EDITORIAL

Scientific Advances, *Investigative Radiology* 2020 (and Beyond)

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COVID-19 has brought many changes to our lives, as well as to research, and will likely have a long-lasting impact on the modern world in many ways. Beyond this topic, advances in medical imaging and health care diagnosis continue, equally important and perhaps more important for the long-term future. Three separate lists of "top" 10 articles that appear in *Investigative Radiology* in 2020 are presented. This represents about 10% of the journal's 2020 publications. Although the focus in this commentary is on these publications, the remainder of 2020 publications are not to be neglected or discounted. *Investigative Radiology* is highly selective, and currently, only 9% of submissions are accepted for publication. The 3 presented "top" 10 lists include that by number of citations, by Altmetric score, and that most viewed on the journal's website. The data come in part from Digital Science's web product Dimensions, launched in 2018, which includes a freely accessible citation database and analytics (as opposed to Scopus and the Journal Citation Reports, where this information is restricted to paid subscribers).

The top 10 cited articles from 2020, as of mid-February 2021, per Dimensions.AI (Digital Science), in *Investigative Radiology* were as follows:

1. The Clinical and Chest CT Features Associated With Severe and Critical COVID-19 Pneumonia[1]
2. Chest CT Findings in Patients With Coronavirus Disease 2019 and Its Relationship With Clinical Features[2]
3. Clinical and High-Resolution CT Features of the COVID-19 Infection: Comparison of the Initial and Follow-up Changes[3]
4. The Performance of Chest CT in Evaluating the Clinical Severity of COVID-19 Pneumonia: Identifying Critical Cases Based on CT Characteristics[4]
5. Recent and Upcoming Technological Developments in Computed Tomography: High Speed, Low Dose, Deep Learning, Multienergy[5]
6. The Limited Sensitivity of Chest Computed Tomography Relative to Reverse Transcription Polymerase Chain Reaction for Severe Acute Respiratory Syndrome Coronavirus-2 Infection: A Systematic Review on COVID-19 Diagnostics[6]
7. Variability and Standardization of Quantitative Imaging: Monoparametric to Multiparametric Quantification, Radiomics, and Artificial Intelligence[7]
8. Clinical High-Resolution 3D-MR Spectroscopic Imaging of the Human Brain at 7 T[8]
9. Effects of Detector Sampling on Noise Reduction in Clinical Photon-Counting Whole-Body Computed Tomography[9]
10. Increased T1 Signal Intensity of the Anterior Pituitary Gland on Unenhanced Magnetic Resonance Images After Chronic Exposure to Gadodiamide[10]

The top 10 articles by Altmetric score, from 2020, in *Investigative Radiology* were (once again using Dimensions as a source) as follows:

1. Chest CT Findings in Patients With Coronavirus Disease 2019 and Its Relationship With Clinical Features[2]
2. Ultrafast Brain Magnetic Resonance Imaging in Acute Neurological Emergencies: Diagnostic Accuracy and Impact on Patient Management[11]
3. Radiation Dose to the Fetus From Computed Tomography of Pregnant Patients—Development and Validation of a Web-Based Tool[12]
4. Gray Matter Nucleus Hyperintensity After Monthly Triple-Dose Gadopentetate Dimeglumine With Long-term Magnetic Resonance Imaging[13]
5. The Clinical and Chest CT Features Associated With Severe and Critical COVID-19 Pneumonia[1]

6. Gadolinium Retention in Erythrocytes and Leukocytes From Human and Murine Blood Upon Treatment With Gadolinium-Based Contrast Agents for Magnetic Resonance Imaging[14]

7. Clinical and High-Resolution CT Features of the COVID-19 Infection: Comparison of the Initial and Follow-up Changes[3]

8. Increased T1 Signal Intensity of the Anterior Pituitary Gland on Unenhanced Magnetic Resonance Images After Chronic Exposure to Gadodiamide[10]

9. Long-term Evaluation of Gadolinium Retention in Rat Brain After Single Injection of a Clinically Relevant Dose of Gadolinium-Based Contrast Agents[15]

10. Is Small Fiber Neuropathy Induced by Gadolinium-Based Contrast Agents?[16]

The top 10 most viewed articles, as of mid-February 2021 (but regardless of year of publication), from the *Investigative Radiology* website were as follows:

1. Chest CT Findings in Patients With Coronavirus Disease 2019 and Its Relationship With Clinical Features[2]

2. The Clinical and Chest CT Features Associated With Severe and Critical COVID-19 Pneumonia[1]

3. Computer-Aided Diagnosis of Pulmonary Fibrosis Using Deep Learning and CT Images[17]

4. The Changing World of Breast Cancer: A Radiologist's Perspective[18]

5. Deep Learning Approach for Generating MRA Images From 3D Quantitative Synthetic MRI Without Additional Scans[19]

6. A Deep Learning Model for the Accurate and Reliable Classification of Disc Degeneration Based on MRI Data[20]

7. Real-Time Magnetic Resonance Imaging: Radial Gradient-Echo Sequences With Nonlinear Inverse Reconstruction[21]

8. Gadolinium-Based MRI Contrast Agents Induce Mitochondrial Toxicity and Cell Death in Human Neurons, and Toxicity Increases With Reduced Kinetic Stability of the Agent[22]

9. Clinical and High-Resolution CT Features of the COVID-19 Infection: Comparison of the Initial and Follow-up Changes[3]

10. Dechelation (Transmetalation): Consequences and Safety Concerns With the Linear Gadolinium-Based Contrast Agents, In View of Recent Health Care Rulings by the EMA (Europe), FDA (United States), and PMDA (Japan)[23]

Beyond the "top" 10, the 2020 issues of the journal are filled with many, many outstanding articles, representing cutting-edge research and technology in diagnostic imaging. Recurring themes include deep learning and artificial intelligence,[24] advances in magnetic resonance (MR) imaging technique (including speed and resolution),[25] safety of the gadolinium chelates (focusing on long-term gadolinium deposition with the linear chelates), advances in imaging at 7 T, improvements in the diagnosis of multiple sclerosis,[26] technological developments in computed tomography (CT) (both with dual energy and photon-counting CT),[27,28] radiation dose, breast imaging,[29] and next-generation contrast media for CT, MR, and ultrasound. One article of importance, not previously mentioned that also ranked in the "top" 20 (as with those already noted in this paragraph), evaluated needle heating and safety during interventional MR.[30]

The 3 "top" 10 listings of journal highlights provide further insight into science in the modern world beyond the significance of the individual works. The scientific literature in 2020 was skewed by the COVID-19 pandemic, with unwarranted high numbers of publications (reflecting the huge number of submissions), and questions regarding the integrity of the scientific work therein. *Investigative Radiology* consciously chose not to focus on the pandemic and publish as always simply the best science and advances therein. Although the top 4 cited articles concern COVID-19, beyond that, the 3 listings are dominated

by other advances and important topics concerning health care. This is very different from comparable journals, for example *Radiology*, in which only 2 publications from a similar 3 listings did not concern COVID-19. Good science should not be ignored in the face of COVID-19, as well as the importance of advances and new knowledge involving topics other than COVID-19.

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