

Management of Chronic Osteomyelitis

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Abstract

Background : Bone infections is one of the most challenging orthopaedic complications, with considerable morbidity. There is significant impact on the life of the patients; socially, financially, physically, and mentally and it could be a limb-threatening complication. Osteomyelitis is a bone infection usually caused by bacteria, including mycobacteria, but mainly *Staphylococcus aureus* which is the most commonly responsible bacteria . Aim of study: To evaluate our management policy of chronic osteomyelitis (C.O.M).

Methods : 32 patients presented with different types &forms of chronic osteomyelitis in many sites of long & flat bones such as tibia , femur , humerus ,iliac bones and knee joint , which are not response to previous management . patients age.... range from 17 to 45 years old. Our study period extended from 2003 to 2009 with about one year follow up. our management include radical local bone debridement

with multiple bone drilling and multiple washing by many antiseptic agents plus post operative specific antibiotic regime include triple intravenous broad spectrum antibiotics for two weeks , followed by parenteral another two antibiotic regime for minimum 1.5 month up to 3 months,

Results : From 32 patients involved in our study , 30 patients were found presented with non specific chronic osteomyelitis in different form as following : 15 patients presented with tibial (C.O.M) & discharging sinus associated with offensive odor , 7 patients (21.8 %) presented with (C.O.M) of femur, 7 patients (21.8 %) presented with (C.O.M) of humerus mainly after internal fixation device application (plate & screw)and one case (3.1 %) presented with discharging pus from knee joint as chronic septic arthritis . only two patients (6.2 %)presented with specific type of (C.O.M) such as T.B osteomyelitis .

Al – Kindy Col Med J 2011; Vol. 8 No. 1 P:103-107

Introduction

Acute bacterial osteomyelitis carried about 50% mortality in the pre-antibiotic era, because of overwhelming sepsis with metastatic abscesses⁽¹⁾. Although antimicrobial drugs have dramatically changed the prognosis of the acute haematogenous form, chronic bacterial osteomyelitis remains a challenging medical problem. Despite advances in antibiotic development, it often remains refractory to chemotherapeutic treatment alone⁽²⁾. The rapid development of antibiotic resistance by *Staphylococcus* spp will probably demand more frequently a strategy of combined medical and surgical treatment .

Bone infections is one of the most challenging orthopaedic complications, with considerable morbidity. There is significant impact on the life of the patients; socially, financially, physically, and mentally and it could be a limb-threatening complication. Osteomyelitis is a bone infection usually caused by bacteria, including mycobacteria, but mainly *Staphylococcus aureus* which is the most commonly responsible bacteria .High-energy penetrating extremity injuries are often associated with open fractures that have varying degrees of soft-tissue contamination and tenuous soft-tissue coverage, resulting in a relatively high prevalence of (C.O.M). This type includes osteomyelitis secondary to a contiguous focus of infection after trauma and /or after its surgical treatment, osteosynthesis.

(C.O.M) represent a persistent infection that is very difficult to eradicate. Usually presented with bone pain, recurring infections in the soft tissue over the bone, and constant or intermittent drainage of pus through the

skin by sinus tract. therefore(C.O.M) is a surgical disease that require significant dedication from both patients & surgeons to eradicate. It is important to understand the etiology of the infection, as well as the pathophysiology of its chronicity⁽³⁾

Conclusion : (C.O.M) is a bone infection which is difficult to cure , but could be successfully controlled with high success rate if combination of local surgical management with specific antibiotics regime applied .the ideal dosing regimens, and the duration of treatment, remain controversial

Key words : Chronic Osteomyelitis , Triple Antibiotics

Methods

32 patients presented with different types &forms of (C.O.M) in many sites of long &flat bones such as tibia , femur , humerus ,iliac bones and knee joint as septic arthritis & osteomyelitis, which are not responding to previous management done by other doctors. their age range from 17 to 45 years old. Our study period extended from 2003 to 2008 with about one year follow up. Most patients were presented with draining wounds that fail to heal or intermittently reopen which gave the suspicious for the presence of an underlying chronic bone infection. Additional signs and symptoms of osteomyelitis include local pain, redness, swelling, offensive odor and bony instability were present also. General blood test was requested also to look for evidence of immune activity and inflammation. The most accurate

method of verifying the presence of(C.O.M) is a

bone biopsy ??....*figure -1*



Figure – 1 : Chronic osteomyelitis of the tibial bone with very offensive odor ,with black soft tissue & multiple sinus discharge of the Lt.lea . seauence of photo showing our mannaement with complete healina .

our management include radical local bone debridement (including fistulectomy & sequestroectomy), with multiple bone drilling and multiple washing by hydrogen peroxide(H₂O₂), normal saline ,bovidon iodine plus post operative specific antibiotic regime include triple intravenous broad spectrum antibiotics for two weeks (Cefotaxime + Metrenidazol + Garamycine), followed by parentral another double antibiotic regime (Ciproflxacin + Refadine) for minimum 1.5 month up to 3 months, depending on severity of infection , surgical finding , clinical response and complete healing , with exception of tuberculous osteomyelitis we keep patients for 6 ~9 months on antituberculous medication .

Adequacy of debridement by removal of all infective and necrotic material, from both of bone origin and soft-tissue in addition to bone drilling , remains the most important clinical predictor of success; Drain the infected area by opening up the area around infected bone allows surgeon to drain any pus or fluid that has accumulated in response to the infection and It is necessary not to close the foci: in this way we leave an external drainage, which is able to provide a tissues sterilization by suction drainage and by the effects of the locally applied sterilizing agents and effect of systemic antimicrobial therapy.



Results :

From 32 patients involved in our study , 30 patients were found presented with non specific chronic osteomyelitis in different form & pictures as following : 15 patients (46.8 %) presented with tibial chronic osteomyelitis & discharging sinus(mainly in upper third of tibia) associated with offensive odor , 7 patients (21.8 %) presented with chronic osteomyelitis of femur (mainly in mid shaft) , 7 patients (21.8%) presented with chronic osteomyelitis of humerus mainly after internal fixation device application (plate & screw) along humerus shaft and one case (3.1 %) as chronic presented with discharging pus from knee join as chronic septic arthritis .only two patients (6.2 %)presented with specific type of chronic osteomyelitis such as T.B osteomyelitis ,represented as multiple focus of discharging sinus extended from lower back (iliac bone) down to thigh involving hip joint with multiple opening sinuses along femoral shaft ,or as single chronic discharging sinus in lower part of thigh

involving knee joint . From cultures of operative specimens, *S. aureus* is the main causative agent of chronic bacterial osteomyelitis, accounting for about two thirds of the cases, followed by pseudomonas and enterobacteria. Osteomyelitis complicating diabetic foot infection, however, is typically polymicrobial, with mixed aerobes &

facultative anaerobes, G -negative *Staphylococcus* spp, such as *S. epidermidis*, are responsible for the majority of chronic osteomyelitis associated with orthopaedic implants and for about 90% of pin tract infections. Other less common micro-organisms isolated include salmonella and anaerobes such as clostridium .

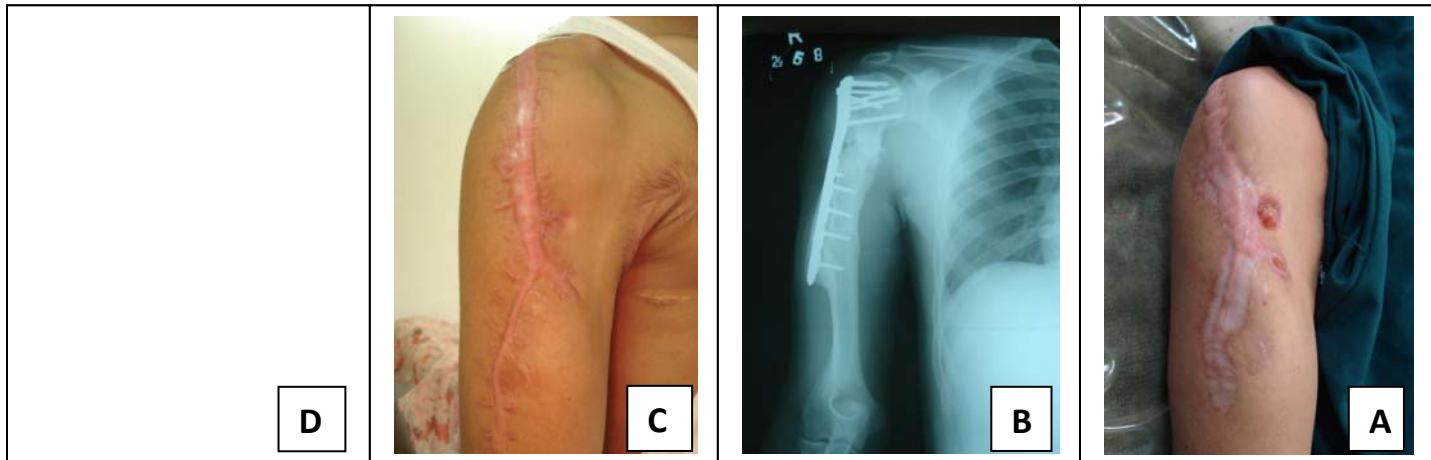


Figure – 2 : showing photo & X- ray picture of chronic osteomyelitis of humerus with two point of discharge sinus in Rt. upper arm . (A ,B) before and (C ,D) after our Management, see complete healing & closure of sinus opening & even of bony union .

or fungal spores may infect the bone directly through open fractures, during bone surgery, or from contaminated objects that pierce the bone.⁽⁵⁾ *Staphylococcus aureus* is the bacteria most commonly responsible. *Mycobacterium tuberculosis* (the main cause of tuberculosis) can infect the vertebrae or any bone to cause osteomyelitis⁽⁶⁾

Osteomyelitis can result from a variety of etiologies but most often is a consequence of trauma - open fractures to a long bone. High-energy penetrating injuries are often associated with severe open fractures that have varying degrees of soft-tissue contamination and tenuous soft-tissue coverage, resulting in a relatively high prevalence of (C.O.M)⁽⁷⁾ , Diagnosing (C.O.M) requires a careful history and thorough physical and radiographic examinations. Sometimes, (C.O.M) is undetectable for a long time, causing no symptoms for months or years⁽⁸⁾ Treatment of (C.O.M) depend on adequacy of debridement with proper antibiotics regime remains the most important clinical predictor of its success.

The cornerstones of treatment include complete excision of unhealthy bone, well-vascularized soft tissue coverage and administration of culture

specific antibiotics. Meticulous debridement (surgical removal) of all infected bone and scar tissue is essential in the treatment of (C.O.M) leaving the wound more or less opened ,we did just wound approximation. Wound swabs alone are often inaccurate in diagnosis real causative bacterial agents of(C.O.M): cultures from operative specimens are a more reliable method of planning precise antibiotic⁽⁹⁾

The chronicity of osteomyelitis may be explained by focusing on how bacteria succeed in overcoming both host defense mechanisms and the antibiotic agents. the current analyzing information about the Pathophysiology of chronic osteomyelitis, have two main aspect : the first one saying that, bacteria adhere to bone matrix and orthopaedic implants via receptors to fibronectin and to other structural proteins⁽¹⁰⁾ They subsequently elude host defenses and antibiotics by “hiding” intracellularly, by developing a slimy coat, or by acquiring a very slow metabolic rate^{(3),(11)} The presence of an orthopaedic implant also causes a local polymorphonuclear cell defect, with decreased ability to kill phagocytosed bacteria⁽¹²⁾ Osteolysis is determined locally by the

interaction of bacterial surface components with immune system cells and subsequent cytokine production.⁽¹³⁾ The increasing development of **Combination of both medical & surgical treatment**⁽¹⁴⁾

antibiotic resistance by *Staphylococcus aureus* and *S.epidermidis* will probably make medical treatment alone was very less successful than **Box -1 , summarises the above section.**

Box -1 Persistence of infection

- Once an **infection** has established, its **eradication** by antibiotic treatment alone, is **very difficult**.
- Dead bone and implants are the most common reasons for failure of conservative treatment, therefore **bacteria cannot be reached by host defence mechanisms or antibiotics ??**
- The presence of an implant causes **exhaustion of local polymorphonuclear cells** that become unable to kill phagocytosed bacteria.
- Bacteria can also **elude host defence mechanisms** by hiding intracellularly and by developing a protective slimy coat.

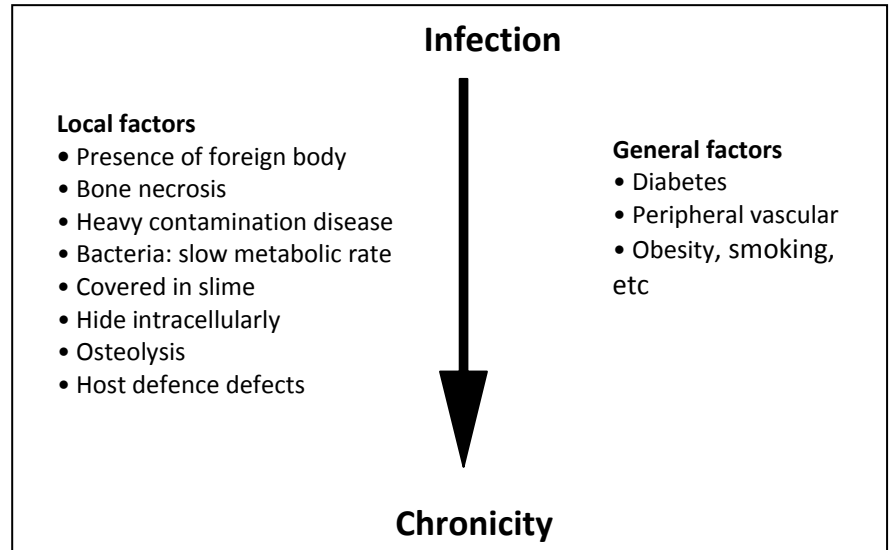


Figure - 3 : Pathogenetic factors behind the chronicity of a bone infection

The second aspect say that ,when a bone becomes infected, the soft, inner part (bone marrow) often swells. As the swollen tissue presses against the rigid outer wall of the bone, the blood vessels in the bone marrow may become compressed, which reduces or cuts off the blood supply to the bone. Without an adequate blood supply, parts of the bone may die⁽¹⁵⁾

These areas of dead bone are difficult to cure infection because it is difficult for the body's natural infection-fighting cells and antibiotics to reach them. See below **figure – 3** .

Regarding cases of refractory osteomyelitis which is a serious disease that fails to respond to aggressive medical and surgical treatment⁽¹⁶⁾ which reflect the cause of relapsing some cases in our study group .

A plethora of many alternative therapies have been evolved such as hyperbaric oxygen therapy which has been proven to enhance bone and soft tissue healing in many vitro and vivo studies .A precise clinical staging system for patient selection and treatment organization is imperative to successful outcome^{(15),(16)}

Conclusion

Success is difficult to measure , but probable cure is better than no cure at all. C.O.M is a bone infection which is difficult to cure . it could be successfully controlled with high success rate , if combination of local surgical management with specific antibiotics regime applied , which include 2 week intravenous triple antibiotics followed by another two oral antibiotics for minimal 1.5 month up to 3.5 months. the ideal dosing regimens and the duration of treatment, remain controversial. ??

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Al – Kindy Col Med J 2011; Vol. 8 No. 1

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Received at 9th Jan 2012 Accepted at : 15th Feb. 2012