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Review Article

The Treatment of Musculoskeletal Trauma in Greece and Europe during the Greek Revolution 1821 - 1828

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Received: January 30, 2020; **Published:** February 21, 2020

Abstract

The treatment of Musculoskeletal Trauma has been the biggest challenge for any doctor since ancient times. Its development had been left at a certain stage up until the early 19th century. The everyday necessities and the variability of trauma seen at the battlefield led doctors to find new ways to treat it based on Ippokratis's medicine. In Greece, during Turkish Dominance, there were limited financial finds and the hospitals were short staffed and ill equipped. As a result, the treatment of trauma was left to be done by practitioners and existential doctors.

Whilst at the same time the rest of Europe was being illuminated by important doctors who had acquired precious experience by the Napoleonic Wars.

Keywords: *Musculoskeletal Trauma; Greece; Europe*

Introduction

War conflicts are an integral part of world history. They have had a direct influence in economy, politics, society and medicine with which there is a bidirectional and dependent relation. The treatment of musculoskeletal trauma is not a doctor's obligation in everyday life only, but also in the battlefield. During the course of history, it has been observed a parallel evolving path in the rule and means of battle with a therapeutic approach on trauma.

The correct treatment of musculoskeletal trauma demands proper infrastructures and funds. Most importantly though it has to have scientific workforce. During Greek revolution Greece was under Turkish Dominance. As a result, Greece didn't have the necessary medical equipment or infrastructure. On the contrary the medical and surgical infrastructure in Europe was continually improving with an outstanding example that of Napoleonic Wars. The major factor in a war conflict is not only lessening the loses but also the ability of having medical services to give their utmost in rehabilitation so that patients can return as soon as possible.

Greek revolution

1821 has been a landmark for the enslaved Greek people as the independence was against the Turkish Dominance was declared. Its timeline was until 1828, that was the actual time of the war, and then until 1832 which is when the Greek government was established. The importance of this war cannot be limited within the borders of Greece and Greek history, it became global as it was the first successful Independence war of an enslaved nation to an empire after the era of American revolution in 1771 [1].

Furthermore, it has inspired later national revolutions in many different parts of the world and had a major impact on the Turkish empire. It has set Greek society in a contemporary European course [2].

It is really important to mention the level in which medical knowledge was during the Greeks' liberation war. In the early 19th century medical improvements were scarce. Medical science had made some progress compared to previous years, but it was solely dependent on Ippokratis's medicine, practical medicine and supernatural and mystical creeds [3] during that period universities taught students based on personal experience and thoughts.

Simply there wasn't any schedule that was applied to all in both teaching the theory and its concept [4].

During revolution the number of doctors, who were able to meet the needs of approximately 1.00.00 residents were no more than 90. After the Revolution and the arrival of Greek and Philhellenic Greek doctors from abroad their number did not exceed 500, when they actually needed many more because of the amount of trauma caused after the war [5,6]. During Turkish Domination a lot of young people from different parts of the enslaved Greece, most of them coming from wealthy families, turn to European Universities to study medicine. Their choices for Medical School Universities were mainly that of Padova, Pavia and Vienna.

Not many graduate doctors from universities chose to get into the battles and offer their services to the troupers during Revolution. Those who entered into the battlefield, chose to deal with the pathological symptoms rather than the treatment of trauma and wounds. That resulted into philhellenic doctors, who were mainly practitioners or existential doctors, taking on the healthcare.

The practitioners or the existential doctors used to practice colloquial medicine and mostly in the mountainous areas. They were dexterous when it came to re dislocations and fractures as well as taking care of trauma and doing some small surgeries. That was the reason they later called them surgeons. What is more they called themselves doctor pharmacists, as besides medical actions they brewed medicine and collected herbs, which they prescribed to patients and wounded people [7]. Existential doctors of the Revolution traditionally knew and applied three basic medical actions which were completely unknown to universities were medicine was taught. What we are talking about is asepsis and antisepsis, antibiotics and the immobilization of fractures.

Those were the practices of medicine which were unknown to graduate doctors at that time, applied systematically and methodically by existential doctors that saved the lives of thousands of people. Also, they did not amputate any wounded patient which was the standard practice for someone severely injured [8]. They used wine, vinegar and raki as antiseptics, alcohol actually in every possible way and pine tar. Of the same importance was in many cases mould. They collected mould from walls that had created it as the sun was not heating them as well as from food. They used mould in serious and infected wounds and made it drinkable when they dissolved it in liquids. Thieves in the mountains used moulded bread and used it on big wounds. The Giatrakis existential doctors used slices of moulded apple on wounds [9-11]. Panagiotis Iatropoulos, an existential surgeon from Andritsena used a medicine, possibly based on mould, with which he used to clean wounds. He was in this way able to save many injured people from gangrene [12].

During the Revolution there was a massive lack in medicine supplies and healthcare units which was basically due to the fact that there weren't any infrastructures especially the first years and as a consequence most of the wounded were treated in the battlefield. The wounded suffered a great deal of pain and if the gravely injured weren't able to help themselves then they were left at their own luck. However, the lightly injured used to help each other [13]. Something really characteristic is that based on tales, most of the injured were carried in wooden beds or at the backs of their fellow fighters. That affected the battlefield [14]. There is a statement of a suicide from an injured soldier because he didn't want to be a burden to his fellows. At the same time, the fighter who was injured at the battle, won everyone's respect [15]. At that period, there weren't any hospitals for soldiers, so they sent the injured soldiers at home or to the nearest town, monastery or village. If that wasn't an option, then their fellows took care of them in the best way they could [16].

The treatment of trauma, fractures and generally the healthcare of the wounded was equivalent of the knowledge of that time [17]. The use of herbs ad grass was vital during the War as they were the main ingredients in taking care the trauma. There are characteristic facts which describe the use of grass and therapeutic herbs to tie wounds and to stop bleeding (hemostasis). One of those was sarkoxorto which is indicated by existential doctors as an herb with healing effects. There is evidence that eggs, oil, wine, and raki were medicinal and not used as food. Eggs with oil were used as basic ingredients for trauma [18,19].

The most common medicines used by scientists and many existential doctors were mainly aloe, theriakis, cardamom, quinoa, ginger, sampouko, sarkotrofi, silfio and more. They also used some medicinal chemical substances such as salt, absinthium, vorax, Arabic gum, minion, nitrio, oxymel and other as well as pharmaceutics imported by Instabul, Smirni, Eptanysa and Tergesti [20].

If a war trauma occurred existential surgeons' main concern was to stop the bleeding. When it the bleeding wasn't massive in depth and width the hemostasis was achieved by just applying pressure or by using wet with raki sheets. In the case that a major vessel was injured and as a result the bleeding was excessive, they used to burn the vessel with heated iron. Then made sure that the bleeding had been stopped and after the treatment of the wound came in line. They didn't usually stitch the wounds. They used to leave them close by themselves as they thought that a wound must be self-healed. If it needed to be stitched the used a sterilized needle and a common thread. Graduate doctors were able to complete a surgery such as amputations, opening up abscesses and taking bullets out of soft tissues. They themselves also used to use the no stitching method leaving the wound open to drain the pus [21].

The healing time of simple injuries was 2 to 3 months because of their treatment. When the injury was smaller in width and depth it was cleansed with raki, wine or vinegar and then they used therapeutic herbs and then a clean cloth was wrapped around the injury. On the contrary, in bigger injuries, which were the majority of the cases, their treatment was gradual and they use an ointment instead. After cleaning it with wine or vinegar they applied a mixture of egg and oil. It was the main ingredient of the ointment that existential doctors used on burns, trauma and some fractures. They mixed oil and egg white, they soaked clothes in it and placed it on the wound.

The majority of the trauma during the War was about the combination of trauma of soft tissue and bone fractures. That was because of the use of specific guns such as swords, axes and scimitars.

The treatment that existential doctors used at that trauma was a special ointment called anakoli. There were other names in different parts of Greece like glue, osteoglue, blastri and poke. The main ingredients were egg white, oil and raki with added soap, gum, incense as well as brick fragments and marble fragments [22]. Then they placed the mix in goat hair which it necessarily had to be greased and then they placed it on the fractured limb adding wooden planks to immobilize the hand or leg. That mixture thickened and soon was a solid bandage. To speed up the process of thickening they used alcohol and if the fracture was more severe, they used more layers of osteokolla.

When anakoli thickened they took off the wooden planks and the mixture was a contemporary plaster cast. With the everyday use of the therapeutic ointment they were able to achieve the gradual healing of trauma its callus [23].

The wide use of alcohol as a deterrent means in mould trauma combined with the immobilization technique resulted in having less amputations during the war. It is important to be stated that the majority of graduate doctors, if we exclude the German Treiber and the American Hau, who were philhellenic, had no surgical experience and never dealt with the treatment of war trauma [24].

Europe

At that time in Europe, medicine was taught based on philosophy, maths, literature and science in all of which the study of the human body was included along with pathology. Doctors were called physicians and knew more about conic sections, algebra, trigonometry and the function of the liver, lungs and kidneys.

This surgical period started to recognize as science and that is owed to the French Revolution. Before that, surgeons were thought to be inferiors to doctors as it was considered as manual work mainly practiced by barbers and existential doctors. Surgical knowledge and ability could be acquired by doctors in the 19th century by simply amputating and applying the theory of pus laudable. That theory was based on the ejection of pus from the body which meant that the state of the patient's health was improving. Basically, the concept was based on causing an artificial wound on the body, which will start ejecting pus resulting in the patient getting better [25].

The European surgeons and mainly army surgeons thought that the treatment of selected and open wounds of the upper and lower limbs should be the amputation of the limb to prevent infection and gangrene.

The main and most important clash of the early 19th century was the Napoleonic Wars a few years before the Greek revolution. In the battlefield many brilliant surgeons acted like the French Larrey or the English Guthrie and many others. They offered basic provisions for the later development of Musculoskeletal trauma treatment, not only in the first line of the battle but also in everyday life.

Taking into consideration the way and form army doctors were educated, the working adversities alongside with the transmitted diseases that arouse during the war, it was miraculous that trauma treatment occurred. Astonishing were the results of the surgeries and percentages of rehabilitation and survival. The majority of the surgeries were mostly done in the battlefield or the hospital.

The surgeries were carried out in primitive conditions. The surgeon's work was constantly stopped by various factors such as no pain-killers during surgery, the bad light, the pressure and volume of work along with fatigue and finally the inconsistent supply of supplies. The worst part was the minimum post operational care and the complications.

Surgical help in the battlefield had to be as simple as possible. The time needed to be spent to observe, make complicated procedures or delicate handlings could spent precious time and funds and cause a lot of unwanted pain. Reducing the bleeding, removing foreign objects and dead tissue as well as bandaging open trauma gave some hope in treatment and avoidance in sepsis. The wise surgeons of that era found out quickly that amputating on time was much better than bandaging a ruined limb and making the patient undergo a process without end.

The pain was the most important problem not only for the patient but for the surgeon as well. A patient who is able to move, is in constant stress and fear and that consequently ended in having a patient which disturbs the tranquility of surgery and the surgeons. Thus, the width of the section is limited the time of the surgery us limited as well. The fatigue of the surgeon and his crew from back to back surgeries and the limited amount of supplies were the main cause of limited use of opium or labdanum preoperational. The use of opioids contained many dangers of side effects like respiratory depression and vomiting.

Labdanum (opium extract) in most cases was mixed with other solutions. The most common solution as a simple pain killer, that included opium, benzoic acid, camphor and dill oil. The soldier usually helped themselves by drinking alcohol, preoperational and post operational.

The used to drink wine, rum, jinn and brandy. Alcohol is one of the most effected stress relief medicine but with mild effect. Injured soldiers who waited to be operated, half dead or people that waited to be treated, were given some alcohol and some painkillers. Opioids were usually given at night.

The quick and immediate amputation after injury was an important asset in the early stages of the phycological depression of the patient. Larrey found out that in the first 24 hours of the injury, amputation of the limb was necessary. He recognized it benefits in the battlefield, it lessened the pain, the possibilities of infections and maximized the possibilities of a safer transportation from the battlefield. He realized that in that way he could get the maximum out of the possibilities of survival for the patient before the edema, sepsis, and excessive bleeding and dehydration [26].

It is generally accepted that cold has the possibility to give the sense of relief. It is achieved by applying a cold towel at the aching part. This is called cryoanalgesia. Larrey observed that injured soldiers that were on the snow didn't feel pain. He described his experience while operating in temperatures -19°C and discovered that he had the chance to amputate painlessly the frozen French soldiers [27].

The way the patient was positioned is different to today's position. In most cases the patient was standing with the help of many other people if they were available. During a lower limb amputation, the patient was placed in a cylindrical blanket at the end of a table. The helpers held the patient from the back and the others, standing or sitting in front of the patient, held the lower limbs.

During that period there was no asepsis and no effort of antisepsis could be completed. Some writers mentioned the effect of alcohol in trauma or in surgical instruments or its antimicrobial use. The situation that defined the sepsis was the bacterial load, the part of injury, the delay of the surgery, the physical condition of the patient, the surgical technique and the cleanliness.

Supportive therapy for the restitution of the patient was nonexistent. The post operational nutrition of the patient was unattractive as it included diluted milk, bread from flour and water, tea, rice and barley porridge. Vegetables, alcohol and red meat was given to those who were recovering [28].

That time there were no x rays, so it was extremely difficult to determine the position and the state of metallic object inside the muscles and bones. The surgeons were based mainly on their fingers and sensor. They used to place the patient on the side that was shot, and they guessed and tried to detect the foreign object. As the time passed by the surgeons learnt to detect better the foreign object. They thoroughly examined the body on both sides to better assess the injury and if the projectile had gone through the other side or if it had been estranged. They also had the ability to puss forwards a part of the muscle to capture the projectile in the inner part of the trauma [29].

During the wars the fracture was very common as they used to fall from horses after conflict. The majority of fractures were overwhelming fractures and were amputating. In the case of long bones, the fracture could be transverse, spiral or overwhelming. If the bones were on top of each other, they would end up shortened of crooked. The incorrect rearrangement of the fracture, the failure to immobilize and the interference of soft tissues in the fractured areas were some of the causes for the delay of callus or the creation of falsification [30].

In the early 19th century the fracture therapy had the patient in bed and restricted all activities with the use of wooden splints and bandages for fish and flour. Dominique Jean Larrey, the French surgeon, in 1812 developed the idea of devices to immobilize (appareils immobiles), which were made with the help of bandages soaked in flour and egg white. He mentioned that if left for several weeks or months on overwhelming fractures the improvement was very successful [31].

Also, the English surgeon George James Guthrie, was the first to insist that the fractures of the thigh had to be aligned as fast as possible, which was a kind of recovery effort. Previously these fractures were left outward. That is, in the position where they were found [32]. For this reason, he inserted the long splint that started from the hip to the foot and the as a result the knee was fully stretched or slightly bent, thereby keeping the hinge immobilized both centrally and peripherally. Fractures of the upper extremity were more easily managed by the use of suspension, restricting them to the body or casting them [33].

The majority of upper and lower limb wounds on battlefield were treated without amputation. Amputations were, perhaps, the most important challenge for surgeons at the time. It was an intolerable and shocking experience for the patients, although it was carried out fairly quickly. The amputee was often forced to quit his job, despite the post-operative complication he had to face and despite the honour and heroism. However, amputation has allowed the risk of infection due to bleeding to be minimized. Turning a dirty and deformed wound into a clean surgical stump makes it more ideal for the patient to be relieved, get the optimum physical condition and remove the risk of surgical sepsis [34].

Larrey and Guthrie concluded that their primary amputation provided less operative mortality, stumps healed faster with less chance of infection, shock and bleeding cases were rare. They both amputated in the field. They recommended the primary surgical treatment to all injuries that were indicating amputation.

In general, the signs of amputation were:

1. All overwhelming long bone fracture resulting from a shotgun or rifle projectile.
2. All fractures containing articular surfaces.
3. All gunshot wounds from thejoints.
4. In cases where there is no fracture but extensive soft-shell detachment, including a basal nerve [35].
5. Necrosis, dry gangrene due to loss of blood.
6. Severe trauma to a member.
7. Tearing a member with tissue necrosis and wet gangrene.
8. Chronic rot with intractable bone infection.
9. Severe persistent pain, numbness or distortion of a member as a result of injury, deafness or infection [36].

Apart from the fact that the amputation had to be carried out within a few hours, and in particular one to four, there was a reason for its delay. This was to give the time to assess the viability of the member. When this was not properly perfused and there was a risk of gangrene a characteristic red-yellow circular barrier was formed between the healthy and dead tissue.

The disadvantages of this philosophy were, firstly by amputating the are the wound healing was delayed due to its improper blood supply and secondly, by waiting until these limits were created the patient's life was endangered [37].

Larrey concluded that wound healing for the first purpose after amputation using leucoplast should not be tested. He found that by using this method, the probability of the patient coming up was very high. His opinion was that the stump should remain slightly covered, while the soft tissue portion should be kept in a circular wrap [38].

Conclusion

In the early 19th century treating musculoskeletal trauma was a challenge for every surgeon, let alone a battlefield surgeon. Knowledge about the trauma was limited and specific so most surgeons would treat it based on the experience they gained over the years on the field.

It is clear that the Napoleon Wars were a milestone in the development of trauma treatment in Europe at this time. They conveyed knowledge and experience that were applied to later warfare but to everyday life too. Their basic principle in open fractures was immediate amputation. In simple trauma control of bleeding and its attachment. In closed fracture their immobilization. There has been an attempt to use some form of anesthesia and analgesia to minimize the amount of pain.

Accordingly, in Greece, the majority of existential doctors were practitioners rather than diplomats, due to the limited number of their recent and immediate involvement in trauma. An important difference with Europe is that Greece lacked the necessary infrastructure and financial support for the organization of medical services but leaving it to heroism and good will of the experienced and qualified doctors. Open infrastructures and simple trauma were treated by various physicians in an effort to avoid amputation and the treatment of closed fractures was similar to that of European physicians.

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Volume 11 Issue 3 March 2020