
RSNA Press Release

Astronauts Submit First Medical Research Paper from Space

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OAK BROOK, Ill., Nov. 8, 2004 - The first medical research paper submitted from the International Space Station (ISS) was published online today by the journal *Radiology*. The report documents the first ultrasound examination of the shoulder performed under the microgravity conditions of space flight.

Members of Expedition 9 crew aboard the ISS completed the study as part of the Advanced Diagnostic Ultrasound in Microgravity (ADUM) experiment.

"It is with great pleasure that we offer to the journal *Radiology* the first paper ever submitted from the ISS," said the study's lead author, ISS Science Officer E. Michael Fincke, M.S.

The ADUM experiment is being conducted to determine the accuracy of ultrasound in novel clinical conditions, to assess feasibility of ultrasound for monitoring in-flight musculoskeletal changes in crewmembers and to determine optimal training methods, including the use of remote guidance. While some aspects of the experiment are unique to space flight, Fincke believes the results are relevant to medical care on the ground. "The ADUM project has begun to provide a great and useful capability onboard the ISS with direct implications to improve life on Earth in the fields of emergency, rural and remote medicine," he said.

Astronauts experience a reduction in bone, muscle and tendon mass during prolonged exposure to microgravity, increasing their risk of injury. Strenuous physical labor during spacewalks and limited upper body and arm mobility in spacesuits make the shoulders particularly vulnerable. For this component of the ADUM experiment, the team evaluated the ability of a nonphysician crewmember on the ISS to obtain quality, shoulder musculoskeletal data from another crewmember using real-time remote guidance. The crewmembers attended a 2½-hour ultrasound training session four months before launch and

At A Glance

- Crewmembers of the International Space Station (ISS) have published the results of the first shoulder ultrasound exam performed in space.
- The study, published in the online edition of the journal *Radiology*, is the first medical research paper ever submitted from the ISS.
- The astronauts were able to successfully complete the exam with limited training and real-time remote guidance from ultrasound specialists on the ground.
- The findings have implications for remote areas of the world where access to medical personnel and equipment is limited.

completed a one-hour computer-based training program while onboard the space station.

The astronauts used special positioning, including foot restraints and hand pressure to adjust the examination to a microgravity environment. During the exam, real-time ultrasound video of the shoulder was transmitted to experienced sonologists in the Telescience Center at the Johnson Space Center in Houston. The sonologists verbally guided the astronaut operator through probe manipulation and equipment adjustment to obtain optimal images for a complete rotator cuff evaluation. The exam was completed in less than 15 minutes. The downloaded images were subsequently reviewed by a musculoskeletal ultrasound specialist. Diagnostic image quality was excellent, and no indication of shoulder injury was found.

The findings indicate that fundamental training, combined with remote guidance from ultrasound experts, may be an effective method of performing diagnostic ultrasound exams in space, and may prove useful on Earth in situations where access to trained physicians and proper medical equipment is limited.

"The remotely guided ultrasound concept, with trained first responders as operators, is a significant and clinically relevant advancement in space science, with profound ramifications for emergency or clinical care," Fincke said.

The complete article and video images of the ultrasound examination being performed onboard the ISS may be accessed online at <http://radiology.rsna.org/cgi/content/full/2342041680v1>. For further information, contact Maureen Morley or Heather Babiar at 630-590-7762.

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"Evaluation of Shoulder Integrity in Space: First Report of Musculoskeletal Ultrasound on the International Space Station." E. Michael Finke, M.S., Gennady Padalka, M.S., Doohi Lee, M.D., Ashot E. Sargsyan, M.D., Douglas R. Hamilton, M.D., Ph.D., David Martin, R.D.M.S., Shannon L. Melton, B.S., Kellie McFarlin, M.D., and Scott A. Dulchavsky, M.D., Ph.D.

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