



Shark Attack!

by
Herbert House
Biology Department
Elon University, Elon, N.C.

It was 5:00 PM on a hot summer afternoon. Eight-year-old Jim Morris, wading in the warm current off Florida's Gulf Coast, swam easily toward his sister Amy and his uncle Robert. But the kids' fun in the shoulder-deep water was cut short by Jim's shouts of "Get it off me! Get it off me!" Amy's screams sliced through the peacefully rolling breakers like a knife, "Help! A shark has bitten off my brother's arm! Call 911!" Nearby swimmers heard the cries as Uncle Robert yelled, "Help us get the shark. It swallowed the arm!"

The swimmers converged on the spot, grabbing the six-and-a-half-foot bull shark by the tail and holding on for dear life. The twitching shark was hauled ashore barehanded by the group of men and shot. They pried open the shark's mouth while Robert pulled Jim's right arm out from between its jaws. As the boy's blood soaked into the white sand, lifeguards began CPR and applied a tourniquet. Paramedics arrived to stabilize Jim for transport to nearby Coastal Hospital. His arm was packed in ice and taken along. In the emergency room, Dr. Elaine Rogers, the physician on duty, quickly ordered multiple transfusions to restore the boy's blood supply as the ER team began stabilizing his vital signs.

Dr. Rogers began assembling the operating room team that would attempt to reattach Jim's arm. She called Ronan McBane, a microvascular surgeon, at his home. "Ronan, we have a cleanly severed arm due to a shark bite. It looks like it was just chopped off, with not much shredding of the tissue. The sharp-edged teeth of the shark bit through the boy's arm so cleanly it almost seems to have been severed by a cleaver. The boy is eight years old and, although he is still in pretty bad shape, we think that since the arm was recovered and is in reasonably good condition, we have a good chance at success." Further conversation convinced Ronan that reattachment was possible.

By the time Dr. McBane arrived, the other members of his medical team had started scrubbing for the 12 hours of surgery that would be needed to reconnect Jim's muscles, bone, and nerves. Dr. McBane announced to the watching interns: "This arm was severed about four inches above the elbow. I want first to identify the muscles, blood vessels, and nerves in both the arm and the stump. We'll mark each of these with sutures so that once Dr. Ramos has trimmed the wound and put in the supporting plate, we'll be able to come back and hook everything up."

Once the sutures were in place, orthopedic surgeon Juliet Ramos explained her role: "I'm going to trim bone on each side of the cut so that we can put in a plate that will keep the two parts of his arm together. This procedure will make the right arm a little shorter than the left one, but the one-inch difference shouldn't be too noticeable."

After the plate was screwed in, Dr. Ronan said: "Jim's arm is now intact from the shoulder to the hand, but the hard part is just beginning. We must now reattach each of the muscles and nerves on either side of this gap between the shoulder portion and the severed arm. We will also need to harvest the saphenous vein in order to reconnect some of these vessels."

Several hours later all of the blood vessels and nerves were connected. Dr. Ronan removed the clamps from the brachial and other arteries and blood started flowing once more through Jim's arm, bringing it to life again. As Jim was sent into the recovery room, Dr. Ramos and Dr. McBane looked at each other with relief.

The two surgeons then left the operating room to explain the operation to Jim's parents. Although the prognosis for their son's recovery was good, one sentence spoken by Dr. Ramos stood out to Mr. and Mrs. Morris: "It is unlikely Jim will ever regain complete use of his arm and hand."

Note: These events are based on the real-life case of Jessie Arbogast, whose arm was bitten off by a bull shark near Pensacola, Florida, on July 6, 2001.

Study Questions

Look up information in your notes, text, atlas, the library, and the web about the arm and reattachment. List the additional resources you use to answer the following questions:

1. Identify at least five organ systems in this region of the arm that the surgeon would have marked for reattachment.
2. List the names of the specific structures that had to be reattached.
3. What organ system was most likely not reattached? Explain.
4. Why was a clean bite so important?
5. Why was the bone shortened?
6. Identify the movements associated with the arm, forearm, wrist, and fingers.
7. Explain how the movements of the reattached arm might be altered after the reattachment.
8. Define collateral circulation and identify the regions of collateral circulation that would be found in the upper extremity.
9. Identify the specific vessels that provide the collateral circulation to the elbow.
10. Identify specific types of activities that might cause Jim problems after recovery.
11. Why would full use of his arm be unlikely?
12. Assume the role of the surgeons as they explain the procedure to Jim's parents. Write a one- to two-page explanation about the surgery, paying particular attention to what you would say about regaining use of his arm, forearm, and hand.
13. Assume the surgery to reconnect blood vessels was successful and blood flow was re-established immediately throughout the arm. Would the nerves of the arm recover as quickly and completely as the muscles? Explain why or why not.
14. How might this situation have been different if Jim had been 80 instead of 8 years old?

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