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ORGANIZATION AND WORK OF THE WAR HOSPITAL IN TOMISLAVGRAD DURING THE WAR IN BOSNIA AND HERZEGOVINA FROM 1992 TO 1995

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ABSTRACT

The work of the War Hospital in Tomislavgrad during the war in Bosnia and Herzegovina from 1992 to 1995 is described. The War Hospital in Tomislavgrad was one of the first medical institutions organized in Bosnia and Herzegovina, with the intention of providing surgical treatment and care to soldiers, local civilians, and refugees who found shelter in this part of the country. It was located on the main communication route connecting Bosnia and Herzegovina and the south part of Croatia. During the four-year period 23,191 examinations, of which 8,341 were first-time examinations, and 1,547 surgical operations were performed. The War hospital provided a high level of surgical and anesthesiologic service in an area where none existed before the war. All patients were treated regardless of their nationality or religion, thus mitigating the consequences of the war.

Key words: *war hospital, field surgery, Bosnia & Herzegovina*

INTRODUCTION

At the beginning of 1992-1995 war in Bosnia and Herzegovina (BH), the Serbian forces had enormous material and logistic advantages over the Moslems and Croats. Since the War in Slovenia in 1991, the Yugoslav Federal Army (YFA), which was completely under Serbian control, had taken control and fortified most of the strategic locations in Bosnia and Herzegovina. The Moslems and Croats were not prepared for war. They had no preorganised defenses and no professional military experience, medical included. The Serbian aggression caused extensive devastation of the country and heavy losses of the civilian population (1,2). The Croats in BH organized their defense through the Croatian Defense Council (CDC). Among other things, the CDC organized the system of medical care, including war hospitals, in all parts of BH that it defended. Most of these hospitals were supported by medical institutions in Croatia and numerous donations from all over the world.

The War Hospital in Tomislavgrad was one of the first medical institutions in BH organized before the actual beginning of the War. With the beginning of Serbian aggression in Croatia in 1991, it was clear that war was imminent in Bosnia and Herzegovina too. In June of 1991, the preparations for developing a medical system that could function during war were under way in the Tomislavgrad region. Organization of a medical system in peace is a complex problem and war imposes even greater logistic and material demands. A decision was reached that local personnel and logistics would be used to organize basic medical units at the battle front and its close vicinity and for transport, while war hospitals would be organized in a few strategically important areas with the help from medical institutions and volunteers from Croatia. Patients requiring specialist medical care and rehabilitation would be transported to medical institutions in Croatia for further treatment. Physicians and other medical personal of the future war hospital were sent to the University Hospitals in Split and Zagreb in Croatia for education.

Community medicine, hygiene, and epidemiological services were also organized relying on the existing facilities, equipment, and personal, with the help and advice of the similar institutions in Croatia.

In March of 1992 a symposium on the organization of military medical services and treatment of war wounds was held in Grude (Herzegovina). This symposium is considered the beginning of the Croat military medical system in Bosnia and Herzegovina. By this time the War Hospital in Tomislavgrad was already functional.

THE WAR AND BATTLEFIELD

The actual war operations of the YFA and Serbian paramilitary forces started in BH with the destruction of the Croatian village of Ravno in East Herzegovina on September 2,1991. The next major attack was in the beginning of April 1992, in the area of the town and

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plateau of Kupres located about 40 km to the north of Tomislavgrad. Despite a determined defense by the CDC forces, the front was moved to the Cincar Mountain in the northwest, the village of Šuica in the north, and mountain Raduša in the north-northeast, only 18 km from Tomislavgrad. The front line covered by the Tomislavgrad War Hospital in was 80 -100 km long and overlapped with the area covered by the Livno Civilian Hospital and Sturba War Hospital (3) in the west and Rama War Hospital in the east (4). The most intense fighting took place during April and May 1992, with the enemy engaging tanks, heavy artillery, including multiple rocket launchers, and aviation. By the second half of May, the Serbian offensive on the Kupres and Livno fronts was neutralized and the front was stabilized. Until the spring of 1995, when the operations for the liberation of this part of the country were undertaken by the joined action of the Croatian and Moslem forces, artillery shelling, sniping rifle fire and low intensity fighting remained the only constant activity on this front. In 1993, when the war between the Croatian and Moslem forces started and the Moslems occupied Bugojno and Uskoplje, thus encircling the Croatian population in Central Bosnia, the War Hospital in Tomislavgrad also covered this new and unexpected front (Figure 1).

FIGURE 1. THE MAP OF BOSNIA AND HERZEGOVINA AND CROATIA. THE AREA COVERED BY THE TOMISLAVGRAD WAR HOSPITAL IS MARKED BY SHADING.

THE HOSPITAL AND EQUIPMENT

The war hospital was located in the new part of the Tomislavgrad Medical Center. It had direct access from the parking space. The entrance went through the ward to the admission and triage area. The admission and triage area had three examination tables with good lighting and all equipment necessary for the primary examination and resuscitation. On the left was an area designated for plaster immobilization, which communicated with two storage rooms and bathrooms for personnel. The X-ray room and a dark chamber for film storage and development were in continuity with the admission area. To the right of this chamber was the intensive care unit with two beds. The two operating rooms separated by a prep room were to the right of the admission area. The sterilization room was in the old part of the Medical Center. The ward had 30 beds, located on two floors. The laboratory was on the ground floor, to the left of the entrance. The hospital had power generators located behind the building. Most of the facilities were shared with the other services of the Medical Center, which continued their normal work.

THE PERSONNEL

The personnel were recruited from the employees of the Tomislavgrad Medical Center, volunteers from Croatia, and refugees from the occupied parts of Bosnia and Herzegovina. As mentioned before, a number of medical professionals were sent to Split and Zagreb for training prior to the actual fighting. Since their number was not sufficient for the requirements of the War Hospital, volunteer mobile surgical teams, consisting of a surgeon, surgery resident, anesthesiologist, two theater nurses, a ward nurse, and anesthetist from different parts of Croatia worked in the War Hospital from April 1992 to December 1995 in two to four week rotations. Four Italian anesthesiology teams consisting of an anesthesiologist and two anesthetists came to help in 1994.

MEDICAL SUPPLIES

Medical supplies came from various sources: commercial suppliers, donations from Croats living abroad, international humanitarian organizations, or were captured from the enemy.

ORGANIZATION OF THE MILITARY MEDICAL SERVICES

Mountainous terrain dictated the organization of a number of front line medical units that were organized by and subordinated to the CDC Medical Headquarters. The number of units changed depending on the situation on the battlefield. Each unit had one medical doctor and two medical technicians or

nurses. A number of soldiers were also educated in advanced first aid and reanimation and they served as emergency medical aids to the medical units on the front line. Each unit had infusions, analgesics, reanimation sets, instruments for urgent haemostasis, and bandages and was about thirty to forty minutes of transportation time to the Tomislavgrad War Hospital.

TRANSPORTATION

The wounded soldiers were evacuated from the front line by fellow soldiers. Medical technicians with cars or armored vehicles transported them to the front line medical stations were the wounded received first aid and life saving treatment. About 200 km of dirt roads were made for this and other purposes on the Tomislavgrad, Livno, Uskoplje, and Jablanica battlefields. From the front line medical stations the wounded were evacuated by cars, ambulances, or helicopters to the Tomislavgrad War Hospital. The helicopter lending pad was about 1 km from the hospital. Often the surgical operations started within one hour after the injury.

TRIAGE

The arrival of the wounded was usually announced by radio communication from the front line medical stations. The civilian causalities usually came in unannounced. The patients were taken to the admission and triage area where they were examined by a surgeon or/and an anesthesiologist. The patients' general status and hemostasis were checked and resuscitation performed if necessary. Laboratory tests and diagnostic procedures were performed as needed. The patients with head injuries that needed neurosurgical care were stabilized and transported to Split as quickly as possible. The most heavily wounded were treated first. The lightly wounded waited for treatment in the admittance room or in the wards. They received anti-tetanus prophylaxis, infusions or transfusions of blood, and antibiotic prophylaxis, and more extensive diagnostic procedures were performed if necessary.

PATIENTS

From April 1 1992 to December 31 1995, medical services were provided in the Tomislavgrad War Hospital for 8,341 newly examined patients: 861 with war wounds, 2,701 with injuries not related to war and 4,779 with other surgical diseases. Besides that, 14,850 control examinations were performed during the same period (Tables 1 and 2).

Table 1. The number of newly examined patients and the number of control examinations in the Tomislavgrad war hospital from april 1992 to december 1995.

YEAR	1992*	1993	1994	1995	TOTAL
NEW EXAMINATIONS	1,309	2,747	2,068	2,217	8,341
CONTROL EXAMINATIONS	1,692	4,407	4,549	4,202	14,850
TOTAL	3,001	7,154	6,617	6,419	23,191

* period from April 1 SI 1992 to December 31 st 1992

Table 2. The number of newly examined patients per year according to the reason of seeking medical treatment in the Tomislavgrad war hospital from april 1992 to december 1995.

YEAR	1992*	1993	1994	1995	TOTAL
WAR WOUNDS	311	388	100	62	861
NON WAR RELATED INJURIES	463	856	685	697	2,701
OTHER REASONS	535	1503	1283	1458	4,779
TOTAL	1,309	2,747	2,068	2,217	8,341

* period from April 1 st 1992 to December 31 st1992.

The patients were members of the CDC forces, civilians refugees, UN personnel, and others, including captured enemy (Serbian and Moslem) soldiers (Table 3). Of the total number 1,438 were children (Table 3).

Table 3. The number of newly examined patients in each population group according to the reason of seeking medical treatment the Tomislavgrad war hospital from april 1992 to december 1995.

	WAR WOUNDS	NON WAR RELATED	OTHER REASONS	TOTAL
CDC SOILDERS	790	1,077	1,426	3,293
CIVILIANS	51	1,085	2417	3,553
CHILDREN	14	503	921	1,438
UN	0	30	13	43
OTHERS	6	6	2	14
TOTAL	861	2,701	4,779	8,341

PATIENT TREATMENT

In the front line medical station, the patients received crystalloid solutions or/and dextran 70, and 10 mg of morphine IM or some similar analgesic. Hemostasis was performed with a compressive bandage or rarely using a tourniquet. Airways were checked and, if necessary, respiration was maintained using an oropharingeal airway and ambu-balloon. In a few cases emergency airway was operatively created by crickoidotomy. After the patient arrived to the War Hospital, at least two veins were cannulated with 12G-needle catheters or/and a central venous line was secured and infusions were continued. Blood was taken for blood group determination, cross matching, and basic blood tests. If necessary, blood transfusion was started immediately after the blood group determination and cross matching were completed. In a few patients in haemorrhagic shock, when there was no time for blood group determination and cross matching, 0 negative blood was given immediately upon arrival. Tetanus toxoid 0.5 ml SC was administered in all cases, as well as 250 or 500 units of human anti-tetanus gamma globulin, depending on the severity of the injury. Prophylactic antimicrobial therapy with penicillin 4x5 M units, gentamycin 5mg/kg, divided into two daily doses, and metronidazol 3x500 mg IV was started as soon as possible. The Croatian Ministry of Health recommended this combination of antibiotics, after the Falkland Islands campaign experience (4,5). Necessary diagnostic procedures were undertaken only if they did not endanger the patient. The patients were taken into the operating theater as soon as possible. Spinal, regional block, or local anesthesia were used as much as possible so that two operations could be performed at the same time if necessary.

The primary treatment of war wounds started with copious irrigation with physiological saline and hydrogen peroxide. Necrectomy was followed by hemostasis, blood vessel reconstruction, and external fixation as necessary The elution was repeated, drains were placed, the wound was left open, covered with Betadine (polyvinyl-iodid-pyrrolidone) and bandaged. The dressing was changed two times a day and secondary sutures or split thickness skin grafts were placed in 3-8 days time. Early tendon repair and reconstruction in hand injuries was performed 3-5 days after the wounding. Larger defects needing soft tissue coverage were reconstructed with local or pedicled fasciocutaneous of miocutaneous flaps. If more complex reconstruction was needed, such as free tissue transfer, the patients were evacuated to medical institutions in Croatia. The number and types of operations performed under local and general anesthesia are shown in Figure 2 and Table 4. Amputations were performed on extremities with traumatic amputations only. Three below knee, one above knee, and one forearm amputation were needed (Table 4). Fractures were stabilized using external fixators (Zagreb 1 and 2, Rohr)(8). Major blood vessels were repaired or reconstructed with saphenous vein grafts. Only eight thoracotomies were performed because the majority of chest injuries -36 were treated by thoracic drainage. Exploratory laparotomy was performed for penetrating injuries of the abdomen. Blunt trauma of the abdomen as a reason for laparotomy was more common in patients sustaining injuries in motor vehicle accidents than in those who were wounded in the war (Table 4). Splenectomies were performed in 6 patients with blunt trauma sustained in motor vehicle accidents, in one patient who fell from the roof while fixing the damage done by an artillery shell, and in a patient who sustained a gunshot wound of the left lower chest with penetration into the abdominal cavity. Sutures of the liver or liver resections were performed in four patients with blunt trauma and three patients with penetrating injuries caused by bullets or shrapnel. The patients needing prolonged intensive care after the operation were transported to the Split University Hospital as soon as their condition was stable enough for transport. The patients who needed prolonged recovery and secondary operations were also sent to the University Hospitals in Split or Zagreb. The others were hospitalized in the War Hospital for periods of 1-30 days and then sent home for rehabilitation or to their units.

Table 4. The number and type of operations performed under general anesthesia in the Tomislavgrad war hospital from april 1992 to december 1995.

SURGERY	WAR WOUNDS	NON WAR RELATED INJURIES	TOTAL
ABDOMINAL	9	190	199
THORACIC	8	0	8
VASCULAR	7	1	8
PLASTIC AND RECONSTRUCTIVE	27	30	57
TRAUMA AND ORTHOPEDIC	12	0	12
WOUND MANAGEMENT	152	4	156
AMPUTATIONS	5	9	14
CESAREAN SECTION	0	25	25
OTHER	4	94	98
TOTAL	224	353	577

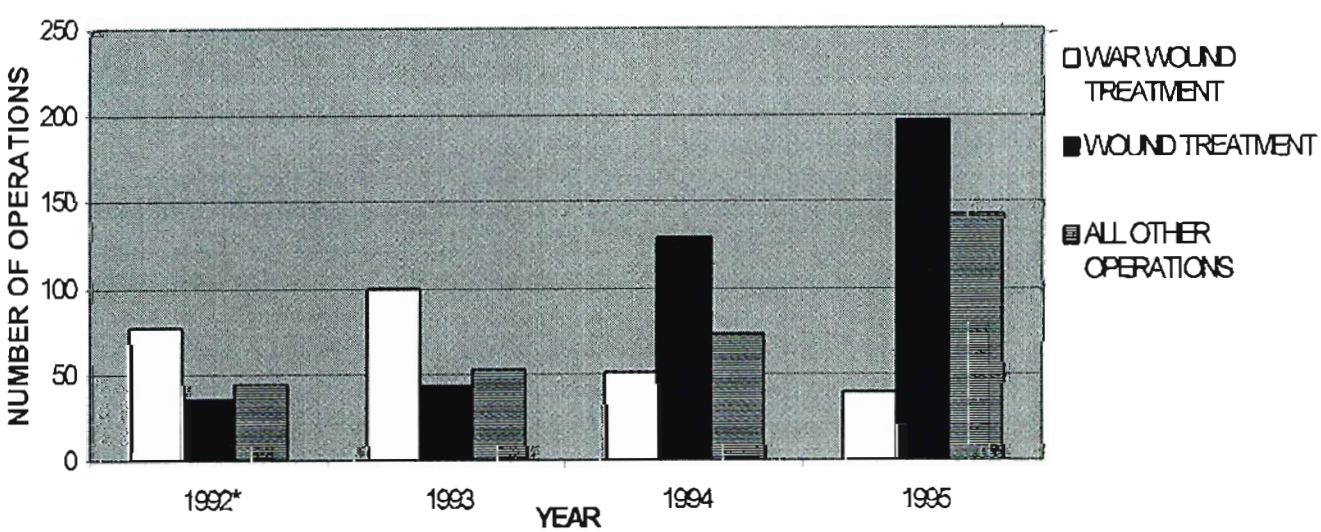
The patients who sustained injuries in accidents related to motor vehicle, work, or everyday activities were treated according to the type and severity of the injury. Some needed only an examination and reassurance while others underwent major operations (splenectomy, liver resection, pancreaticoduodenectomy-Whipple procedure, major blood vessel reconstruction, external fixation) or were transported to Split (intracranial injury, bone trauma that needed internal fixation) after the necessary resuctitation, intubation, and immobilization were performed. Civilian surgical problems included emergencies such as acute appendicitis, acute cholecystitis, peptic ulcer perforations, hernia incarcerations, bowel obstruction, ischemic or diabetic gangrene and elective procedures for gallbladder stones, hernias, and tumors (Table 4.) These elective operations were performed during periods without military activity.

During the four year period, 1,254 children were born in the Tomislavgrad Medical Center of whom 25 by cesarean section, which was performed by a gynecologist and surgeons in the Tomislavgrad War Hospital (Table 4). Other obstetric (circlage) and gynecologic (conisation, hysterectomy, ovarian tumor, and cyst resections) procedures were also performed when the situation allowed. None of the patients died in the hospital or during transport from the hospital to the University Hospital in Split.

DISCUSSION

The War Hospital in Tomislavgrad provided medical services in the period from 1992 to 1995 to the soldiers fighting on the Kupres, Jablanica (Slatina, Doljani, Gračac) and Uskoplje (Gornji Vakuf) fronts. It also provided surgical treatment and care for the population of the Tomislavgrad, Kupres, Rama, Posušje, and Uskoplje regions and for the numerous refugees from the town of Jajce (12,000) and Central Bosnia (Bugojno, Travnik). It was one of the first medical institutions in BH organized before the actual beginning of the Serbian aggression. It provided medical services in a period when other medical facilities ceased to function or were inaccessible to the population living in this area. It was located on the main communication connecting the south part of Croatia with Bosnia and Herzegovina on the road Split-Tomislavgrad-Central Bosnia-Sarajevo (Figure 1). These were the main reasons for the large number of examinations (23,191) and operations (1,547) performed in the War Hospital.

The local population with little or no military experience defended the front lines covered by the War Hospital in Tomislavgrad. Those who volunteered to defend the country reported to the CDC headquarters and received arms and uniforms but rarely passed any training before being engaged in combat. This and the overwhelming superiority of the Yugoslav Federal Army and Serbian paramilitaries in heavy weapons contributed to the larger number of wounded soldiers in 1992 and 1993 compared to 1995 when offensive actions were undertaken by the combined Croatian-Moslem forces to liberate parts of the country occupied by the Serbian forces in the period from 1992-1995. In contrast to most war-affected parts of Croatia (9-12), in this part of Bosnia and Herzegovina civilians sustaining war wounds made up a relatively small portion of treated patients. This is due to the fact that Serbian aggression was expected in the part of BH populated by



*period from April 1 st 1992 to December 31 st1992.

Figure 2. *The number of operations performed in the Tomislavgrad war hospital under local anestesia from april 1992 to december 1995.*

Croats and the civilians were evacuated in time. Most of the civilian victims were caused by artillery attacks aimed specifically at civilian targets in reprisal for Serbian losses on the battlefield or came from areas where the fighting was between Moslems and Croats. The advantages of advanced surgery as close as possible to the fighting zone have been documented previously (13-15). Our results show that even complex injuries involving major blood vessels and internal organs can be treated successfully if the patient arrives on time. The number of amputations in our patients was only 2.2% of patients with serious injuries or 0.6% of all patients with war wounds. This number is significantly lower than the usual battlefield casualty statistics from conflicts prior to 1990 (14,16). This is probably do to the early operative treatment and new developments in the field of vascular and plastic surgery (17). The nearby war hospital in Sturba (3) had similar organization and equipment while covering a similar battle zone during a five month period in 1992. Although the number of war wounds in this time period is similar we had more civilian patients with injuries not related to the war or with other surgically amendable diseases then the predominantly military oriented Sturba War Hospital. The Tomislavgrad War Hospital was able to perform effectively because of its thorough and timely preparation and because it had the support of the local community, medical institutions and individuals in Croatia, Croats living abroad, and international humanitarian organizations. The equipment, medical supplies and well trained and motivated medical professionals made it possible to provide a high level of surgical and anesthesiologic service in an area where none existed before the war, to all victims regardless of their nationality or religion, thus mitigating the consequences of the war in this area.

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