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Effects Of COVID-19 Isolation Practices on Neusurgical Traumas

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ABSTRACT

Aim: Coronavirus disease 2019 (COVID-19) is an infectious disease caused by severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) that was declared a pandemic by the World Health Organization (WHO) on March 11, 2020. Our objective was to investigate the incidence of head and spine injuries due to trauma before and after the pandemic. To identify the situations that should be considered in isolation measures due to the possibility of the occurrence of such epidemics in the globalized world.

Material and Method: Medical records of 2595 patients were accessed, and 1309 patients with missing patient data were excluded from the study. Normal distribution of continuous variables was tested with the Kolmogorov-Smirnov test. Continuous variables were compared with the Mann-Whitney U test, and categorical variables were compared with the Chi-square test or Fisher's exact test.

Results: Data from 1286 patients were analyzed. Some parameters differ before and after the pandemic, including age, injury mechanism, type of lesion, and spinal trauma. The average age is 33.9, and the male-female ratio is 3/2. The most frequent admission to the emergency room was in the summer. Our data showed significant differences in age, gunshot wounds in the trauma mechanism, soft tissue injury and contusion in lesions, and spinal trauma.

Conclusion: The Covid pandemic has caused imperative changes in every aspect of life. This situation also caused a shift in the reasons for applying to hospitals. It has been shown that the isolations performed because of Covid-19 did not affect the patient's diagnosis, treatment, and mortality, although they changed the mechanisms of head and spine trauma. Even with compulsory isolation for public health, the approach to neurosurgical traumas that may occur should not change. It should not be forgotten that other clinical situations continue during the COVID-19 pandemic

Keywords: Emergency, COVID-19, neurosurgical, trauma, isolation, pandemic

COVID-19 İzolasyon Uygulamalarının Beyin Cerrahisi Travmalarına Etkisi

Süreç

Geliş: 25/07/2022
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ÖZ

Amaç: Coronavirüs hastalığı 2019 (COVID-19), şiddetli akut solunum sendromu koronavirüs 2'nin (SARS-CoV-2) neden olduğu bulaşıcı bir hastalıktır ve 11 Mart 2020 tarihinde Dünya Sağlık Örgütü (WHO) tarafından pandemi ilan edilmiştir.Bizde bu çalışmada pandemi öncesi ve sonrasında travmaya bağlı kafa ve omurilik yaralanmalarının sıklığını araştırmayı amaçladık.

Gereç ve Yöntem: 2595 hastanın tıbbi kayıtlarına ulaşıldı ve eksik hasta verileri olan 1309 hasta çalışma dışı bırakıldı. Sürekli değişkenlerin normal dağılımı Kolmogorov-Smirnov testi kullanılarak değerlendirildi. Sürekli değişkenler Mann-Whitney U testi ile karşılaştırıldı ve kategorik değişkenler Ki-kare testi veya Fisher'in kesin testi kullanılarak karşılaştırıldı. Globalleşen dünyada bu tür salgınların ortaya çıkma ihtimalinden dolayı, izolasyon tedbirlerinde dikkat edilmesi gereken durumları ortaya koymak.

Bulgular: 1286 hastanın verileri analiz edildi. Pandemi öncesi ve sonrası, yaş, yaralanma mekanizması, lezyon tipi, spinal travma gibi bazı parametreler farklılık göstermektedir. Yaş ortalaması 33.9 ve erkek-kadın oranı 3/2'dir. Acil servise en sık başvuru yazın oldu. Verilerimizde yaş, travma mekanizmasında ateşli silah yaralanması, lezyonlarda yumuşak doku yaralanması ve kontüzyon ve spinal travma açısından anlamlı farklılıklar vardı.

Sonuç: Covid pandemisi hayatın her alanında zorunlu değişikliklere neden olmuştur. Bu durum hastanelere başvuru nedenlerinde de değişikliğe neden olmuştur. Covid-19 nedeniyle yapılan izolasyonların, baş ve omurga travmasının mekanizmalarını değiştirse de hastaların tanı, tedavi ve mortalitesini etkilemediği gösterildi. Halk sağlığı için zorunlu izolasyona rağmen oluşabilecek beyin cerrahisi travmalarına yaklaşım değişmemelidir. Unutulmamalıdır ki Covid 19 pandemisinin varlığında diğer klinik durumlarda da devam etmektedir.

Anahtar sözcükler: Acil, COVID-19, beyin cerrahisi, travma, izolasyon, pandemi

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INTRODUCTION

Traumatic brain injury (TBI) is a disruption in the normal function of the brain and spinal cord caused by an external mechanical force. TBI has physical and psychological effects on people and also has serious economic consequences for the countries.[1,2]

TBI is also known as a silent epidemic due to the lack of public awareness and accounts for almost half of all injuries admitted to the emergency department[3.] Although spinal traumas are less common than brain traumas, their morbidity rates are relatively higher.[4] Most people with TBI suffer from disability for the rest of their lives.[3]

In all age groups, the annual incidence of TBI in Europe is 326 per 100,000, while the frequency of spinal injuries is 12.1-57.8 per one million.[2,4] In the USA, nearly 50,000 annual deaths are associated with TBI.[3] Motor vehicle accidents mostly cause TBI and falls from heights, followed by exposure to physical violence and concussion sustained because of sports activities (e.g., mountaineering, skiing, football, and basketball), recreational activities, and excessive alcohol consumption.[2] Severe and fatal TBIs often occur due to motor vehicle accidents.[2]

The risk of TBI increases with age.[3] The elderly often have higher mortality and morbidity rates compared to those of young people due to the use of anticoagulant drugs, the presence of comorbidities (orthopedic, neurological, cardiac diseases), and the anatomical changes in the brain structure that occur with age.[3]

Coronavirus disease 2019 (COVID-19) is an infectious disease caused by severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) and was declared a pandemic by the World Health Organization (WHO) on March 11, 2020, after this declaration, WHO recommended that all countries develop their own national risk assessments to combat the COVID-19 outbreak.[5,6] One of the most effective methods in this combat is social isolation, which has changed the trauma mechanisms and the demographic characteristics of TBI patients admitted to hospitals.[6] In this study, we aimed to investigate the frequency of head and spinal injuries caused by low-energy trauma before and after the pandemic.

METHODOLOGY

The retrospective study included TBI patients who applied to our emergency department between January 1, 2019, and January 1, 2021. The study was conducted according to the World Medical Association Declaration of Helsinki for studies on human subjects and was approved by our university's Scientific Research Ethics Committee (dated January 15, 2021; protocol number (2021/01-26). The data of the study were obtained using emergency room notes, neurosurgery consultation notes and, radiological imaging reports, the national disease classification codes (ICD-10) in the electronic data system (Enlil). Medical records of 2595 patients were accessed, and their data were entered into SPSS software using the following ICD-10 codes: W19, V49.9, S01.0, S01.9, S02.0, S02.1, S02.3, S02.7, S02.9, S04.0, S06.0, S06.9, S07.0, S07.1, S07.8, S07.9, S09.7, S09.9, T01.0, T02.0, T04.0, T06.0, T90.1, T90.2, T90.4, T90.5, T90.8, and T90.9.

Patients were divided into two groups based on their admission date: (i) January-December 2019 and (ii) January-December 2020. Most common mechanisms of injury included falls from heights, motor vehicle accidents, assault, hanging, gunshot injury, injury, electric shock, and drowning. The severity of TBI was categorized into three categories using Glasgow Coma Scale (GCS): (I) mild (GCS score, 13-15), moderate (GCS score, 9-12), and severe (GCS score, ≤8). Cranial lesions, epidural/subdural/subarachnoid hemorrhage, cerebral contusion, cerebral edema, skull fracture, and pneumonia were recorded for each patient.[2] Spinal trauma was categorized as cervical, thoracic, lumbar, and sacral injuries. Isolated soft tissue injury was excluded from the study. The presence of pain alone was soft tissue injury. Patients whose observation periods ended in the emergency and neurosurgical service or operated were included in the study.

Data were analyzed using SPSS for Windows version 27.0 (Armonk, NY: IBM Corp.). Descriptives were expressed as mean, standard deviation (SD), median, minimum-maximum values, frequencies (n), and percentages (%). Normal distribution of continuous variables was assessed using the Kolmogorov-Smirnov test. Continuous variables were compared using the Mann-Whitney U test, and categorical variables were compared using the Chi-square test or Fisher's exact test.

RESULTS

Data from 1286 patients were analyzed in this study. The average age is 33.9, and the male-female ratio is 3/2. Demographic data are given in table 1. Hospitalizations and follow-ups were made in the emergency department, neurosurgery service, and intensive care unit. Patients who applied to the emergency department after trauma and were planned to be followed for over 6 hours were admitted to the hospital. Except for minor traumas, all suspicious clinical conditions were followed up by hospitalization. Trauma mechanisms, clinical lesions and, mortality rates are given in table 2.

The most common injury mechanism was a fall, and the most common lesion was a bone fracture. Subarachnoid hemorrhage was not seen in any of our cases. The most injured area in spinal trauma was the lumbar region. The surgical treatment rate was 3.51%, and the mortality rate was 0.43.

Admissions to the emergency department by months before and after the pandemic are given in Table 1

Table 1: Admissions to the emergency department by age, gender, before-after pandemic, and months

		Before pandemic	After pandemic		Total	
		Mean ± s.s/n-%	Mean ± s.s/n-%	P	Min.-Max. / Median	Mean ± s.s/n-%
Age		35 ± 26,4	32,8 ± 25,2	***0,012***	1,0-97,0 / 31,0	33,9 ± 25,8
Gender	Male	789- 61,4%	786 – 56,6%	0,495		1575- 60,7%
	Female	497 – 38,6%	523 – 37,7%			1020-39,3%
Before pandemic						1286- 49,6%
After pandemic						1309- 50,4%
Months						
January		108-8,4%	67-4,8%			175-6,7%
February		107-8,3%	85-6,1%			192-7,4%
March		101-7,9%	72-5,2%			173-6,7%
April		87-6,8%	106-7,6%			193-7,4%
May		81-6,3%	107-7,7%			188-7,2%
June		119-9,3%	143-10,3%			262-10,1%
July		158-12,3%	160-11,5%			318-12,3%
August		116-9%	140-10,1%			256-9,9%
September		104-8,1%	118-8,5%			222-8,6%
October		101-7,9%	126-9,1%			227-8,7%
November		94-7,3%	103-7,4%			197-7,6%
December		110-8,6%	82-5,9%			192-7,4%

The most frequent admission to the emergency room was in the summer.

The mean age was significantly lower in patients admitted after the pandemic compared with those admitted before the pandemic ($p<0.05$). In contrast, no significant difference was found regarding gender distribution between the two periods ($p>0.05$). The frequency of admissions because of gunshot injury was significantly higher in patients admitted after the pandemic compared to those admitted before the pandemic ($p<0.05$). The prevalence of cerebral contusion and the frequency of admissions due to spinal trauma were significantly higher in patients admitted after the pandemic compared to those admitted before the pandemic ($p<0.05$). The frequency of admissions because of soft tissue injury was significantly higher in patients admitted after the pandemic compared to those admitted before the pandemic ($p<0.05$). Statistical distribution of pre-pandemic and post-pandemic age, gender, trauma mechanisms, clinical lesions, and mortality are given in Table 2.

Table 2. Comparison results by groups

		Pre-Pandemic		Post-Pandemic		*p.
		N	%	N	%	
GENDER	Male	1675	77,8%	478	22,2%	,275
	Female	1061	76,2%	331	23,8%	
TRAUMA MECHANISM	Fall	434	73,8%	154	26,2%	**,045**
	Motor vehicle accident	360	83,1%	73	16,9%	
	Minting	48	81,4%	11	18,6%	
	Vaccine	10	90,9%	1	9,1%	
	ASY	56	77,8%	16	22,2%	
	İnjury	34	75,6%	11	24,4%	
	Electric shock	2	100,0%	0	0,0%	
	Suffocation	2	100,0%	0	0,0%	
	Other	1790	76,7%	543	23,3%	
TRAUMA VIOLENCE	Light	479	81,0%	112	19,0%	,061
	Middle	33	76,7%	10	23,3%	
	Heavy	44	83,0%	9	17,0%	
	Unknown	2180	76,3%	678	23,7%	
SCALP LASERATION	Available	147	77,4%	43	22,6%	,807
	No	83	79,8%	21	20,2%	
	Unknown	2506	77,1%	745	22,9%	
INTRACRANIAL LESION	Available	107	84,3%	20	15,7%	,118
	No	130	79,3%	34	20,7%	
	Unknown	2499	76,8%	755	23,2%	
LESION	Epidural	17	85,0%	3	15,0%	,905
	Epidural, Subdural	2	100,0%	0	0,0%	
	Epidural, Bone fracture	11	84,6%	2	15,4%	
	Subdural	20	80,0%	5	20,0%	
	Subdural, Contusion	3	100,0%	0	0,0%	
	Subdural, Bone fracture	6	60,0%	4	40,0%	
	Subarachnoid	1	50,0%	1	50,0%	
	Contusion	28	80,0%	7	20,0%	
	Contusion, Edema	5	100,0%	0	0,0%	
	Contusion, Bone fracture	12	75,0%	4	25,0%	
	Edema	12	85,7%	2	14,3%	
	Edema, Bone fracture	3	100,0%	0	0,0%	
	Bone fracture	271	77,2%	80	22,8%	
	Bone fracture, Pneumocephalus	3	75,0%	1	25,0%	
	Midline shift	0	0,0%	0	0,0%	
	Pneumocephalus	3	75,0%	1	25,0%	
	Unknown	2339	77,0%	699	23,0%	
SPINAL TRAUMA	Available	223	74,3%	77	25,7%	,148
	No	103	83,1%	21	16,9%	
	Unknown	2410	77,2%	711	22,8%	
CERVICAL	Cervical	48	80,0%	12	20,0%	,390
	Cervical, Thoracic	11	90,9%	1	9,1%	
	Thoracic	45	67,2%	22	32,8%	
	Thoracic, Lumbal	15	68,2%	7	31,8%	
	Lumbar	93	73,8%	33	26,2%	
	Lumbal, Soft tissue	2	100,0%	0	0,0%	
	Sacral	2	66,7%	1	33,3%	
	Soft tissue	150	80,6%	36	19,4%	
	Unknown	2369	77,3%	697	22,7%	
SURGICAL DONE?	Available	26	63,4%	15	36,6%	**,001**
	No	757	81,8%	168	18,2%	
	Unknown	1953	75,7%	626	24,3%	
URGENTLY DISCHARGE	There is	140	75,7%	45	24,3%	,680
	No	370	78,6%	101	21,4%	
	Unknown	2226	77,1%	663	22,9%	
MORTALITY	There is	4	100,0%	0	0,0%	,260
	No	952	78,4%	263	21,6%	
	Unknown	1780	76,5%	546	23,5%	
		Mean	**Std. Dev.**	**Mean**	**Std. Dev.**	****p.**
AGE		34,09	25,93	34,31	26,35	,495

**Chi-square test Statistics* ***Mann-Whitney U test Statistics*

DISCUSSION

The labor loss and the impairment of physical or mental function caused by head and spinal trauma place a serious burden on the patients and countries.[2,7]

Traumatic brain injury (TBI) mostly affects individuals aged 21-40 years and has two peaks of incidence, of which the first peak is at 20-40 years, mostly due to motor vehicle accidents, and the second peak is often seen in the elderly over 65 years of age due to falls.[4] In children, however, the most affected age range is 0-10 years.[8] A study conducted in Iran reported that the incidence of head injuries caused by low-energy trauma had recently increased in individuals over 60 years, particularly those aged between 83-90 years.

The authors also noted that such patients might be asymptomatic.[3]A study conducted in Scotland reported that the rates of hospitalization because of neurosurgical trauma in patients aged over 65 years had increased remarkably.[9] Perez et al. reported that the traumatic spinal injury rate in individuals over 65 years showed no significant change.[4] In the literature, advanced age is accepted as a prognostic factor for head trauma.[10] In this study, the mean age of patients admitted to the emergency department with neurosurgical trauma was 33.9 ± 25.8 years. The mean age of the patients who applied after the pandemic was significantly lower than those who applied before the pandemic. We think this is because patients over 65, who are in the highest risk group in the Covid-19 pandemic, are more isolated in our country.

The incidence of neurosurgical trauma shows wide variation among studies, which could be attributed to the differences in the inclusion criteria of the studies and two, including patients with headache, vertigo, and amnesia, particularly in cases with mild trauma.[11] A previous review analyzed 23 studies conducted in Europe and reported the incidence of head trauma as 23, mortality as 15 per 100,000 population, and traumatic spinal injury as 13.4 (20.4 in men and 4.7 in women) per one million population.[1,4] In Spain, 1000 recent cases of traumatic spinal injury are diagnosed, and 20000 traumatic brain injury patients are hospitalized each year.[4] According to a study conducted in Nigeria, patients with head trauma made up 30.9% of all trauma patients admitted to the hospital.[8] Heydari et al. reported that traumatic brain injury had doubled, and the hospitalization rate had increased 2.5 times over the last 18 years.[3] These studies show that patients with neurosurgical traumas have a high hospitalization rate (Table 2). The rate of those who were followed up in the emergency service, neurosurgery service, and intensive care unit was 72.9%. The reason for this high rate is the prolongation of the follow-up period in case of clinical suspicion since the trauma is a dynamic process.

According to the literature, both head and spinal traumas are more common in males. It is known that men are more involved in business life than women.[2,4,8,9,12] Although the rate of males was higher before and after the pandemic in our study, no statistically significant difference was found between the genders (Table 1). We think this difference does not exist as all genders stay at home as active life is restricted due to Covid-19 isolation.

Falls from height and motor vehicle accidents are the most common causes of neurosurgical trauma in all age groups, followed by assault, domestic injuries, and gunshot injuries.[8] Motor vehicle accidents and falls from heights are more common in younger ages, while falling from the same level is more frequent in elderly individuals.[3,7,9] In our study, no significant difference was found between pre- and post-pandemic periods regarding the frequency of admissions due to motor vehicle accidents, assault, hanging, injury, electric shock, and drowning ($p>0.05$). In contrast, the frequency of admissions because of gunshot injury was significantly higher in patients that were admitted after the pandemic compared to those who were admitted before the pandemic. We think that long quarantine periods cause a tendency to violence by negatively affecting human psychology.

The severity of TBI is commonly assessed using GCS. Most TBIs admitted to the emergency department are often categorized as mild trauma, with a GCS score of ≥13.[13] Heydari et al. and Onwuchekwa et al. evaluated TBI patients admitted to the emergency department and reported that 85.3% and 39% of the patients had mild TBI, respectively.[3,8] Low GCS is associated with high mortality and morbidity and thus can be used in predicting the prognosis of TBI patients.[3,10] However, patients with a history of conditions such as hypotension, alcohol abuse, and medication may be under the influence of drugs[11]. In this study, 85.5% of the cases had mild TBI (Table 2). We want to state that the social quarantine measures implemented in our country due to Covid-19 do not significantly affect the severity of TBI in our patients.

Patients with head and spinal traumas can present with many manifestations ranging from asymptomatic to intracranial lesions or lateralizing signs[1,4]. In patients with minor head trauma, altered mental status, clinical signs of skull fracture, vomiting, and soft tissue injury in the craniofacial region are alarming factors.[12]

A 2020 study evaluated patients who applied to the emergency department and reported that intracranial lesions were detected in 14% of patients with mild trauma and 22.9% of patients with mild-moderate trauma.[3] Fractures of the skull, skull base, and facial bones, focal neurological deficits, seizures, coagulation disorder, and ongoing anticoagulant therapies have been associated with severe TBI.[11] But no relationship has been found between scalp lacerations and intracranial hemorrhage.[3]

In the present study, no significant difference was found between before-after pandemic periods regarding the incidence of intracranial lesions, cerebral edema, bone fracture, scalp lacerations, and pneumocephalus. In contrast, the incidence of contusion decreased, and the incidence of soft tissue injury increased after the pandemic. These findings may be due to the relatively increased frequency of low-energy trauma because of decreased motor vehicle accidents during the quarantine period.

Spinal cord injury can be seen at any age, mostly in the third decade of life.[4,13,14] Knútsdóttir et al. reported the incidence of spinal cord injury per one million as 289 in Finland, 365 in Norway, 534 in Australia, and 750 in the USA(14).

Although the incidence of spinal cord injury has been higher in men in recent years, its incidence is gradually increasing in both genders. [4,14] The incidence of cervical spinal cord injury is higher than that of thoracic/lumbar injury.[14] In our study, although the overall incidence of spinal cord injury was significantly higher in the after-pandemic period, no significant difference was found between the two periods in terms of the incidence of cervical, thoracic, and lumbar injuries (Table 2). We can explain this situation because the trauma mechanism did not change before and after the pandemic.

Neurosurgical traumas often occur during working hours and social activities.[8] A study conducted in Denmark showed that the incidence of neurosurgical traumas increased at the weekend and in summer, and the authors attributed this increase to violence, entertainment, and substance and alcohol abuse.[2] In Turkey, following the identification of the first cases of Covid-19 in March 2020, the incidence of neurosurgical traumas admitted to the emergency department decreased slightly beginning from April 2020, particularly between July and December, compared to the same period in the previous year, mainly due to the intermittent social isolation imposed in the country (Table 1). In our study, most patients presented to the emergency department in summer, both before and after the pandemic, which could be associated with the loosening of isolation policies and travel rules in summer due to the decline in the number of cases in summer.

Treatment of neurosurgical trauma depends on the severity of the trauma and clinical and comorbid conditions. The most effective treatment method is the prevention of trauma.[1] In the case of trauma, the primary goal is to minimize the risk of permanent neurological injury.[10] Computed tomography (CT) is recommended in the presence of clinical signs of increased intracranial pressure and spinal cord compression.[12] The specificity and sensitivity of CT in trauma patients were found to be superior to direct roentgenograms.[15] The patient can be treated surgically or conservatively, depending on the lesion status.[10] In such patients, stroke, cancer, coronary artery disease, and anticoagulant drug use may affect the recovery time.[8,10] It has been shown that patients with chronic conditions are not significantly affected by isolation measures.[16] In the present study, no significant difference was found between pre- and post-pandemic periods regarding the number of surgical procedures performed and the number of patients discharged from the emergency department (Table 2). Since most cases do not require surgical treatment, we think there is no significant difference between before and after the pandemic. Most important parameters affecting mortality after head and spinal trauma include trauma severity, low GCS, advanced age, and comorbidities.[3,8,9]

In the present study, no significant difference in mortality rate was found between before-after pandemic periods.

CONCLUSION

Coronavirus disease 2019 (Covid-19) is a global pandemic affecting the entire world and leading to different lifestyles in social and business settings. With the globalization of the world, the risk of threatening public health from such pandemics continues. The best method to control pandemic processes in isolation. We think these processes will affect individuals, societies, and states. Our findings indicated that, although this isolation changed the mechanisms of head and spinal traumas, it did not affect the patient's diagnosis, treatment, and mortality. More studies are needed to detect and control these effects.

ETHICAL APPROVAL

The study was started after the approval of the local ethics committee of Yüzüncü Yıl University with the number 2021/01-26.

PATIENTS' CONSENT

Informed consent is not required as it is a retrospective study, and patient identity was kept anonymous.

CONFLICT OF INTEREST

The authors declared no conflict of interest.

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