



UM Surgeons Replace Ankle Bone with 3D-Printed Metallic Implant

Surgeons have treated a patient's "dead" ankle bone with a custom, 3D-printed replacement for the first time at UHealth Tower and the University of Miami Miller School of Medicine.



3D-printed metallic ankle bone implants

It was a "Terminator-style, 21st Century approach" to helping the 24-year-old patient, said Amiethab Aiyer, M.D., a UHealth orthopedic surgeon specializing in foot and ankle surgery.

"We believe that bringing this treatment to UHealth shows how we are at the vanguard of innovation and early incorporation of the most exciting surgical developments from around the world," said Stephen Quinnan, M.D., a trauma orthopedic surgeon at UHealth. The two surgeons collaborated on the case.



Blood flow to one of Gracia Sylla's ankle bones became compromised because of sickle cell disease. The lack of blood, in turn, led to the death of her talus bone, a process known as avascular necrosis (AVN).

"She had significant pain from AVN associated with the talus," Dr. Aiyer said. This is a major bone within the ankle, one that is "particularly important for loading and movement, and activities like walking and running."

Non-surgical approaches were recommended first. However, the patient came back after failing conservative measures.

"I was skeptical at first," Sylla said when asked about her reaction to getting a 3D-printed implant. "I wondered, would my body reject it or not?"

Dr. Aiyer referred her to Dr. Quinnan for further evaluation. "When I first evaluated the patient, it was for consideration of possible ankle fusion," Dr. Quinnan said. "Fusion of the ankle would traditionally have been the best option available for this young woman. However, there are several serious drawbacks – including the inability to move the ankle and the need for a complex reconstruction to avoid having a leg length difference."

"I didn't want to get my ankle fused," Sylla said. "I want to be able to move it up and down."

"I had seen success while in Australia and similar reports from Japan using an exciting new solution to simply replace the talus bone with a 3D-printed talus bone," Dr. Quinnan added. "Due to her young age and the still normal appearance of the distal tibia part of the ankle joint, I thought this



innovate approach was worth consideration. I discussed this with Dr. Aiyer, who noted he had recently met a 3D printing orthopedic company at a conference and we agreed to work together to offer the patient this exciting new treatment option.”

“Sometimes we have to think outside the box,” Dr. Aiyer said. “The variety of pathology we are seeing at the University of Miami really facilitates our ability to be creative with regards to solutions.”

They took CT scans of Sylla’s ankle. Then the surgeons worked with a company in Durham, North Carolina, to create custom, 3D-printed metallic bones based on the size of her talus. During the surgery, they tried three different sizes.

“We wanted to use the one with the best fit and avoid stuffing the ankle, which could limit her mobility,” Dr. Aiyer said. “But it was good to have options, because sometimes when you go in there, you find changes in bone morphology or there are bone defects that are not well appreciated on imaging.”

The procedure puts the Miller School on the forefront of using 3D printing technology to create orthopedic solutions customized for individual patients. Drs. Aiyer and Quinnan estimate that fewer than 100 such bone replacements have been performed in the United States to date.

Some cases reported in the literature from abroad involved a 3D ceramic implant, but the UM surgeons opted for cobalt chrome, a metal often used in hip replacements and one that might be more durable, particularly for the load-bearing ankle.



“The patient is doing awesome,” Dr. Aiyer said. “It is great to see her doing as well as she is doing. I hope she continues to do well during the course of her rehabilitation process.”

“I am starting to put pressure on it and I can walk with one crutch,” Sylla said. “Before I couldn’t put a lot of weight on it. It’s been great.”