



Massive necrotizing fasciitis following below-knee arterial surgery – A therapeutic challenge

Masivni nekrotizujući fasciitis posle hirurškog zahvata na arteriji potkolenice – terapijski izazov

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Abstract

Introduction. Necrotizing fasciitis is a rare, progressive bacterial infection of superficial fascia followed by secondary subcutaneous tissue necrosis. We presented a patient with massive fulminant lifethreatening necrotizing fasciitis after below-knee femoro-popliteal vein bypass grafting successfully treated by antibiotics, surgical debridement and final skin reconstruction using the Tierch method. **Case report.** A 61-year-old patient was admitted to the Vascular Surgery Clinic for below-knee femoro-popliteal bypass grafting. He complained of intermittent claudication in the left leg after 50 m, ankle brachial indexes were 0.45 on the left and 1.0 on the right side. Femoropopliteal below-knee bypass grafting was done using the autologous great saphenous vein. In the very next day, initial signs of skin infection appeared including local inflammation, erythema, swelling and cellulitis restricted to saphenectomy site. These changes had rapidly spread in the following days on the deep tissue of the whole upper and lower leg, including the groin and with clinical signs of life-threatening systemic infection. Immediate surgical debridement was done followed by extensive wound packing and wide spectrum antibiotics administration for the next 33 days when final skin reconstruction by the Tierch method was performed. Interesting point is that this entire time wound swab was sterile. **Conclusion.** In the presented case immediate surgical debridement, wide spectrum antibiotics administration and consistent wound packing gave satisfactory results in this life-threatening systemic infection. Wound swab is not always a reliable indicator of the infection while clinical findings and surgeons' experience are of great significance in rapid reaction to this rare surgical complication.

Key words:

vascular surgical procedures; treatment outcome; fasciitis, necrotizing; anti-bacterial agents.

Apstrakt

Uvod. Nekrotizujući fasciitis je retka, progresivna bakterijska infekcija površinske fascije, praćena sekundarnom nekrozom potkožnog tkiva. Prikazali smo bolesnika primljenog radi femorodistalne rekonstrukcije venskim graftom, koja je u neposrednom postoperativnom toku bila komplikovana fulminantnim, nekrotizirajućim fasciitisom. Bolesnik je uspešno tretiran ekstenzivnim, dnevnim debridmanom inficirane rane uz parenteralnu primenu antibiotika širokog spektra. Lečenje je izvršeno uspešnom rekonstrukcijom kože Tiršovim graftom. **Prikaz bolesnika.** Bolesnik, star 61 godinu, primljen je radi planirane hirurške revaskularizacije venskim femoropoplitealnim *bypass*-om. Žalio se na intermitentnu klaudikaciju u levoj nozi, posle pređenih 50 metara. Brahijalni indeks gležnja iznosio je 0.45 levo i 1.0 desno. Drugog dana po rekonstrukciji pojavili su se prvi znaci infekcije kože na mesu salenektomije, uz ubrzano širenje na dublja tkiva i mišiće cele noge praćeno sistemskim znacima sepse. Ukupno 33 dana primarna terapija bila je hirurška debridman rane podržan parenteralnom primenom antibiotika. Bris rane uziman je na drugi dan i konstantno je bio sterilan. Sticanjem adekvatnih uslova urađena je rekonstrukcija kože Tiršovom metodom. **Zaključak.** Hitan opsežan hirurški debridman uz adekvatnu primenu antibiotika dali su zadovoljavajuće rezultate. Samo bris rane nije uvek pouzdan indikator prisustva infekcije. Kliničko iskustvo hirurga i lokalni status rane ključni su faktori uspeha.

Ključne reči:

hirurgija, vaskularna, procedure; lečenje, ishod; fasciitis, nekrotizujući; antibiotici.

Introduction

Necrotising fasciitis (NF) is rare, progressive, rapidly spreading, inflammatory infection, primarily involving the superficial fascia and usually followed by secondary necrosis of the subcutaneous tissues.¹⁻⁷ The infective process leads to thrombosis of subcutaneous blood vessels, resulting in gangrene of the overlying skin. We presented a patient with massive fulminant life-threatening NF after below-knee femoropopliteal vein bypass grafting successfully treated by antibiotic, surgical debridement and final reconstruction by skin transplant using the Tierch method. The Institutional Ethics Committee approved the manuscript.

Case report

A 61-year-old male patient was admitted to the Vascular Surgery Clinic for below-knee femoro-popliteal bypass grafting. He complained of intermittent claudication in the left leg after 50 m of walking. The ankle-brachial index (ABI) was 0.45 on the left and 1.0 on the right side. Previously, multislice computed tomography (MSCT) (a General Electrics light speed VCT 64) discovered left superficial femoral artery occlusion as well as popliteal artery above knee with a good run-off of the crural arteries. As it was, below-knee bypass was indicated. The preoperative medical history of the patient included hypertension and hyperlipoproteinemia. All laboratory findings were within referent values [white blood cells (WBC) $5.1 \times 10^9/L$ (normal range $4.5-10.0 \times 10^9/L$); haemoglobin (Hgb) - 9.8 g/dL (normal range 13.5-17.5 g/dL); platelets count $405 \times 10^9/L$ (normal range $150-400 \times 10^9/L$)].

The femoro-popliteal below-knee bypass procedure was performed using an autologous great saphenous vein graft from the left leg. Ceftriaxone [2 g/intravenous (*iv*)/24 h] was administrated initially as usual postoperative antibiotic. Immediately after the surgical reconstruction, ABIs for the left foot were 0.82 and 0.77.

In the very next day, initial signs of skin infection were noted with accompanied local inflammation, erythema, swelling and cellulitis restricted to the saphenectomy site.

In the meantime, body temperature rase over 39 °C and local necrosis rapidly progressed with associated ecchymosis, vesicles and bullae all around the incision sites. As soon as possible, more aggressive antibiotic therapy was introduced with ceftazidime (1 g/*iv*/12 h) and clindamycin (400 mg/*iv*/8 h), with concomitant *iv* crystalloid infusions. Still, the patient had a high fever followed by general malaise and unclear confusion.

Regardless a newly introduced therapy, as time went by skin lesions became deeper, accompanied by microvascular thrombosis and large surrounding areas of necrosis including the groin and calf. Superficial fascia was patchy with yellowish-green colour followed by diffuse superficial muscle necrosis (Figures 1a and 1b). The first wound swab was sterile. At the moment, there was no imbalance concerning electrolytes, renal function, and glucose values. Blood and urine culture samples were tested, as well.

On the second day, extensive necrotic tissue excision and debridement removing the smelling parts of necrotic fas-

cia and muscles were performed. Open wounds quoted bandage three to four times a day. All wound swabs taken daily were sterile. The whole leg was swollen, painful to touch, with limited mobility.



Fig. 1 – A) Massive necrosis of the left groin; B) thigh and lower leg after femoro-popliteal bypass application.

The next few days, despite daily debridement, adequate wound toilets and vigorous antibiotic therapy, the patient was still highly febrile (38.2–40.2°C) and extremely prostrated. The laboratory value of C-reactive protein was 150 mg/L (normal range < 10 mg/L), procalcitonin level > 0.25 ng/mL (normal level < 0.1 ng/mL), WBC $40 \times 10^9/L$, erythrocyte sedimentation rate > 100 mm/h. The immune status was examined in detail, and we were not endorsed more important immunity disorders.

The plain x-ray films of the left leg revealed no gas in the involved tissues, thus the third time, we changed antibiotic therapy, introducing the most powerful combination with vancomycin (10 mcg/mL) and imipenem (500 mg/*iv*/6 h). Sixteen days later the body temperature dropped down on subfebrile level (37.5 °C). Computed tomography (CT) did not identify pus collections or gas in the examined leg muscles. Several tissue biopsies and smear cultures did not isolate causative bacteria clearly. Also, pathogenic bacteria were not isolated from blood or urine.

After 33 days of extensive wound packing and antibiotic therapy, the local wound status was significantly better (Figure 2).



Fig. 2 – Local wound status 33 days following the surgery.

Inflammation factors had a significant tendency to fall. When the wound looked clean enough with pearly grey looking fascia, without new signs of necrosis, skin transplantation was performed using the Tierch method with skin transplant taken from the other thigh (Figure 3). The skin transplant was well received, with no signs of rejection, nor reinfection. In the later stages of the treatment, the patient went to the everyday treatment in a hyperbaric chamber.



Fig. 3 – Local status after skin transplantaton (Tierch method).

The patient was dismissed from the hospital on the postoperative day 45 in good general condition with locally well healed and cicatrized wounds (Figures 4a and 4b). After a 6-month follow-up, local status of wounds was satisfactory (Figure 5). Although control CT angiography showed femoro-popliteal bypass occlusion, conservative treatment was indicated since the patient had claudication after 200 m and no signs of threatening vascular ischemia were noted.



Fig. 4 – A) left groin; B) thigh and lower leg after 45 days.

Discussion

The NF is a life threatening bacterial infection with reported mortality rate of 25–60%^{1–7}. The NF clinical manifestations range from a fulminant presentation to a subtle and insidious development^{6–14}. The underlying pathogenesis of

idiopathic NF is basically unknown, occurs in the absence of a known or identifiable etiologic factor and difficult to recognize in early stages.



Fig. 5 – Left leg local status after six months.

On the other side, a form of the group A streptococcal invasive disease (GAS) could be NF. Sometimes, the culture of tissue involved by NF also yields a mixture of other non-aerobic bacterial agents such as *Pseudomonas*, *Esherichia coli*, *Klebsiella*, *Clostridium* and *Staphylococci*. The underlying conditions or diseases of NF are certainly some kind of an immunological failure mostly provoked by diabetes mellitus, malignant disease, renal failure, malnutrition, radiotherapy, hepatic disease, chronic skin ulcers and others.

The nature of infection involves a rapid progression of tissue necrosis. Possible causes are unknown aerobic or anaerobic bacteria and the expected clinical course is individual. This paper illustrates the evolution of rapidly spreading massive NF following below-knee femoro-popliteal autologous vein graft bypass. We believe that the condition associated with NF was probably operative trauma. Early recognition of the problem, persistent wound debridement and intensive antibiotic therapy prevented possible loss of the limb and other severe life-threatening postoperative complications such as respiratory failure and sepsis due to released toxins into the bloodstream.

When discussing NF, in addition to surgical debridement and antibiotic therapy hyperbaric oxygen therapy (HBOT) and vacuum-assisted closure (VAC) system might be very helpful^{15–18}. Some authors¹⁵ report that HBOT could significantly improve the effectiveness of necrotizing soft tissues infection healing by bactericidal and bacteriostatic effects and increasing oxygen supply up to the cellular level. In contrast to this, the authors¹⁶ of a recently published review concluded that none of the patients with NF had benefit from HBOT. In the presented case, HBOT was introduced as soon as infection was verified, still its effect remained questionable having in mind aggressive antibiotic

therapy and persistent surgical debridement. Likewise, the use of VAC system has been reported with favorable outcome in managing non-healing limb wounds in patients suffering from acute NF^{17, 18}. Unfortunately, at the time VAC system had not yet been introduced to our Clinic. When NF is identified, all of these mentioned treatment modalities should be applied to contribute to faster wound healing. As for the diagnosis, prompt investigation such as ultrasonography and CT might be very helpful in recognising the problem timely and start immediate surgical excision of all necrotic tissue until a full recovery of the wound¹²⁻¹⁴.

Conclusion

The presented case suggests that immediate surgical debridement, wide spectrum antibiotics administration and consistent wound packing give satisfactory results in fulminant necrotizing fasciitis treatment.

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