Standardized testing to evaluate the microclimate, immersion, and envelopment capabilities of a support surface.

Executive Summary

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Value of testing

The NPUAP Research Mission's Support Surface Standards Committee, S3I, provides methods to evaluate the characteristics of support surfaces to provide clinicians with data on how a surface will perform in normal use. The purpose of this study was to expand on the methods and results of three of those standards which evaluate and determine the effects of microclimate, immersion, and envelopment properties on four brands of support surfaces. (Surface A-Stryker IsoTour®, Surface B-Hill-Rom P500™, Surface C-ArjoHuntleigh AtmosAir™ & Surface D-Hill-Rom AccuMax Quantum™) were evaluated using RESNA SS-1:2019 standardized testing methods.

Support Surface Settings:

Each support surface was tested under standard testing conditions. Surface B was the only manual adjusting power capable surface. Surface D and C were tested as non-powered in all methods. Surface A is a non-powered gel surface that could be converted into a microclimate management support surface. Surface A was tested on both powered (power settings turned on) and non-powered (power settings turned off) for the microclimate testing.

Results

Microclimate

IsoTour powered and P500™ were significantly higher in heat removal than the other surfaces. Although the average of IsoTour powered was lower than P500™, the 95% confidence interval overlapped which indicates that there was no statistical difference. Both IsoTour powered and P500™ were significantly higher than AtmosAir™ and Accumax™.

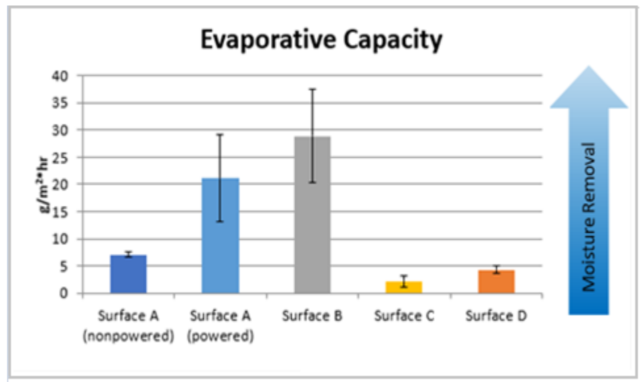


Figure 1. Comparison of evaporative capacity (EvapCap). Error bars indicate 95% confidence interval.

Immersion

Surface B had a thickness of 243.21 mm with the highest measured immersion at 85.4 mm where the mannequin immersed 47.3% into the surface. Surface C had a thickness of 203.05 mm and the lowest measured immersion at 52 mm where the mannequin immersed 31.4% into the surface (Figure 2). Surface A, C, and D where similar in their immersive characteristic ranging between 30-35% with the 95% confidence interval. IsoTour, AtmosAir™, and Accumax™ were similar in their immersive characteristic ranging between 30-35% with the 95% confidence interval.

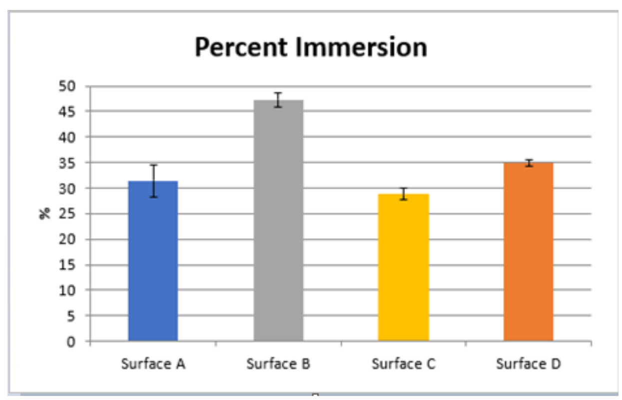


Figure 2. Comparison of measured immersion depth, percent (%) of the indenter that immersed, and thickness of support surfaces. Error bars indicate 95% confidence interval.

Envelopment

Envelopment refers to the ability of a support surface to conform (fit or mold) around irregularities in the body.[1,2] IsoTour maintained a more even pressure distribution (lower slope and lower y-intercept between sensor readings) from the Apex to Ring 5 (Figure 3) compared to the other three surfaces (Figure 4).

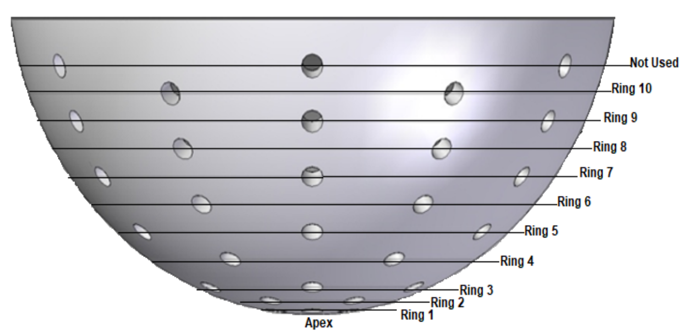
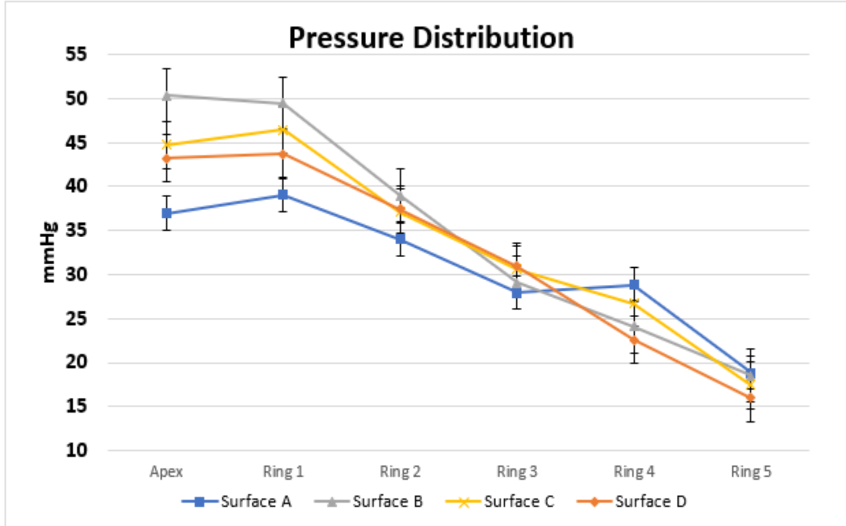


Figure 3. Side-view of test indenter. The sensors are arranged in concentric rings starting from the apex (intended to simulate bony prominence) which is the point that contacts the support surface first when lowered.

Envelopment (continued)

Figure 4 (right). Average mmHg of each sensor ring from Apex to Ring 5. Lower slope combined with lower y-intercept indicates better overall envelopment and even force distribution. Error bars indicate 95% confidence interval.



Discussion

IsoTour performed better than AtmosAir™ and Accumax™ when tested for microclimate, immersion, and envelopment. The microclimate data indicates IsoTour and P500™ are effective in removing moisture and allowing heat flow, but not excessively where it may risk the skin drying out and cracking (Figure 1).

The envelopment slope of the line is an indication of the quality of the force redistribution (Figure 4). The closer to zero (0) slope, the better the force distribution as the force was spread more evenly across the surface. When the supporting surface is able to cradle or mold around a bony prominence, pressure gradients are reduced, the contact area is increased, and the potential for tissue deformation is reduced. The pressure readings with IsoTour had a lower slope and lower y-intercept between sensor readings so the values were more even than the pressure readings for P500™, AmosAir™ and Accumax™ (Figure 4).

Immersion and envelopment are tied together in providing protection for patients (Figure 5). Based on the data, IsoTour provided better overall pressure redistribution with the combination of its immersive characteristics that showed more support for the patient's weight and the envelopment characteristics that distributed even pressure on the most prominent sensors. The combination of immersion and envelopment provides the best picture of potential tissue protection as immersion and envelopment together provide even force redistribution and comfort as seen in IsoTour.

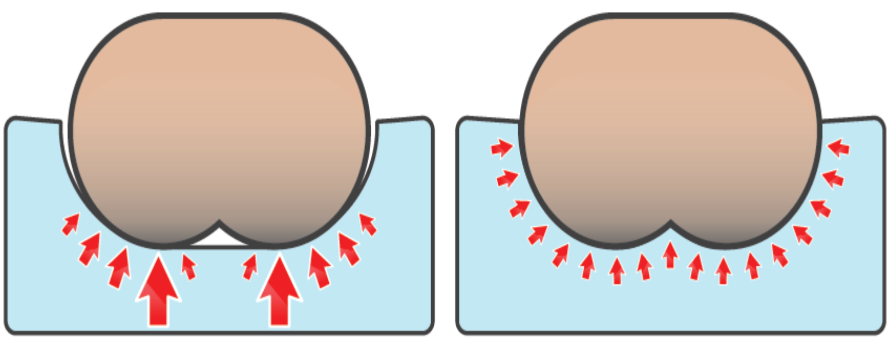


Figure 5. Comparison of support surface with poor envelopment with immersion characteristics (left) vs. support surface with ideal envelopment with immersion characteristics (right).

Conclusion

Clinicians are faced with the daunting task to make clinically relevant choices from a wide variety of support surfaces incorporating different designs and technologies. Detailed information provided by standardized reports can help clinicians to effectively and objectively compare the clinical outcomes associated with the use of various support surfaces.

As the correlations between performance data and outcomes are established, so will the ability to determine the appropriateness of a support surface in meeting specific patient needs. Quantifying the relationship between performance data and clinical outcomes is an important factor in mitigating risk and improving patient care.

References

1.Jordan R. Development of uniform terminology for support surfaces. J Wound OstomyContinence Nurs. 2005;32(3S):S1

2.RESNA SS-1:2019 Volume 1: Requirements and Test Methods for Full Body Support Surfaces(Section1, Section 2, Section 4, and Section 6)

3.Call, E., Capunay, C. (2019). Standardized testing to evaluate the microclimate, immersion and envelopment capabilities of a support surface. Refer to Stryker document (MKT-EXT-027 DEC 2018 Rev A).

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