

By Mary Ann Yantis, PhD, RN, Kandace Newsom O'Toole, BSN, RN, and Patricia Ring, BSN

Leech Therapy

Hirudo medicinalis has made a comeback.

Overview: Leech therapy is experiencing a resurgence in health care today, primarily in plastic and reconstructive surgery as a treatment for venous congestion, which can threaten surgical outcomes. Most nurses have had no formal training in administering the therapy or in maintaining *Hirudo medicinalis*, the species of freshwater worm used therapeutically. Yet nurses may be expected to participate in this therapy in a variety of clinical settings and can use these guidelines for the safe and effective use of the leech in treatment.

If it hadn't been for leech therapy, I would have lost part of my finger," said Lynn Shank, 67, recently by phone. His voice retained a sense of amazement three years after surgery. His wife Jackie chimed in on an extension: "We love natural therapies, and you can't get more natural than that."

Although the Shanks, who live in Salida, Colorado, admitted to having been "a little squeamish" at first, the end result—Mr. Shank retains the use of an index finger that would otherwise have been amputated—has made them advocates of this reemerging therapy. (For more of the Shanks' story, see *Bleed 'Em and Weep*.) Of course, leeches were used for bloodletting in ancient times, beginning in Egypt, and leech therapy reached its zenith in the early 19th century.¹ But after that, leech therapy waned and nearly disappeared; it wasn't until the second half of the 20th century that medical journals began reporting the use of the leech to aid in the postsurgery survival of tissue flap transplants.² Since then, a renaissance has occurred: in a 2003 telephone survey of 62 plastic surgery units in the

United Kingdom, 80% had used leech therapy in the previous five years for postoperative "salvage of compromised free flaps or digital transplants."³ During microvascular surgery, anastomosis of arteries is performed more easily than that of veins, because arterial walls are thicker than venous walls. With adequate arterial flow but restricted venous flow, congestion may occur in reattached digits or skin flaps, leading to increased pressure, which can restrict arterial flow and lead to tissue necrosis. Leeches are used to reduce that congestion by removing blood that can't exit via the venous system.

Recent research also supports leech use in relieving pain in patients with osteoarthritis of the knee, as well as in treating purpura fulminans, periorbital hematoma, sublingual hematoma, systemic lupus erythematosus, and ear infection.^{2,6}

LEECH THERAPY: AN OVERVIEW

The leech is a freshwater amphibious worm, usually black or brown and about 10 cm in length. Of the more than 650 known species in the *Hirudo* genus, *Hirudo medicinalis* is used most often in medical therapy. The mouth of the leech has three jaws, each of which has about 100 tiny teeth. It also has a posterior suction device that it uses for stability.

Leech therapy involves an initial bite, which is usually painless (it's thought that leech saliva contains a mild anesthetic); an attachment period lasting 20 to 45 minutes, during which the leech sucks between 5 and 15 mL of blood; and a postattachment period, during which the site continues to bleed.^{4,7} The final stage provides the primary therapeutic benefit; it's caused by components in the leech's saliva, including hirudin, a protein anticoagulant that inhibits thrombin in the clotting process, as well as histamine-like substances that induce vasodilation.

The first medicinal leeches were obtained from streams and rivers, but today they're purchased from companies that function as leech farms. Facilities that don't have established protocols can

follow the recommendations of these leech farms. It's advised that leeches be stored at a cool temperature (42° to 45°F [5° to 7°C] and no higher than 68°F [20°C]) in "leech mobile homes" containing distilled water treated with a special salt; some recommend changing the solution every other day.⁸

PATIENT ASSESSMENT

Before leech therapy begins, a thorough assessment should be performed. Also, the nurse should be able to differentiate between arterial insufficiency and venous congestion. In arterial insufficiency, the tissue is pale, turgid, and cool to the touch; capillary refill is either slow (longer than two seconds) or absent. The tissue in venous congestion will have a purple appearance and be engorged, taut, and warm to the touch. Capillary refill will be brisk and instantaneous (less than one second). Although leech therapy may alleviate venous congestion, it's contraindicated in the presence of arterial insufficiency.⁹

The nurse should also ask the patient whether she or he is taking vitamins, herbal supplements, or drugs; some may increase the risk of excessive bleeding or reduced immune response. For example, large doses of vitamin E can prolong prothrombin time, cause coagulopathy, and suppress immunity. Herbal supplements such as dong quai, garlic, ginger, ginkgo biloba, and ginseng and medications such as aspirin, heparin, warfarin, and nonsteroidal antiinflammatory drugs may increase the risk of hemorrhage.^{10,11}

Caffeine (found in coffee, tea, some sodas, and chocolate) must be eliminated in order to decrease the risk of vasoconstriction. Smoking (and even exposure to secondhand smoke) is absolutely contraindicated because the carbon monoxide and nicotine in tobacco are potent vasoconstrictors.

Contraindications. Leech therapy should not be used in patients who are immunocompromised, those with bleeding disorders such as hemophilia, and those with preexisting arterial insufficiency; all of these conditions pose an extreme risk of infection or excessive blood loss. A patient's refusal to accept blood transfusions is another contraindication, as is unstable medical status. And of course, patients who refuse leech therapy should not receive it.⁹

Patient education. Few patients are willing to have contact with leeches without understanding the benefits of treatment. This obstacle is usually overcome with education.

INITIATING THERAPY

An order for leech therapy should contain the following information:

Figure 1. One Day After Surgery



The right ear of a 45-year-old white man was reattached through microvascular surgery. Venous congestion resulted from a lack of veins available for anastomosis (one small artery was anastomosed). All photographs courtesy of Kulwant S. Bhangoo, MD.

Figure 2. Two Days After Surgery



The improvement seen is the result of leech therapy, which consisted of three leeches being applied every eight hours.

Figure 3. Three Days After Surgery



After continuation of the same leech regimen, the ear shows less swelling and discoloration, signs that venous congestion is decreasing.

Figure 4. Six Days After Surgery



The reattached segment is healing well, and color is returning to a normal hue.

- the number of leeches to be applied
- the specific placement of the leech or leeches
- the frequency of the therapy

In addition, orders often include antithrombotics such as aspirin, heparin, or low-molecular-weight dextran (dextran 40; Rheomacrodex and others) to decrease the risk of venous thrombosis. The physician may

also prescribe chlorpromazine (Thorazine) for its specific vasodilating effect on small blood vessels.^{9,12}

Attaching the leech. Before attaching the leech, wash the area with soap and water and rinse it with distilled, nonchlorinated water; Whitaker and colleagues recommend using warmed heparinized saline.³ Wearing gloves, gently grasp one leech. (Some clinicians use smooth forceps, although we've found that this can injure the leech.) It's helpful to have a small, dry gauze pad in the nondominant hand because the leech may attach itself to a wet glove and can be difficult to remove because it is wet; dry gauze allows you to gently grip the leech and pull it off the glove and direct the head toward the therapy site.

There are several ways to encourage attachment. One is to use a syringe to direct the leech to the site. Remove the plunger from a 5- or 10-mL syringe, place the leech

in the barrel, and invert the barrel, holding the open end in place until the leech attaches. The head, the smallest part of the leech, should attach first. Gently withdraw the syringe, allowing the other end of the leech to come free and attach.¹³ Leeches usually attach with both ends placed closely together in a U shape. If the leech resists attaching, encourage it by placing a drop of glucose or sucrose at the desired site. Leeches are attracted to the sweet taste. Alternatively, gently prick the patient's skin with a sterile needle at the desired site so that a drop of fresh blood appears.

Additionally, leeches can move from the desired treatment site to another, an action often called "leech migration" in the literature. One of the simplest ways to prevent migration is to wrap the treatment area with gauze and leave only the desired attachment site exposed—creating a sort of "leech corral." A clear, occlusive dressing (such as those used to cover IV insertion sites) can also be used to cover the area, with a small hole cut in the center that is large enough to allow the leech to attach. A plastic cup is another solution.^{14,15} The cup can be used in two ways; in both a hole large enough for the leech to have access to the site of attachment is cut into the base of a clear plastic cup. For digits with venous congestion, a slit is cut up the side of the cup and it is placed around the gauze-wrapped digit. For flaps, the cup is placed over the desired site and covered with transparent stretch film secured with strips of tape. The leeches will attach to the flap through the hole.

MONITORING LEECH THERAPY

Monitor the site at least every 15 minutes to check for detachment and ensure that the leech hasn't migrated. If the latter does occur, don't forcibly

Thanks, Bob

A Q&A with Mary Ann Yantis about her experiences providing leech therapy.

What was your first experience with leech therapy? Did you feel prepared?

My first experience was as a clinical instructor about five years ago. In my practice I had not worked in an area in which leech therapy was used. I researched the topic on the Internet for current, evidence-based research that supported practice. I also spoke with nurses and physicians who performed and prescribed the therapy regularly.

How, exactly, do you tell patients about the viability of this therapy?

I explain the physiology of circulation and use a diagram showing how leeches help. Also, showing patients before-and-after pictures of similar wounds helps. I explain the principles before bringing in the leeches. For patients who are still reluctant (though few are when they understand that they might lose a finger or ear without it), I try to arrange for them to talk to another patient who has had similar injuries and leech therapy.

How have your patients reacted to leech therapy? Is it difficult for them to overcome their squeamishness?

Not really. They may not be overjoyed at the prospect of allowing a bloodsucking worm to be attached to their body, but when it's explained in easy-to-understand

terms and with diagrams, they agree. I use humor and remind them that the therapy is short and may be of tremendous benefit.

Some people don't want to look at the leeches at first, but curiosity gets the better of most of them eventually. We've found it's helpful to ask patients to keep an eye on the leeches and call the nurses when the leeches begin to detach because it is important to prevent leech migration (the leeches may go wandering down into the dressing, which is massive and rather bloody in most cases, and then we have to go digging into the dressing to find them). That's not a good thing; the surgeons don't want to disturb the operative site. Once, I heard a patient say, "Watch out for the leeches on the floor." I looked down and saw two leeches leisurely crawling across the room.

How would you respond to readers who might object to the killing of leeches in the course of therapy?

I understand this completely. We have just used an innocent creature for our benefit, and we reward it by killing it. I have been known to cope with this by naming the leeches and then, prior to killing them, delivering a eulogy of sorts: "Thank you, God, for the life of Bob the leech. He gave his all in promoting the health of Mr. Smith's hand." It's a little humorous and helps to lighten up the atmosphere.—*Lisa Santandrea*

remove the leech. Force could cause the teeth to be left in the patient, becoming a source of infection. Instead, put a small amount of alcohol, saline, or vinegar on a pad or a cotton swab and stroke the head of the leech. This will usually cause spontaneous detachment.^{3,4} Be careful to use only minimal amounts of these liquids, however, because they're noxious to the leech, and large amounts may cause it to regurgitate into the bite site, increasing the risk of infection.²

During leech therapy, it's common to measure and record skin temperatures every three hours, with the goal of keeping the temperature of the area at or above 86°F (30°C), or as indicated in a physician's orders (David Zehr, MD, written communication, January 27, 2009). A reduction in temperature below 86°F may indicate problems with either arterial or venous circulation and should be reported immediately to the physician. Keeping the room temperature slightly warm and the surrounding area wrapped lightly in gauze and a light blanket can

also help in maintaining the desired therapeutic temperature. These coverings should not be tight enough to restrict circulation and are usually removed only during assessment or while measuring temperatures or changing dressings.

The nurse should perform a detailed evaluation of the site at least every four hours, assessing the appearance of the patient's skin for signs or symptoms of infection and checking nearby pulses.^{7,9} Baseline labo-

Leeches in Action

For a free online video produced by the Discovery Channel's *Discover Magazine* on the therapeutic use of leeches, go to <http://videos.howstuffworks.com/discovery/28332-discover-magazine-leech-therapy-video.htm>.

Figure 5. Two Months After Surgery



The ear has healed completely, and reattached tissue is intact.

ratory values should also be checked, including a complete blood count, partial thromboplastin time, and prothrombin time. The physician should be notified of abnormal values such as a drop in the hemoglobin level or hematocrit, increased bleeding times, or changes consistent with infection or risk of infection.

When the leech detaches. Satiated leeches usually detach spontaneously. Feeding times vary; researchers have reported feeding times ranging from 20 to 120 minutes.^{9,13} Generally, a single leech will extract 5 to 15 mL of blood during each attachment. The greater benefit of leech therapy is the blood loss after the detachment, because of the slow oozing at the site of the bite.

After use, the leech should be destroyed by placing it in 70% alcohol solution.^{2,7} Many nurses use a small plastic cup with a screw-on lid, such as a urine specimen container, with 20 mL of alcohol. The leech dies within 10 minutes and is then treated as biohazardous waste, disposed of in an appropriate waste receptacle.⁷ Because of the risk of blood-borne infection, the leech should never be reused on another person.³ Nor is it useful to reuse a leech on the same patient: after feeding leeches usually don't want to feed again for several weeks.

Leech therapy is commonly required for three to seven days, or until angiogenesis (new blood vessel formation) occurs. Success will be evidenced by changes in the tissue—it will change from a purplish hue to a more normal skin color, from engorged to nonengorged, and from a very fast capillary refill (less than one second) to a more normal one (one to two

Patient Education

Possible responses to some frequently asked questions.

Why do I need leech therapy?

Leeches remove excessive blood or body fluids that collect and cause painful pressure or venous congestion in tissue. If the pressure is not relieved, the tissue could die. The leeches remove excess blood from the area, promoting circulation and increased oxygen to the tissues.

Will leech therapy hurt?

You might feel a slight prick as the leech attaches, but otherwise the procedure is relatively painless.

Can leech therapy have any adverse effects?

Leech therapy is very beneficial and relatively safe. But there is a slight chance of infection caused by a bac-

terium in the leech that allows it to digest the blood on which it feeds. You will be receiving antibiotics during and for some time after therapy to decrease the risk of infection. Other risks include excessive bleeding, allergic reactions, and scarring. While you're in the hospital, the nurses will be assessing you frequently for these adverse effects. When you're discharged, you should look for increased redness, swelling, or discharge from the leech therapy site or excessive bleeding from any part of your body. If you notice any of these symptoms, immediately notify your health care provider. If you have symptoms of a severe allergic reaction such as a raised rash, severe itching, or shortness of breath, immediately call your health care provider or dial 911.

Bleed 'Em and Weep

One man's success with leech therapy.

While helping to refurbish his son's home in 2006, avid craftsman Lynn Shank had an accident with a table saw. Three fingers on his left hand were involved: by far the worst was his index finger. "It was cut straight up the middle, like a fork," he recalls.

Mr. Shank went into surgery that evening at Baylor University Medical Center at Dallas. "I don't recall too much about what happened that first night," he says, but he remembers the next morning, despite the haze of postsurgery medication. He awoke as his surgeon, David Zehr, MD, was discussing the results with

his wife, Jackie. Zehr didn't like the color of the hand.

"It was very, very gray," Ms. Shank recalls. "It looked dead." There was a possibility that the surgeon would have to amputate the index finger below the first joint. One thing that might save the finger, they were told, was leech therapy.

"I was awake enough," says Mr. Shank. "I heard him say leech. But I wasn't in any position to argue."

'It was something like a caterpillar, without the legs.'

His spouse, however, wasn't so amenable. "'You mean some sort of mechanical thing, right?'" she recalls responding out of desperate hope.

But the prospect of saving the finger trumped their anxiety about a "prehistoric creature," and within the hour, a nurse was at his bedside, explaining and performing his first treatment. At first he avoided watching, but after the first couple of treatments, "it became rather interesting," he admits. Now, he describes the process—how the leech attached at both ends, the techniques his nurses used to encourage attachment, even a "pretty funny moment" when a leech fell into his bandages.

Although there was no pain, he says he "could feel it some; it was something like a caterpillar, without the legs." Within 48 hours the color of his finger had begun to improve. When Mr. Shank returned home with his index finger intact, he also took a small container of leeches. Ms. Shank was to continue providing leech therapy at home.

His appreciation for the leech has grown to awe. "I could have had just a stub of a finger," he says. He credits his success to both the extraordinary care provided at Baylor and "this small creature with a purpose."—*Lisa Santandrea*

seconds).¹² Once angiogenesis is established, the tissue will have sufficient venous drainage and no longer require therapy. As long as venous congestion persists between leech applications, therapy should continue.

During therapy, remember to document the estimated blood loss; the appearance of the site before and after leech application; the time, location, and duration of each leech application; any significant hematologic laboratory results; patient education and the patient's response to therapy; and the presence of signs or symptoms of infection.

COMPLICATIONS

Excessive bleeding can occur with leech therapy; it can be controlled by applying direct pressure or topical thrombin.¹⁶ Excessive blood loss may necessitate blood transfusion, so patients should be informed of the possibility.⁹ Allergic responses, including anaphylaxis, can also occur. Patients and their families should be alerted to watch for and report allergy symptoms. Scarring may also occur but is usually minimal.

Infection. The most serious complication of leech therapy is infection. The leech's digestive system contains *Aeromonas hydrophila*, a Gram-negative bacil-

lus that enables the breakdown of ingested blood. Although most infections involving leech therapy are caused by *A. hydrophila*, infections with *Serratia marcescens*, *A. sobria*, and *Vibrio fluvialis* have been reported.^{2,16,17} Infections can arise from two to 11 days after therapy begins and can result in abscesses and cellulitis, which can progress in some cases to sepsis.² In a five-year retrospective study, Sartor and colleagues found that infections arose in 4.1% of patients who received leech therapy.¹⁸ Prophylactic antibiotics are usually given: double coverage (two antibiotics) during therapy and single coverage (one antibiotic) for two weeks afterward.⁹ Established infection is treated with antibiotics such as third-generation cephalosporins, along with aminoglycosides, fluoroquinolones, tetracycline, or trimethoprim.^{2,17} Because infection is a serious adverse effect of leech therapy, the patient and family should also be instructed to observe for and report early signs and symptoms. ▼

Mary Ann Yantis is an associate professor at Baylor University in Dallas, and Kandace Newsom O'Toole is staff nurse in the cardiovascular ICU at Baylor Medical Center in Dallas. At the time of the writing of this article, Patricia Ring was a senior nursing student at Louise Herrington School of Nursing, Baylor University.

She passed away after completing the article and was awarded her degree posthumously. Contact author: Mary Ann Yantis, dr_may@verizon.net. The authors of this article have disclosed no significant ties, financial or otherwise, to any company that might have an interest in the publication of this educational activity.

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