Management of Chronic Osteomyelitis Following Gunshot Injury: A Systematic Review of Literature

Essay

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Abstract

Background: The term osteomyelitis defined as an inflammatory process accompanied by bone destruction and infected by microorganism. The infection can be limited to a portion of the bone or can involve several regions, such as periosteum, cortex, marrow, and the surrounding soft tissue. Historically, osteomyelitis has been classified as acute, sub acute, or chronic based on occurrence of infection or injury. The duration of symptoms of infection is associated with peculiar anatomo-pathological findings and clinical and diagnosis features.

Aim of the Work: The aim of this work is to systemic review different methods of management of chronic osteomyelitis following gunshot injuries.

Methodology: The electronic databases Medline, PubMed, Google scholar, and Cochrane collaboration were systematically searched From 1995 TO 2016. We conducted a systematic review and best evidence synthesis.

Results: Studies were selected based on the title and abstract by the assessment of chronic osteomyelitis and gunshot injuries. A total of 850 studies of which 26 met our inclusion criteria after initial screening of titles and abstracts of these 26 studies 5 met the criteria for final review.

Conclusion: Chronic bone infection due to gunshot injuries is one of the most difficult treatments. Multiple bacterial organisms usually contaminate gunshot and war wounds.

The results of the included studies imply that treatment of chronic osteomyelitis with antibiotic and external fixations with radical debridement were showed high success rates.

Keywords: Management of Chronic Osteomyelitis, Gunshot Injury

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I would like to dedicate this work to

My beloved Mother and my dear Father For pushing me into Science and Honor, They are the basis of everything

My Wife Rehab, my son Ahmed and my daughters Rafeef and Reem strongly doubt there are any words to express how them, they are my gift from Allah.

My Brothers and Sisters To those who are close to mysoul, who share melap of the mother and their derived Ezzati and my insistence.

Thank you

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Contents

List of Abbreviations

CBC:	Complete Blood Count.
CNS:	Central Nerve System.
CRP:	C-Reactive Protein.
CT:	Computed Tomography.
ESR:	Erythrocyte Sedimentation Rate.
GSWs:	Gun Shot wounds.
HBOT:	Hyperbaric Oxygenation Therapy.
KE:	Kinetic Energy.
MICs:	Minimum inhibitory concentrations
MRI:	Magnetic Resonance Imaging.
MRSA:	Methicillin resistant staphylococcus aureus.
PET:	Positron Emission Tomography.
PMMA:	Polymethylmethaxrylate
PTH:	ParaThyroid hormone.
TNF:	Tumor Necrosis Factor.
VAC:	Vaccum Assisted Closure.

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Aim of the Work

The aim of this work is to systemic review different methods of management of chronic osteomyelitis following gunshot injuries.

Mechanism of Gunshot Injury

Introduction

The term osteomyelitis defined as an inflammatory process accompanied by bone destruction and infected by microorganism. The infection can be limited to a portion of the bone or can involve several regions, such as periosteum, cortex, marrow, and the surrounding soft tissue. Historically, osteomyelitis has been classified as acute, sub acute, or chronic based on occurrence of infection or injury. The duration of symptoms of infection is associated with peculiar anatomo-pathological findings and clinical and diagnosis features (Figure 1.1**) (1).**

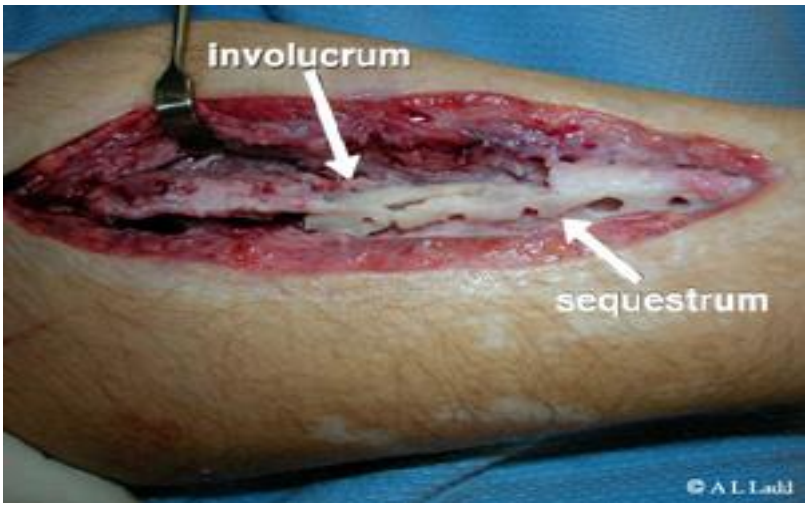

Fig.1.1: Chronic bone infection **(2).**

Management of chronic osteomyelitis is challenging to the patient and physician at the same time. Treatment of chronic osteomyelitis consists of excision of the devitalized material, skeletal stabilization, obliteration of dead space, obtaining good soft tissue cover and reconstruction of the bone defects, all in conjunction with antibiotics **(3).**

Mechanism of Gunshot Injury:

Gunshot wounds caused by firearms, represent damage to the body, whose features are large destruction of the tissue, primary contamination with polymorphic bacterial flora and contaminated organisms. Gunshot injuries are usually injuries to the extremities about 70%, out of which about 40% is accompanied with comminuted fractures. They occur due to the force of bullets from firearms or a piece of grenade, land mines, or other explosive devices **(4).**

The majority of gunshot injuries in the battlefield caused by military ammunition, which has typically higher velocity with greater kinetic energy and consequently potential to destroy tissue. The damage inflicted on tissues depends on the amount of kinetic energy holder by the bullet when it strikes the body and the amount holder when, and if, it exits the body. Kinetic energy (KE) is given by the following equation:

$$KE = MV2/2$$

Where; M = mass, V = velocity

Modern military ammunition, like M-16 and AK-74 used by military are all high velocity with relatively low mass and carried a large KE. The KE of bullets produced tumbling, fragmentation, or deformation (sometime called expansion due to the increases the surface area presented by the bullet) increases the drag on the bullet, slowing it, and increasing the transfer of energy. A similar effect occurs when the bullet strikes bone after traversing soft tissue **(4).**

The wounding effect of bullets can be divided into two types (Fig.1.2):

1. A permanent cavity: the formation of a wound tract by the direct cutting and shearing effect of the bullet forcing its way through tissue, i.e., the same wound that would be produced by arrow of the same diameter travelling through the body.

2. A temporary cavity or cavitation: This results from the turbulent flow created in the wake of the bullet and produces an expanding bubble of low pressure vapor that rapidly collapses back on itself. Cavitation occurs in around of most of bullets, but is greater with more turbulence around the bullet, i.e., if it is fragmenting, tumbling, or deforming or is faster.

These features are more commonly seen in large military ammunition **(4)**.

It is very important to distinguish between anatomic and functional effect of GSWs. The anatomic effect of bullet traversing the body and creating a permanent cavity will be similar in the thigh or the head, but the functional effect may be negligible in the former and almost certainly fatal in latter. In the head and torso, there are organs and structures in which almost any anatomic disruption will result in death, e.g., the CNS, heart, and great vessels, whereas structures in the extremities are more tolerant of gunshot injuries **(4).**

Gunshot wounds cause open wounds, which are more suspected to expose to microorganisms. In addition, acute osteomyelitis will happen and over several days or weeks become as long standing infection, which is somewhat defined as chronic osteomyelitis that evolves over months or even years, characterized by the persistence of microorganisms, low grade inflammation, and the presence of sequestrum and fistulous tracts (Figure 1.3) **(4).**