CLINICAL CASE

THE ABDOMINAL FLAP - A CHANCE FOR UPPER LIMB RECOVERY (AFTER A DOG BITE) - A CASE REPORT

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Abstract

A 57-year-old male presents himself at the Emergency Room, 5 days after a dog bite. He is immediately admitted, with indication for surgical treatment for a neglected, septic wound, localized on the left hypothenar eminence, with significant functional impairment. His personal health history includes hypertension and dyslipidemia. Radiocarpal infectious arthritis, pus secretion, fascial-myositis of the left hypothenar eminence and of the left volar region are diagnosed during surgery. The pus is sent to the Microbiology Laboratory for analysis and cultures and an anaerobic germ infection is identified. The damaged tissue is surgically excised, resulting in a skin defect of 10x15 cm. Although there is important tissue removal, amputation of the hand is avoided and the patient's evolution is fairly good. Postoperatively, wound dressing is performed daily, combined with antibiotherapy, icing and administration of non-steroidal anti-inflammatory drugs. A neglected dog bite can have a dramatic evolution: there is serious potential for aggressive infection, followed by further local necrosis or septicemia. In our case, the evolution was favorable, since amputation was avoided. In order to prevent such instances, an efficient method for addressing small defects is to radically excise the septic tissues, followed by direct suture. In the case of large defects, one can perform an Italian flap, which is normally detached, safely, after three weeks.

Keywords*: septic, fascio-myositis, arthritis, pedicled Italian flap*

Introduction

Statistics indicate that dog bites are the most frequent mammal bites, followed by cat and human bites; some of them represent major health threats [1,2].

Studies show that 10% to 15% of cases develop infection at the wound site. In order to decrease the infectious risk, it is advisable to follow an adequate antibiotic therapy interweaved with surgical debridement and treatment [1-3].

Normally, the surgical treatment of a recent dog bite consists of abundant washing of the wound with antiseptic solutions, debridement of the injury site, local hemostasis and delayed closure. An immediate apposition suture would create an ideal environment for the development of bacteria, especially the anaerobic species. Therefore, the delayed approach is the best option, in order to decrease the infection rate, as the wounds produced by dog bites are considered as infected from the beginning [3,4].

On the other hand, when facing a few days' old, infected dog bite, as surgeon in charge, one must ask a number of questions: one might not be able to restore the defect as easily; one may not be able to fully cover the joint; one may have a bad graft-take which will become necrotic. Most of the times one will be obliged to perform a much more complex procedure, such as an Italian flap graft, that requires an additional surgical site and a long recovery: in short, the treatment and care of not one, but two wounds [5, 6].

Case Presentation

A 57-years-old male presents at the Emergency Room, with a 5 days' old dog bite.

He is immediately admitted to the Plastic Surgery Department with an indication for surgical treatment for a neglected, septic wound, localized on the left hypothenar eminence, with marked functional impotence and local pain. From his personal history, we note that he is overweight and that he suffers from arterial hypertension (treated with Indapamide) and dyslipidemia (treated with Rosuvastatine and Omega Acids). He describes an altered status, presenting with fever of 39 degrees Celsius.

Figure 1-Aspect of the hand and forearm upon presentation

General Examination reveals local pain, functional impotence, hypothenar necrosis, excess fat tissue and important oedema of left hand; moreover, he presents a lymphangitis route (Figure 2) and left axilary adenopathy.

On the anterior aspect of the forearm a sero-fibrinous secretion is oozing from the wound; also, the necrotizing area is surrounded by an erythematous halo (Figure 3).

Figure 2 - Lymphangitis route

From the Patient History we learn that he had already undergone an infectious disease consult, having received tetanus prophylaxis, anti-rabies vaccination and administration of analgetics. In addition, he had also benefited from a previous surgical consult in an another unit, which had consisted in incision, drainage, lavage and wound dressing.

Blood samplings and investigations are carried out: the paraclinical examination reveals major leukocytosis ($19{,}5*10^3/\mu L$; N: $4\text{-}9*10^3/\mu L$) . The haemostasis profile is not significantly altered. The results of the hand and forearm radiography depict no osteolytic lesions.

Figure 3 - Left hipotenary eminence - gradually necrotizing

From this data, the presumtive diagnosis is that of an infected wound of the left hipothenar eminence and arthritis of radio-carpian joint. In this case, a surgical treatment is the common indication, in order to debride, perform decompression incisions and wound exploration. We considered a lesion of the

sensitive branch of the ulnar nerve as well, because of the hand's limited mobility.

Prior to the first surgical step, the patient was psychologically, biologically and surgically prepared. The patient undergoes an incision with exploration, excision of the necrotic tissue and opening of Guyon's and Carpal Tunnel, for decompression and prevention of a pus collection.

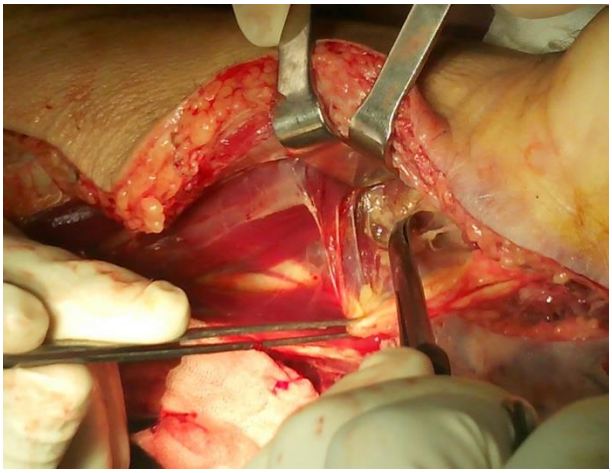

Figure 4 - Septic transformation of the tissue and volar fascia myositis

Afterwards, exploration and lavage of the injury site is performed and ulnar artery thrombosis and ulnar nerve involvement is revealed. This step ends with hemostasis and wound dressing.

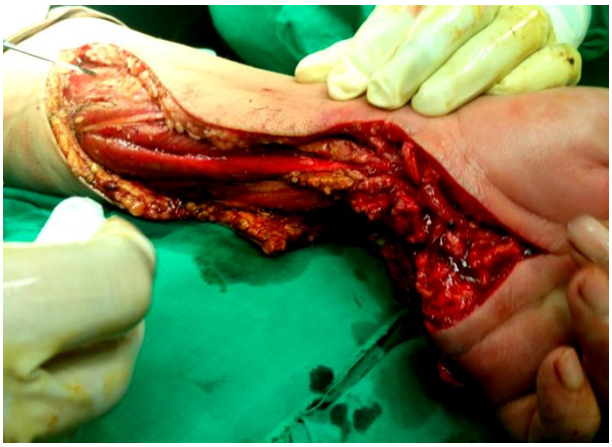

Figure 5 - Final aspect of the first intervention

The main post-operative diagnosis is: left hypothenar eminence – fasciomyositis, with left volar forearm compartment syndrome and, with involvement of the sensitive branch of ulnar nerve. Additionally, the paraclinical examination shows leukocytosis: 14, 00*10^3/µL (N: 4-9*10^3/µL) – an elevated value, but on the normal descending trend, depicting a correct administration of the treatment (the peak was of 19,5*10^3 leukocytes/µL). The excision of the infected tissue alongside with the excision of a large amount of skin, adipose tissue and muscle, results in the exposure of the radio-carpal joint and in the loss of the skin of the left eminence with a defect of approximately 5*15 cm in dimension.

The patient therefore needs a second surgical procedure in order to restore the anatomical integrity of the region.

The complex residual defect makes the patient a perfect candidate for a particular treatment, consisting of three surgical procedures:

- a direct suture, in order to close the proximal margins from the middle third of the forearm – technique used because of its simplicity and effectiveness;
- a split-thickness skin graft, drawn from the hip with an electro-dermatome and placed in the distal third of the forearm, in order to partially close the defect;
- an Italian flap, in order to cover the radio-carpal joint and the hypothenar region.

After ten days of daily wound dressing, cold applications, antibiotic and non-steroidal anti-inflammatory therapy and splitting of the hand (in order to prevent the spreading of the infection), the second surgical step is performed.

It begins with the Italian flap, which consists of two interventions:

- Firstly, designing and tailoring the flap, which is then dissected and thinning of the pedicle to provide a perfect match to the recipient site skin defect. The flap is anchored to the radio-carpal joint. The recipient site is prepared beforehand - with abundant lavage, hemostasis and removal of granulation tissue. The donor area is closed by direct suture, leaving a raw area underneath the pedicle.
- Secondly, the pedicle from the left side of the abdomen is sectioned transversely and placed on the left forearm and hand in order to cover the residual defect. Then, a skin graft from the thigh is harvested with the electro-dermatome, in order to cover the distal third of the forearm. Finally, the rest of the defect, from the middle third of the forearm, is closed by direct suture. In order to promote healing of the

donor area, the thigh is dressed with an oily-gauze porous dressing and the area is left to epithelize spontaneously, with regular topical Oxytetracycline and Hydrocortizone spray.

Figure 6 - 5th day after skin graft neovascularization and successful graft uptake.

The second intervention is performed after three weeks. Meanwhile, daily wound dressing and splinting of the upper arm is performed. During this period, cutaneous angiogenesis develops at the margins of the flap covering the radio-carpal joint and hypothenar left eminence.

Figure 7 - 5th day after flap inset.

There is favorable local evolution, with a viable flap (warm, pink, with good capillary pulse) after the pedicle is sectioned. The donor area is closed by direct suture.

Figure 8 - Final intra-operative aspect after pedicle was sectioned and flap was sutured.

Discussions

Such a wide-opened defect with uncovered radio-carpal joint could be approached by two different techniques: Italian flap and free flap. We considered the Italian flap as the most effective because of following benefits:

- Shorter intraoperatory duration (1.5-2 hours);
- Lower costs;
- Basic level of instruction required from the medical staff
- Shorter anesthesia time bearing in mind the patients' comorbidities: hypertension and overweight;
- Higher effectiveness of the technique and chances of success, since the patient was only partly compliant to his treatment.

We considered that the advantages outbalanced the disadvantages, which are:

- A long period (3 weeks) during which the patient in constrained to an uncomfortable and cumbersome position, resulting in mild ankyloses of the upper limb joints.
- Lower comfort which reduces the patient's compliance;
- Higher infectious risk;
- Different texture of the skin graft and flap compared to the normal texture of the hand.

Another surgical option would have been a free flap, which would have been beneficial because:

- A fasciocutanous free flap would prevent adhesions from developing and eliminate the potential need for tenolysis in the future.
- Higher degree of comfort – since only the forearm is splinted
- Lower donor site morbidity since it is closed during the first surgery.
- No need for a second surgery.
- But, at the same time the free flap would have been characterized by:
- Slower technique and prolonged procedure, lasting 6-8 hours.
- Higher cost;
- Higher level of expertise from the medical personnel;
- Higher risk of failure of the free flap due to anastomosis failure or thrombosis, especially in the case of a poorly compliant patient;
- Higher post-operative stress for the patient.

It is crucial to use a flap for joint coverage, as to ensure long term protection, prevent joint contracture and provide padding. This explains why the flap was combined with skin grafting along with the fact that skin grafts applied directly on bony tissue will automatically result in graft failure and necrosis..

Conclusions

A dog bite must never be neglected, because of the dramatic complications that could arise from it, such as extensive tissue damage due to mauling, local, widespread or systemic infection, compartment syndrome, and even death from infectious causes – such as rabies and tetanus.

Our case perfectly illustrates how a patient with a low socio-economic status displays low levels of compliance to medical indications, resulting in an uncontrolled infection with serious consequences on the upper limb. All these factors lead to a complex surgical journey for this patient consisting in three different procedures (an abdominal flap pedicle was used to cover the exposed radio carpal joint; skin grafting was provided for the upper limb at the same time together with direct suture to close the defect) and 31 days of hospitalization. Because his post-operative result is satisfactory, he is discharged and followed-up as an out-patient with further recommendations: avoiding the overuse of the joint of the hand, avoiding contact to external agents (because of the insensate nature of the flaps and grafts), physiotherapy [6-9].

In the present case, the most challenging task was to rescue the patient's forearm and hand; this was successfully achieved by using an abdominal pedicle flap and a skin graft.

We faced a neglected, infected dog bite, because of the patient's reduced grade of compliance. The first step in our case management is to assess the limits of the infection. This led to an important defect of the skin, fat tissue and muscular tissue at the forearm level, with an exposed radio-carpal joint. Thus, we have chosen to perform an Italian flap in order to cover the joint, instead of a free flap, because of its advantages:

- lower risk for the patient;
- lower cost;
- simplicity of the techniques.

We completed the treatment with a skin graft alongside a direct suture.

The outcome is satisfactory since hand amputation is avoided by using a complex surgical treatment.

Long term risks include:

- chronic instability of the wrist joint;
- the absence of sensibility in the hypothenar region and the fourth and fifth fingers - because of the ulnar nerve fibrosis.

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