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ORIGINAL ARTICLE

Diagnosis and treatment of clavicular fractures in Belgium between 2006 and 2015

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Background: Clavicular fractures are common fractures of the shoulder girdle. The debate about whether these fractures should be treated conservatively or surgically is ongoing. This study describes the incidence of clavicular fractures in Belgium between 2006 and 2015 and how the surgical treatment rates have evolved during this time span.

Methods: The study included all patients who were diagnosed with a clavicular fracture or surgically treated in Belgium. The Belgian National Institute for Health and Disability Insurance provided the data, which included the patients' age, sex, location, and time of injury for the entire Belgian population. The fracture incidences and surgical treatment rates for different population groups were assessed.

Results: The incidence of clavicular fractures in Belgium increased from 56.5/100,000 persons/year in 2006 to 70.6/100,000 persons/year in 2015. The age-related incidence was U-shaped, with high incidences seen in both men and women younger than 18 and older than 70. The rate of surgically treated clavicular fractures increased by 190% between 2006 and 2015.

Conclusion: The incidence of clavicular fractures in Belgium increased between 2006 and 2015. In the male population, the fracture incidence increased among all age groups, but in the female population, the increase was most noted in elderly patients. Although the preferred treatment strategy of clavicular fractures continues to be debated, there is a high and increasing rate of surgical treatment in Belgium, with an increasing percentage of patients that are surgically treated as outpatients.

Level of evidence: Epidemiology Study; Large Database Analysis

Keywords: Clavicle; fracture; epidemiology; health care; costs; Belgium

The incidence and treatment strategies of clavicular fractures have been reported in numerous studies. The largest studies report incidences of 29 up to 59.3 clavicle fractures per 100,000 persons/year.[7,10,11,20] Huttunen et al[10] reported an increasing incidence of clavicular fractures in the Swedish population from 35.6 per 100,000 persons/year in 2001 to 59.3 per 100,000 persons/year in 2012. They also reported a 705% increase in the rate of surgically treated clavicular fractures.[10] This increase in surgical treatment was 10.5-times higher than the increase in fracture incidence. On one hand, several retrospective and prospective studies have reported higher union rates and a faster improvement of functional impairment of operatively treated clavicular fractures. On the other hand,

Ethical Committee approval for this study was not necessary because there was no connection to the individual patient and the data used in the study are freely available to whoever requests it.

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there is no consensus regarding the functional benefit and the costs associated with these fractures.[2,6,18,19,24,25]

The results of epidemiologic research are important and can contribute to the organization and provision of trauma services and to the development of effective strategies for their management.[1] Also, regional differences have been reported in surgical treatment of various pathologies.[4] We therefore assessed the epidemiology of clavicular fractures and their treatment in Belgium. We describe the incidence of clavicular fractures in Belgium between 2006 and 2015, the demographic distribution in relation to sex and age groups, the treatment strategy, and its evolution over this time span.

Materials and methods

This retrospective population-based study was conducted with the help of the Belgian government. The Belgian National Institute for Health and Disability Insurance (NIHDI-INAMI-RIZIV)[3] retrieved and collected the data by using the NIHDI nomenclature. This is a numerically official fee code encompassing different medical diagnoses and treatments and their reimbursement rates.[8] All Belgian medical doctors are required to register their medical diagnoses and treatments based on this nomenclature to receive financial reimbursement. The electronic database was set up in 2006, and data were available until 2015.

Data retrieval

The search used the following nomenclature numbers: 296.612 (ambulatory diagnosis of clavicular fracture), 296.623 (diagnosis of clavicular fracture with hospital stay of >24 hours), 283.474 (surgery for a clavicular fracture in an ambulatory setting, <24 hours), 283.485 (surgery of clavicular fracture with hospital stay >24 hours). There were no exclusion criteria. The nomenclature numbers were linked to the patients' age category (5 years per age category), sex, year of performance, and region of residence. The provided database did not allow us to identify patients who had multiple or recurrent clavicular fractures.

The exported data were anonymized, and patients were regrouped in 10-year age clusters, and the incidence per 100,000 persons/year was calculated based on the population data provided by the Belgian Federal Government.[23] The rate of surgical treatment was the percentage of patients diagnosed with a clavicular fracture that underwent operative treatment and was calculated for the different age clusters, years, and sex. Because Belgium has a federal government structure, which is made up of a Flemish region (Dutch speaking, ±6 million people) in the north, a Wallonian region (French speaking, ±4 million people) in the south, and a Brussels region in the center (majority French speaking, ±1 million people), the rate of surgery per region was calculated and set out in function of time.

Statistical analysis

Data analysis was performed using GraphPad Prism 7.00 for Windows (GraphPad Software, La Jolla, CA, USA). The incidence of clavicular fractures per 100,000 persons/year was calculated by dividing the number of clavicular fractures by the number of people of a certain age group, per year, and multiplied by 100,000. Rates of surgery were calculated by dividing the incidence of surgical treatment by the incidence of diagnosis, which was then multiplied by 100. The resulting incidences and rates are based on the data of the Belgian population and not on a sample size; therefore, no significances, trends, or other advanced statistical tests could be calculated.

Results

Fracture incidence

Between 2006 and 2015 70,872 clavicular fractures were diagnosed in Belgium. These diagnoses were distributed among 23,357 women (33%) and 47,515 men (67%). The total fracture incidence during this period increased by 123% (from 57.3 per 100,000 persons/year to 70.2 per 100,000 persons/year; Fig. 1). This increase was true for both male patients (120% increase: 78.4 per 100,000 persons/year in 2006 to 94.6 per 100,000 persons/year in 2015) and female patients (125% increase: 37.1 per 100,000 persons/year in 2006 to 46.6 per 100,000 persons/year in 2015).

The mean age of all patients diagnosed with a clavicular fracture slightly increased from 31 years in 2006 to 34 years in 2016. The mean age at the time of injury increased from 36 years in 2006 to 41 years in 2015 for women and from 28 to 30 years for men (Table I). The age-related incidence

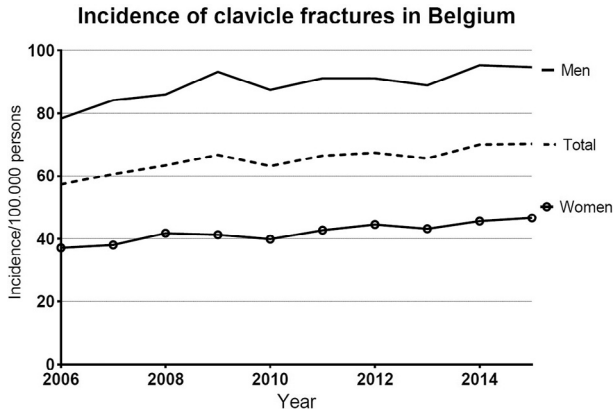

Figure 1 Incidence of clavicular fractures in Belgium per 100,000 person-years.

Table I Mean age of male and female patients in relation to year of diagnosis

Patients	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
Female, yr	36	38	37	38	38	38	38	39	38	41
Male, yr	28	27	28	28	28	28	29	29	29	30
Total, yr	31	31	31	31	31	31	32	32	32	34