

# Humeral fractures – Epidemiology, treatment and reoperations in the Swedish Fracture Register

AKADEMISK AVHANDLING

Som för avläggande av medicine doktorsexamen vid Sahlgrenska akademien, Göteborgs universitet kommer att offentligens försvaras i Hörsal aulan, R-huset, Sahlgrenska Universitetssjukhuset, Mölndal, den 5:e november 2021, klockan 9.00

av Carl Bergdahl, leg. läkare

Fakultetsopponent:

Docent Per Olof Josefsson

Institutionen för kliniska vetenskaper, Lunds Universitet, Lund

## Avhandlingen baseras på följande delarbeten

- I. Carl Bergdahl, Filip Nilsson, David Wennergren, Carl Ekholm, Michael Möller. Completeness in the Swedish Fracture Register and the Swedish National Patient Register: an assessment of humeral fracture registrations.  
*Clinical Epidemiology 2021;13:325-333.*
- II. Carl Bergdahl, Carl Ekholm, David Wennergren, Filip Nilsson, Michael Möller. Epidemiology and pathoanatomical pattern of 2,011 humeral fractures: data from the Swedish Fracture Register.  
*BMC Musculoskeletal Disorders 2016;17:159*
- III. Carl Bergdahl, David Wennergren, Jan Ekelund, Michael Möller. Mortality after a proximal humeral fracture – data on 18,452 patients from the Swedish Fracture Register.  
*Bone Joint Journal 2020;102-B(11):1484-1490.*
- IV. Carl Bergdahl, David Wennergren, Eleonora Swensson-Backelin, Jan Ekelund, Michael Möller. No change in reoperation rates despite shifting treatment trends: results of a population-based study of 4,070 proximal humeral fractures.  
*Acta Orthopaedica 2021;30:1-7.*

**SAHLGRENKA AKADEMIN  
INSTITUTIONEN FÖR KLINISKA VETENSKAPER**



# Humeral fractures – Epidemiology, treatment and reoperations in the Swedish Fracture Register

CARL BERGDAHL

Department of Orthopaedics, Institute of Clinical Sciences, Sahlgrenska Academy,  
University of Gothenburg, Sweden, 2021.

## Abstract

Fractures are common, but the knowledge on outcomes, treatment methods or the actual number of fractures treated each year has been sparse. With the introduction of the Swedish Fracture Register (SFR) in 2011, prospective registration and analysis of detailed population-based fracture data was made possible for the first time.

*Aim:* The overall aim of this thesis was to analyse the quality of data in the SFR and to determine whether, and to which extent, the SFR can be used in epidemiological research. Particularly, the incidence of humeral fractures and the mortality associated with proximal humeral fractures were analysed, and changes in treatment practice for proximal humeral fractures in recent years were evaluated.

*Methods:* All the papers in this thesis were based on fracture registrations in the SFR. Comparisons with other data sources were made; fracture registrations in the National Patient Register (NPR) were used to examine data quality, and information from Statistics Sweden were used to calculate fracture incidence and to compare mortality rates between fracture patients and the general population.

*Result:* In this thesis, Study I demonstrates that 88% of humeral fractures were registered in the SFR, and that all registrations were valid fracture registrations. The SFR therefore constitutes a complete, accurate and efficient source of information, well suited to epidemiological research. In contrast, data from the NPR contain a large proportion of non-valid fracture registrations and need to be improved in order to function as a solid basis for epidemiological research. Studies II-IV in this thesis demonstrate that the incidence of humeral fractures, regardless of fractured segment, increases significantly after the age of 50 years and is predominantly related to low-energy falls. This indicates the important influence of age-related risk factors, such as osteoporosis. Moreover, a proximal humeral fracture is associated with a substantially increased mortality, especially within the first weeks following the fracture. Male gender and low-energy trauma mechanisms were two independent risk factors for death following a humeral fracture. Finally, there was no significant change in the overall proportion of patients treated surgically between 2011 and 2017. However, considerable changes within the different surgical treatment modalities were observed. The use of plate fixation decreased significantly, while the use of intramedullary nails and reversed shoulder arthroplasty increased. Unfortunately, these changes in treatment practice did not affect the reoperation rate, which continued to be high throughout the study period.

*Conclusion:* The SFR is a reliable tool for population-based observational research. Data from the SFR demonstrate that proximal humeral fractures predominately affect frail people. A surprisingly high reoperation rate calls for awareness of the importance of choosing the right treatment to the right patient.

**Keywords:** Register, fracture, validation, epidemiology, mortality, treatment, reoperation