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WHAT DO WE SIT ON? ANATOMY OF THE SEATED BUTTOCKS

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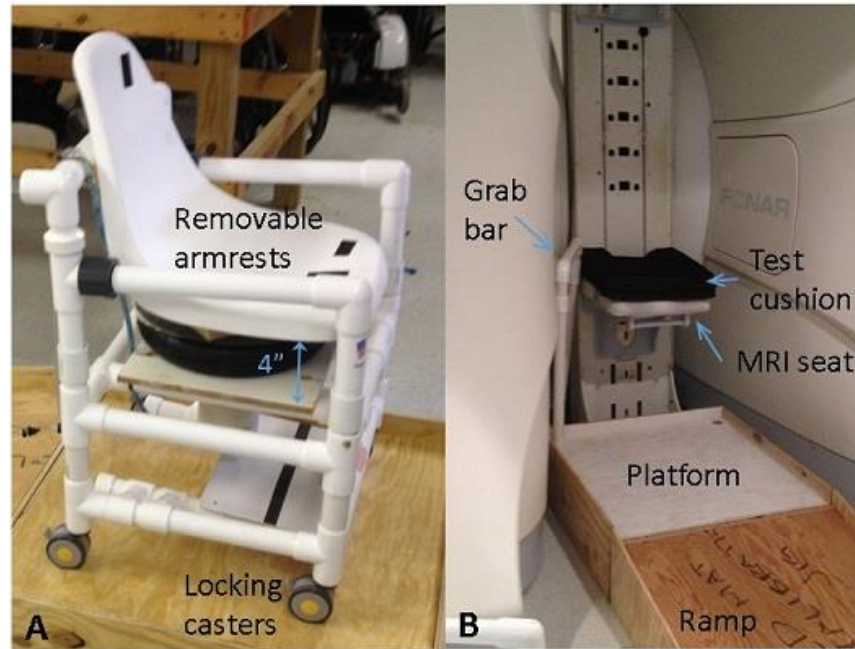
Objectives

- Describe the variations in buttocks anatomy seen in our participants.
- Describe which tissues are under the most load during sitting.

Approach

- Observe and measure (not model)
- MRI Scan of seated buttocks
 - Scanned complete ischial tuberosity, gluteus maximus and surrounding tissues
 - One side
- Flat foam (HR45)
- 7 participants
 - 2 women, 5 men
 - 4 a/b, 3 SCI

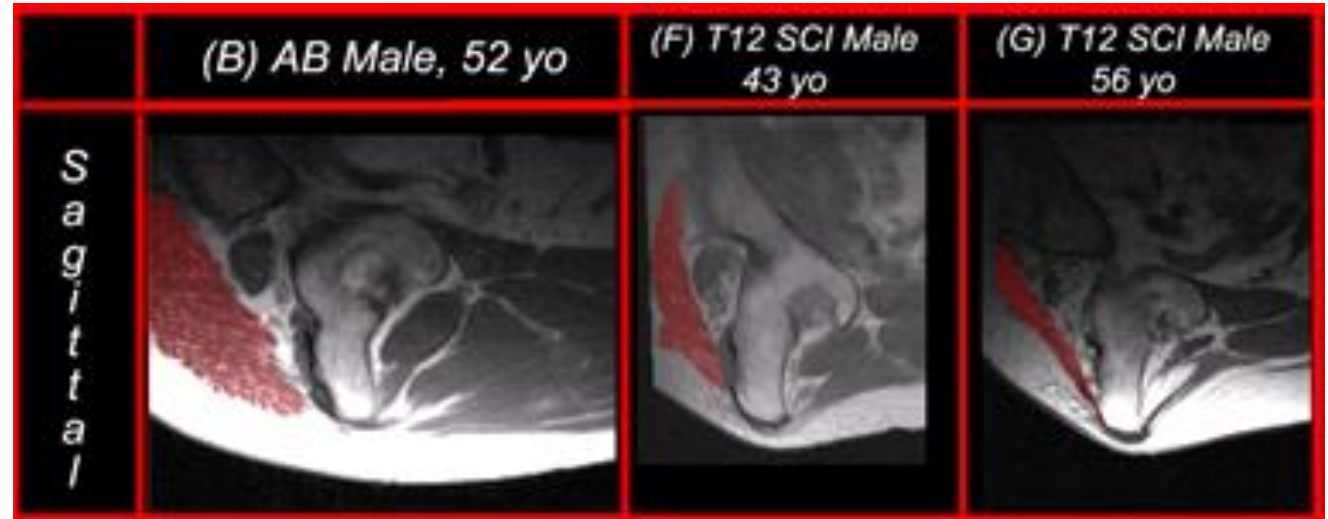
Approach: FONAR “Stand-up” MRI



Subjects

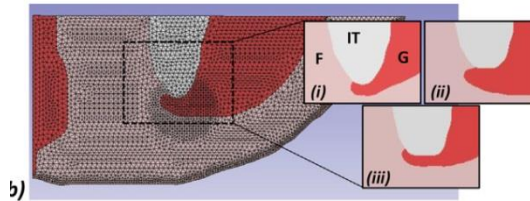
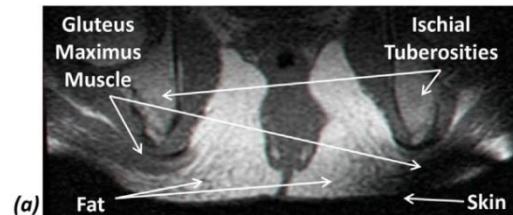
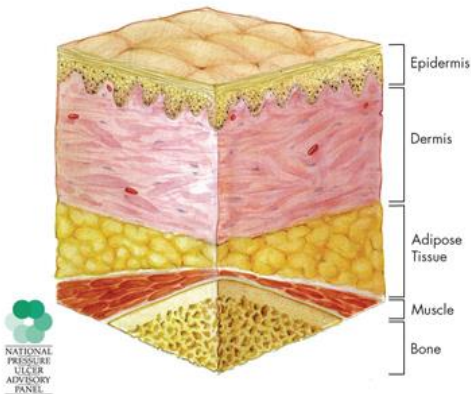
Subject ID	Gender	Age	Weight (lbs)	Diagnosis
A	F	32	115	a/b
B	M	52	209	a/b
C	M	53	185	a/b
D	F	23	117	a/b
E	M	18	105	SCI – C6/C7 Complete, 17 years post injury, Spasticity
F	M	43	190	SCI – T12 Incomplete, 10 years post injury
G	M	56	260	SCI – T12 Complete, 5 years post injury, No spasticity

Anatomical Variation of Buttocks Structures While Seated

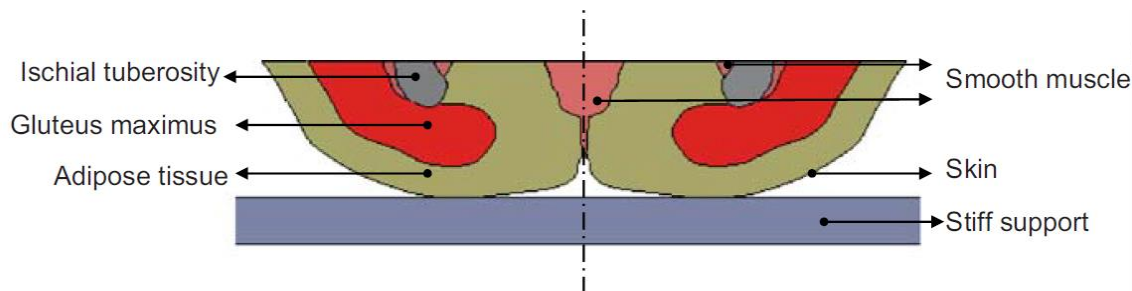


- Gluteus
 - Quantity
 - Shape
 - Position
- Adipose Tissue
 - Subcutaneous
 - Visceral and intermuscular

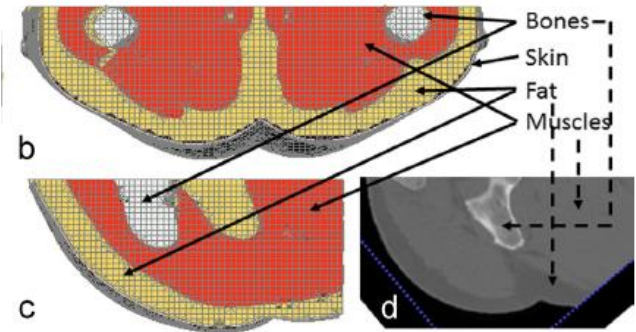
Typical Assumption: People are Sitting on Muscle



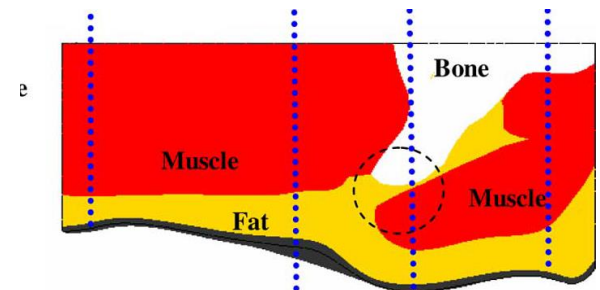
Levy, A., et al. *J Tissue Viability*, 2014. 23(1): p. 13-23.



Sopher, R., et al. *J Biomech*, 2010. 43(2): p. 280-6.

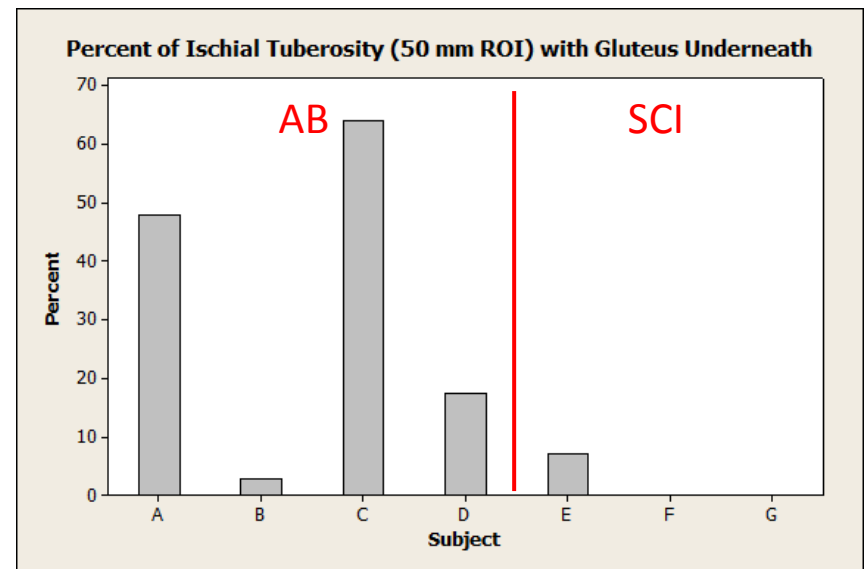
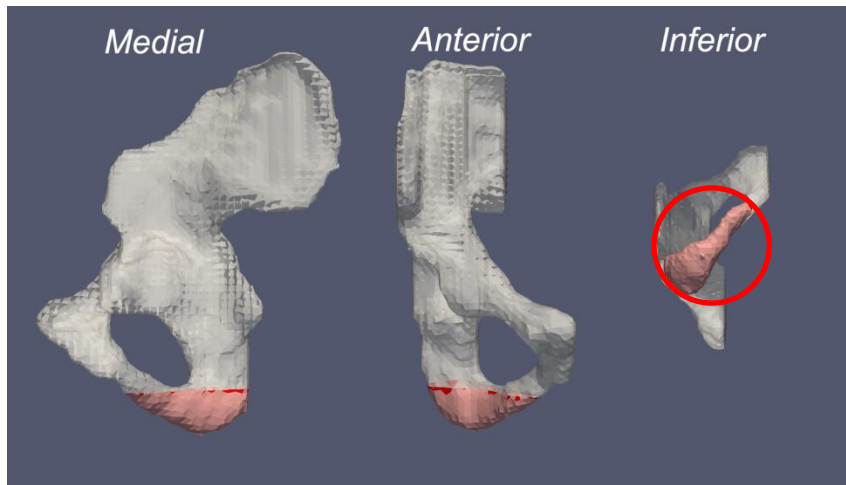


Luboz, V., et al. *J Biomech*, 2014. 47(10): p. 2231-6.

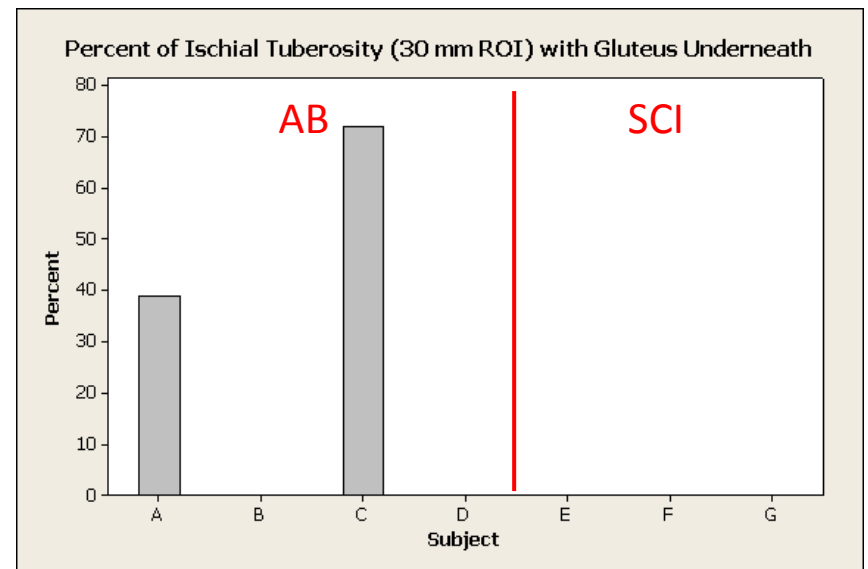
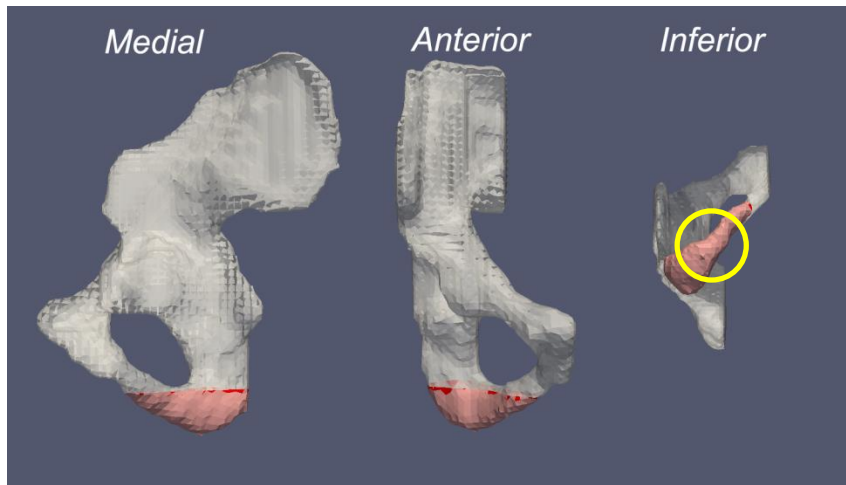


Makhsous, M., et al. *IEEE Trans Neural Syst Rehabil Eng*, 2007. 15(4): p. 517-25.

Are the Gluts the Tissue Under Greatest Load During Sitting?

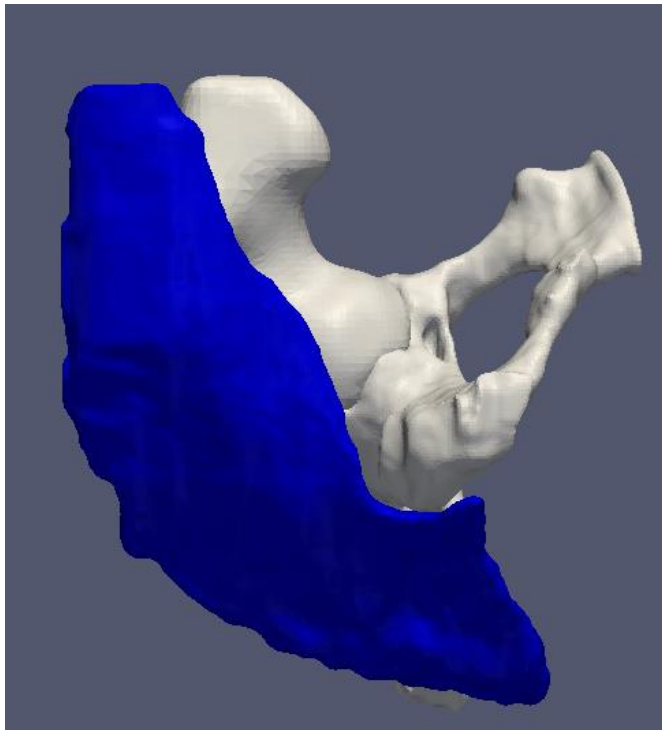


Are the Gluts the Tissue Under Greatest Load During Sitting?

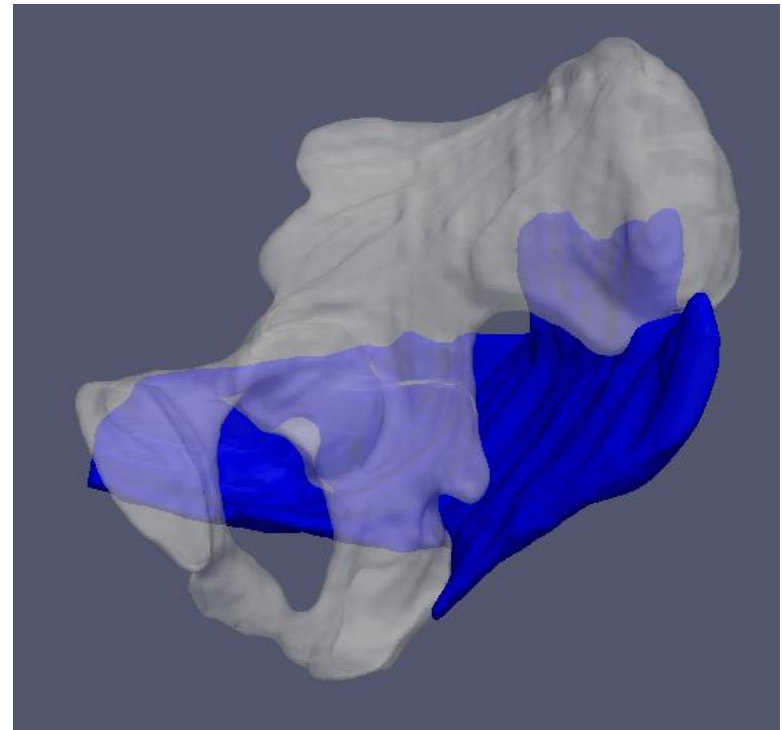


Example of the Gluteus Maximum While Seated: (G) T12 SCI Male

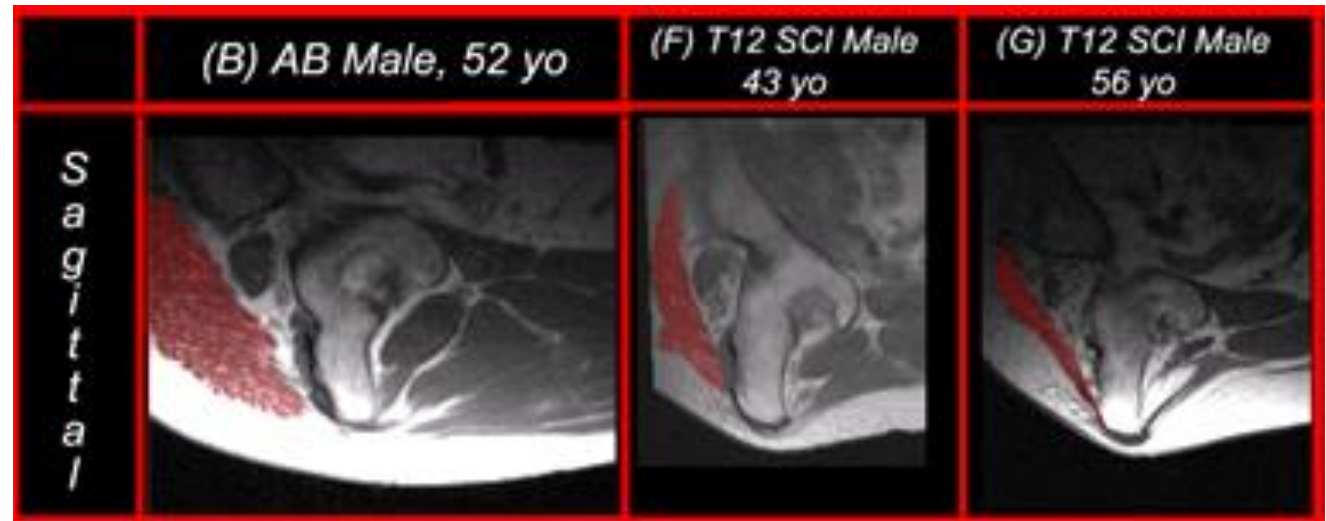
Inferior View



Medial View



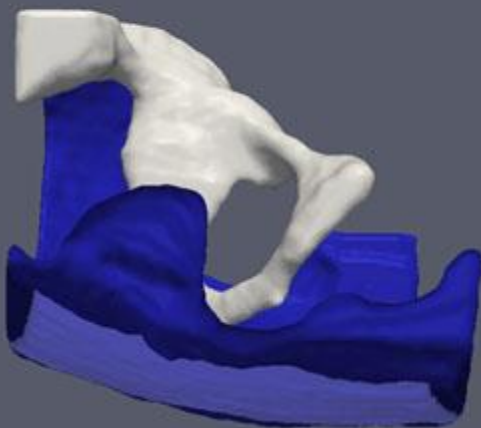
If not the gluteus maximus, what is loaded?



- Gluteus
 - Quantity
 - Shape
 - Position
- Adipose Tissue
 - Subcutaneous
 - Visceral and intermuscular
- Connective Tissue

The Inner Adipose Surface

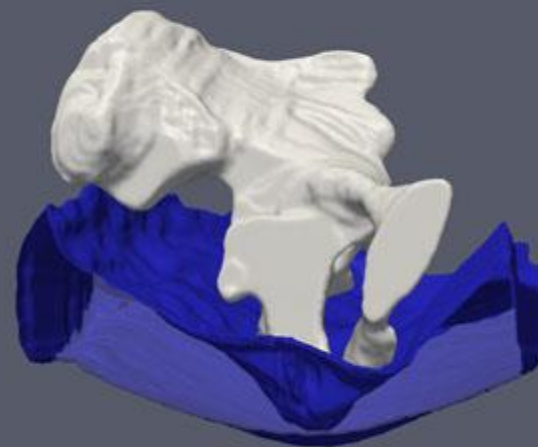
(B) AB Male, 52 yo



(F) T12 SCI Male, 43 yo



(G) T12 SCI Male, 56 yo



Conclusions & Future Efforts

- Methodology
 - Requires multiplanar imaging
 - Anatomists should participate in analysis
- Avoid defining DTI as tissue damage of muscle overlying bone.
- Maybe the gluteus is not the first thing to experience damage. Have to measure and study other structures.
- Finite element models may not be accurate (anatomy is not typical)
- There are different kinds butts, consistent with differences in risk.
- Future efforts:
 - Identify the different kinds of buttocks with different Biomechanical Risk
 - Develop a test and evaluate cushions
 - Match buttocks types with cushion cohorts

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For More Information

- <http://authors.elsevier.com/a/1R5SJ,LyZq~7ai>