



Book review

William H. Harris, MD, DS. *Vanishing Bone, Conquering a Stealth Disease Caused by Total Hip Replacements*. New York: Oxford University Press, 2018, p. 219. \$21.95

Professor William Hamilton Harris, MD, DS, possibly the most influential figure in the adoption and perfection of total hip replacement surgery in the United States, has written a compelling account that acts as not only a scientific mystery but also a professional autobiography.

To a whole generation of adult reconstruction specialists and orthopedic surgeons, this is the story of an implant material that we use every day, and one that may not have come about but for Professor Harris and his research team. Many younger surgeons take this ubiquitous material and the durability that it has imparted for granted. The lessons learned from Harris' account do not stop at being grateful for his work to investigate periprosthetic osteolysis and to perfect cross-linked polyethylene.

New challenges in orthopedics will surely arise again and the combination of keen observation, careful study of our own patients, thoughtful and methodical problem dissection, and resilience in finding a solution—these are the lessons readers must take to their own surgical practices.

In Part 1 of *Vanishing Bone*, Professor Harris tells the story of how he and his team of collaborators first observed osteolysis around well-functioning total hip prostheses and their mindset and approach to understand and resolve this potentially grave failure. The narrative is told through a series of patient stories in the manner of authors Oliver Sacks and Atul Gawande, and all of the patients are Harris' own. The book takes us from the first cases of this novel "disease," through its pathological analysis, and then to the ultimate realization that it is caused by the body's inflammatory response to submicron particles produced by the artificial hip's polyethylene bearing surface. Next in the story, Harris' Massachusetts General Hospital biomechanics laboratory—in association with colleagues from Massachusetts Institute of Technology—designs a "first of its kind" anatomic hip simulator. The team then starts by testing old style hips to confirm the failure mode they have uncovered. Next, the investigators trial various formulations of a new plastic for the articulation. Armed with this powerful new tool, perhaps the lynchpin in the story, the Harris team methodically analyzes how wear debris particles are formed and ultimately devises an innovative polymer that minimizes wear but is stable enough for decades of constant usage in active patients.

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I was an adult reconstruction fellow with Professor Harris at Massachusetts General Hospital in 1994 and 1995 as this dramatic story culminated. The first part of the book captures completely the intensity of the laboratory at that time and the excitement and ultimate exhilaration of the team as each major breakthrough occurred.

In Part 2, Professor Harris takes the reader on a slightly different intellectual and emotional ride. Here we learn the real-world challenges of bringing a scientific breakthrough to patients. The complexities of intellectual property law, the United States Food and Drug Administration device approval and clearance processes, and implant manufacturer industry decision making are all part of the incredible account. Commercialization of a new prosthesis is an area that few orthopedic surgeons are intimately familiar with, and this part of the story adds to the drama because of the myriad setbacks that were encountered. The story finishes up with a truly Herculean effort by the research team to assess the performance of their discovery in patients with radiographic and retrieval studies for many long years after regulatory approval and adoption by surgeons. These investigations from Harris' laboratory, in addition to those by several independent research groups, have confirmed minimal wear and significantly less revisions overall when crosslinked polyethylene is used in total hip replacements.

Vanishing Bone concludes with Professor Harris' explanation of the "clinician-scientist" and his concern that few follow this path today. He believes that this type of doctor is becoming an "endangered species," because the 2 operative activities necessary for success (namely clinical practitioner and scientific researcher) have very different intellectual and human characteristics. Here Harris reflects on his own motivations and rewards for a unique and stellar career.

There are several unique aspects of the book that work well for all readers such as its stand-alone section with an explanation of key terms, the timeline of important events, interspersed reproductions of exemplary radiographs, excellent schematic drawings, and relevant detailed profiles (with photographs) of major collaborators.

In the Forward, renowned biologist Edward Owen Wilson explains that the book's genius is in presenting a "clear image of the process of scientific research." That this image is presented by the very pioneer who worked to uncover the disease in question and then led a multidisciplinary team to conceive and execute a solution, is all the more impressive. That this effort was undertaken by a physician while personally caring for thousands of patients over a storied surgical career is just astounding.

Ultimately, Dr. Harris' tale is one of patient empathy, deep curiosity, methodical observation and analysis, indefatigable grit, and some good fortune. This is the recipe for a successful clinician-scientist and also for an informative and entertaining read.

I think that this book will be a great introduction for medical students and should be mandatory for orthopedic residents and fellows. With the size of the world and our aging population,

the requirement for increasing the longevity of surgical implants is likely nowhere near fulfilled. The lessons learned and methodical approach demonstrated in *Vanishing Bone* will be the lasting message for those clinician scientists of the present and future who will rise to this challenge.

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