

Pressure Relief and Weight Shift behavior during prolonged sitting in patients with a spinal cord injury

T.E. Vonk^{1,2}, S.E. Sonenblum¹, PhD,

S.H. Sprigle¹, PhD, PT, R.Schofield³, PT, A.Porter-Armstrong³, PhD

¹ Rehabilitation Engineering and Applied Research Laboratory, Georgia Institute of Technology, ² Faculty of Human Movement Sciences, VU University Amsterdam, The Netherlands, ³University of Ulster, Jordanstown, UK

Introduction

- Pressure ulcers are a common secondary problem after spinal cord injury
- Patients learn to do pressure relief maneuvers (PR's) every 15-30 minutes to relief pressure from their sitting bones to prevent pressure ulcers
- There is no clear information about whether people follow this pressure relief regime and if the performed PR's in normal life indeed reduce pressure

Objectives

- Explore current pressure relief behavior of spinal cord injured people during prolonged sitting
- Examine if the observed PR's reduce pressure
- Investigate if there are more center of pressure (CoP) movements in people with more observed body movements
- Compare the CoP and the trunk posture to evaluate if trunk posture can be used to express the movement in the CoP

Methods

- Fourteen patients with a diagnosis of paraplegia or tetraplegia were recruited from the Regional Spinal Cord Injury Unit, Musgrave Park Hospital, Belfast, Occupational Therapy Outpatients department
- An Xsensor X3 system pressure mat was placed on top of the participants' wheelchair cushion in their own wheelchair to record the pressure while subjects performed a computer-based activity for one hour
- An ActivPAL3™ accelerometer was attached to participants sternum to measure the trunk posture
- One of the researchers observed each participant to monitor and report the type and timing of PR's held for at least 5 seconds

Data analysis

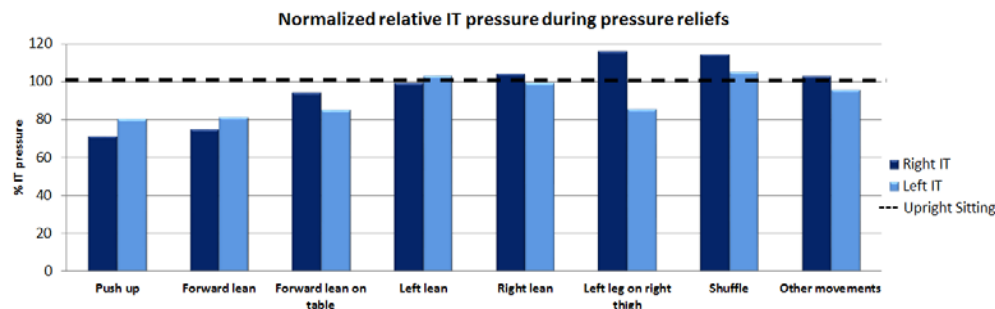
- The PR frequency was determined by the number of PR's listed by the observer divided by one hour
- The duration between PR's and of duration of PR's for each subject was calculated by the observed PR times
- The peak pressure index (PPI) in mmHg was calculated to indicate the amount of pressure under both ischial tuberosity (IT's). The means for the PPI's during upright sitting and PR's were compared to indicate the pressure relieving effect of PR's
- The correlation between the total number of observed PR's and the distance CoP traveled was calculated per subject
- The correlation between the CoP and trunk posture measured with the accelerometer at all times was determined for each subject

Results

- Big differences between people in the PR frequency, duration between PR's and duration of PR's

	Mean	Standard deviation	Median (minimum-maximum)
PR frequency (number of movements/hour)	4.82	6.21	3 (0-20)
Duration of PR's (sec)	27	25	18 (3-71)
Duration between PR's (sec)	1519	1366	899 (198-3600)

- Significant main effect of the observed PR's on the pressure under the right IT and left IT



- There was no significant correlation ($r = 0.291$, $p=0.313$) between the number of observed movements and the CoP distance traveled
- There were significant correlations ($p<0.05$) for the anterior-posterior location of the CoP with the coronal and the sagittal angle of the trunk for each subject
- In 8 of the 13 subjects a significant correlation ($p<0.005$) was found between the medio-lateral location of CoP and both trunk angles
- Significant main effect of the observed PR's on the CoP location

Discussion

- Observation of sitting behavior showed that there was a big difference in PR frequency, duration of PR's, and duration between PR's across people
- CoP position changed during observed PR's, which indicates that the observed movements had an effect on the overall pressure distribution
- Most observed PR's reduced the pressure under the IT's
- The lack of correlation between the CoP distance traveled and movement frequency suggests that people move differently than observers can detect. This suggests the possibility that people may get pressure relief from movements observers cannot detect
- The correlation between the CoP and the trunk angles suggests that trunk posture can express CoP movements in the anterior-posterior direction, but may not be a reliable measure for movements in the medio-lateral direction

Conclusion

- People move differently, future research is needed to show if people who move more get more pressure relief and are less prone to developing pressure ulcers
- Observation of body movements or measuring of the trunk posture are insufficient to really capture the whole sitting behavior, future research should use CoP movements express sitting behavior

Acknowledgements

This work was completed as part of the Mobility RERC, which is funded by the National Institute on Disability and Rehabilitation Research of the U.S. Department of Education under grant number H133E080003. The opinions contained in this poster are those of the grantee and do not necessarily reflect those of the U.S. Department of Education. This work was also supported by the United Kingdom Occupational Therapy Research Foundation.

