

# THE IMPACT OF ADHESIVE TAPE AND WOUND DRESSINGS ON THE SKIN WITH PARTICULAR REFERENCE TO SKIN STRIPPING

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## Introduction

Care of the skin, including protection against mechanical/chemical injury and microbial invasion, should be an unavoidable issue for those involved in any aspect of dermatological care, yet sadly it is one that at times is overlooked. Human skin is a large and complex organ, with a surface area of around 1.5 -2.0m<sup>2</sup>, comprising some 10% of normal adult body mass. It weighs approximately 4kg. Nine grams of skin are shed every 24 hours and subsequently 'renewed' every 28 days. Two major anatomical skin layers are recognised. The epidermis is composed of a protective covering of keratinised stratified squamous epithelium (stratum corneum). The underlying dermis consists of interlacing collagen and elastic fibres in an extracellular matrix (ECM) (Figure 1).

Early-presenting aetiological factors play a pivotal role in skin integrity and dermatological changes associated with diseases related to venous dysfunction and diabetes are common, with many factors being responsible for the formation of skin abnormalities in patients with these conditions. These skin abnormalities (Table 1) may be exacerbated when adhesive dressings are used to treat ulcers commonly linked with these conditions. Exogenous damage to the skin caused by repeated application and removal of adhesive dressings may result in skin stripping and variable levels of damage may be inflicted that usually involves the stratum corneum<sup>1</sup>. Damage may also induce inflammatory skin damage, oedema and skin soreness, all of which can have an adverse effect on skin barrier function<sup>2,3,4,5</sup>.

## Aims

A literature search was undertaken to establish what scientific / clinical evidence there exists to support the view that some dressings with traditional acrylic adhesives may cause more collateral damage to adjacent skin when compared with newer skin friendly dressings with, for example, soft silicone.

## Methods

An extensive literature search was undertaken to identify relevant published data. Electronic searches of bibliographic databases (MEDLINE, National Library of Medicine, Bethesda, USA; EMBASE, Elsevier BV, Amsterdam, Netherlands; CINAHL, Cinahl Information Systems, Glendale USA) and Internet sites (Cochrane Library; World Wide Wounds) were supplemented with manual searches of conference proceedings and journals of relevance to wound management.

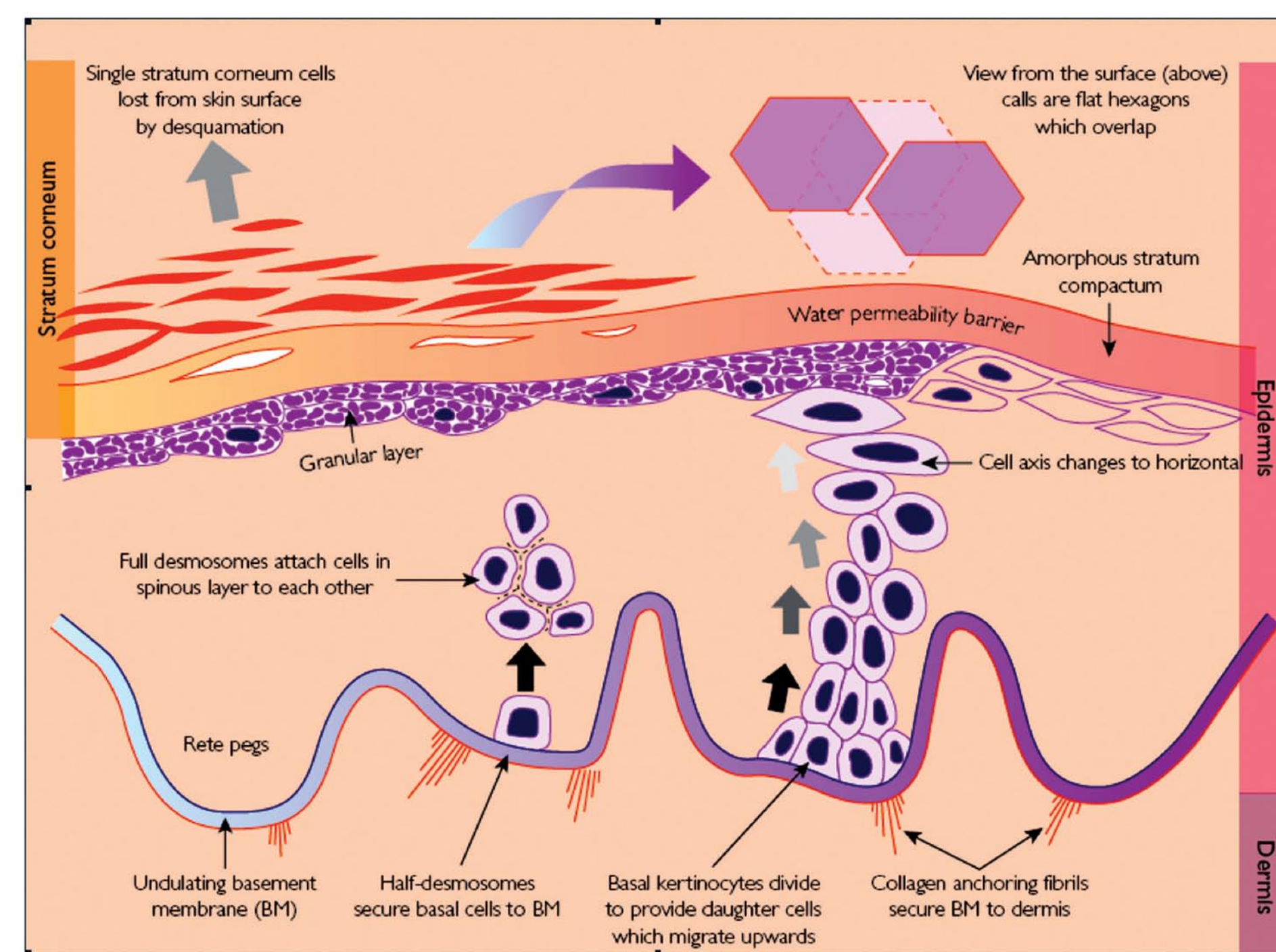


Figure 1. Diagrammatic representation of skin structure

## Results

Data from the literature shows that pain, particularly at dressing change, has been identified as a major problem in wound management. In a study undertaken to evaluate the effects of repeated removal of dressings utilising different adhesive systems on peri-ulcer skin, a number of traditional adhesive dressings induced major functional alterations of peri-ulcer skin (as measured by transepidermal water loss) and conductance, whereas the soft silicone dressing did not influence these parameters<sup>6</sup> (Figure 2). In a volunteer study, the effects of adhesive dressings on cutaneous trauma were assessed. It was shown that the removal of a number of traditional adhesive dressings, including one with an acrylic adhesive (Allevyn Adhesive), required higher peel forces and were associated with greater skin damage, when compared with a dressing utilising soft silicone technology (Mepilex Border Lite)<sup>1</sup> (Figure 3). Stratum corneum damage and irritation due to skin stripping is known to be subject to many variables, including adhesive strength, anatomical site and seasonal variation<sup>5,7</sup>. The repeated peeling from the same skin site increases the potential for cutaneous damage and causes significant adverse effects to skin topography. The quantity and depth of stripped corneocytes removed has a direct relationship with the degree of skin irritancy and adhesive applied. Repeated applications enhance these detrimental effects<sup>8</sup>. Worst case scenarios are on patients that have excessively fragile skin such as those with epidermolysis bullosa (Figure 4) or who are old and have fragile skin (Figure 5) although even "normal" patients can have problems with repeated adhesives of adhesive causing trauma to the skin (Figure 6).

Table 1. Summary of age and disease related pathological skin conditions

	Pathology	Reference
Chronological changes	<ul style="list-style-type: none"> <li>wrinkles</li> <li>solar lentigines (freckles)</li> <li>melanoma</li> <li>epidermal hyperplasia/neoplasia, dermal elastosis</li> <li>reduction in cutaneous vessel size</li> <li>mechanical properties/tissue hydration</li> </ul>	Kurban and Kurban, 1993 <sup>9</sup> Bolognia 1995 <sup>10</sup> Kligman, 1989 <sup>11</sup>
Skin changes associated disease	<ul style="list-style-type: none"> <li>infantile eczema</li> <li>atopic dermatitis</li> <li>epidermolysis bullosa</li> <li>skin ectodermal dysplasia/skin fragility syndrome</li> </ul>	Broberg et al, 2000 <sup>12</sup> Fukuzumi et al 2005 <sup>13</sup> Bergman and Sprecher, 2005 <sup>14</sup> Diedrichson et al, 2005 <sup>15</sup>
Children		Kurban and Kurban, 1993 <sup>9</sup>
Adults	<ul style="list-style-type: none"> <li>senescent skin</li> <li>contact and seborrhoeic dermatitis conditions associated with diabetes eg.lipohypertrophy, necrobiosis lipoidica and diabetic dermopathy</li> <li>conditions associated with VLU eg lipodermatosclerosis</li> </ul>	Perez and Kohn, 1994 <sup>16</sup> Ahmed and Goldstein, 2006 <sup>17</sup>  Kirsner et al, 1993 <sup>18</sup> Herrick et al, 2002 <sup>19</sup>

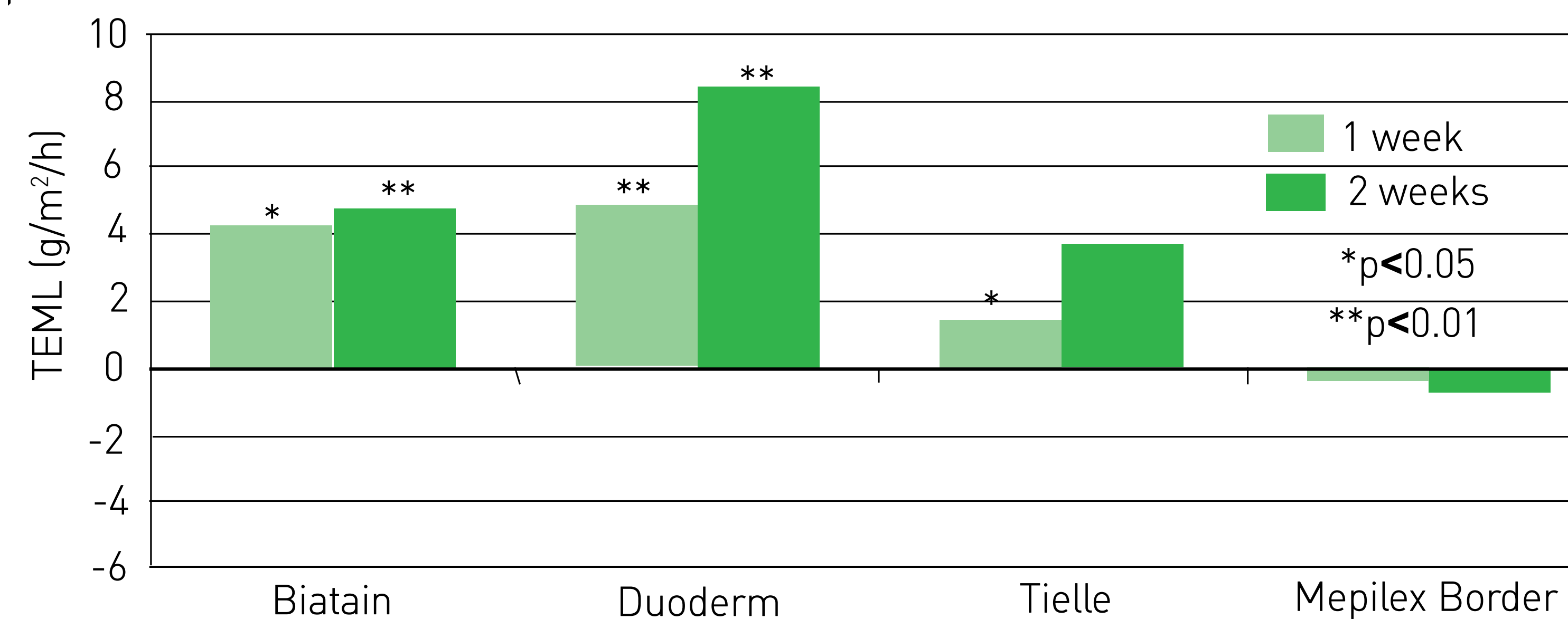


Figure 2: Comparison of absolute transepidermal water loss changes associated with adhesive dressings<sup>6</sup>

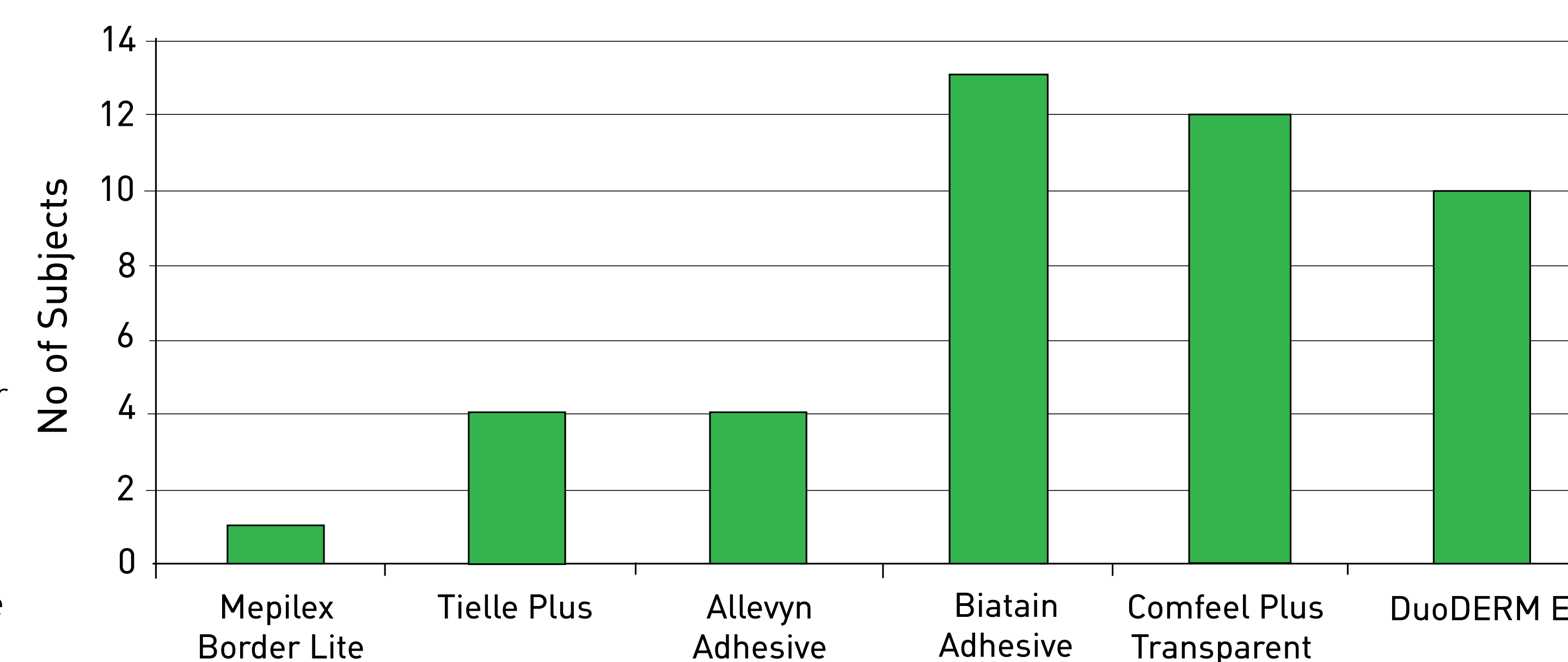


Figure 3. Comparison of cumulative irritancy scores associated with adhesive dressings<sup>1</sup>



Figure 4. Epidermolysis bullosa. Photographs courtesy of Jacqueline Denyer, Great Ormond Street Hospital, London UK.



Figure 5. Skin trauma as a result of application and removal of an adherent dressing to the arm of an elderly woman. Photograph courtesy of Pauline Beldon, Epsom and St Helier University Hospital NHS Trust, Carshalton, UK.



Figure 6. Adhesive tape damage Photograph courtesy of Jackie Stephen-Haynes, University of Worcester and Worcestershire PCT, Worcester, UK

## Conclusion:

Repeated removal of dressings with traditional acrylic adhesives causes trauma that impacts adversely on the peri-wound skin and the wound itself. Adhesive-skin interactions are clearly important considerations in dressing choice in modern wound care and the choice of appropriate dressings is a key component in ensuring good clinical practice.