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The impact of atraumatic vs conventional dressings on pain and stress

D. Upton, PhD, PBPSS, Professor of Health Psychology;
K. Solowiej, BSc, MSc, PhD Student;
Institute of Health and Society, University of Worcester, UK.
Email: d.upton@worc.ac.uk

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- **Objective:** To compare the pain and stress experiences of patients with chronic wounds being treated with atraumatic vs conventional dressings at dressing change.
- **Method:** This exploratory study adopted an independent samples design to identify any differences between reported levels of pain and stress associated with the use of atraumatic and conventional dressings used in treatment regimens of patients with chronic wounds. Physiological and psychological assessments of pain and stress were recorded at dressing change (including numerical ratings, heart rate, blood pressure, respiration rate, GSR, salivary cortisol and the Perceived Stress Scale (PSS) and State Trait Anxiety Inventory (STAI) questionnaire surveys).
- **Results:** In total, 49 patients with chronic wounds took part in the study. Fifty-three percent of patients were male (n=26) and 47% were female (n=23). Patients were aged 38–95 years, with a mean age of 69.11 ± 14.08 years. Overall, 10 patients were receiving atraumatic dressings with Safetac technology as part of their routine wound treatment and 39 were receiving conventional dressings. Patients receiving atraumatic dressings reported significantly lower numerical pain and stress ratings and experienced significantly lower GSR at dressing change. Mean heart rate, blood pressure, salivary cortisol were also lower for patients with atraumatic dressings. However, patients' PSS (atraumatic=24.60, conventional=22.72) and STAI (atraumatic=34.90, conventional=33.21) scores were similar for both dressing type groups.
- **Conclusion:** This study provides a basis for understanding how different dressing types can impact pain and stress at dressing change. Acute episodes of pain and stress were much lower in patients receiving atraumatic dressings; however factors associated with the overall experience of living with a chronic wound may be contributing to underlying and ongoing feelings of stress and anxiety. The impact of these implications on selection of dressings and cost of care are also discussed.
- **Declaration of interest:** This research was commissioned by Mölnlycke Health Care. None of the authors work for Mölnlycke Health Care or have any financial interests with the company. There are no additional conflicts of interest to declare.

chronic wounds; dressing change; pain; stress; heart rate; blood pressure; numerical ratings

D. Upton, PhD, PBPoS,
Professor of Health
Psychology;
K. Solowiej, BSc, MSc,
PhD Student;
Institute of Health and
Society, University of
Worcester, UK.
Email: d.upton@
worc.ac.uk

Wound pain and stress continue to be an important clinical focus in wound care. In particular, the relationship between pain and stress has been well explored,¹⁻⁴ indicating that wound pain itself can contribute significantly to stress. Several studies of biopsy, surgical and chronic wounds have demonstrated that pain-induced stress can result in delayed wound healing.⁵⁻⁹

In light of this, consensus documents and statements have been published to provide health professionals with best practice guidance on the management of wound pain,¹⁰ to promote concordance and enhance patient quality of life. When using such guidelines, it is important to recognise that, in addition to pain from the wound itself, wound pain can result due to continuous wound treatment, as well as anticipatory pain, which some patients encounter as a consequence of negative past experiences of

care.^{11,12} Specifically, the pain caused by the removal and re-application of dressings has been identified as a major contributor to wound pain,¹³ from both a patient and health professional perspective.^{14,15}

A survey by Hollinworth and Collier indicated that health professionals were aware of the importance of avoiding pain during wound care; however, they were unaware of the types of dressings that could be used to minimise it.¹⁶ Therefore, appropriate dressing selection should form a significant part of recommended individual pain management plans, including regular review and reassessment.¹⁷

Assessment of pain can help clinicians to differentiate wound pain from procedure-related pain, in order to plan the most suitable pain management.¹⁰ Awareness of the patient's experience of pain and stress before, during and after wound treatments, such as dressing changes, should be established to inform the appropriate pain and stress

Table 1. Patient demographics

	Atraumatic	Conventional	Total
No. of patients (n)	10	39	49
Male (n)	5 (50%)	21 (54%)	26 (53%)
Female (n)	5 (50%)	18 (46%)	23 (47%)
Age (years)	71.10 ± 14.29	68.57 ± 14.17	69.11 ± 14.08
Age range	53–95	38–91	38–95

management,¹⁸ with particular attention paid to dressing selection for patients, on an individual basis, as it is known that poor dressing choice can lead to increased wound pain.¹³

In the past, wound dressings have been classified according to clinical performance parameters, with this typically including the characteristics of an ideal dressing.¹⁹ However, it is important to recognise that dressing classification on the basis of composition is not necessarily fully informative.

Thomas describes the use of the term of 'atraumatic dressings' relating to products which, on removal, do not cause trauma to newly formed tissue or to the peri-wound skin.¹⁹ This classification is of importance to both the clinician and the patient, as it defines clinical effectiveness in terms of applicability of the dressing to the wound.

Atraumatic dressings utilise technologies that have been developed to avoid adhesion, such as soft silicone adhesive technology (Safetec Technology; Mölnlycke Healthcare Ltd.).²⁰ The term atraumatic can refer to dressings that are both adhesive and non-adhesive, coated in soft silicone to interact with dry skin, but not the fragile wound surface.

Given that wound pain and stress can contribute to delayed healing,^{5–9} the cost of wound care for patients with long-term, chronic wounds can be high. As dressings are known to impact on wound pain specifically, attention should be paid to cost-effectiveness in addition to suitability when selecting the most appropriate dressings. However, selecting dressings based solely on low cost does not necessarily equate to the best value for money when trying to achieve the best clinical outcome for patients.²¹ Effective treatment and awareness of the impact of pain and stress could significantly reduce the cost of chronic wound care. For example, use of atraumatic dressings could reduce pain and trauma in chronic wounds, with the potential to facilitate patient rehabilitation, resulting in shorter initial hospital stays, treatment regimens and reduced costs of care.²²

The impact of dressing type on wound pain and stress is an under-researched area; therefore, the present study aimed to explore whether different

Table 2. Wound aetiology

Wound type	Atraumatic n (%)	Conventional n (%)
Venous leg ulcer	3 (30%)	5 (13%)
Other leg ulcer	2 (20%)	5 (13%)
Diabetic foot ulcer	1 (10%)	15 (38%)
Other foot ulcer	4 (40%)	8 (21%)
Other chronic wound	—	6 (15%)
Total	10	39

dressing types were associated with the pain and stress experiences of patients with chronic wounds at dressing change and during a period of limited activity/rest. In light of the current research, it was hypothesised that patients with atraumatic dressings as part of their treatment regimen would experience less pain at dressing change, in comparison with patients who are treated with conventional dressings.

Method

This exploratory study adopted an independent samples design to identify any differences between reported levels of pain and stress associated with the use of atraumatic and conventional dressings used in treatment regimens of patients with chronic wounds. All data collected for the purpose of this study were based on the dressings that patients had been receiving over the course of their wound treatment; therefore, dressing types were not altered for any patients during the study.

Institutional contacts were utilised to gain access to patients with chronic wounds. A purposive sample of patients from Wrexham and Salford were invited to take part in the study, over a period of approximately 6 months, with wounds including leg ulcers, foot ulcers, and 'other' chronic wounds.

Patients with chronic wounds were approached individually by their health professional to explain the purpose of the study and invite them to take part. Inclusion criteria for the study included patients with a chronic wound, aged 18 years or over and able to give written informed consent. Exclusion criteria comprised patients who were undergoing any other treatments that may have influenced the measurements taken in the present study, such as treatment for mood problems, stress or anxiety.

If patients were satisfied to give verbal consent, a member of the research team visited them individually to read aloud a participant information sheet and consent form, to inform them of the study details. Patients were then given the opportunity to ask further questions of the research team and were given time to consider taking part in the study.

The study was granted NHS ethical approval and the research team adhered to the Data Protection Act (1998) and the Caldicott principles, throughout.

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Study protocol

After written informed consent was obtained, a visit was arranged with the patient and concerned health professional for a member of the research team to attend a dressing change to take a series of pain and stress assessments. Patients were visited by a member of the research team in care homes and in their own homes, accompanied by a district nurse. Information about patients' dressing types were obtained from district nurses.

At dressing change, two questionnaires to assess stress (Perceived Stress Scale [PSS];²³ and State Trait Anxiety Inventory [STAI])²⁴ were read aloud to each patient and verbal responses were recorded by a member of the research team. Physiological assessments were also conducted, including heart rate, respiration rate, systolic and diastolic blood pressure (BP), galvanic skin response (GSR) and salivary cortisol, as these increased physiological responses are associated with stress. In addition to this, current levels of stress and pain were assessed using a numerical rating scale (0=no pain/stress, 10=worst pain/stress). Assessments of pain and stress were recorded immediately after a dressing change was completed.

Statistical analysis

Data were analysed using SPSS (v19; IBM) to compare the psychological and physiological measurements of pain and stress between patients receiving atraumatic dressings and those being treated with conventional dressings. Descriptive statistics and a series of one-tailed, independent t-tests were conducted. Statistical tests were adjusted to account for uneven group numbers, and significance was taken as $p < 0.05$.

A one-tailed, independent method was considered appropriate as the hypothesis of the study was one-directional: psychological and physiological measures of pain and stress were hypothesised to be higher among patients being treated with conventional dressings.

Results

In total, 49 patients with chronic wounds took part in the study. Fifty-three per cent of patients were male ($n=26$) and 47% were female ($n=23$). Patients were aged 38–95 years, with a mean age of 69.1 ± 14.1 years, and all patients were of white, British ethnic origin. Wound types included venous leg ulcers (16%), other aetiology leg ulcers (14%), diabetic foot ulcers (33%), other foot ulcers (25%) and other chronic wounds (12%), including, mixed aetiology wounds and pyoderma (Tables 1 and 2).

Overall, 10 patients (20%) were receiving atraumatic dressings as part of their routine wound treatment and 39 (80%) were receiving conventional dressings. The latter included Activon Tulle (Advan-

Table 3. Mean psychological and physiological pain and stress scores for patients receiving atraumatic and conventional dressings

Pain/stress measures	Atraumatic	Conventional
STAI	38.40 ± 15.62	33.31 ± 11.16
PSS	24.60 ± 10.08	22.72 ± 9.17
Numerical pain	1.43 ± 0.98*	3.66 ± 3.13*
Numerical stress	2.00 ± 0.58*	3.63 ± 2.66*
Heart rate	69.11 ± 7.53	75.62 ± 14.05
Respiration rate	16.86 ± 8.17	16.09 ± 1.95
Systolic blood pressure (BP)	125.70 ± 12.23	137.82 ± 17.03
Diastolic blood pressure (BP)	64.22 ± 11.56	69.13 ± 12.91
Galvanic skin response (GSR)	19.76 ± 5.42*	33.15 ± 16.32*
Salivary cortisol	0.13 ± 0.03	0.17 ± 0.09

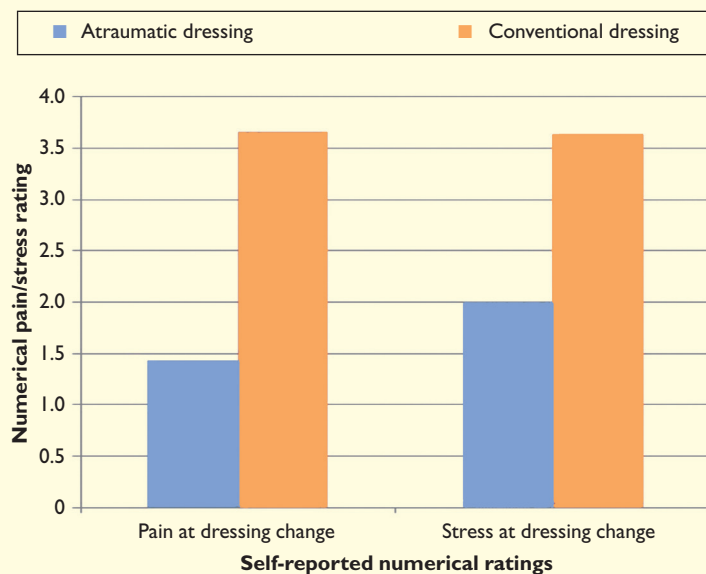
* Difference between groups statistically significant at $p < 0.05$
STAI=state trait anxiety inventory; PSS=perceived stress scale

cis Medical), Allevyn (Smith & Nephew), Aquacel Ag (ConvaTec), Biatain (Coloplast), Comfeel (Coloplast), Cutimed Sorbact Hydroactive (BSN medical), Inadine (Systagenix), Melolin (Smith & Nephew), Mepore (Mölnlycke Health Care), Mesitran (Aspen Medical Europe), Tegaderm Foam Adhesive (3M Health Care), UrgoClean (Urgo Medical) and Versiva XC (ConvaTec). Atraumatic dressings included Mepilex (Mölnlycke).

The data obtained were found to be normally distributed and met the assumptions of homogeneity of variance for psychometric analysis to be conducted. A series of one-tailed, independent-samples t-tests were conducted to compare the stress and pain scores, and physiological measurements of patients with atraumatic vs conventional dressings.

It was found that patients being treated with conventional dressings experienced significantly higher numerical pain ratings $\{t(40)=-1.85, p < 0.05\}$, numerical stress ratings $\{t(40)=-1.60, p < 0.05\}$, and GSR $\{t(31)=-1.80, p < 0.05\}$ at dressing change, compared with the atraumatic dressing group. This indicated that patients being treated with conventional dressings in this sample experienced increased physiological signs of stress at dressing change, compared with those treated with atraumatic dressings. Furthermore, although not statistically significant, mean heart rate (75.62 ± 14.05), systolic BP (137.82 ± 17.03), diastolic BP (69.13 ± 12.91) and salivary cortisol (0.17 ± 0.09) scores were higher at dressing change for patients being treated with conventional dressings (Table 3).

Fig 1. Self-reported numerical stress and pain ratings of patients receiving atraumatic and conventional dressings as part of wound treatment



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In addition to the increased physiological indicators of stress among patients receiving conventional dressings, the self-reported severity of acute pain and stress also demonstrated higher pain and stress at dressing change for the conventional dressing group (Fig 1).

From this initial exploration of underlying stress among this purposive sample, stress scores on the PSS and STAI (state/trait anxiety) were relatively similar for patients receiving both types of dressings. Mean PSS scores were 24.60 ± 10.08 for patients receiving atraumatic dressings and 22.72 ± 9.17 for patients with conventional dressings, out of a maximum PSS score of 56. Similarly, patients with atraumatic dressings scored an average of 34.90 ± 11.41 for underlying anxiety and 38.40 ± 15.62 for acute anxiety at dressing change, in comparison with the conventional dressing group, who scored an average of 33.21 ± 11.20 for trait anxiety and 33.31 ± 11.16 for acute anxiety at dressing change on the STAI, out of a maximum score of 80.

Discussion

Overall, the findings of this exploratory research has shown that patients receiving atraumatic dressing as part of their wound treatment experienced significantly lower self-reported episodes of acute pain and stress at dressing change compared with patients being treated with conventional dressings. In addition, the atraumatic dressing group had reduced physiological signs of acute stress in

comparison with the conventional dressings group, including lower heart rate, systolic and diastolic BP, GSR, and salivary cortisol at dressing change.

Specifically, increased physiological signs of stress and levels of the stress hormone cortisol can have a negative impact on immunity, and previous studies have associated this with a delay in wound healing.⁷ As prolonged healing can impact patient wellbeing and quality of life, these findings provide a basis for future research to establish the potential impact that dressing type can have on patients' experience of stress and pain. In particular, atraumatic dressings appear to improve and minimise the experience of acute stress and pain at dressing change.

Overall, these findings support the literature that suggests atraumatic dressings cause less acute pain and wound trauma when removed and re-applied during wound treatment, compared with conventional dressings.^{19,20} Despite the small sample of patients included in this study, these findings suggest that acute episodes of pain and stress associated with dressing change could be significantly reduced by the appropriate selection of atraumatic dressings as opposed to conventional types. Patients could, therefore, benefit from the use of atraumatic dressings as opposed to conventional dressings, where appropriate, as pain-induced stress has been shown to reduce healing rates of chronic wounds.^{1,13} However, future research with a larger sample of patients would be beneficial to explore the impact of atraumatic vs conventional dressings on acute pain and stress further.

In line with previous research,^{1,2} it was found that patients were experiencing similar levels of underlying/chronic stress, irrespective of the type of dressing used during wound treatment. Higher scores on the PSS and STAI measures both indicate higher levels of long-term stress with the highest possible scores totalling 56 and 80, respectively. Patients' average levels of underlying stress were 24.60 ± 10.08 (atraumatic dressings group) and 22.72 ± 9.17 (conventional dressings group) on the PSS and 34.90 (atraumatic dressings group) and 33.21 (conventional dressings group) on the STAI. This could suggest that, although acute episodes of pain and stress were much lower in patients receiving atraumatic dressings, factors associated with the overall experience of living with a chronic wound may be contributing to underlying and ongoing feelings of stress and anxiety.

As suggested in previous studies, other factors can contribute to chronic stress in patients with long-term wounds, such as the frequency of dressing change and other treatments, limited mobility and inability to engage in daily tasks, and the length of time the patient has been suffering from the wound.¹⁷ In addition, emotional factors, including uncertainty surrounding diagnosis, coping abilities, availability of social support, and attitudes and behaviours of health professionals, can also contribute to long-

term distress in chronic wound patients.²⁵ It is possible, therefore, that long-term stress and trait anxiety are prevalent in this small sample of patients due to other factors that affect patient wellbeing.

Unfortunately, this study could not determine other contributing factors, as information, such as the length of time patients had been suffering from their chronic wounds, or the period during which they had been receiving atraumatic or conventional dressings,¹³ were not available, which may have contributed to the understanding of individual experiences of stress and anxiety among this sample.

Overall, the results of this study support the notion that appropriate selection of dressings can contribute to a reduction in acute pain and stress, which could lead to an overall improvement in wound treatment experience. These findings may also have implications for the cost of wound care. For example, patients with chronic wounds can be affected by pain and stress for a prolonged period of time, resulting in increased costs of care.^{26,27} This would suggest that implementing treatment/dressings that are perceived as the most cost-effective may actually increase pain and stress in patients, as opposed to dressings that are designed to minimise these symptoms. Health professionals should be made aware of the potential impact dressings can have on pain, stress and overall healing rates of chronic wounds, as careful selection of dressings that do not cause pain or further trauma to the wound could have the potential to improve healing rates and consequently reduce the overall cost of wound treatment for individual patients.

Limitations

Due to the exploratory nature of this research, a number of limitations to the study were identified. The small sample and non-longitudinal design of this particular study prevented the research team from identifying other factors that may be contributing to long-term feelings of stress and anxiety among these patients. Furthermore, the opportunity sampling approach to patient recruitment meant

access to participants was dependent on the availability of patients and district nurses, as well as patient consent; therefore, recruitment of equal numbers of patients with each wound aetiology and dressing type to the study was difficult to achieve. This resulted in unequal numbers of patients with each dressing type and wound aetiology, which could have influenced the findings of this research.

The mean values for the PSS and STAI assessments of stress and anxiety were similar for both patient groups; therefore, significant findings may have been achieved with a larger and more homogenous sample of patients, with underlying factors influencing chronic stress also possibly explored further. For example, experience of pain and wound treatment may be different for patients who have been suffering from their wound for a prolonged period of time in comparison with those who have recently developed a chronic wound.

This research provides a basis for future clinical trials to explore stress and pain associated with different dressing types further. Future research could also adopt a longitudinal design, in which psychological and physiological indicators of stress and pain are assessed over a longer time period, including several dressing changes. This methodology would enable researchers to assess patients' experiences of pain and stress over time, to establish whether patients experience an increase in stress associated with specific dressing types.

Conclusion

This exploratory study has shown that different dressing types can impact patients' experience of pain and stress at dressing change. Specifically, atraumatic dressings appear to minimise acute episodes of pain and stress at dressing change, and appropriate selection of atraumatic dressings could, therefore, lead to improved healing. Future research is necessary to explore the impact of dressing types further in a larger sample of patients, as appropriate dressing selection could contribute to improved healing rates and wound care experience. ■

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