

RETROSPECTIVE STUDY OF A GROUP OF 12 000 POLYTRAUMA PATIENTS TREATED BETWEEN 1978-2014

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Abstract: The study is based on the research of the documentation through multicenter evaluation with published and controlled data. Regarding the etiology of the study, 90% is based on work accidents taking place in Jiu Valley mining basin in the period 1978-2000, 10% representing other causes. After the year 1996, the etiology of the polytraumas was modified being gradually dominated by road accidents and aggressions. Between 1978 and 1988, in order to set up the thoracic-abdominal emergency diagnosis, standard investigations were: thoracic, abdominal RTG, sonography started in 1977, peritoneal puncture lavage, exploratory laparotomy. After 1988, computed tomography (CT) became standard in the diagnosis of intrathoracic, abdominal, retroperitoneal lesions, providing high accuracy imaging for liver, splenic and renal injuries.

INTRODUCTION

CT scan plays a fundamental part in the diagnosis of intra-abdominal injury with three dimensional anatomical details of the abdominal organs and accurate image of the intra and extra peritoneal spaces.(1,2) CT scanning is effective in spleen, liver kidneys injuries.(3)

In the last decades several studies have shown an increase in hospital trauma death and a decrease in pre-hospital mortality, due a to more rapid transportation of patients.(4,5)

The immediate and early trauma deaths are determined as a result of brain injuries and hemorrhagic shock. Late mortality (> 72h after trauma) is caused by inflammatory complications of the trauma.(5,6)

Hemorrhagic shock as a result of the trauma and the complex tissue trauma lead to systemic inflammatory response syndrome (SIRS) and the persistent SIRS result in multiple organ dysfunction syndrome (MODS).(7)

Recent studies indicated that SIRS is frequent in the posttraumatic time, but no data is yet available on the clinical relevance of the injury in incidence and severity of SIRS, compared to septic complications and posttraumatic MODS (< 72h after trauma).(8)

AIM

The aim of this study is the analysis of a long-term retrospective study on ploytrauma.

MATERIALS AND METHODS

The study includes investigations and therapeutic conduct regarding polytrauma, both in the emergency room and in the first 24-48 hours, with complications and postoperative mortality.

The study carried out involves the separation of thoracic abdominal lesions as well as the introduction of videothoracoscopy in the evaluation of thoracic lesions.

The study included 12 000 patients treated in the surgery department of the Petroșani and Sibiu hospitals between 1978-2014.

All polytrauma patients (PT) have undergone ultrasound procedures and clinical and laboratory imaging evaluation in the first hour after the admission in the emergency room, named the "golden hour". These procedures consisted of: radiological investigation determined by the clinical examination, including the x-ray of the cervical spine, urogastric catheter, urinary catheter, abdominal ecography, peritoneal puncture lavage.

When the traumatized patient arrived at the emergency room, two maneuvers are required to be performed: rapid surveillance and investigations to determine the lesions: systematic radiography of the cervical spine, CT, Doppler ultrasound, rapid correction of dysfunctions, as they compromise polytrauma patients' survival

Polytrauma patients' treatment is complex and specific as many of them are brought into a coma, confused or under anesthesia. There is also the possibility that some non-lethal injuries or complications mask the life-threatening injuries

In our study, the inpatient treatment in PT was classified in three stages

The first stage, considered the "golden hour" aims atrestoring respiratory function, maintaining the circulatory function in order to prevent the collapse, decreased intracranial hypertension, haemostasis in the case of internal bleeding, evacuation of the extradural hematoma.

The second stage includes the first two hours and aims at the stabilization and maintenance of respiratory function with the assurance of a SaO₂> 90%, monitoring the neurological status of the patient (often influenced by the sedatives administered especially in the case of orotracheal intubation with the necessary ventilation) to detect the secondary complications, performing the necessary surgical interventions, reducing the sequelae with differentiating the order of execution to avoid the aggravation of the evolution.

The third stage is characterized by the occurrence of visceral complications in the polytrauma patient with "difficult evolution" after the second therapeutic stage, pulmonary edema, acute renal failure, multiple organ failure (MODS).

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In the patients with dominant neurosurgical or thoracic traumatic pathology within the PT, several special aspects were taken into consideration, with immediate measures imposed by the observed symptoms: sudden respiratory failure, traumatic shock, acute pulmonary edema, acute renal failure, MODS progression, as a result of which manifestations occur later in the third stage. Regarding respiratory problems, we applied a few standard gestures, as follows: immediately after the arrival of the PT in the emergency room, the immediate measures for respiratory insufficiency were applied in two situations: comatose patient with hypoventilation or if the patient cannot inhale due to upper airway obstruction (jaw fractures, epistaxis with airway obstruction, etc., the conscious patient struggling with asphyxiation, the origin of which is pulmonary (contusion, edema, aspiration, vomiting) or laryngeal injury through laryngeal or thoracic trauma (intact sheath), commonly associated with hemothorax+/-pneumothorax. In these dramatic situations, pulmonary auscultation, whether or not associated with chest radiography, blood tests and, exceptionally, thoracentesis integrate the image of suffocation. Under the conditions of an adequate endoscopy, fixed bronchoscopy with optical monitor and low laryngoscopy can improve the state of asphyxiation by exploring the obstructive secretion.

In most of the thoracic traumas, immediate gestures were applied consisting of: mask oxygen therapy, diuretics administration, pleura drainage, sedation of pain by infiltration of local intercostal anesthetic, epidural anesthesia with intrapleural catheter inserted, the establishment of the mobile flail chest by leucoplast bands, especially in the case of posterolateral flail chest shutters without mediastinal balloons, while the anterior, mobile antero-lateral flail chests were stabilized with COMAN blades under orotracheal intubation.

Thoracotomy was indicated in the presence of the unstable lateral flail chest, especially in unconscious patients, without signs of chronic respiratory distress in order to reduce the duration of orotracheal intubation with mechanical ventilation, avoiding the risk of hospital-acquired pulmonary suppuration. Thoracotomy was also indicated in patients with inefficient pleural drainage with persistent acute asphyxia syndrome due to bronchial injury or post-traumatic bronchopleural fistula. In such situations, thoracotomy indication was applied when setting up the emergency diagnosis of: persistent and severe hemothorax, in case of >1500-2500 ml blood evacuated within three hours through thoracic drainage, diaphragmatic rupture revealed on CT scan or in cardiac tamponade (11 cases operated), refractory shock of thoracic etiology excluding other origins of the shock.

Data statistical processing. Statistical analysis was performed using SPSS 11.0 Macintosh software. The standard deviation (DS) and the data obtained were analyzed by Mann-Whitney score, the differences were compared by the text x², the differences being considered significant at <0.05.

RESULTS AND DISCUSSIONS

One of the aspects aimed at was the comparison of the incomplete diagnoses established in the immediate emergencies, taking into account different intervals between 1980-2014

Table no. 1 presents the data obtained by studying the complete number of cases with incomplete or erroneous diagnoses, taking into study intervals of 5 years, between 1980 and 2014. The percentage of incomplete diagnoses in emergency room ranged from 6.1-24% during 20 years of evaluated cases. From the studied data, a significant decrease of incomplete diagnoses is observed during the period 1980-2014 from 8% to 1.3% in abdominal trauma. Significant differences were also recorded in thoracic traumas, where the percentage of 9% of the

incomplete diagnosis recorded in 1980, was reduced to 1.6% in the period 2004-2014, the differences of 3% being observed in fractures.

Table no. 1. Shortcomings or incomplete diagnosis in immediate emergency

Localization	1980 - 1985		1986 - 1991		1992 - 1997		1998 - 2004		2004 - 2014	
Number	460		1628		1568		1716		1680	
Abdomen	36	8 %	36	2 %	32	2.1 %	32	1.8 %	24	1.3 %
Thorax	44	9 %	40	2.5 %	36	2.4 %	32	1.8 %	28	1.6 %
Fractures	28	6 %	56	3.5 %	48	3.1 %	48	2.8 %	56	3.2 %
Total	108	23 %	132	8 %	116	7.6 %	112	6.4 %	108	6.1 %

By summing up of all incomplete or erroneous diagnoses, it was found that in the period 1980-1985, there was recorded a decrease to 6.1% in the period 2004-2014 from 23%. The study was extended detailing the lesions found after incomplete diagnoses, both for the abdomen-thoracic viscera and for fractures (table no. 2).

Table no. 2. The detailed aspect of the lesions incompletely diagnosed in immediate emergency

Localization	Incomplete diagnosed lesions	'80 - '85	'86 - '91	'92 - '97	'98 - 2004	2004 - 2015
Abdomen	Spleen rupture	24 %	20 %	16 %	12 %	4 %
	Liver, pancreas, duodenum, retroperitoneum rupture	7 %	0.7 %	0.8 %	0.7 %	0.4 %
	Mesenterial hemorrhage	4 %	4 %	4 %	8 %	8 %
Thorax	Pulmonary contusion	3.4 %	0.7 %	0.8 %	0.5 %	0.2 %
	Diaphragmatic rupture	12 %	12 %	8 %	8 %	4 %
	Aorta rupture	8 %	12 %	12 %	4 %	16 %
Fractures	Extremities	16 %	40 %	36 %	12 %	44 %
	Spine	8 %	8 %	4 %	40 %	8 %
	Pelvis	4 %	8 %	8 %	4 %	4 %

Table no. 2. shows that in those conditions in which imaging plays an important role in establishing the diagnosis of patients, the percentage of uncertain diagnoses decreases from 3.5-7% to 0.2-0.4%, whereas in those cases where the diagnosis is established based on classical criteria, the percentage remains unchanged.

Regarding the pathology of abdominal trauma, incomplete diagnoses for the period 1980-1985 were 5.2% in splenic ruptures, 7% in hepato-pancreatic and retroperitoneal lesions, the percentage gradually decreasing, so that in the period 2000-2015, the incomplete diagnosis in splenic rupture decreased to 0.2% and 0.4% for retroperitoneal hepato-pancreatic lesions. Regarding the pathology of thoracic traumas, in the period 1980-1985, 3.4% incomplete diagnoses of pulmonary contusions were registered, the percentage reaching 0.2% between 2004-2015, the same tendency being observed in the diaphragmatic and aortic

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traumatic lesions.

Incomplete diagnoses below 1% between 1980 and 1985 were recorded in bleeding through mesentery ruptures and pelvic fractures (0.9%), percentages that decreased between 2000 and 2015 to 0.5% and 0.2% respectively.

The study of extremity fractures showed a small difference between the percentage of incomplete diagnosis between 1980 (3.5%) and 2015 (2.5%). The multifunctional complex study also included the results obtained by the types of interventions performed in the study interval. Thus, in table no. 3, the diagnosis and the number of interventions performed between 1980 and 2015 were summarized.

Table no. 3. Diagnosis and surgical interventions

Diagnosis	Intervention number
Liver ruptures	248
Emergency thoracotomy	402
Retroperitoneal hematoma	202
Diaphragmatic ruptures	58
II – IV degree duodeno - pancreatic ruptures	78

In the study, 248 emergency interventions were performed for I-V grade liver injury, 402 emergency thoracotomies including for resuscitation purposes, 702 traumatic retroperitoneal hematomas required surgical approach in relation to the zonal topography of the hematoma. Regarding the studied casuistry, 58 interventions were performed for diaphragmatic ruptures and 78 interventions for duodenal-pancreatic fences I-V.

The study performed in the evaluation of puncture, peritoneal lavage (PLP) sensitivity showed a sensitivity of 88% and a specificity of 95% (table no. 4), the results being obtained on a total of 460 emergency PLP performed for abdominal trauma.

Table no. 4. P.L.P. sensitivity in hemoperitoneum

Authors	Number	Sensitivity	Specificity
Hehremam	944	87	97
Day	200	85	96
Patyn	629	97	98
Fincher	2586	96	99
Kiss	460	88	95

Of the total number of 402 (5.7%) of emergency thoracotomies, 82% were indicated in closed thoracic traumas (TT), the total number of TT being 5760, and in 18% of thoracic penetrating wounds (1240 plagues). In a percentage of 28.8%, TT were associated with other polytrauma injuries, with 30.3% (2140) associated with extrathoracic lesions.

Morbidity, mortality and incidence, complexity of post-traumatic complications differ in relation to the existence of isolated lesions or the presence of polytrauma injuries.

In the present study the major complications of polytrauma, SIRS, MODS were evaluated.

In our experience, the study revealed a 14% incidence of severe MODS compared to the total number of patients in the polytrauma study.

In the polytrauma patients, the incidence of moderate or severe MODS was significantly higher with 16% overall mortality compared to total number of cases, 35% in polytrauma and 7% in patients with organic lesions or single systems.

We analyzed the incidence of severe SIRS as well as all types of SIRS, severe sepsis in all cases of thoracic, isolated abdominal trauma and in polytrauma patients, and also in a small number of polytrauma with extremity injuries. As the number of cases with cranial and extremity injuries included in the statistics is relatively small, we did not include in the polytrauma study these cases from our statistics.

In patients with isolated traumatic lesions, severe SIRS developed in 13% of cases, but in severe isolated trauma, septic

complications occurred in 26.5% and 17% of pelvic trauma.

In patients with complex penetrating abdominal lesions, the incidence of sepsis was 6.39% compared with closed traumatic lesions 3.18%.

From our study it was found that the incidence of moderate or severe MODS is significantly higher in the category of polytrauma patients with severe traumatic abdominal injuries or multiple limb fractures. Patients with polytrauma associating cranial lesions showed higher mortality compared to polytrauma patients without cranial lesions, but the association of lesions from other regions of the body did not influence the mortality rate.

Our statistics on polytrauma mortality showed that the highest mortality was recorded in polytrauma patients with association of traumatic brain injury, respectively 12% followed by association with thoracic lesions (8%) and 6% in association with abdominal injuries and 4% in the presence of pelvic injury.

Regarding severe polytrauma mortality with major multisystemic injury associations, the highest mortality was recorded in 45% of cases in association with head injury, 35% in association with abdominal injury, 20% in association with chest injury and 45% in association with pelvic injury.

The 45% mortality in the case of polytrauma with association of pelvic lesions is explained by the presence of traumatic retroperitoneal hematomas accompanied by major blood loss, complex fractures of the skeletal bone of the pelvis accompanied by severe traumatic shock and SIRS.

Of the causes of death 49% (95 patients) died from MSOF, 6% from pulmonary embolism, 4% from myocardial infarction and 41% by post-contusion brain edema.

In patients with isolated lesions without cranial trauma, 68% of deaths were caused by MODS, 17% by embolism, 17% by heart attack, and in 18% by other causes.

It should be noted that over 78% of deaths were due to MODS, 12% from embolism and 10-11% from infection.

CONCLUSIONS

In polytrauma, the complex multisystem injuries represent a risk factor for posttraumatic sepsis. When the polytrauma patients associate head injuries, this type of injuries represents the bookmark for survival in early and late period.

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