

# Leech treatment for prolonged digital ischemia

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## INTRODUCTION

An ingrown toenail is a common problem that can be treated conservatively or surgically. Surgery is mostly performed under digital block anesthesia with the use of a digital tourniquet. Herein, we present an emergent case of a forgotten digital tourniquet that was used during the surgical treatment of an ingrown toenail and the subsequent treatment with hirudotherapy. Informed consent was obtained from the patient.

## CASE REPORT

A 19-year-old woman underwent surgery for an ingrown toenail on the right foot at another facility. The tourniquet was accidentally left in place after surgery by a nurse who applied the dressing over the tourniquet after the surgeon had left the operating suite to do another operation. The patient was discharged the same day, and antibiotics and painkillers were prescribed. Fifty-three hours after surgery, the patient came to the emergency department to have the dressing changed. During wound dressing, the tourniquet around her hallux was discovered. According to the patient, on the first postoperative day she did not feel anything because of the local anesthetic effect; however, later she had fierce aching that was slowly replaced by numbness of the hallux.

The tourniquet was removed, and a comprehensive physical examination was performed. The toe distal to the level of the tourniquet was cold, pale, swollen, and edematous. The dorsal skin of the hallux was purple-black in color, and the lateral border of the nail was sutured. The volar pulp also was ischemic, with no observable capillary refill. There was no touch feeling, and the patient was insensitive to sharp touch with a needle. The toe tip did not bleed upon pinprick test.

The patient was immediately hospitalized and survival treatment started. Tetanus prophylaxis was administered. Her foot was elevated, and a conservative plan of treatment was commenced. Intravenous cefazoline sodium (1 gr) was given three times per day. Pentoxifylline 300 mg and 500 cc Dextran were given at 20 cc per hour. Acetylsalicylic acid 325 mg was given and enoxaparin sodium 0.6 IU was given

twice a day subcutaneously. The foot was kept on a warm pad. After 6 h, the toe tip was bleeding upon pinprick and the hallux was hyperemic and swollen, and there was a bullous lesion on the dorsal aspect of the toe (Figure 1). Venous ischemia was noted, and leech therapy was started. After consultation with the infectious disease department, the antibiotics were changed to ciprofloxacin 500 mg twice daily. Leeches were supplied from a biopharmaceutical laboratory. Three leeches were applied along the tip of the toe, three times a day, being replaced every 8 h. Each leech was used only once. After they dropped off, the leeches were buried. Leech therapy was stopped on the third day.

On the first day of treatment, edema was reduced, and on the fourth day venous congestion had improved. There was progressive improvement of toe circulation by the seventh day. On day 8, the patient was discharged from the hospital.

In the follow-up period, there was a skin necrosis on the dorsolateral aspect of toe, and hypoesthesia was still present at 15 days. Wound care was performed every 2 days. Necrotic tissue was debrided during control examinations and secondary wound closure occurred. New nail regeneration commenced at 5 mo. At 8 mo, hypoesthesia was still present, but sensitivity was returning. The hallux was hyperemic but healed completely by 12 mo (Figure 2).

## DISCUSSION

We reported this patient to raise awareness about forgotten tourniquets and the circumstances that might allow this to happen. Because the solutions for this complication are very limited, prevention is of utmost importance. However, if any emergency department comes up against this complication, hirudotherapy may be a good alternative that should be kept in mind.

A digital tourniquet is a quick, cheap, effective, non-traumatic, simple, and reliable method to ensure a bloodless operative field distal to the metatarsophalangeal joint.<sup>1</sup> For a toe tourniquet, one popular method, which was used in this instance, is a single finger of a surgical glove rolled down to the base of the toe for exsanguination.<sup>2</sup> Although a digital tourniquet has become universally accepted as an essential instrument in hand and foot surgery, it is not completely benign.<sup>3</sup> The most common complications that occur include neurovascular injuries secondary to excessive tourniquet pressure, skin lesions and digital ischemia.<sup>4</sup> A forgotten tourniquet is a very rare but catastrophic complication that may lead to digital ischemia and amputation.<sup>1,3,5-8</sup> Because it is so rare, emergency room physicians can easily overlook such a condition, which may cause a further delay in treatment.

Prevention of a forgotten tourniquet is of extreme importance. Methods of avoiding this iatrogenic complication

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**FIGURE 1.** Ischemic toe with leeches in place.

include use of a colored glove, a rolled glove tourniquet with an arterial clamp, or a rolled glove tourniquet leaving the entire glove in place. In our patient a single finger of surgical glove was used as the tourniquet. Overlooking the tourniquet the nurse applied the dressing without removing it at the end of the operation after the surgeon had left the operating room. Digital tourniquet complications, especially those involving a forgotten tourniquet, mostly occur in busy work environments.<sup>3,4,8</sup> For this reason, surgeons must be careful and establish their own control protocols.

Different results after forgotten tourniquets have been

reported in the literature (Table 1). The most commonly accepted limit for warm ischemia time is between 6 and 12 h.<sup>3</sup> However, there have been cases in which digital replantation was performed within 84 to 94 h.<sup>9</sup> Microsurgery for exploration of neurovascular structures or fasciotomy may be performed if the time delay after damage is under 8 or 10 h. In our patient, the hallux was viable 53 h after tourniquet application.

Because of the prolonged ischemia time, surgical treatment was not considered. Conservative treatment was carried out because the patient was young, a nonsmoker,



**FIGURE 2.** Wound healing at 1-year after iatrogenic complication.

**TABLE 1.** Similar forgotten digital tourniquet cases in the literature

	Age	Sex	Reason for Operation	Lapse time	Digit	Result
Hou SM <i>et al.</i> <sup>5</sup>	–	–	–	168 h	Thumb	Amputation + skin graft
Haas F <i>et al.</i> <sup>6</sup>	20	Female	Ingrown toe nail	48 h	Big toe	Microsurgical reconstruction
Avci G <i>et al.</i> <sup>3</sup>	18	Male	Foreign body excision	36 h	Index finger	Healed
Karabagli Y <i>et al.</i> <sup>7</sup>	17	Female	Ingrown toe nail	48 h	Big toe	Amputation
Durrant C <i>et al.</i> <sup>8</sup>	16	Male	Crush injury	96 h	Little finger	Healed

had no chronic disease, and the affected digit contained little perishable tissue like muscle, which is a most susceptible tissue for ischemia. Digits begin to undergo irreversible changes after 6 h at room temperature, and have a much longer ischemic tolerance.

The antithrombotic property of a leech's saliva was first noted in the 1880s. Jacoby discovered the anticoagulant factor in the saliva of leeches and named it hirudin in 1904.<sup>10</sup> Hirudotherapy was again popularized as an adjunct to plastic, reconstructive, and trauma surgery in the 20th century.<sup>8,11</sup> Today, the medicinal leech often is used to treat venous congestion in the settings of microvascular replantation, reconstructive surgery, and traumatology.<sup>12,13</sup> The disadvantage of hirudotherapy is the presence of several pathogens in the saliva of leeches, the most common infectious agent encountered being the gram negative rod, *Aeromonas* spp.<sup>14</sup> Our patient was prescribed ciprofloxacin prophylaxis for *Aeromonas* spp, and the leeches were supplied from biopharmaceutical laboratory. Leeches may represent a potential vector of blood-borne diseases, including the human immunodeficiency virus [HIV] and hepatitis viruses;<sup>12,13</sup> therefore they were buried after dropping off to prevent blood-borne disease spread.

Surgeons must be cautious when using digital tourniquets. Although a digital tourniquet is a simple, cheap, effective, and reliable method to ensure a bloodless operative field distal to the metatarsophalangeal joint, complications can be very serious. Forgotten tourniquets can cause catastrophic complications for both a patient and a surgeon. When any emergency department comes up against the complication of a forgotten tourniquet, medicinal leeches may be a useful adjunct for treatment.

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