, the research does not specify the identity or percentage of occurrence for APU.

Three categories of aetiology were found in a previous pilot study by the author (2): medical devices as a local (extrinsic) risk factors and severe spasticity and bony deformities as systemic (intrinsic) factors.

Key Messages

- atypical pressure ulcers are distinguished from common pressure ulcers with both unusual location and different aetiology. The aetiology differs and is not the usual compression of bony prominence and hard surface while lying or sitting
- the aetiology is primarily three definable categories: severe spasticity and bone deformity as systemic (intrinsic) factors and medical devices as local (extrinsic) risk factors. These categories are definable and time observable
- atypical pressure ulcers are important to be recognisable, can be healed as well as being prevented. The prominent role of the multidisciplinary team in identity, prevention and treatment of APU is primary
- the main finding identified atypical pressure ulcers occurrence rate of 21% within acquired pressure ulcers over a three and a half year period

It is important to identify and recognise the potential development of APU and to be aware of specific risk factors and the modalities for prevention and treatment in order to minimise complications.

Purpose of the study

This cohort study analyses the occurrence of atypical PU and the circumstances of the causation, and draws attention to the prevention and treatment by appropriate multidisciplinary team.

Methods

The Skilled Geriatric Nursing Department of Herzog Hospital, Jerusalem, consists of a 32-bed ward contained within a major 340-bed psycho-geriatric inpatient health care facility. Admission criteria to the skilled geriatric nursing ward include one or more of the following: extensive PU grade 3 or 4, bed-bound oxygen dependence and/or non invasive ventilation (continuous positive airway pressure (CPAP) use), tracheostomy use, terminal cancer requiring palliative care, bed-bound renal failure requiring haemodialysis and tube feeding. Patients are referred from medical facilities throughout the country, and treatment is supported by the major health funds.

Each patient upon admission is assessed by diverse staff disciplines. The nurse performs a skin examination and the assessment of Norton Scale. The attending physician undertakes physical examination and a routine blood analysis including serum albumin and haemoglobin levels, total lymphocyte count and the Glasgow Coma Scale that measures the level of consciousness (score range 3–15, with a score below 10 indicating vegetative state) (3). The dietician assesses the weight, body mass index, and recommended appropriate calorie and protein intake. Rehabilitation treatment requires the physical therapy (PT) and occupational therapy (OT) to evaluate the muscle tonus and cognitive state of the patient, and the speech therapist concentrates on swallowing capacity. The social worker assesses the emotional and economic resources of the patient and family.

As a preventive measure, each patient upon admission receives pressure relief devices consisting of an air alternating-pressure mattress overlay and foam cushion for sitting.

The standard recommended nutritional support consists of 30–50 kcal/kg/day, including 1–1.5 kg protein/day, given either orally or by tube feeding (nasogastric or percutaneous endoscopic gastrostomy).

The unit incorporates two weekly combined staff meetings. One concentrates on wound assessment including the site, appearance, grade and size, with treatment decisions made in a team approach by the physician and nurse, and the other, a multidisciplinary team reviewing all patients and coordinating treatment. Policy changes are generally instituted from these weekly meetings, recognising that alternative treatment may be decided during daily visits. Ongoing treatment is coordinated by the nurse with each discipline and auxiliary staff.

A PU assessment and data collection sheet used as the investigative tool are described in detail in a previous study (2).

Design

The duration of the cohort study spanned three and a half years starting from July 2008 through the end of December 2011. It includes a previous pilot study and is an integral part of a continuing ongoing study.

Site

The patients were located in the Skilled Nursing Department of the Herzog Hospital, Jerusalem.

Results

Study population

The original cohort study lasting three and a half years in the Skilled Nursing Department totalled 174 patients in a consecutive order. A total of 166 new PU were recorded during this study period while patients were hospitalised in the unit.

Among the 166 total new wounds, 35 (21%) atypical wounds were occurring in 23 (13%) patients from the entire study population.

Characteristics of the two groups (the entire group with 174 patients and the APU group with 23 patients) are shown in Table 1. The mean age of the entire group was 77.4 years compared with the mean age of 72 years for those with atypical wounds. Gender distribution was equal between male and female in the entire group in comparison with 35% female and 75% male in the APU group. Married individuals comprised 54% in the entire group versus 48% in the APU group. Hospital stay in the APU group was longer, averaging 451 days compared with 208 days in the entire group.

A comparison of geriatric conditions that require medical devices in both groups (the entire group versus the APU group respectively), indicated higher prevalence of related wounds caused by medical devices in the APU group, including tube feeding (70% versus 91%), urinary catheter (63% versus 65%) and tracheostomy (17.8% versus 26%). The effect of comorbidities had different results for the APU group.

A higher prevalence of neuro-degenerative disease was found in the APU group occurring in: advanced dementia (53% versus 56%), persistent vegetative state (PVS) (14% versus 39%) and Parkinson disease (10% versus 17%). A lower prevalence of cardiovascular disease was evidenced in the APU group occurring in: cerebrovascular accident (40% versus 30%), ischaemic heart disease (47% versus 26%), hypertension (57% versus 30%), peripheral vascular disease (21% versus 13%) and diabetes (41% versus 22%) (Table 1).

Aetiology and location characteristic

The 35 atypical wounds were divided into three categories according to aetiology: medical devices, severe spasticity and bony deformities. Ten wounds were caused by medical devices including: four at the nape of the neck, one on the posterior scalp, one on the chin, one adjacent to the percutaneous gastrostomy tube and one adjacent to the tracheostomy tube in

Table 1 Characteristics of study population*

Characteristics	Atypical pressure	
	Entire group (N = 174)	ulcers group (N = 23)
Age (years) average	77.4	72
Gender (male)	50	75
Married	54	48
Immobility	96	100
Tube feeding	70	91
Urinary catheter	63	65
Tracheostomy	18	26
Global Deterioration Scale (GDS)† mean	6.44	6.4
Glasgow Coma Scale (GCS)‡ mean	11.46	11.5
Total Norton Scale§ mean	9.26	9.3
Advanced dementia	53	56
Persistent vegetative state	14	39
Parkinson disease	10	17
Cerebrovascular accident	40	30
Ischaemic heart disease	47	26
Hypertension	57	30
Peripheral vascular disease	21	13
Diabetes mellitus	41	22
Length of stay (days)	208	451

*Values are in %.

†Global Deterioration Scale (GDS), score range: 1 (no disability) to 7 (severe dementia).

‡Glasgow Coma Scale (GCS), total range 3–15: score 5–9 indicates vegetative state, >10 indicates alert.

§Norton Scale, score range 4–24.

the neck. Two wounds on the penis included one at the urethral meatus next to the exit point of the indwelling urinary catheter and one on the penile shaft where an external urethral catheter had been applied.

Sixteen of the new PU were caused by severe spasticity: ten wounds were on the medial surface of the knee, four on the medial surface of the elbow and two on the ventral surface of the palm. Nine of the new PU were attributable to bony deformities: two wounds occurred on the shoulder blades (scapula), three above upper thoracic spine and four on the ears (Table 2).

The intervention course

The treatment course of the atypical wounds differed according to the categories. The category of medical devices includes: the four wounds appearing in the nape of the neck related to tapes that affix the tracheostomy tube or the oxygen mask used to stabilise. In response, the nursing staff substituted the tightly bound cloth tape with a soft wide plastic tape and added a hydrocolloid dressing directly on the skin to reduce pressure on the wound thereby distributing the pressure over the surrounding skin area, resulting in healing and curing. The wound in the scalp and chin was related to the placement of oxygen tubing. Increased awareness of this problem contributed to its resolution. Of the two atypical wounds on the penis, the one at the urethral meatus next to the exit point of the indwelling urinary catheter was treated by attempting to withdraw the catheter, or to be replaced with a supra-pubic catheter. Initial treatment consisted of thigh fixation,

Table 2 Thirty-five atypical pressure ulcer: location and potential preventive\healing according to category

Category	N	Location	Prevention\healing
10 Medical devices	2	Urethra	Thigh fixation, not pulling
	4	Back of neck	Soft wide tape to avoid tightness, hydrochloride dressing
	1	Tracheostomy	Proper fixation or reducing cannula diameter
	1	Posterior scalp	Increased awareness to placement tube
	1	On the chin	Increased awareness
	1	Gastrostomy	Vertical abdomen fixation, not pulling
16 Severe spasticities	10	Inner knee	Muscle relaxant medication
	2	Ventral surface palm	Passive exercises and inserting a ball
	4	Inner elbow	Exercise, cushion, pressure relief
	9	Bony deformities	More frequent repositioning
9 Bony deformities	2	Shoulder blades (scapula)	
	3	Upper spine	Hydrocolloid dressing
	4	Helix of ears	Pressure relief device

focused on reducing traction on the tube. This approach was subsequently determined to be ineffective, with insertion of supra-pubic catheter proving to be more effective. The second wound on the penile shaft was treated by removal of external urethral catheter and by the use of diapers alone. The atypical wound on the abdominal wall due to tube feeding was treated by vertical abdominal fixation of the tube, reducing traction. The wound in the neck due to a tracheostomy cannula was treated effectively either by using both a collar and proper fixation, or by reducing the cannula diameter. The category of spasticity included 14 atypical wounds found on the inner part of the knees and elbows. The rehabilitation teams worked via passive exercises, splints and offload pillows between the knees and between the chest and elbow. Attempts at manipulating the extremities did not always succeed, only because of the difficulty in extending the knees/elbows. Use of muscle relaxant medications contributed minimal effectiveness. Alternative treatments are examined in the Discussion section.

Additional two atypical wounds on the palmar surface of the hand were treated by the rehabilitation team through the use of passive exercises and by making the patient hold a ball inside the fist to keep the palm opened and to prevent closing the fist and flexing of the fingers. Healing time of the wounds in this category was lengthy and in part without improvement.

Bony deformities include five atypical wounds, three found in the upper vertebrae and two on shoulder blades (scapula). Treatment involved frequent repositioning of the patient on the side by the nursing staff and aides according to the deformities, and the use of hydrocolloid dressing to protect the skin. Additional four atypical wounds in the helix of ears were also treated by positioning and increasing the duration of lying supine and supplying an offload pressure device such as viscoelastic or air inflated cushion (Table 2).

Discussion

Atypical pressure ulcers are distinguished from common PU in both location and aetiology. The locations are unusual, and the aetiology is primarily the three categories of medical devices, severe spasticity and bony deformities. These categories are definable and time observable.

Atypical pressure ulcers accounted for 21% of all department-acquired PU during the entire study period. This finding presents a high reduction rate (50%) in the occurrence of APU differing from the previous pilot study of six months period. The longer duration of the study and the increased number of patients suggests a rising level of awareness for the prevention of development of atypical wounds on the part of the hospital staff.

It is interesting to note that within a comparative study in medical literature, APU are listed as 'other' and account for 13% of all PU (4). Another study describing 'medical device related' wounds found that 34.5% resulted from hospital-acquired PU during eight quarterly (5).

There were comparative differences between the two groups. The APU group had higher rates of advanced dementia, PVS, Parkinson disease and lower rates of cardiovascular disease and diabetes. The higher prevalence of degenerative disease with long hospital duration of 451 days (more than a year) indicates longer survival in the APU group. The entire group, in comparison, had higher comorbidity prevalence due to cardiovascular disease and diabetes, occurring within the shorter hospitalized survival duration averaging 208 days.

Severe spasticity constituted the largest group in this study compared with the previous study in which medical devices were the largest APU group. Severe spasticity caused 16 atypical wounds (primarily in knee, elbow and palms areas).

Applying direct high pressure to the exposed extensor surfaces of knees or elbows caused typical PU resulting in skin being compressed between the patient's bony prominence and the bed or wheelchair. In the further progression of such contractures, 'kissing lesions' are observed, causing APU in both locations where the patient's medial aspects of the elbows press against the chest wall, or the medial aspects of the knees press against each other (6). The palmar surface of the hands developed atypical wounds because of the fist compressing and hurting the skin of the palms. Severe spasticity also has a direct impact on immobility, repositioning and pressure redistribution as well as preventing skin inspection (7). These wounds were the most resistant to treatment and did not respond to conventional treatments, taking 6 months to cure or improve; thus alternative treatments should be considered.

Repositioning and relaxing contractures in those patients are particularly challenging (8). Attainment of certain positions is a physical impossibility. A combination of modalities, including physical and occupational therapy, hand and leg orthoses, serial casting, surgical techniques and medication are needed (9).

A review of literature indicates few case studies with attempts to prevent and heal severe spasticity-caused APU. A report of ten cases with multiple sclerosis cited the release of flexion contractures by using skin flaps and skin grafts and postoperative casting, and immobilisation in a special lamb's

wool sling for the treatment of pressure sore (7). Another study of nine patients with severe cerebral spasticity indicated serial casting for effective treatment of PU at the extremities (10). Recently, a case report citing APU on the popliteal fossa that developed a year after injury to spinal cord (road traffic) in a patient with paraplegia noted the unusual site (11). Another case report presents an unusual site location on external genitals in a female paraplegic for 20 years, but did not recognise spasticity as a cause. The report describes the successful surgical treatment of excision of the lesion tissue and reconstruction of the vulva (12).

The use of medications such as Baclofen and dantrolene, diazepam and tizanidine as muscle relaxant has found limited evidence for the effectiveness in relieving spasticity. There is valid evidence for the use of botulinum toxin and intrathecal Baclofen in reducing spasticity. However, these latter two treatments are invasive and more expensive (13,14).

Severe spasticity appears more frequently and consequently as PU in atypical locations with the increased current prevalence of advanced dementia and Parkinson disease. The identification of spasticity should heighten the awareness of the medical staff and treatment be implemented before contractures and severe spasticity worsens. It is important for PT and OT to occur earlier in the treatment including exercise, passive tactile stretching, neurological techniques, splints and ongoing programmes for the staff and the family (15).

Medical devices caused the second largest occurrence of atypical wounds in the study. These atypical wounds were corrected by a high level of awareness and treatment on the part of the staff; thus, all medical device wounds were cured in periods as short as a month opposed to those wounds caused by severe spasticity requiring 6 months or more.

The cause of APU in medical device usage is an extrinsic factor: tubes, catheters, cannulas, oxygen masks and use of adhesive or fixation. Damages to the epidermis of the skin were at the place of greatest friction (site of insertion or placement on the body), and not connected with bone prominence as in typical PU.

Medical devices associated with inappropriate use can be referred to as 'iatrogenesis', applicable to any adverse condition in a patient resulting from medical treatment or procedures potentially preventable by increased awareness. Iatrogenesis is a major problem in medicine and of particular concern in the treatment of the older patient (16,17). High awareness is needed in case of physical restriction (18). Physical restriction is a source of potential PU development, particularly in atypical locations, and is not recommended.

A review of literature indicates the reported cases describing APU derived from medical devices. Two female patients with spinal cord injury and urethral catheter developed APU in the medial aspects of thighs. The treatment recommended proper position (not defined) and intermittent catheterisation (19). A male patient with an epidural catheter in the midline of his back developed APU in his back. The treatment encouraged position change, preferring the mid-auxiliary line, avoiding a course along the midline (20). For a patient with supra-pubic urinary catheter, wrapping the catheter with a non irritant, soft material is recommended (21). A case involving a wrist splint on a female patient is cited and traditional

treatment with padding, antibiotics and elevating the arm is recommended (22). A case study recently described three adult patients with spinal cord injury who developed APU on the toes after prolonged application of graduated compression stockings to prevent thromboembolism. The hospital staff did not monitor the skin for potential PU caused by the graduated compression stockings. Upon discovery, all PU were managed conservatively and healed without complication (23). An APU of unusual location was described elsewhere in the popliteal fossae due to thromboembolic deterrent stockings (24).

Bony deformities are a dormant symptom awakened in conditions of immobility and inability to reposition. Wing scapula bony deformity is a latent source for developing atypical wounds. The ageing process induces dorsal spine vertebral collapse or degeneration causing hyperkyphosis or scoliosis of the dorsal spine and inducing increased pressure to the mid-back spine. This condition is 20–40% prevalent among older adults with osteoporosis and osteoarthritis (25,26). The helix of the ear is an anatomical structure that causes APU when protruding. Identifying this APU requires a high level of awareness and suspicion.

Conclusion

The cohort study identified an APU occurrence rate of 21% within PU development over a three and a half year period. Three major APU categories of aetiology are medical devices, severe spasticity and bony deformities which are definable, time observable and recognisable as risk factors.

Technology in these days is dominant in medical treatment thus increasing the applicability of medical devices. A high level of staff awareness is required to prevent susceptibility to side effects, iatrogenesis and predisposition to both PU and APU. In addition, patients live longer with disability and extension of diseases; these are increasingly accompanied by the development of APU in unusual locations as well as complications progressing to severe spasticity and bony deformities. The prominent role of the multidisciplinary team in identity, prevention and treatment of APU is primary.

References

- National Pressure Ulcer Advisory Panel (NPUAP) and European Pressure Ulcer Advisory Panel. International pressure ulcer prevention and treatment guidelines 2010 [WWW document]. URL <http://www.npuap.org> [accessed on 11 November 2012].
- Jaul E. A prospective pilot study of atypical pressure ulcers presentation in a skilled nursing setting. *J Ostomy Wound Manage* 2010;**57**:49–54.
- Teasdale G, Jennett B. Assessment of coma and impaired consciousness: practical scales. *Lancet* 1974;**2**:81–4.
- Smith DM. Pressure ulcers in the nursing home. *Ann Intern Med* 1995;**123**:433–42.
- Black JM, Cuddigan JE, Walko MA, Didier LA, Lander MJ, Kelpel MR. Medical device related pressure ulcers in hospitalized patients. *Int Wound J* 2010;**7**:358–65.
- Grey JE, Enoch S, Harding KG. Wound assessment. ABC of wound healing. *BMJ* 2006;**332**:285–8.
- Haheer JN, Haheer TR, Devlin VJ, Schwartz J. The release of flexion contractures as a prerequisite for the treatment of pressure sore in multiple sclerosis: a report of ten cases. *Ann Plast Surg* 1983;**11**:246–9.
- Atiyeh BS, Hayek SN. Pressure sores with associated spasticity: a clinical challenge. *Int Wound J* 2005;**2**:77–80.
- Woo R. Spasticity: orthopedic perspective. *J Child Neurol* 2001;**16**:47–53.
- Pohl M, Ruckuem S, Strick S, Hrtinger B, Meiner D, Mehrholz J, Pause M. Treatment of pressure ulcers by serial casting in patients with severe spasticity of cerebral origin. *Arch Phys Med Rehabil* 2007;**83**:35–9.
- Kataria K, Sagar S, Singhal M, Yadav R. Pressure sore at an unusual site- the bilateral popliteal fossa: a case report. *Oman Med J* 2012;**27**:3.
- Rakic VS, Colic MM, Lazovic GD. Unusual localization of pressure ulcer – the vulva. *Int Wound J* 2011;**8**:313–6.
- Hesse S, Brandi Hesse B, Bardeleben A, Werner C, Funk M. Botulinum toxin: a treatment of adult upper and lower limb spasticity. *Drug Aging* 2001;**18**:255–62.
- Mess SA, Kim S, Davison S, Heckler F. Implantable baclofen pump as an adjuvant in treatment of pressure sores. *Ann Plast Surg* 2003;**51**:465–7.
- Yelnik AP, Simon O, Parratte B, Gracies JM. How to clinically assess and treat muscle over-activity in spastic paresis. *J Rehabil Med* 2010;**42**:801–7.
- Kelley LS, Mobily PR. Iatrogenesis in the elderly. Impaired skin integrity. *J Gerontol Nurs* 1991;**17**:24–9.
- Palmer MP. Iatrogenic illness in hospital. In: Hazzard WR, Ettinger J, et al., editors. *Principles of geriatric medicine and gerontology*, 4th edn. New York: McGraw-Hill, 1999:484–5.
- Weinberg AD. *Risk management in long term care: pressure ulcers*. New York: Springer Publishing Company, Inc, 1998:8–13.
- Sivaraman Nair KP, Taly AB, Roopa N, Murali T. Pressure ulcers: an unusual complication of indwelling urethral catheter. *Spinal Cord* 2001;**39**:234–6.
- Cherng CH, Wong CS. Pressure sore, induced by epidural catheter in a patient receiving postoperative pain control. *Reg Anesth Pain Med* 2003;**28**:580.
- Vaidyanathan S, Soni BM, Bingley J, Brown E, Markey S. Prevention of pressure sore caused by indwelling urinary catheters. *Spinal Cord* 2002;**40**:489.
- Hughes D. Skin necrosis in prolonged application of an elasticated wrist splint in a psychiatric patient. *J Accid Emerg Med* 1996;**13**:230.
- Rathore FA, New PW, Waheed A. Pressure ulcers in spinal cord injury: an unusual site and etiology. *Am J Phys Med Rehabil* 2009;**88**:587–90.
- Ong JC, Chan FC, McCann J. Pressure ulcers of the popliteal fossae caused by thromboembolic deterrent stockings (TEDS). *Ir J Med Sci* 2011;**180**:601–2.
- Kado DM, Prenovost K, Crandall C. Narrative review: hyperkyphosis in older persons. *Ann Intern Med* 2007;**147**:330–8.
- Jaovisidha S, Kim JK, Sartoris DJ, Bosch E. Scoliosis in elderly and age-related bone loss: a population-based study. *J Clin Densitom* 1998;**1**:227–33.