

Long term influence of LiquiCell on discomfort

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March 2005

Abstract

The feeling of discomfort is an important ergonomic aspect of body supporting surfaces. In the past it has been shown that there is a link between discomfort and poor biomechanics and fatigue. Poor biomechanics has to do with the force that acts between the body supporting surface and the tissue of the body. LiquiCell has developed a principle to eliminate/reduce the shear force on a body supporting surface. Previous measurements on healthy subjects have confirmed this fact (Goossens, 2001). It is therefore expected that a LiquiCell cushion reduces the awareness of discomfort over time. The aim of this study is to examine the long term influence on discomfort of LiquiCell technology by means of a randomized and blinded trial.

A blind randomized test on 2 types of cushions was performed on the feeling of discomfort using the Visual Analogue Scale (VAS). The cushions all looked the same from the outside but had different fillings. One cushion (No LiquiCell) had foam inside, the other cushion (LiquiCell) was identical but with LiquiCell incorporated or trimmed to the inside of the top surface. The results showed that the initial feeling on discomfort is not significantly different between the two types of cushions. After two hours the cushion without LiquiCell inside had a significant increase in discomfort as measured on a Visual Analogue Scale ($P=0.03$). The initial feeling of discomfort measured on a VAS-scale was not significantly different for the two cushions ($P=0.84$).

These results imply that a subject only will feel the difference in discomfort between a LiquiCell cushion and a regular foam cushion after some time of use.

Introduction

The feeling of discomfort is an important ergonomic aspect of body supporting surfaces. In the past it has been shown that there is a link between discomfort and poor biomechanics and fatigue [Helander and Zhang, 1997]. Poor biomechanics has to do with the force that acts between the body supporting surface and the tissue of the body. The force can be divided between pressure and shear.

Most of the studies that can be found in literature study the relation between discomfort and pressure alone, and ignore the influence of shear force. LiquiCell has developed a principle to eliminate/reduce the shear force on a body supporting surface, by means of a bursa-like principle. Previous measurements on healthy subjects have confirmed this fact [Goossens, 2001]. Out of the previous studies it is therefore expected that LiquiCell body support surfaces, reduce the awareness of discomfort over time.

This has, however, not been validated in a study with subjects. Therefore, the aim of this study is to examine the long term influence on discomfort of LiquiCell technology by means of a randomized and blinded trial.

Materials and Methods

Discomfort over time is measured in two situations. One type of cushion had foam inside, in this study we refer to this cushion as (No LiquiCell). The other type of cushion was identical but with LiquiCell incorporated or trimmed to the inside of the top surface, we refer to this cushion as LiquiCell. From both types two cushions were made, so in total four cushions were used in this test that all look the same from the outside (figure 1).



Figure 1. The test cushions that were used in the comfort test. The cushions all look the same from the outside, but have different fillings.

The cushions are tested for a period of 2 hours during office work in a seated position. The subjects started their office work at 9:00 a.m.

Directly after they were seated at 9:00 a.m. and at 11:00 a.m the subjects are asked to fill in a VAS-score (visual analogue scale) on discomfort and comfort [figure 2].



Figure 2. Visual Analogue Scale on discomfort and comfort. The scale was used twice. First during a question on discomfort. The both ends of the line represent in that case ‘no discomfort at all’ and ‘most thinkable discomfort’. Secondly during a question on comfort. In that case the both ends of the line represent ‘no comfort at all’ and ‘most thinkable comfort’.

The cushions were given randomly to the subjects who work at their standard workstation setting. The workstation is adapted by parameters of relevant body dimensions of an individual and all corresponding product dimensions. Each type of cushion is measured twice and used for statistics.

The measurements were performed on 14 healthy adult subjects (range 21-45 years of age), average length 171 cm (s.d. 6.8 cm), average weight 67.7 kg (s.d. 7.6 kg), and average BMI (body mass index) 23.1 (s.d. 2.2), range 20-29.

For each type of cushion the following data was used for statistics:

- Mean on all subjects VAS on discomfort
- Mean on all subjects VAS on comfort

The following hypotheses on the VAS-scores will be tested with a paired samples t-test comparing the results of the situation at 11:00 a.m. to the start at 9:00 a.m. A level of significance $\alpha=0.05$ is used in SPSS 12.0.

H0: There is no difference in mean VAS-score between the two time intervals

H1: There is an increase in VAS-score on discomfort (decrease of VAS-score on comfort) between the two time intervals

Also the initial score of both cushions will be evaluated.

H0: There is a difference in VAS-score at the start (9:00 a.m.) for the different types of cushions

H1: There is no difference between the different types of cushions.

Results

The data as measured on 14 subjects can be found in Table 1.

	LiquiCell		No LiquiCell	
	9:00 a.m.	11:00 a.m.	9:00 a.m.	11:00 a.m.
VAS-discomfort	24.5 (s.d. 21.2)	26.5 (s.d. 18.8)	23.9 (s.d. 21.3)	31.5 (s.d. 24.2)
VAS-comfort	64.7 (s.d. 20.1)	65.4 (s.d. 17.7)	66.5 (s.d. 22.7)	63.7 (s.d. 21.4)

Table 1. The mean VAS-scores measured (s.d. in brackets) on 14 subjects by using the Visual Analogue Scale on discomfort and comfort.

The VAS-score on discomfort shows the effects of the two types of cushions (figure 3). It can be seen quite clear that during the time interval the cushion with the LiquiCell inside hardly increase the feeling of discomfort, while the cushion with only foam inside shows a significant increase ($P=0.03$). When the LiquiCell cushion is used there is no significant increase in the VAS on discomfort ($P=0.23$) after two hours from the initial contact with the cushion. The initial feeling of discomfort at 9:00 a.m. was not significantly different between the two types of cushions ($P=0.84$). It can also be observed (figure 4) that the feeling of comfort on the VAS-scale remains constant during the two hour period of use when sitting on the LiquiCell cushion. When the foam cushion is used, the level of comfort decreases. However, none of these effects measured on the VAS-comfort scale were significant.

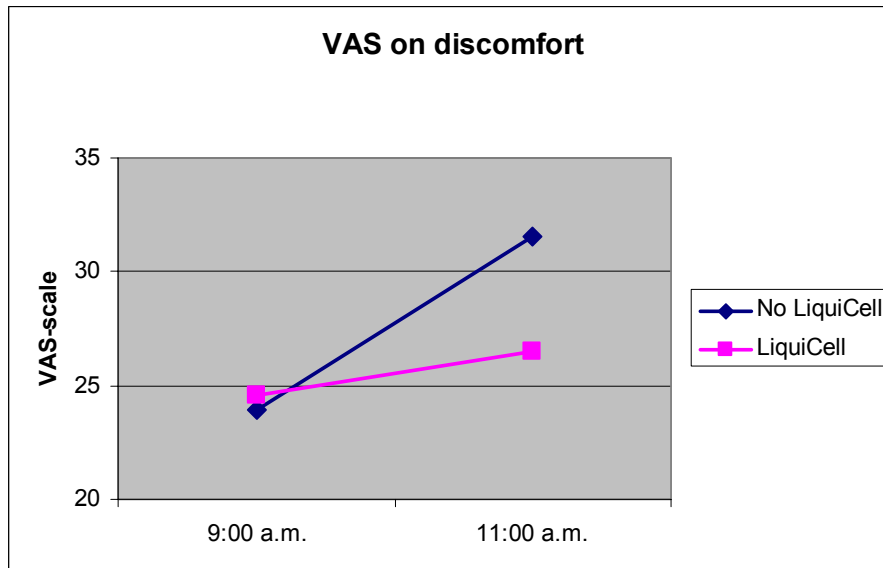


Figure 3. The results of the measurements on 14 subjects by using the Visual Analogue Scale on discomfort and comfort. The top figure shows a significant increase on the feelings of discomfort when the foam cushion was used ($P=0.03$). When the LiquiCell cushion is used there is no significant increase in the VAS on discomfort ($P=0.23$).

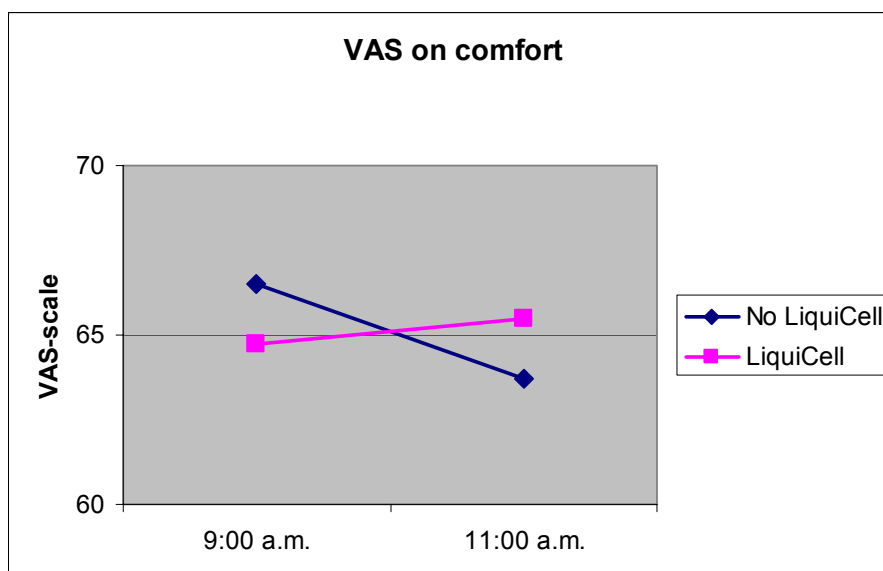


Figure 4. The figure shows that the VAS-score in comfort remains constant when the LiquiCell cushion is used. When a foam cushion is used a decrease in the VAS-score on comfort can be seen. The effects measured on the LiquiCell cushion and the foam cushion are not significant.

Conclusion

A blind randomized test on 2 types of cushions was performed on the feeling of discomfort. The cushions all looked the same from the outside but had different fillings. One cushion (No LiquiCell) had foam inside, the other cushion (LiquiCell) was identical but with LiquiCell incorporated or trimmed to the inside of the top surface. The results showed that the initial feeling on discomfort is not significantly different between the two types of cushions. After two hours the cushion without LiquiCell inside had a significant increase in discomfort as measured on a Visual Analogue Scale ($P=0.03$). The initial feeling of discomfort measured on a VAS-scale was not significantly different for the two cushions. These results imply that a subject only will feel the difference in discomfort between a LiquiCell cushion and a regular foam cushion after some time of use.

References

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