Oral Communication
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Usefulness of a Custom-contoured Cushion Designed With Pressure Maps to Reduce Pressure Points and Increase Contact Area in Wheelchair Users – A Pilot Study

Topic: Assistive products

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BACKGROUND

The seated position is considered a risk factor for developing pressure ulcers in wheelchair users, a public health issue that significantly impacts quality of life. This condition is preventable using pressure-relief cushions that improve the contact surface and reduce pressure on vulnerable areas, particularly bony prominences. Developing affordable technologies to enhance the quality of life for wheelchair users is a priority in low-resource countries. This study aims to evaluate the performance of a low-cost pressure-relief cushion, designed using pressure maps, to increase contact area and reduce pressure compared to commercial foam, gel, and air cushions.

METHODS

Custom contoured cushion fabrication followed a pressure map-based methodology developed at Universidad Iberoamericana Ciudad de México using an FSA sensor (BodiTrak NT1510). Seat depth and footrest height were adjusted according to the participant's anthropometric dimensions, and a seat positioning device ensured a neutral posture (hip: 90°, knee: 90°, ankle: 90°). Buttock pressure was recorded every minute for 10 minutes. Pressure maps were obtained using a flat foam block (R-90, used for the custom cushion), a ROHO High Profile (HP) air cushion, a Jay X2 gel-foam cushion, and the custom cushion fabricated using the proposed methodology. Peak pressure (PP), peak pressure index (PPI), mean pressure (MP), and contact area (CA) were recorded for all measurements and cushions. Statistical Analysis: Descriptive statistics (means and SD, paired-samples T-test.

RESULTS

Ten wheelchair users participated, 60% were women with a mean age of 47 ± 12 years. Diagnoses included spinal cord injury (30%), cerebral palsy (20%), pelvic limb amputation (20%), poliomyelitis (20%), and stroke (10%). The most frequent comorbidities were hypertension (20%) and diabetes mellitus (20%). Users spent 10 ± 5 hours/day in their wheelchairs. Statistically significant differences were found in all pressure variables across the cushions, with the custom-contoured cushion demonstrating lower pressure values and greater contact area compared to commercial models. The exception was the contact area between the custom and gel cushions, where no significant difference was observed (CA = 1457.6 ± 254.1 vs 1442.4 ± 187.7; $p = 0.595$).

CONCLUSION

Custom cushions designed and manufactured using pressure maps outperformed commercial models, such as flat foam R90, Jay® X2, and ROHO® HP, regarding pressure relief and increased contact area.

Statement of Disclosures

The authors have no conflicts of interest to declare.

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