

A commemoration of the “digital” side of Juan Rosai: a junior’s perspective of the legacy of an all-round pathologist

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Summary

Juan Rosai, the “Maradona” of surgical pathology, played a role not only as a diagnostician but also as a researcher, a consultant and a teacher, distinguishing himself as a real icon at all levels of modern pathology. He was an innovative promoter of emerging technologies including digital pathology.

These few lines commemorate the digital side of the “Maestro” Juan Rosai from a junior’s perspective highlighting how Rosai supported digital pathology and remembering that, according to his own words, digital pathology “will revolutionize the field of pathology, if it is not doing that already”.

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Conflict of interest

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When Bethany and Filippo asked me to write down a few lines in commemoration of Juan Rosai, underlining his role in the field of digital pathology, the first thought that arose in my mind was ‘Who is or who was Juan Rosai’?

As a first-year pathology resident, Rosai’s name was especially familiar because of the surgical pathology book bearing his name that I have seen in regular use in different institutions. But apart from the fame of this work, I found myself knowing very little concerning his career and the professional achievements that must have led to his writing of an almost singled-authored masterpiece. To confront my question, I turned to the internet.

After doing some digging, the information I found started depicting Rosai as an authentic all-round professional. At a first and superficial sight, he was described as a firm defender of conventional H&E slides and a convinced believer in morphology. He apparently played a role not only as a diagnostician but also as a researcher, a consultant and a teacher, distinguishing himself as a real icon at all levels of modern pathology. Furthermore, among his multifaceted contributions to the discipline, he was also overtly acclaimed as a master of surgical pathology, to the point of receiving several flattering nicknames, such as “the Maradona of surgical pathology”.

However, going on in my personal quest for Rosai’s true identity, I realized that he was not only focused on H&E and microscopy, but he was also a polyhedric pathologist: he was an innovative promoter of emerg-

ing technologies, such as immunohistochemistry, molecular biology and digital pathology. He foresaw their importance and future applications before they proved to be mainstays in the field of modern pathology, and correctly anticipated the main benefits of their wider usage in both his consultation work and in the general practice of surgical pathology. All the more surprisingly, he did all this while remaining a staunch supporter of the continuous role of morphology in standard diagnostic practice¹. He probably was the very first one to understand that all these innovations, leading to evolving subspecialties of their own and including digital pathology itself, are *per se* pathology.

During his long career as a consultant, Rosai had the chance to witness the steady technical advances that improved the quality and accessibility of digital pathology, starting from the first examples of 'static' digital images to the more up to date 'dynamic' whole slide imaging². He understood the value of digital pathology and tried to communicate its fundamental pros to the wider scientific community.

He was among the first to promote digital pathology as the key to facilitate second opinion consultations, thanks to an easier and faster sharing of digital images, rather than physical glass slides, among geographically distant pathologists³. He understood the benefit of being able to carry out reproducible measurements directly on the digital slide, such as tumor width or depth of invasion, and to objectively quantify positive cells during immunohistochemical examinations. He also praised digital pathology for a number of other secondary features, such as the opportunity to manipulate the digital slide and add annotations, and the chance to examine the material at magnifications not easily attainable with traditional microscopy. I was truly fascinated by reading his wholehearted support of digital pathology in an email he sent to the FDA, which clearly showed how strong Rosai's advocacy of this new discipline was⁴.

Lastly, he understood the potential of being able to archive countless digital slides within servers rather than in conventional storage rooms, a feature that proved to be the basis for the creation of his own 'Rosai Digital Collection' (<https://www.rosaicollection.org/index.cfm>). For someone as young as me, the sole existence of this collection appears exciting and incredibly stimulating. It helps you realize how vast pathology is as a discipline and grants you the chance to have a look at slides that you would hardly ever see in routine work and, probably, in one's entire diagnostic career. All the more excitingly, thanks to the digital nature of such a collection, all the material Rosai collected and commented is made freely available to all, from the young trainees to the more seasoned diagnosticians, regard-

less of geographical location. Without any doubt, all this underlines Rosai's forerunning openness to the promising educational role digital pathology has to offer.

From 2000 to 2005, Rosai moved back to Italy to serve as Chairman of the Pathology Department of the National Cancer Center in Milan. From 2005 onwards, he created and became the director of the International Center for Pathology Consultations of the Italian Diagnostic Center in Milan, with the core aim of providing surgical pathology consultations through digital telepathology for pathologists, clinicians and patients both in Italy and overseas.

Going back to the starting question of this journey, Rosai is the surgical pathologist in the truest meaning of the word, embracing all the technologies, from H&E to the digital, to render a diagnosis valuable for both the clinician and the patient. What I imagine now is Juan Rosai rendering diagnoses using digital slides with all their associated benefits, including the AI. Although it is difficult to imagine an AI minimally close to Rosai's talent as a diagnostician, in all likelihood Rosai himself would have encouraged to pursue further research in the field to create better-performing AI tools and to promote their wider usage by all.

So, given Rosai's strong support to digital pathology, what are we waiting for to embrace and follow his ideas in this field? The following statement by Rosai should erase any lingering doubts and encourage to move on to a fully digital approach⁴.

"I would simply conclude by saying than from a technical and scientific standpoint I am thoroughly convinced that a diagnosis made on the basis of a *well-prepared digital image* of a representative whole section is *just as informative and accurate* as that performed by using the time-honored examination of a glass slide under the binocular microscope."

"Such an important matter [...] I have no doubts will revolutionize the field of pathology, if it is not doing that already."

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