VITAL SIGNS

BY W. ROY SMYTHE

A body scan reveals a lemon-size mass in the chest of a 16-month-old boy. Fearing cancer, surgeons perform a risky operation to save his life.

I WAS REVIEWING MY EMAILS LATE IN THE DAY when I found a message flagged "Important" in the subject line. It was from Kelsey, one of our hospital's new pediatric surgeons. "Consulted regarding a 16-month-old with a middle mediastinal mass," her message read. "Compression of trachea. Would love your thoughts."

The mass Kelsey referred to in her email was in an area where a lot of things can go wrong, what we call the *mediastinum*—the middle of the chest between the lungs, where several important organs, such as the heart, trachea, and esophagus, reside.

As a thoracic surgeon, I specialize in operating on organs in this area and often review cases with colleagues.

I responded that I'd be happy to speak with her, and in less than 15 minutes she was tapping on my door. Kelsey was obviously very concerned about this one, so I quickly pulled the CT scan of the mass up on the computer as she relayed the details of the case. The patient was a 16-month-old boy who was developing normally but had recently been diagnosed with asthma.

He had been admitted to the hospital because of increasing stridor, a high-pitched sound made during inhalation. Stridor indicates a narrowing somewhere in the main, or proximal, airways—the area of the respiratory tract between the vocal cords high in the neck and where the trachea, or windpipe, branches to meet the two lungs. Stridor is often thought to indicate asthma, but it usually doesn't. Asthmatics make a different sound: a wheeze. Wheezes occur during exhalation and imply obstruction of the smaller airways that are in the lungs themselves.

The boy's name was Ian, and it was clear that his breathing problems were not caused by asthma. The CT images showed a five-centimeter mass—about the size of a lemon—narrowing his trachea by more than half and encasing the adjacent esophagus, which carries food from the mouth to the stomach. It looked as if malevolent bees had built a rounded, ill-formed hive in Ian's chest.

I took in a deep breath: "That looks bad, Kelsey."

"Yeah," she replied. "It may be malignant. I'm worried about a sarcoma."

We knew that about half of mediastinal tumors in children are malignant—aggressive cancers that grow into surrounding organs. Such tumors can take various forms. Sarcomas are malignant tumors of connective tissues such as muscle and bone. Tumors can also form in the lymph glands, the small organs of the immune system that filter bacteria from the bloodstream. Mediastinal tumors are rare, however. A total of 10,000 children are diagnosed with cancer every year in the United States, and mediastinal tumors account for about 100 of those cases.

"If not a tumor, I guess this could be a fistula," Kelsey said, "with a chicken bone or something lodged there and causing an infection."

A fistula is an abnormal connection of tissue between two organs. There are a group of congenital fistulas that can connect the trachea and esophagus, which grow from the same embryonic tissue. If a child swallows an object that lodges in the fistula, it can trigger an infection that may result in an inflamed mass. But Kelsey said that Ian's white blood cell count and other tests that would indicate an infection were normal.

I considered whether we should get other tests, such as a biopsy or an MRI. "We could," Kelsey replied. "But if the mass enlarges, it will block the trachea completely. I think we just have to go for it."

We discussed the challenges of removing Ian's mass surgically. If it was attached to the esophagus extensively, we would have to remove much of the organ and replace it with a section of the stomach. The tracheal part of the procedure could get even more complex. The trachea does not heal as reliably as the esophagus, and only a small amount of tissue can be removed from it for reconstruction, giving us a narrower margin of error in the event of damage and subsequent repair. The complexities and risks were so great that Kelsey and I sought the input of other doctors as well. Kelsey called her mentor at the pediatric surgical program where she had trained, and I called a pediatric surgeon who had trained with me years earlier. These colleagues felt surgery was unavoidable.

We scheduled Ian's operation and went to see him and his family in the pediatric ward. While we talked, Ian stood in his crib, sucking his pacifier.

We did our best to assuage the parents' fears, but this was a lot of surgery for a little person, and it

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involved a great deal of risk. Whether or not we found a malignancy, the outcome might be bad.

AFTER A NIGHT OF LITTLE SLEEP for me, and most likely less for Ian's parents, the morning of the surgery arrived. In the operating room, nurses carefully inserted a breathing tube into Ian's narrowed airway. He was then anesthetized, positioned with his right side up, and cleaned with an antiseptic solution. Drapes covered his tiny body, exposing only the operative field.

We made an incision in his chest and placed retractors to make room between his ribs. The mass was immediately evident. It was oval-shaped, with an irregular contour, like the surface of a reddish-tan rock. We both felt it. "It's fixed and firm," said Kelsey, not needing to mention that this was consistent with a cancerous tumor. We began by working our way around the mass with surgical scissors to the back wall of the esophagus. It was a struggle.

"It's definitely involving the esophagus," I said. "Let's try the trachea." Kelsey was a skilled young surgeon, but using a variety of tools, including an electric scalpel, we could not free the mass from either structure. It was too firmly attached. While working around the mass, we spotted an enlarged lymph node nearby. "That's not a good sign," I murmured. "Might have spread there."

We worked without speaking—four adult hands in a small space. A sense of foreboding was accumulating in the room around us like fog.

Finally, I made a desperate suggestion. "Let's divide the mass," I said. "Maybe we can see from another perspective how it's attached to the trachea and esophagus separately—we aren't making progress."

This was something we preferred not to do. When removing a tumor, an "en masse" approach is best, meaning the entire tumor is extracted intact with any surrounding tissues attached, which gives surgeons the best chance to leave no cancerous tissue behind.

"Agreed," Kelsey replied. "Maybe we can save some of the trachea that way, make the repair easier."

I took a scalpel and carefully incised the mass. After a couple of passes, it cracked open. Ian's heartbeat, a beep on the anesthesia monitor, registered five times before either of us spoke.

There was something dark and linear at the center. It looked horrifyingly like a slug. "What is that?" Kelsey asked.

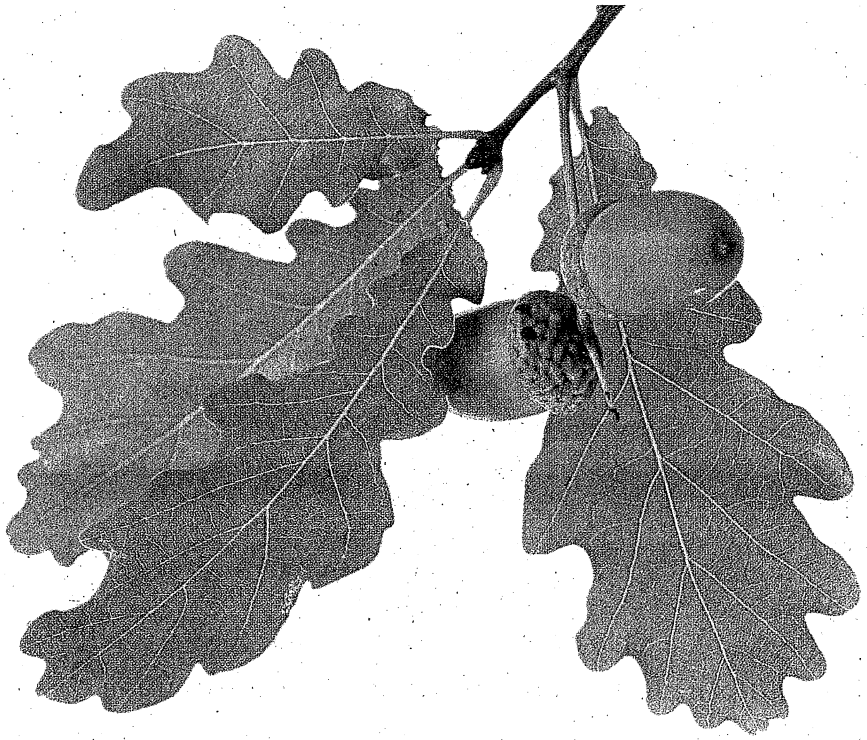
I reached down and grasped it with a pair of forceps. "It's firm," I said. Kelsey adjusted the light overhead—there was a glint of reflection. "Metal?" I asked. I carefully pulled the object free. It was dark gray, oval, and covered in a layer of mucus.

I held it up in the light between us.

It was a leaf.

"A leaf?" Kelsey asked. "A leaf?" Her eyes were squinting above her mask, and her forehead wrinkled in disbelief. Suddenly it was clear. The mass formed to protect Ian's body from the leaf and had taken on a life of its own. We both started laughing. The nurses clapped. There was no cancer; Ian was going to survive.

During the rest of the operation, we found that the leaf was nestled in a place where the normally cylindrical esophageal wall bulged out—a *diverticulum* in medical jargon. It all added up. Ian had swallowed an oak leaf months before, and it had lodged in the diverticulum, unable to pass. The leaf's tip had eroded into the trachea and eventually, after white blood cells homed in on the region to heal the lesion, a scar formed around both the inflamed tissue and the leaf.



An oak leaf can be a deadly object if it ends up in the wrong part of the body.

The young mother and father were incredibly relieved at the news, which Kelsey and I delivered immediately following the operation. They hugged each other, and after several moments, Kelsey and I left the room quietly, the two of them still embracing. Ian left the hospital after a few days. He was going to be fine.

The fact that the mass was not a malignant tumor didn't change the urgency behind the operation. If Ian's diagnosis of stridor and the surgery had been delayed, the mass could have led to the complete obstruction of the airway and sudden suffocation, or a leakage of esophageal contents, laden with bacteria from the mouth. If leaked into the trachea, these contents could have led to pneumonia, or if into the mediastinum, to sepsis and vascular collapse. We were relieved to find that the mass was not cancer, but left untreated, a simple leaf could very well have ended Ian's life.

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