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Buttock pressure management of able-bodied people seated on a rigid surface for two hours

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Introduction

It is now well known that deep pressure ulcers are due to excessive pressure intensity (leading to soft tissues internal strains above 50 % for some minutes) and prolonged compression (leading to internal strains above 20 % for about two hours) [1]. Paraplegic people particularly suffer from pressure ulcers in the buttock area because of the inactivity of their leg muscles that make them a lot thinner and fragile [2] and because of the sensory dysfunctions that unable them to perceive warning signals thus keeping a risky situation by not moving enough. This paper aims at better understanding why able-bodied individuals put in quite extreme conditions (i.e seated for 2 hours long on a rigid surface) do not get pressure ulcers.

Methods

Thirty young healthy subjects agreed to stay seated on a rigid surface during two hours while watching a movie. The buttocks/seat interface pressures were recorded at 10 Hz by a Vista Medical pressure mapping system (Orthotest). Subjects were asked to move (e.g. change their postures, release high pressures, ...) only if necessary. The study was conducted by the CIC-IT and CIC at the Grenoble University Hospital and was approved by an ethics committee (CPP Sud-Est).

Results

The first results focus on the global bi-dimensional Pressure x Time curves.

Figure 1 shows, for different levels of pressure, the maximum durations they were hold.

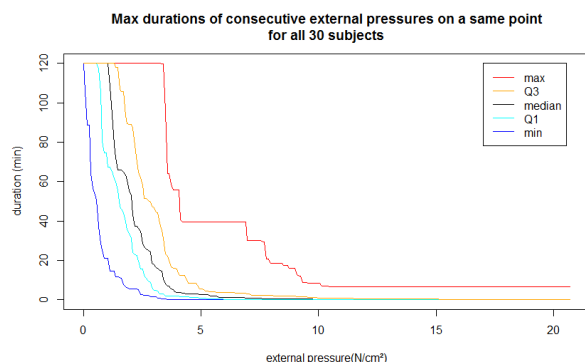


Fig. 1: For a given level of pressure (x axis), the curve indicates the longest time one region of the buttock

maintains that pressure (y axis). Black (resp. blue, cyan, orange, red) plot is the median (resp. min, 1st quartile, 3rd quartile, max) of data computed for the whole 30 subjects.

Discussion

The experiment presented here aimed at observing the behaviors of young able-bodied subjects seated on a rigid surface for a duration of 2 hours, theoretically sufficient to cause pressure ulcers [1].

Figure 1 shows a very thin interquartile range, indicating that most of the subjects seem to have similar tissue tolerance. To compare this result with the thresholds found by Loerakker et al. [1], internal stresses and strains should be used instead of external pressures. Such a computation of internal stress and strain from external pressure is possible [3] but needs the elaboration of a person-specific biomechanical model based on medical imaging exams.

Clinical relevance

This study aims at understanding the prevention strategies of able-bodied people and estimating the dangerous thresholds of Pressure among Time.

Acknowledgements

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Conflict of Interest

Some authors are involved with the TexiSense Company (http://www.taxisense.com/home_en).

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