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Research on neurorehabilitation results in vertebro-medullary post-traumatic conditions associating fractures, in a politramatic context

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Abstract

Introduction

Polytrauma is considered to be an array of traumatic injuries, of which at least one is directly life-threatening. In another deffinition, polytrauma refers to the existence of two or more organ and / or system impairments, one of which is life-threatening, leading to physical, cognitive, psychological, psychosocial and consecutive functional disabilities, all requiring a complex and long-lasting rehabilitation program. The essential condition for polytrauma is the existence of a severe damage that involves one of the vital functions of the body. The first aim of this paper is to evidence the functional benefit of the specific rehabilitation program of patients with polytrauma, mainly associated with spinal cord injury (SCI) and other fractures. **Materials and method.** We performed a retrospective analysis of 68 patients having their consent and The Theaching Emergency Hospital "Bagdasar-Arseni" ethics Committee approval, N.O. 684/21.02.2019. Patients were admitted to the Neuro-Muscular Rehabilitation Clinic Division, between October 2017 and May 2019 between the ages of 19 and 79, divided into two lots of 34 patients: the study group, composed by patients with SCI and associated fractures and the control group composed by patients who had only SCI. **Results.** The level of severity is much higher in the study group, which includes AIS A patients (38%) and AIS C (29%), than the control group composed mostly by incomplete patients - AIS D (41%) and C (26%). The FIM average at admission and discharge is statistically significantly lower in the study group compared with the control group both at admission (25.05 versus 42.29; p = 0.001) and at discharge (38.47 vs. 55.55; P = 0.009). **Conclusions.** Spinal cord injury in combination with multiple fractures is a negative functioning prognostic factor, both before and after the rehabilitation program.

Key words: *Polytrauma, spinal cord injury (SCI), rehabilitation program,*

Introduction

Polytrauma is considered to be an array of traumatic injuries, of which at least one is directly life-threatening (1,2,6). In another deffinition, polytrauma refers to the existence of two or more organ and / or system impairments, one of which is life-threatening, leading to physical, cognitive, psychological, psychosocial and consecutive functional disabilities, all requiring a complex and long-lasting rehabilitation program(1,4,5). The essential condition for polytrauma is the existence of a severe damage that involves one of the vital functions of the body (3,7,8).

The first aim of this paper is to evidence the functional benefit of the specific rehabilitation program of patients with polytrauma, mainly associated with spinal cord injury (SCI) and other multiple fractures(9,11,13). All of deficiencies mentioned before are requiring a complex and long-lasting rehabilitation program(7,10,12). Rehabilitation is mandatory for a good recovery and functional life(3,6, 11).

Materials and method

We performed a retrospective analysis of 68 patients having their consent and the Theaching Emergency Hospital "Bagdasar-Arseni" ethics Committee approval, N.O. 684/21.02.2019. Patients were admitted to the Neuro-Muscular Rehabilitation Clinic Division, between October 2017 and May 2019. The 68 patients of the study, between the ages of 19 and 79 were divided into two lots of 34 patients: the study group, composed by patients with SCI and associated fractures and the control group composed by patients who had only SCI (without associating limb fractures).

Regarding the general criteria of the retrospective study we mention on the one hand the inclusion citeria - patients diagnosed with SCI (with different neurological levels and degrees of severity Frankel /

AIS) all over 18 years old. On the othe hand, the general exclusion criteria was represented by subjects over 18 years old who were not diagnosed with SCI.

The evaluation criterias of the study were: **epidemiological items** - the age at which SCI has been produced, gender distribution, environment origin (urban / rural); **functional, clinical and evolution items** : the severity grade of SCI, the neurological / traumatic level of SCI, the type of fractures associated, the level of functional independence (FIM) at admission.

The analysis of population normality was made by using frequency histograms and data presentation was realized with box and whisker plot statistical charts. Also important, T test revealed that if the p value was less than 0.001, the difference was considered statistically highly significant (Figure 1). These results were considered credible and had been communicated in this study. For comparing the average values, the T test was used considering the independent samples, with normal distribution.

Statistic value	Unimportant statistic	Comparable value	Statistic important	High statistic important
Valoare variabila	p>0,05	0,05>p> 0,01	0,01>p>0,001	P<0,001

Figure 1

In what regards the demographic analysis and gender distribution, in both studied groups male patients predominate: in the study group were 20 men (59%) and in the control group were 28 men (82%).

About the age item we can confirm that in our study were included patients with the age between19 to 79 years, having an average of 54 years (Figure 2).

	Minimum age	Maximum age	Average	Standard deviation
Study group	22	79	55	16,03
Control group	19	78	48	15,61
Total	19	79	54	16,14

Figure 2

In the study group, the patients in the urban area predominate - 23 versus 14 and in the control group they are equally distributed 17:17.

The most important item from the functional, clinical and evaluation citeria was the severity grade of SCI, determined by the use of Frankel scale:

- A - complete (plegia + anesthesia + autonomic denervation)
- B - sensitive only (has sacral sparing: perineal sensitivity S 4-5, anal sphincter contraction)
- C - useless motor (force below lesion level is less than 3 for most of myomers)
- D - usefull motor (force below lesion level is over 3 for most myomers)
- E - complete recovery (force 5 for all segments, sphincter control, etc.)

We discovered that the majority of patients in the study group were Frankel A complete level (38%) and the association of fractures leds to the worsening of their functional prognosis. On the other side, the most patients from the control group were Frankel D incomplete level (41%) and the lack of fractures could have improve their functional prognosis.

Analysing the neurological level we found that in the control group there were more patients with cervical vertebra-modularly fractures, SCI C (76%) despite of the study group in which the proportions were relatively equal (Figure 3, Figure 4).

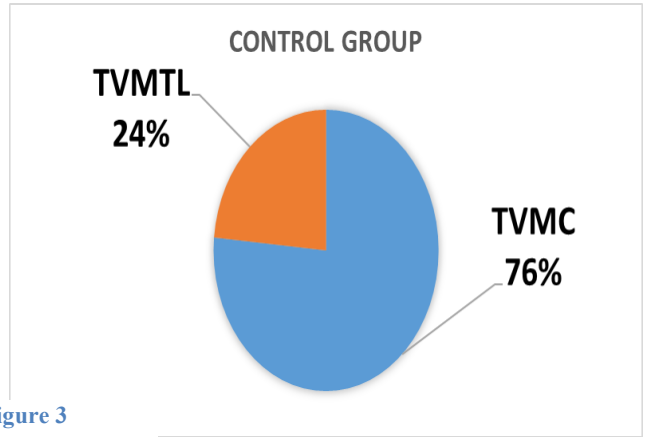

Figure 3

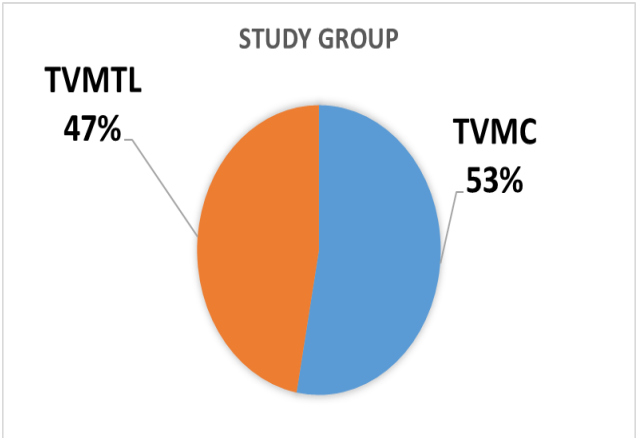

Figure 4

We also made a fracture analysis and the result was the following: in the study group it was not observed the predominance of a single type of fracture but multiple of this, which affected the patients further more. There are some types of associated fractures: left occipital fracture, right radio-carpal fracture and

left mastoid fracture, multiple costal fractures bilaterally, sternum fracture, right clavicle fracture, multiple skull fractures, pelvic ring fracture, right leg fracture, right leg fracture, right radius fracture, multiple rib fractures, right hemorrhage, fracture 1/3 proximal humerus left, fracture of acetabulum left. Each patient had minimum one associated fracture and maximum 5.

Very important for this study was the functional level of independence (FIM). Lower the numerical value of the FIM was, the more functional affected patient was (Figure 5).

FIM value	Level
under 50-55	Bedridden
56-70	Autonomy in the wheelchair
70-80	Ortostatism, roller walker
80-90	Assistive device (walker)
90-100	Walking stick
100-110	Stair climbing
110-126	Normal

Figure 5

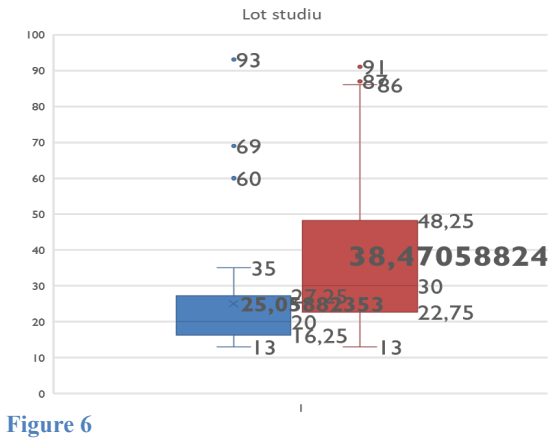

Figure 6

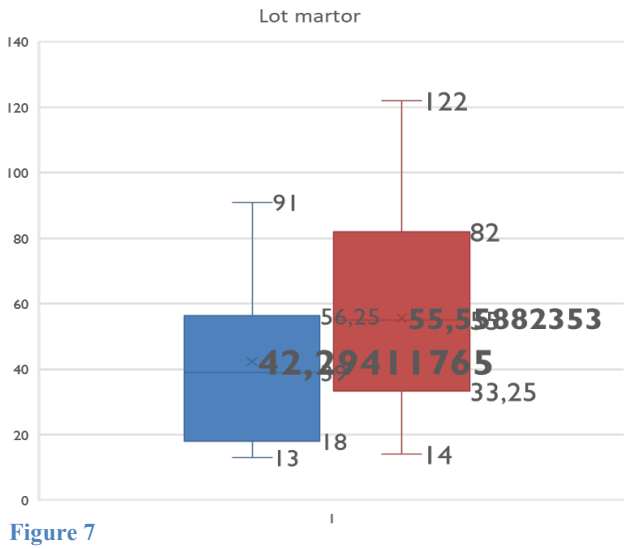

Figure 7

FIM scale of functionality evaluation was completed both at admission and at discharge. Both groups have good evolution but with but with few significant differences. Using statistic method box and wiskerplot we observed that in the control group FIM results were better - the admission FIM was 40 and the when discharged, 25% of patients were walking and 50% were at least standing (Figure 6 and 7). Study group FIM was lower, only 25% of patients were barely standing, excepting 5 cases (aberrant values).

Discriminate analysis, t test, p value <0.001, indicated a statistically significant evolution. The FIM average at admission and at discharge was statistically significant better in the control group, in patients without fractures (42 and 55) compared to the study group (25 and 38). This proved once more that the association of fractures with SCI is a functionally unfavorable prognostic factor.

Disscusions

The level of severity was much higher in the study group, which includes AIS A patients (38%) and AIS C (29%), than the control group composed mostly by incomplete patients - AIS D (41%) and C (26%) (Figure 8). The FIM average at admission and discharge was statistically significantly lower in the study group compared with the control group both at admission (25.05 versus 42.29; p = 0.001) and at discharge (38.47 vs. 55.55; P = 0.009).

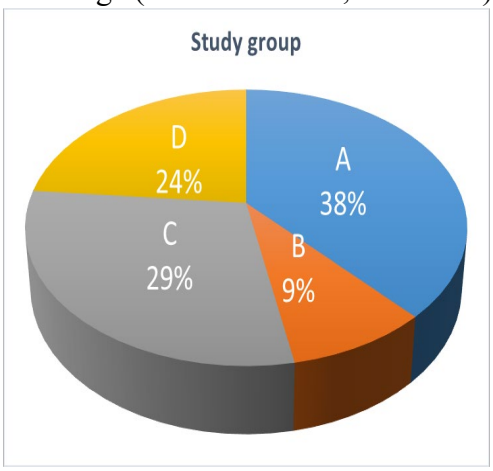

Figure 8

Patients with vertebra-medullar traumatism and associated fractures had a seriously bad general condition since admission. They were severe neurologically affected and despite of the specific rehabilitation program followed, their functional gain was maintained at a lower level than the patients who had no associated fractures. The presence of 1-5 associated fractures could led to complications and in principle maked the patient's rehabilitation program more difficult.

Conclusion

Vertebral-medullary trauma in association with multiple fractures is a bad functional prognostic factor, both before and after performing the recovery program. Also, spinal cord injury in combination with multiple fractures is a negative functioning prognostic factor, both before and after the rehabilitation program.

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