



LEADING
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109TH SCIENTIFIC ASSEMBLY AND ANNUAL MEETING
McCORMICK PLACE \ CHICAGO

RSNA 2023

PRESS KIT

Visit the RSNA Newsroom at
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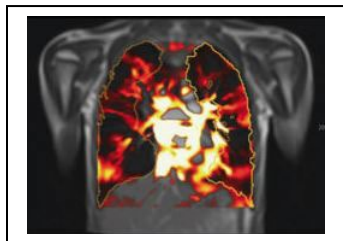


Annual Meeting: Nov. 26–30
Technical Exhibits: Nov. 26–29

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Contact the RSNA media team for help with your medical stories.



WHY:

Our team can provide you with the experts, the context and the background you need for medical stories related to radiology.

WHO:

Our network of renowned medical experts and thought leaders is ready to provide journalists with authoritative background, commentary and quotes.

WHAT:

Standards, such as mammography, CT, MRI, PET, ultrasound and imaging-guided therapies. The latest technologies and treatments, including AI, photon-counting CT, theranostics, 3D printing and advanced visualization in medicine.

HOW:

Annual Meeting — The RSNA Scientific Assembly and Annual Meeting is the world's leading annual radiology forum and offers more than 3,000 research papers, posters and education exhibits. Our onsite newsroom provides press kits, images, access to radiology experts and media workspace. Visit the RSNA online newsroom: [RSNA.org/press23](https://www.rsna.org/press23).

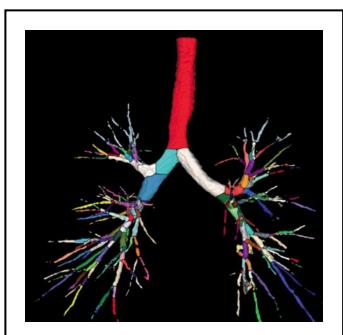
Publications — News releases and highlights from RSNA's peer-reviewed scientific journals [Radiology](#), [Radiology: Artificial Intelligence](#), [Radiology: Cardiothoracic Imaging](#) and [Radiology: Imaging Cancer](#) are distributed regularly to RSNA media subscribers. Visit [RSNA.org](https://www.rsna.org) for access to news releases, journal abstracts and articles from [RSNA News](#).

[RadiologyInfo.org](#) — Our website for patients offers detailed information in English and Spanish about imaging procedures and treatments, screening and more, written for the general public.

Images & B-Roll — RSNA has radiologic images for a variety of conditions. RSNA's [video library](#) features imaging procedures and treatments to help television and web producers create timely, realistic medical segments.

Public Service Announcements (PSAs) — RSNA offers scripted and pre-recorded radio [PSAs](#) on important issues, such as breast cancer and lung cancer awareness.

RSNA is an association of radiologists, radiation oncologists, medical physicists and related scientists, promoting excellence in patient care and health care delivery through education, research and technologic innovation.





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LOOKING FOR ADDITIONAL INFORMATION?

The RSNA 2023 Online Newsroom Provides:

- ▶ High-resolution images
- ▶ Presenter interviews
- ▶ Additional meeting announcements
- ▶ Videos
- ▶ Scientific abstracts
- ▶ Exhibitor news center



All in one convenient location:

[RSNA.org/Press23](https://rsna.org/Press23)

Email: **Media@RSNA.org**



Annual Meeting: Nov. 26–30
Technical Exhibits: Nov. 26–29

November 26, 2023

To: RSNA 2023 Media Attendees

From: Jennifer Kemp, M.D.
Chair, RSNA Public Information Committee

Welcome to the 109th Scientific Assembly and Annual Meeting of the Radiological Society of North America (RSNA), the world's premier annual radiologic meeting. More than 3,900 scientific research presentations and education exhibits will cover the latest developments in radiology and related imaging technologies dealing with diagnosis, intervention and therapy.

RSNA 2023 offers you access to an abundance of compelling medical stories and the latest in artificial intelligence (AI) research and technology.

THE KIT:

The RSNA Board and Public Information Committee are pleased to present the media with 15 news releases on some of the hottest topics from the scientific program. The meeting also provides facilitated access to many of the world's leading radiologic researchers and hundreds of story ideas for now and later.

Here are the topics you'll find in this kit.

Hidden Belly Fat in Midlife Linked to Alzheimer's Disease
MRI Reveals Brain Activity Behind Fanaticism
AI May Aid in Diagnosing Adolescents with ADHD
Marijuana, Cigarette Smokers at Increased Risk of Emphysema
Novel AI System Could Diagnose Autism Much Earlier
Soccer Heading Linked to Measurable Decline in Brain Function
AI Model Predicts Breast Cancer Risk Without Racial Bias
Novel MRI Reveals Brain Changes in Long-COVID Patients
Children Who Play Baseball Risk Elbow Injury
Common Headaches Tied to Neck Inflammation
AI Identifies Non-smokers at High Risk for Lung Cancer
Black Patients Face Delays in Alzheimer's Diagnosis
New Treatment Restores Sense of Smell in Patients with Long COVID
Stronger Thigh Muscles May Prevent Knee Replacement Surgery
Regular Screening Mammograms Significantly Reduce Breast Cancer Deaths

You will also find Learning Center Theater highlights and a list of additional story ideas from other scientific papers and posters being presented at RSNA 2023 that are of interest to both general and specialized audiences.

I encourage you to attend [plenary and special sessions](#) to hear some of the most influential leaders, physicians and researchers speak on topics important to patient care. At the Opening Session on Sunday, RSNA President Matthew A. Mauro, M.D., will deliver his President's Address: "Leading Through Change."

Also at the Opening Session, Howard Chrisman, M.D., will present "History Never Repeats Itself, But It Does Often Rhyme."

On Nov. 27, Elizabeth S. Burnside, M.D., M.P.H. will present “Leading Through Technology: Valuing Artificial and Human Intelligence.”

Vin Gupta, M.D., will speak Nov. 28 on “The Future of Healthcare Delivery: Considerations for Patients and Providers.” On Nov. 29, Jocelyn Chertoff, M.D., M.S., presents “Understanding and Revitalizing the Radiology Workforce.”

The Image Interpretation Session on Nov. 27, moderated by C. Douglas Phillips, M.D., offers a cross-disciplinary opportunity for attendees to test their knowledge beyond their areas of expertise and follow along as a panel of experts identify abnormal findings critical to making accurate diagnoses.

Julius Chapiro, M.D., Ph.D., and Anna Shapiro, M.D., will host “Oncology Imaging and Interventions: The Radiology Jeopardy,” a lively interactive game show experience, on Nov. 29.

The RSNA/AAPM Symposium: “Together We Can Make a Difference,” held on Nov. 30, will focus on successful collaboration between radiologists and physicists in technical developments and clinical translations in medical imaging. The symposium will be moderated by Guang-Hong Chen, Ph.D.

Popular sessions like Case of the Day and “Fast 5” will offer engaging experiences for attendees. The Discovery Theater will feature informative presentations and entertainment.

The [Technical Exhibit](#) halls, featuring the expansive [AI Showcase and Theater](#), provide attendees the opportunity to see all the innovative products and services being offered by exhibitors.

The Imaging AI in Practice demo is an interactive exhibit spotlighting new AI technologies and integration standards needed to embed AI into the radiology workflow. Stop by the Innovation Theater, where you can be the first to hear about leading-edge technology and product launches.

Be sure to take some time to unwind at Happy Hour in the North and South Halls on Tuesday from 2-5 p.m. and enjoy some entertainment at the Discovery Theater in Lakeside Center.

For more information about any of these events and sessions, including locations and times, please consult the meeting program, call 1-312-791-6610 or visit the Newsroom staff.

I appreciate your interest in the field of radiology and hope you have a wonderful experience at RSNA 2023!

Policies and Guidelines for News Media Covering the RSNA 2023 Meeting

The Radiological Society of North America is pleased to welcome the world press to its 109th Scientific Assembly and Annual Meeting.

GENERAL INFORMATION The 109th Scientific Assembly and Annual Meeting, Sunday, Nov. 26, to Thursday, Nov. 30, 2023, at McCormick Place in Chicago, is an international forum of peer-reviewed research, state-of-the-art technology and education for radiologists, radiation oncologists, medical physicists and allied scientists. It is a meeting place for medical imaging leaders worldwide. As such, it provides a host of news opportunities.

NEWSROOM LOCATION The RSNA Newsroom is located in the South Building, Level 1 S103. Newsroom facilities include a work area, interview cubicles and food service.

NEWSROOM HOURS Sunday – Wednesday, Nov. 26 – Nov. 29, 8 a.m. – 5:30 p.m.

MEDIA ELIGIBILITY Press badges are available only to *working press* who can show evidence that their attendance results in original coverage of the RSNA Scientific Assembly and Annual Meeting in print, broadcast or recognized Internet news media. RSNA does not issue press badges to: publishers or a publication's advertising, marketing, public relations or sales representatives; publishers, editors or reporters from manufacturers' house organs or promotional publications; public relations staff of exhibitors or educational institutions; or other individuals who are not actively reporting on the meeting.

To obtain a press badge, identification certifying that you are a working member of the print, online or broadcast news media and/or a letter from an editor stating that you are on assignment to cover the RSNA Scientific Assembly and Annual Meeting is required. Business cards or membership cards from communications or writers' organizations are not sufficient to establish eligibility. If RSNA issues you a press badge, you must not participate in sales or development of ads, products for sale or CME products. Working press may NOT also register as exhibitors. RSNA reserves the right to make final determination of media eligibility.

PROOF OF COVERAGE If you attended a past RSNA meeting as media, you will be asked to furnish a copy of an article or report resulting from that assignment to be credentialed as press at a subsequent RSNA meeting. If a news outlet sends a staff member or freelancer, the outlet must furnish proof of resulting original coverage in order to send a representative in subsequent years. RSNA does not bear the responsibility for locating coverage.

ADVANCE REGISTRATION Advance registration is *strongly encouraged*. Members of the media interested in attending should visit our [online registration](#) page to access registration materials.

ONSITE MEDIA REGISTRATION Media must check in at the Newsroom to pick up their credentials or to register onsite. A business card or other proof of identity may be required to obtain credentials. For media registering onsite, proof of eligibility will be required. Television, video crews and photographers covering the meeting are required to check in immediately at the Newsroom each day and must be accompanied by a Newsroom representative

when shooting inside McCormick Place. Shooting schedules should be provided by Nov. 1 to ensure Newsroom staff availability.

EXHIBITOR MEDIA INFORMATION RSNA rules prohibit news conferences at hotels or other locations away from the meeting site during meeting hours. Journalists invited to such events are asked to notify RSNA Newsroom staff. As a convenience for journalists, news releases and other information from exhibitors will be displayed in a special area of the Newsroom. Exhibitor representatives are not allowed to distribute press materials outside the Newsroom. It is inappropriate to provide any exhibitor with the news material of other exhibitors. Exhibitor representatives are not allowed in the Newsroom unless accompanied by a journalist who intends to conduct an interview. RSNA advises journalists that it neither reviews for accuracy nor endorses exhibitor news materials. A list of exhibitor press conferences will be posted in the Newsroom.

SCIENTIFIC PAPERS & VISUALS In order to help maintain their eligibility for peer-reviewed journal publication, scientific papers and posters may not be available to media. Reprinting of scientific abstracts or posters is strictly prohibited. Journalists who want to use slides, graphs and other visuals to illustrate coverage must have the presenter's permission. Each presenter has been notified that publication or broadcast of illustrations, tables or other portions of his or her work may adversely affect eligibility for publication in peer-reviewed journals.

CME CREDIT The Radiological Society of North America is accredited by the Accreditation Council for Continuing Medical Education to provide continuing medical education for physicians. The Society sponsors this annual scientific assembly, and as an accredited sponsor, designates this educational activity for CME credit. Because RSNA is the sole sponsor of its assembly, and because the ability to offer CME credit for an educational activity rests on integral participation in the planning, implementation and evaluation of that activity, only the Society can designate this meeting or any portion of it for CME credit. To retain its status as an accredited provider, RSNA cannot and does not designate news or promotional stories issued from its meeting for CME credit, nor does it allow press to do so.

MEDIA ACCESS Media may access scientific presentations, plenary sessions, scientific and educational exhibits and technical exhibits during posted hours. Private areas and events, including but not limited to Board and staff offices, physician lounges, Board and committee meetings, and other scheduled private events, are reserved for RSNA representatives and designated professional attendees. RSNA retains final authority in all issues of access. Questions regarding media access should be directed to Newsroom staff.

INTERVIEWS Cubicles will be available in the Newsroom for media to conduct private interviews. Interviews may also be conducted in public areas, provided that traffic flow is not impeded. Interview opportunities with RSNA Board members and other Society leaders are extremely limited and must be arranged through RSNA media relations staff at 1-630-590-7762 or media@rsna.org prior to October 1. No interviews with RSNA Board members will be available during the annual meeting.

VIDEO/PHOTO REGULATIONS Special audio/video requests, including arrangements for taped interviews, must be submitted in writing to RSNA prior to October 1. Please email audio/video requests to Linda Brooks at media@rsna.org.

Scientific Presentations/Plenary Sessions. Television and video crews and photographers must be accompanied by a Newsroom representative when shooting in scientific sessions. Availability of photo escorts is limited. Requests for photo escorts should be emailed along with a planned shooting schedule to Linda Brooks at media@rsna.org by November 15, to ensure Newsroom staff availability. As a courtesy to presenters, television and video crews and photographers must obtain the permission of the speaker and moderator before shooting presentations. Television and video crews may not use artificial lights during presentations. Lights may be used only before the session begins or after it concludes. Flash photography is not allowed during scientific presentations and plenary sessions.

Lakeside Learning Center. Crews and photographers are asked not to interrupt physicians and others who are studying education exhibits and scientific posters. Physicians can be interviewed in public areas, provided that traffic flow is not impeded, or as they leave the Lakeside Learning Center. Flash photography is not allowed during author presentations.

Scientific Slides or Posters. Photographic or video reproduction of scientific presentation slides or scientific posters for publication without permission of the presenter is strictly prohibited. Media are permitted to capture images of slides and posters without the presenter's permission as background for reporting accuracy only.

Technical Exhibits. Technical exhibits cannot be videotaped or photographed without the expressed advance consent of the exhibitor. Crews must not enter or walk through the exhibit area with cameras rolling. Arrangements for taping establishing shots of wider areas of the show floor should be made through the Newsroom. Videotaping and photographing of technical exhibits by media must occur during posted exhibit hours. Interviews conducted with exhibitors must be used strictly for news reporting purposes without promotional consideration. Photo escorts are not required on the exhibit floor. However, media wishing to capture images or video on the exhibit floor must provide RSNA Newsroom staff with a planned shooting schedule in advance and a list of interviews conducted before the Newsroom closes each day. Advance shooting schedules should be sent to Linda Brooks via email at media@rsna.org.

USE OF AUDIO RECORDING EQUIPMENT Media may not affix taping devices to the speaker, lectern, speaker's table, microphone or McCormick Place power source during scientific or plenary presentations. Audio recordings are to be used for reportorial notes only.

ELECTRONIC EQUIPMENT/POWER SOURCE Media using video cameras, lights, audio recording equipment, computers or any other electronic equipment must provide their own battery-operated power source. Outside of the Newsroom, media may not plug into the McCormick Place power system.

EMAIL DISTRIBUTION LIST Press wishing to receive email notifications about upcoming news from future RSNA meetings can opt-in to the distribution list at the Newsroom front desk.

HEALTH & SAFETY As a health care organization, RSNA is strongly committed to protecting the health and safety of all meeting attendees and personnel. We will continue to monitor recommendations issued by the CDC and state/local health authorities and will adjust health and safety protocols as needed.

RSNA 2023 will be a mask-friendly environment. Attendees may choose whether to wear a face mask based on their personal health assessment and comfort level onsite. RSNA strives to deliver a welcoming environment for all. We ask attendees to be respectful of other people's choices.

Failure to follow any of the policies outlined above will result in forfeiture of media credentials for RSNA 2023 and denial of credentials for subsequent RSNA meetings.

Questions can be directed to RSNA Media Relations: 1-630-590-7762 or media@rsna.org.

RSNA 2023 Press Kit

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Media Contacts:

RSNA Newsroom

1-312-791-6610

Before 11/25/23 or after 11/29/23:

RSNA Media Relations 1-630-590-7762

Linda Brooks
1-630-590-7738
lbrooks@rsna.org

Imani Harris
1-630-481-1009
iharris@rsna.org

Embargoed for release on Monday, Nov. 20, 2023, at 5:00 a.m. ET

Hidden Belly Fat in Midlife Linked to Alzheimer's Disease

AT A GLANCE

- **Higher amounts of fat surrounding the abdominal organs in midlife are linked to Alzheimer's disease.**
- **Higher visceral fat is related to an increased burden of inflammation in the brain on MRI.**
- **These brain changes can occur as early as age 50, on average—up to 15 years before the earliest memory loss symptoms of Alzheimer's disease occur.**

CHICAGO – Higher amounts of visceral abdominal fat in midlife are linked to the development of Alzheimer's disease, according to research being presented next week at the [annual meeting](#) of the Radiological Society of North America ([RSNA](#)). Visceral fat is fat surrounding the internal organs deep in the belly. Researchers found that this hidden abdominal fat is related to changes in the brain up to 15 years before the earliest memory loss symptoms of Alzheimer's disease occur.

According to the Alzheimer's Association, there are more than 6 million Americans living with Alzheimer's disease. By 2050, this number is projected to rise to nearly 13 million. One in every five women and one out of 10 men will develop Alzheimer's disease in their lifetime.

To try and identify Alzheimer's risks earlier, researchers assessed the association between brain MRI volumes, as well as amyloid and tau uptake on positron emission tomography (PET) scans, with body mass index (BMI), obesity, insulin resistance and abdominal adipose (fatty) tissue in a cognitively normal midlife population. Amyloid and tau are proteins thought to interfere with the communication between brain cells.

“Even though there have been other studies linking BMI with brain atrophy or even a higher dementia risk, no prior study has linked a specific type of fat to the actual Alzheimer's disease protein in cognitively normal people,” said study author Mahsa Dolatshahi, M.D., M.P.H., post-doctoral research fellow with Mallinckrodt Institute of Radiology (MIR) at Washington University School of Medicine in St. Louis. “Similar studies have not investigated the differential role of visceral and subcutaneous fat, especially in terms of Alzheimer's amyloid pathology, as early as midlife.”

For this cross-sectional study, researchers analyzed data from 54 cognitively healthy participants, ranging in age from 40 to 60 years old, with an average BMI of 32. The participants underwent glucose and insulin measurements, as well as glucose tolerance tests. The volume of subcutaneous fat (fat under the skin) and visceral fat were measured using abdominal MRI. Brain MRI measured the cortical thickness of brain regions that are affected in Alzheimer's disease. PET was used to examine disease pathology in a subset of 32 participants, focusing on amyloid plaques and tau tangles that accumulate in Alzheimer's disease.

The researchers found that a higher visceral to subcutaneous fat ratio was associated with higher amyloid PET tracer uptake in the precuneus cortex, the region known to be affected early by amyloid pathology in Alzheimer's disease. This relationship was worse in men than in women. The researchers also found that higher visceral fat measurements are related to an increased burden of inflammation in the brain.

“Several pathways are suggested to play a role,” Dr. Dolatshahi said. “Inflammatory secretions of visceral fat—as opposed to potentially protective effects of subcutaneous fat—may lead to inflammation in the brain, one of the main mechanisms contributing to Alzheimer's disease.”

Senior author Cyrus A. Raji, M.D., Ph.D., associate professor of radiology and neurology, and director of neuromagnetic resonance imaging at MIR, noted that the findings have several key implications for earlier diagnosis and intervention.

“This study highlights a key mechanism by which hidden fat can increase the risk of Alzheimer's disease,” he said. “It shows that such brain changes occur as early as age 50, on average—up to 15 years before the earliest memory loss symptoms of Alzheimer's occur.”

Dr. Raji added that the results may point to visceral fat as a treatment target to modify risk of future brain inflammation and dementia.

“By moving beyond body mass index in better characterizing the anatomical distribution of body fat on MRI, we now have a uniquely better understanding of why this factor may increase risk for Alzheimer's disease,” he said.

Additional co-authors are Paul K. Commean, B.E.E., Joseph E. Ippolito, M.D., Ph.D., Tammie L. S. Benzinger, M.D., Ph.D., and John C. Morris, M.D.

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Note: Copies of RSNA 2023 news releases and electronic images will be available online at [RSNA.org/press23](https://www.rsna.org/press23).

RSNA is an association of radiologists, radiation oncologists, medical physicists and related scientists promoting excellence in patient care and health care delivery through education, research and technologic innovation. The Society is based in Oak Brook, Illinois. ([RSNA.org](https://www.rsna.org))

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For patient-friendly information on MRI and PET, visit [RadiologyInfo.org](https://www.radiologyinfo.org).

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Linda Brooks
1-630-590-7738
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Embargoed for release on Monday, Nov. 20, 2023, at 5:00 a.m. ET

New Treatment Restores Sense of Smell in Patients with Long COVID

AT A GLANCE

- **A minimally invasive, 10-minute procedure may restore the sense of smell in patients with long COVID.**
- **For the study, 54 patients were treated with a stellate ganglion block, which includes injecting anesthetic directly into the nerves on one side of the neck to stimulate the nervous system.**
- **At follow-up one week later, 59% of patients reported improvement in symptoms.**

CHICAGO – Using an image-guided minimally invasive procedure, researchers may be able to restore the sense of smell in patients who have suffered with long-COVID, according to research being presented next week at the [annual meeting](#) of the Radiological Society of North America ([RSNA](#)).

Parosmia, a condition where the sense of smell no longer works correctly, is a known symptom of COVID-19. Recent research has found that up to 60% of COVID-19 patients have been affected. While most patients do recover their sense of smell over time, some patients with long COVID continue to have these symptoms for months, or even years, after infection, negatively impacting their appetite for food and their overall quality of life.

“Post-COVID parosmia is common and increasingly recognized,” said the study’s lead author, Adam C. Zoga, M.D., M.B.A., professor of musculoskeletal radiology at Jefferson Health in Philadelphia, Pennsylvania. “Patients can develop a distaste for foods and drinks they used to enjoy.”

The distorted sense of smell can also affect smell perception, and some patients may suffer from phantosmia, a condition that causes people to detect smells—foul or pleasant—that aren’t in their environment.

To assess a possible treatment for patients with long-term post-COVID parosmia, researchers looked at the potential benefits of CT-guided stellate ganglion block. Part of the autonomic nervous system, which regulates involuntary processes including heart rate, blood pressure, breathing and digestion, the stellate ganglia are nerves on each side of the neck. They deliver certain signals to the head, neck, arms and a portion of the upper chest.

The research team used a stellate ganglion block, which includes injecting anesthetic directly into the stellate ganglion on one side of the neck to stimulate the regional autonomic nervous system. The minimally invasive procedure takes less than 10 minutes, and no sedation or intravenous analgesia is necessary. Stellate ganglion block has been used with varying degrees of success to treat a number of conditions, including cluster headaches, phantom limb pain, Raynaud’s and Meniere’s syndromes, angina and cardiac arrhythmia.

“Parosmia has previously been reported as a rare disorder occurring after brain trauma, brain surgery, stroke, viral syndromes, and with some head and neck tumors,” Dr. Zoga said. “We were not entirely confident that the procedure would work for parosmia.”

For the study, 54 patients were referred from an ear, nose and throat specialist after at least six months of post-COVID parosmia that was resistant to pharmaceutical and topical therapies.

CT guidance was used to position a spinal needle at the base of the neck for injection into the stellate ganglion. The researchers added a small dose of corticosteroid to the anesthetic in the pharmacologic preparation, suspecting that the COVID virus may be causing nerve inflammation.

“The initial patient had a tremendously positive outcome, almost immediately, with continued improvement to the point of symptom resolution at four weeks,” Dr. Zoga said. “We have been surprised at some outcomes, including near 100% resolution of phantosmia in some patients, throughout the trial.”

Follow-up was obtained for 37 patients (65%), with 22 (59%) of the 37 reporting improved symptoms at one week post-injection. Of these 22, 18 (82%) reported significant progressive improvement by one month post-procedure. At three months, there was a mean 49% improvement in symptoms (range 10% to 100%) among the 22 patients.

Twenty-six patients returned for a second injection given on the other side (contralateral) of their neck after at least a six-week interval. While the second injection was not effective in patients who did not respond to the first injection, 86% of patients who reported some improvement after the first injection reported additional improvement after the contralateral injection. No complications or adverse events were reported.

“Other treatments have failed to date,” Dr. Zoga said. “This injection is working.”

Co-authors are Sarah I. Kamel, M.D., T. Rohan, M. A. Moriarty, Johannes B. Roedl, Ph.D., M.D., Vishal Desai, M.D., and Jeffrey A. Belair, M.D.

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For patient-friendly information on CT-guided procedures, visit [RadiologyInfo.org](https://www.RadiologyInfo.org).

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Linda Brooks
1-630-590-7738
lbrooks@rsna.org

Imani Harris
1-630-481-1009
iharris@rsna.org

Embargoed for release on Tuesday, Nov. 21, 2023, at 5:00 a.m. ET

MRI Reveals Brain Activity Behind Fanaticism

AT A GLANCE

- **Researchers used fMRI to measure brain activity in fans of rival soccer teams during match play.**
- **When their team wins, the reward system in the fan's brain is activated, but when they lose, the mentalization network may be activated, or the mechanism that regulates cognitive control may be inhibited.**
- **The findings lend themselves to extreme fanaticism in other areas like politics and may shed light on social dynamics in all walks of life.**

CHICAGO – Soccer fans exhibit different patterns of brain activation while watching a match that may trigger positive and negative emotions and behaviors, according to research being presented next week at the [annual meeting](#) of the Radiological Society of North America ([RSNA](#)). The researchers say the implication of these findings could extend beyond sports to fanaticism in other areas, such as politics.

“This study aims to shed light on the behaviors and dynamics associated with extreme rivalry, aggression and social affiliation within and between groups of fanatics,” said the study’s lead author, Francisco Zamorano Mendieta, Ph.D., researcher in the Department of Imaging at Clínica Alemana de Santiago, and associate professor at Facultad de Ciencias para el Cuidado de la Salud, Universidad San Sebastián, Santiago, Chile.

Rivalries run deep in the history of sports, and fans can be very protective of their “home” team and favorite players. These same fans run the gamut of emotions watching their team succeed or fail over the course of a game or match, cheering when they score or raging at a bad call. Soccer fans are known for their team loyalty and enthusiasm, particularly in Europe and South America.

To gain some insight into the brain mechanisms behind the behaviors of the fans, Dr. Zamorano and colleagues recruited 43 healthy male volunteers who support Chilean football teams for a functional MRI (fMRI) study.

The study involved football fans from the two most popular Chilean soccer teams, considered archrivals. Participants were divided into two groups, 22 supporters of one team and 21 supporters of the rival team. Participants completed a survey to determine a soccer fanaticism score and underwent psychological evaluations.

All participants were presented with a compilation of matches containing 63 goals. While the participants viewed the match compilation, their brain activity was measured using fMRI, a noninvasive imaging technique that detects changes in the brain’s blood flow.

The fMRI results showed that brain activity changed when the fan's team succeeded or failed.

“When their team wins, the reward system in the brain is activated,” Dr. Zamorano said. “When they lose, the mentalization network can be activated, taking the fan to an introspective state. This may mitigate some of the pain of the loss. We also observed inhibition of the brain hub that connects the limbic system with frontal cortices, hampering the mechanism that regulates cognitive control and increasing the probability to fall into disruptive or violent behavior.”

According to Dr. Zamorano, the findings may shed light on social dynamics in all walks of life.

“People inherently crave social connections, be it through membership in a running club, participation in a book discussion group, or engagement in virtual forums,” he said. “While these social bonds often form around shared beliefs, values and interests, there can also be an element of persuasive proselytism, or ‘group think,’ which may give rise to unreasoned beliefs and societal discord.”

Dr. Zamorano believes that the zealousness found among some sports fans can serve as a compelling example of intense emotional investment, occasional aggressive behavior and impaired rationality.

“Understanding the psychology of group identification and competition can shed light on decision-making processes and social dynamics, leading to a fuller comprehension of how societies operate,” he said.

Dr. Zamorano noted that research in fanaticism and partisanship necessitates robust scientific frameworks but added that arenas like political stances, electoral loyalties, ethnicity, spirituality and identity issues are frequently mired in controversy, complicating efforts to pinpoint the neurological foundations of extreme allegiance.

“Sports fandom, on the other hand, presents a unique opportunity to analyze how intense devotion affects neural activity in a less contentious context, particularly by highlighting the role of negative emotions, the related inhibitory control mechanisms and possible adaptative strategies,” he said.

Co-authors are José María Hurtado, Ph.D., Patricio Carvajal-Paredes, Ximena Stecher Guzman, M.D., Patricia Soto-Icaza, Ph.D., Cesar Salinas, V. López, M.D., Ph.D., Waldemar Méndez, Pablo Billeke, M.D., Ph.D., and Claudio Silva, M.D.

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For patient-friendly information on brain MRI, visit [RadiologyInfo.org](https://www.radiologyinfo.org).

Media Contacts:

RSNA Newsroom

1-312-791-6610

Before 11/25/23 or after 11/29/23:

RSNA Media Relations 1-630-590-7762

Linda Brooks
1-630-590-7738
lbrooks@rsna.org

Imani Harris
1-630-481-1009
iharris@rsna.org

Embargoed for release on Tuesday, Nov. 21, 2023, at 5:00 a.m. ET

Novel AI System Could Diagnose Autism Much Earlier

AT A GLANCE

- **An AI system that analyzes specialized MRIs of the brain accurately diagnosed children between the ages of 24 and 48 months with autism at a 98.5% accuracy rate.**
- **The researchers applied their methodology to the DT-MRI brain scans of 226 children between the ages of 24 and 48 months.**
- **According to a 2023 CDC report, fewer than half of children with autism received a developmental evaluation by three years of age, and 30% who met the criteria did not receive a formal diagnosis by 8 years of age.**

CHICAGO – A newly developed artificial intelligence (AI) system that analyzes specialized MRIs of the brain accurately diagnosed children between the ages of 24 and 48 months with autism at a 98.5% accuracy rate, according to research being presented next week at the [annual meeting](#) of the Radiological Society of North America ([RSNA](#)).

Mohamed Khudri, B.Sc., a visiting research scholar at the University of Louisville in Kentucky, was part of a multi-disciplinary team that developed the three-stage system to analyze and classify diffusion tensor MRI (DT-MRI) of the brain. DT-MRI is a special technique that detects how water travels along white matter tracts in the brain.

“Our algorithm is trained to identify areas of deviation to diagnose whether someone is autistic or neurotypical,” Khudri said.

The AI system involves isolating brain tissue images from the DT-MRI scans and extracting imaging markers that indicate the level of connectivity between brain regions. A machine learning algorithm compares the marker patterns in the brains of children with autism to those of the normally developed brains.

“Autism is primarily a disease of improper connections within the brain,” said co-author Gregory N. Barnes, M.D., Ph.D., professor of neurology and director of the Norton Children’s Autism Center in Louisville. “DT-MRI captures these abnormal connections that lead to the symptoms that children with autism often have, such as impaired social communication and repetitive behaviors.”

The researchers applied their methodology to the DT-MRI brain scans of 226 children between the ages of 24 and 48 months from the Autism Brain Imaging Data Exchange-II. The dataset included scans of 126 children affected by autism and 100 normally developing children. The technology demonstrated 97% sensitivity, 98% specificity, and an overall accuracy of 98.5% in identifying the children with autism.

“Our approach is a novel advancement that enables the early detection of autism in infants under two years of age,” Khudri said. “We believe that therapeutic intervention before the age of three can lead to better

outcomes, including the potential for individuals with autism to achieve greater independence and higher IQs.”

According to the CDC’s 2023 Community Report on Autism, fewer than half of children with autism spectrum disorder received a developmental evaluation by three years of age, and 30% of children who met the criteria for autism spectrum disorder did not receive a formal diagnosis by 8 years of age.

“The idea behind early intervention is to take advantage of brain plasticity, or the ability of the brain to normalize function with therapy,” Dr. Barnes said.

The researchers said infants and young children with autism receive a delayed diagnosis for several reasons, including a lack of bandwidth at testing centers. Khudri said their AI system could facilitate precise autism management while reducing the time and costs associated with assessment and treatment.

“Imaging offers the promise of quickly detecting autism in an objective fashion,” Dr. Barnes said. “We envision an autism assessment that begins with DT-MRI followed by an abbreviated session with a psychologist to confirm the results and guide parents on next steps. This approach could reduce the psychologists’ workload by up to 30%.”

The AI system produces a report detailing which neural pathways are affected, the anticipated impact on brain functionality, and a severity grade that can be used to guide early therapeutic intervention.

The researchers are working toward commercializing and obtaining FDA clearance for their AI software.

Additional co-authors are Mostafa Abdelrahim, B.Sc., Yaser El-Nakieb, Ph.D., Mohamed Ali, Ph.D., Ahmed S. Shalaby, Ph.D., A. Gebreil, M.D., Ali Mahmoud, Ph.D., Ahmed Elnakib, Ph.D., Andrew Switala, Sohail Contractor, M.D., and Ayman S. El-Baz, Ph.D.

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Media Contacts:

RSNA Newsroom

1-312-791-6610

Before 11/25/23 or after 11/29/23:

RSNA Media Relations 1-630-590-7762

Linda Brooks
1-630-590-7738
lbrooks@rsna.org

Imani Harris
1-630-481-1009
iharris@rsna.org

Embargoed for release on Wednesday, Nov. 22, 2023, at 5:00 a.m. ET

Novel MRI Reveals Brain Changes in Long-COVID Patients

AT A GLANCE

- **COVID-19 infection is associated with long-lasting microstructural brain changes.**
- **Patients with long COVID had different patterns of brain changes than people who had recovered from COVID-19 infection without any long-term symptoms.**
- **Diffusion microstructure imaging, a novel MRI technique, can provide detailed information about brain tissues.**

CHICAGO – People with long COVID exhibit patterns of changes in the brain that are different from fully recovered COVID-19 patients, according to research being presented next week at the [annual meeting](#) of the Radiological Society of North America ([RSNA](#)).

“To the best of our knowledge, this is the first study comparing patients with long COVID to both a group without history of COVID-19 and a group that went through a COVID-19 infection but is subjectively unimpaired,” said one of the study’s lead authors, Alexander Rau, M.D., resident in the Departments of Neuroradiology and Diagnostic and Interventional Radiology at University Hospital Freiburg in Freiburg, Germany.

After infection with COVID-19, as many as 10-25% of patients may develop a post-COVID condition commonly referred to as “long COVID.” People with long COVID may experience a wide variety of symptoms, including difficulty concentrating (“brain fog”), change in sense of smell or taste, fatigue, joint or muscle pain, shortness of breath, digestive symptoms, and more. These symptoms may persist for weeks, months, or—as is only now becoming apparent—years after COVID-19 infection.

However, the basis of this condition is poorly understood. Diffusion microstructure imaging (DMI), a novel MRI technique, is a promising approach to fill this gap.

DMI looks at the movement of water molecules in tissues. By studying how water molecules move in different directions and at various speeds, DMI can provide detailed information on the microstructure of the brain. It can detect even very small changes in the brain, not detectable with conventional MRI.

For this prospective, cross-sectional study, Dr. Rau and colleagues compared MRI brain scans of three groups: 89 patients with long COVID, 38 patients that had contracted COVID-19 but did not report any subjective long-term symptoms, and 46 healthy controls with no history of COVID-19.

The researchers first compared the cerebral macrostructure of these three groups to test for atrophy or any other abnormalities. Next, they used DMI to gain a deeper insight into the brain.

The three groups were compared to reveal group differences in the brain's microstructure. DMI parameters were read for the gray matter in the brain. Additionally, whole brain analyses were employed to reveal the spatial distribution of alterations and associations with clinical data, including long-COVID symptoms like fatigue, cognitive impairment or impaired sense of smell.

The results showed no brain volume loss or any other lesions that might explain the symptoms of long COVID. However, COVID-19 infection induced a specific pattern of microstructural changes in various brain regions, and this pattern differed between those who had long COVID and those who did not.

"This study allows for an in vivo insight on the impact of COVID-19 on the brain," Dr. Rau said. "Here, we noted gray matter alterations in both patients with long-COVID and those unimpaired after a COVID-19 infection. Interestingly, we not only noted widespread microstructural alterations in patients with long COVID, but also in those unimpaired after having contracted COVID-19."

The findings also revealed a correlation between microstructural changes and symptom-specific brain networks associated with impaired cognition, sense of smell and fatigue.

"Expression of post-COVID symptoms was associated with specific affected cerebral networks, suggesting a pathophysiological basis of this syndrome" Dr. Rau said.

The researchers hope to reexamine the patients in the future, recording both clinical symptoms and changes to the brain's microstructure.

Despite these brain imaging findings, it remains unclear why some people develop long COVID while others do not, although previous studies have identified risk factors including female sex, older age, higher body mass index, smoking, preexisting comorbidities, and previous hospitalization or intensive care unit admission.

Co-authors are Jonas A. Hosp, M.D., Nils Schroter, M.D., Marco Reisert, Ph.D., Horst Urbach, M.D., Cornelius Weiller, M.D., and Elias Kellner, Ph.D.

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Media Contacts:

RSNA Newsroom

1-312-791-6610

Before 11/25/23 or after 11/29/23:

RSNA Media Relations 1-630-590-7762

Linda Brooks
1-630-590-7738
lbrooks@rsna.org

Imani Harris
1-630-481-1009
iharris@rsna.org

Embargoed for release on Wednesday, Nov. 22, 2023, at 5:00 a.m. ET

AI Identifies Non-smokers at High Risk for Lung Cancer

AT A GLANCE

- **Using a single chest X-ray, a new AI tool can identify non-smokers who are at high risk for lung cancer.**
- **Federal guidelines currently recommend lung cancer screening CT only for individuals with an extensive smoking history.**
- **The never-smokers identified as high risk in the study group exceeded the six-year risk threshold where lung cancer screening can be recommended for smokers.**

CHICAGO – Using a routine chest X-ray image, an artificial intelligence (AI) tool can identify non-smokers who are at high risk for lung cancer, according to a study being presented next week at the [annual meeting](#) of the Radiological Society of North America ([RSNA](#)).

Lung cancer is the most common cause of cancer death. The American Cancer Society estimates about 238,340 new cases of lung cancer in the United States this year and 127,070 lung cancer deaths. Approximately 10-20% of lung cancers occur in “never-smokers” – people who have never smoked cigarettes or smoked fewer than 100 cigarettes in their lifetime.

The United States Preventive Services Task Force (USPSTF) currently recommends lung cancer screening with low-dose CT for adults between the ages of 50 and 80

who have at least a 20 pack-year smoking history and currently smoke or have quit within the past 15 years. The USPSTF does not recommend screening for individuals who have never smoked or who have smoked very little. However, incidence of lung cancer among never-smokers is on the rise, and—without early detection through screening—when discovered, these cancers tend to be more advanced than those found in smokers.

“Current Medicare and USPSTF guidelines recommend lung cancer screening CT only for individuals with a substantial smoking history,” said the study’s lead author, Anika S. Walia, B.A., a medical student at Boston University School of Medicine and researcher at the Cardiovascular Imaging Research Center (CIRC) at Massachusetts General Hospital (MGH) and Harvard Medical School in Boston. “However, lung cancer is increasingly common in never-smokers and often presents at an advanced stage.”

One reason federal guidelines exclude never-smokers from screening recommendations is because it is difficult to predict lung cancer risk in this population. Existing lung cancer risk scores require information that is not readily available for most individuals, such as family history of lung cancer, pulmonary function testing or serum biomarkers.

For the study, CIRC researchers set out to improve lung cancer risk prediction in never-smokers by testing whether a deep learning model could identify never-smokers at high risk for lung cancer, based on their chest

X-rays from the electronic medical record. Deep learning is an advanced type of AI that can be trained to search X-ray images to find patterns associated with disease.

“A major advantage to our approach is that it only requires a single chest-X-ray image, which is one of the most common tests in medicine and widely available in the electronic medical record,” Walia said.

The “CXR-Lung-Risk” model was developed using 147,497 chest X-rays of 40,643 asymptomatic smokers and never-smokers from the Prostate, Lung, Colorectal, and Ovarian (PLCO) cancer screening trial to predict lung-related mortality risk, based on a single chest X-ray image as input.

The researchers externally validated the model in a separate group of never-smokers having routine outpatient chest X-rays from 2013 to 2014. The primary outcome was six-year incident lung cancer, identified using International Classification of Disease codes. Risk scores were then converted to low, moderate and high-risk groups based on externally derived risk thresholds.

Of 17,407 patients (mean age 63 years) included in the study, 28% were deemed high risk by the deep learning model, and 2.9% of these patients later had a diagnosis of lung cancer. The high-risk group well exceeded the 1.3% six-year risk threshold where lung cancer screening CT is recommended by National Comprehensive Cancer Network guidelines.

After adjusting for age, sex, race, previous lower respiratory tract infection and prevalent chronic obstructive pulmonary disease, there was still a 2.1 times greater risk of developing lung cancer in the high-risk group compared to the low-risk group.

“This AI tool opens the door for opportunistic screening for never-smokers at high risk of lung cancer, using existing chest X-rays in the electronic medical record,” said senior author Michael T. Lu, M.D., M.P.H., director of artificial intelligence and co-director of CIRC at MGH. “Since cigarette smoking rates are declining, approaches to detect lung cancer early in those who do not smoke are going to be increasingly important.”

Additional co-authors are Saman Doroodgar Jorshery, M.D., Ph.D., and Vineet K. Raghu, Ph.D.

The researchers report support from the Boston University School of Medicine Student Committee on Medical School Affairs, National Academy of Medicine/Johnson & Johnson Innovation Quickfire Challenge, and the Risk Management Corporation of the Harvard Medical Institutions Incorporated.

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For patient-friendly information on lung cancer screening, visit [RadiologyInfo.org](https://radiologyinfo.org).

Media Contacts: **RSNA Newsroom** **1-312-791-6610**

Before 11/25/23 or after 11/29/23: **RSNA Media Relations** **1-630-590-7762**

Linda Brooks
1-630-590-7738
lbrooks@rsna.org

Imani Harris
1-630-481-1009
iharris@rsna.org

Embargoed for release on Sunday, Nov. 26, 2023, at 4 p.m. ET

Curtis P. Langlotz, M.D., Ph.D., Named President of the RSNA Board

CHICAGO – Curtis P. Langlotz, M.D., Ph.D., was named president of the Radiological Society of North America ([RSNA](#)) Board of Directors today at the Society's [annual meeting](#).

A renowned imaging informatics leader and committed advocate for improved clinical communication, Dr. Langlotz is professor of radiology, medicine and biomedical data science, director of the Center for Artificial Intelligence in Medicine and Imaging, and associate chair for information systems in the Department of Radiology at Stanford University. He is also associate director and senior fellow at the Institute for Human-Centered Artificial Intelligence at Stanford. As a medical informatics director for Stanford Health Care, Dr. Langlotz sets strategy for the computer technology that supports the Stanford Radiology practice.

As RSNA president, Dr. Langlotz will inform and guide Society initiatives, including informatics programs and resources designed to equip RSNA members with the tools they need to integrate AI systems into clinical practice.

“As I begin my service as RSNA president, our specialty faces many opportunities and challenges, including artificial intelligence, image-guided intervention, theranostics, workforce shortages and burnout,” Dr. Langlotz said. “In the coming year, I look forward to working with our members and volunteers whose dedication enables RSNA to create innovative programs that support our specialty as we embrace our exciting future together.”

Dr. Langlotz received his medical degree, a master's degree in artificial intelligence and a doctorate in medical information science from Stanford University. He completed an internship and radiology residency at the University of Pennsylvania, where he remained on the faculty for 20 years. He accepted his current position at Stanford in 2014.

A longtime RSNA member, Dr. Langlotz served for many years on RSNA's Radiology Informatics Committee and has served the Society as an informatics advisor. He led the development of numerous RSNA informatics initiatives, including the RadLex terminology standard, the LOINC-RadLex Playbook of standard exam codes and the RSNA Imaging AI Certificate program.

Dr. Langlotz has also served as a member of the RSNA Publications Council, the Research Development Committee, the *Radiology* Editor Search Committee and the Steering Committee for the RSNA Digital

Roadmap. He has served on the RSNA Board of Directors as the Liaison for Information Technology and Annual Meeting since 2016 and as chair for the past year.

His National Institutes of Health (NIH)-funded research laboratory aims to reduce diagnostic errors and improve the accuracy and consistency of clinical communication by developing novel machine learning algorithms that provide real-time assistance to physicians and patients. Dr. Langlotz has authored or co-authored 200 scientific publications, reviews and editorials. He has also authored *The Radiology Report: A Guide to Thoughtful Communication for Radiologists and Other Medical Professionals* and co-edited *Cancer Informatics: Essential Technologies for Clinical Trials*.

Dr. Langlotz and his trainees have been recognized for their contributions to radiology research with many scientific awards, including numerous best paper awards and research career development grants.

He is a principal investigator for several projects funded by the NIH, including the Medical Imaging and Data Resource Center ([MIDRC](#)), an open-source database that has ingested more than 300,000 medical imaging exams to help doctors better understand, diagnose, monitor and treat COVID-19.

Dr. Langlotz founded and is a past president of the Radiology Alliance for Health Services Research. He received its career achievement award in 2017. Dr. Langlotz served as chair of the Society for Imaging Informatics in Medicine (SIIM) and as a board member of the Association of University Radiologists and the American Medical Informatics Association. He is a fellow of the American College of Medical Informatics, the American Institute for Medical and Biological Engineering and the Society of Imaging Informatics in Medicine. He has served on the external advisory board of the National Cancer Institute's Imaging Data Commons for the past three years.

Dr. Langlotz has founded three health care information technology companies, most recently Montage Healthcare Solutions, which was acquired by Nuance Communications in 2016.

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Linda Brooks
1-630-590-7738
lbrooks@rsna.org

Imani Harris
1-630-481-1009
iharris@rsna.org

Embargoed for release on Sunday, Nov. 26, 2023, at 4 p.m. ET

Umar Mahmood, M.D., Ph.D., Named Chair of the RSNA Board

CHICAGO – Umar Mahmood, M.D., Ph.D., was named chair of the Radiological Society of North America ([RSNA](#)) Board of Directors today at the Society's [annual meeting](#).

A radiologist at Massachusetts General Hospital (MGH) in Boston, Dr. Mahmood serves as chief of Nuclear Medicine and Molecular Imaging, where he oversees a service that spans multiple hospitals and facilities in the region. He is director of the Center for Precision Imaging and associate chair of Imaging Sciences in the Department of Radiology at MGH. Dr. Mahmood is also professor of radiology at Harvard Medical School. His career arc has broadly emphasized organizational leadership, research, clinical care and mentoring.

As RSNA chair, Dr. Mahmood will support RSNA's work as a convener, connecting people globally through innovative research and education programs, and he will work with the Board of Directors to provide attendees with an exceptional annual meeting program and experience.

"RSNA brings the entire world of radiology together, both at our annual meeting and throughout the entire year, in person and accessible virtually everywhere," Dr. Mahmood said. "In the coming year, RSNA will continue to innovate in how we enable understanding, making it easier to access new insights learned from listening to the latest imaging research or knowledge gained from amazing educational material delivered by global leaders in every area of radiology. RSNA is transforming how we connect with that content, while fostering our connections with each other."

Dr. Mahmood earned his bachelor's degree from the California Institute of Technology, and his medical degree and doctorate in biophysics and physiology from Cornell University. After completing his doctoral and postdoctoral work in tumor physiology at Memorial Sloan Kettering Cancer Center, Dr. Mahmood went on to complete his radiology residency at MGH in 2001 and has since served on the faculty at MGH and Harvard Medical School.

A member of RSNA since 1997, Dr. Mahmood has served on numerous RSNA committees including the Annual Meeting Program Planning Committee, Committee on Scientific Affairs, Molecular Imaging Committee, Research Development Committee, and multiple RSNA journal Editor Search committees. He has served as chair for the RSNA Finance Committee, Grant Program Committee, Board Committee on International Affairs, and Molecular Imaging Scientific Abstract and Educational Exhibit Review Committees. He has served as associate editor and consultant to the editor for the journal *Radiology*.

Starting in 2016, Dr. Mahmood served six years on the RSNA Research and Education (R&E) Foundation Board of Trustees, which annually funds more than \$4 million in radiology research and education to grow the next generation of radiologists and ensure continued innovation in the field. He has served on the RSNA Board of Directors since 2017 as the RSNA Board Liaison for International Affairs, helping foster best practices and collaboration globally in radiology.

Dr. Mahmood's primary research interest over the last 30 years has been in the area of molecular imaging and its application to guide precision medicine. He has authored more than 180 peer-reviewed research manuscripts and numerous reviews, chapters and editorials. He has been an invited presenter or course instructor at more than 130 regional, national and international meetings, seminars and conferences. He has been a principal investigator for numerous projects funded by the National Institutes of Health (NIH) that have utilized nuclear medicine and optical imaging techniques to advance translational efforts to better understand drivers of cancer, including the tumor microenvironment, cancer signaling pathways, changes in cancer metabolism and the interaction of the immune system with tumors.

Dr. Mahmood is a Fellow of the American College of Radiology and Fellow of the Society of Nuclear Medicine and Molecular Imaging (SNMMI). He is an Honorary Member of the Italian Society of Medical and Interventional Radiology and an adjunct professor at the Medical University of Vienna in Austria. Dr. Mahmood received the SNMMI's first Minoshima-Pappas Transformative Leadership Award and received the Distinguished Investigator award from the Academy for Radiology and Biomedical Imaging Research (The Academy).

Dr. Mahmood served for four years as chair of the Board of Scientific Counselors of the Clinical Center of the NIH. He served on the Board of Directors of SNMMI and as chair of the SNMMI Scientific Program Committee. Dr. Mahmood also serves on the Board of Directors of The Academy and on the Executive Committee of the International Society of Radiology.

During his career, Dr. Mahmood has had a longstanding commitment to growing the next generation of clinical radiologists and physician scientists. Trainees have come from around the world and from diverse backgrounds and experiences. He has directly guided more than 100 research mentees, many who have gone on to become academic medical faculty at top institutions globally.

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1-312-791-6610

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RSNA Media Relations 1-630-590-7762

Linda Brooks
1-630-590-7738
lbrooks@rsna.org

Imani Harris
1-630-481-1009
iharris@rsna.org

Embargoed for release on Monday, Nov. 27, 2023, at 5:00 a.m. ET

Stronger Thigh Muscles May Prevent Knee Replacement Surgery

AT A GLANCE

- **Stronger quadriceps muscles, relative to the hamstrings, may lower the risk of total knee replacement.**
- **Researchers evaluated thigh muscle volume in 134 participants and found a higher ratio of quadricep-hamstring volume was significantly associated with lower odds of total knee replacement.**
- **The results suggest that training programs that strengthen the quadriceps compared to the hamstrings may be beneficial.**

CHICAGO – Stronger quadriceps muscles, relative to the hamstrings, may lower the risk of total knee replacement, according to research being presented today at the [annual meeting](#) of the Radiological Society of North America ([RSNA](#)). Researchers said the findings could inform strength-training programs for people with advanced arthritis in the knee.

Advanced knee osteoarthritis is a major cause of pain and disability worldwide. In the U.S. alone, 14 million adults have symptomatic knee osteoarthritis, and more than half of those diagnosed are projected to eventually undergo total knee replacement surgery.

While stronger muscle groups are generally understood to be associated with a lower rate of total knee replacement, their relative importance is not well established. Of

particular interest is the relationship between the extensors and the hamstrings, the two most important muscle groups in the knee.

The extensors, the muscles on the front of the thigh commonly referred to as the quadriceps, are the strongest muscle group in the body and have essential influence on gait, other activities and biomechanics. The muscles around the back of the thigh known as the hamstrings are responsible for extension of the hip and flexion of the knee, making them equally essential for physical activity.

“The two muscle groups act as counter forces, and the balance between them enables a wide range of activities while protecting the knee joint,” said study lead author Upasana Upadhyay Bharadwaj, M.D., from the University of California, San Francisco (UCSF). “An imbalance, in addition to other factors, leads to a change in the biomechanics resulting in the progression of osteoarthritis.”

Dr. Upadhyay Bharadwaj and colleagues evaluated thigh muscle volume in 134 participants from the Osteoarthritis Initiative, a nationwide study sponsored by the National Institutes of Health. They compared 67 patients who underwent total knee replacement of a single knee with 67 control participants who had not undergone knee replacement. The cases and controls were matched for variables including age and gender.

The researchers obtained 3T MRI of the thigh at the time of surgery. They also evaluated MRI findings from two years and four years before the surgery. They used a previously trained deep-learning model to segment and compute volumes of the muscles of the thigh—measures that are tedious to compute manually.

Comparing patients who had total knee replacement with the control group, a higher ratio of quadriceps to hamstring volume was significantly associated with lower odds of total knee replacement. Higher volumes of hamstrings and gracilis, a long, thin muscle on the inside of the thigh, were also linked with lower odds of total knee replacement.

“Our study shows that in addition to strong muscles individually, larger extensor muscle groups—relative to hamstring muscle groups—are significantly associated with lower odds of total knee replacement surgery in two to four years,” Dr. Upadhyay Bharadwaj said.

The study findings have implications for both the interpretation of imaging exams and clinical management. The results suggest that training programs that strengthen the quadriceps in relation to the hamstrings may be beneficial.

“Although we presume that overall muscle volume is important as a surrogate marker for muscle strength, the ratio, hence the balance, between extensor and hamstring muscles may be more important and significantly associated with lower odds of total knee replacement,” Dr. Upadhyay Bharadwaj said.

Although the study focused on people with arthritis, the findings may also help inform strength training for a wider segment of the population.

“While these results are essential for targeted therapy in a population at risk for osteoarthritis, even the general public can benefit from our results to preventively incorporate appropriate strengthening exercises,” Dr. Upadhyay Bharadwaj said.

Co-authors are John A. Lynch, Ph.D., Gabby B. Joseph, Ph.D., and Thomas M. Link, M.D., Ph.D.

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Linda Brooks
1-630-590-7738
lbrooks@rsna.org

Imani Harris
1-630-481-1009
iharris@rsna.org

Embargoed for release on Monday, Nov. 27, 2023, at 5:00 a.m. ET

Black Patients Face Delays in Alzheimer's Diagnosis

AT A GLANCE

- **Researchers found that Black patients were imaged for cognitive impairment at an older age than white patients and were less likely to undergo MRI, the optimal exam for cognitive impairment and Alzheimer's disease diagnosis.**
- **The average age at imaging for Black patients was 72.5 years, compared with 67.8 years for white patients and 66.5 years for Hispanics.**
- **Only 50.9% of Black patients underwent MRI testing, compared to 60% of whites and 67% of Hispanics.**

CHICAGO – Black patients underwent medical imaging for cognitive impairment years later than white and Hispanic patients and were less frequently tested with MRI, according to research being presented this week at the [annual meeting](#) of the Radiological Society of North America ([RSNA](#)).

Previous studies have shown that Black patients are at increased risk of Alzheimer's disease and other types of dementia. They are less likely to have a diagnosis and are diagnosed at a more advanced stage of disease compared to white patients.

Medical imaging—ideally with MRI—plays an increasingly important role in the diagnostic work-up of cognitive impairment. However, it is unknown how disparities in imaging access may lead to these delays in cognitive impairment diagnoses.

“If disparity in obtaining access to neuroimaging is one possible barrier that delays diagnosis, it is important to identify this and figure out possible solutions to benefit these patients and prevent a delayed diagnosis,” said study lead author Joshua Wibecan, M.D., radiology resident at Boston Medical Center in Boston, Massachusetts.

Drawing from four years of data, Dr. Wibecan and colleagues studied imaging disparities at their safety net academic medical center. A safety net medical center provides health care for people regardless of their insurance status or ability to pay.

The researchers identified all outpatient CTs of the head, CT angiographies of the head and MRI brain examinations performed for cognitive impairment. They obtained patient self-identified race from the Boston Medical Center Clinical Data Warehouse for Research.

Self-identified Black/African American patients were imaged for cognitive impairment at an older age and were less frequently imaged for cognitive impairment with MRI. While CT and MRI can both be useful in detection of cognitive impairment and dementia diagnoses, MRI provides much more detail about brain abnormalities.

The average age at imaging for cognitive impairment among the groups with Black patients was 72.5 years, compared with 67.8 years for white patients, 66.5 years for Hispanics and 66.7 years for the Other group. Only 50.9% of Black patients underwent MRI testing for cognitive impairment, compared to 60% of white patients, 67% of Hispanics and 68.2% in the Other group.

“Our study demonstrates two main findings,” Dr. Wibecan said. “First, Black patients who received MRI or CT for cognitive impairment were significantly older than patients from other races. Second, Black patients were significantly less likely to be imaged with MRI, the optimal type of imaging for cognitive impairment, as opposed to CT.”

Early imaging evaluation is important to identify treatable causes of cognitive impairment, such as tumors, bleeding or swelling within the brain. Additionally, new treatments have recently become available for Alzheimer's disease that can potentially slow the rate of decline. Earlier diagnosis may, therefore, lead to early treatment and a longer period of better cognitive function.

“As treatment for Alzheimer's Disease improves, it will be even more important to identify patients at early stages of disease for optimal treatment,” Dr. Wibecan said.

Further research is needed, Dr. Wibecan said, to understand why there was a significant difference in the types of imaging exams ordered for the workup of cognitive impairment across racial groups.

Chad W. Farris, M.D., Ph.D., neuroradiologist from Boston Medical Center and assistant professor of radiology at Boston University Chobanian & Avedisian School of Medicine, co-authored the study.

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Linda Brooks
1-630-590-7738
lbrooks@rsna.org

Imani Harris
1-630-481-1009
iharris@rsna.org

Embargoed for release on Tuesday, Nov. 28, 2023, at 5:00 a.m. ET

Marijuana, Cigarette Smokers at Increased Risk of Emphysema

AT A GLANCE

- **People who smoke both cigarettes and marijuana are more likely to develop emphysema.**
- **Combined marijuana and cigarette smokers were also three to four times more likely to have airway wall thickening, which can indicate damage to the airways.**
- **Marijuana that is smoked is often unfiltered, which can potentially lead to more damaging particles entering the airways and lungs.**

CHICAGO – Smoking marijuana in combination with cigarettes may lead to increased damage of the lung's air sacs, according to research being presented today at the [annual meeting](#) of the Radiological Society of North America ([RSNA](#)).

It is commonly believed that smoking marijuana is not harmful to the lungs. There is an abundance of established research that identifies the harms of cigarette smoking. In contrast, very little is known about the effects of marijuana smoking, and even less research has been done on the combined effects of smoking marijuana and cigarettes.

“Marijuana is the most widely used illicit psychoactive substance in the world, and its use has increased in Canada since the legalization of non-medical marijuana in 2018,” said study co-author Jessie Kang, M.D., cardiothoracic

radiologist and assistant professor in the Department of Diagnostic Radiology at Dalhousie University in Halifax, Nova Scotia, Canada. “Currently, not much research exists on the effects of marijuana smoking on the lungs.”

To determine the effects of marijuana and cigarette smoking, researchers for the multicenter prospective study examined the chest CT images of four patient groups: non-smokers, cigarette smokers, marijuana smokers, and combined marijuana and cigarette smokers. Marijuana smokers included in the study had smoked marijuana at least four times a month for two years. Patients who ingested marijuana via edibles or oral drops were excluded from the study.

The researchers found that people who combined marijuana and cigarettes were 12 times more likely to have centrilobular emphysema than non-smokers. Centrilobular emphysema is a type of pulmonary emphysema where the air sacs within the lungs are damaged. This can lead to breathing difficulties and other serious respiratory symptoms.

“The mean number of marijuana smoking years was less than compared to cigarette smokers and combined marijuana and cigarette smokers,” Dr. Kang said. “However, marijuana that is smoked is often unfiltered, which can potentially lead to more damaging particles entering the airways and lungs.”

Combined marijuana and cigarette smokers were three to four times more likely to have airway wall thickening, which can lead to infections, scarring and further airway damage. Association with marijuana only and smoking only with bronchial wall thickening was not as significant. Similar results were seen with centrilobular and paraseptal emphysema, suggesting that the combination of cigarette and marijuana smoking may have a synergistic role on the lungs and airways.

“With our study, we show that there are physical effects of marijuana smoking on the lungs and that cigarette smoking and marijuana smoking may have a combined damaging effect on the lungs,” Dr. Kang said.

According to Dr. Kang, further research is needed to identify the long-term effects of smoking marijuana.

“There is a common public misconception that marijuana smoking is not harmful,” Dr. Kang said. “More research needs to be done in this area, so the public can make an informed decision on their recreational usage of marijuana.”

Co-authors are Sebastian Karpinski, B.Sc., Paul Sathiadoss, M.B.B.S., Eric Lam, M.Sc., Eric Hutfluss, M.D., O. Osorio, M.D., D. A. Hashem, M.D., Matthew D. F. McInnes, M.D., and Giselle Y. Revah, M.D.

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Linda Brooks

1-630-590-7738

lbrooks@rsna.org

Imani Harris

1-630-481-1009

iharris@rsna.org

Embargoed for release on Tuesday, Nov. 28, 2023, at 5:00 a.m. ET

Soccer Heading Linked to Measurable Decline in Brain Function

AT A GLANCE

- **Soccer heading by young adult amateur players over a two-year period is linked to measurable decline in the microstructure and function of the brain.**
- **Researchers found that high levels of heading over the two-year period were associated with changes in brain microstructure similar to findings seen in mild traumatic brain injury.**
- **A brain region called the gray and white matter interface was blunted in proportion to high repetitive head impact exposure.**

CHICAGO – New research being presented this week at the [annual meeting](#) of the Radiological Society of North America ([RSNA](#)) links soccer heading – where players hit the ball with their head – to a measurable decline in the microstructure and function of the brain over a two-year period.

“There is enormous worldwide concern for brain injury in general and in the potential for soccer heading to cause long-term adverse brain effects in particular,” said senior author Michael L. Lipton, M.D., Ph.D., professor of radiology at Columbia University’s Vagelos College of Physicians and Surgeons and affiliate professor of biomedical engineering at Columbia University. “A large part of this concern relates to the potential for changes in young adulthood to confer risk for neurodegeneration and dementia later in life.”

While previous research has examined adverse effects on the brain related to soccer heading at a single point in time, this new study looked at brain changes over two years.

The study included 148 young adult amateur soccer players (mean age 27, 26% women). The research team developed a specialized questionnaire for players to determine how often they hit the soccer ball with their head.

“When we first started, there was no method for assessing the number of head impacts a player experienced,” Dr. Lipton said. “So, we developed a structured, epidemiological questionnaire that has been validated in multiple studies.”

The questionnaire consists of a series of questions about how often an individual plays, practices and heads the ball, and in what type of situations. Two-year heading exposure was categorized as low, moderate or high.

The players were assessed for verbal learning and memory and underwent diffusion tensor imaging (DTI), an MRI technique, at the time of enrollment and two years later. DTI characterizes the microstructure of the brain by tracking the microscopic movement of water molecules through the tissue.

Compared to the baseline test results, the high-heading group (over 1,500 headers in two years) demonstrated an increase of diffusivity in frontal white matter regions, and a decrease of orientation dispersion index (a measure

of brain organization) in certain brain regions after two years of heading exposure. The analysis adjusted for variables including age, sex, education and concussion history.

“Our analysis found that high levels of heading over the two-year period were associated with changes in brain microstructure similar to findings seen in mild traumatic brain injuries,” Dr. Lipton said. “High levels of heading were also associated with a decline in verbal learning performance. This is the first study to show a change of brain structure over the long term related to sub-concussive head impacts in soccer.”

Dr. Lipton and colleagues also presented another study today in which they used DTI to investigate the association between repetitive head impacts from soccer heading and verbal learning performance.

For the second study, researchers analyzed heading over 12 months prior to DTI and verbal learning performance testing in 353 amateur soccer players (age 18-53, 27% female). Unlike previous research that has focused on deep white matter regions, this study employed a new technique, using DTI parameters to evaluate the integrity of the interface between the brain’s gray and white matter closer to the skull.

“Importantly, our new approach addresses a brain region that is susceptible to injury but has been neglected due to limitations of existing methods,” Dr. Lipton said. “Application of this technique has potential to disclose the extent of injury from repetitive heading, but also from concussion and traumatic brain injury to an extent not previously possible.”

The researchers found that the normally sharp gray matter-white matter interface was blunted in proportion to high repetitive head impact exposure.

“We used DTI to assess the sharpness of the transition from gray matter to white matter,” Dr. Lipton said. “In various brain disorders, what is typically a sharp distinction between these two brain tissues becomes a more gradual, or fuzzier transition.”

He added that gray matter-white matter interface integrity may play a causal role in the adverse association between repetitive head impacts and cognitive performance.

“These findings add to the ongoing conversation and contentious debate as to whether soccer heading is benign or confers significant risk,” he said.

Co-authors on the first study are Molly F. Charney, M.D., Kenny Ye, Ph.D., Roman Fleysheer, Ph.D., Liane E. Hunter, M.D., Ph.D., Shimon Garrel, B.S., Bluyé Demessie, A.B., M.S., Joan Y. Song, B.S.E., M.S., Molly E. Zimmerman, Ph.D., Walter F. Stewart, Ph.D., Mimi Kim, Sc.D., and Richard B. Lipton, M.D.

Co-authors on the second study are Joan Y. Song, B.S.E., M.S., and Roman Fleysheer, Ph.D.

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Linda Brooks
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lbrooks@rsna.org

Imani Harris
1-630-481-1009
iharris@rsna.org

Embargoed for release on Wednesday, Nov. 29, 2023, at 5:00 a.m. ET

AI May Aid in Diagnosing Adolescents with ADHD

AT A GLANCE

- **Using AI, researchers found significant differences in nine areas of the brain's white matter in adolescents with ADHD.**
- **The AI deep learning model was trained using brain imaging data from 1,704 participants in the Adolescent Brain Cognitive Development Study.**
- **The findings show promise for an objective method of diagnosis of the condition affecting 5.7 million children and adolescents in the U.S.**

CHICAGO – Using artificial intelligence (AI) to analyze specialized brain MRI scans of adolescents with and without attention-deficit/hyperactivity disorder (ADHD), researchers found significant differences in nine brain white matter tracts in individuals with ADHD. Results of the study will be presented today at the [annual meeting](#) of the Radiological Society of North America ([RSNA](#)).

ADHD is a common disorder often diagnosed in childhood and continuing into adulthood, according to the Centers for Disease Control and Prevention. In the U.S., an estimated 5.7 million children and adolescents between the ages of 6 and 17 have been diagnosed with ADHD.

“ADHD often manifests at an early age and can have a massive impact on someone’s quality of life and ability to function in society,” said study co-author Justin Huynh, M.S., a research specialist in the Department of Neuroradiology at the University of California, San Francisco, and medical

student at the Carle Illinois College of Medicine at Urbana-Champaign. “It is also becoming increasingly prevalent in society among today’s youth, with the influx of smartphones and other distracting devices readily accessible.”

Children with ADHD may have trouble paying attention, controlling impulsive behaviors or regulating activity. Early diagnosis and intervention are key to managing the condition.

“ADHD is extremely difficult to diagnose and relies on subjective self-reported surveys,” Huynh said. “There is definitely an unmet need for more objective metrics for diagnosis. That’s the gap we are trying to fill.”

Huynh said this is the first study to apply deep learning, a type of AI, to identify markers of ADHD in the multi-institutional Adolescent Brain Cognitive Development (ABCD) Study, which includes brain imaging, clinical surveys and other data on over 11,000 adolescents from 21 research sites in the U.S. The brain imaging data included a specialized type of MRI called diffusion-weighted imaging (DWI).

“Prior research studies using AI to detect ADHD have not been successful due to a small sample size and the complexity of the disorder,” Huynh said.

The research team selected a group of 1,704 individuals from the ABCD dataset, including adolescents with and without ADHD. Using DWI scans, the researchers extracted fractional anisotropy (FA) measurements along 30 major white matter tracts in the brain. FA is a measure of how water molecules move along the fibers of white matter tracts.

The FA values from 1,371 individuals were used as input for training a deep-learning AI model, which was then tested on 333 patients, including 193 diagnosed with ADHD and 140 without. ADHD diagnoses were determined by the Brief Problem Monitor assessment, a rating tool used for monitoring a child’s functioning and their responses to interventions.

With the help of AI, the researchers discovered that in patients with ADHD, FA values were significantly elevated in nine white matter tracts.

“These differences in MRI signatures in individuals with ADHD have never been seen before at this level of detail,” Huynh said. “In general, the abnormalities seen in the nine white matter tracts coincide with the symptoms of ADHD.”

The researchers intend to continue obtaining data from the rest of the individuals in the ABCD dataset, comparing the performance of additional AI models.

“Many people feel that they have ADHD, but it is undiagnosed due to the subjective nature of the available diagnostic tests,” Huynh said. “This method provides a promising step towards finding imaging biomarkers that can be used to diagnose ADHD in a quantitative, objective diagnostic framework,” Huynh said.

Co-authors are Pierre F. Nedelec, M.S., M.T.M., Samuel Lashof-Regas, Michael Romano, M.D., Ph.D., Leo P. Sugrue, M.D., Ph.D., and Andreas M. Rauschecker, M.D., Ph.D.

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Linda Brooks
1-630-590-7738
lbrooks@rsna.org

Imani Harris
1-630-481-1009
iharris@rsna.org

Embargoed for release on Wednesday, Nov. 29, 2023, at 5:00 a.m. ET

Common Headaches Tied to Neck Inflammation

AT A GLANCE

- **Using data from 3D turbo spin-echo MRI, researchers quantified neck muscle involvement in primary headaches.**
- **People with tension-type headaches plus migraine episodes had evidence of the most inflammation in the neck muscles.**
- **The findings could lead to safer and more effective treatment options that directly target the site of pain in the neck muscles.**

CHICAGO – Researchers have identified objective evidence of how the neck muscles are involved in primary headaches, according to a study being presented today at the [annual meeting](#) of the Radiological Society of North America ([RSNA](#)). The findings could lead to better treatments.

The distinct underlying causes of primary headaches are still not fully understood. The most common primary headaches are tension-type headaches and migraines.

“Our imaging approach provides first objective evidence for the very frequent involvement of the neck muscles in primary headaches, such as neck pain in migraine or tension-type headache, using the ability to quantify subtle inflammation within muscles,” said Nico Sollmann, M.D.,

Ph.D., resident in the Department of Diagnostic and Interventional Radiology at University Hospital Ulm, and the Department of Diagnostic and Interventional Neuroradiology at University Hospital Rechts der Isar in Munich, Germany.

Tension-type headaches affect two out of every three adults in the U.S. People with tension-type headaches often feel a tightening in the head and mild to moderate dull pain on both sides of the head. While these headaches are typically associated with stress and muscle tension, their exact origin is not fully understood.

Migraines are characterized by a severe throbbing pain. Migraines generally occur on one side of the head, or the pain is worse on one side. Migraines may also cause nausea, weakness and light sensitivity. According to the American Migraine Foundation, over 37 million people in the U.S. are affected by migraine, and up to 148 million people worldwide suffer from chronic migraine.

Neck pain is commonly associated with primary headaches. However, no objective biomarkers exist for myofascial involvement. Myofascial pain is associated with inflammation or irritation of muscle or of the connective tissue, known as fascia, that surrounds the muscle.

For the study, Dr. Sollmann and colleagues aimed to investigate the involvement of the trapezius muscles in primary headache disorders by quantitative magnetic resonance imaging (MRI) and to explore associations between muscle T2 values and headache and neck pain frequency.

The prospective study included 50 participants, mostly women, ranging in age from 20 to 31 years old. Of the study group, 16 had tension-type headache, and 12 had tension-type headache plus migraine episodes. The groups were matched with 22 healthy controls.

All participants underwent 3D turbo spin-echo MRI. The bilateral trapezius muscles were manually segmented, followed by muscle T2 extraction. Associations between muscle T2 values and the presence of neck pain, number of days with headache, and number of myofascial trigger points as determined by manual palpation of the trapezius muscles were analyzed (adjusting for age, sex and body mass index).

The tension-type headache plus migraine group demonstrated the highest muscle T2 values. Muscle T2 was significantly associated with the number of headache days and the presence of neck pain. The increased muscle T2 values could be interpreted as a surrogate of inflammation arising from the nervous system and increased sensitivity of nerve fibers within myofascial tissues.

“The quantified inflammatory changes of neck muscles significantly correlate with the number of days lived with headache and the presence of subjectively perceived neck pain,” Dr. Sollmann said. “Those changes allow us to differentiate between healthy individuals and patients suffering from primary headaches.”

Muscle T2 mapping could be used to stratify patients with primary headaches and to track potential treatment effects for monitoring.

“Our findings support the role of neck muscles in the pathophysiology of primary headaches,” Dr. Sollmann said. “Therefore, treatments that target the neck muscles could lead to a simultaneous relief of neck pain, as well as headache.”

Dr. Sollmann pointed out that non-invasive treatment options that directly target the site of pain in the neck muscles could be highly effective and safer than systemic drugs.

“Our imaging approach with delivery of an objective biomarker could facilitate therapy monitoring and patient selection for certain treatments in the near future,” he added.

Co-authors are Paul Schandelmaier, M.D., Gabby B. Joseph, Ph.D., Dimitrios C. Karampinos, Ph.D., Meinrad J. Beer, M.D., Claus Zimmer, M.D., Florian Heinen, M.D., Thomas Baum, M.D., and Michaela V. Bonfert, M.D.

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Linda Brooks
1-630-590-7738
lbrooks@rsna.org

Imani Harris
1-630-481-1009
iharris@rsna.org

Embargoed for release on Wednesday, Nov. 29, 2023, at 5:00 a.m. ET

AI Model Predicts Breast Cancer Risk Without Racial Bias

AT A GLANCE

- **An image-based deep learning model accurately predicted a woman's risk of developing ductal carcinoma in situ or invasive breast cancer and showed no bias across multiple races.**
- **Traditional risk models have demonstrated poor performance across patient races, most likely due to the data used to develop the models.**
- **The AI model showed no significant difference in predicting DCIS and invasive cancer among white, Black, Asian and other races.**

CHICAGO – A deep learning artificial intelligence (AI) model that was developed using only mammogram image biomarkers accurately predicted both ductal carcinoma in situ (DCIS) and invasive carcinoma, according to research being presented today at the [annual meeting](#) of the Radiological Society of North America ([RSNA](#)). Additionally, the model showed no bias across multiple races.

Traditional breast cancer risk assessment models use information obtained from patient questionnaires, such as medical and reproductive history, to calculate a patient's future risk of developing breast cancer.

"In the domain of precision medicine, risk-based screening has been elusive because we have not been able to accurately evaluate a woman's risk of developing breast cancer," said study lead author Leslie R. Lamb, M.D.,

M.Sc., a breast radiologist at Massachusetts General Hospital (MGH) in Boston. "Even the best existing traditional risk models do not perform well on the individual level."

Traditional risk models have also demonstrated poor performance across different patient races, most likely due to the data used to develop the model.

"Traditional models likely have racial biases due to the populations on which they were developed," Dr. Lamb said. "Several of the commonly used models were developed on predominantly European Caucasian populations."

According to the American Cancer Society, Black women demonstrate the lowest 5-year relative survival rate for breast cancer among all racial and ethnic groups. This translates to a persistent 6% to 8% disparity in 5-year survival rates between Black and white women across all breast cancer types.

To accurately determine breast cancer risk, foster early detection and improve patient survival rates, it is important that risk models are developed that are applicable across different populations.

A deep learning AI risk assessment model developed using mammographic images alone can outperform traditional risk assessment models in future breast cancer development while also mitigating the racial biases seen in traditional models.

In the first study of its kind, Dr. Lamb and colleagues sought to assess the performance of an image-based deep learning risk assessment model in predicting both future invasive breast cancer and DCIS across multiple races.

The model's performance was assessed by comparing areas under the receiver operating characteristic curve (AUC) with the DeLong test. The AUC score measures the predictive rate of the model on a scale of from 0 to 1. Multiple prior studies have estimated traditional risk model performance measured by AUC in the range of 0.59-0.62 for white women, with much lower performance in women of other races.

The multisite study included 129,340 routine bilateral screening mammograms performed in 71,479 women between 2009 to 2018 with five-year follow-up data. Patient demographics were obtained from electronic medical records, and instances of cancer were identified from the regional tumor registry.

The racial makeup of the study group included white (106,839 exams), Black (6,154 exams), Asian (6,435 exams), self-reported other races (6,257 exams) and unknown (3,655 exams). The mean age of the women was 59 years old.

The deep learning model consistently outperformed traditional risk models in predicting a woman's risk of developing DCIS, which is early-stage breast cancer, and invasive breast cancer, which is cancer that has potential to spread.

"The model is able to translate the full diversity of subtle imaging biomarkers in the mammogram, beyond what the naked eye can see, that can predict a woman's future risk of both DCIS and invasive breast cancer," Dr. Lamb said. "The deep learning image-only risk model can provide increased access to more accurate, equitable and less costly risk assessment."

The predictive rate of both DCIS and invasive cancer was 0.71 across all races. The AUC in predicting DCIS was 0.77 in non-white patients and 0.71 in white patients. The AUC in predicting invasive cancer was 0.72 in non-white patients and 0.71 in white patients.

"This is a particularly exciting domain for AI, as it demonstrates the opportunity to apply 'AI for good'—to reduce well-known racial disparities in risk assessment," said senior author Constance D. Lehman, M.D., Ph.D., a breast radiologist at MGH. "We are now poised to translate these findings into improved clinical care for our patients."

Additional co-authors are Sarah F. Mercaldo, Ph.D., and Andrew R. Carney, M.S.

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For patient-friendly information on breast imaging, visit [RadiologyInfo.org](https://www.radiologyinfo.org).

Media Contacts:

RSNA Newsroom

1-312-791-6610

Before 11/25/23 or after 11/29/23:

RSNA Media Relations 1-630-590-7762

Linda Brooks
1-630-590-7738
lbrooks@rsna.org

Imani Harris
1-630-481-1009
iharris@rsna.org

Embargoed for release on Thursday, Nov. 30, 2023, at 5:00 a.m. ET

Children Who Play Baseball Risk Elbow Injury

AT A GLANCE

- **Different patterns of elbow injuries can occur among youth baseball players depending on skeletal maturity.**
- **Repetitive throwing motion places overuse stress on the bones, joints, and muscles of the elbows of youth baseball players.**
- **Most common MRI findings among symptomatic youth baseball players were fluid build-up in the joint, stress injuries, fractures and OCD, where a piece of bone and the overlying cartilage is injured and can detach.**

CHICAGO – Youth baseball players are prone to elbow pain and injuries, including repetitive overuse changes and fractures, based on the maturity of their bones, according to a new study being presented today at the [annual meeting](#) of the Radiological Society of North America ([RSNA](#)).

The repetitive motion and force of throwing a baseball places a large amount of stress on the growing bones, joints and muscles of the elbows of baseball players. Youth baseball players who have not yet reached skeletal maturity might be especially vulnerable to elbow pain and injuries.

“When we look at the forces that baseball players, even Little League baseball players, deal with during routine practice and games, it becomes apparent why elbow injuries are so common amongst this group,” said study co-author Vandan Patel, B.S., a radiology-orthopedics research scholar at

Children’s Hospital of Philadelphia (CHOP) in Pennsylvania.

Most recent estimates show that 20 to 40% of youth baseball players between the ages of nine and 12 complain of elbow pain at least once during the season.

Skeletally immature children have growth plates, which are areas of bone that are made up of cartilage, a rubbery and flexible connective tissue, that allows the bones to grow and change in shape as a child ages. Growth plates are weaker than the surrounding muscles and bones and prone to injury that can lead to either reversible changes or permanent deformity.

Skeletal maturity occurs when the growth plates have closed, and no more bone (or growth) is being made. This usually occurs at the end of puberty, typically around age 13 to 15 for girls and 15 to 17 for boys.

In this retrospective study, the researchers reviewed elbow MRI exams from 130 youth players (18 years of age and younger) being evaluated for elbow pain. MRI is an ideal method for identifying joint problems, because it can non-invasively show cross-sectional details of soft tissues (cartilage, tendons and ligaments) and bone.

“We conducted this study in order to better understand the patterns of injuries that can occur among youth baseball players with elbow pain,” said senior author Jie C. Nguyen, M.D., M.S., director for the Section of Musculoskeletal Imaging in the Department of Radiology at CHOP. “Tissue vulnerability and, thus, sites at risk

for injury, change with growth and maturation. A younger player injures differently than an older player. It is our hope that this data will help us continue to improve and individualize the care of current and future generations of youth baseball players.”

The average age of this study group of patients was 13.9 years, with 115 boys and 15 girls included. The frequency with which the patients played baseball varied from daily to recreationally.

Two radiologists independently reviewed the MRI exams to categorize the skeletal maturity and different findings of each patient’s elbow. They classified 85 patients as skeletally mature and 45 patients as skeletally immature.

The most common MRI findings in skeletally immature players included fluid build-up around the joint, stress injuries near the growth plate, fractures, and osteochondritis dissecans (OCD) lesions, where a piece of bone and the overlying cartilage is injured and can detach, leading to reduced range of motion and risk for premature osteoarthritis in adulthood.

Conversely, in skeletally mature players, the injury pattern shifts from the growth plates to the soft tissue. These players most often had triceps tendinosis—a condition in which the tendon connecting the triceps muscle to the elbow bone becomes strained, irritated or torn—and fluid build-up in the bony area of the elbow where the ulnar collateral ligament attaches. The ulnar collateral ligament runs on the inner side of the elbow and helps stabilize it.

Injuries that required surgery included intra-articular bodies (small fragments inside the joint), and unstable OCD.

“In terms of the skeletally immature children, 9 patients (11%) had intra-articular bodies, and 19 patients (22%) had OCD lesions,” Patel said.

The researchers hope that the results of this study will help to identify elbow injuries in children who play baseball and to individualize treatment based on skeletal maturity.

“This information is critically important not only to physicians, but also to parents and team coaches, all of whom provide crucial support for these children, reducing injury and preventing permanent damage on and off the field,” said co-author Theodore J. Ganley, M.D., director of Sports Medicine and Performance Center in the Division of Orthopaedics at CHOP. “As parents, caregivers and coaches, it is important to be aware of these findings in order to ensure that symptoms of pain are not overlooked during the baseball season.”

Although they did find that prevalence of injury was linked to prolonged play, the researchers said further studies are needed to identify exactly which injuries are more time dependent compared to others.

“This does not mean that elbow injuries are inevitable in baseball,” Patel said. “With proper technique and proper rest, these injuries could potentially be avoided.”

Additional co-authors are Shahwar M. Tariq, B.S., Liya Gendler, D.O., Apurva S. Shah, M.D., M.B.A., and Adam C. Zoga, M.D., M.B.A.

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For patient-friendly information on pediatric and musculoskeletal imaging, visit [RadiologyInfo.org](https://www.radiologyinfo.org).

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Embargoed for release on Thursday, Nov. 30, 2023, at 5:00 a.m. ET

Regular Screening Mammograms Significantly Reduce Breast Cancer Deaths

AT A GLANCE

- **Breast cancer mortality is significantly reduced when women regularly attend screening mammograms.**
- **Researchers tracked mammography screening attendance trends among 36,000 women.**
- **After adjustment, there was a 66% reduction in the risk of breast cancer death among women who attended their five most recent screening mammograms, compared to those who attended none.**

CHICAGO – Breast cancer mortality is significantly reduced when women regularly attend screening mammograms, according to research being presented today at the [annual meeting](#) of the Radiological Society of North America ([RSNA](#)).

Early detection of breast cancer, before symptoms are present, is key to survivability. According to the American Cancer Society, women between the ages of 45 and 54 should get mammograms every year. Women who are 55 years and older can switch to every other year or continue with annual mammograms. Skipping just one scheduled mammogram could result in a more advanced breast cancer diagnosis, significantly impacting a patient's chance of survival.

“The purpose of mammography is to detect breast cancer during the few years it can be seen on a mammogram, but

before symptoms are apparent,” said study author Robert A. Smith, Ph.D., senior vice president and director of the American Cancer Society Center for Cancer Screening in Atlanta, Georgia. “If a woman unknowingly has breast cancer and misses or postpones her mammogram during this time when she has no symptoms, but her breast cancer is growing and perhaps spreading, then the window for early detection will be lost.”

Even though regular mammograms are an important factor in early breast cancer detection, there are still many barriers that restrict women from receiving this preventative care, including [access](#) and work or family obligations.

“It is challenging to keep track of your schedule, and in the U.S., many women do not receive reminders. Further, for all of us, the obligations of work and family compete with our scheduled health care,” Dr. Smith said.

Dr. Smith and colleagues sought to identify the exact impact of missing even one mammogram.

The researchers obtained women's screening history from oncology centers throughout Sweden for a period from 1992 to 2016. A total of 36,079 breast cancer patients were included in the study.

Using data from the Swedish Cause of Death Register, the researchers identified 4,564 breast cancer deaths among the patients included in the study.

The researchers then tracked all of the women's participation in five or fewer most recent invitations for breast cancer screening prior to cancer diagnosis.

Women who attended all their invited screening mammograms had a survivability rate of over 80%. Women who didn't participate in any screenings had a survival rate that ranged from 59.1% to 77.6%.

Women who attended all five screening mammograms saw a 72% reduction in the risk of dying from breast cancer compared to women who didn't participate in any screening mammograms. Even after conservative adjustment for potential self-selection factors, there was a highly significant 66% reduction in the risk of breast cancer death.

"Women who attended all five previous mammography examinations prior to a diagnosis of breast cancer were nearly three times less likely to die from breast cancer compared with women who had not attended any examinations, and each additional examination attended among the five previous examinations conferred an additive protective effect against dying from breast cancer," Dr. Smith said.

The researchers stressed that imaging facilities should prioritize getting patients in for screening at the earliest opportunity. This is especially important when women have to cancel their appointments. Facilities should reschedule these screening mammograms for the next earliest available appointment.

"These findings show that as much as possible, adherence to regular mammography screening is the very best insurance a woman has against being diagnosed with an advanced breast cancer that could be life-threatening," Dr. Smith said.

Co-authors are Stephen W. Duffy, M.Sc., Amy Ming-Fang Yen, Ph.D., László Tabár, M.D., Abbie Ting-Yu, Ph.D., Sam Li-Sheng Chen, Ph.D., Chen-Yant Hsu, M.D., Peter B. Dean, M.D., and Tony Hsiu-His Chen, Ph.D.

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For patient-friendly information on breast cancer screening with mammography, visit [RadiologyInfo.org](https://www.RadiologyInfo.org).

ADDITIONAL STORY IDEAS
RSNA 109th SCIENTIFIC ASSEMBLY AND ANNUAL MEETING

In addition to the presentations described in RSNA news releases, the following presentations have been identified as particularly newsworthy. Times, locations and abstracts for the presentations can be found in the [online program](#).

Scientific Presentations

Mon. Nov. 27, #M6-SSNPM01-6, *Reducing Residuals of Contrast Agents in Wastewater: Preliminary Results of the GREENWATER Study*, Moreno Zanardo, Ph.D.

Tues. Nov. 28, #T7-SSNPM02-1, *Pink on Pink Aggression*, Ami Gokli, M.D.

Scientific Posters

#10308, *Quantitative Chest of Marijuana Use*, Ozgu Alkali, M.D.

#15454, *New Method of Knee OA Treatment with Intra Genicular Artery Injection of Mesenchymal Stem Cells*, Maedeh Rouzbahani

#14703, *Long-term Effects of a Breast Cancer Screening Programme on Breast Cancer Incidence and Mortality: Results from a Cohort of 2.6 million Women*, Amanda Dibden

#10060, *Enhancing Patient Communication with Chat-GPT in Radiology: Evaluating the Efficacy and Readability of Answers to Common Imaging-related Questions*, Emile Gordon, M.D.

#14525, *MRI Volumetric of Limbic System in Burnout Syndrome and Vigilant Attention in a Population with Nocturnal Shifts*, Christian Torres Ramirez, M.D.

LEARNING CENTER THEATER HIGHLIGHTS RSNA 109th SCIENTIFIC ASSEMBLY AND ANNUAL MEETING

Nearly 150 research papers and posters on the topics of generative AI, theranostics, sustainability in imaging, and imaging of immunotherapy will be presented in the Learning Center at RSNA 2023. Ten studies identified as newsworthy are highlighted below.

➤ Session Number: S1-STCE2-2

Assessment of a Syndecan-1 targeted theranostic nanoparticle for improved detection and treatment of pancreatic cancer

Sunday, Nov. 26, 9:30 AM

We demonstrate that actively targeted nanodelivery of echinomycin results in autophagic cell death in pancreatic and potentially other high-autophagy, apoptosis-resistant tumors. Collectively, these findings support syndecan-1-targeted delivery of echinomycin and dysregulation of autophagy to induce cell death in pancreatic cancer.

➤ Session Number: T2-STCE2-1

Nanoscale NIR-II tracing combined with immunology reveals the dynamic progress of the atherosclerotic plaque immune microenvironment

Sunday, Nov. 26, 9:30 AM

Nanoscale NIR-II tracing combined with immunology can effectively monitor plaque immune microenvironment deterioration, providing a new strategy for real-time diagnosis and the clinical prevention of atherosclerotic unstable plaque rupture.

➤ Session Number: S5-STCE1-2

Unveiling a Paradigm in Sustainable Radiography: The World's Smallest and Lightest Carbon Nanotube-Based Pocket X-ray System for Soft X-ray Imaging and Irradiation, Featuring Low Energy Consumption and Powered by AAA

Sunday, Nov. 26, 2:30 PM

Researchers developed and characterized a carbon nanotube (CNTs)-based X-ray source that is smaller than the size of the human palm, powered by AAA battery, requiring half the energy to operate compared to filament-based X-ray source, capable of soft X-ray imaging at 7 kV, yielding approximately 1 Gy/hr of radiation dose.

➤ Session Number: S2-STCE1-2

Energy and greenhouse gas emission savings from power down of CT scanners in non-operational hours in a large regional practice

Sunday, Nov. 26, 10:30 AM

To assess the clinical practicality of placing CT scanners in low power mode, researchers gathered CT scanner use data from practice settings over a multi-hospital region serving 3.1 million people. They found that placing CT scanners in lower power mode in non-operational hours in low-use and medium-use clinical settings results in substantial energy and greenhouse gas savings.

➤ Session Number: M7-STCE1-3

Radiology and Sustainability: The Experience of the First Carbon-neutral Hospital in Brazil

Monday, Nov. 27, 2:30 PM

This study describes the efforts and initiatives of a tertiary hospital in Brazil to achieve carbon neutrality through a comprehensive renewable energy transition.

➤ Session Number: T3-STCE1-1

Addressing Healthcare's Carbon Footprint: Imaging Practices and Environmental Impact

Tuesday, Nov. 28, 10:00 AM

This poster analyzes the environmental impact of radiologic studies, compares carbon footprints among different radiologic studies, and examines the influence of imaging guidelines on appropriate imaging use.

➤ Session Number: T3-STCE1-3

A Global Assessment of Energy Consumption in Radiology and Radiation Oncology: An Environmental Impact Study

Tuesday, Nov. 28, 10:00 AM

The research emphasizes the significant and often disregarded energy consumption of radiology and radiation oncology machines. With the ongoing rise in demand for radiology and radiation oncology services worldwide, it becomes imperative to undertake efforts to curb this environmental impact. This could involve increasing the energy efficiency of machines and looking into alternative energy sources.

➤ Session Number: T5-STCE2-3

Simplifying Radiology reports into layman language with Large Language Models: a pilot study of effect on patient satisfaction

Tuesday, Nov. 28, 12:15 PM

Simplified radiology reports generated using LLMs can positively impact the patient's understanding of their disease status and improve their overall radiology experience.

➤ Session Number: W6-STCE1-2

Exploring Racial Disparities in Imaging Datasets via Generative AI: A Path to Enhanced Model Transparency

Wednesday Nov. 29, 1:30 PM

The study demonstrates the effective use of generative AI models for detecting anatomical differences between white and African American patients. African American patients had a significantly higher osteoarthritis severity compared to white patients, suggesting healthcare access disparities at early stages of disease.

➤ Session Number: W2-STCE1-3

Utilizing Large Language Models for Neuro-Oncologic Prediction: A Multi-Center Study on Magnetic Resonance Imaging Reports

Wednesday, Nov. 29, 9:00 AM

Central nervous system tumors are a leading cause of cancer-related mortality worldwide. We developed large language models (LLMs) using MR imaging reports for the automated curation of neuro-oncologic outcomes across a diverse array of brain tumor types to enhance prognostication accuracy.

Schedule subject to change. Please consult the [RSNA 2023 Meeting Program](#) for the latest information.

RSNA Fosters AI Research, Education

The Radiological Society of North America (RSNA) is a trusted source for peer-reviewed research, high-quality education, grant funding, and other valuable opportunities and resources for the practical and ethical application of artificial intelligence (AI) in medical imaging.

The [RSNA Imaging AI Certificate Program](#)—the first-ever radiology-specific AI certificate program—blends a case-based curriculum with practical application and delivers a pathway for all radiologists to understand how to leverage AI for their practices and careers.

RSNA's peer-reviewed [journals](#) publish the latest advances in radiology, including numerous articles exploring the use of AI to aid in patient care and clinical workflow management, as well as informative perspectives from thought leaders in the field. [Radiology: Artificial Intelligence](#) is dedicated to highlighting emerging AI medical imaging research across multiple disciplines.

RSNA's [AI Challenges](#) spur the creation of AI tools for radiology to improve patient care.

The [RSNA Research & Education Foundation](#) provides millions of dollars in funding for innovative radiology research and education across a broad spectrum of topics, including AI.

RSNA's AI [Community](#) allows imaging professionals and AI researchers to connect and discuss AI advances and challenges, while RSNA's comprehensive [education](#) program offers live and online AI learning opportunities throughout the year.

RSNA 2023 AI HIGHLIGHTS

RSNA 2023 has an abundance of papers, posters, courses and education exhibits spotlighting AI and machine learning applications.

Imaging AI in Practice Demonstration

The Imaging AI in Practice (IAIP) demonstration is an interoperability demonstration that takes place during the RSNA annual meeting to showcase new technologies and communication standards needed to integrate artificial intelligence (AI) into the diagnostic radiology workflow. The demonstration uses real-world clinical scenarios and interoperability standards to demonstrate new tools and practice enhancements enabled by AI. It includes many steps in the radiology workflow where AI can assist the radiologist and improve the efficiency and quality of care.

The diagrams linked here give a visual overview of the flow of information among systems in a radiology practice with AI tools integrated:

- [Imaging AI Workflow](#)
- [Post-Imaging AI Workflow](#)

RSNA AI Challenge Recognition Event

A recognition event will be held in the AI Theater at RSNA 2023 for the winners of the 2023 [RSNA Abdominal Trauma Detection AI Challenge](#). The challenge invited participants to develop machine learning

models that match radiologists' performance in detecting, locating and classifying the severity of traumatic abdominal injuries.

To create the ground truth dataset, the challenge planning task force collected imaging data sourced from 23 sites in 14 countries on six continents, including more than 4,000 CT exams with various abdominal injuries and a roughly equal number of cases without injury.

The winners of the [RSNA Screening Mammography Breast Cancer Detection AI Challenge](#), held earlier this year, will also be recognized. That challenge invited participants to develop AI models that can aid in the detection of breast cancer and attracted 2,146 competitors forming 1,687 teams.

AI Showcase

The [AI Showcase](#) is the center of all the latest imaging AI technology at RSNA 2023. Connect with industry leaders and visit more than 100 exhibitor booths to see new products and technical solutions in action. Located within the showcase is the [AI Theater](#), where attendees can view daily industry presentations from companies highlighting the innovations fueling the future of AI, and the [RSNAI Resource Center](#), which will provide attendees with the opportunity to learn and ask questions about a wide variety of RSNA-led or co-sponsored medical imaging AI initiatives.

**109th SCIENTIFIC ASSEMBLY AND ANNUAL MEETING
RADIOLOGICAL SOCIETY OF NORTH AMERICA**

Sunday, November 26 – Thursday, November 30, 2023
McCormick Place, Chicago, Illinois
(as of 10/20/2023)

RSNA FACTS

- RSNA[®] has over 48,110 members in 160 countries.
- The RSNA Scientific Assembly and Annual Meeting is the premier annual radiology forum in the world. It has been held consecutively in Chicago since 1985. RSNA 2022 hosted nearly 38,000 attendees. McCormick Place was first used in 1975.
- RSNA publishes five peer-reviewed medical journals.

Editors:

- *Radiology*, David A. Bluemke, M.D.
- *RadioGraphics*, Christine (Cooky) O. Menias, M.D.
- *Radiology: Artificial Intelligence*, Charles E. Kahn Jr., M.D., M.S.
- *Radiology: Cardiothoracic Imaging*, Suhny Abbara, M.D.
- *Radiology: Imaging Cancer*, Gary D. Luker, M.D.
- *Radiology Advances*, an open access journal focusing on the publication of a broad spectrum of high-quality international radiology and medical imaging research, will launch in early 2024 under editor Susanna I. Lee, M.D., Ph.D. *Radiology Advances* is owned by RSNA and will be published by Oxford University Press.
- RSNA offers a comprehensive collection of online continuing education courses covering every subspecialty in radiology.
- Since 1984, the RSNA Research & Education (R&E) Foundation has awarded more than \$78 million in grant funding for over 1,800 grant projects.
- RSNA employs 266 people.
- RSNA headquarters is located at 820 Jorie Blvd., Oak Brook, Ill.

RSNA ANNUAL MEETING FACTS

(as of 10/20/23, some numbers subject to change)

The Scientific Assembly and Annual Meeting of the Radiological Society of North America (RSNA®) is the world's premier scientific and educational forum in radiology.

Facts about RSNA 2023 include:

- 5 days of educational programs for radiologists, radiation oncologists, physicists in medicine, radiologic technologists and allied healthcare professionals
- 670 technical exhibits occupying 396,000 square feet at McCormick Place
- 113 first-time RSNA exhibitors
- 851 scientific papers in 19 subspecialties: breast; cardiac; chest; emergency radiology; gastrointestinal; genitourinary; head & neck; informatics; interventional; multisystem; musculoskeletal; neuroradiology; noninterpretive skills/practice management; nuclear medicine/molecular imaging; pediatric; physics; radiation oncology; OB/gynecology; and vascular
- Over 300 education courses and 7 plenary sessions
- 1,654 education exhibits and 1,419 scientific posters featured in the Lakeside Learning Center
- 150 Learning Center Theater abstracts

Corporate Symposia and Lunch & Learns

Corporate Symposia

Check out these one-hour education sessions presented by RSNA exhibitors and sponsors throughout the week. Morning sessions are held from 8 a.m. to noon and afternoon sessions are held from 1 p.m. to 4 p.m. You can also view select symposia via livestream on the virtual platform or on-demand through April 30, 2024 at noon CT.

Lunch & Learns

Participate in midday panel discussions, demonstrations and lectures with company leaders and medical professionals. Lunch & Learn sessions are held in-person and are available on demand through April 30, 2024 at noon CT.

Industry Presentation	Time	Sunday, November 26	Monday, November 27	Tuesday, November 28	Wednesday, November 29
Morning Corporate Symposia	60 minute sessions hosted between 8 AM-12 PM		Bracco 9:00-10:00 AM S101AB	Bayer 9:00-10:00 AM S102AB	GRAIL, LLC 9:30-10:30 AM S101AB
			Merge by Merative 9:30-10:30 AM S102CD	Philips 9:30-10:30 AM S101AB	
				Siemens Healthineers 9:30-10:30 AM S102CD	
Lunch & Learns	Sunday Lunch & Learns 11:45 AM-12:45 PM Monday, Tuesday and Wednesday Lunch & Learns 12 PM-1 PM	Hologic 11:45 AM-12:45 PM S502	BD 12:00-1:00 PM S403B	Hologic 12:00-1:00 PM S502	Canon Medical Systems USA, Inc. 12:00-1:00 PM S501
		PocketHealth 11:45 AM-12:45 PM S501	GE HealthCare and Quantum Imaging & Therapeutic Associates, Inc. 12:00-1:00 PM S502	Nuance, a Microsoft company 12:00-1:00 PM S403B	
			Intelerad 12:00-1:00 PM S501	Shimadzu Medical Systems 12:00-1:00 PM S501	
			Legally Mine 12:00-1:00 PM S403A	Subtle Medical 12:00-1:00 PM S403A	
Afternoon Corporate Symposia	60 minute sessions hosted between 1PM-4PM		Bayer 1:30-2:30 PM S102AB	AWS, Dicom Systems, and UC San Diego Health 1:30-2:30 PM S102CD	
			Corcept Therapeutics 1:30-2:30 PM S101AB	Novartis 1:30-2:30 PM S101AB	
			Envisionit Deep AI® 3:00-4:00 PM S102CD		

Center Stage Presentations

Join us at the Innovation Theater during the lunch hour to hear compelling stories of insight and inspiration presented by executives from RSNA 2023 exhibiting companies. Presentations take place from 12:00-12:45 p.m., Sunday through Wednesday, in the open-air Innovation Theater in the South Exhibit Hall.

Industry Presentation	Time	Sunday, November 26	Monday, November 27	Tuesday, November 28	Wednesday, November 29
Lunch Hour Presentations	12:00-12:45 PM		RamSoft, Inc.		

Virtual Industry Presentations

Attend fully virtual presentations from select companies who are ready to engage with attendees across the globe through our virtual meeting platform. Presentations will be available before and after RSNA 2023 each day and during breaks in RSNA programming. Watch live or view the on-demand recordings through April 30, 2024 at noon CT.

Industry Presentation	Time	Monday, November 27	Tuesday, November 28	Wednesday, November 29
Pre-Show Presentations	7:00-8:00 AM	Philips		
Morning Presentations	9:00-9:30 AM			
	10:30-11:00 AM		Bayer	
Lunch Hour Presentations	12:00-1:00 PM			
Afternoon Presentations	2:30-3:00 PM			
	4:00-4:30 PM			
Post-Show Presentations	After 6 PM			

AI Theater Presentations

Stop by the RSNA AI Theater for daily industry presentations from companies highlighting the innovations fueling the future of AI. Presentations run from 10:30 a.m. to 3:45 p.m., Sunday through Wednesday. Don't miss other special AI events happening on select days.

Time	Sunday, November 26	Monday, November 27	Tuesday, November 28	Wednesday, November 29
10:30-10:45 AM		Bayer Radiology - Digital Solutions	Segmed	V7
11:00-11:15 AM	Subtle Medical	AIRS Medical	CodaMetrix	Blackford
11:30-11:45 AM	DeepRad.AI, presented by Taipei Medical University	Subtle Medical	Flywheel	United Imaging Intelligence
12:00-12:15 PM		Qure.ai	Riverain Technologies	Amazon Web Services
12:30-12:45 PM		Shukun Technology	Inflo Health	Circle Cardiovascular Imaging
1:00-1:15 PM	Median Technologies	Cortechs.ai	RapidAI	FONAR Corporation and AIRS Medical
1:30-1:45 PM	Smart Reporting GmbH	CARPL.ai	ClariPi Inc.	Cerebriu
2:00-2:15 PM	Gradient Health	Merge by Merative	HealthLevel	Google Cloud
2:30-2:45 PM	deepc GmbH	Vista.ai	Oxipit	
3:00-3:15 PM		NEUROPHET Inc.	RadScribe, Inc.	
3:30-3:45 PM	Formalizing Artificial Intelligence for Radiology Trainees: presented by RSNA (3:30-4:00 PM)	iCAD, Inc.	TeraRecon, A Concert AI Company and Cercare Medical	MIDRC: Data for Your AI: presented by RSNA (3:30-4:00 PM)
Special AI Events 4:00-5:00 PM		AI Challenge Recognition Event: presented by RSNA (4:00-5:00 PM)	RSNA's Imaging AI Certificate Program – Next Steps: presented by RSNA (4:00-4:30 PM)	Radiology AI Fireside Chat: presented by RSNA (4:00-5:00 PM)

Innovation Theater Presentations

Be the first to hear about the latest innovations in radiology at these industry presentations highlighting cutting edge solutions. Presentations run from 10:30 a.m. to 3:45 p.m., Sunday through Wednesday.

Time	Sunday, November 26	Monday, November 27	Tuesday, November 28	Wednesday, November 29
10:30-10:45 AM	Hyland	PocketHealth	Lenovo	Hyperfine, Inc.
11:00-11:15 AM	Carestream Health	3D Systems	OpenRad Services UK Ltd.	See-Mode Technologies
11:30-11:45 AM	Dextro Imaging Solutions	Canon Medical Systems USA, Inc.	Merge by Merative	Resoundant
12:00-12:15 PM	RadAssist® powered by LucidHealth		GE HealthCare	Sonio
12:30-12:45 PM	MEDICAL IP		Agamon	
1:00-1:15 PM	Varex Imaging Corp	Guerbet LLC	DataFirst - Silverback® Workflow Engine	ThinkSono
1:30-1:45 PM	Dunlee	Rad AI	AGFA HealthCare	Bayer Radiology - Digital Solutions
2:00-2:15 PM	Subtle Medical	SpinTech MRI	Amazon Web Services	
2:30-2:45 PM	VMware	annalise.ai	Tempus	
3:00-3:15 PM	GE HealthCare	Paragon Health IT	Nuance, a Microsoft company	
3:30-3:45 PM	QGenda, LLC	Kailo Medical	Fresenius Kabi USA	

Fireside Chat Presentations

Join us at the Career Resource Center in the South Exhibit Hall for Fireside Chat presentations. These 15-minute presentations are on important aspects of career management or professional development and take place on the half hour, 10:30 a.m. to 2:30 p.m., Sunday through Wednesday.

Time	Sunday, November 26	Monday, November 27	Tuesday, November 28	Wednesday, November 29
10:30-10:45 AM				
11:30-11:45 AM		Envision Physician Services		
12:30-12:45 PM				
1:30-1:45 PM			Medality, formerly MRI Online	
2:30-2:45 PM				

Vendor Workshops

Gain first-hand experience on an exhibiting company's proprietary systems by attending user training and product instruction in classroom space in the exhibit halls. Workshop sessions may run from 10 a.m. to 5 p.m. CT each day, Sunday through Wednesday.

Company	Booth	Hall
GE HealthCare	8349	North Hall, Level 3
Siemens Healthineers	5528	South Hall, Level 3



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