Masseter spasm has been implicated as an early indicator of susceptibility to malignant hyperthermia. Other markers for malignant hyperthermia include hyperpyrexia, increased end tidal CO_2, generalised rigidity, autonomic instability, and rhabdomyolysis. The exact incidence of patients who develop masseter spasm and actually go on to develop malignant hyperthermia is unknown. An incidence as high as 50% has been reported in children, but some authors believe that this may be due to overreporting.[3 11] The incidence of malignant hyperthermia is unknown in adults with masseter spasm, although isolated masseter spasm is not pathognomonic for malignant hyperthermia.[12] Although not given to our patient, the treatment for malignant hyperthermia is dantrolene 1 mg/kg administered intravenously. This may be repeated until symptoms resolve or a maximum dose of 10 mg/kg is reached.

Did malignant hyperthermia cause our patient's masseter spasm? We do not think so. The patient did not develop generalised rigidity, nor did he develop increased end tidal CO_2 based on repeat blood gases. His creatinine phosphokinase never rose above 100 IU/l and he did not develop myoglobinuria. A repeat rectal temperature approximately 30 minutes after masseter spasm was 38 ℃ (100.4 ℉). It has been recommended that patients who develop masseter spasm undergo muscle biopsy for evaluation of potential susceptibility to malignant hyperthermia. We did not take a muscle biopsy from our patient, however, his family was extensively questioned and there was no family history of anaesthetic reactions. His grown children were advised to have biopsies done to determine if they were susceptible to malignant hyperthermia.

Many lessons can be learned from this case report. First and foremost, succinylcholine has many adverse effects that must be anticipated. Secondly, a patient's external anatomy should not be entirely relied upon as an indicator of the ease of intubation as many other factors such as medication side effects can contribute to a failed airway. Finally, dantrolene administration should be considered if masseter spasm is encountered after succinylcholine as this may signal the development of malignant hyperthermia.

SUMMARY

Succinylcholine is the neuromuscular blocking agent of choice in rapid sequence intubation due to its rapid onset of action and relatively rapid return of muscle tone.[13] Emergency physicians need to be aware of the significant adverse side effects of succinylcholine and must be prepared to deal with them, including the potential for masseter spasm and malignant hyperthermia.

Authors' affiliations
S J Bauer, 4th Infantry Division, 2nd Brigade, Surgeon Section, Fort Hood, TX 76544, USA
B D Adams, Brooke Army Medical Center, Fort Sam Houston, TX 78234, USA
K Orio, Wilford Hall Medical Center, Department of Emergency Medicine, Lackland Air Force Base, TX 78236, USA

Competing interests: none declared

Consent was obtained from the patient's wife.

Correspondence to: S J Bauer; sberdoc@aol.com

Accepted for publication 19 August 2004

REFERENCES

1 **Orebaugh SL**. Succinylcholine: adverse effects and alternatives in emergency medicine. *Am J Emerg Med* 1999;**17**:715–21.
2 **Brandom BW**, Fine GF. Neuromuscular blocking drugs in pediatric anesthesia. *Anesthesiol Clin North Am* 2002;**20**:45–58.
3 **Rosenberg H**. Trismus is not trivial. *Anesthesiology* 1987;**67**:453–5.
4 **Schwartz L**, Rockoff MA, Koka BV. Masseter spasm with anesthesia: incidence and implications. *Anesthesiology* 1984;**61**:772–5.
5 **Skoog SJ**, Belman AB. Anesthetic induction trismus, more than a closed-mouth problem. *J Urol* 1986;**136**:686–7.
6 **Evans TJ**, Parent CM, McGunigal MP. Atypical presentation of malignant hyperthermia. *Anesthesiology* 2002;**97**:507–8.
7 **Hinkle AJ**, Dorsch JA. Maternal masseter muscle rigidity and neonatal fasciculations after induction for emergency cesarean section. *Anesthesiology* 1993;**79**:175–7.
8 **Dufour DG**, Larose DL, Clement SC. Rapid sequence intubation in the emergency department. *J Emerg Med* 1995;**13**:705–10.
9 **Sakles JC**, Laurin EG, Rantapaa AA, *et al*. Airway management in the emergency department: a one-year study of 610 tracheal intubations. *Ann Emerg Med* 1998;**31**:325–32.
10 **Li J**, Murphy-Lavoie H, Bugas C, *et al*. Complications of emergency intubation with and without paralysis. *Am J Emerg Med* 1999;**17**:141–3.
11 **Kosko JR**, Brandom BW, Chan KH. Masseter spasm and malignant hyperthermia: a retrospective review of a hospital-based pediatric otolaryngology practice. *Int J Pediatr Otorhinolaryngol* 1992;**23**:45–50.
12 **van der Spek AF**, Reynolds PI, Fang WB, *et al*. Changes in resistance to mouth opening induced by depolarizing and non-depolarizing neuromuscular relaxants. *Br J Anaesth* 1990;**64**:21–7.
13 **Laurin EG**, Sakles JC, Panacek EA, *et al*. A comparison of succinylcholine and rocuronium for rapid-sequence intubation of emergency department patients. *Acad Emerg Med* 2000;**7**:1362–9.

Bleeding due to a medicinal leech bite

İ İkizceli, L Avşaroğulları, E Sözüer, Y Yürümez, O Akdur

Emerg Med J 2005;**22**:458–460. doi: 10.1136/emj.2003.013847

This paper reports a case of prolonged bleeding following application of leeches to treat chronic pain. The paper discusses the characteristics of the wounds and possible complication of prolonged bleeding following medicinal leech application. The principles of treatment are also described.

Both doctors and lay health practitioners use leeches of the phylum Annelida for therapeutic purposes in many countries worldwide. The medicinal leech, *Hirudo medicinalis*, is used for bloodletting and pain relief in traditional folk medicine, as well as by doctors to maintain local circulation after reimplantation, flap repairs, and breast and thoracic wall reconstructions. Complications related to leech bites are not commonly seen in emergency departments (ED). To date, only one patient with bleeding secondary to a leech bite, who received advice from an ED by phone, has been reported.[1] Here we describe a patient who presented to the ED with prolonged bleeding from a leech bite, the first such report in the emergency medicine literature.

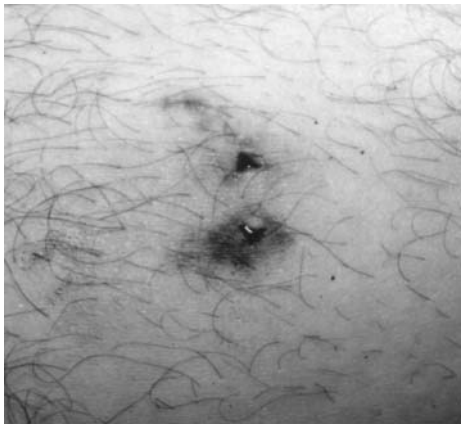

Figure 1 Leech bites in our patient resulted in a triradiate wound (consistent with reports in literature[1 3]).

CASE REPORT

A 19 year old man presented to our ED complaining of bleeding from both legs. He had applied leeches to both legs at midnight to treat chronic leg pains of over a year's duration. After the leeches spontaneously detached, he dressed his wounds and went to bed. When he woke up three hours later, he saw bloody bandages. The exact time of the onset of bleeding was unknown. As the bleeding did not stop in spite of compression and wrapping with tight bandages, he came to the ED at 8 45 am. He had no remarkable medical history.

On physical examination, he appeared generally healthy, was alert and oriented, and in no acute distress. Vital signs were as follows: blood pressure 110/80 mm Hg, heart rate 92 beats per minute, respiration rate 16 per minute, temperature 36 °C. Blood was oozing from two lacerations on his right leg, one 3 cm below and the other 4 cm medial to the tibial tuberosity. The distance between them was 7 cm. In addition, there were two lacerations on the lateral head of the gastrocnemius muscle on the left leg that had stopped bleeding. The distance between them was 5 cm. No ecchymosis, swelling, or erythema was present. His physical examination was otherwise normal. Laboratory findings were as follows: haemoglobin 18.1 g/dl, haematocrit 56%, mean corpuscular volume 98.1 femto l, white blood cells 6400/mm^3, platelets 171 000/mm^3, prothrombin time 13.48 seconds, activated partial thromboplastin time 35.3 seconds, and international normalised ratio 1.19. The peripheral blood smear was normal.

The wounds were rinsed with antiseptic solutions and bandaged with sterile gauze, following which he was observed in the ED for three hours. He was then discharged as no further bleeding had occurred. The wounds were unremarkable three days later, but the patient stated that the wounds had started oozing again one hour after discharge from the ED. When he had changed the dressings later that day, he had noticed clots on the wounds with bruising in the surrounding tissues, but there was no redness, warmth, or pain in the areas surrounding the wounds.

DISCUSSION

The medicinal leech has been used for medical purposes since at least 200 BC and is still used in Asia and Africa.[1–3] A recent clinical study has reported that leech therapy may be an effective treatment for rapid reduction of pain associated with knee osteoarthritis.[2] Our patient used leeches for alleviating pain and placed them at painful periarticular sites of the knee.

H. medicinalis has an approximately 10 cm long, cylindrical body with two suckers: one present anteriorly on the head, and the other on the posterior end. The mouth lies in the anterior sucker and has three jaws with teeth well designed for biting. The leech can ingest blood almost ten times its own weight (5–15 ml).[1 3]

Leech bites are painless and results in a triradiate wound which remains open for a long time and heals slowly[1 3] (fig 1). The commonest complication of leech application is oozing, as was the case in our patient. The amount and duration of bleeding vary according to the area bitten, with bleeding from the vagina, rectum, urinary bladder, and pharynx having been reported.[1 3 4] Prolonged haemorrhage may result in anaemia, and deaths from excessive exsanguination have been reported.[3] In our patient, the bleeding continued for three hours and persisted intermittently for the next 18 hours, although he did not have any haematological problems. The mean duration of bleeding from leech bite wounds in one report was 10 hours (range 6.5–23).[5]

The saliva of the leech contains hirudin, which inhibits thrombin in the clotting process, and histamine-like substances which may cause continuous bleeding by preventing closure of capillaries.[6] Munro *et al* reported that hirudin has only a transient antithrombin effect, lasting only about 15 minutes in humans. The prolonged duration of bleeding can be attributed to collagen–platelet interaction, along with possible modifications of the vascular walls by proteases or other enzymes secreted by the leech during feeding.[5]

Contamination with pathogenic microorganisms may result in erysipelas and submucosal abscesses.[1 3] Leech application can also cause infection with *Mycobacterium marinum*, a parasitic bacteria usually hosted by salt water fish, or with *Aeromonas hydrophilia*, which leeches carry in their gut.[7] As a medicinal leech bite heals, ecchymosis and scarring are not uncommon sequelae.[1]

As regards treatment, if the leech is still in place, it should be removed with the help of table salt, a saline solution, or vinegar. It should not be forcibly removed because its jaws may remain in the wound, causing infection.[1] After removing the leech, pressure should be applied to the wound. If the bleeding persists, sterile gauze soaked in thrombin solution may be applied. After control of bleeding, the wound should be rechecked for signs of infection.[1]

In our patient, the leech had detached before arrival to the ED, and we had no thrombin solution to apply with the bandages. There was intermittent bleeding for an additional 18 hours. Leeches application in the evening or night should be avoided because bleeding cannot be noticed during sleep. Patients with bleeding disorders should not apply leeches to avoid prolonged bleeding. Emergency physicians should exercise caution when removing leeches, and they should not be surprised if patients present with persistent bleeding after removal.

CONTRIBUTORS

I Ikizceli: data collection and drafting of the report. L Avşarogulları, E Sözüer: critical revision and drafting of the report. Y Yürümez, O Akdur: data collection and treatment and follow up of the patient during his admission and stay in the emergency department.

Authors' affiliations

İ İkizceli, L Avşaroğulları, E Sözüer, Y Yürümez, O Akdur, Department of Emergency Medicine, Erciyes University School of Medicine, Kayseri, Turkey

Competing interests: none declared

Patient consent was obtained.

Correspondence to: Dr L Avşaroğulları, Kılıçarslan Mh, Kızılırmak Cd, Irmak Sitesi, B Blok, No: 56/29, 38030, Melikgazi, Kayseri, Turkey; lavsar@erciyes.edu.tr; leventavsarogullari@yahoo.com

Accepted for publication 22 March 2004

REFERENCES

1 **Adams LA**. The emergency management of a medicinal leech bite. *Ann Emerg Med* 1989;**18**:316–19.
2 **Michalsen A**, Moebus S, Spahn G, *et al*. Leech therapy for symptomatic treatment of knee osteoarthritis: results and implications of a pilot study. *Altern Ther Health Med* 2002;**8**:84–8.
3 **Faust EC**, Russel PF, Jurg RC. *Craig and Faust's Clinical Parasitology*, 8th edn. Philadelphia: Lea & Febiger, 1970:563–70.
4 **Raj SM**, Radzi M, Tee MH. Severe rectal bleeding due to leech bite. *Am J Gastroenterol* 2000;**95**:1607.
5 **Munro R**, Hechtel FOP, Sawyer RT. Sustained bleeding after a leech bite in the apparent absence of hirudin. *Thromb Haemost* 1989;**61**:366–9.
6 **Shamsaddini S**, Dabiri S. Basal cell carcinoma on nickel dermatitis after leech applying. *East Mediterr Health J* 2000;**6**:194–6.
7 **Whitlock MR**, O'Hare PM, Sanders R, *et al*. The medicinal leech and its use in plastic surgery: a possible cause for infection. *Br J Plast Surg* 1983;**36**:240–4.

Stabbing chest pain: a case of intermittent diaphragmatic herniation

P Ransom, P Cornelius

Emerg Med J 2005;**22**:460–461. doi: 10.1136/emj.2003.012468

A case of traumatic diaphragmatic herniation is described in which gross mediastinal shift was caused by a combination of the herniated abdominal organs, purulent exudate, and air. This complex presentation might best be described as a case of gastrocolopyopneumothorax, diagnosis of which was further complicated by the intermittent nature of the herniation.

A case of traumatic diaphragmatic herniation is described in which gross mediastinal shift was caused by a combination of the herniated abdominal organs, purulent exudate, and air.

CASE REPORT

A 21 year old man presented to our emergency department complaining of a 2 day worsening of anterior and posterior chest pain with shortness of breath, and a 2 month history of intermittent vomiting, dysphagia, and weight loss. Three months previously, he had sustained a stab wound to the left chest and presented to hospital. A chest radiograph taken on that admission was reported as normal, and an abdominal ultrasound had shown only a small left pleural effusion. Shortly after, he had self discharged against medical advice. One month later he began the first of six visits to two separate emergency departments complaining of episodic abdominal pain and vomiting, leading to admission on two occasions. Blood results for these visits showed white cell counts of between 16 and 23×10^9/l, and varying degrees of dehydration, on one occasion leading to acute pre-renal failure with urea of 33 mmol/l. During the later visits, confusion had been noted. A chest radiograph taken 3 weeks prior to his presentation to us had been reported as normal by the radiologist and treating doctors, and oesophagogastroduodenoscopy (OGD) performed during that admission found a normal stomach, pylorus, and duodenum, with a degree of oesophageal candidiasis. This, together with his emaciated appearance, had led to a suspicion of immunocompromise. HIV testing was subsequently performed, which had proved to be negative. In the light of the normal chest radiograph and unremarkable gastroduodenal examination, a diagnosis of self induced vomiting had been given on his last discharge.

On examination at our hospital, he was emaciated and distressed, tachypnoeic at 30 breaths/min, with pulse oximetry on air of 97%. He was normotensive at 110/70, with a pulse of 110 beats/min. He was vomiting an almost clear fluid. Examination of the chest showed a trachea deviated to the right, absent breath sounds on the left side, with percussion note being resonant over the left upper chest and dull from the midline down. A small, healed scar was seen below the anterior axillary line of the 10th rib.

The initial portable chest radiograph showed massive diaphragmatic herniation of stomach and bowel, with a left sided pneumothorax and what appeared to be a collection of fluid reaching to the mid-thorax, all of which had caused marked rightward mediastinal shift (fig 1A).

As the patient's oxygen saturation was normal and the radiographic appearances were not those of a classical tension pneumothorax, we elected to place a small (size 12) chest drain anteriorly through the second intercostal space rather than perform a needle thoracentesis. A hiss of air was noted upon drain insertion, and during the patient's initial breaths, continuous bubbling of the drain bottle was seen throughout the respiratory cycle. Within minutes, his chest pain had decreased. Over the next 15 minutes, 1.4 litres of thick, purulent fluid was discharged. A second radiograph taken 40 minutes after the first showed the stomach partially decompressed, some remaining fluid, and the mediastinum shifted back towards the midline (fig 1B).

Thoracotomy revealed that the greater part of the stomach and a loop of colon had herniated through a 6 cm defect of the left diaphragm. There was still an appreciable amount of purulent exudate, but no perforation of the abdominal organs and no damage to the lung structures. A sample of the fluid showed white cell debris, and culture revealed scanty growth of upper respiratory tract flora. He made an uneventful recovery, and once again self discharged against medical advice.

DISCUSSION

Herniation though a diaphragmatic stab wound is a well recognised, although infrequent cause of cardiothoracic embarrassment,[1] while tension gastrothorax or colothorax appears in the literature occasionally as a case report.[2] Intrapleural effusion caused by herniation of the abdominal contents has likewise been noted on occasion.[3 4] Radiological diagnosis of diaphragmatic rupture is difficult, and many