Acta Biomed 2023; Vol. 94, N. 3: e2023108 DOI: 10.23750/abm.v94i3.14217

Original article

The impact of Covid-19 in proximal femur fractures. An observational study for the analysis of mortality rate

Andrea Cosentino, Gianni Odorizzi, Wilhelm Berger

Department of Orthopedic and Traumatology, Franz Tappeiner Hospital – ASDAA Azienda Sanitaria Alto Adige, Meran (Bz), Italy

Abstract. *Background and aim:* Fractures of the proximal femur in the elderly are probably the leading cause of death in the orthopedic patients. Furthermore, after the spread of the Covid-19 pandemic, the mortality rate in the elderly has certainly increased. The aim of our study is to evaluate whether the mortality following proximal femur fractures is affected by the concomitant pandemic. *Methods:* We admitted to our study patients over 65 years old, who presented to our Emergency Room with a diagnosis of proximal femur fracture in the first quarter of the years 2019, the period before the development of the pandemic, of 2020 during the pandemic and of 2021 with the new wave of Covid-19. 2022 was not taken into consideration because the mortality data are not yet available and to have at least one year follow-up after surgery. All patients were divided by fracture's type and treatment; the time elapsed from trauma to surgery and from trauma to discharge was also evaluated. For each deceased patient, we considered the time elapsed from the operation to death and whether there was an episode of positivity to Covid-19 following the trauma and after discharge (all patients had a negative swab at the time of admission). *Conclusions*: Fractures of the proximal femur in the elderly patient are undoubtedly an important cause leading to the death. The spreading of the Covid-19 pandemic has allowed our department to reduce the gap between trauma and intervention time and from trauma to discharge which is undoubtedly a positive prognostic factor. However, the concurrence of a positivity from the virus does not seem to influence the mortality times following the fracture. (www.actabiomedica.it)

Key words: Proximal femur fracture, mortality, Covid-19

Background and aim

Proximal femur fractures (PFF) rank among the top ten causes of disability and mortality in the elderly population (1). PFF are a significant global public health issue (2,3). A 15–30% 1-year death rate and an even larger percentage of patients with long-term functional disabilities are linked to these fractures, which are also associated with severe morbidity and mortality (2,4,5).

Understanding patient outcomes in the older population is crucial for optimizing patient management due to the high cost of both acute and long-term hip fracture treatment (6,7). The gold standard for treating hip fractures is surgery and factors such as timing of surgical fixation and coexisting medical comorbidity must be considered in the treatment plan (8,9).

As is now well known, a new Coronavirus disease, called Severe Acute Respiratory Syndrome Coronavirus 2 (SARS-CoV-2) causing the Coronavirus Disease 2019 (COVID-19), hit in December 2019. On March 11th 2020, the World Health Organization (WHO) declared the disease a pandemic (10). In Italy, the total people affected by Covid-19 at the moment of writing the paper are 25.279.682 with 185.417 deaths (11). In the age group between 70-79 years, a total of 44.032 died; in the age group 80-89 there are

74.180 and >90 years are 38.087, data that shows that the elderly are more at risk of death. The aim of our study is to evaluate whether the mortality rate in patients with hip fracture is affected by the Covid-19 pandemic.

Method

The study included patients older than 65 years who came to our emergency department with a PFF in the first quarter of the years 2019, 2020 and 2021. We chose to compare the period of the greatest impact of Covid-19 in its first wave in Italy (first quarter of 2020), comparing it with the same period of the previous year (2019) and the following year (2021), when Covid-19 was again at its peak of incidence. 2022 has not been taken into consideration, because the data on mortality were not available and to have at least one year of postoperative follow-up. Patients with AO 31A1-2, 31A3, or 31B PFF were included in the study, according to the AO/OTA Fracture and Dislocation Classification, but patients with type 31C, periprosthetic, or peri-implant fractures were not included. Each patient at the time of hospitalization presented a negative swab for Covid-19; we evaluated the interval time between the trauma and the operation, between the operation and the discharge and eventually the death with the relative interval between the trauma and death. If the patient had contracted Covid-19, the intervals between positivity and the date of discharge as well as between positivity and death were evaluated.

Since the statistical analysis and data comparison required basic formulas, we decided to perform our study just using Microsoft Excel.

Results

In 2019, the total number of included patients was 54, of which 15 males and 39 females and with an average age of 84.7 years (Figure 1a); in 2020, 64 patients with an average age of 83.7 years were recruited (Figure 1b), including 17 males and 47 females. In 2021 there were 65 hospitalized patients, of which 20 males and 45 females with an average age of 83.4 (Figure 1c).

Looking at every single year, in 2019 there were 22 patients with a 31A1-2 fracture, 29 patients with a type 31B fracture, and 3 patients with a 31A3 fracture. Of these patients, 24% were on previous anticoagulant therapy. Treatment included a cemented endoprosthesis for 31%, arthroplasty for 6%, intramedullary nail for 31%, Dynamic Hip Screw (DHS) for 19% and just screws treatment for the remaining 7%; 3 patients were treated conservatively.

The mean interval between admission and surgery was 2.9 days (Figure 2a) and between surgery and discharge was 9.7 days (Figure 3a). No patients died during the hospitalization, while a total of 24 patients (44%) died with a mean interval of 584 days between fracture and death (Figure 4a). In 2020, 24 patients arrived with a 31A1-2 fracture type, 7 patients with fracture type 31A3, and 33 patients with fracture type

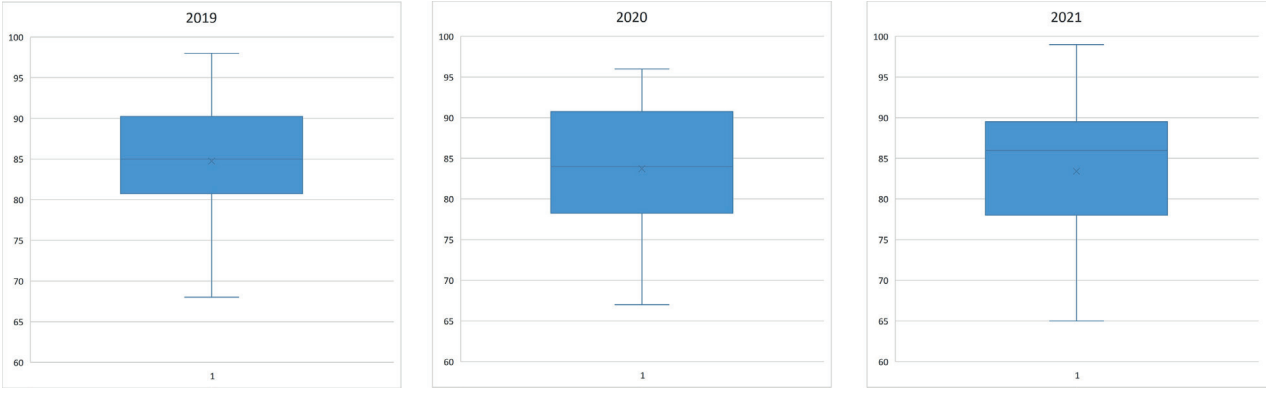

Figure 1. Average age. a) 2019, b) 2020, c) 2021.

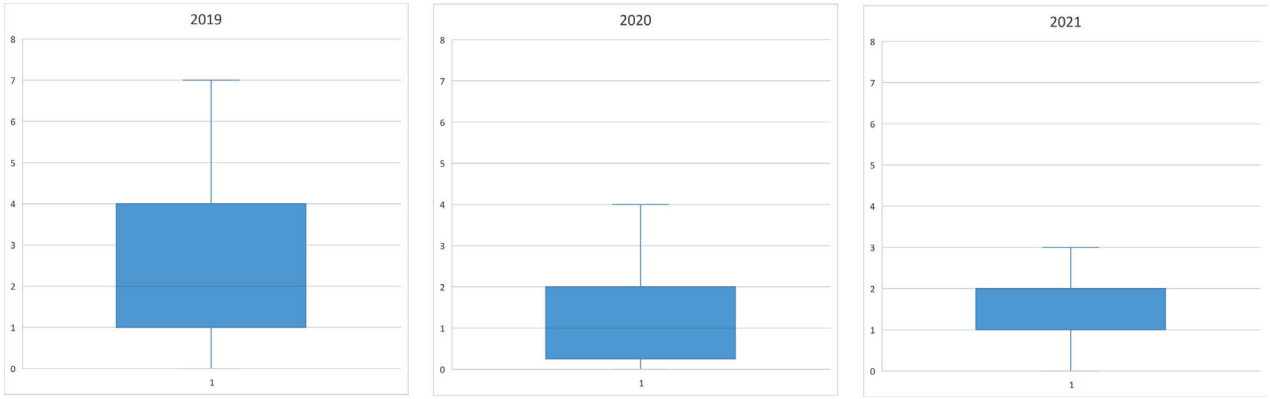

Figure 2. Time between admission and surgery. a) 2019, b) 2020, c) 2021.

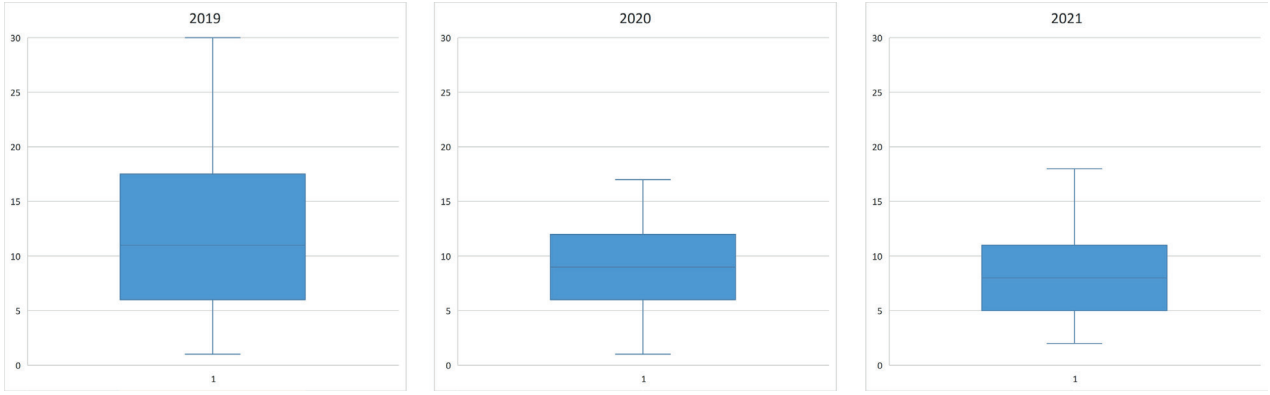

Figure 3. Time between surgery and discharge. a) 2019, b) 2020, c) 2021.

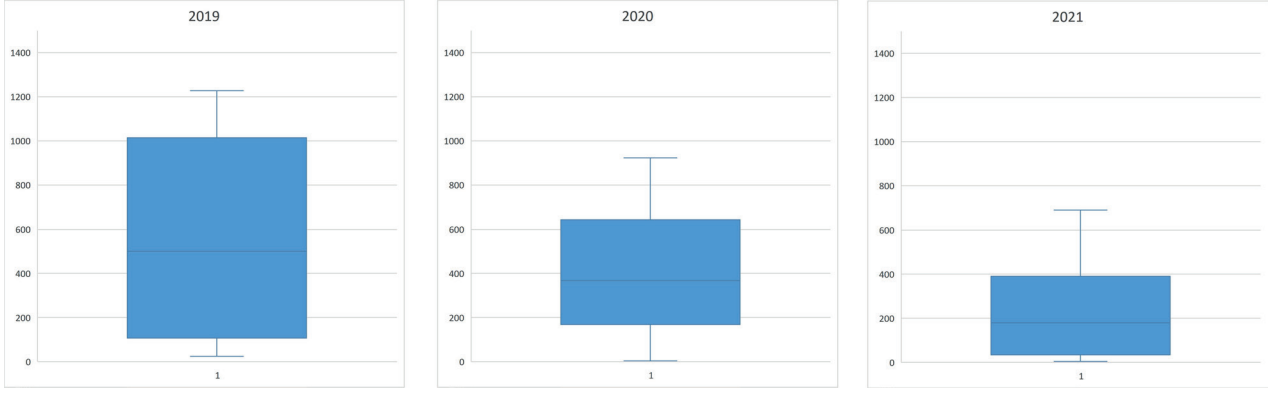

Figure 4. Time between fracture and death. a) 2019, b) 2020, c) 2021.

31B; in this case, 27% were undergoing an anticoagulant therapy. 30% of patients received a cemented endoprosthesis, 2% an arthroplasty, 48% an intramedullary nail, 3% a DHS, and 11% screws only; 4 patients instead were treated conservatively. In this quarter, the mean time between trauma and surgery decreased to 1.4 days (Figure 2b), as well as the interval between surgery and discharge to 7.9 days (Figure 3b). One patient died during the hospitalization and a total of 31 patients (48%) died, with a time interval of 407 days from the injury (Figure 4b).

Lastly, the first quarter of 2021 presented 22 patients with fractures type 31A1-2, 7 patients with fractures 31A3 and 32 patients with fractures type 31B; 26 percent had an anticoagulant therapy. 2 patients were treated conservatively, 32% received a cemented endoprosthesis, 2% a total hip arthroplasty, 43% a nail, 15% a DHS and 5% screws only. Also in this quarter, the interval between the trauma and the operation was 1.5 days (Figure 2c) and between the operation and discharge was 7.2 days (Figure 3c). A total of 25 patients died, of which 2 during hospitalization, with a mean interval between trauma and death of 223 days (Figure 4c).

As regards the positivity for Covid 19, among the patients recruited in the 2019 group, only 6 were tested positive and all subsequently died, with an interval time between infection and death of 236 days ± 220 days. In 2020 the infections rose to 7, all of them also deceased and with an average interval of 97 days ± 132 days. Finally, in 2021 there were just four infected patients, who died on average after 191 days ± 263 days.

Discussion

Our primary objective was to define how the mortality rate of patients with hip fracture in our hospital in Italy changes before and during the worldwide Pandemic of Covid-19. It is known that in geriatric patients a fracture of the proximal femur leads to a decline in the quality of life and significantly reduces life expectancy. The factors for improvement in long term survival post-hip fracture may include the ethnicity of the population, changing treatment patterns, increasing life expectancy, early surgery, and adoption of secondary prevention and current best practices for the care of patients. The mortality rate after one year follow-up of hip fractures has traditionally been reported in the literature as 30% (12).

Reviewing the major findings of literature on the topic in the Italian Hospitals, Dallari et al reported in their study, despite the numerical heterogeneity and small size of the subgroup of C+ patients who underwent surgery within 48 hours, that patients with a proximal femur fracture who had COVID-19 infection were found to have a higher 1-month mortality rate (13).

Fusini et al tried to assess the mortality rates at 30, 60, and 90 days in patients who underwent surgery for PFFs and also had COVID-19, and to analyse the correlation between their clinical presentation, comorbidities, and mortality. Despite it was a multicentric retrospective observational cohort study, the result of the study shows that the 30-day mortality rate of patients with COVID-19 infection was found to be comparable to that of non-COVID-19-infected patients as reported in the literature, the 60-day mortality rate increased and remained steady at the 90-day follow-up (14).

Looking at the rest of the world, The "CovidSurg Collaborative" group in their study analysed 1063 patients from 174 hospitals in 19 countries, with the aim to document the 30-day mortality rate in patients with perioperative infection who have undergone surgery for proximal femoral fractures and to analyse the factors that affect mortality through multivariate analysis. At the end of the study, they confirmed the higher rate of mortality in operated patients with a peri-operative infection of SARS-CoV-2 (15).

Referring to our study and comparing the available data, the first thing we noticed was that in 2020 and 2021 there were 10 more cases than in the first quarter of 2019, that could be explained by the physical decay of the elderly following the consequent social isolation after the indications of the ministry of health. In all the three groups analyzed, approximately 70% of the patients were female, probably due to the greater longevity and that approximately one third of the patients were treated with anticoagulant drugs.

Evaluating the analyzed data, the mortality rate is 44% in 2019 (longer follow-up period), 48% in 2020 and drops to 38% in 2021. Regarding the protocols for the management of Covid-19 of our hospital, all patients at the time of admission had to perform a PCR test. In order to obtain the updated data, we asked the health observatory to provide us all the episodes of Covid 19 among the patients analyzed and any deaths. The data, however, did not provide satisfactory values, because the patients who tested positive were just about 10% of every group and the mortality of these patients had an extreme variability.

Conclusion

Proximal femoral fractures in the elderly are undoubtedly an important problem regarding the general decay of the patient, for the family and for the socioeconomic impact. The concomitant Covid-19 pandemic with the consequent social isolation has certainly worsened the physical condition of the elderly, increasing their risk of fracture. However, the certainty that Covid-19could affect the mortality of these patients cannot be confirmed at the moment, probably because of the restricted number of the patient or the shorter follow up of the 2020 and 2021 groups.

Acknowledgement: none

Ethic Committee: not requested

Conflict of Interest: Each author declares that he has no commercial associations (e.g. consultancies, stock ownership, equity interest, patent/licensing arrangement etc.) that might pose a conflict of interest in connection with the submitted article.

Authors Contribution: Dr A.C. provided to the conceptualization, methodology, discussion of paper content, draft of paper, acquisition and interpretation of data, final approval, and submission. Dr G.O. provided to the methodology, discussion of paper content, interpretation of data, critical revision. Dr W.B. made the validation and the definitive review of the paper. All authors have read and approved the final submitted manuscript.

References

1. Bhandari M, Swiontkowski M. Management of Acute Hip Fracture. N Engl J Med. 2017 Nov 23;377(21):2053-2062. doi: 10.1056/NEJMcp1611090.
2. Melton LJ 3rd, Gabriel SE, Crowson CS, Tosteson AN, Johnell O, Kanis JA. Cost-equivalence of different osteoporotic fractures. Osteoporos Int. 2003 Jun;14(5):383-8. doi: 10.1007/s00198-003-1385-4.
3. Brauer CA, Coca-Perraillon M, Cutler DM, Rosen AB. Incidence and mortality of hip fractures in the United States. JAMA. 2009 Oct 14;302(14):1573-9. doi: 10.1001/jama.2009.1462.
4. Abrahamsen B, van Staa T, Ariely R, Olson M, Cooper C. Excess mortality following hip fracture: a systematic epidemiological review. Osteoporos Int. 2009 Oct;20(10):1633-50. doi: 10.1007/s00198-009-0920-3.
5. Roberts SE, Goldacre MJ. Time trends and demography of mortality after fractured neck of femur in an English population, 1968-98: database study. BMJ. 2003 Oct 4;327(7418):771-5. doi: 10.1136/bmj.327.7418.771.
6. Jaglal SB, Weller I, Mamdani M, Hawker G, Kreder H, Jaakkimainen L, Adachi JD. Population trends in BMD testing, treatment, and hip and wrist fracture rates: are the hip fracture projections wrong? J Bone Miner Res. 2005 Jun;20(6):898-905. doi: 10.1359/JBMR.041231.
7. Kanasi E, Ayilavarapu S, Jones J. The aging population: demographics and the biology of aging. Periodontol 2000. 2016 Oct;72(1):13-8. doi: 10.1111/prd.12126
8. Burge R, Dawson-Hughes B, Solomon DH, Wong JB, King A, Tosteson A. Incidence and economic burden of osteoporosis-related fractures in the United States, 2005-2025. J Bone Miner Res. 2007 Mar;22(3):465-75. doi: 10.1359/jbmr.061113
9. Leal J, Gray AM, Prieto-Alhambra D, et al; REFReSH study group. Impact of hip fracture on hospital care costs: a population-based study. Osteoporos Int. 2016 Feb;27(2):549-58. doi: 10.1007/s00198-015-3277-9.
10. Halim A, Grauer JN. Orthopedics in the Era of COVID-19. Orthopedics. 2020 May 1;43(3):138-139. doi: 10.3928/01477447-20200426-01.
11. Dong E, Du H, Gardner L. An interactive web-based dashboard to track COVID-19 in real time. Lancet Infect Dis. 2020 May;20(5):533-534. doi: 10.1016/S1473-3099(20)30120-1. Epub 2020 Feb 19. Erratum in: Lancet Infect Dis. 2020 Sep;20(9):e215.
12. Moran CG, Wenn RT, Sikand M, Taylor AM. Early mortality after hip fracture: is delay before surgery important? J Bone Joint Surg Am. 2005 Mar;87(3):483-9. doi: 10.2106/JBJS.D.01796.
13. Dallari D, Zagra L, Cimatti P, et al. Early mortality in hip fracture patients admitted during first wave of the COVID-19 pandemic in Northern Italy: a multicentre study. J Orthop Traumatol. 2021;22(1):15. doi:10.1186/s10195-021-00577-9

14. Fusini F, Massè A, Risitano S, et al. Should we operate on all patients with COVID-19 and proximal femoral fractures? An analysis of thirty, sixty, and ninety day mortality rates based on patients' clinical presentation and comorbidity: a multicentric study in Northern Italy. Int Orthop. 2021;45(10):2499-2505. doi:10.1007/s00264-021-05166-3
15. COVIDSurg Collaborative. Outcomes after perioperative SARS-CoV-2 infection in patients with proximal femoral fractures: an international cohort study. BMJ Open. 2021;11(11):e050830. Published 2021 Nov 30. doi:10.1136/bmjopen-2021-050830

Correspondence:
Received: 31 January 2023
Accepted: 2 March 2023
Dr. Andrea Cosentino
Department of Orthopedic and Traumatology, Franz Tappeiner Hospital,
Via Rossini 5, 39012 Meran (Bz), Italy
E-mail: andreacosentino2@gmail.com
Orcid: 0000-0001-7885-512X