Back to the Future

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I was asked to describe the left atrial anatomy in Mr Smith, an elderly gentleman with atrial fibrillation, whose cardiologist needed a CT to plan the ablation of a potentially arrhythmogenic foci in the pulmonary veins. Despite the complexity of the procedure, the questions for me were simple: How many veins? How big are the veins? Any tributaries within 10 mm of the vein joining the left atrium? My report would then be copied and pasted into the cardiologist’s summary of the patient under the heading “Data.”

Ordinarily, my curiosity would have been limited to the clinical question. I would measure the pulmonary veins, in two dimensions—being in an academic medical center. I would dispatch the case rapidly, read the next case asking another cognitively simple reductionist question, and rapidly move on to the next case. I am a highly specialized reductionist. I complete my assigned tasks with industrial-level productivity.

Because the case load was unusually low, I casually wandered beyond the pulmonary veins. Unsurprisingly, Mr Smith’s left atrium was large. His coronary arteries were densely calcified. According to the electronic health record, he was taking a statin. Because of his kyphotic posture—his thoracic vertebrae had shrunk as his bones became osteopenic—I saw more of his neck than was supposed to be in my jurisdiction of the thorax.

Continuing my peripatetic mood, I ventured beyond my assigned field of view. In his imaging jacket, I found a head CT from 7 days earlier requested by the emergency physician because he had fallen. The question was simple: “Is there an intracranial bleed?” The answer was even simpler: “No.”

I scrolled through Mr Smith’s head CT, which, as the radiologist succinctly described, was “negative for hemorrhage.” But his cerebellum was atrophic. The sulci were unusually large. His frontal lobes were of normal size. It is as if his cerebellum was born before the rest of his brain.

I rang the cardiologist, who was surprised to receive a call for a straightforward pulmonary vein analysis. I was concerned that the cerebellar atrophy was caused by alcohol overuse, which could cause both recurrent falls and atrial fibrillation. At any rate, because he was predisposed to falls, he was at risk for intracranial hemorrhage, particularly because he was on prophylactic anticoagulation to prevent an embolic stroke from a thrombus due to his atrial fibrillation.

When thinking about how future radiologists should practice, I remember the radiologists of the past such as the late Wallace T. Miller Sr (Wally Sr) from the University of Pennsylvania, one of the most accomplished of his time. I recall him once reviewing a chest radiograph with a pulmonologist for a patient with a mysterious infection impervious to antibiotics. Wally Sr quizzed the pulmonologist on all aspects of the patient’s clinical course. It seemed more conversation than quiz, with both doctors displaying their vast knowledge of clinical medicine.

“Have you considered epidural abscess?” asked Wally Sr, with his eyes on the radiograph. The pulmonologist smiled. He had not considered epidural abscess.

Watching me stare at the radiograph struggling to see signs of epidural abscess—there were none—Wally Sr then said, “A good radiologist listens. Our ears are as important as our eyes.” His point was that there is often more to the story than meets the eyes. What is seen or not seen must be contextualized with what is heard.

Our ears have been made redundant by the electronic health record. This is one reason we have become reductionists—sophisticated one-trick ponies, masters of our shrinking fiefdoms. Imaging has become more information-rich. It has become more complex. But this complexity belies that much can be gleaned from simple studies, such as unenhanced head CT, when findings are contextualized.

The complexity is often manufactured. To borrow an aviation analogy—we are not flying more often over Alaskan mountains in a storm. We are flying over the Kansas plains with perfect visibility, pretending it is Alaska. We conscript cardiothoracic radiologists with long training to
document the manipulation of lines and tubes in intensive care unit portable radiographs, an important task that nonetheless exacts little cognitive muscle.

Even sophisticated modalities are afflicted by reductionism. A typical cardiac MRI contains more than 500 images. The interpreter having slogged through the complex sequences answers simple questions. What is the ejection fraction? How thick is the ventricular wall? How much scar is present? The complexity of the modality so consumes the radiologist that he or she thinks of nothing but the heart. The territorial division of the human body binds radiologists into anatomical kingdoms. They think a whole lot about the part but very little about the whole.

It is no coincidence that complexity, sophistication, and simplicity have risen synchronously in imaging. Therapeutic decision making remains binary. For instance, one either breaks the clot or does not. But information is multilayered and is becoming more complex.

We are drifting further away from the whole to smaller and smaller parts aided in part by standardized reports. My small kingdom, the chest, has been broken into smaller provinces by a template: lungs, mediastinum, pleura, and heart. I must describe each as if they are pathophysiologically unique. If imaging is the first derivative, standardized reports are the second derivative. The radiologist is no longer the integrator of information but the filler of rows and columns. The radiology report often resembles an Excel spreadsheet.

Interobserver variability is frowned upon. Radiology reports must be indistinguishable. The report is an institutional brand. Compliance is now both an intellectual endeavor and a moral goal for radiologists. The art has surrendered to the science of uniformity. Technically, it is pseudoscience. Just because all radiologists report adrenal nodules in the same manner does not mean they are all correct—they are all wrong in the same way.

Uniformity has drowned the tacit information often embedded in radiology reports, best illustrated by the “Sosman’s psychological side-step.”

[1] Dr Merrill Sosman was a radiologist in 1950s. When reporting normal radiographs in patients with a high pretest probability of disease (eg, a patient with headache and focal neurology), Sosman would add a qualifier such as “no evidence of acoustic neuroma.” By naming a disease, if only to deny it, he brought it to the attention of the clinician, who may not have thought of it.

Like Wally Sr, Sosman went beyond the reductionism of the imaging and thought of the patient as a whole. His job was thinking not just about the imaging at hand but the patient for whom the imaging was performed. He would deduce the differential diagnosis by the clinical presentation—just like the referring physician, and then, not finding signs of the disease with the understanding of the limitations of the test, he would include his top diagnosis in the report by mentioning its absence. It was an amalgam of domain expertise, clinical knowledge, and conditional probabilities.

Clinicians would consult Wally Sr because he made them smarter clinicians. They consulted him not just because of his radiological expertise but because of his clinical knowledge. The chest radiograph was incidental. Wally Sr’s true expertise was clinical medicine.

Future radiologists should emulate Wally Sr and Sosman rather than the anatomically focused list destroyers of today, who are deferent to turnaround time, relative value units, and other metrics that commoditize us. They should move away from reductionism and leave simple questions to algorithms. They should become the integrators of information, perched on their stools like the Oracle of Delhi. They should be the joiners of dots rather than the dots themselves—data points in clinician’s crib sheets, like complete blood count and erythrocyte sedimentation rate.

Such a change obviously needs a change in incentive structure. Fee-for-service encourages status quo. However, reimbursements are diminishing. Radiology is not the cash cow it once was. Hospitals will place pressure on radiologists to deliver the highest informational bang for the buck.

It transpired that Mr Smith had been coy about his alcohol consumption, which he called “moderate” but was actually severe. His cardiologist took a different approach to his atrial fibrillation. He closed the left atrial appendage, the source of thrombus, and stopped the anticoagulation. The information that changed the management did not come from interrogating Mr Smith. His story was embedded in the pixels. It just needed a narrator.

REFERENCE


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