

The Use of Spacer Fabrics for Absorbent Medical Applications

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Abstract: With an increasing ageing population, the incidence of pressure sores and incontinence is becoming an increasing burden on the health sector and requires new forms of intervention. Three dimensional knitted spacer fabrics can afford a range of properties making them ideal for use against the skin in a variety of medical applications. Fabrics can be engineered with the appropriate choice of yarns to meet a range of product specifications with each layer having a different characteristic. Spacer fabrics are washable and thus reusable making them viable alternatives to disposable products in the medical sector, at a time when there is great emphasis on sustainability and the environmental impact of textile products. Focusing on medical applications requiring bulk liquid absorption, a range of three dimensional weft knitted spacer fabrics were produced and evaluated for desirable properties such as high absorbency and liquid retention using standard test methods. The surface of the fabric was engineered to afford rapid liquid transfer. The level of liquid spreading on the surface of the fabric could be measured using conventional test methods, however to understand how the liquid spreads at different points through the thickness of the fabric a new test method was designed. Results of testing showed good repeatability and use of the prototype test method offering scope for further development.

Keywords: spacer fabric, absorbency, liquid, spreading, incontinence, three dimensional, medical, test method

1. Introduction

With an increasing ageing population, the incidence of pressure sores and incontinence is becoming an increasing burden on the health sector and requires new forms of intervention. The use of textiles is commonplace with a growing emphasis on disposable items. However with the economic downturn and the interest in more environmentally friendly and sustainable products, reusability and recycling are creating new market opportunities.

2. Incontinence and The Elderly

The population of the UK was 60,975,000 in mid-2007 [1]. Within 20 years half of the adult UK population will be over 50 and one in four children born today will live beyond 100. This creates an ever-increasing need for society to adapt to new challenges and opportunities [2]. By 2025, more than a third of the UK's population will be over 55 [3]. A similar picture exists across Europe and North America, people are living longer and staying active until

much later in life. In a dramatic and unprecedented demographic shift the number of young people is dwindling while the older sector of the population rapidly expands. In the UK the underlying cause is that the population are living longer and having fewer children [3].

Medical advances are one of the key factors for this longevity, however it follows that these advances and technologies should also keep people healthier for longer, allowing them to live more independent lives and even work for longer. Although people in the UK today are living longer than ever, latest figures show that on average older men and women will live 6.8 and 9.1 years respectively of their lives with a limiting long term illness. Moreover, it is estimated that 50% of people over 75 currently suffer with long term infirmity [4]. With the increased numbers of infirm people having limited mobility or being completely bed bound, the number of elderly suffering from bed sores and other skin related conditions is rising. The health of skin is dependent on age, and for old people the process of damage is exacerbated by the fact that the skin is less resistant to shear forces, and that the

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healing process is much slower than for young skin. Many of the elderly suffering from an infirmity also suffer from some form of incontinence, which can increase the risk of skin conditions, as wet skin is more susceptible to damage, Figure 1a and 1b.



Figure 1a Wet sore skin.



Figure 1b pressure sore [5]

When skin is hydrated, for example by the continuous wearing of incontinence pads, it is vulnerable to frictional damage. The skin is softened by the water, providing greater contact area between the pad and skin so increasing the frictional resistance between the surfaces [6]. Incontinence and excessive skin moisture have been identified as key factors in the development of pressure ulcers. If the patient is lying flat on a bed for long periods, pressure exerted by the body onto the mattress creates pressure points which can cause discomfort. When lying flat on a standard hospital mattress in the supine position, most pressure is exerted at the sacrum (bottom) with 23% of the body's weight being distributed at this point which would be in contact with an incontinence product. Hospital tests have shown that pressure areas above 32 mm of mercury (4.27kPa) shut off capillary blood flow causing muscle pain and potential pressure sore development exasperated by wet skin from the use of incontinence pads [7]. Figure 2 shows the main areas of pressure when the body lies flat on a bed.

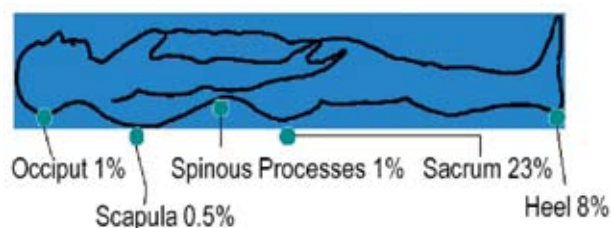


Figure 2 Pressure points [8].

Over 200 million people worldwide have a significant urinary incontinence (UI) and many more with mild bladder problems [9]. In the UK over 3million people suffer from some form of incontinence with this figure predicted to rise dramatically to over 4 million by 2025 [10].

Although incontinence is not life threatening it does present high costs to health services. This is indicative of a total expenditure for the UK of more than £420 million (approximately 0.85% of the total cost of the NHS) [11]. Incontinence is a common problem affecting both sexes and all age groups, but at all ages UI is more common in females. Prevalence increases with advancing age and with a growing older population there is an increase in incontinence occurrence with over 60% of elderly in nursing homes experiencing incontinence. Urine incontinence affecting the older population is predominantly urge incontinence (detrusor instability and bladder hyperactivity) accounting for two thirds of cases followed by prostate gland enlargement problems in older men. An increasing number of elderly people are being admitted into nursing homes due to incontinence. If exercises and drug treatments fail, the use of catheters or surgery offers an alternative but with the risks of complications becoming more prevalent with age, the use of body worn pads and bed pads are the best option. It is not just the elderly who suffer from urinary incontinence, it can affect all age groups as a temporary condition especially stress incontinence which is commonly seen in women after child birth due to weakened pelvic floor muscles.

3. Incontinence Products

Successful patient friendly incontinence products have only been available since the start of the twenty first century [12]. These are either bed pads or body worn pads, often similar to a baby's nappy. During