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Pressure tactics

Once a symbol of quackery, the hyperbaric chamber is now healing wounds in a flood of pressurized oxygen. But its champions still battle for respect.

By Shari Rudavsky, *Globe* Correspondent, 1/8/2002

More than 70 years ago, Orval Cunningham thought he had found an answer to many of life's ills, from cancer to baldness: Expose patients to oxygen at high pressure. So, Cunningham erected a five-story ball of a hospital - a completely pressurized sphere - to promulgate this treatment, called hyperbaric medicine.

Cunningham's overexuberant vision earned him little more than a spot in the annals of medical quackery. Within a decade, the Cleveland hospital closed, its impressive shell transformed into scrap metal for war efforts.

Today, Cunningham would be delighted to see how far the idea has been absorbed into the medical mainstream. Hyperbaric treatment is used in more than 500 hospitals, including the Massachusetts Eye and Ear Infirmary, to treat patients with smoke inhalation, decompression sickness, and persistent wounds. The American College of Hyperbaric Medicine, a professional group, has grown from 80 members to 300 in the past five years.

But the spectacle of "Cunningham's folly," as his spherical hospital became known, continues to haunt the field. Some free-standing clinics still stretch the scientific evidence with claims that hyperbarics can stall aging or increase pep. And, as the field struggles to gain widespread acceptance, advocates say insurance coverage is lagging behind what hyperbaric medicine can really do.

"We want to see indications for hyperbarics increase, but we don't want to see hyperbarics get the bad reputation again that it had in the '50s or '60s where people would just willy-nilly recommend these treatments," said Thomas M. Bozzuto, president of the American College of Hyperbaric Medicine, an organization for physicians in the field. "We're still trying to overcome some of that in a lot of the medical profession."

Although it sounds like a modern idea, high-pressure medicine's origins date

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back centuries. As early as the 17th century, doctors experimented with varying pressures to treat diseases; high pressure, it was thought, would help cure acute conditions, and low pressure could help with chronic diseases. In the 1870s, French surgeons performed operations in hyperbaric chambers, claiming that the increased pressure alleviated side effects of anesthesia.

In the United States, Cunningham wholeheartedly embraced the technology, arguing that oxygen-phobic bacteria lay behind many diseases such as cancer and diabetes, and thus a high-pressure oxygen chamber would cure those diseases. But Cunningham offered no proof and was roundly scorned by the medical establishment.

Around the time Cunningham's sphere was dismantled, though, naval and medical researchers began exploring a use of hyperbarics that clearly did work - helping deep-sea divers recover from the bends. The painful nitrogen bubbles that had built up in their tissues would dissipate as they sat in an oxygen-rich pressure chamber.

In the mid-1960s, a British submarine company produced the first chamber not constructed of steel. The new, less expensive design opened the door for widespread use and doctors began exploring hyperbaric medicines for other conditions.

The modern hyperbaric chamber is a far cry from Cunningham's sphere. Since it opened in 1995, the Norman Knight Center for Hyperbaric Medicine at the Massachusetts Eye and Ear Infirmary has been used more than 10,000 times. Its three chambers - each a one-person tube with a glass roof - treat patients for everything from gas gangrene to recalcitrant wounds that resist healing under normal conditions.

About one-third of the center's patients come for emergency visits. Some are divers with the bends; some are smoke-inhalation victims, for whom the extra oxygen rapidly reverses the toxic effects of poisonous carbon monoxide.

The other two-thirds of patients are there to help wounds heal. Robert A. Knocco is one of those. On a recent afternoon, he lay patiently in the torpedo of a chamber, watching television and hoping that the pure air and high pressure would reinfuse life into his black, numb toes. It was treatment number 24 for Knocco, whose problems started with a leg aneurysm about six weeks before. After an operation on his leg, the tissue in his toes began to die. If it did not recover, doctors warned him, amputation would be likely.

Knocco and his girlfriend did some research, discovered hyperbarics and paid the Knight Center a visit. He figured that anything was better than losing his toes.

"I didn't want to lose anything," said the 53-year-old construction worker. "If you could have told me you'd put me in there, I'd have said, 'I'll do anything.'"

During treatment, Knocco went to the chamber five days a week. In a nod to the chamber's origin as a treatment for divers, nurses have decorated the room with photographs of corals. Tropical fish swim across their scrubs, maintaining the underwater theme.

Most treatments last between 90 and 120 minutes. In the chamber, patients can watch TV or just lie quietly. On at least one occasion, Knocco even fell asleep.

Lying in the chamber, Knocco wears street clothes under a hospital gown as he is immersed in 100 percent oxygen that can reach three times normal atmospheric pressure. The oxygen in the chamber fills Knocco's lungs, saturating the hemoglobin in his blood with as much oxygen as it can carry. The high pressure forces yet more oxygen into the blood's plasma, which increases oxygen in the blood up to six times its normal level.

In Knocco's case, the hope is that this extra oxygen will help revitalize his toes, which have not been receiving sufficient quantities of the life-sustaining gas. An oxygen-rich environment will help white blood cells, key players in wound healing, work faster and more efficiently.

After a dozen or so treatments, Knocco said he started noticing a little pink returning to his toes, along with a little sensation. Now half of the digits on his right foot "almost look like real toes," he said.

Scientifically the evidence is strong enough that few dispute the efficacy of hyperbaric medicine for problem wounds such as those of Knocco.

But other types of wounds spark controversy. A lack of randomized clinical trials of hyperbarics' effects has led Medicare and Medicaid - and by extension many private insurers - to declare they will pay for hyperbaric wound treatment - but only for some wounds.

The issue is important to doctors in the field, partly because of the high cost of treatment - on average \$600 to \$900 per session. Since wounds require multiple visits, a full course can run \$20,000.

Right now, tissue injuries sustained after radiation or bone infection are covered by insurance. But others are not, such as diabetic ulcers. That discrepancy rankles hyperbaric specialists, who say many diabetics with ulcers would be helped by hyperbarics - but without insurance coverage, they don't have access to the treatment.

So, in recent years, the Undersea and Hyperbaric Medical Society, an international group of professionals in the field, have asked the government to change the way it classifies wounds. They argue that hyperbaric treatment should be funded not by the type of wound the patient has, but by how much oxygen reaches it. Wounds with little oxygen, they say, would be helped enough to be worth the cost of treatment.

"We have gotten more precise at determining what kinds of wounds really need hyperbarics," said Caroline Fife, past president of the society and director of the Hermann Hospital Center for Hyperbaric Medicine in Houston. "You could be diabetic and have a sore on your foot but your circulation is very good. By the same token, you could be a diabetic and have a sore on your foot due to poor circulation that's not going to heal."

While many hyperbaric practitioners endorse the idea, not all experts have embraced it. A 49-page report commissioned by the Centers for Medicare and Medicaid Services at the end of November found "insufficient evidence" that measuring oxygen levels was an effective way to determine whether hyperbaric treatment would help.

The continued uncertainty leaves doctors frustrated. Each week, Neil Hampson - a hyperbaric doctor in Seattle and president-elect of the society - said he turns away prospective patients with diabetic ulcers because insurance won't cover their treatment.

At the Boston hyperbaric center, Richard Fabian, director of the unit and a head and neck surgeon, sees to it that any patient who could benefit from the facility receives the treatment. He and his staff work in concert with third-party payers. "There is no patient who needs to have it who will be denied treatment," Fabian said. "On the other hand, we treat a lot of patients we don't get paid for."

Nonetheless, Fabian added that the tide appears to be turning. Years ago he became a convert to hyperbarics after witnessing how treatment helped a patient of his who had a radiation bone injury. When the freestanding unit to which he referred patients closed, he lobbied for a unit at his own hospital.

"It's like with everything in medicine. As the field is developing, there's a certain amount of skepticism," he said. "As more and more referring physicians begin to see the effectiveness, that feedback will get back to third-party payers."

And, thanks to Cunningham's legacy, hyperbarics will continue to receive close attention, the Society's Hampson said. "The things we do treat are supported by a huge amount of clinical evidence," he said. "Because of what we came out of decades ago, there's probably more scrutiny on what we do than on a lot of other areas of medicine."

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