Traumatic Ballistic : Analysis of Parameters and Confrontation of Wounds Caused from Missiles in Human Body

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ABSTRACT

The aim of the present inquiring work is the study of the damages which are caused in the human body in case it offends by missiles, the confrontation of wounds that are attributed to these missiles, the nursing and medical diagnosis which is held through the examination of wounded people. Regarding the diagnosis of the damage, which is caused in the human organism, is essential the knowledge of parameters that recommend the wound of missile, like penetration medium, permanent cavity, temporary cavity and fragmentation. The results of the present study shows that the central nervous system and the circulatory system need direct confrontation, when they are offended, while it is possible to lead to instantaneous death.

Key words: cavity, fragmentation, hydrostatic shock, mechanism of missile's wound, penetration medium, traumatic ballistic.

Introduction

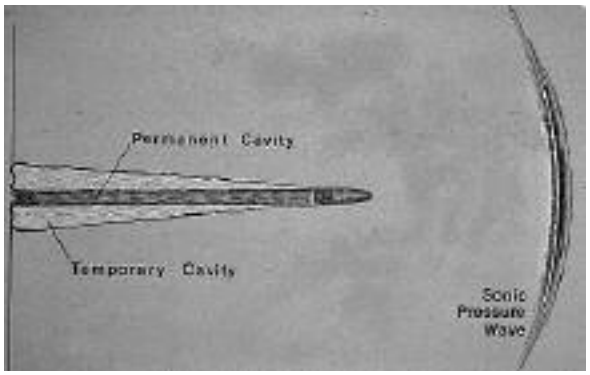
In the past, when people hadn't created the first cultures, they wasted the bigger part of their life trying to ensure food, roof and water. Many times, they were called to face other people and other kinds that were trying to ensure the same things. Centuries later, people faced the problem of immigration, since they abandoned the place, in which they lived, so as to look for new grounds with better conditions to live in. In these days, people are involved in conflicts in order to gain their freedom, money or raw materials.

In any season of human type we are referred, we can observe with regard to the conflicts that the person studied and searched the methods, which were the most damaging for his opponents. For instance, what kind of material should he use in order to manufacture the peak of javelin, what parts of the opponent's human body are more frail, in which parts of the human body will a damage cause faster death e.t.c. In these days, the arms, which are used, exploit explosive materials (like the gunpowder) in order to transmit big quantity of kinetic energy in missiles against mobile and constant objectives of offence. In this principle is supported the function of machine-guns, the shotguns and some kinds of grenades (Winter J.M., 1989).

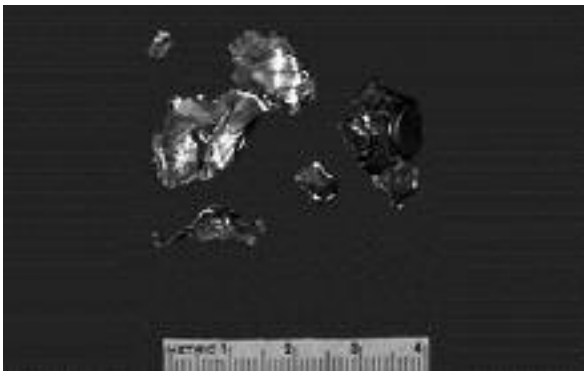
The Traumatic Ballistic is an important field of science of ballistic, which studies the damages in the human body that result from missiles and modern arms of battle that enter into this (Ann H. Ross, 1995). Particularly, this field examines the types of wound which are caused by various bullets of different calibre, the parts of the human body, which if they offend, will cause faster death, as well as the damages which are caused from bullets in the human body that are not obvious (Ann H. Ross, 1995).

Ballistic Wound Mechanism

The present study is focused on the investigation of the level of knowledge, attitudes and beliefs of the healthcare students of the University of Athens. This study is keen to analyse the parameters that have an impact on the disease and the role of the health authorities in preventing the spread of the disease. The study used as a representative sample healthcare students, a fact that is of particular interest, because this group of individuals due to their knowledge and experience based on their clinical practice are expected to be more sensitized regarding the disease.



Picture 1: Illustration of permanent and temporary cavity creations, which are attributed to the kinetic energy that is transported in the tissues of the human body from the entrance of missile. It is also depicted the form of pressing sound wave that is created by the bullet due to its high speed.



Picture 2: When a bullet strikes a target, it is possible to cause remarkable deformity and fragmentation. In this case, the bullet's head is deformed completely and broken away from its wrapping of (right of the head).

Damages in the Human Organism

The wounds resulted from missiles in the human organism, is possible to cause collapse or death. This can happen either by destroying some points of the central nervous system, either by causing serious loss of blood offending big arteries of circulatory system or by interrupting the supplement of oxygen in the brain (Peter's C.E., 1997). If the parameters of a missile's wound cause or increase the damages of the above three mechanisms in important degree, then possibly they will increase the possibility of collapse or death.

I. Shots in the central nervous system: The shots in the central nervous system are almost always lethal (Picture 3). When a bullet penetrates the brain, it is possible to injure or even to cut the nervous tissues that result in vital systems, like the myocardium, the liver and the lungs. As a result, these systems cease their function. In addition, it is possible the centre of senses of brain to be destroyed. Consequently, the individual goes into a coma from which it is difficult to come back. The shots in the cerebellum cause instantaneous death, while the shots in the spinal marrow, which is the inferior point of the central nervous system, can possibly cause from palsy to death (Sellier K.G et. al., 1994).

2. Shots in the circulatory system (Picture 3): According to clinical surveys that have been conducted, it has been proved that the organism of a medium person can put up with up to 20% loss of blood. Practically, this means that a person's organism can function only with the 80% of his blood, despite the appearance of small intensity of anaemia's symptoms. Bigger loss of blood leads to progressive necrosis of the parts of brain. How much is therefore the most minimum time that is required, so as someone, who has been struck from bullet, can lose the 20% of his blood? The answer is the following: The cardiac attribution of an individual of 70 kilos amounts in 5,5 litres per minute (this means that his heart bloods his body with 5,5 litres of blood per minute). The volume of his blood is 60 ml per kilo, which means that totally is 4,2 litres. Supposing that the individual is being in stress, his cardiac attribution increases to 11 litres per minute. If a missile, while it penetrates the individual's body, manage to cut the thoracic aorta, it will need only 4,6 seconds so as the individual lose the 20% of his blood from only one point. Surely, the brain will continue functioning for some more seconds due to the oxygenated blood that circulates in the brain (Sachini – Kardasi A. et. al., 1993).

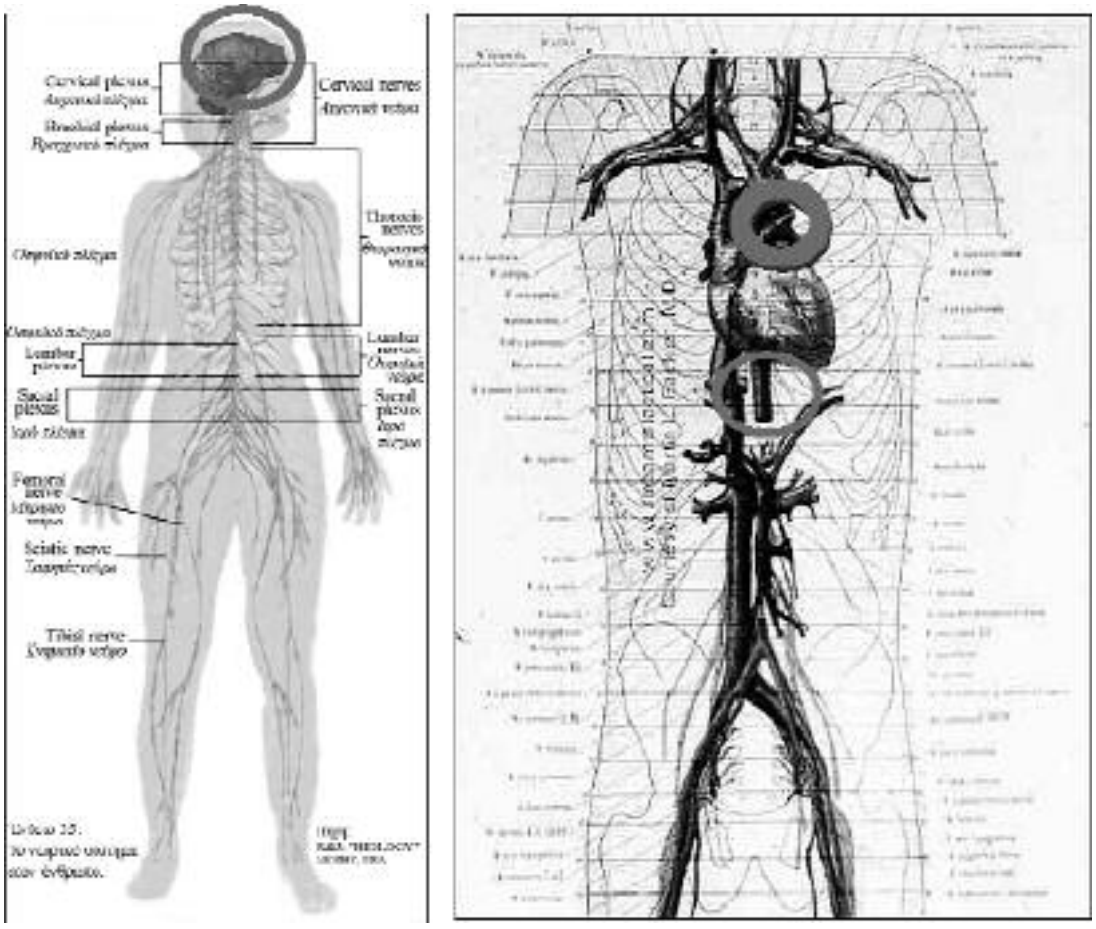
It should be marked that the majority of missile's wound do not bleed with such rythm, but in enough smaller, because: a) the bullets do not usually cut perfectly the arteries, b) while the blood pressure falls, the bleeding is decreased, c) the around tissues function as dam that limits the loss of blood, d) the bullets maybe can't hit a big artery (Peter's C.E., 1990).

3. Hydrostatic shock: It is the phenomenon, at which a missile that penetrates the body, causes damages in tissues, which are far away from the permanent cavity, due to hydraulic phenomena that are presented in parts of body, full with liquid, such as the vessels, the brain and the liver (Patel HC et. al., 2002). According to the theory of hydrostatic shock, the pressing wave that a bullet creates by virtue of high velocity speed, in case it enters in the body, displaces a big part of flesh up to ten times its size. By this way is created the temporary cavity.

A pressing wave can be created when a fluid (like the air and the water) abandons with big speed the place in which it calmed down, absorbing energy from an explosion or a missile of big speed. The tissues of the human body have a behaviour, which is similar with the water's behaviour, when enters a bullet, creating pressing waves of force above 100 atmospheres. The tissues recede violently under the effect of this pressure, creating the temporary cavity, while they drift in their movement liquids of the human body, like the blood (Sellier K.G et. al., 1994).

Moving with speed in the blood vessels, the blood is possible to destroy the smaller vessels creating bleedings far away from the orbit of entering missile. From a shot at the breast, through the vessels, the pressing wave can reach the brain creating disorders at the function of hypothalamus and of some nerves, while it is possible to be marked some small bleedings by virtue of the increased blood pressure. This

phenomenon was confirmed by the inquiring team of Goransson, who held experiments with pigs (Goransson A.M et. al., 1988). According to this research, the pigs were connected with electronic brain device and afterwards the team held shots with revolver in the breast of animals from near distance. The electronic brain device presented clues of decreased cerebral function almost immediately. Afterwards, the studies in the brain of pigs showed that a part of the nervous tissues became dead enough, before the animal dies. Similar results showed the experiments, which were held at dogs. Moreover, the inquiring team of the doctor Roberts proved with experiments of shots in bulletproof waistcoats Kevlar that even if the bullet does not penetrate the waistcoat from a shot in the breastbone with missile of mass of 8 grams and speed 400 metres per second, the heart will accept pressure 2 MPa (280 psi), while the lungs will accept pressure 1,5 MPa (210 psi).



Picture 3: Depiction of systems of vital importance of nervous (left) and circulatory (right) system, which if they are offended by missiles, they can lead to instantaneous death

"Ballistic" Examination of Wounded Person

Necessary condition for the correct confrontation of wounded person is the ascertainment of damage that he has existed. This ascertainment can be based on information, which is taken either from the wounded person or from the people who were present at the accident (medical and nursing historical), as well as on the examination, which will be held (Roupa – Daribaki Z. et. al., 2005).

The questions will be held:

a) At the people who were present at the accident and they are supposed to mention the conditions of the accident,

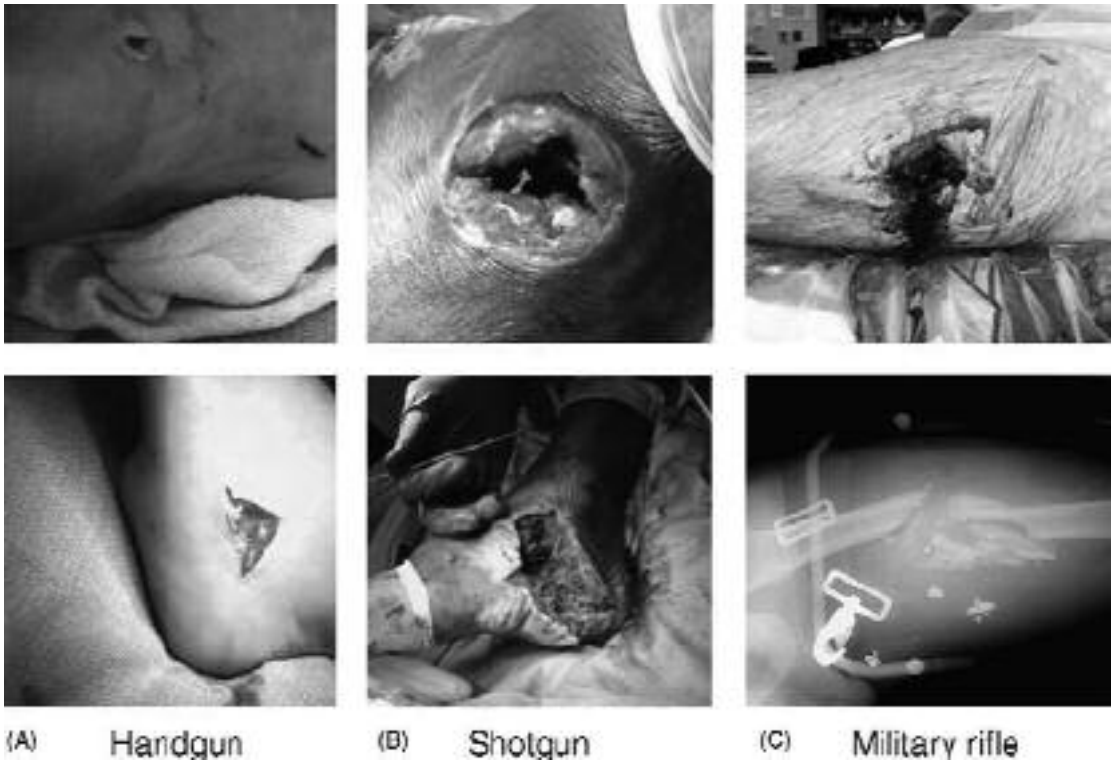
b) At the wounded person for the symptoms he feels (pain, difficulty while he breathes etc.).

The examination of the wounded person aims to point out the following:

1. Bleeding.
2. Fracture in the cervical fate of vertebral column. If the patient has difficulty in moving his head, right or left, it is very likely to be suffering from fracture in the nape. The fractures of cervical fate are possible to lead to wound of spinal marrow. As a result, the patient is possible to be handicapped or it is possible the roots of brachial mesh to be injured (Malgarinou M.A et. al., 2005).
3. Fracture in the thoracic and lumbar fate of vertebral

column. If the patient aches while we press lightly with our hand his back, it is likely to be suffering from fracture in the thoracic or lumbar fate of vertebral column. We meet more often, such kind of fractures, at the eleventh and twelfth thoracic vertebra, and at the first and second lumbar vertebra. In the case of fracture of spinal marrow, the patient is handicapped for the rest of his life (Sachini – Kardasi A et. al., 1993).

4. Fracture in the thorax. If the patient, while he breathes, he aches, it is very likely to be suffering from fracture in the thorax. A fracture in the thorax can cause to the wounded person big difficulty while he breathes, especially if it is accompanied by various diseases of the respiratory system. In this case, the artificial breathing does not benefit, while the patient's situation does not improve, but remains the same (Steyerberg EW et. al., 2008).
5. Fracture in hands and legs (Picture 4). If the patient presents acute pain in his hands or legs and can't move them or if one of them presents swelling or has taken unnatural place, it is possible the wounded person to be suffering from fracture in his hand or leg that suffers (Nteros K et. al., 1999).
6. Internal wounds in the abdominal area. These are usually accompanied from fracture of the basin's bones. The frailest abdominal parts of the human body are the urinary bladder, the urethra, the small and large intestine (Malgarinou M.A et. al., 2005).



Picture 4: Wounds at the legs from: A) handgun, B) shotgun, C) military rifle

Confontation of Wounds From Missiles

The usual handling of all wounds from missiles is based on the direct support of respiratory and circulatory system. The medical and nursing personnel ought to be educated on the placement of endotracheal intubation and on the support of breathing. It is necessary the venous catheter to be placed directly so as the intravenous administration of antibiotics to begin within the first 48 hours for the prevention of contaminations. The contaminations are caused while the bullet enters the human body. This happens because the bacteria are widely widespread in the human body and in the clothes. As a result they are transported at the wound's area (Peter's C.E et. al., 1996). In case of contamination is recommended the intravenous administration of penicillin. If there is doubt for damage in the thorax, it is placed an incision of thorax.

The use of temporary arterial access is recommended when it becomes extended surgical investigation. The arterial access, as first step of surgical intervention, allows at the medical and nursing personnel, who are involved in the surgical treatment, to work without important bleeding in tissues that are more far away from the point of artery's rupture, without the danger of thrombosis, and allowing by this way the better evaluation of viability of the involved systems (Sachini – Kardasi A. et. al., 1993).

In traumatic amputations, the mutilation should not be closed immediately, as well as the nerve's wounds should not be treated surgically immediately (Nteros K. et. al., 1999). The tablets that are administrated for the blood's coagulation, it is likely to cause dangerous side effects. It can exist rupture of intestine far away from the point of entrance of wound and sometimes is required the realisation of big extent of intestine's amputation (Roupa – Daribaki Z. et. al., 2005). Big extent of liver's amputation usually is essential due to the destruction of hepatic parenchyma. The effect of waves of percussion is observed in the liver and the spleen, which is the result from the wounds of thorax (Goransson A.M et. al., 1988).

The creation of cavity in the brain probably causes irreversible damages of cerebral substance and direct wound at the brain, which usually is incompatible with the life (Perel P. et. al., 2008).

The direct wound of abdominal area is proved mortally fatal, except if it is treated surgically directly. In some cases, it is likely to be needed a second surgical investigation. The wounds of thighs and buttocks should be dealt with attention and with big suspicion for wounds in the body's basin and in the abdomen, which are not located easily. If there are wounds at the nape, it is required surgical investigation, while further thorax's incision should be our next movement (Patel HC et. al., 2002).

The trap of "neurosis of battle" should always be in our mind with its known symptoms: the fear, the stress, the without aim movement and the precessions of conscience. These symptoms can easily deceive us, pretending cerebral wounds, shock situation, deficiency of oxygen at the brain and various other pathological situations (Steyerberg EW et. al., 2008).

Conclusions

According to the analysis, which was held in the previous units, the factors that determine the importance of wound depend on the missile's characteristics and on the characteristics of tissues of the human body that are affected. As long as bigger are the speed and the missile's mass, the form and the deceleration into the body, so much bigger is the opening up of the permanent cavity and bigger the wound. The kind of tissue, which is affected, is a decisive factor for the survival of the wounded person. The wound of brain, of big vessels or of liver are usually incompatible with the life.

In the field of battle, all wounds should be considered as though result from missile, even if they result from abrupt fall or sudden deceleration and acceleration, particularly the wounds that result from explosion. The medical and nursing intervention, in the field of battle, is very important for the patient's life. Anyone who knows how to support the basic vital functions of the human organism, like the support of breathing, the reduction of bleeding, the immobilisation of fractures, can contribute to the patient's treatment. Particular attention should be given in the medical and nursing handlings for the maintenance of open airways, so as a wound in the vertebral column, in case it exists, not to be in a worse situation than it was. In addition, the wounded person should be led in a secure place (for instance, far away from a fire) and transported at the hospital, in order to be treated.

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