شبكة المعلومات الجامعية

سامية محمد مصطفى

بسم الله الرحمن الرحيم

شبكة المعلومات الجامعية

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التوثيق الالكتروني والميكروفيلم

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جامعة عين شمس

التوثيق الإلكتروني والميكروفيلم

قسم

نقسم بالله العظيم أن المادة التي تم توثيقها وتسجيلها علي هذه الأقراص المدمجة قد أعدت دون أية تغيرات

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سامية محمد مصطفى

شبكة المعلومات الجامعية

بعض الوثائق الأصلية تالفة

بالرسالة صفحات لم ترد بالأصل

Penetrating Injuries of the Brain

Essay Submitted

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By

Maged Shawky Farid Morgan

M.B., B.Ch.

Supervisors

Prof. Dr. Alaa El-Din Abd-El-Hay

Professor of Neurosurgery

Faculty of Medicine - Ain Shams University

Ass. Prof. Dr. Mohamed Alaa Fakhr

Assistant Professor of Neurosurgery

Faculty of Medicine - Ain Shams University

Faculty of Medicine

Ain-Shams University

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To

My Parents

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INTRODUCTION

The term "**Penetrating**" is frequently used to designate missile wounds of the head. While "**Perforating**" will be used to designate puncture and stab wounds.

Depending on its energy, a missile may lodge in the brain, ricochet off the opposite inner table (creating another wound tract), or exit the cranium. Exit wounds in the brain and skull are frequently larger than entrance wounds owing to deformation, yawing or tumbling, and slowing of the missile, all of which result in greater energy transfer to the surrounding tissue and have risks of infection and hemorrhage. Additional problems result from retained foreign bodies and from the deeper, more extensive parenchymal damage *(Youmans, 1990).*

Patient's population vary in military from civilian practice concerning age, missile origin and high versus low impact velocity as well as time lag from wounding to definitive care *(Clark, 1986).*

The intent of treatment in such penetrating injuries is to increase the incidence and quality of survival by debridement with removal of all accessible bone or metallic fragments, intracranial hematoma, control and relief of increased intracranial tension, prevention of early or late infection of the brain, early and late post traumatic epilepsy and reduction of secondary damage to the affected brain tissue *(Brandvold, 1990).*

Aim of the Work

This study aims at evaluation of the best measures for early diagnosis and management of cases of penetrating injuries of the brain.

The work is in a form of an essay where a review of literature regarding penetrating injuries of the brain will be given:

- Pathophysiology
- Clinical Picture
- Investigations
- Management
- Complications

Pathophysiology

PATHOPHYSIOLOGY

The impact of missile to the head causes immediate tissue, displacement and disruption that is soon followed by secondary alterations in the physiological parameters of the brain.

Tissue disruption occurs at three anatomical levels:

1. Superficial soft tissue of **the scalp** is torn by the missile itself and, if the weapon is sufficiently close by the pressure waves of gas combustion. Beyond the air tissue interface, the gaseous pressure waves of weapon firing are of little significance. Lacerated soft tissue carried intracranially by the force of the missile may act as a vehicle for inward transport of bacteria.

2. **Bone** is comminutedly fractured, and depressed edges may damage immediately subjacent vascular or cortical structures. Indriven fragments may act as secondary missiles.

3. **Dura** is perforated, cerebral parenchyma is displaced by the missile and bone fragments and disrupted both along the missile path and at distant sites within the cranium by emanating shock waves and contrecoup injury.

(Fackler, 1984)

The amount of kinetic energy contained by a missile is defined by the formula:

$$E = \frac{1}{2} mv^2$$

Where: "**m**" is the mass of the missile, and "**v**" is its velocity.

Because the energy varies directly with the mass and with the square of the velocity. Velocity is relatively more important in determining the energy of the missile and thus the extent of the injury.

The bullet's ability to destroy tissue is directly related to its kinetic energy at the moment of impact. The damage created by high-velocity bullets (more than 700 meters/sec) is disproportionately greater than that produced by ordinary velocity (less than 250 meters/sec).

Point of separation between high-velocity missiles and those of low velocity is the speed of sound (approximately 320 m/s) *(Nagib, 1986).*

The amount of energy imparted to the brain is dependent on the difference between the missile velocity at impact with brain and its residual velocity upon exiting from brain and is defined by the formula

$$E = \frac{1}{2} mv_1^2 - \frac{1}{2} mv_r^2$$

Where: v_1 = the initial velocity of the missile at impact, and v_r = the velocity of the missile when it leaves the head *(Carey, 1989).*

MISSILE CHARACTERISTICS

1. Missile Velocity and Yaw

Yaw is the deviation of the bullet from its longitudinal axis about a vertical axis of rotation established by the center of gravity of the bullet.

A bullet may yaw upward or downward to 90°. High velocity missiles usually hit their target with only 0 to 4° of yaw.

(Adams, 1982)

2. Shock Wave

On impact with tissue, high-velocity bullets produce a shock wave with a pressure of up to 60 atm. The shock wave travels faster than the bullet and precedes its cutting and crushing path through tissue. This over pressure does not appear to cause damage to the tissue in the bullet's path since its total duration is only a few μsec. However, it has been hypothesized that this wave may be responsible for hemorrhagic contusions.

3. Bullet Fragmentation and Deformation

Soft-point bullets and copper jacketed military bullets may fragment as they pass through soft tissue. Many tiny fragments shear off bullet and are scattered in a radial direction perpendicular to the bullet path. These fragments may cause extensive tissue destruction *(Fackler, 1984)*.