Carpal Scaphoid Fracture in Elderly: Analysis in a High Incidence Area

La fractura del escafoides carpiano en edad avanzada: Análisis en un área de alta incidencia

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Abstract

Introduction The scaphoid fracture is the most common carpal fracture. This study aimed to analyze scaphoid fracture outcomes in elderly subjects.

Method This study is retrospective and observational based on all scaphoid fractures in patients over 65 years old diagnosed from 2016 to 2020. The analyzed variables included age, gender, laterality, trauma type, trauma location, fracture stability, Herbert classification, fracture line, associated injuries, dominant hand involvement, treatment type, and consolidation presence or absence.

Results The study included 24 patients over 65 years old with scaphoid fractures. Seventy-five percent of the subjects were women. The incidence rate was 5.49 fractures per 100,000 inhabitants. The nonunion incidence was 8.3%. Treatment was surgical for 8.3% of patients, and 37.5% of the fractures were classified as A2.

Conclusion The incidence rate of scaphoid fracture in patients over 65 years in our healthcare area is higher than the few previous reports. The female gender was more affected, and there were no significant differences in fracture consolidation when comparing conservative and surgical management.

Keywords
- scaphoid
- fracture
- advanced age

Resumen

Introducción y objetivos La fractura de escafoides es la más común dentro de las fracturas del carpo. El objetivo de nuestro trabajo es realizar un estudio analizando los resultados de las fracturas de escafoides en gente de edad avanzada.

Material y método Se realizó un estudio observacional retrospectivo recogiendo todas las fracturas de escafoides en pacientes de más de 65 años diagnosticadas del 2016 al 2020. Se recogieron las variables de edad, género, lateralidad, tipo de traumatismo, lugar del traumatismo, estabilidad de la fractura, clasificación según

Palabras clave
- escafoides
- fractura
- edad avanzada

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Herbert, trazo de fractura, presencia de lesiones asociadas, afectación de la mano dominante, tipo de tratamiento realizado y ausencia o no de consolidación.

Resultados Se registraron 24 pacientes con fractura de escafoides de más de 65 años. El 75% eran mujeres. La tasa de incidencia fue de 5,49 fracturas por cada 100.000 habitantes. Se halló una incidencia de pseudoartrosis del 8,3%. Se manejaron quirúrgicamente el 8,3% y fueron clasificadas como A2 el 37,5% de las fracturas.

Conclusión La tasa de incidencia de la fractura de escafoides en pacientes de más de 65 años hallada en nuestra área sanitaria es superior a la referida en los escasos estudios previos. Se observó prevalencia del género femenino y no se hallaron diferencias significativas para la consolidación de la fractura al comparar manejo conservador y quirúrgico.

Introduction

The scaphoid fracture is the most common carpal fracture, accounting for 70% of these injuries. In addition, it is the second most common fracture in the upper limb after the distal radius fracture.[1]

The incidence of scaphoid fracture significantly relies on the studied region. The Swedish national registry recorded an incidence rate of 22 per 100,000 person-years,[2] while a study from the USA reported a rate of 1.47 fractures per 100,000 person-years.[3] Other studies differ in their incidence rates. For instance, Duckworth et al., from Edinburgh, published an incidence rate of 29 per 100,000 people,[4] while Garala et al., in Leicester, found a rate of 12.4 per 100,000[5] and Holloway et al., in Australia, reported 54.6 per 100,000 people.[6]

The age group with the highest scaphoid fracture incidence is from 20 to 29 years old.[7] This injury usually affects men.[2] Most cases result from low-energy injuries after falls from own height.[1] The most frequent anatomical sites are the scaphoid waist and the middle third.[5] The most common Herbert type classification is type B2[4] (►**Fig. 1**). Conservative treatment results in optimal outcomes in managing stable fractures (A1 and A2), while B1, B2, B3, and B4 fractures undergo surgical therapy with different osteosynthesis alternatives.[8]

There are few analytical or comparative studies on scaphoid fractures in older people. This study aimed to analyze the outcomes of scaphoid fractures in elderlies in the healthcare area covered by our hospital complex, to understand their epidemiology in our environment, to assess union rates, and to compare our findings with those previously published in other places around the globe.

Material and Methods

This study is retrospective and observational. It included all patients over 65 years old diagnosed with a scaphoid fracture

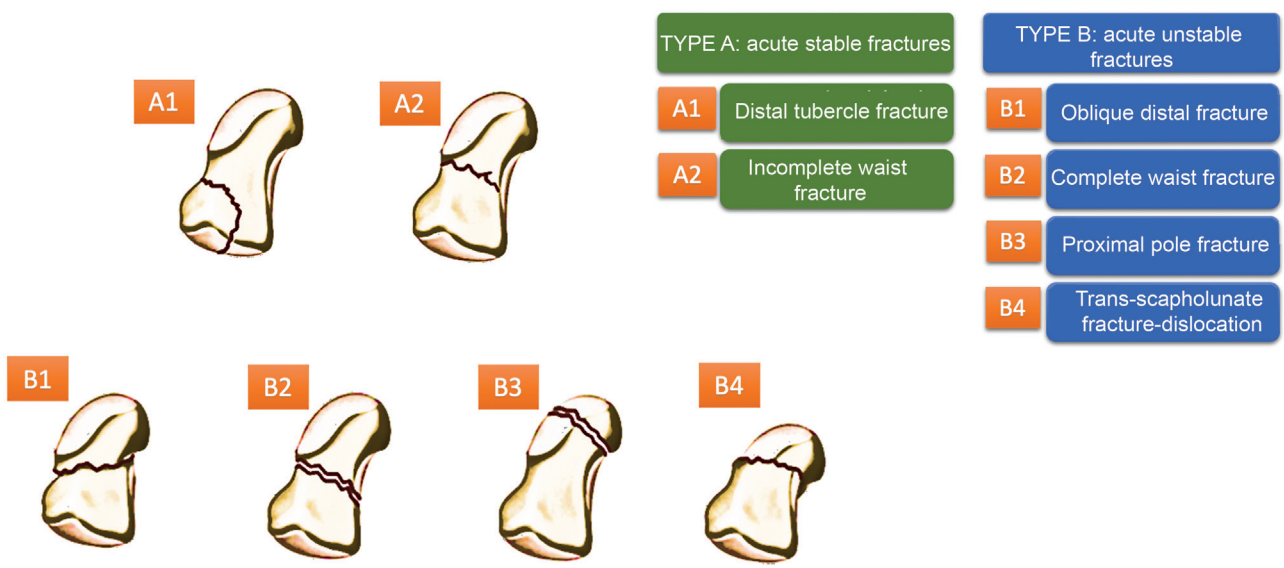

Fig. 1 Scaphoid fracture classification per the Herbert system.

during five years, from 2016 to 2020, treated in our tertiary center providing care for approximately 470,000 inhabitants, including urban and rural areas.

All patients with suspected scaphoid fractures underwent three carpal radiographs in the Emergency Department: an anteroposterior projection, a lateral projection, and a 45° oblique projection with the hand in pronation. If radiography detected a complex fracture, we requested a computed tomography (CT).

We collected the following data from our patients: age, gender, laterality, trauma type (high energy [such as traffic or sports accidents and falls of more than 2 meters] or low energy [including falls from own height]), season of the year in which the fracture occurred, place of residence (urban or rural), trauma location, fracture stability, Herbert and Weber classifications, displacement, Weber fracture zone, fracture line, associated injuries, dominant hand involvement, treatment type, and presence or absence of consolidation.

The incidence rate was calculated and defined as the risk of developing a new condition during a specific period; in our case, it was the risk of a subject suffering a scaphoid fracture in 1 year. The incidence rate was calculated as follows:[9]

$$\frac{Number\ of\ events\ occuring\ in\ a\ given\ period}{Population\ at\ risk\ in\ a\ given\ period}\ x\ 10^n$$

Therapeutic decision

Treatment indication followed the upper limb unit criteria from the Orthopedic Surgery and Traumatology service of our center. Stable fractures, i.e., with no displacement, affecting the distal third of the scaphoid, and non-displaced middle third fractures, underwent conservative treatment. If these criteria were not met and the fracture was unstable, the patient underwent surgical treatment.

This study followed the principles of the Declaration of Helsinki. Our institutional Ethics Committee approved the study protocol and data recording from the patient's clinical history. The study followed the protocol and complied with the good clinical practice standards described by the International Council for Harmonization (ICH).

Statistical analysis

The descriptive analysis of the variables used frequencies (percentages) and measures of central tendency (mean and standard deviation). Chi-square, Fischer's exact test, and Student's t-test compared these variables between the different groups of patients. Statistical significance considered $p < 0.05$. The analyses occurred in SPSS v24.0 (IBM®).

Results

There were 24 patients aged 65 or older with scaphoid fractures. Their mean age was 73.71 years (95% confidence interval [CI] = 71.07-76.77). The oldest subject was 91 years old. Most (70.8%) scaphoid fractures occurred at the right hand. The incidence rate was 5.49 fractures per 100,000 patients over 65.

Seventy-five percent of the affected patients were women, and most fractures happened during the summer (37.5%). Most resulted from low-energy traumas (87.5%), in urban areas (62.5%), and usually at home (66.7%).

►**Figure 2A** shows that the most common fracture type per the Herbert classification was A2 (37.5%), and 33.3% of the total number of fractures were unstable. ►**Figure 2B** reveals that the most frequent location was the middle third of the scaphoid bone, at 37.5%.

Conservative management occurred in 22 cases (91.7%), while 8.3% of patients underwent surgery. In those who opted for conservative treatment, the pseudarthrosis rate was 9.1%, with no statistical significance ($p = 0.837$). All fractures undergoing surgical treatment (2 cases) showed

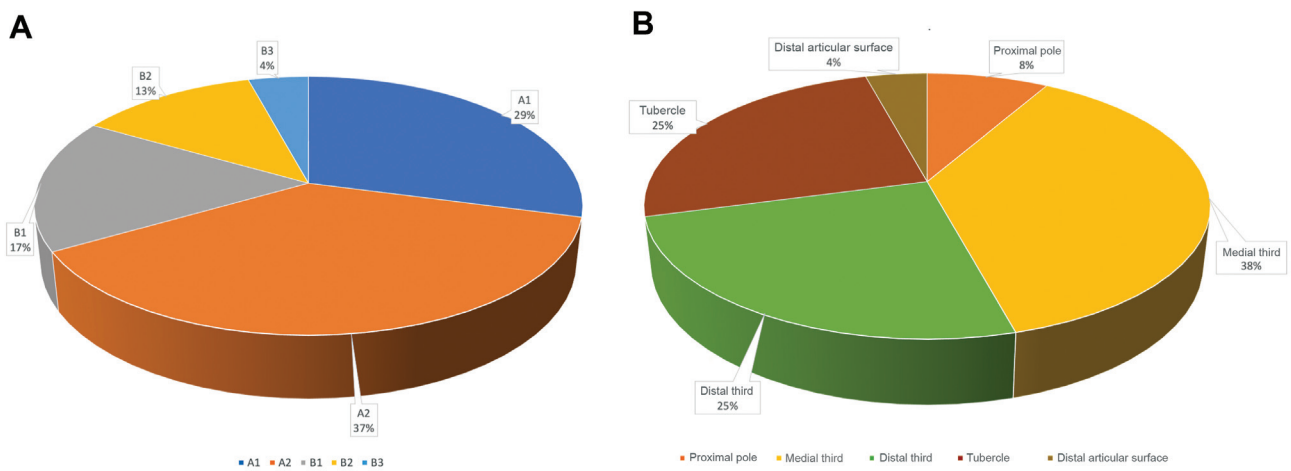

Fig. 2 **(A)** Fracture distribution according to the Herbert classification. **(B)** Fracture distribution per location.

Table 1 Fracture consolidation according to different variables

		Consolidation (n = 22)	No consolidation (n = 2)	p
Age (years), mean (CI95%)		73.23 (70.32-76.52)	79 (75-83)	0.697
Female gender, n (%)		17 (77.3)	1 (50)	0.446
Urban residence, n (%)		14 (63.6)	1 (50)	0.849
Low energy, n (%)		19 (86.4)	2 (100)	0.761
Fall at home, n (%)		15 (68.2)	1 (50)	0.565
Herbert classification n (%)	A1	7 (31.8)	0	0,112
	A2	8 (36.4)	1 (50)	
	B1	4 (18.2)	0	
	B2	3 (13.6)	0	
	B3	0	1 (50)	
Unstable fractures, n (%)		7 (31.8)	1 (50)	0.565
Displacement n (%)	No displacement	19 (86.4)	1 (50)	**0,003**
	Angled fracture	3 (13.6)	0	
	Displaced fracture	0	1 (50)	
Weber zone n (%)	Proximal pole	1 (4.5)	1 (50)	0,213
	Medial third	8 (36.4)	1 (50)	
	Distal third	6 (27.3)	0	
	Tubercle	6 (27.3)	0	
	Distal articular surface	1 (4.5)	0	
Fracture line n (%)	Horizontal oblique	6 (27.3)	0	0,917
	Transversal	9 (40.9)	1 (50)	
	Vertical oblique	7 (31.8)	1 (50)	
Associated lesions, n (%)		1 (4.5)	0	0.618
Right side, n (%)		15 (68.2)	2 (100)	0.343
Conservative management, n (%)		20 (90.9)	2 (100)	0.837

Abbreviations: CI95%: 95% confidence interval.

good healing. Both cases employed osteosynthesis screws. There were no reinterventions.

Assessing the type of treatment according to Herbert's classification, all A1, A2, B1, and B3 fractures (►**Fig. 1**) underwent conservative management. Most (66.7%) type B2 fractures underwent surgery.

Regarding the nonunion rate, only two fractures did not consolidate (8.3%), with no statistically significant differences ($p = 0.112$) for consolidation according to the Herbert classification (►**Table 1**). We also did not find significant differences regarding consolidation presence or absence when comparing data per age ($p = 0.697$), gender ($p = 0.446$), or fracture line ($p = 0.917$). Regarding fracture displacement, there was a single displaced fracture with nonunion (100%), with a statistical significance case ($p = 0.003$). There were no statistically significant differences (►**Table 1**) when assessing consolidation according to the fracture area ($p = 0.213$), with a higher pseudoarthrosis rate in the proximal pole (50%) and middle third fractures (50%). All distal third, tubercle, and distal articular surface fractures healed with no intercurrences.

Discussion

Scaphoid fracture is a significant public health problem, predominantly affecting young, active patients in their most productive years.[10] Data regarding the incidence, prevalence, or demographics of scaphoid fractures in the older population, outside the workforce age, remain scarce. A literature review published in 2012 by Alsawadi et al. revealed few epidemiological studies determining the frequency of these fractures in aging patients.[11]

In our study, with patients over 65, the incidence rate was 5.49 scaphoid fractures per 100,000 inhabitants. This figure is significantly higher compared with the few previous studies. Hove et al.[12] described a rate of 1.2 fractures per 100,000 men and 0.7 per 100,000 women. Van Tassel et al.[3] reported a rate ranging from 0.7 to 0.2 fractures per 100,000 inhabitants in the age range from 70 to 99. In our bibliographic review, we did not find epidemiological data on scaphoid fracture in the elderly Spanish population.

One of the reasons for this high incidence rate in our sample may be the progressive aging in Galicia, the region of the city of Vigo, where the study occurred.

We also observed a higher fracture prevalence in females (75%); in contrast, in the most important registries of scaphoid fractures not limited by age, the male gender was predominant.[1,2] However, our data are consistent with Brondum et al.,[13] who studied people over 70 and found an incidence rate of 14 fractures per 100,000 inhabitants in females and six fractures per 100,000 inhabitants in males.

In addition, it has been observed that the incidence in females rises from the fourth decade onwards, surpassing the incidence in males in the population over 60.[3,4] The higher overall survival of women, as well as the higher number of falls associated with aging and osteoporosis,[14] may explain this prevalence of scaphoid fractures in older women.

In their epidemiological analysis, Duckworth et al.,[4] highlighted that the most frequent fractures per the Herbert classification were type B2 fractures, although we have not found any literature review analyzing the Herbert fracture type in older women with scaphoid fractures. In our study, the most frequent fractures were type A2 (37%), followed by type A1 (29%) (►**Fig. 2A**).

Herbert types B1 and B2 fractures usually undergo surgical intervention with reduction and fixation with a Herbert screw.[8,15] In our review, 66.7% of B2 fractures were treated surgically, resulting in satisfactory consolidation in all cases. The four patients with type B1 fractures underwent conservative treatment. In our study, in elderly patients, with lower functional demands and a higher number of comorbidities, the indication for surgical treatment was more limited than in young subjects, in whom this fracture is more common. Moreover, as previously described, fragment mobility is significantly higher in B2 compared with B1 fractures, potentially leading to secondary displacements, increasing the risk of pseudoarthrosis, and evolution to a dorsal intercalated segment instability (DISI)-type deformity. DISI results in a rapidly progressive scaphoid nonunion advanced collapse (SNAC)-type wrist deformity.[16] In our study, 100% of type B1 and B2 fractures healed with no intercurrences.

The current literature reports that the nonunion rate ranges from 10 to 15% even with correct conservative management.[17] In our case, 9.1% of fractures treated conservatively presented no consolidation. However, when assessing fracture stability, we found a 16.7% nonunion rate in unstable fractures undergoing conservative treatment. Therefore, we propose that our study had an excessive indication for conservative management in patients with unstable fractures, resulting in a high nonunion rate.

In our study, the fracture location is consistent with previous studies. The most frequent locations were the middle third (38%), followed by the distal third (25%) of the scaphoid bone. In their systematic review, Jorgsholm et al. also observed that middle-third fractures were the most frequent, with a prevalence ranging from 60 to 69%.[18]

Our study presents limitations inherent to a retrospective observational study. We did not include patients followed up by the private health system; however, the total number of patients who could contribute to the sample is small since the vast majority of our society uses the national public health system for treatment and follow-up of these fractures. Furthermore, five different orthopedic surgeons performed the fracture classification, and we did not include clinical and functional variables, such as DASH.

As a main strength, and even though the total sample size is small, we have not found in our region or our country any epidemiological study on scaphoid fractures in the selected age groups of similar or larger size. In addition, thanks to the total health coverage of our population in the public system and the global nature of the electronic medical record system for all regional health centers, we have access to all healthcare data.

Conclusion

The incidence rate of scaphoid fracture in patients over 65 in our healthcare area is higher than in the previous reports. The prevalence of the female gender was higher, and there were no significant differences in fracture consolidation when comparing conservative and surgical management. In any case, further, larger studies are required to analyze scaphoid fractures in age strata outside the classic description, such as older adults and children.

Statement of Ethical Responsibility

The study followed the protocol and the principles of the Declaration of Helsinki. In addition, it complied with the good clinical practice standards described by the International Council for Harmonization (ICH).

Conflict of Interest

Each author ensures having no commercial relationships that could represent a conflict of interest in this article.

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