

Original Article

Effects of the SARS-CoV-2 pandemic on the incidence of surgically treated fractures in Sao Paulo city

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Abstract

Objective: Evaluate the effect of the SARS-CoV-2 pandemic in the two years since it started.

Methods: Retrospective study to analyze the complex structured data set of high volume and variability (Big Data) publicly available on the TabNet platform (DATASUS) through artificial intelligence software. The results of foot and ankle fractures, all lower limb fractures, and all body fractures were analyzed comparatively from 2018-2019 to 2020-2021.

Result: The isolated fibula fracture suffered the greatest decrease from 2018-2019 to 2020, and the malleolar fracture presented the highest increase in this period. All fractures showed an increase in 2021 compared to 2020. Except for the distal tibial articular and the talar fractures, the length of hospital stay decreased for all other fractures and the malleolar fracture, remaining up to 36% fewer days hospitalized.

Conclusion: COVID-19 pandemic initially decreased the incidence of surgically treated fractures in most fracture patterns, but this effect was not maintained in the second year of the pandemic. The length of hospital stay of these patients decreased in the two years of the pandemic compared to 2018-2019.

Level of Evidence II; Retrospective Study; Economic and Decision Analyses - Developing an Economic or Decision Model.

Keywords: COVID-19; Fractures, bone; Hospitalization; Pandemics; SARS-CoV-2.

Introduction

One of the current main diseases is the coronavirus-19 (COVID-19), the largest infection that has affected the world in the last 100 years⁽¹⁻³⁾. It was first described in Wuhan/China in late 2019 but spread worldwide in early 2020 when the World Health Organization (WHO) considered it a pandemic^(4,5). The first case described in Brazil was in February 2020.

Social isolation was one of the main ways to combat the transmission of COVID-19, and it was expected to minimize contact between people^(6,7). The decrease in traumas could be possible with the isolation, especially those of high energy, due to the reduction of sports practices, the traffic of cars/motorcycles, and high falls.

Some articles described this decrease in some fracture incidence during the pandemic's peak period, but it was described for short periods of up to six months⁽⁸⁻¹³⁾. Therefore, the objective of this study is to describe the effect of the pandemic in its two years of duration compared to the previous two years.

Methods

Retrospective study to analyze the complex structured data set of high volume and variability (Big Data) publicly available on the TabNet platform of the public health informatics system (DATASUS)⁽¹⁴⁾ in one of the most populated cities in the world (Sao Paulo), through artificial intelligence software.

Study performed at the Hospital Israelita Albert Einstein, São Paulo, SP, Brazil.

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The following codes were used:

04.08.05.049-7 Surgical treatment of bimalleolar/trimalleolar/ankle dislocation-fracture;

04.08.05.054-3 Surgical treatment of tibial pilon fracture;

04.08.05.057-8 Surgical treatment of unimalleolar ankle fracture;

04.08.05.0454 Surgical treatment of fracture/physical injury of midfoot bones;

04.08.05.046-2 Surgical treatment of fracture/physical injury of metatarsals;

04.08.05.047-0 Surgical treatment of fracture/physical injury of the toes;

04.08.05.053-5 Surgical treatment of calcaneal fracture;

04.08.05.056-0 Surgical treatment of talar fracture;

04.08.05.069-1 Surgical treatment of metatarsophalangeal/interphalangeal dislocation/fracture-dislocation;

04.08.05.070-5 Surgical treatment of subtalar and intra-tarsal dislocation/fracture-dislocation;

04.08.05.071-3 Surgical treatment of tarsal-metatarsal dislocation/fracture-dislocation.

In addition, information was also processed for all lower limb fractures using the ICD-10 classification (codes S72, S82, and S92) and for all body fractures using the ICD-10 classification (codes S12, S22, S32, S42, S52, S62, S72, S82, and S92), in

patients over 20 years. Information on the number of hospitalizations and the length of hospital stay was collected for all these injuries. The TabNet platform or system also extracted data from the last population census of the studied city⁽¹⁵⁾.

The authors defined that for an alteration to be significant, it should not exceed 5%, and less than 5% could be considered a normal variation between years.

Results

In the incidence of fractures in 2020, the distal tibial articular fracture and foot fracture had little change with the emergence of SARS-CoV-2, with less than a 5% variation compared to the mean of 2018-2019 (Figure 1A and Table 1). The isolated fibula fracture showed a large drop in incidence from 15.83 and 16.70/10⁵ cases-inhabitants in the pre-COVID-19 years to 10.72/10⁵ cases-inhabitants in 2020, representing a drop of 34% compared to the mean of previous years. The calcaneal fracture, the lower limb fractures, and all fractures present a small decrease in incidence between pre-/during COVID-19 years, with a reduction of around 6% in 2020 compared to the mean of 2018-2019 (Figure 1B). The malleolar fracture presented the opposite behavior with an increase in the incidence of 10.41 and 11.29/10⁵ cases-inhabitants in 2018-2019 to 16.95/10⁵ cases-inhabitants. Finally, the talar fracture showed a slight increase of 7.69% in the incidence of 2020 compared to 2018-2019.

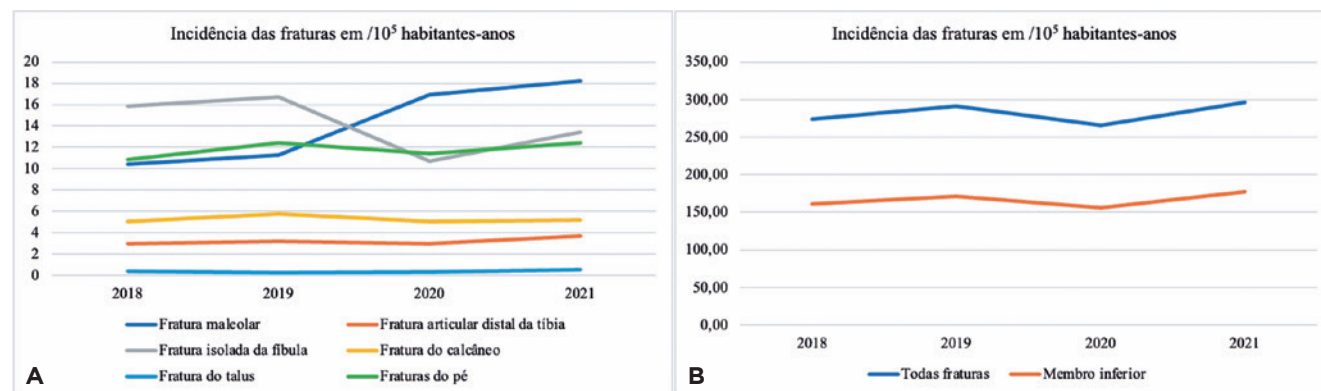


Figure 1. A) Graph showing the incidence of ankle and foot fractures between 2018-2021. B) Graph showing the incidence of all body and lower limb fractures.

Table 1. Comparison of incidences

	2020 vs. 2018-2019	2021 vs. 2020	2021 vs. 2018-2019
All fractures	6.05%	11.43%	-4.69%
Lower limb	6.42%	13.65%	-6.36%
Malleolar fracture	-56.25%	7.50%	-67.96%
Distal tibial articular fracture	2.45%	22.42%	19.42%
Isolated fibula fracture	34.10%	25.54%	17.27%
Calcaneal fracture	6.96%	2.21%	4.90%
Talus fracture	-7.69%	53.57%	-65.38%
Foot fracture	2.08%	9.02%	-6.76%

There was an increased incidence of all analyzed fractures when comparing 2021 to 2020, with the calcaneal fracture the least increased (2.21%) and the talus fractures with the greatest increase (53.57%). When comparing 2021 with the mean of 2018-2019, the isolated fibula fracture still has a lower incidence than in the pre-COVID-19 years; calcaneal and general fractures returned to similar levels to these years. The other fractures have an incidence already higher than 2018-2019, with the malleolar fracture having increased by 68% compared to these years.

Regarding the length of hospital stay for these fractures, in 2020, only the talar fracture presented a longer length of hospital stay than the previous mean (51.94% more, equal to 3.24 days more) (Table 2 and Figure 2). The distal tibial articular and isolated fibula fractures did not have significant changes. However, the length of hospital stay decreased for all other fractures and the malleolar fracture, reducing by almost a third their length of stay.

Most fractures maintained a similar length of hospital stay in 2021, only the talar fracture had a significant reduction of

47.62% and the calcaneal and foot fractures showed an increase of 10.50% and 9.07%, respectively. Compared to the pre-pandemic years, only the distal tibial articular fractures and isolated fibula and foot fractures did not present a reduction in the mean length of hospital stay.

Discussion

In the first year of COVID-19, the incidence of surgical fractures in Sao Paulo city decreased, as did the lower limb surgical fractures. The reduction may be due to the isolation applied in the city that reduced the chance of high-energy traumas such as automobile accidents, falls from great heights, or sports traumas^(16,17). This decrease in incidence was seen in most studies that described the initial phase of COVID-19^(8-13,16,17). However, malleolar and talar fractures, considered high-energy trauma, increased during this period and may be associated with changes in patient habits during the isolation period.

The second year of COVID-19 showed an increase in the incidence of all fractures compared to the initial year; this may be related to the decrease in social isolation in 2021. Mo et al.⁽¹⁶⁾ also described this increasing number of cases in 2021.

In addition, Khabiri et al.⁽¹³⁾ found that some fractures had a faster treatment due to the cancellation of elective surgeries that did not dispute the operating room and medical availability, which is more relevant in developing countries with less access to health care. This pattern of faster treatments was also found in the analyzed years, but it remained even in 2021 when most hospitals had already returned with elective surgeries, which may indicate that there was a restructuring of services to allow greater efficiency in bed management.

The study's limitations are the database where the information was extracted; there is no description of the type of accident suffered by the patient. In addition, it was not possible to verify the number of patients who underwent conservative treatment and how many patients received the diagnosis in the emergency room and were sent home and returned only on the day of surgery. Also, there is no data on the private care system and health insurance. However, this study is one of the only articles that analyze COVID-19 data in 2020-2021 and describes how much it affected the length of hospital stay and not only the occurrence.

Table 2. Comparison of length of hospital stay

	2020 vs. 2018-2019	2021 vs. 2020	2021 vs. 2018-2019
All fractures	9.83%	-2.36%	7.70%
Lower limb	8.65%	-1.07%	7.67%
Malleolar fracture	33.10%	4.30%	35.98%
Distal tibial articular fracture	-0.40%	0.26%	-0.14%
Isolated fibula fracture	1.44%	3.25%	4.64%
Calcaneal fracture	17.54%	-10.50%	8.88%
Talus fracture	-51.94%	47.62%	20.42%
Foot fracture	10.86%	-9.07%	2.78%

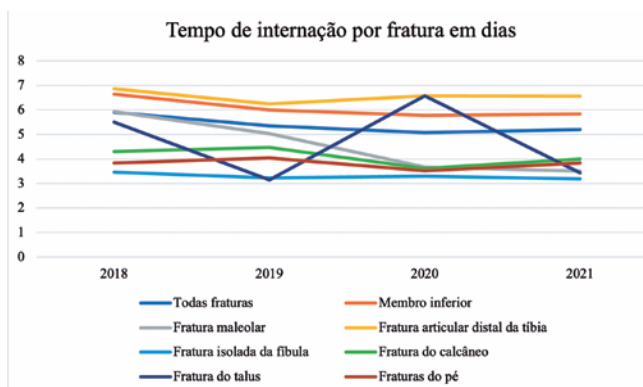



Figure 2. Graph showing the variation in the length of hospital stay for fractures in the last two years.

Conclusion

The emergence of SARS-CoV-2 decreased the incidence of in-hospital treatment of most fractures patterns, but in 2021 this effect was not maintained, with the incidence of most fractures greater than 2020. On the other hand, one of the results of COVID-19 was a reduction in the length of hospital stay, something that remained in the two years of the pandemic, which may represent a new trend.

Author's contributions: Each author contributed individually and significantly to the development of this article: DLR*(<https://orcid.org/0000-0003-0183-8641>) Conceived and planned the activities that led to the study, data collection, statistical analysis, wrote the article; NW *(<https://orcid.org/0000-0003-1991-3507>), and MFAS *(<https://orcid.org/0000-0002-0714-5291>) Interpreted the results of the study, participated in the review process, performed the surgeries; VG *(<https://orcid.org/0000-0002-4429-312X>), and ALG *(<https://orcid.org/0000-0002-6672-1869>) Interpreted the results of the study, participated in the review process, performed the surgeries. All authors read and approved the final manuscript. *ORCID (Open Researcher and Contributor ID) .

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