

Studies of tibial fractures using the Swedish Fracture Register

AKADEMISK AVHANDLING

Som för avläggande av medicine doktorexamen vid Sahlgrenska akademien,
Göteborgs universitet kommer att offentligens försvaras i R-aulan,
Sahlgrenska universitetssjukhuset, Mölndal

Fredag 4 oktober klockan 9:00

av

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Avhandlingen baseras på följande delarbeten

- I. Wennergren D, Ekholm C, Sandelin A, Möller M. The Swedish fracture register: 103,000 fractures registered. *BMC Musculoskeletal Disorders*. 2015;16:338.
- II. Wennergren D, Ekholm C, Sundfeldt M, Karlsson J, Bhandari M, Möller M. High reliability in classification of tibia fractures in the Swedish Fracture Register. *Injury*. 2016;47:478-82.
- III. Wennergren D, Bergdahl C, Ekelund J, Juto H, Sundfeldt M, Möller M. Epidemiology and incidence of tibia fractures in the Swedish Fracture Register. *Injury*. 2018;49:2068-74.
- IV. Wennergren D, Bergdahl C, Selse A, Ekelund J, Sundfeldt M, Möller M. Treatment and reoperation rates in 1,371 tibial fractures from the Swedish Fracture Register. *Submitted*

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Abstract

This thesis has two topics. First, the creation and application of the Swedish Fracture Register (SFR) is described. Second, a series of studies of tibial fractures based on data from the SFR follows.

Until the start of the SFR, there was no previous national fracture register with prospectively collected data on fractures of all types, treated surgically as well as non-surgically. In this thesis, the construction and implementation of the SFR is described (Study I). The validity of tibial fracture classification upon registration in the SFR is evaluated (Study II). The epidemiology and incidence of tibial fractures treated at Sahlgrenska University Hospital during a period of five years are described (Study III). In the last study, the treatment and re-operation rates for tibial fractures in the same cohort are analysed and described (Study IV).

Study I: The study demonstrates that the SFR is already a well-functioning, population-based fracture register that prospectively collects data on fractures of all types, regardless of location and treatment. The main outcomes are re-operation rates and patient-reported outcome measures (PROMs). In 2019, 42 of Sweden's 55 orthopaedic departments were affiliated to the SFR. This means that the SFR covers more than 75% of the inhabitants in Sweden. In March 2019, the SFR contained data on more than 365,000 fractures.

Study II: In this study, three experienced trauma surgeons (raters) were presented with the radiographs of 114 patients with tibial fractures randomly allocated from the SFR. The raters classified the fractures independently and were blinded to clinical patient information in two classification sessions with a time interval of four weeks. The AO/OTA classification coded by the three expert raters (the predefined gold standard) was compared with the classifications in the SFR. The accuracy of the classification of tibial fractures in the SFR, defined as agreement (kappa value) between the SFR and the gold standard classification, was 0.75 for the AO/OTA type and 0.56 for the AO/OTA group, corresponding to substantial and moderate agreement respectively.

Study III: Study III describes epidemiological data on 1,371 tibial fractures in 1,325 persons. Approximately 50 persons per 100,000 inhabitants a year sustain a tibial fracture. Among women, the incidence of tibial fractures in all segments of the tibia increases with age, whereas men have a flat incidence curve, except for tibial shaft fractures, which displayed a peak among young males.

Study IV: The study comprised 1,371 tibial fractures – 712 proximal, 417 diaphyseal and 242 distal fractures. Sixty-six per cent of all tibial fractures were treated surgically. Almost 30% (29.8%) of all surgically treated tibial fractures underwent re-operation. The removal of internal fixation devices was by far the most commonly performed re-operation. The AO/OTA classes that had the largest numbers of re-operated fractures were 41C3 (46.0%), 42A3 (47.7%), 42B2 (45.8%), 42C1 (51.6%), 42C3 (47.1%) and 43A2 (40.0%). Re-operations due to non-union, malunion, infection and implant failure were more or less equally common.

To conclude, the SFR is a well-functioning, population-based fracture register that collects data on fractures of all types including surgeon- and patient-reported outcome. The accuracy of the classification of tibial fractures in the SFR is acceptable. Data from the SFR can be used to describe the epidemiology of fractures in detail. The re-operation rates after the surgical treatment of tibial fractures are approximately 30%. Re-operations due to non-union, malunion, infection and implant failure account for approximately half of re-operations and are more or less equally common.

Keywords: Fracture Register, Tibial Fracture, Classification, Reliability, Agreement, Accuracy, Epidemiology, Incidence, Treatment, Reoperation