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Evaluation of patients applying for disability determination procedures in terms of spine injury

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Abstract

Vertebral are not easily injured due to both the strength of the bone structure and the anatomical protection of the soft tissues. Traumas that cause damage to the vertebral column are often high-energy traumas such as traffic accidents. In our study, vertebral fractures seen in patients who applied for a report for disability determination; were aimed to evaluate the fracture site in terms of its sequelae and its provisions in the disability determination charts. In our study, the reports of the cases that were examined by us after applying for disability assessment in Tokat Gaziosmanpaşa University Faculty of Medicine, Department of Forensic Medicine between the years 2019-2021 were examined. Cases with vertebral injuries were included in the study and were examined in terms of age, gender, spine region, additional traumatic findings, sequelae, treatment method, how many points they got from which disability scale, and duration of incapacity. As a result of joint range of motion examinations, in cervical vertebral fractures, limitation of cervical extension movement, in thoracic vertebral fractures, limitation of thoracic flexion movement, in lumbar vertebral fractures, it was determined that the limitation of lumbar extension movement was observed mostly. In our study, vertebral injuries were seen in 17% of the patients who applied for disability detection procedures after a traffic accident. In addition, vertebral injuries are important injuries in terms of public health and health expenditures, as well as important causes of disability and incapacity to work. Vertebral injuries resulting from traffic accidents can cause significant limitations and adversely affect people's lives.

Keywords: Vertebra, spine injury, disability, incapacity

Introduction

Traffic accidents cause general body trauma, material and moral losses, and systemic injuries that affect the vital functions of people. One of these injuries is vertebral injuries, mostly after high-energy trauma [1]. Vertebrae are deep-seated bone structures in our body and traumas that will cause fractures in the vertebrae are high-energy traumas, except for osteoporotic patients [2].

Vertebral fractures are economically important because both surgical and conservative treatments have high costs. Vertebral fractures may cause limitations in people at the end of the healing process. These limitations, which can develop after vertebral fractures, affect the social life of the person, cause material, moral losses, cause incapacity and disability [3]. Vertebral trauma patients apply to forensic medicine units for disability determination procedures, either individually or by court referral and request a report in order to seek their rights.

In our study, vertebral fractures seen in patients who applied

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for a report for disability determination; were aimed to evaluate the fracture site in terms of its sequelae and its provisions in the disability determination charts.

Material and Methods

Approval numbered 83116987-763 was received from the Tokat Gaziosmanpaşa University Faculty of Medicine Dean's Clinical Research Ethics Committee, stating that there was no ethical or scientific objection to our study.

In our study, the reports of the cases that were examined by us after applying for disability assessment in Tokat Gaziosmanpaşa University Faculty of Medicine, Department of Forensic Medicine between the years 2019-2021 were examined. Cases with vertebral injuries were included in the study and were examined in terms of age, gender, spine region, additional traumatic findings, sequelae, treatment method, how many points they got from which disability scale, and duration of incapacity.

Statistical Analysis

Descriptive analyzes were performed to give information about the general characteristics of the study groups and Pearson Chi-Square Tests was used in comparisons. Data belonging to continuous variables are in the form of mean±standard deviation and median minimum and maximum values; Data on categorical variables were given as n (%). It was considered statistically significant when the p-value was calculated less than 0.05. Ready-made statistical software was used for calculations (SPSS 22.0 Chicago, IL, USA).

Results

Vertebral injuries were detected in 263 (17%) of the 1547 cases that were examined by us after applying for disability assessment in Tokat Gaziosmanpaşa University Faculty of Medicine, Department of Forensic Medicine. Of the cases, 163 (62%) were male and 100 (38%) were female, and the male/female ratio was found to be 1.6. The mean age of the cases was 37.2 (min:5, max:77). It was determined that 184 of the cases had in-vehicle traffic accidents, 53 of them had non-vehicle traffic accidents, 24 of them were motorcycle accidents, 2 of them were bicycle accidents (Table 1) It was determined that 102 of the cases who had in-vehicle traffic accidents were male and 82 were female. Thirty five of the cases who had non-vehicle traffic accidents were male and 18 were female. Of the cases who had motorcycle accidents, 22 were male and 2 were female. Of the cases who had a bicycle accident, 1 was male and 1 was female. (p:0.01) (Table 2).

In 92 cases, other regional traumas were found in addition to vertebral injuries. It was observed that the most common accompanying additional trauma was in the extremities with 61 cases. Additional trauma findings were detected respectively in the thorax in 47 cases, in the lower extremities in 35 cases, in the upper extremities in 26 cases, in the head region in 23 cases, in the pelvis in 15 cases, and in the face in 11 cases (Table 3). It was found that 29 of the cases were treated surgically after the trauma, 179 cases were treated conservatively with corsets and 55 cases with a neck brace.

Table 1. Accident type

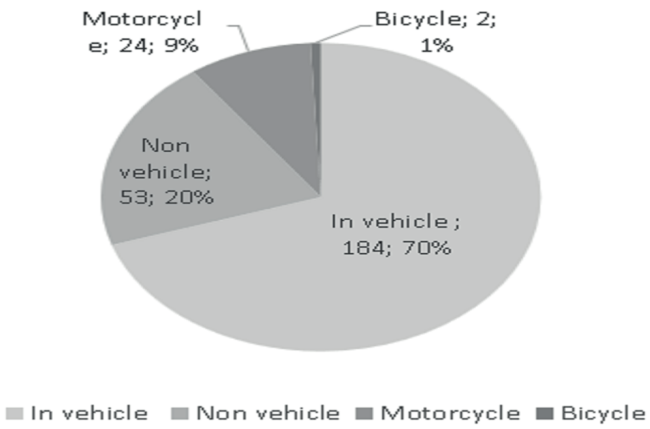
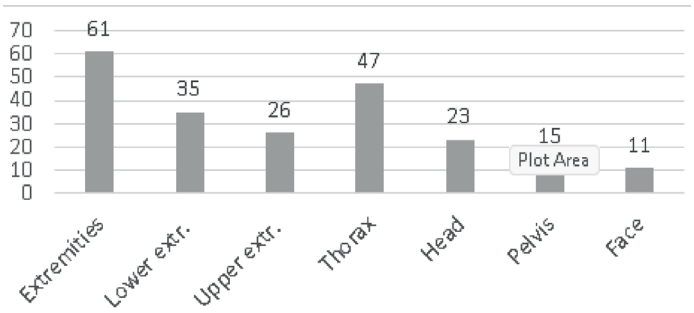


Table 2. Type of accident by gender

	In vehicle	Non-vehicle	Motorcycle	Bicycle	p
Male	102	35	22	1	0.010
Female	82	18	2	1	

Table 3. Additional trauma



Vertebral fractures were found at one level in 58% of the cases, at two levels in 25%, and at three or more than three levels in 17%. When the vertebral column was divided into cervical, thoracic, lumbar, and sacral, the most common fracture was found in the lumbar vertebrae (L1-5) in 228 cases. Fractures were observed in thoracic vertebrae in 138 cases (T1-12), cervical vertebrae in 101 cases (C1-7), and sacral vertebrae in 7 cases. L2 vertebra (66 cases) fractures were found most frequently in lumbar vertebrae. In order of the number of cases of other lumbar vertebral fractures; L1 62 cases, L3 45 cases, L4 35 cases, and L5 20 cases. T12 vertebrae (29 cases) were the most common fractures in the thoracic vertebrae. T11 vertebral fracture in 16 cases, T8 vertebral fracture in 13 cases, T5 and T9 vertebral fracture in 11 cases, T4 vertebral fracture in 10 cases, T3, T6 and T7 vertebral fractures in 9 cases, T10 vertebral fracture in 8 cases, T2 vertebral fracture in 7 cases, T1 vertebra fracture in 6 cases was detected. Fractures were found most frequently in the C2 vertebra (20 cases) in cervical vertebrae. The number of cases

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of other cervical vertebral fractures; C6 was 16 cases, C7 was 15 cases, C1, C3 and C5 were 13 cases, C4 was 11 cases. In sacral vertebrae, fractures were most common in S1 vertebra (5 cases), and fractures were found in one case each in S2 and S3 vertebrae. Most frequently fractured vertebrae are shown in Figure 1. It was determined that the lumbar vertebra was the most common injury in the patients who had an in-vehicle traffic accident, non-vehicle accident and motorcycle accident. The accident type and injured vertebral regions are given in Table 4.

Figure 1. Most frequently fractured vertebrae

Table 4. The accident type and injured vertebral regions

	In vehicle	Non-vehicle	Motorcycle	Bicycle	p
Cervikal	46	15	4	1	0.582
Thoracic	54	11	12	0	0.035
Lumbar	100	31	14	1	0.924
Sacral	6	1	0	0	0.902

Odontoid fractures were the most common in the upper cervical vertebrae (C1-C2), and lamina fractures were the most common in the lower cervical vertebrae. In the thoracic vertebrae, the most common corpus fracture, the second most common transverse process (62% right transverse process, 38% left transverse process) fracture was observed. It was observed that the most common transverse process fracture (51% left transverse process, 49% right transverse process) was developed in the lumbar region, and the second most common corpus fracture occurred. It was determined that the most common corpus fracture developed in the sacral region.

As a result of joint range of motion examinations, in cervical vertebral fractures, limitation of cervical extension movement was observed mostly. Limitations were detected respectively in bilateral rotation movement, bilateral lateral flexion movement and cervical flexion movements. In thoracic vertebral fractures, limitation of thoracic flexion movement was observed mostly. In lumbar vertebral fractures, it was determined that the limitation of lumbar extension movement was the most common. Respectively; It was observed that there were limitations in lumbar flexion, left lateral flexion and right lateral flexion movements. Neurological sequelae remained due to vertebral trauma in a total of 19 cases (%7.2), including 9 cases of cervical vertebral fracture, 5 cases of thoracic vertebral fracture, and 5 cases of lumbar vertebral fracture. It was determined that 14 of the cases with neurological sequelae were male and 5 were female. Neurological sequelae were detected after in-vehicle traffic accident in 14 cases, out-of-vehicle traffic accident in 4 cases, and after motorcycle accident in 1 case. There was no statistical significance between neurological sequels and gender (p:0.275) and type of accidents (p:0.91).

Fifty-five of the cases received rates from the Determination of Work Power and Loss of Proficiency in Occupation, 51 from the Disability Criterion, and 157 from the Adult Disability Assessment Schedule. Considering the medical recovery and rehabilitation periods due to the vertebral fracture, the duration of temporary incapacity for work, which was considered by us, was determined between the lowest 90 days and the highest 120 days (average 99 days). The average time of stay at the hospital of the patients treated surgically was determined as 11.8 days. 76% of patients treated surgically and 66% of patients treated conservatively stated that they had difficulty in doing their job and there was a decrease in their earnings.

Table 5. Avarage rate from the regulation charts

Regulation charts	Section	Table	n	Average Rate
Regulation on Disability Assessment for Adults	Musculoskeletal System 1-1.1 Injury Model and Diagnosis-related assessment	Table1.1	61	10.7
		Table1.2	31	10.1
		Table 1.3	33	10.4
	The joint range of motion model is 1-1.2	Table 1.4 to Table 1.10	32	19.3
Regulation on Disability Criteria, Classification and Health Reports to be Given to the Disabled	Musculoskeletal System 1-1.1 Injury Model and Diagnosis-related assessment	Table1.1	24	8.6
		Table1.2	8	10.5
		Table 1.3	10	11.3
	The joint range of motion model is 1-1.2	Table 1.4 to Table 1.10	9	15.5
Regulation on Determination of Working Power and Loss of Profession Loss Rate	Ruler A, spine malfunctions	10. List - 1	48	16.9
	Ruler A, spine malfunctions	10. List - 2	7	33

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The disability rates of the lumbar spine under the heading Musculoskeletal System 1-1.1 Injury Model and Diagnosis-related assessment in the scale of 85 cases that received a ratio from the Disability Criterion and Disability Assessment Table for Adults are from Table1.1, and the disability rates of 39 cases of the cervical spine are from Table1.2. The disability rates of the thoracic spine for 43 cases received a ratio from Table 1.3. Disability Criterion and Adult Disability Assessment Chart, in the disability section of spine problems, based on the item 'If there is no injury, if the injury model is insufficient, or if the injury affects more than one segment in the same spine region, the joint range of motion model is used, and 41 cases were rated from the Section 1-1.2 range of motion model [4,5]. The average rate of cases that received a rate from the Regulation on Disability Criteria, Classification and Health Reports to be Given to the Disabled was 11%, and the average rate of cases that received a rate from the Regulation on Disability Assessment for Adults was 12.4%.

Twenty-four cases that received a rating from the Determination Procedures for Work Power and Loss of Proficiency in Occupation were rated for mild 1Aa (1/3 loss of vertebral height) for crushing (compression) or comminuted fractures of a vertebra. 2 cases of medium 1Ab (loss of 1/2 of the vertebral height), 9 cases of crushing or comminuted fractures of a vertebra with dislocation in the cervical region from item 1Ba, 13 cases of multiple vertebra processus spinosus, processus transversus fractures from item 1C. 7 cases of ankylosis of the vertebrae in two or more segments occurred after vertebral fractures or fusion surgeries due to their fractures from item 2 [6]. The average rate of cases that received a rate from the Determination Procedures for the Loss of Working Power and Profession Loss of Earning Power was determined as 19%. The average scores and the number of cases obtained from the regulation charts are given in Table 5.

Discussion

Vertebrae are not easily injured due to both the strength of the bone structure and the anatomical protection of the soft tissues. Traumas that cause damage to the vertebral column are often high-energy traumas such as traffic accidents and falling from a height [7].

In studies in the literature, the average age of vertebral injuries has been reported to be generally in the thirties and 80% of cases with vertebral injuries are under the age of 40 [8,9,10]. In our study, the mean age was found to be 37.2. Vertebral injuries are 2-4 times more common in male than in female [11,12,13]. Consistent with literature, in our study %62 were male and %38 were female, the male-female ratio was found to be 1.6. It was determined that male had more spinal injuries in in-vehicle traffic accidents, non-vehicle traffic accidents and motorcycle accidents. The reason why vertebral injuries are more common in men is that they are more intense in traffic than women. Vertebral fractures are more common in men up to the age of 55 and in women over the age of 55 [14].

In the literature, traffic accidents and falling from a height have been shown as the most common causes of spinal injuries [15]. In our study, all cases with vertebral fractures were injured as a result of traffic accidents due to the examination of the reports prepared for disability determination procedures. For this reason, it does not reflect the most common cause of vertebral fractures in the whole population, as our study lacks. Vertebral injuries were found to be the most common in-vehicle traffic accidents among traffic accidents. When the bone fractures caused by traffic accidents are evaluated, vertebral fractures are among the first three bones in the list of the most broken bones [16].

Injuries to other systems may occur in high-energy traumas that cause spinal fractures [10]. Skeletal traumas constitute half of the additional injuries, the frequency of which is reported between 43-78%, and various organ injuries in the other half. In our study, the frequency of additional trauma findings was found to be 34.98%. Limb injuries are the most common accompanying injuries to vertebral fractures. In one study, Concomitant trauma was found in 47% of 508 patients brought to the hospital for spinal trauma. The most common ones were head trauma (26%), chest trauma (24%), and long bone fractures (23%) [17]. In another study, it was seen that lower extremity fractures were the most frequent, and fractures of the extremities were the most [18]. In our study, areas with additional trauma were the upper extremity in 26 cases (28%), lower extremity in 35 cases (38%), extremity injury in 61 cases, thoracic region injury in 47 cases (51%), head trauma in 23 cases (25%), Pelvis injury in 15 cases (16%) and facial bone fractures were detected in 11 cases (12%).

It has been reported in the literature that the most common injury is at the thoracolumbar junction (52%), that is, at the T11-L1 level. This is followed by the lumbar region (L2-L5) with 32% and the thoracic region (T1-T10) with 16% [8]. In our study, it was found that the most common injury was in the lumbar region (L2-5), with 166 cases. The most frequently injured vertebra was L2 (66 cases). The incidence of injury is higher in the thoracolumbar junction and lumbar region due to the facet joint incompatibility caused by the lack of protective effect of the rib cage and the facet joints in the thoracic region in the coronal plane and in the lumbar region in the sagittal plane [17].

In the literature, neurological deficit is observed in 14-38% of all vertebral traumas and fractures [19]. Neurologic deficits in cervical vertebral injuries reach 40%. Neurological deficits in thoracolumbar vertebral injuries in adults are seen at rates ranging from 10-38% [20,21]. In a study, the rate of neurological deficit was 10.9% [22]. In our study, the rate of neurological deficit was 7.2%. It was found that cervical vertebral fractures were the most common cause of the neurological deficit. Neurological sequelae were found to occur most frequently in males and in-vehicle traffic accidents. In our study, it was determined that the most common lamina fracture in the cervical vertebrae, the most common corpus fracture in the thorocal vertebrae, the most common left trans vertebrae fracture in the lumbar vertebrae, and the most common corpus fracture in the sacral vertebrae as a result of traffic accidents.

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It was seen that the average rate of cases that received a rate from the Determination Procedures for the Rate of Loss of Working Power and Profession, was 19%, the average rate of cases that received a rate from the Disability Criterion was 11%, and the average rate of cases that received a rate from the Disability Assessment Chart for Adults was 12.4% [4,5,6]. It is seen that the section reserved for spinal defects in Determination of Labor Force and Loss of Profitability in Occupation is less detailed than other charts. As a result, disability report issuers cannot find the exact equivalent of vertebral injuries in the charts and give results as a result on their own opinions. This situation, especially in the cases where results are obtained by using the Determination of Loss of Working Power and Profession Loss Rate, causes the rates to be different and higher.

In the literature, it is seen that the hospitalization period of the operated patients varies between 10 and 107 days [22,23]. In accordance with the literature in our study, the average time of stay at the hospital of the patients treated surgically was determined as 11.8 days. The duration of temporary incapacity for work, which was considered by us, was determined between the lowest 90 days and the highest 120 days (average 99 days).

Conclusion

All examinations should be carried out in accordance with the methods specified in the charts and in accordance with objective criteria. In addition to active range of motion, passive range of motion should also be evaluated. Medical documents and radiological results of the applied treatment should be examined in detail. In this way, both patients and insurance companies can be prevented from losing their rights regarding the event that is the subject of the lawsuit.

Our study has made significant contributions to the literature on patients with vertebral injuries who applied to Forensic Medicine Units for disability determination. In addition, vertebral injuries are important injuries in terms of public health and health expenditures, as well as important causes of disability and incapacity to work. Vertebral injuries resulting from traffic accidents can cause significant limitations and adversely affect people's lives. In our study, vertebral injuries were seen in 17% of the patients who applied for disability detection procedures after a traffic accident. Individuals with limited vertebral movements will suffer economically by staying away from most work areas. In order to reduce the loss of rights, necessary steps should be taken for these individuals to seek their rights through disability determination procedures, and by providing appropriate working conditions, it is necessary to prevent them from suffering further economic damage.

Our study was presented as an oral presentation at the 3nd International Turaz Academy Forensic Sciences, Forensic Medicine and Pathology Congress.

Conflict of interests

The authors declare that there is no conflict of interest in the study.

Financial Disclosure

The authors declare that they have received no financial support for the study.

Ethical approval

In our study, the reports of the cases that were examined by us after applying for disability assessment in Tokat Gaziosmanpaşa University Faculty of Medicine, Department of Forensic Medicine between the years 2019-2021 were examined.

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