Spontaneous clostridial myonecrosis after pregnancy – emergency treatment to the limb salvage and functional recovery: a case report

Barbara De Angelis1,2, Paolo Cerulli1, Lucarini Lucilla1, Augusto Fusco3, Camilla Di Pasquali1, Ilaria Bocchini1, Fabrizio Orlandi1, Annarita Agovino1 & Valerio Cervelli1

1 Department of Plastic and Reconstructive Surgery, University of Rome Tor Vergata, Rome, Italy
2 Regenerative Surgery, University of Rome Tor Vergata, Rome, Italy
3 Clinical Laboratory of Experimental Neurorehabilitation, Santa Lucia Foundation, I.R.C.C.S., Rome, Italy

Key words
Clostridium perfringens; Myonecrosis; Rehabilitation; Tissue regeneration

Correspondence to
B De Angelis, MD, PhD, Department of Plastic and Reconstructive Surgery, Policlinico Casilino, University of Rome Tor Vergata, Rome, Italy
E-mail: bdeangelisdoc@gmail.com
doi: 10.1111/j.1742-481X.2012.01072.x


Abstract
Clostridial myonecrosis (CM) is a rare, life threatening necrotizing infection of a skeletal muscle caused by Clostridium perfringens in the majority of cases. The diagnosis may be difficult because of few diagnostic and cutaneous signs early in its course. Standard therapy involves surgical debridements of a devitalized tissue and high-dose organism-specific antibiotic therapy. The hyperbaric oxygen has also showed its usefulness in the treatment of these infections. Autograft systems as tissue replacement, based on bioengineered materials, have been demonstrated to be safe and effective treatments for chronic wounds and a suitable physiotherapy is recommended for the recovery of functional impairments of upper extremities. We present a rare case of CM of right upper limb treated with a combination of standard treatments and new techniques.

Introduction
Necrotising soft tissue infections are a highly lethal group of infections that require early and aggressive therapy (1).

Clostridial myonecrosis (CM) is a life threatening necrotising infection of a skeletal muscle that may progress to a systemic toxicity and a multisystem organ failure (2). Aetiology is usually traumatic with direct inoculation of the bacteria into deep tissues. It is found to be post-traumatic in 50% of cases and post-surgical in 35% of cases. Spontaneous CM, without precedent trauma or surgery, accounts for approximately 10% of all cases (3). Of all the CM cases reported, 80% were caused by Clostridium perfringens.

The treatment must be prompt, often based on clinical judgement alone. Therapy includes aggressive surgical debridement of a devitalised tissue and high-dose organism-specific antibiotic therapy (4).

Hyperbaric oxygen (HBO) may help to treat these infections. No studies have been conducted on the functional and aesthetic outcomes after the infection has been cleared.

Key Messages
• diagnosis of Clostridial myonecrosis
• patient underwent irrigation, debridement and fasciotomy of the forearm and hand, and toilette of the necrotic areas
• antibiotic treatment (200 mg of teicoplanin once a day and 1 g of meropenem three times a day) was administered; HBO therapy started once a day for 16 days
• after the resolution of the infection, the patient received a skin replacement in order to cover the area previously damaged by the infection with the engineered tissue
• after physiotherapy there was good functional recovery and aesthetic improvement

The advances in wound physiology and the healing process have led to the development of new techniques based on bioengineering as tissue replacement.
Physiotherapy for the recovery of the functional impairments of upper limbs is well documented, particularly for neurological diseases such as stroke. Recovery in the postinfectious stage of diseases is less investigated.

A case report on a 32-year-old female with CM of right upper extremity developed after pregnancy and treatment of the same is presented here.

Case report

A 32-year-old female, right-handed, was admitted to the Department of Plastic and Aesthetic Surgery after a brief observation in the emergency room. She complained of a shooting pain of medium intensity associated with fever. The patient had given birth approximately 6 months earlier. At that time, her hand had been treated with topical drugs for dermatitis, partially resolving her symptoms. She denied any trauma or contamination with soil.

On the physical examination, the patient’s right hand was oedematous and tender with a local erythema; her pain increased on passive motion of the wrist. There was necrosis of the fifth finger and the hypothenar eminence with the presence of bullae. No systemic signs of toxicity were present (Figure 1). Her laboratory investigations revealed mild leucocytosis (11.2 × 10^3/ml), with high presence of neutrocytes (88%); liver function test: SGOT 375 U/l, SGPT 377 U/l; LDH 545 U/l; C-reactive protein 71-70 mg/dl and serum glucose 162 mg/dl. Other laboratory values were within normal limits. Electrocardiogram revealed normal sinus rhythm without significant ST or T wave abnormalities; the radiographs of the right wrist were unremarkable (Figures 1 and 2).

CT findings showed a thickening of the subcutaneous fat tissues in the carpal tunnel with evidence of gangrenous blisters on volar side.

The patient gave an informed consent for irrigation and debridement of the right hand and possible medium forearm amputation.

The patient underwent irrigation, debridement and fasciotomy of the forearm and hand and toilettage of the necrotic areas. Wound culture was obtained and later was identified as C. perfringens.

After surgery, treatment with antibiotics (200 mg of teicoplanin once a day and 1 g of meropenem three times a day) was administered. HBO therapy was started once a day for 16 days.

At the end of HBO treatment, necrosis was limited and the patient underwent another surgical session for escarectomy of the fifth digit and hypotenar eminence and curettage.

After resolution of the infection, the patient received a skin replacement in order to cover the area previously damaged by the infection.

For tissue replacements, the TissueTech autograft system (Fidia Farmaceutici S.p.A., Abano Terme, PD, Italy) was used. The system consists of a dermal replacement made in accordance with the impairment level of the patient.

The training consisted of physical therapy and therapeutic exercises twice a day. Therapeutic exercises were passive, active-assistive, and active range of motion and strengthening exercises, planned to improve the affected movements in accordance with the impairment level of the patient.

At the time of discharge, all blood and functional test results were normal (Figure 2).

Discussion

In the literature CM is widely discussed, but few studies investigated spontaneous CM, limited to single cases due to infrequent occurrence. Also, there have been no reported studies on the spontaneous CM of extremities after pregnancy.

Therapy may follow three clearly defined pathways: surgical debridement, antibiotic therapy and HBO. The treatment of chronic wounds and functional outcomes have not been thoroughly investigated.

CM represents a severe example of the spectrum of necrotising soft tissue infections. These infections may occur in almost any anatomic area, but they most frequently involve the abdomen, perineum and lower extremities (5). Extremities are involved in more than 50% of necrotising soft tissue infections, which are rare but potentially fatal occurrences.

Despite aggressive therapy, the mortality in patients with necrotising soft tissue infections remains high (15–50%) (6). Among Clostridial species, C. perfringens has been detected in 60–90% of cases of CM (7).

Clostridium perfringens infections sometimes remain difficult to diagnose because they may have few diagnostic or cutaneous signs early in their course. They may also be of the subacute variety and, therefore, hard to distinguish from standard soft tissue infections (7). The external appearance of the skin wound may initially mask the seriousness of this infection, contributing to diagnostic delay. Soft tissue gas, detected clinically or radiologically, is a classic sign, but its absence does not exclude the presence of a necrotising infection (8).

Standard treatment for CM includes early and repeated surgical debridement, broad-spectrum antibiotics, physiologic and nutritional support and HBO therapy. These treatments
must be started as soon as a necrotising soft tissue infection is suspected (4). The application of all three approaches show improved tissue salvage and an overall mortality rate of 16% (9).

Surgical debridement should be aggressive and all the necrotising tissue must be excised. Repeated debridements, sometimes on a daily basis, should be done until the local infectious process has been arrested.

The HBO therapy is not as important as urgent surgical intervention. It may accelerate the healing of the local wound (10), and induce high oxygen partial pressure in all treated tissues. These oxygen levels are lethal to anaerobic bacteria such as *C. perfringens* (11). Moreover, HBO therapy promotes angiogenesis and increases endothelial cells, fibroblast proliferation and collagen deposition (12). It can modify the cellular functions of the activated neutrophils, resulting in increased oxidative microbial killing and decreased neutrophil-endothelial adhesion. At the molecular level, HBO up-regulates platelet-derived growth factor receptor. All of these modifications may help resolve the infection and change a non-healing wound to an active wound healing status (11).

After the sepsis is controlled, coverage of the wound is usually obtained by skin grafting. The autograft systems provide skin coverage of the wound and influence the healing through growth factors and cytokines within the wound (13). In addition, autologous tissues have the advantage of immunological compatibility. The presence of HA has been reported to facilitate tissue remodelling, modulating the release of cytokines and other mediators (14) and inducing a neodermis at the wound bed (15). As in HBO therapy, the HA stimulates angiogenesis (15), favouring the anti-inflammatory process.

TissueTech indications and contraindications are the same as that of grafts. The indications are as follows: coverage of superficial skin deficits. The contraindications are as follows: conditions that impede healing (arterial disease, diabetes, malnutrition), infections, presence of haematoma or exudation between the graft and the bottom, insufficient vascularisation

---

**Figure 1** (A) Aspect of right hand with Penrose drain: subcutaneous tissue appears oedematous with the presence of bullae and signs of necrosis. (B) Aspect at the second surgical operation. Necrosis was limited and oedema was lacking. No signs of systemic toxicity. (C) CT findings: carpal view. It shows the oedema of subcutaneous tissue and the presence of the bullae.
of the receiving area (radiotherapy tissue damage, necrotic areas).

In this patient, Physiotherapy was focused on the recovery of mobility and strength. In addition, rehabilitation of the injured hand was directed towards treating the functional impairments following the surgical debridement and autologous tissue replacement. Hence, specific exercises for grip had been carried out, because hand functionality is necessary to perform activities of daily living. In conclusion, our experience shows the importance of early therapeutic intervention with standard treatments (surgery, antibiotics and HBO therapy) and demonstrates that the combination of autologous tissue replacement and physiotherapy are necessary to obtain recovery of functional impairments in chronic, post-infectious wounds.

Acknowledgements
We thank Marina N. Kesler, PT, for her help on revision of the manuscript for English language improvement and for her comments on the adopted physiotherapy. No benefits in any form have been received or will be received from a commercial party related directly or indirectly to the subject of this article.

References

Figure 2 (A, B) One month post-operative view. The skin growth on the wound with good satisfaction from aesthetic point of view, but there is an incomplete closure of the hand. (C, D) Six years post-operative view. Complete functional recovery and aesthetic.


