

The Effect of COVID-19 Pandemic on the Characteristics of Pediatric Supracondylar Fracture: A Retrospective Cohort Study

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Abstract

Background: Environmental factors play a key role in the occurrence of pediatric supracondylar humerus (SH) fracture which has been widely affected by the COVID-19 pandemic and the measures taken to curb its spread. In this study, we aim to investigate the ultimate impact coronavirus pandemic has had on SH fractures in children.

Materials and Methods: This retrospective cohort study compares SH fractures which occurred during the pandemic with their prepandemic counterpart in a pediatric trauma public hospital. Patient's data, submitted from February to July 2020 and 2019, were collected and divided into two groups based on fractures' time of occurrence, i.e., during or before the pandemic.

Results: There was no significant difference in terms of gender, type of fracture, injury location, and time of admission during a day between the aforementioned groups. However, in the pandemic group, patients were transferred to the operating room significantly quicker (odds ratio; 2.13 vs. 0.607, $P = 0.01$) and the surgery duration was shorter (40.17 ± 12.28 min vs. 49.11 ± 15.48 min, $P = 0.011$). It was found that the location of injury (home, school, etc.) varied between the two groups ($P = 0.01$) and the proportion of domestic injuries during the pandemic grew significantly (53.6% vs. 19.8%).

Conclusion: Although the incidence of pediatric SH fractures has decreased due to the closure of schools and sports clubs during the pandemic, domestic occurrence of the same fracture type has grown disproportionately. To prevent this trend, pediatric centers should educate parents on child safety measures and fracture risks during the lockdown.

Keywords: Coronavirus, COVID-19, epidemiology, pediatric, supracondylar humerus fractures

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INTRODUCTION

Coronavirus infection is an acute respiratory syndrome caused by the Severe Acute Respiratory Syndrome Coronavirus-2 virus, which originated in Wuhan, China in December 2019, and spread rapidly to other parts of the world.^[1] On March 11, 2020, the World Health Organization characterized the disease as a pandemic.^[2] The clinical pattern of COVID-19 is not clear, especially in children and the symptoms are different in children compared to adults;^[3,4] in a study conducted in

Wuhan, China, 15% of the children who were diagnosed with COVID-19 were clinically asymptomatic with normal radiological findings, despite laboratory confirmation of the disease.^[4] The incidence of COVID-19 is lower in children compared to adults due to their high resistance against the disease. As reports suggest, children transmit the virus mostly through person-to-person contact.^[5] Given these differences, more consideration should be given to pediatric

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orthopedic surgical systems. Recent studies on the pandemic have indicated a reduction in total number of pediatric fractures, as well as the characteristics associated with them.^[6] SH supracondylar humeral fracture is still the most common fracture among children^[7] and constitutes 60%–80% of pediatric humeral fractures.^[8–10] The average age of SH fracture incidence has been reported in various studies to be between 3 and 8 years.^[11,12] Gartland classification is widely used to categorize SH fractures, according to which Type I is a nondisplaced fracture, Type II is an incomplete fracture with an intact posterior cortex, and Type III is a fracture with a complete displacement.^[13] Complications are highly probable in nonsurgical treatment of Types II and III, which renders it inefficient.^[14] Therefore, in this study, we objective to investigate the ultimate impact coronavirus pandemic has had on SH fractures in children.

MATERIALS AND METHODS

Study design

With the approval of the Institutional Review Board of Shahid Beheshti University of Medical Sciences, This retrospective study was performed within a 6-month time span from February to July 2020 and in the same period in 2019 on children with SH fracture at the Pediatric Orthopedic Trauma Center (Akhtar Public Hospital - Iran). We selected 137 patients and divided them into two groups to evaluate their fracture characteristics. All surgeries were performed by an orthopedic surgeon and all patients were operated on with closed reduction and percutaneous fixation with k-wires and a long splint applied after surgery. Inclusion criteria included (1) children aged 2–12 years, (2) without previous history of surgery around the same elbow, (3) without neurologic disorder, and (4) diagnosed with Gartland Type II and III fractures. Exclusion criteria included (1) patients with multiple fractures or open fractures, (2) patients with incomplete medical records, or (3) patients with previous elbow deformity. Demographic information was extracted from patients' electronic files. Digital Picture Archiving and Communication System and Gartland system were used to diagnose the type of fracture and classify it, respectively. Patients' data included demographic characteristics, type of fracture, time of hospital admission (daytime, i.e., between 8:00 a.m. and 8:00 p.m./nighttime, i.e., later than 8:00 p.m.), duration of surgery (total time of anesthesia and surgery), urgency of surgery (urgent for under 8 h/emergent for above 8 h), and location of the injury (home/street/school/kindergarten/playground, etc.). The aim of this study was to compare, retrospectively, the characteristics of supracondylar fractures which occurred during the pandemic with a pre-pandemic record.

Statistical methods

Following the coding of data, the qualitative variables were evaluated using the Chi-squared (χ^2) test or Fisher's exact test, whereas quantitative variables were assessed

by Student's *t*-test and odds ratio obtained from univariate logistic regression. We used the Statistical Package for the Social Sciences version 16.0 software (SPSS Inc., Chicago, IL, USA) for all statistical analyses. Our data were presented as either (mean \pm standard deviation), median (range), or *n* (%), and the significance level was set to $P = 0.05$ with a confidence interval of 95%.

RESULTS

In our study, 137 patients (below 12 years of age and diagnosed with SH fracture) were selected out of 250 pediatric fracture cases. Patients were then grouped (based on whether the fractures occurred during the pandemic or not) and evaluated in various aspects [Table 1]. The pandemic and the pre-pandemic groups did not differ significantly by gender ($P = 0.123$) and by the average age of patients (4.14 ± 2.02 years vs. 5.06 ± 2.61 years, $P = 0.055$). The pandemic had no significant effect on the side of injury as the left side was more frequently injured in both groups (67.9% vs. 56.8%, $P = 0.191$). Furthermore, the fracture pattern did not vary significantly between the two groups ($P = 0.854$).

Although hospital admission time for SH fractures did not change significantly during the pandemic (daytime vs. nighttime, $P = 0.590$), transferring patients to the operating room was quicker (odds ratio; 2.13 vs. 0.607, $P = 0.01$), and surgeries were of shorter duration (40.17 ± 12.28 min vs. 49.11 ± 15.48 min, $P = 0.011$). As for SH fractures during the pandemic, the proportion of domestic injuries significantly

Table 1: General demographic information of supracondylar fractures in children

Variable	<i>n</i> (%)
Total case	137 (100)
Sex	
Male	78 (56.9)
Female	59 (43.1)
Side	
Right	53 (38.7)
Left	84 (61.3)
Type of fracture	
Type II	77 (56.2)
Type III	60 (43.8)
Admission	
Nighttime	82 (59.9)
Daytime	55 (40.1)
Type of surgery	
Urgent	71 (51.8)
Emergent	66 (48.2)
Location of injury	
Home	46 (33.6)
Street	19 (13.9)
School/kindergarten	36 (26.3)
Playground	27 (19.75)
Other	9 (6.6)
Period of injury	

increased (53.6% vs. 19.8%) and the most common fracture type was Gartland II [Table 2].

DISCUSSION

The spread of the COVID-19 has created a major challenge for the health care system; it has altered the treatment pattern of trauma and has also brought emergency patients into more focus. The nationwide restrictions imposed by governments (e.g., social distancing, schools' closure, etc.) have substantially influenced pediatric fractures,^[15] especially supracondylar ones. SH fracture is one of the most common pediatric fractures for which a large number of patients undergo surgery every year.^[9,16] The characteristics of SH fracture have changed during the pandemic, and so have the methods to approach them as a consequence. As indicated by this study, COVID-19 restrictions reduced the total number of fractures in children, especially the SH fracture compared to the prepandemic period (40.9% vs. 59.1%). Such changes are evident as a result of reduced outdoor activities (e.g., school, sports, etc.) since the restrictions came into effect. Despite this overall decrease, on account of more time being spent at home, domestic SH injuries have increased by 33.8%. According to our findings, patients, once admitted, were transferred to the operating room within a significantly shorter time span during the pandemic. This is due to the health system pandemic policies which were implemented to reduce patients' length of stay. The operating time has also

decreased during the pandemic. As a preventive measure, more effort should be taken to inform parents of the potential fractures risks and encourage them to boost the safety level of children's play environment.

This study revealed consistent findings with the previous literature; the mean age of patients (which remained nearly constant across pandemic and prepandemic groups) corresponded to similar studies^[17,18] and the left side was consistently reported as the most frequent fracture side.^[11] Lack of access to patients' objective data in the prepandemic period (2019) and exclusive use of electronic records posed limitations to the study. Patients who referred to private hospitals instead due to their insurance coverage and those who did not seek medical help due to COVID-19 concerns were not included in this study for their information was unobtainable for public hospitals.

CONCLUSION

Although the incidence of pediatric SH fractures has decreased due to the closure of schools and sports clubs during the pandemic, domestic occurrence of the same fracture type has grown disproportionately. To prevent this trend, pediatric centers should educate parents on child safety measures and fracture risks during the lockdown.

Limitations of the study

The limitations of this study included: Small number of patients, lack of access to pediatric orthopedic trauma centers,

Table 2: Analysis of fracture demographic information in pandemic and prepandemic groups

Variable	Pandemic, n (%)	Prepandemic, n (%)	P	OR
Age (year), mean±SD	4.14±2.02	5.06±2.61	0.055	
Gender				
Male	31 (55.4)	47 (58)	0.086 exact	0.728 versus 1.248
Female	25 (44.6)	34 (42)	0.123	
Side				
Left	38 (67.9)	46 (56.8)	0.129 exact	0.728 versus 1.248
Right	18 (32.1)	35 (43.2)	0.191	
Type of fracture				
Type II	32 (41.6)	45 (58.4)	0.854	1.03 versus 0.974
Type III	24 (40)	36 (60)		
Admission				
Daytime	24 (42.9)	31 (38.4)	0.590	1.11 versus 0.924
Nighttime	32 (57.1)	50 (61.7)		
Type of surgery				
Urgency	39 (69.6)	32 (39.5)	0.01	2.13 versus 0.607
Emergency	17 (30.4)	137 (100)		
Duration of surgery, (min), means±SD	40.17±12.28	49.11±15.48	0.011	
Location of injury				
Home	30 (53.6)	16 (19.8)	0.01	
Street	10 (17.9)	9 (11.1)		
School/kindergarten	3 (5.4)	33 (40.7)		
Playground	8 (14.3)	19 (23.5)		
Other	5 (8.9)	4 (4.9)		

SD: Standard deviation, OR: Odds ratio

and lack of timely referral due to fear of coronavirus, which in future studies should be given special attention.

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Conflicts of interest

There are no conflicts of interest.

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