EXPERIMENTAL ASSESSMENT OF PELVIS SLIPPING DURING POSTLESS TRACTION FOR ORTHOPEDIC APPLICATIONS

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Introduction

Common orthopedic surgeries, such as hip arthroscopy and proximal femoral fracture reduction, require the traction of the patient's lower limb with a perineal post. Pressure in the perineal region has been reported to cause groin-related complications, including soft tissue damage and neuropraxia [1]. To contend with these issues, the use of high friction conformable pads was recently introduced [2]. However, whether these pads provide sufficient adherence remains undocumented. In this study we thus evaluate the relative displacement of a single subject lying on high-friction pads.

Methods

In this single-case study, the healthy, male subject (73 kg, 177 cm) was tested on a padded bed, in supine and in two Trendelenburg positions (α: 5° and 10°). Tensile forces of progressively greater magnitude were applied coaxially to the longitudinal axis of the right leg through a customised, boot-pulley system (Figure 1).

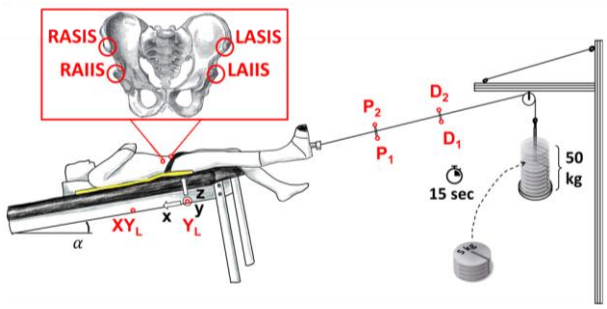

Figure 1: Representation of the experimental set up.

Ten load disks (5 kg) were dropped at 15 s intervals, each at a time, increasing gradually the tensile load from 2 kg to 52 kg. Movement of the pelvis was measured through a 12-camera motion capture system. Four markers were used to define the bed plane, with respect to which the pelvis displacement was measured using a four-marker protocol [3]. Two pairs of markers were placed on the steel cable to assess the traction direction. Nine trials were applied, three inclinations and three commercial pads: PinkPad by Xodus Medical, CarePad by Ab Medica and an antislip pad by BioMatrix.

Results

Figure 2 shows that all pads were able to limit x-axis pelvis displacement to values lower than 75 mm. Comparing pads, seemingly, the BioMatrix pad was the one causing larger displacements at higher loads. Surprisingly, no clear trend between bed inclination and pelvis displacement was observed; conversely, the cable inclination with respect to the bed appeared to affect the pelvis slipping: higher inclinations resulted in higher displacements. Lastly, rotation of the pelvis lower than 5° over the three axis was observed for all pads tested.

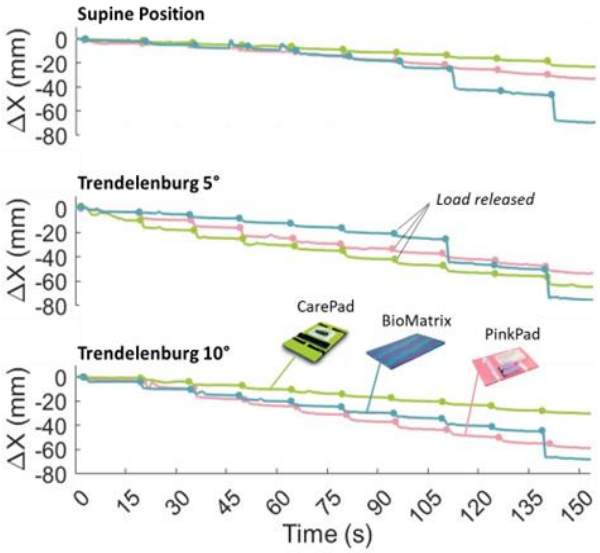

Figure 2: Pelvis displacement along the x axis with respect to the initial stance.

Discussion

The weak relationship between Trendelenburg angle and pelvis slipping could be due to other factors, such as the cable inclination in relation to the bed plane. Results obtained for a single subject encourage furthering this study on a participant pool, as we are actively enlisting subjects. If confirmed for a larger cohort with different body compositions, the use of high-friction pads would be advised when perineal pressure resulting from the conventional procedure is to be suppressed.

References

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2. Aprato et al, Tech Orthop, 36(2): 205-208, 2021.
3. van Hellemondt et al, Clin Orthop Relat Res, 405: 287-293, 2002.

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