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**Progress in the development of a system for early detection of deep pressure sores associated with sitting: Results from control subjects**

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Wheelchair bound paralyzed patients are susceptible to deep pressure sores (DPS) which typically affect the gluteus muscles under the ischial tuberosities (IT). In these patients, elevated mechanical strains and stresses form around the IT, and are not relieved through motion. However, no attempts were made to develop patient-specific models with clinical orientation of providing early detection of sub-dermal mechanical conditions that potentially lead to DPS. Here, we aim at developing a subject-specific finite element (FE) model of the buttock that allows visualization and analysis of sub-dermal tissue strains and stresses during wheelchair sitting, in real-time, based on continuously measured interface forces. The hardware and software components of our subject-specific real-time FE system are described in reference [1]. As a first stage of the present research, internal gluteal strains and stresses were obtained from 4 control subjects monitored by this prototype for 90 minutes of continuous sitting. For each subject, a FE model of the IT and enveloping soft tissues was developed based on his/her MRI of the buttocks. Sitting contact forces were fed into the subject-specific models as real-time boundary conditions. The healthy subject studies showed maximal principal compressive strains of  $72\pm5\%$  and  $68\pm7\%$  in the right and left gluteus, respectively. Principal compressive, shear and von Mises stresses were  $34\pm3$  kPa,  $14\pm1$  kPa and  $31\pm4$  kPa under the right IT, and  $32\pm4$  kPa,  $13\pm2$  kPa and  $30\pm2$  kPa under the left IT, respectively. Maximal continuous exposure to internal gluteal stress was  $24\pm17$  minutes and  $13\pm8$  minutes for right and left buttock sides, respectively. We expect that this method will make a substantial contribution to efforts made to prevent DPS among permanent wheelchair users.

*Reference: 1. Yarnitzky G., Yizhar Z., Gefen A. Real-time subject-specific monitoring of internal deformations and stresses in the soft tissues of the foot: A new approach in gait analysis. J Biomech 2005; in press. doi: 10.1016/j.jbiomech.2005.08.021.*

