lead to premature birth, yet there is no clinically established method to objectively and quantitatively measure softening. Our objective is to develop a safe, reliable, noninvasive quantitative method to assess cervical softness. We have shown that shear wave speed estimation (SWS) is an effective method to measure cervical softness in hysterectomy specimens. A critical step toward transitioning to in vivo studies is to determine the spatial variability in cervical softness, and that is the aim of the current work.

Methods—Five multiparous hysterectomy specimens from nonpregnant women were bivalved, placed in a saline bath, and scanned with a 9L4 linear array transducer aligned parallel with the endocervical canal using a Siemens Acuson S2000 system. SWS measurements were obtained in 5 positions along the canal (10–30 mm from the external os) and at 3 depths from the surface of the canal (0.25–8.25 mm deep) with 10 replicate measurements at each location. The shear wave speeds were estimated using an iterative random sample consensus (RANSAC) method.

Results—In all specimens, the shear wave speed systematically increased along the canal from distal to proximal (closer to the uterus) on the anterior side (1.47 ± 0.08 vs 4.54 ± 0.22 m/s for distal and proximal, respectively). This represents an increase in SWS of 1.5 m/s/cm along the length of the cervix. The posterior side showed much greater, and less systematic, spatial variation (3.61 ± 0.98 vs 4.14 ± 0.58 m/s for distal and proximal, respectively). All estimates had a RANSAC inlier percentage of 99%, representing strong confidence in the SWS estimates.

Conclusions—Normal cervical tissue has a significant stiffness gradient that can be characterized with acoustic radiation force-based shear elasticity imaging methods. With careful development and testing, SWS measurement will provide a means to noninvasively assess softening of the pregnant cervix and could be a useful research tool for exploring premature cervical remodeling.

New Investigator Award Session

Moderators: Arthur Fleischer, MD, Elisa Konofagou, PhD

1434714 Longitudinal Analysis of Grayscale Imaging and Electromyography in an Animal Model of Carpal Tunnel Syndrome

Shawn Roll,[1]* Kevin Evans,[2] Kevin Volz,[2] Carolyn Sommerich[2]
[1]Division of Occupational Science and Occupational Therapy, University of Southern California, Los Angeles, California USA; [2]School of Health and Rehabilitation Sciences, Ohio State University, Columbus, Ohio USA

Objectives—The objective of this research was to determine the ability of sonography to identify changes over time in median nerve morphology due to controlled exposure to a physical task related to the development of carpal tunnel syndrome.

Methods—Fifteen *Macaca fascicularis* monkeys pinched a lever while in various amounts of wrist flexion to receive a treat. Subjects worked at a self-regulated pace up to 8 hours a day, 5 days a week, for 14 weeks. Nerve conduction velocity (NCV) and sonographic evaluation of the median nerve were completed every other week during 4 weeks of training (baseline), 16 weeks of working, and 6 weeks of recovery. A GE LOGIQ *i* with a 12-MHz linear transducer was used for sonographic evaluation. Cross-sectional area (CSA) was measured via a direct trace around the inner hyperechoic border of the nerve in the forearm and at the level of the pisiform. NCV and CSA measures were analyzed across the 3 phases using analysis of variance and trend graphs.

Results—NCV slowed slightly from baseline to the working phase across all subjects ($P = .03$). CSA of the nerve at the level of the pisiform was noted to increase significantly from baseline and working phases as compared to the recovery phase ($P = .03$). At the same time, CSA of the median nerve in the distal forearm did not change across the phases ($P = .20$).

Conclusions—Based on this controlled study, changes in CSA of the median nerve can be observed over time and may be directly associated with work exposure. Sonography may be a highly useful tool for periodic preventative screening for work-related musculoskeletal disorders. Early detection of these changes through longitudinal evaluations in workers at risk for carpal tunnel syndrome could trigger interventions meant to reverse the progression of tissue pathology.

Table 1. Average (SD) Nerve Measurements Across the Study Phases

	Baseline	Working	Recovery	*P*
Nerve conduction velocity, m/sec	35.96 (3.46)	34.33 (3.76)	34.81 (3.19)	.03
CSA in forearm, mm^2	0.61 (0.15)	0.59 (0.16)	0.64 (0.17)	.20
CSA at pisiform, mm^2	0.82 (0.28)	0.81 (0.29)	0.96 (0.36)	.03
CSA change (pisiform – forearm), mm^2	0.20 (0.28)	0.22 (0.31)	0.30 (0.38)	.27

1526604 Risk Reduction of Brain Infarction During Carotid Endarterectomy or Stenting Using Sonolysis: Prospective Randomized Study Pilot Data

Martin Kuliha,[1]* David Školoudík,[1,4] Eva Hurtíková,[1] Martin Roubec,[1] Andrea Goldírová,[1] Roman Herzig,[4] Václav Procházka,[2] Tomáš Jonszta,[2] Dan Czerný,[2] Jan Krajča,[2] David Otáhal,[3] Tomáš Hrbáč[3] *[1]Neurology, [2]Radiology, [3]Neurosurgery, University Hospital Ostrava, Ostrava, Czech Republic; [4]Neurology, University Hospital Olomouc, Olomouc, Czech Republic*

Objectives—Sonolysis is a new therapeutic option for acceleration of arterial recanalization. The aim of this study was to confirm risk reduction of brain infarction during carotid endarterectomy (CEA) and carotid stenting (CS) of the internal carotid artery (ICA) using sonolysis with continuous transcranial Doppler monitoring by a diagnostic 2-MHz probe.

Methods—All patients with ICA stenosis >70%, an indication for CEA or CS, and signed informed consent were enrolled to the study during 18 months. Patients were randomized into 2 groups: group 1 with sonolysis during intervention and group 2 without sonolysis. Neurologic examination, cognitive tests, and brain magnetic resonance imaging were performed before and 24 hours after intervention in all patients. New brain infarctions, infarctions >0.5 cm^3, a mini–mental state examination, a clock test, and a speech fluency test were statistically evaluated using a *t* test.

Results—Totally, 127 patients were included in the study. Sixty-two (48 males; mean age, 65.6 ± 7.6 years) were randomized into group 1; 33 underwent CEA and 29 CS. Sixty-five patients (39 males; mean age, 65.6 ± 7.8 years) were randomized into group 2; 30 underwent CEA and 35 CS. New brain infarctions/infarctions >0.5 cm^3 were found in 19 (30.6%)/4 (6.5%) patients in group 1 and in 26 (40.0%)/12 (18.5%) patients in group 2, respectively ($P = .14$/$P = .02$, respectively). No significant differences were found in cognitive tests ($P > .05$ in all tests).

Conclusions—Sonolysis seems to be effective in prevention of large brain infarction during CEA and CS. (Supported by grants IGA MH CR NT/11386-5/2010, NT/11046-6/2010, and NT/13498-4/2012.)

1536178 Measured Single-Bubble Postexcitation Collapse Thresholds for Standard and Size-Altered Ultrasound Contrast Agents

Daniel King,[1,2]* William O'Brien Jr[2,3] *[1]Mechanical Science and Engineering, [2]Bioacoustics Research Laboratory, [3]Electrical and Computer Engineering, University of Illinois at Urbana-Champaign, Urbana, Illinois USA*

Objectives—Experimentally measured responses of ultrasound contrast agents (UCAs) at high acoustic pressures are valuable for imaging and therapeutic ultrasound applications as well as for interpreting bio-