BRIEF REPORT

Wheelchair Tilt-in-Space and Recline Does Not Reduce Sacral Skin Perfusion as Changing From the Upright to the Tilted and Reclined Position in People With Spinal Cord Injury

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Abstract

Objective: To investigate the effect of various wheelchair tilt-in-space and recline angles on sacral skin perfusion in wheelchair users with spinal cord injury.

Design: Repeated-measures, intervention and outcomes measure design.

Setting: University research laboratory.

Participants: Power wheelchair users with spinal cord injury (N = 11).

Interventions: Six protocols of various wheelchair tilt-in-space and recline angles were randomly assigned to the participants: (1) 15° tilt-in-space and 100° recline, (2) 25° tilt-in-space and 100° recline, (3) 35° tilt-in-space and 100° recline, (4) 15° tilt-in-space and 120° recline, (5) 25° tilt-in-space and 120° recline, and (6) 35° tilt-in-space and 120° recline. Each protocol consisted of a 5-minute upright sitting and a 5-minute tilted and reclined period.

Main Outcome Measures: Skin perfusion over the sacrum (midpoint between the right posterior superior iliac spine and the adjacent spinous process) and right ischial tuberosity was measured using laser Doppler flowmetry.

Results: Sacral skin perfusion did not show a significant difference in all 6 protocols of various tilt-in-space and recline angles when changing from an upright to a tilted and reclined position (not significant). However, as previously reported, skin perfusion over the ischial tuberosity showed a significant increase at 15°, 25°, and 35° tilt-in-space when combined with 120° recline and at 35° tilt-in-space when combined with 100° recline (P < .008).

Conclusions: Our results indicate that wheelchair tilt-in-space and recline enhances skin perfusion over the ischial tuberosities without reducing sacral skin perfusion when changing from an upright to a tilted and reclined position.

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Specific combinations of wheelchair tilt-in-space and recline angles are recommended for clinically effective pressure relief to reduce the risk of pressure ulcers in wheelchair users with spinal cord injury (SCI).1,3 Such clinical practices are based on evidence that wheelchair tilt-in-space and recline can reduce seating pressure.3,5 It has also been demonstrated that ischemic tissues can restore blood flow during these pressure-relieving maneuvers.2,6 Although wheelchair tilt-in-space and recline can be used to reduce the risk of pressure ulcers under the ischial tuberosities,1,3 it is unclear whether such activities will increase pressure and reduce blood flow to the tissues over the sacrum, another common site of pressure ulcers.7 In addition, the use of recline may cause shearing of tissues in the sacral area, further increasing the risk of tissue ischemia.4

In response to the position paper on the clinical use of wheelchair tilt-in-space and recline published by the Rehabilitation Engineering and Assistive Technology Society of North America,1 we have designed a series of studies2,6 to investigate the effectiveness of wheelchair tilt-in-space and recline in reducing the risk of pressure ulcers in wheelchair users with SCI. In our previous study,2,6 we demonstrated an increase in skin perfusion over the ischial tuberosity in response to wheelchair tilt-in-space and

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