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TECHNOLOGY

Finding Gold in GE's Garbage

After Jack Welch's company discarded a cancer-fighting technology, a startup turned it into a $40-million-a-year business.
By Justin Martin


Mackie and Reckwerdt with Hi-Art radiation machine
(Photo: James Schnepf)

In a lab tucked away on the lakeside campus of the University of Wisconsin, two scientists were working on a way to revolutionize the treatment of cancer. It was 1997, and Thomas "Rock" Mackie and Paul Reckwerdt, known around Madison simply as "Rock and Paul" (said in a clipped cadence, like "rock & roll"), were building a machine that would make a radiation beam lock onto a tumor like a heat-seeking missile going after an enemy jet. The research project was largely bankrolled by General Electric, which had been providing about $700,000 a year. But GE Medical, deciding the project would never amount to a major business, suddenly abandoned the technology. For Mackie and Reckwerdt, losing their major backer triggered a crisis.

Most people would have given up, but for these two the project was personal. Mackie's mother had died of cancer after what he describes as "substandard" radiation treatment, and his brother had also succumbed to the disease. Reckwerdt had lost both his uncle and his father-in-law to cancer. Rock and Paul even kept a hope chest in the office in which they placed mementos of their lost loved ones. So with $1.5 million the two had netted from a medical software program they had just sold, they took the technology GE had dumped and started a new company called TomoTherapy. Says Mackie: "It was Jack Welch's loss and our gain."

After 15 years of development, TomoTherapy has just begun selling a breakthrough cancer-fighting machine called the Hi-Art. A combination CT scan and radiation gun, the Hi-Art lets a doctor clearly see a tumor and then simultaneously zap it with radiation with pinpoint accuracy—a medical first.

Dr. Eric Rost, director of the Southeast Regional Cancer Center in Tallahassee, has been using the Hi-Art for about six months. So far he has treated only a handful of patients, but he says he's getting remarkable results, including dramatic tumor shrinkage and diminished side effects, even in people with rare or rapidly metastasizing cancers. "This is probably the biggest innovation we've had in radiation treatment since 1950," says Rost.

He's not alone in his enthusiasm. The Hi-Art received FDA clearance in 2002, and so far cancer-treatment centers have installed eight of the $3.2 million machines. Another 26 have been ordered. Buyers include the Methodist

Hospital in Houston, the University of Virginia Medical Center, and the University of California at Davis in Sacramento. TomoTherapy expects to generate $40 million in revenues in 2004 and turn its first-ever profit.

That could be just the beginning, because the potential for the technology is huge. According to TomoTherapy's market research, 7,500 traditional radiation machines (called linear accelerators, or "linacs" in doctorspeak) are in operation worldwide. This year 400 will be replaced, and 300 additional units will be purchased at about $2.3 million each. That adds up to an annual linac market of roughly $1.6 billion worldwide. (Larger treatment centers often have ten or more linacs from multiple manufacturers.) Throw in an x factor: Over the past quarter-century, cancer has grown as a cause of mortality. It accounted for 19% of deaths in 1975; that number has grown to 25% today. The simple explanation: As other diseases, such as smallpox, are eradicated, something still has to ultimately end a person's life, and cancer is increasingly the culprit. It is the No. 2 killer behind heart disease. So the need for linacs will only increase.

At the same time, TomoTherapy remains a small, financially vulnerable company peddling an extremely promising but unproven therapy. As recently as last year the company, which had raised $21 million from eight VCs and a dozen angel investors, was burning through $1 million a month, and for a good part of that year it was limping along with less than $1 million in the bank. But the company is relatively flush at present, with more than $10 million in cash on hand.

Meanwhile, TomoTherapy's field, already competitive, is about to get more crowded. Goliaths of the radiation oncology industry, such as Siemens Medical Solutions and Varian Medical Systems, are racing to bring out products that will go head-to-head with TomoTherapy's Hi-Art. For a small company born in a university lab and lacking the resources and marketing polish of its rivals, it will truly be a clash of brains vs. brawn.

If the folks at TomoTherapy do have anything going for them, it's brains. Mackie, 49, the company's chairman, still teaches at the University of Wisconsin at Madison in the medical physics and human oncology departments. Among academics, the native of Saskatoon, Saskatchewan, has an international reputation. Reckwerdt, 52, Tomo's president, is a self-taught techno-whiz who grew up in the Illinois countryside and later landed a post as a research scientist at Wisconsin. That's where the pair met. "We have this camaraderie based on this combination of complementary weird-assed skills," says Reckwerdt, who did the brain-sizzlingly complex computer programming on Hi-Art.

Mackie and Reckwerdt first began thinking about how to better battle cancer in 1988. There are three main methods for treating tumors: radiation, chemotherapy, and surgery. But because of its effectiveness and versatility, radiation remains the primary tool, used in roughly 50% of cases. It can fight the disease in many of its forms, including those affecting the brain, breasts, lungs, and prostate.

The founders noted a troubling deficiency in the traditional way radiation is used to treat cancer. Typically the disease is first detected using a CT scanner, which generates a high-resolution image of the cancer. Oncologists rely on those scans to draw up elaborate treatment plans. By the time a patient actually receives radiation treatment on a linac, however, weeks or even months may have elapsed. The cancer may have grown or changed shape, or perhaps the patient has lost weight, causing the tumor to shift position. That initial CT scan is now way out of date. Because time is needed to interpret such scans, it's not possible to take a fresh one at the time of treatment.

Of course, doctors have various techniques—none ideal—for dealing with this conundrum. A common practice is to take an X-ray. Many conventional linacs have the ability to produce X-rays, rough images generated by the same radiation beams used to attack the cancer. But relying on imprecise images carries grave dangers. Say a tumor the size and shape of a marble appears to be slightly larger than it actually is. That can prompt a doctor to deliver radiation outside the contours of the tumor, in the process damaging healthy tissue. If rockets depended on such poor guidance, they'd miss the moon.

Sometimes small cancer clinics rely on shockingly crude approaches. TomoTherapy's founders even came across doctors whose standard practice was to take a conventional X-ray right before treatment, then use a felt-tip marker to draw targets on the patient's body, and aim the radiation at the bull's eye. "You think medicine is at the leading edge of technology," says Reckwerdt. "But I'd go to clinics and see what doctors were actually doing. I'd think, 'My God, this is archaic!' "