Let's Get It Clear No.54
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What makes a good cushion?

6. The benefits to skin care of the right cover

This is the sixth article in the series which aims to start getting people thinking more about what goes into a cushion that makes it 'good' for one person, but maybe not so good for another. In the first article we identified the three key elements around which a cushion can be assessed – functionality, posture management, and tissue integrity. In the third and fourth articles we address the benefits of a neutral pelvis and stability for posture management, and contouring of the cushion to optimise positioning. Parts five and six cover the elements of a cushion that address the integrity of the tissues of the skin: this article concentrates on the influence of the cushion's cover.

The cover of the cushion is arguably the most important element of a cushion for caring for the tissues of the skin, in that this is the part of the cushion closest to the skin. Therefore, the materials that the cover is made from will have an effect on the facility of immersion and envelopment, on friction and hence shear stresses on the skin, and on the microclimate at the skin's surface. In this article we consider various elements to consider when selecting the most appropriate cover for a client's cushion.

Immersion and envelopment

In part 5 we covered the importance of envelopment of the buttocks for maximising pressure redistribution. To facilitate this, the cover has to have sufficient stretch-ability, and flexibility, to allow for full immersion into, and envelopment from, the cushion – any cover materials without these properties will lead to 'hammocking' and incomplete potential envelopment. Any taut material is likely to have an adverse affect around the ischial tuberosities – the area most at risk from pressure damage. The person's clothing may also have an effect here as well!

Friction and shear

In another article, published in the August 2020 issue of THIIS[1] (and article no 13 in our Knowledge Hub), the definitions of, and differences between Pressure, Shear, and Friction are covered, while introducing the content of ISO/TS 16840-14[2]. Static friction helps to keep us in our seats, but is also what grabs the skin and distorts it: these shear forces lead to distortion of the shape of the cells in our skin and also our blood capillaries (shear strain) - too much distortion for too long leads to cell death. This is on top of the damage from compression of the tissues and blood vessels from the pressures (axial strain) created by gravity pulling down on the mass of our bodies (Fig. 1).

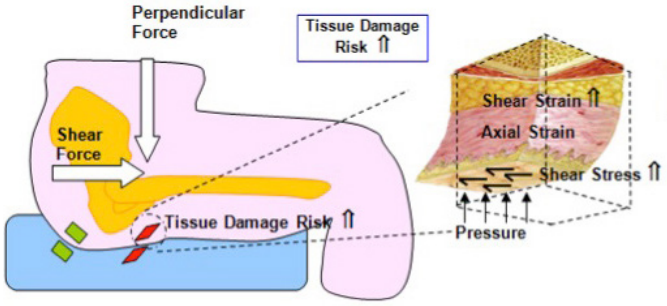

Figure 1. Example of body tissue strains resulting from contact surface stresses when sitting on a cushion. Complex strains are developed inside the cushion as well.

For most people there is more flesh under the thighs than under the bony bits of the pelvis. Thus, there is more tissue under the thighs than there is under the pelvis to take up the shear stresses of sitting, and so it is ideal if the material under the pelvis can, to some degree, move with the skin, while having grippier material under the thighs (to stop us slipping into posterior pelvic tilt, or out of the seat) (Fig. 2).

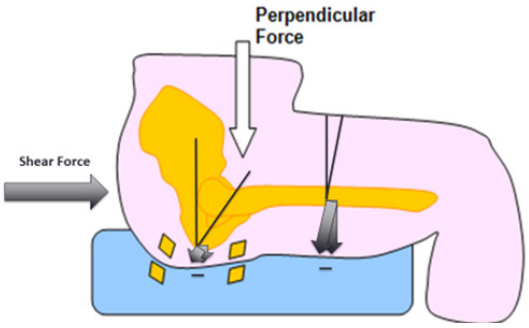

Figure 2. Relative effects of shear strain on thinner tissues under a bony prominence (ischial tuberosity) as compared with deeper tissues (under the femur along the thighs)

Risks from transfers

During transfers there are two key sources of risk to skin tissues from the design of a cushion. The first relates to the 'slipperiness' of the cover materials – the less the friction, the easier to slide across it and the less 'grabbing' of the skin and therefore less shear strain on the skin tissue. The second relates to the degree of contouring of the cushion – the greater the profile of any medial and lateral thigh supports, the greater the amount the user will need to lift or be lifted for a lateral (or forward) transfer.

Microclimate

Whereas pressure, friction, and shear can lead to pressure ulcers, there's another element that has an influence on skin health, and that's the microclimate at the skin's surface. Microclimate covers the effects of temperature and moisture.

Taking temperature first: if a cushion has been stored overnight in a cold environment, then sitting on this cold surface could encourage capillary closure, and therefore restrict the transfer of nutrients to the tissues. If the temperature is too high this leads to the risk of sweating and moisture accumulation. An important side-effect of higher temperatures is that for each one degree centigrade of increase in temperature leads to 13 % more metabolic demand: 13 % more oxygen and nutrients needed, and 13 % more carbon dioxide and metabolites to be disposed of.

When we come to moisture, this comes from the skin as water vapour or as sweat. Non-breathable cover materials often lead to water vapour not being able to dissipate away, and thus leads to moisture build up. Moisture on the skin leads to maceration (the wrinkling of the skin we get with having our hands in water for too long), and macerated skin is more susceptible to the effects of friction and shear. Further sources of moisture can come from leaking wounds, and faecal or urinary incontinence.
The take home message is, again, that the material that the cushion cover is made from is critical to the health of the user's skin. Issuing a water-resistant or 'incontinence' cover may protect the cushion from the user's outputs, but the water vapour permeability will have a large influence on whether the water vapour will condense or wick away. So, how much do we want to protect the cushion versus protecting the user?

Cushion additives

Both cushions and covers may have additives to their materials, in particular to improve their resistance to ignition. Since cushions may be placed against bare skin, there are biocompatibility and REACH related requirements for these chemicals.

Be aware that some of these chemicals will be removed in washing processes, and cushions which pass flammability tests when new, may lose some of this protection after washing. However, the washability of covers is important – users are recommended to have two covers so that when one is in the wash, the other is available to place on the cushion to protect the skin – see part 2 in this series of articles[3].

The furnishing flammability standards and the REACH regulations between them had started to get in the way of designing good cushion and cover materials for optimal protection of the skin in medical products. For this reason, the flammability testing for cushions and other wheelchair postural support devices have been updated in the ISO 16840-10 standard[4]. For more detail see the May 2020 issue of THIIS[5] (and article No 9 in our Knowledge Hub)

In conclusion

There are always elements of compromise for each user: the process of assessing the risk/benefit profile will indicate which cover solution is the most appropriate for each client. From the topics covered in this article, what the cover of a cushion is made from is critical for optimising tissue integrity, whether it is from enabling envelopment into the cushion, reducing the risks from friction and shear strain, and keeping air circulating to optimise temperature and moisture control at the microclimate level. The cushion materials have more influence on positioning and pressure redistribution.

Cushion Cover Tissue Integrity
Check/Score as per a cushion cover's ability to meet the user's needs

1. Immersion
2. Envelopment
3. Friction optimisation
4. Shear reduction under ITs
5. Breathable cover
6. Microclimate management
7. Washability
8. Ignition resistance
9. Biocompatible components

References

1. *Pressure, Shear, and Friction. What's the difference, how do they relate, and why should each be managed in their own right? THIIS August 2020 pp 52-53*
2. *ISO/TS 16840-14:2023 Wheelchair Seating – Part 14: Concepts relating to managing external sources to maintain tissue integrity*
3. *What makes a good cushion? 2. Functionality THIIS March 2020 pp 62-63*
4. *ISO 16840-10:2021 Wheelchair Seating — Part 10: Resistance to ignition of postural support devices — Requirements and test method*
5. *You've been fired! Flammability standards put to the test THIIS May 2020 pp 42-43*