The effect of a lumbopelvic compression belt on load transfer during the Active Straight Leg Raise Test: A Proof-of-Concept Study using ultrasound imaging

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PURPOSE

The active straight leg raise (ASLR) test assesses load transfer through the pelvis with a positive test indicating impaired load transfer. During the ASLR, intra-abdominal pressure (IAP) rises, increasing the load on the lumbopelvic region. There is a correlation between the magnitude of bladder base displacement (BBD) during the ASLR and lumbopelvic instability. Additionally, greater BBD and the impact on pelvic floor muscles is associated with motor control impairments associated with form and force closure. Pelvic stability belts are a common therapeutic intervention for individuals who report pelvic girdle pain. The belts mechanism of action is to improve form closure and assist force closure and motor control. Impaired form and force closure mechanisms through the lumbopelvic area are associated with poor load transfer, low back pain, sacroiliac pain, stress urinary incontinence and chronic pelvic pain.

OBJECTIVES

This study describes the response of the bladder base during the ASLR test performed with and without a Serola lumbopelvic belt and participant self-reported level of difficulty score

Figure 1. Ultrasound imaging
Portable Clarius® C3 curvilinear ultrasound oriented in the transverse plane with image of bladder and pelvic floor muscles shown on IPAD.

METHODS

A convenience sample of fifteen physical therapy students (mean age 24.5 years, mean BMI 24.6) who were previously identified as having lumbopelvic instability were recruited for this study. PCOM's institutional review board approved the study, and each participant provided informed consent. All participants completed a bladder filling protocol via natural diuresis to standardize bladder volumes to allow for bladder and pelvic floor delineation on ultrasound imaging. A Clarius C3 curvilinear wireless ultrasound unit was used for image acquisition with images displayed on an IPAD. The ultrasound transducer was placed suprapublically on the lower abdomen, oriented transversely, and manipulated until a clear image of the bladder base was apparent. A standard script was read to each participant to standardize the testing. Ultrasound cine loops were acquired during the ASLR test and repeated for the test with the participant wearing a lumbopelvic belt. Participants also self-reported the level of difficulty for each testing condition. Participants were fitted with the lumbopelvic belt according to manufacturer's recommendation. The belt tension was standardized using a manometer set to 20mmHG placed between the belt's anterior aspect and the participant's lower abdomen. On-screen calipers identified the lateral and medial aspects of the bladder base. All images were saved for post hoc analysis to determine the magnitude and direction of BBD between both testing conditions.

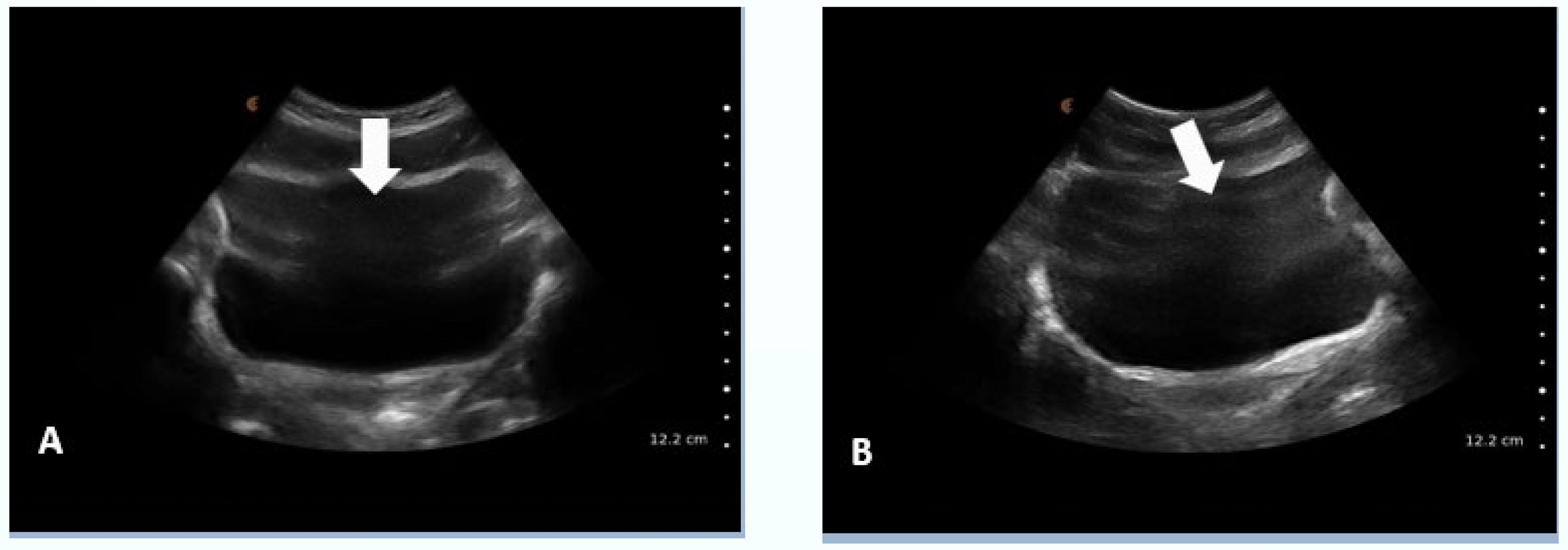

Figure 2. Transabdominal Ultrasound Images
Caudal displacement of the bladder base during:
A. The ASLR test
B. The ASLR test wearing a lumbopelvic stability belt shown below

RESULTS

A caudal BBD occurred during the ASLR during both testing conditions. At times this resulted in a lateral shift of the bladder to the right or the left side. Further analysis regarding the magnitude and direction of the displacement is ongoing. There was no difference (p=.79) between participants self reported difficulty during the ASLR with or without the belt.

CONCLUSIONS

Our observational findings did not find a difference in motor planning during the ASLR with or without the belt with the tension standardized for all participants. The tension selected may have limited our findings. The BBD was displaced caudally and frequently tilted to the right or left during all testing conditions. This infers either a bilateral or unilateral insufficiency of the pelvic floor or excessive unilateral activation of the abdominal oblique muscles resulting in a failure to dissipate increases in intra-abdominal pressure during the loading response associated with the ASLR test.

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