

CLENCHED FIST INJURY : A PITFALL FOR PATIENTS AND SURGEONS

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Clenched fist injuries or human bite-fight wounds are the result of an impact of the fist with the opponent's teeth, with perforation of the skin and joint. Severe septic arthritis of the third metacarpal joint of the dominant hand often occurs. The consequences, medical and legal, on the long run are important.

Keywords : fist ; infection ; hand ; bites.

Mots-clés : poing ; infection ; main ; morsure.

INTRODUCTION

Good medicine is based upon confidence between the patient and the doctor. Sometimes this confidence is absent. Clenched fist injuries are one of the situations in which the patient does not always tell the true history, and the surgeon, misled by the story of the accident, underestimates the severity of the injury and does not proceed with adequate treatment. Many of these injuries occur in unusual places at inconvenient hours, follow alcohol or drug abuse, and the surgeon on call is not always an expert in hand injuries. All these conditions create the basis for disaster, with medical and legal implications. It is imperative to recognize these lesions and in suspected cases, even when the injury mechanism is denied, to proceed with aggressive surgical therapy.

ILLUSTRATIVE CASES

Case 1

A 27-year-old male was seen on a Monday morning with a painful swollen right hand. A small abrasion on top of the third metacarpal head was present. The patient claimed to have fallen

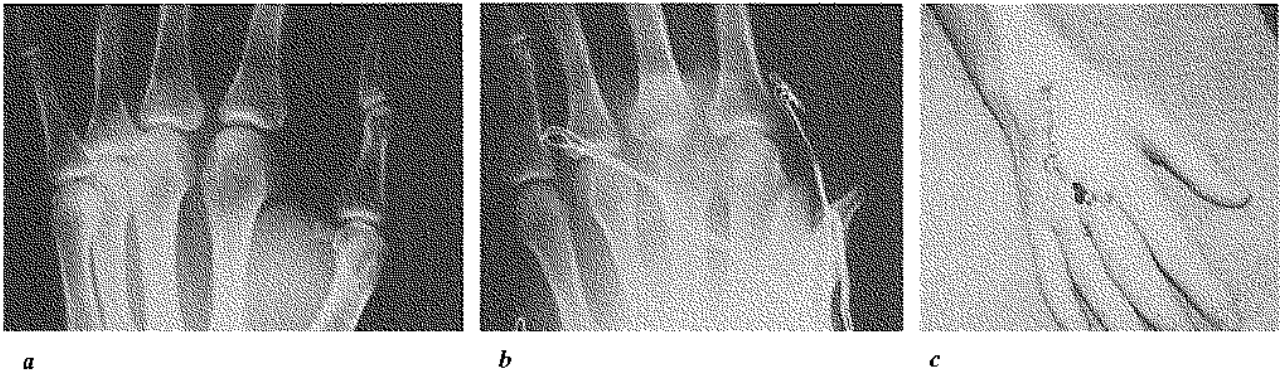
from a stair. No treatment was initiated. Two days later he came back with extreme pain and swelling. Drainage of pus was obvious the following day and a paraarticular abscess was drained. Antibiotic therapy (Duracef®) was instituted. The organisms



Fig. 1 : Case 1 — Tomogram 1 revealing arthritis with bone erosion.

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cultured were *Staphylococcus saprophyticus* and *Streptococcus enterococcae*. Pain and swelling decreased. A week later he consulted again with increasing pain and stiffness of his middle finger. The radiographs revealed arthritis (fig. 1), and at that moment he admitted the real origin of his injury. The further follow-up was characterized by irregular visits, noncompliance with antibiotic intake and missed appointments. At 2 months we saw him with a poor function of his third finger (range of motion (extension/flexion) : metacarpophalangeal joint (MCP) : - 30/50 ; proximal interphalangeal joint (PIP) : - 30/45 ; distal interphalangeal joint (DIP) : 0/30).

Case 2

An 18-year-old male had a nocturnal injury of obscure origin, incurred on 31 December. Clinical assessment revealed a small wound on the dorsal aspect of the third metacarpal head of his right hand. The wound was sutured. The radiograph taken at that time was normal (fig. 2a). Pain, swelling and suppuration made several debridements necessary, including resection of the distal third of the metacarpal. Even then the infection could not be controlled. We saw him at that stage (fig. 2c) with a draining wound, poor function and extreme pain. He only admitted in our department the real events on New Year's eve. A third ray resection was performed, with good healing. He initiated a claim against his first physician. He regained full range of motion of all other fingers.

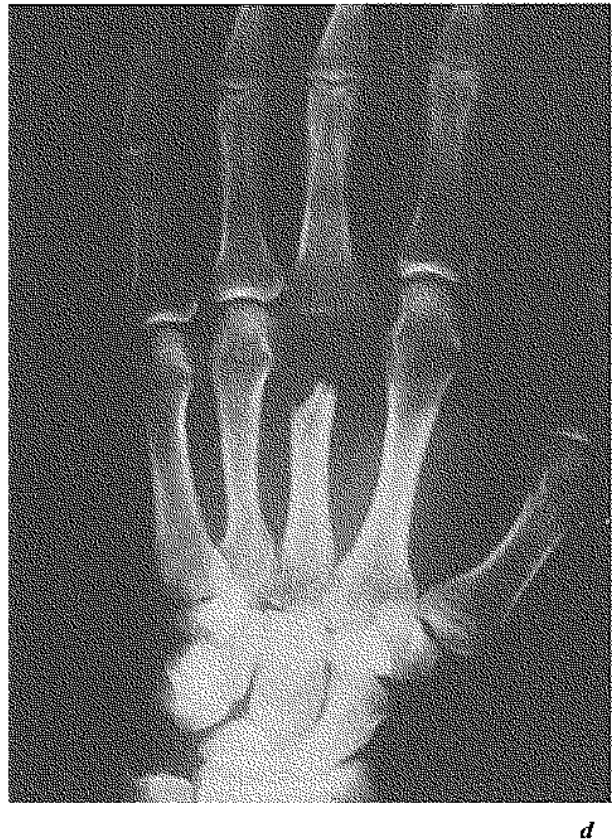


Fig. 2 : Case 2 — The radiographs on admission (a), 3 weeks later, (b) on presentation in our department ; draining wound, (c) and radiographs (d) 2 months later.

Case 3

A 44-year-old bar keeper was seen in the emergency room with a cerebral concussion and an abrasion on top of the third metacarpal head of his right hand. The wound was explored, no tendon injury was revealed, and the wound was left open. Antibiotics (Floxapen®) were started.

Several days later he was seen with increasing pain and swelling, making several debridements necessary. The joint was resected. He refused amputation. No organisms could be cultured from the various tissue samples. A vascularized metatarsophalangeal joint transfer of the second toe with overlying tendon and skin was performed, 4 months postinjury. Although this microvascular procedure was a success technically, the functional outcome was poor (Range of motion (extension/flexion) : MCP : 0/15 ; PIP : 0/10 ; DIP : 0/10). He too initiated a legal procedure with claims against all previous surgeons.

PATHOGENESIS

The clenched fist injury or the human fight-bite injury is the result of punching the closed fist into the victim's open mouth, whereby the teeth produce a wound on the dorsum of the metacarpophalangeal joint, with or without penetration of the joint, usually of the third ray of the dominant hand (2, 4, 9).

With a closed fist, the metacarpophalangeal joint of the third finger is the most prominent part of the hand in any plane ; it is obvious that this structure will strike the opponent's teeth first. It is interesting that the penetration of skin, extensor tendon, capsule and metacarpal head are aligned during impact, but with the fingers extended and with the accompanying soft tissue swelling these four puncture wounds will not correspond. The entrance wounds are usually small and far more proximal than the metacarpophalangeal joint level. When the teeth penetrate the joint, direct inoculation of oral flora occurs. These are human-adapted microorganisms already at an appropriate temperature. They spread rapidly in the subcutaneous, subfascial and subtendinous spaces of the dorsum of the hand and into the metacarpophalangeal joint. The traumatized tissue and the synovial fluid, and the anaerobic conditions create an ideal environment for the organisms.

The impact of the teeth on the metacarpal head frequently produces a chondral "divot" fracture (6). Sometimes a fragment of broken tooth can be found in the joint.

MICROBIOLOGY

The oral cavity contains a large amount of bacteria, and more than 40 species have been identified. The most common isolates are *Staphylococcus*, *Streptococcus* and *Eikenella corrodens*. The latter is usually found on dental scrapings and is responsible for 7 to 29% of clenched fist infections (2, 5, 7, 8, 9). Other organisms have been cultured, including gram-negative bacteria (*Klebsiella*, *Enterobacter*, *E. coli*, *Bacteroides* and *Proteus*) and *Neisseria*, *Clostridia*, and *Micrococcus*. There are reports on the transmission of tuberculosis, syphilis, hepatitis B and actinomycosis by human bites.

CLINICAL PRESENTATION

The patients are usually reluctant to tell the exact mechanism of injury or even to seek early medical treatment. A distinction is made between early (within 24 hours), delayed (1 to 7 days) and late (at least 7 days after the incident) presentations.

In the early presentation, the patient comes to the emergency room with an innocuous looking wound on top of the third metacarpal head of his dominant hand. The wound is often very small, no larger than a puncture wound, sometimes stellate in configuration. A direct communication with the joint space is usually not revealed, mainly because the hand is examined with the fingers in extension. Only in flexion, do perforations of skin, tendon and joint capsule come in line (6). Often the area is more swollen and tender than would be expected with such a minimal wound. Conventional radiographs are normal. Evers and Allen (3) described a skyline view for the disclosure of intra-articular damage. Although standard radiographs are usually normal, they should be obtained to note the presence or absence of a fracture or a foreign body.

After 24 hours the hand is extremely painful and swollen with profuse discharge of malodorous fluid. Moderate general symptoms as fever and leucocytosis are present in moderation. Probing the wound or opening it reveals the true nature and extent of the injury.

In the late presentation, the patient has undergone several debridements, not all successful, with variable amounts of bone, soft tissue and joint structures removed. Patients are then aggressive and hostile towards their previous physicians, and often threaten legal action.

THERAPY

Immediately

A puncture wound over the third metacarpophalangeal joint must be considered as a clenched fist injury until proven otherwise. Suspicion is the cornerstone of adequate treatment. Tetanus prophylaxis is of course mandatory.

The wound should be explored and debrided under good conditions : a competent surgeon with good equipment, a fully adapted set-up in the operating theater (lighting, tourniquet, draping), personnel, and the necessary anesthesia (regional or general) are the basic rules. Aerobic and anaerobic cultures should be obtained ; an extensile approach is used, abundant irrigation and debridement of all damaged tissue are necessary ; all tissue planes should be explored, and the joint cavity must be opened. If the tendons are avascular or macroscopically infected, they should also be resected.

Most authors recommend leaving the wound open, although recently Chadaev *et al.* (1), based on a very large series (221 cases), compared open treatment with the treatment including closure of the skin and found better results in the latter treatment protocol.

We too prefer closure of the skin.

When the joint surfaces are damaged by the infection or the treatment, it is important to maintain the length of the finger with an external fixator with the metacarpophalangeal joint in distraction. The PIP and DIP joints are mobilized. This will prevent joint stiffness and makes later reconstruction possible. Too often we see patients after numerous debridements, with a large part of the metacarpal resected and a collapsed finger. Under these conditions a reconstructive procedure, usually a vascularized joint transfer, is excluded.

After the surgical procedure combined antibiotic treatment must be started : a combination of penicillin (6×1 million units/day) (anaerobes and *Eikenella*) and a cephalosporin ; a cephalosporin alone is another possibility (i.e. cefotaxime 2-45 mg/day). *Eikenella* is also sensitive to ampicillin, carbenicillin and tetracycline, but resistant to oxacillin, methicillin, nafcillin, clindamycin and most aminoglycosides.

Once the organism(s) and its (their) antibiotic sensitivities are determined the appropriate (oral) antibiotics can be administered. We usually continue oral antibiotics 4 weeks after healing has become obvious (in general 6 to 8 weeks total).

Late reconstructions

Once the infection is under control, reconstructive procedures can be proposed. When the emergency procedure was adequate and successful, the outcome will be reasonably good, but when the treatment required resection of bone and soft tissue (delayed treatment, severe infection) several reconstructive options are possible. A ray amputation must be considered when local or general conditions do not allow major reconstructive surgery. When the soft tissue conditions are good, arthroplasty or an arthrodesis is another possibility. Usually however the defect is a combined one, and a free vascularized metatarsophalangeal joint transfer with overlying extensor tendon and skin is the treatment of choice.

CONCLUSION

Human bite wounds, in particular the clenched fist wound, are severe injuries with major complications : joint stiffness, pain, early arthritis and a high amputation rate (7 to 20%). Some authors claimed to restore normal joint function in only 10% of the cases. The key to successful outcome is suspicion of the injury and aggressive surgical treatment. The role of prophylactic antibiotic administration to patients with wounds of obscure origin can be questioned, since the potential danger of masking a deeper infection or an unusual organism is a reality. We only start antibiotics after a tissue sample has been taken.

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SAMENVATTING

L. DE SMET, D. STOFFELEN. Het gebalde vuist syndroom.

Bij contact van de gebalde vuist met de tanden van de tegenstander kan een perforatie optreden van huid, pees en gewricht van het metacarpophalangeale gewricht van de derde vinger van de dominante hand met ernstige sepsis. De gevolgen zijn vaak desastreus, zowel medisch als juridisch.

RÉSUMÉ

L. DE SMET, D. STOFFELEN. Le syndrome du poing fermé.

Après contact du poing fermé avec les dents d'un adversaire, une perforation de la peau, du tendon extenseur et de l'articulation métacarpo-phalangienne du troisième rayon de la main dominante peut se produire. Cet accident provoque régulièrement une arthrite septique catastrophique. Les conséquences sont importantes, tant au plan médical qu'au plan médico-légal.