

Retrospective Epidemiological Analysis of Colles' Fracture in Patients Admitted in Fernandes Távora Hospital

Yuri Borges Morais^{1,2,3}, Antonio Valterno Nogueira Pinheiro³,
Antonio Valterno Nogueira Pinheiro Filho⁴, Liana Alves de Freitas Soares Borges⁵,
Maria Suelly Nogueira Pinheiro⁶, Rian Vilar Lima⁴, Letícia Pinheiro Pontes⁴,
Lia Camurça Costa⁴, Igor Castelo Branco Fontenele Costa⁴,
Velko Veras Pereira de Matos Filho⁴

¹Professor da Faculdade de Medicina, Centro Universitário Christus, UNICHRISTUS, Fortaleza, Brasil

²Instituto Superior de Ciências Biomédicas—ISCB, Universidade Estadual do Ceará, UECE, Fortaleza, Brasil

³Departamento de Cirurgia, Hospital Fernandes Távora, HFT, Fortaleza, Brasil

⁴Faculdade de Medicina, Universidade de Fortaleza, UNIFOR, Fortaleza, Brasil

⁵Faculdade de Medicina, Centro Universitário Christus, UNICHRISTUS, Fortaleza, Brasil

⁶Faculdade de Medicina, Universidade Federal do Ceará, UFC, Fortaleza, Brasi

Email: valternofilho@edu.unifor.br

How to cite this paper: Morais, Y.B., Pinheiro, A.V.N., Filho, A.V.N.P., Borges, L.A. de F.S., Pinheiro, M.S.N., Lima, R.V., Pontes, L.P., Costa, L.C., Costa, I.C.B.F. and de Matos Filho, V.V.P. (2023) Retrospective Epidemiological Analysis of Colles' Fracture in Patients Admitted in Fernandes Távora Hospital. *Open Journal of Epidemiology*, 13, 16-23.

<https://doi.org/10.4236/ojepi.2023.131002>

Received: November 1, 2022

Accepted: February 6, 2023

Published: February 9, 2023

Copyright © 2023 by author(s) and Scientific Research Publishing Inc. This work is licensed under the Creative Commons Attribution International License (CC BY 4.0).

<http://creativecommons.org/licenses/by/4.0/>



Open Access

Abstract

Background: Colles' fracture is a type of fracture of the distal third of the radius and its most common cause is falling from patient's own height and, epidemiologically, it is more common in the elderly. **Objectives:** The main objective of this study is to analyze the epidemiology of Colles' fracture retrospectively, in patients admitted to Fernandes Távora Hospital. **Materials and Methods:** This retrospective study conducted at the Fernandes Távora Hospital used 1030 radiographic images of patients with wrist fractures. **Results:** (After a careful analysis) It was found that this type of fracture occurred with a greater frequency in age groups of 50 to 69, 60 to 69, and 40 to 49 years old, which corresponds to 59.5% of patients and the most affected sex were females (51.1%). **Conclusion:** The study concluded that this type of bone injury is more common in people aged 40 to 69 years old, especially in women, because of their geometry and bone composition. It is evident that Colles' fracture impacts the life of the affected person, therefore, an adequate diagnosis and treatment having utmost importance.

Keywords

Fracture, Colles' Fracture, Epidemiology

1. Introduction

Colles' fracture is defined as a fracture of the distal third of the radius, in which the fragment moves posteriorly without extending to the articular surface. It was named after the Irish surgeon Abraham Colles who, even before the advent of radiography, in 1814, described the fracture for the first time.

The most common cause of injury is falling from one's own height, where the individual rests on the flattened hand. This causes the distal end of the radius to absorb the impact [1].

According to large-scale epidemiological studies conducted in the United States, Colles' fracture tends to be distributed in a bimodal manner, affecting mainly young people in puberty, during sports, as well as the elderly, especially women over 50 with osteoporosis [2].

This disease, despite not being the result of major complications for the affected younger population, has special relevance in the loss of quality of life in the elderly population [2], which has gained attention and deserved specialized studies, since the global demographic trend shows an increase in the number of this population [3].

The present study aims to elucidate the epidemiological characteristics of this fracture in a tertiary hospital in the capital of Ceará, in order to elucidate the local epidemiology and, consequently, provide data for health professionals and technical support for local public policies.

2. Methods and Materials

2.1. Study Design

2.1.1. Location

A retrospective study was carried out at Hospital Fernandes Távora, a hospital complex founded more than 50 years ago, located at Avenida Francisco Sá, 5445-Álvaro Weyne, zip code: 60335-195, in Fortaleza, Ceará. The images for the analysis were collected from the hospital's surgical center database from April 2022 to June 2022.

2.1.2. Sample

For the study, 1030 radiographic images of fractures of patients admitted to the hospital from June 2021 to June 2022 were collected in both Posterior-Anterior (PA) and Anteroposterior (AP) views, in addition to profile view, using the descriptors "wrist" and "forearm" in the *software* that stores the patients' radiographic images, in order to have a higher prevalence of Colles' fractures.

2.2. Inclusion and Exclusion Criteria

To select the images from the hospital database, some inclusion and exclusion criteria were used in order to determine the most reliable sample possible made up only of Colles' fractures.

2.2.1. Exclusion Criteria

Radiographic images of patients with only a single radiographic view in PA or

AP were discarded, because these views alone by themselves make it impossible to classify the types of distal radius fractures.

Smith's and Barton's fractures were disregarded, because even though they involve fracturing the distal third of the radius, they do not fit the characteristics of Colles' fracture.

Galeazzi and Monteggia fractures were also disregarded because they are not restricted only to distal fractures of the radius, and can occur in the radius diaphysis and ulna extension.

Additionally, repeat images of the same patient were excluded, also excluded radiographs of the same patient from both limbs.

2.2.2. Inclusion Criteria

We considered all the radiographic images of patients that have only a single incidence, provided that this is the profile, because with this incidence it was possible to identify Colles' fracture.

All radiographic images of patients with more than one radiographic image (profile, AP and/or PA) were considered, as they enable the identification of this type of fracture.

All radiographic images registered as "wrist" and "forearm" that have features of Colles' fracture will be included.

2.3. Proposed Methodology

After approval by the ethics and research committee, the researchers surveyed the radiographic images and then selected the images meeting with the characteristics of Colles' fracture, following the inclusion and exclusion criteria presented in item 2.2.

After this selection, based on age and gender, the patients were allocated to the previously defined age groups to trace the epidemiological profile. Then, the data were quantified and illustrated by statistical analysis.

2.4. Risks and Benefits

In the research, there was no risk to the patients because their radiographic images were only used for the epidemiological analysis of the study. The results obtained from the research will bring scientific contribution since there is scarce epidemiological information on this subject in the consulted databases. Furthermore, given the epidemiological importance of the topic, the approach will enable a better and faster diagnosis of Colles' fracture due to improved clinical reasoning.

2.5. Outcomes

2.5.1. Primary Endpoint

To determine the epidemiological groups most affected by Colles' fracture at Fernandes Távora Hospital, defining priority and risk groups for clinical analysis and hospital service improvement.

2.5.2. Secondary Endpoint

To differentiate the types of distal third fracture, quantify the patients affected by Colles' fracture at the Fernandes Távora Hospital, thus outlining an epidemiological profile.

2.6. Ethical Aspects

The research is indirectly involving human beings and is committed to treating them in their dignity, respecting their autonomy and defending them in their vulnerability, obeying the ethical principles of beneficence, non-maleficence, justice and equity.

All patient data contained in the radiographs were used solely and exclusively for the research, and the confidentiality of such information was fully preserved.

This research has not and will not cause any harm to the patients whose images will be used in the analysis.

2.7. Data Analysis Methodology

The data obtained from the collection of radiological images with the diagnosis of Colles' fracture were tabulated and analyzed using GraphPad Prism 8 software. Comparisons with a p-value up to 0.05 were considered significant. Exactly 1030 radiographic images were collected for this study with the descriptors "wrist" and "forearm" fracture from the hospital software. After applying the inclusion and exclusion criteria, 230 images were selected and classified as Colles' fracture, and the 800 excluded images were of other fracture types. All records were stored in a virtual cloud by using the application Google Docs.

3. Results

After a thorough evaluation of the images of patients affected by Colles' fracture, the age groups were divided, and consequently, the allocation of patients who fit into the age groups was performed. **Graph 1** represents the number of fractures for each group of patients within their respective allocated ages affected by the Colles' fracture.

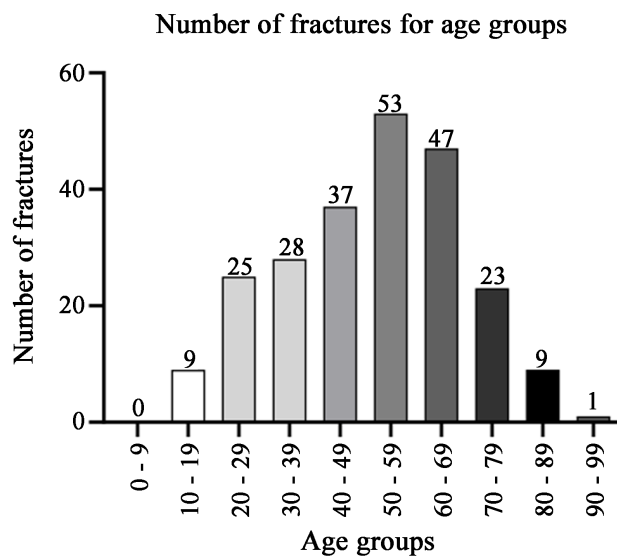
According to **Graph 1**, the group from 0 to 9 years old had no patients affected by Colles' fracture. In the group from 10 to 19 years old, it reached 9 patients. In the 20 to 29 age group, it affected 25 patients, 28 patients were in the 30 to 39 age group, and 37 patients were in the 40 to 49 age group. In the 50 to 59 age group it reached 53 patients. In the 60 to 69 age group, it reached 47 patients. In the 70 to 79, 80 to 89, and 90 to 99 age groups it reached 23, 9, and 1 patients, respectively.

It can be observed that, according to **Graph 1**, the group of patients who were most affected by Colles' fracture were those aged 50 to 59 years old with 53 patients, followed by the group aged 60 to 69 years old with 47 patients, and then the group aged 40 to 49 years old with 37 patients affected by Colles' fracture. If the three age groups are added together, the total reaches 137 patients affected

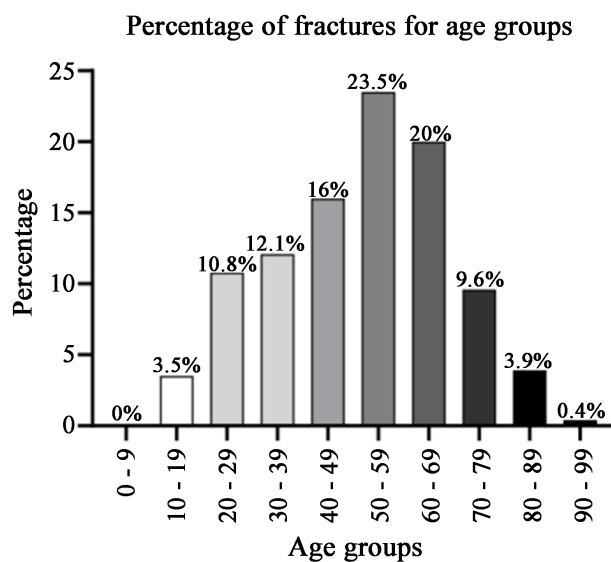
by Colles' fracture out of 232 patients brought to this study, corresponding to approximately 59.5% of the patients.

According to **Graph 2**, the group from 0 to 9 years old had no patients affected by Colles' fracture, and consequently reached 0%. In the group from 10 to 19 years old, it reached 3.5% of patients. In the 20 to 29 age group it reached 10.8% of patients, 12.1% of patients were in the 30 to 39 age group, and 16% of patients were in the 40 to 49 age group. In the 50 to 59 age group it reached 23.5% of the patients. In the 60 to 69 age group, it reached 20% of the patients. In the 70 to 79, 80 to 89, and 90 to 99 age groups, it reached 9.6%, 3.9%, and 0.4% of the patients, respectively.

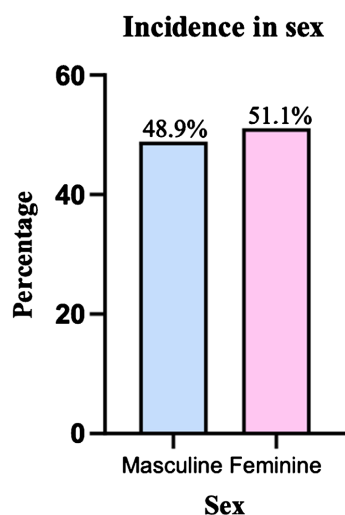
It can be observed that, according to **Graph 2**, the group of patients that most affected by Colles' fracture was those aged 50 to 59 years old with 23.5% of the



Graph 1. Number of Colles' fractures by age group.



Graph 2. Percentage of Colles' fractures by age group.



Graph 3. Incidence of Colles' fractures by gender.

patients, followed by the group aged 60 to 69 years old with 20% of the patients, and then the group aged 40 to 49 years old with 16% of the patients affected with Colles' fracture.

According to **Graph 3**, the female group has a slight predominance in the number of patients affected by Colles' fracture with 51.1%.

These sex differences were expected to occur due to osteoporotic and osteopenic conditions that preferentially affect women.

4. Discussion

Fractures can impact the patient's social life because of limited mobility that compromises social activity [1]. The predominantly female gender of most populations indicates that these were generally representative of people who suffer these injuries in industrialized societies [2].

Our study shows prevalence of Colles' fracture mostly between 40 and 79 years and slightly bigger prevalence in women, which differs from another researches that suggest a bi-modal distribution for Colles' fracture, mainly in the pediatric sport practicant population and women over 50 [3].

This difference in the pediatric population may be due the absence of more violent or radical sports which are more common in developed countries, that proportion more opportunities for fracture's then soccer, the most popular sport in Brazil's pediatric population [4]. Although there are a few epidemiological studies on Colles' fracture in the pediatric population in Brazil to confirm these hypotheses.

The incidence of a distal radius fracture in patients older than 50 years old was 77/10,000 person-years among women in 2005 and 63/10,000 person-years in 2013. The incidence of a distal radius fracture in men in the same age group was 18/10,000 person-years in 2005 and 14/10,000 in 2013 [5].

This higher incidence found in older people is related to the increased progression of the incidence of osteopenia in this population group, contributing to

the increased prevalence of osteoporotic fractures [6]. Because of this relation with osteoporosis, its prevention is linked to a lower risk of distal radius fractures [3].

The most common trauma mechanisms for this type of fracture in young adults come from high-energy trauma with intra-articular components. In the geriatric population, the most common fracture pattern is extra-articular [7].

In another study, the mean age of the cohort was 51.5 years and was slightly female dominant (51.5%), with demographic data on the main fractures. Most patients were classified as coming from urban areas (81.9%; rural 16.2%) [8].

For distal radius fractures and multiple radial and ulnar fractures, the highest proportion of fractures occurred in the 51 - 65 age group. Distal radius fractures were more prevalent in females at 73.3% [8].

Another study shows that distal radius fractures were by far the most common wrist fractures, with over 16,000 cases in the 51 to 65 age group. There were more cases in females through all age groups, although the difference was small in the 18 to 40 year age category and became highly sex-differentiated in the older age groups, such as the 51 to 65 year age group (12,615 females versus 3759 males) [8].

In a case-control study, it was observed that postmenopausal women who had been diagnosed with Colles' fracture had a lower bone mineral density than the control group and that the incidence of osteoporosis was higher in the group with fractures. Women have high risks of fracture due to their geometry and bone composition [9].

At age 50, there is a large increase in the amount of distal radius fractures in women when compared to men, although the population contains very similar numbers of men and women at this age [8]. The results of the present study corroborate the data already published in the literature.

5. Limitations

During the study, limitations were found, among them the presence of a single radiological view in PA or AP, which made the analysis difficult, as it is only possible to classify the types of distal radius fractures with the use of both views.

Another difficulty was the presence of other types of fractures, such as Smith's and Barton's fractures, which were disregarded, because even though they involve a fracture of the distal third of the radius, they do not fit Colles' fractures.

Galeazzi and Monteggia fractures were also excluded from the study, as they are not restricted only to the distal portions of the radius, and may affect the radius diaphysis and ulna extension. Finally, all repeated radiographs of the same patient were excluded from the study.

6. Conclusion

From this study, we conclude that Colles' Fracture is very clinically relevant and has a prevalence among people aged 40 to 69 years, especially females (51.1%).

In this analysis, the results obtained validate the data already exposed in the literature. Thus, it is evident that Colles' Fracture impacts the patient's social life and mobility, making its diagnosis and adequate treatment essential, with the inclusion of radiographs in two views (anteroposterior and profile) for a better wrist evaluation.

Conflicts of Interest

The authors declare no conflicts of interest regarding the publication of this paper.

References

- [1] Karantana, A., Handoll, H.H. and Sabouni, A. (2020) Percutaneous Pinning for Treating Distal Radial Fractures in Adults. *Cochrane Database of Systematic Reviews*. <https://doi.org/10.1002/14651858.CD006080.pub3>
- [2] Mellstrand Navarro, C., Brolund, A., Ekholm, C., Heintz, E., Hoxha Ekström, E., Josefsson, P.O., *et al.* (2019) Treatment of Radius or Ulna Fractures in the Elderly: A Systematic Review Covering Effectiveness, Safety, Economic Aspects and Current Practice. *PLOS ONE*, **4**, e0214362. <https://doi.org/10.1371/journal.pone.0214362>
- [3] Nellans, K.W., Kowalski, E. and Chung, K.C. (2012) The Epidemiology of Distal Radius Fractures. *Hand Clinics*, **28**, 113-125. <https://doi.org/10.1016/j.hcl.2012.02.001>
- [4] Lindau, T.R., Aspenberg, P., Arner, M., Redlundh-Johnell, I. and Hagberg, L. (1999) Fractures of the Distal Forearm in Young Adults: An Epidemiologic Description of 341 Patients. *Acta Orthopaedica Scandinavica*, **70**, 124-128. <https://doi.org/10.3109/17453679909011248>
- [5] MacDermid, J.C., McClure, J.A., Richard, L., Faber, K.J. and Jaglal, S. (2021) Fracture Profiles of a 4-Year Cohort of 266,324 First Incident Upper Extremity Fractures from Population Health Data in Ontario. *BMC Musculoskeletal Disorders*, **22**, Article No. 996. <https://doi.org/10.1186/s12891-021-04849-7>
- [6] Egol, K.A., Koval, K.J. and Zuckerman, J.D. (2010) *Handbook of Fractures*. Lippincott Williams & Wilkins, Philadelphia.
- [7] Meena, S., Sharma, P., Sambharia, A.K. and Dawar, A. (2014) Fractures of Distal Radius: An Overview. *Journal of Family Medicine and Primary Care*, **3**, 325-332. <https://doi.org/10.4103/2249-4863.148101>
- [8] Seeman, E. (2008) Bone Quality: The Material and Structural Basis of Bone Strength. *Journal of Bone and Mineral Metabolism*, **26**, 1-8. <https://doi.org/10.1007/s00774-007-0793-5>
- [9] Jutberger, H., Sinclair, H., Malmqvist, B. and Obrant, K. (2003) Utredning av postmenopausal osteoporos. Kvinnor med distal radiusfraktur bör bentäthetsmätas [Screening for Postmenopausal Osteoporosis. Women with Distal Radius Fractures Should Be Evaluated for Bone Density]. *Lakartidningen*, **100**, 31-34.