Epidemiology and treatment results for ankle fractures at Sahlgrenska University Hospital

Degree project thesis in Medicine

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Abstract

Introduction

The decision between surgical and non-surgical treatment for the common type B1 ankle fractures is not always easy. An injury to the medial deltoid ligament might make the fracture unstable, even though it cannot be seen on the radiograph.

Aim

The aim of the present study is to describe the epidemiology, as well as how the clinical examination, decision-making and treatment of ankle fractures of type AO/OTA 44B1 is managed at Sahlgrenska University Hospital (SU).

Methods

The study is based on prospectively registered data from the Swedish Fracture Register (SFR). For all registered B1 ankle fractures treated at SU 2012-04-01 to 2014-03-31, medical records and radiographs were analysed. A second data set was extracted from SFR concerning all types of ankle fractures. Descriptive statistical analyses were performed using Excel.

Results

During the two years studied, 1332 ankle fractures were treated at SU. Among these 512 were B1-fracturs, of which 439 met our inclusion criteria. Non-operative treatment was chosen in 309 patients and 130 patients received operative treatment. At an early stage the treatment was changed from non-surgical to surgical in four patients. In addition three patients was treated surgically at a later stage.

Conclusion

We were able to describe the management of B1-fractures at SU in a detailed way based on data from SFR and a review of the medical records. Our results can be utilized to improve the decision-making and the subsequent treatment for patients with this very common type of ankle fracture.

Keywords

Ankle Fracture, The Swedish Fracture Register, epidemiology, fracture management.

Introduction

Anatomy of the ankle joint

In the ankle joint, the talocrural articulation, articulate three bones, the superior part of talus, the distal aspect of the tibia and the distal aspect of the fibula. The distal end of the tibia, as well as the fibular distal end, can be palpated as hard prominences on medial respectively lateral side of the ankle. These, the medial malleolus respective the lateral malleolus, form the ankle mortise into which the superior articular surface of the talus fits. The roof of the mortise is formed by the tibial inferior surface, the tibial plafond. The main articulation in the ankle joint takes place between the rounded superior articular surface of the talus, the trochlea, and the tibial plafond. Nevertheless, talus medial and lateral facets which articulate with respective malleoli, are also of importance. (1, 2)

The stability of the ankle mortise is ensured by the ligaments of the tibiofibular syndesmosis. The tibiofibular syndesmosis, or inferior tibiofibular joint, is said to be a fibrous joint uniting the distal ends of tibia and fibula. However some studies argue that fairly frequently this distal connection of the tibia and fibula is not a mere syndesmosis but also a synovial joint. (3) The tibiofibular syndesmosis consists of the interosseous tibiofibular ligament, the anterior tibiofibular ligament and the posterior tibiofibular ligament. Additionally some imply there is a forth ligament composing the tibiofibular syndesmosis, the inferior transverse tibiofibular ligament, whereas other argue this to be a part of the posterior tibiofibular ligament and not a separate ligament. (3, 4) The posterior tibiofibular ligament extends almost horizontally from the posterior tibial tubercle (the posterior malleolus) to the lateral malleolus. It is stronger than the anterior tibiofibular ligament and a strong inferior margin of the ligament constitute the posterior wall in the ankle mortise. The anterior tibiofibular ligament runs laterally distally from the anterior tibial tubercle (Tillaux-Chaput tubercle) to the anterior fibular tubercle (Le Forts tubercle). The interosseous tibiofibular ligament connects the fibular notch of the tibia with the medial aspect of the distal fibula and is superiorly continuous with the weaker interosseous membrane. The fibers of the interosseous membrane, as well as tibiofibular syndesmosis runs inferiorly from the tibia to the fibula, hence strongly resisting the downward pull placed on the fibula by the major part of muscles attached to it. Moreover stability of the ankle mortise, keeping tibia and fibula together, the tibiofibular syndesmosis does permit a slight movement of the fibula during dorsiflexion when the wider anterior part of the trochlea of the talus is wedged between the malleoli. This tightens the malleoli grip on the trochlea of the talus during dorsiflexion at the ankle. On the contrary, is the ankle joint relatively unstable

during plantarflexion, since the narrow posteriorly part of the trochlea lies loosely between the malleoli and enable a small amount of addaction, abduction, eversion and inversion. (1-4)

The ankle joint is further reinforced by collateral ligaments that prevent the varus-valgus tilting of the talus. On the lateral side there are three ligaments. The anterior talofibular ligament, a weak band that runs anteromedially from that lateral malleolus to the talus. The posterior talofibular ligament is fairly strong and extends from the posterior aspect of the lateral malleolus and inserts posteriorly onto the talus. The calcaneofibular ligament originates at the tip of the lateral malleolus and attaches onto the calcaneus. The medial collateral ligament complex, the strong deltoid ligament, consists of two sets of fibers, superficial and deep. The superficial deltoid ligament is compost of three parts, the tibionavicular part, the tibiocalcaneal part and the posterior tibiotalar part. The deep deltoid ligament consists of the anterior tibiotalar part. These four adjacent and continuous originates from the medial malleolus and fans out and inserts onto the navicular bone, calcaneus and talus. (1, 2, 5)

Ankle fractures

Ankle fractures can be caused by indirect or direct trauma, most common are indirect rotational or translational forces, sometimes combined with an axial force, causing the malleolar fractures. There is a substantial different entity of fractures, distal tibial (pilon) fractures, caused by a direct axial load. Though these as well involve the ankle joint, they constitute a separate class of fractures and are not included when treating the subject ankle fractures here. (2)

The ankle fractures can involve the lateral malleolus, the fibula, the medial malleolus and the posterior malleolus. When fractures of both the lateral and the medial malleolus is present, they are often referred to as a bimalleolar fracture. When adding a fracture to the posterior malleolus they are often called a trimalleolar fracture. Irrespective of if it is a uni-, bi- or tri-malleolar fracture, ankle fractures are always considered intraarticular, even if there is no actual fracture line in the articular surface.

There are different classification systems for ankle fractures. Lauge-Hansen classification was developed around 1950 from a series of cadaver studies, where Lauge-Hansen, based on a presumed mechanism of injury, produceds series of osseous and soft-tissue injuries. These were presented as predictable sequences of osseous and soft-tissue injuries determined by the foot position and the direction of the deforming force and is the basis for the Lauge-Hansen

classification. (6) This stands as a seminal work for how our understanding of the pathomechanics of ankle fractures has evolved to what it is today. Over the past years several studies has in different ways tried to, but not completely been able to reproduce and validate the patterns Lauge-Hansen described. (7) Other classification systems has also emerged. A classification system was developed by Danis and later modified by Weber, on the basis of the location of the fibular fracture relative to the distal tibiofibular syndesmosis. With this classification, known as Danis-Weber or Weber classification, as basis was then the Müller AO classification of malleolar fractures developed. (8) Fracture classes in the two different systems, the AO classification and the Lauge-Hansen classification, are often referred to as classes corresponding to each other.

Müller AO Classification

In this study the AO fracture classification system was used. This classification system originates from the work initiated by Swiss surgeons who established the AO (Arbeitsgemeinschaft für Osteosynthesefragen/Association for the Study of Internal Fixation) in 1958. Today AO has the status as a worldwide surgical and scientific foundation and community.

The core of the early AO group, was inspired by Robert Danis, who had made observations that if absolute stability to a diaphyseal fracture through compression was obtained, fracture healing without callus took place. This among other things formed the basis for the original AO principles: restoration of anatomy, stable fracture fixation, preservation of blood supply and early mobilization of the limb and patient. With these principles as foundation the AO group initiated a process of development of instruments, implants, surgical techniques, as well as basic research and clinical documentation, aiming to apply this concept of fracture treatment clinically and establish how and why it worked. The AO group was not fist to appreciate operative fixation of fractures. However, great technical, metallurgical and biological obstacles prevented a wide adoption of internal fixation as fracture treatment. Here the AO group contributed with a coordinated approach to study and set about overcoming these obstacles.

In order for their principles of operative fracture treatment to gain acceptance, substantial improvements in the clinical results had to be shown. To attain this, radiographs and complete case histories of the patients from the clinics of the founding members of AO were collected. After evaluating the documentation of more than 150,000 surgically treated fractures they could confirm clinical benefits of the AO principles and techniques. In addition, did this

documentation served to the creation of the basis of AO fracture classification system, first presented by Müller et al in 1987.

In the Müller AO classification is anatomical location of the fracture designated by two numbers, one depending on in which bone and the second number on in which segment of the bone the fracture is located. Malleolar fractures get the localization code 44. The fractures are then further classified after the fracture morphology into types, groups and subgroups. (9) In accordance with the Danis-Weber classification, malleolar fractures are in the AO classification divide into the types A, B and C according to the fracture's location in relation to the inferior syndesmosis. Fractures below the level of the syndesmosis are being referred to as type A fractures, if located at the level of the syndesmosis as type B and fractures located above the inferior syndesmosis are type C fractures. However, the AO classification, in contrast to the Danis-Weber classification, further divide the A, B and C type fractures in three groups each, numbered one to three. Furthermore subgrouping is added by a decimal division of the A1-3 and B1-3 fractures. The fractures at the level of the syndesmosis, which are the fractures of interest in this study, are referred to as B1 fractures, if the lateral malleolus fracture is the only fracture present. If a fracture is apparent on the medial malleolus in addition to the lateral malleolus fracture, it is a B2 fracture. Further adding of a fracture to the posterior malleolus, makes it a B3 injury. (10)

Treatment of ankle fractures

Ankle fractures can be treated operatively with open reduction and internal fixation (ORIF) or non-operatively with immobilisation in a below knee cast or brace. ORIF might be a good treatment in many cases and render the possibility to achieve anatomical reduction and stabilise the fracture. (11) However, the risk for wound complications and infections that might lead to reoperation or even amputation, should always be taken into account. (12) It is of additional importance to consider the risks of complications following surgery for patients with risk factors. Increased risk can be due to diabetes, peripheral vascular disease, medication that affect wound-healing and high age. (12-14) Non-operative treatment might on the other hand lead to fracture displacement, delayed or non-union and incongruity in the ankle mortise. (15, 16) Incongruity in the mortise with lateral talar shift has in cadaver studies been found to result in loss of contact area in the ankle joint, which presumably leads to increased contact pressure, increased pain and supposedly an increased risk for arthrosis as consequence. (17, 18) Likewise has displacement of the fibula been found to increase the contact pressure in the ankle joint. (19) Clinically certain types of ankle fractures have shown

better outcome after operative treatment (11), whereas other fracture types have better or equally good clinical outcome with non-operative treatment. (15, 20)

Stable ankle fractures can be successfully non-operatively treated. Uni-malleolar ankle fractures below the syndesmosis, AO 44 A1, is usually a stable type of fractures doing well with non-surgical treatment. (21) If the fractures on the other hand are above the syndesmosis, C type injuries, or are bi- or tri-malleolar fractures, they present as unstable fractures who will benefit from ORIF. (10, 22) The lateral malleolar fractures at the level of the syndesmosis, AO 44 B1, might appear on the radiographs as uni-malleolar and stable. However, the injury-mechanism resulting in a fracture at the level of the syndesmosis can also cause a medial injury. A rupture of the deltoid ligament can occur, which might not be seen on the radiographs. If such a deltoid ligament rupture has occurred, the fracture becomes unstable and better suited for operative treatment, in contrast to the B1 fractures without an impaired deltoid ligament. (11, 15, 20, 23, 24)

The orthopaedic surgeon has to decide whether the B1 fracture has an associated deltoid ligament injury or not, in order to know if surgical or non-surgical treatment is preferable. How to determine this in the best way is not yet fully elucidated. Clinical signs like medial tenderness, ecchymosis and swelling is commonly considered, as well as tests for stability like the external rotation test. (21, 25, 26) Some B1-fractures are identified as unstable on ankle mortise radiographs. A talar shift in form of widening of the medial tibiotalar clear space (MTTCS) relative the superior tibiotalar clear space (STTCS) is seen. (27) The decision of surgery or not is not always easy. The patients at the accident and emergency department (A&E) might be seen by unexperienced junior doctors. When the surgeon is not entirely sure of which treatment strategy to practise, the decision is confirmed after discussion with experienced orthopaedic surgeons the following morning. However, in order to enable a correct treatment decision an adequate documentation in the medical records of clinical signs like medial tenderness is necessary.

The Swedish Fracture Register

The Swedish Fracture Register (SFR) is a national quality register that was started with the aim to establish as solid foundation of knowledge on epidemiology and effectiveness of Swedish fracture care. The inclusion criteria is fresh fracture confirmed on radiographs, a Swedish personal identity number and that the fracture has occurred in Sweden. The SFR collects data regarding the cause of the injury, type of fracture and given treatment, including non-operative treatment, as well as subsequent treatment results. Outcome is measured by

frequency of reoperations/operations in a late stage and Patient Reported Outcome Measures (PROM). (28-31) EQ-5D is used to measure health-related quality of life on an ascending scale from zero to one, where zero represents death and one completely healthy. Short Musculoskeletal Function Assessment (SMFA) measures the functional status with focus on musculoskeletal function and contains a dysfunction-index and bothersome-index. These are presented on a descending scale from 100 to 0, where 100 is a maximum bad value and 0 is the best possible score. (29, 32-34) The patients receive questionnaires shortly after the injury (day zero) in order to, with recall technique, report their pre-injury function. Those who answered the questionnaires for day zero are then sent identical questionnaires one year later, to assess how much of their prior function that has been restored. The knowledge provided by SFR can be utilized in evidence based work for improvement of quality and effectiveness in the treatment of fractures. The registrations of fractures started at Sahlgrenska University Hospital (SU) 2011-01-01 and the number of participating departments have increased in 2015 to include approximately 60 % of the departments treating fractures in Sweden. (28-31) Several research projects have been carried out in order to validate different types of data in the register. (35)

Ankle fractures, including lateral malleolar fractures (ICD S82.60), are registered since 2012-04-01. Fracture of the lateral malleolus is the fourth most common fracture registered in SFR. The lateral malleolus fracture at the level of the syndesmosis (AO 44 B1) is by far the most common type of ankle fracture and represent about 40 % of the total number of ankle fractures. The rate of operatively treated B1 fractures differ clearly over the country and one possible explanation is a varying evaluation of the indication for surgery. (29-31)

Aim

The purpose of this study is to do a general epidemiologic mapping of all ankle fracture types and a more detailed epidemiological mapping of the common lateral malleolar fracture at the level of the syndesmosis. For the lateral malleolar fractures at the level of the syndesmosis we further aim to survey the clinical examination, decision-making and treatment. The results of the survey and the treatment results is aimed to elucidate possible improvement in the treatment algorithm regarding the fracture type in question. The hypothesis is that there are obtainable changes, which can be made to improve the treatment for the patients and in addition result in a more cost effective use of the health service resources.

Materials and methods

The data was mainly extracted from The Swedish Fracture Register. The data provided from SFR contained among other things: the Swedish personal identity number, injury date, injury type, given treatment types and patient reported outcome measures in form of EQ-5D and SMFA. With the register data as basis, manual review of medical records were made in order to collect further data and in addition control the accuracy of some of the variables obtained through SFR.

At the time for the first data extraction, 538 patients were registered as treated at Sahlgrenska University Hospital (SU) for a B1-fracture during 2012-04-01 to 2014-03-31. These patients' medical records and radiographs, concerning the fracture of interest and the management of it, were studied. 56 patients were found to initially have been managed at other hospitals than SU and ten patients had been followed up elsewhere after initial treatment at SU and where therefore excluded since we needed complete documentation of the diagnostics and the treatment. Additionally 25 patients were found to have another fracture type than B1 and two patients had no fracture. These cases were likewise excluded since they did not meet our inclusion criteria. Four patients could not be found in the medical records at SU. Finally two patients had to be excluded since we could not access their medical records (Table 1). The remaining 439 patients were studied and data was gathered in an Excel document regarding: the first physical examination, radiographic findings, other significant concomitant injuries, whether stability test at the operating theatre was performed or not, if and how many operations were carried out, days with inpatient treatment, numbers of visits to physician respective to assistant nurse specialised on applying and removing orthopaedic casts, numbers of plain radiographs, CTs, MRIs respective ultrasounds, immobilization time and weight bearing advices (Table 2). Five patients had initially been treated according to a non-operative strategy, but in an early stage, the strategy was changed into surgical treatment. These patients were additionally studied with respect of why the treatment modality was changed. The tibiotalar clear space quotation was calculated in another eight patients who had no ankle fracture. After the review of the medical records, data that was missing or incorrect in the SFR was corrected. A second data set was extracted after the corrections were made.

The second data set contained data on all patients registered at SU with ankle fractures (ICD S82.50, 51, 60, 61, 80, 81) between 2012-04-01 and 2014-03-31. A descriptive analyse of the data in SFR was done. This analyse gives an overview of age, gender, injury cause, frequency

of high/low energy trauma, frequency of closed/open fracture and treatments given for all classes of ankle fractures.

Table 1. Number of patients from the originally 538 patients registered with a B1-fracture excluded and reasons for the exclusion.

Reason for exclusion	Number of patients
Initially managed at other hospital	56
Follow-up at other hospital	10
Other fracture than AO 44B1	25
No fracture	2
Patient not found in the medical records	4
No access to the medical records	2
Total	99

Table 2. Definition of different variables studied in the review of the medical records of the patients with type B1-fracture.

Variable specification	
Medial tenderness	Findings in the initial physical examination of: • Tenderness to pressure (by palpation) found on the medial side of the ankle • Tenderness over the deltoid ligament • Tenderness over the whole ankle • Open fracture with soft tissue defect on the medial side
Stability at the physical examination	Findings in the initial physical examination of: • Unstable ankle • Luxation with obvious dislocation of the ankle joint
Inadequate physical examination	Neither medial tenderness nor stability/instability of ankle was commented in the medical record.
Radiographic findings commented	Radiographic findings considered in the decision-making regarding treatment, commented in the medical records.
Stability test at the operating theatre	Stability tests with fluoroscopy at the operation theatre as a part of the diagnosing.
Time immobilized	Time immobilized in any kind of: • Lower leg cast • Ankle orthosis • Plaster splint
Weight bearing advice	The strictest weight bearing restriction after the chosen primary treatment was initiated, in other words after cast was applied in cases of non-operative treatment respective after the operation in cases of surgical treatment.
Time of inpatient care	The date discharged from the hospital (orthopaedic department) subtracted with the date admitted to the hospital.
The number of visits to surgeon	• Visits to the A&E • Follow-up visits to surgeon • Outpatient surgery • Orthopaedic consults of patient hospitalized in other department

Number of visits to assistant nurse	Visits to an assistant nurse for applying, changing or removing a cast or orthosis. Casts/orthoses applied at the A&E or in conjunction with an operation are not counted.
Number of radiographs	Number of occasions for a patient when plain radiographs, concerning the injury of the ankle, were taken.
Number of CTs	Number of occasions when a CT scan, concerning the injury of the ankle, was made.
Number of MRIs	Number of times a patient underwent a MRI, with regard to the ankle injury.
Number of ultrasound	Number of occasions when ultrasound was performed with respect to the ankle injury.
Tibiotalar clear space quotient	The quotient, MTTCS/STTCS*, on the first mortise radiograph taken after the trauma.
Dislocation on lateral view	The dislocation in the fracture on the lateral view on the first plain radiographs taken after the trauma.
*MTTCS=Medial Tibiotalar Clear Space STTCS=Superior Tibiotalar Clear Space	

Statistical methods

Descriptive statistical analyses and the building of charts were executed in Excel 2013.

Ethics

The study is based on data from The Swedish Fracture Register, which means that the patients have been informed about the registration and their right to decline participation. Thus, the patients are aware this type of research may be conducted. Written consent is not mandatory for registration in national quality registers in Sweden. Since only already collected data in SFR and medical records were studied, there were no risks for physical or psychological injury, pain or discomfort. After data extracted from SFR was linked to the data from medical records, all data was anonymized. All analyses were performed on unidentifiable patient data. The results are reported in aggregated, anonymous form at statistical group level. Directions regarding data security are followed and the Swedish fracture registers database is stored with high security. An application to the Regional Ethical Review Board in Gothenburg, Sweden, has been sent in for approval of the study, in which this research will be the first part.

Results

During the two years from 2012-04-01 to 2014-03-31 1328 patients with ankle fractures were treated at SU. 768 of the patients were females and 560 males (Figure 5). Four of the female patients had sustained two ankle fractures, hence the total number of ankle fractures treated at SU during this period were 1332. The patients were between 16 and 98 years old at the time

for the injury. There were 512 B1-fractures (Figure 1), however, only 439 met our inclusion criteria and were included in the study.

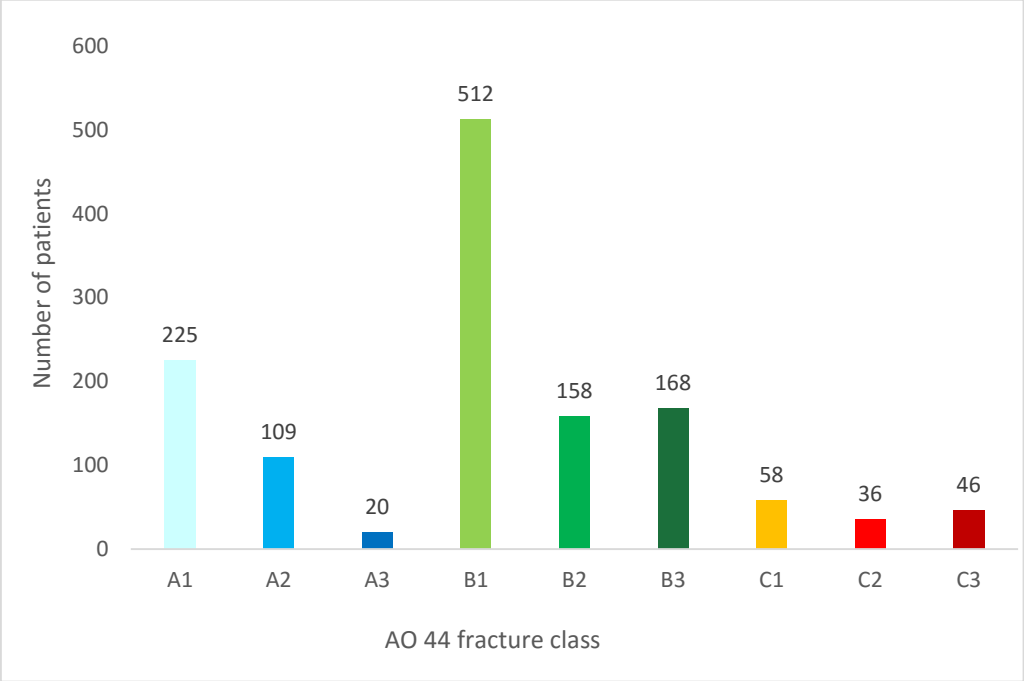


Figure 1. Number of different types of ankle fractures registered in SFR at SU between 12-04-01 and 14-03-31.

Epidemiology for ankle fractures

The most common age group where ankle fractures occur is the 56-65 years age group (Figure 2). The median age when sustaining an ankle fracture was 55 years. The common B1-type fractures, are as well most frequent in the age-group 56-65 years (Figure 3). The A- and C-fractures, are more common in younger patients compared with B-fractures. (Figure 4).

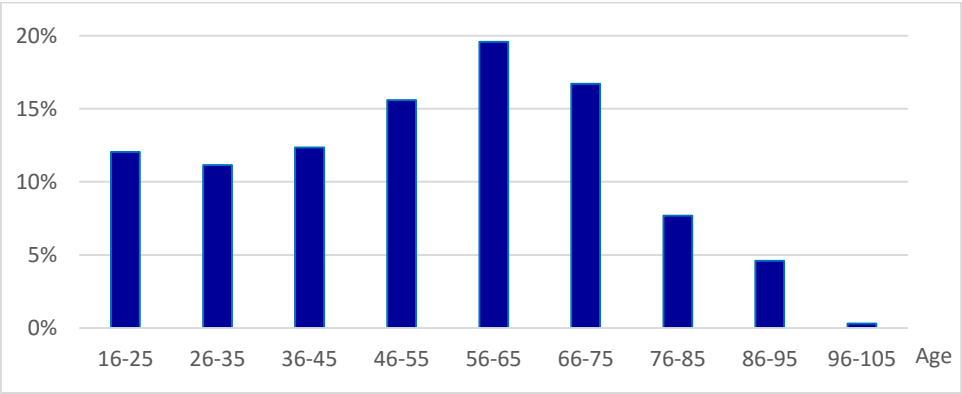
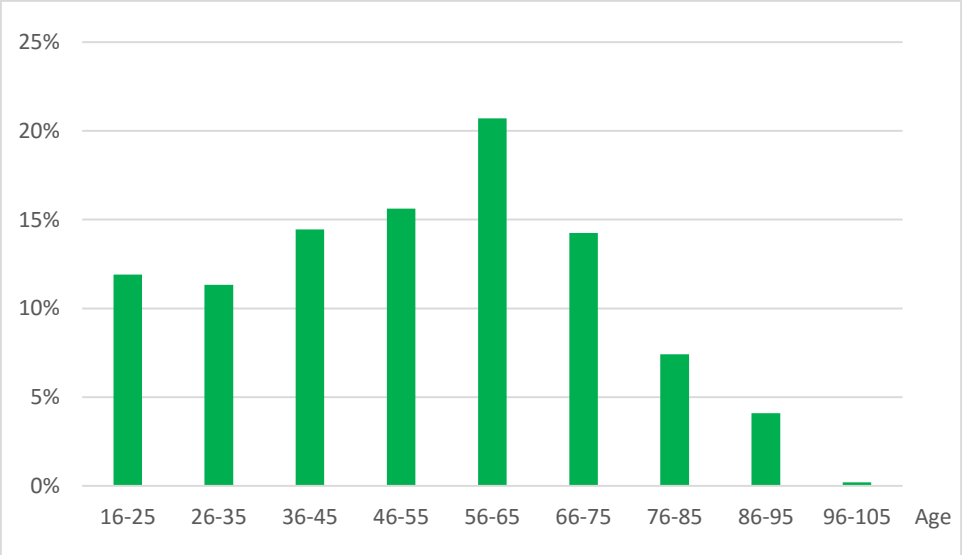


Figure 2. Age distribution of all the patients registered in SFR at SU with an ankle fracture, irrespective of fractur class, between 12-04-01 and 14-03-31.



Figur 3. Age distribution of the patients registered in SFR at SU with a type B1-ankel fracture between 12-04-01 and 14-03-31.

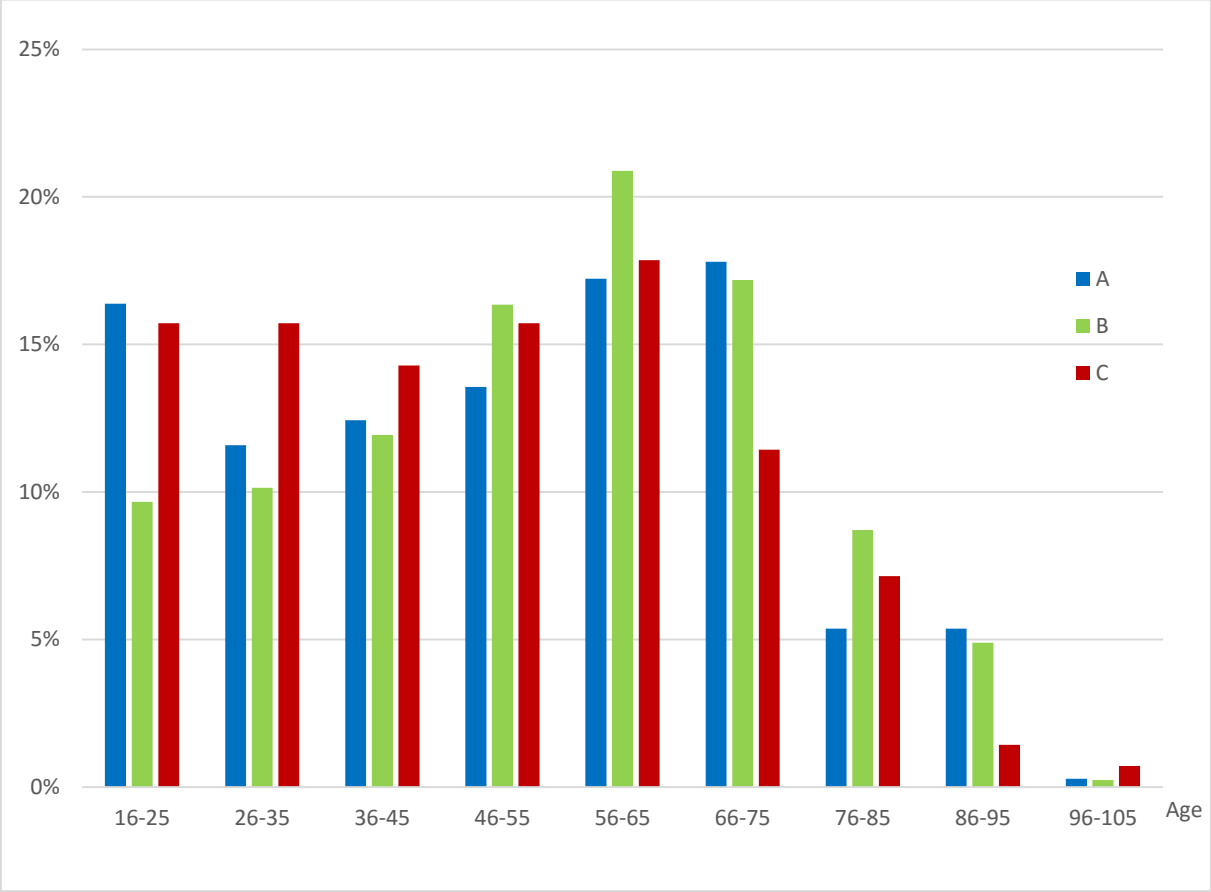


Figure 4. Age distribution by fracture type A, B and C, of all the patients registered in SFR at SU with an ankle fracture between 12-04-01 and 14-03-31.

More females then males, sustained an ankle fracture (Figure 5). However, the gender distirbution was, in conformity with the age distirbution, varying for the different fracture classes. For C3 and A3 fractures male gender was preponderant.

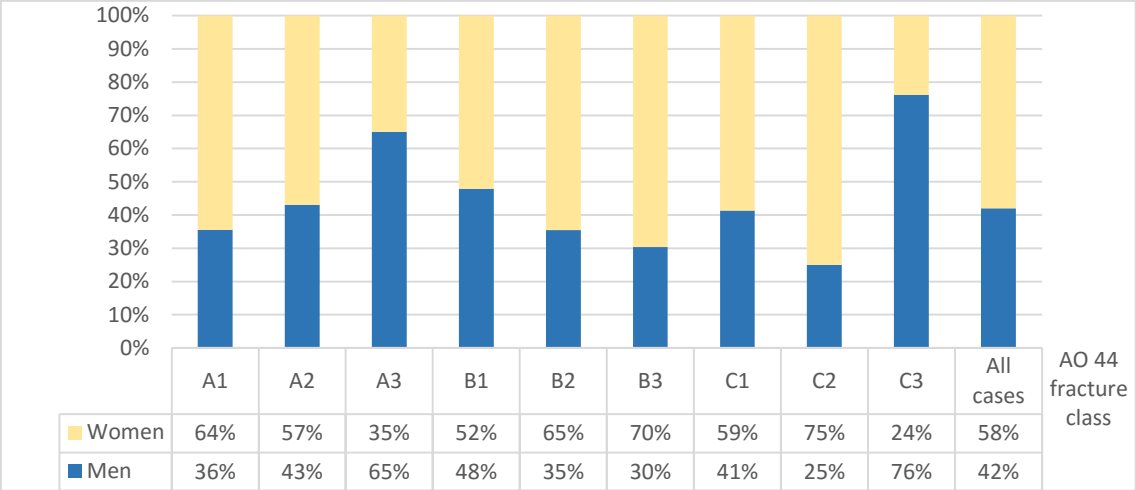


Figure 5. Gender distribution of patients with ankle fracture registered in SFR at SU between 12-04-01 and 14-03-31, within each fracture class and for all fractures.

Of all ankle fractures 93 % were caused by low energy trauma. The most common cause of ankle fractures, in all the different fracture classes, is a fall on the same level from slipping, tipping or stumbling (Table 3). Fall due to ice and snow and unspecified falls, are also common injury causes and are as common as all the different transport accidents counted together. The majority (98 %) of the ankle fractures are closed fractures (Figure 6).

Table 3. Injury mechanism according to V/W-codes for patients with an ankle fracture registered in SFR at SU between 12-04-01 and 14-03-31, within each fracture class and for all fractures.

Injury cause code	AO 44 fracture class A1	A2	A3	B1	B2	B3	C1	C2	C3	All AO 44 fractures
W00	8 (4 %)	7 (6 %)	2 (10 %)	59 (12 %)	14 (9 %)	21 (13 %)	9 (16 %)	5 (14 %)	9 (20 %)	134 (10 %)
W01	123 (55 %)	38 (35 %)	9 (45 %)	240 (47 %)	89 (56 %)	77 (46 %)	26 (45 %)	12 (33 %)	17 (37 %)	631 (47 %)
W02	2 (1 %)	1 (1 %)	0 (0 %)	17 (3 %)	1 (1 %)	4 (2 %)	2 (3 %)	1 (3 %)	2 (4 %)	30 (2 %)
W03	13 (6 %)	1 (1 %)	0 (0 %)	7 (1 %)	0 (0 %)	0 (0 %)	2 (3 %)	1 (3 %)	2 (4 %)	26 (2 %)
W04-09	3 (1 %)	2 (2 %)	0 (0 %)	8 (2 %)	5 (3 %)	2 (1 %)	2 (3 %)	0 (0 %)	0 (0 %)	22 (2 %)
W10	10 (4 %)	9 (8 %)	0 (0 %)	30 (6 %)	12 (8 %)	15 (9 %)	3 (5 %)	4 (11 %)	2 (4 %)	85 (6 %)
W11-16	2 (1 %)	5 (5 %)	1 (5 %)	10 (2 %)	1 (1 %)	5 (3 %)	0 (0 %)	2 (6 %)	2 (4 %)	28 (2 %)
W17-18	2 (1 %)	1 (1 %)	0 (0 %)	6 (1 %)	3 (2 %)	8 (5 %)	2 (3 %)	0 (0 %)	2 (4 %)	24 (2 %)
W19	25 (11 %)	6 (6 %)	4 (20 %)	56 (11 %)	14 (9 %)	22 (13 %)	3 (5 %)	3 (8 %)	3 (7 %)	136 (10 %)
W20-23, W31	4 (2 %)	5 (5 %)	0 (0 %)	9 (2 %)	1 (1 %)	2 (1 %)	1 (2 %)	3 (8 %)	0 (0 %)	25 (2 %)
W50-50, W64	4 (2 %)	4 (4 %)	1 (5 %)	12 (2 %)	2 (1 %)	2 (1 %)	1 (2 %)	0 (0 %)	3 (7 %)	29 (2 %)
V03-V99	24 (11 %)	28 (26 %)	2 (10 %)	52 (10 %)	16 (10 %)	10 (6 %)	5 (9 %)	5 (14 %)	3 (7 %)	145 (11 %)
Other	3 (1 %)	2 (2 %)	1 (5 %)	3 (1 %)	0 (0 %)	0 (0 %)	2 (3 %)	0 (0 %)	0 (0 %)	11 (1 %)
ND	2 (1 %)	0 (0 %)	0 (0 %)	3 (1 %)	0 (0 %)	0 (0 %)	0 (0 %)	0 (0 %)	1 (2 %)	6 (0 %)

W00 – Fall due to ice and snow
W01 – Fall on same level from slipping, tripping and stumbling
W02 – Fall skiing/ice skating
W03 – Other fall on same level due to collision with another person
W04-W09 – Fall indoors
W10 – Fall on and from stairs and steps
W11-W16 – Fall outdoors
W17-W18 – Other fall
W19 – Unspecified fall
W20-23, W31 – Exposure to inanimate mechanical forces (Exposure to mechanical forces by objects)
W50-52, W64 – Exposure to animate mechanical forces (Exposure to mechanical forces by humans or other living beings)
V03-V99 – Transport accident
ND – No Data

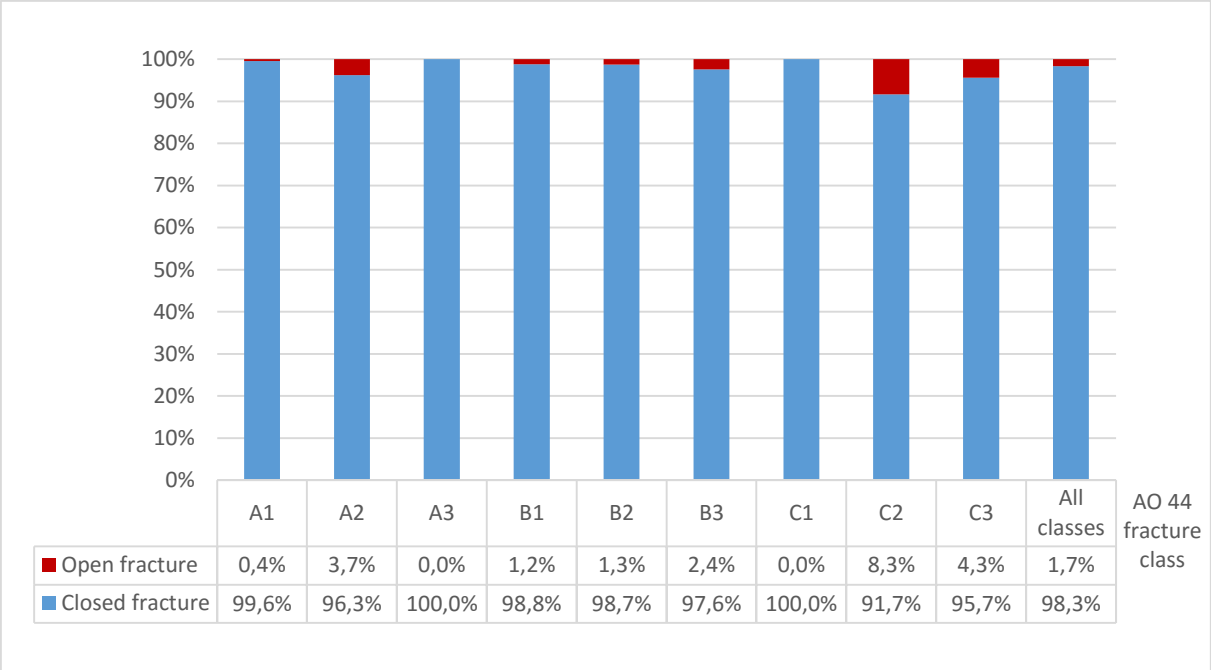


Figure 6. Per cent of open and closed fractures respectively within each fracture class and for all fractures. Patients with ankle fracture registered in SFR at SU between 12-04-01 and 14-03-31.

Among the 1332 cases of ankle fractures registered at SU there was no treatment registered in six cases. In additionally three cases data concerning primary treatment strategy were not available. Overall primary non-operative and operative treatment were approximately equally frequent. Some fracture types (B3, C2) are almost solely treated surgically, whereas A1 fractures is almost exclusively non-operatively treated (Figure 7). The A2 and A3 fractures are approximately equally frequent primarily treated non-operatively as operatively. Two out of three of the B1-fractures were treated non-operatively.

Of all the 693 primarily non-operatively treated ankle fractures, the treatment was at an early stage converted to operative treatment in 12 cases (Table 4). There were 40 planned additional operations performed and a total number of 73 reoperations/operations at a late stage were performed.

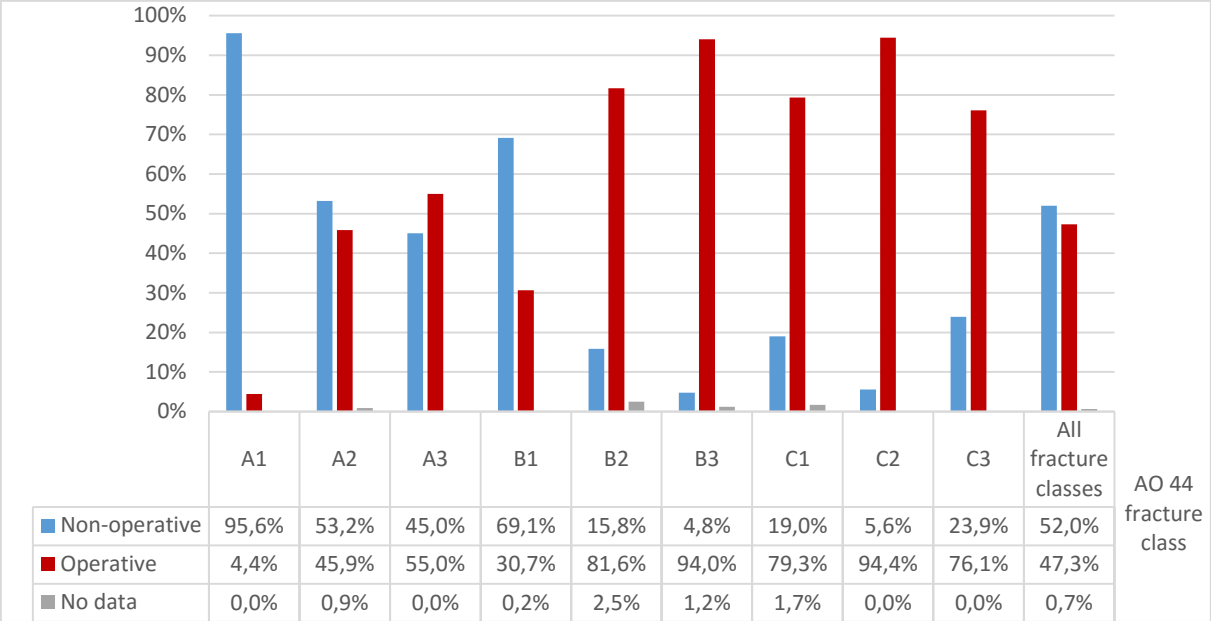


Figure 7. Primary treatment for patients with an ankle fracture registered in SFR at SU between 12-04-01 and 14-03-31, distribution within each fracture class and for all fractures.

Table 4. Number of operations besides the primary treatment for patients with an ankle fracture registered in SFR at SU between 12-04-01 and 14-03-31, for each fracture class and totally.

	A1	A2	A3	B1	B2	B3	C1	C2	C3	Total
Operation at an early stage after non-operative treatment had been discarded		2	1	5	2				2	12
Planed additional operation		1	1	9	6	14	1	4	4	40
Reoperation* due to non-union	2	1		2	2	2		1		10
Reoperation* due to dislocation/ healing in incorrect position		1		3	1	3	1		1	10
Reoperation* due to infection				3	4	1		1		9
Reoperation* due to wrong placed implant /implant failure		1		1	1	5	1		1	10
Reoperation* due to other cause		4		20	1	6		3		34
Total reoperation all sorts	2	7	0	29	9	17	2	5	2	73
* Reoperaiton can also be operation at a late stage in primary non-operaively treated patients										

The lateral malleolus fractures at the level of the syndesmosis; our main interest in this study

Among the 439 patients with B1-fractures that met the inclusion criteria, 309 patients were treated non-operatively and 130 patients surgically. At an early stage the treatment was changed from non-surgical to surgical in five patients. In addition three patients was treated surgically at a later stage (Figure 8).

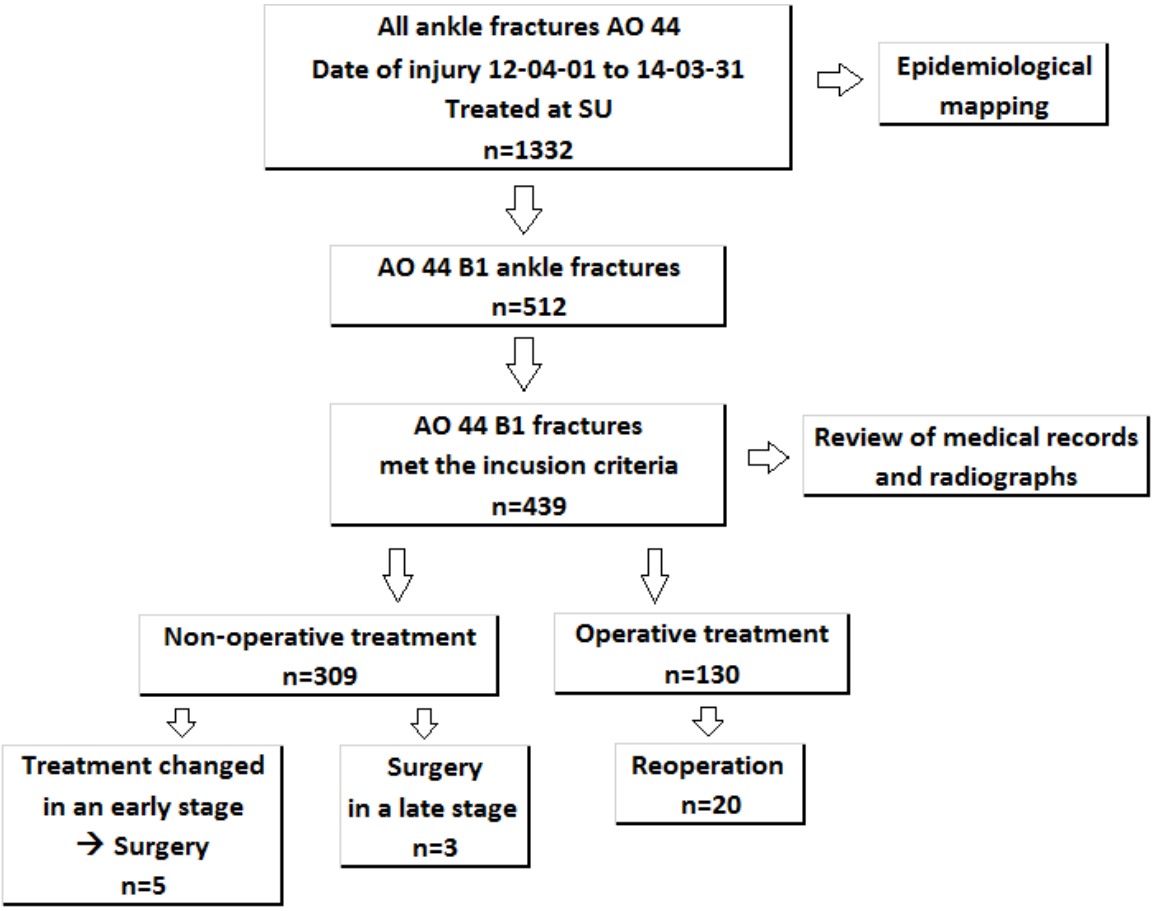


Figure 8. Flowchart of number of ankle fractures in the different study groups.

The treatment, were still not finished in four cases, at the time for the review of the medical records. Three of these patients were planned for extraction of osteosynthesis materials and the fourth patient was awaiting a decision on treatment due to remaining complaints.

Diagnostics

The median patient delay before seeking medical care at the A&E department was 1 days. At the physical examination medial tenderness was found in 24 % and instability in 2 % of the patients treated non-operatively. In the surgically treated group corresponding figures were 48 % respectively 29 % (Table 5). A comment regarding medial tenderness in the medical records was absent in a greater proportion of the patients treated operatively (34 %) than the non-operatively treated (25 %). With respect of stability a comment was on the other hand more frequently missing in the non-operatively treated patients (42 %) than the operatively treated patients (30 %). Inadequate documentation of the physical examination with neither medial tenderness nor stability commented, was found in 57 cases (13 %). The radiographic findings were in contrary almost always commented in the medical record (98 % of non-operative treatment and in 99 % of operative treatment).

Table 5. Diagnostic findings according to the medical records for patients with a type B1-fracture registered at SU in SFR between 12-04-01 and 14-03-31.

	Non-operative			Operative		
	Instability	Medial tenderness	Radiographs commented	Instability	Medial tenderness	Radiographs commented
Yes	7 (2 %)	73 (24 %)	303 (98 %)	38 (29 %)	62 (48 %)	129 (99 %)
No	141 (46 %)	159 (51 %)	6 (2 %)	21 (16 %)	24 (18 %)	1 (1 %)
Not commented	130 (42 %)	77 (25 %)		39 (30 %)	44 (34 %)	
Uncertain	31 (10 %)			32 (25 %)		

A test of stability was performed in the operating theatre as a part of the diagnostic procedures, in 32 of the 439 patients with B1-fractures. These stability tests led in 22 cases to a decision of non-operative treatment, whereas in 10 patients an operative treatment strategy was chosen.

Diagnostic imaging

In the vast majority of cases (97 %) plain radiographs were the only diagnostic imaging modality used (Table 6). In total during the treatment and follow-up period the average number of radiographs performed for non-operatively treated patients were 2.2, compared to 2.9 radiographic examinations performed if the fracture was treated operatively (Figure 9). Additional CT, MRI and ultrasound was used in a few patients (Table 6).

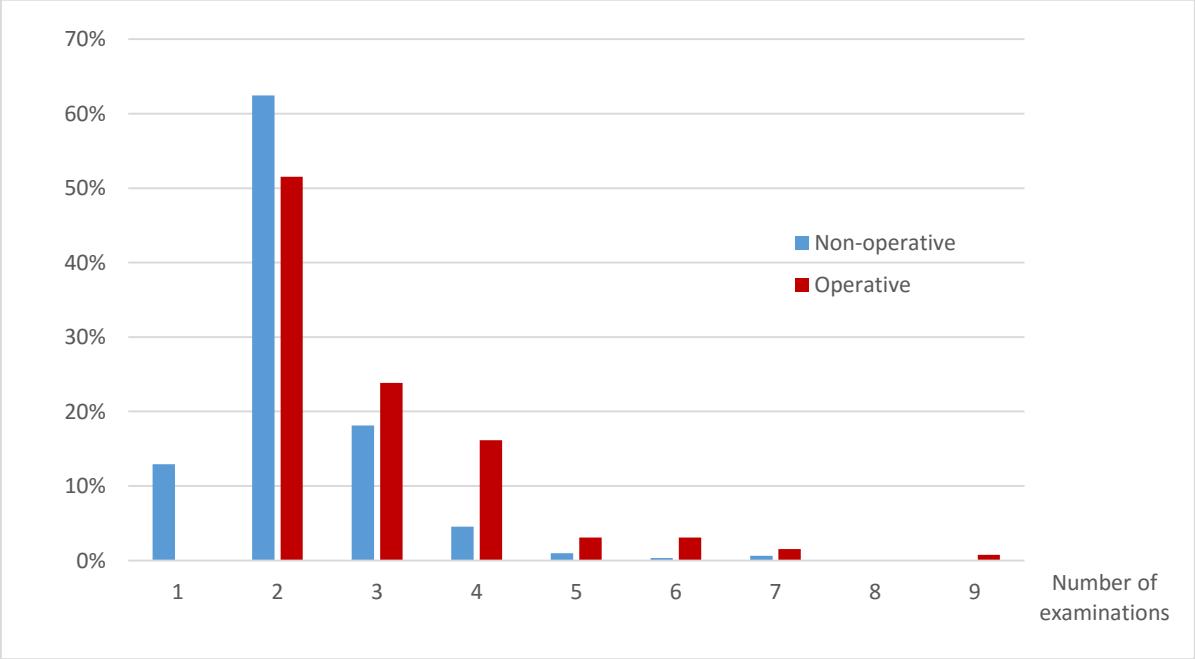


Figure 9. Number of plain radiographic examinations for patients with a type B1-fracture, non-operatively and operatively treated respectively, registered in SFR at SU between 12-04-01 and 14-03-31.

Table 6. Frequency of different types of diagnostic imaging for patients with a B1-fracture, non-operatively and operatively treated respectively. Patients registered in SFR at SU between 12-04-01 and 14-03-31.

Number of examinations	Number (percentage) of patients with non-operative treatment				Number (percentage) of patients with operative treatment			
	Plain radiograph	CT	MRI	Ultrasound	Plain radiograph	CT	MRI	Ultrasound
1	40 (13 %)	7 (2 %)	2 (1 %)	0 (0 %)	0 (0 %)	3 (2 %)	1 (1 %)	2 (2 %)
2	193 (62 %)				67 (52 %)			
3	56 (18 %)				31 (24 %)			
4	14 (5 %)				21 (16 %)			
5	3 (1 %)				4 (3 %)			
6	1 (0 %)				4 (3 %)			
7	2 (1 %)				2 (2 %)			
8	0 (0 %)				0 (0 %)			
9	0 (0 %)				1 (1 %)			

A rough estimate often used as a cut-off for surgical treatment has been a dislocation on a true lateral radiographic view of ≥2 mm. Among the operatively treated patients, 51 % had a fracture dislocated ≥2 mm and among the non-operatively treated patients the number was 16 % (Figure 10). The median tibiotalar clear space quotation in the non-operatively treated patients was 1.0 (range 0.7-1.5). In the operatively treated group the median was 1.3 (range 0.7-4.8) (Figure 11). Eight patients with no ankle fracture had the median tibiotalar clear space 0.8 (range 0.5-1.1).

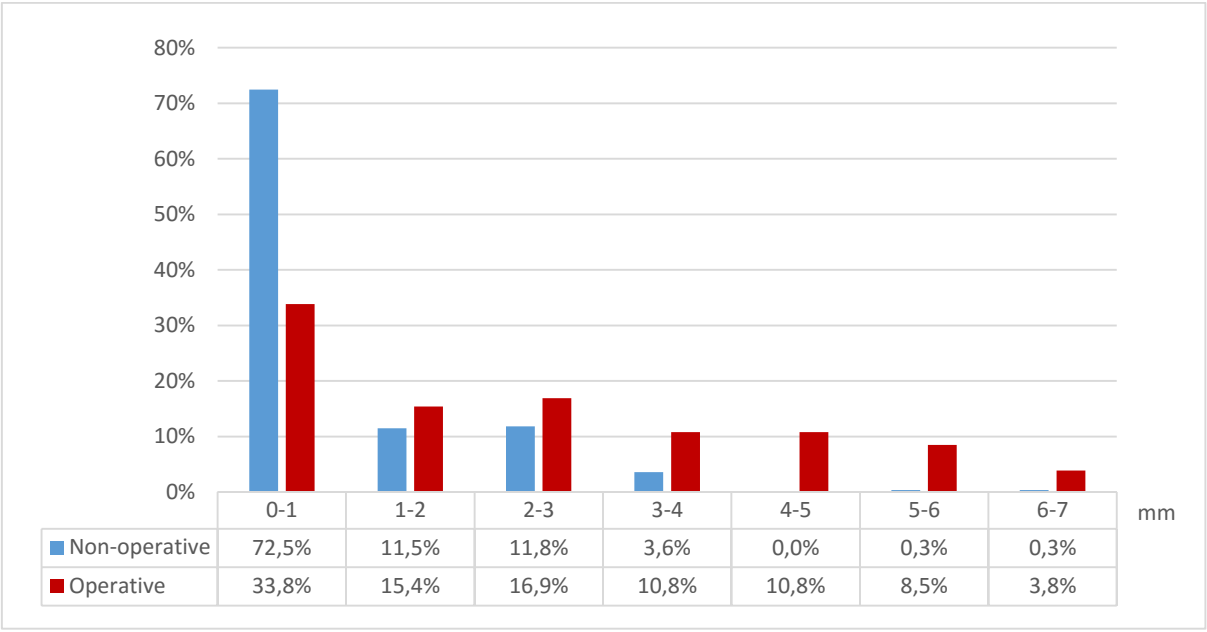
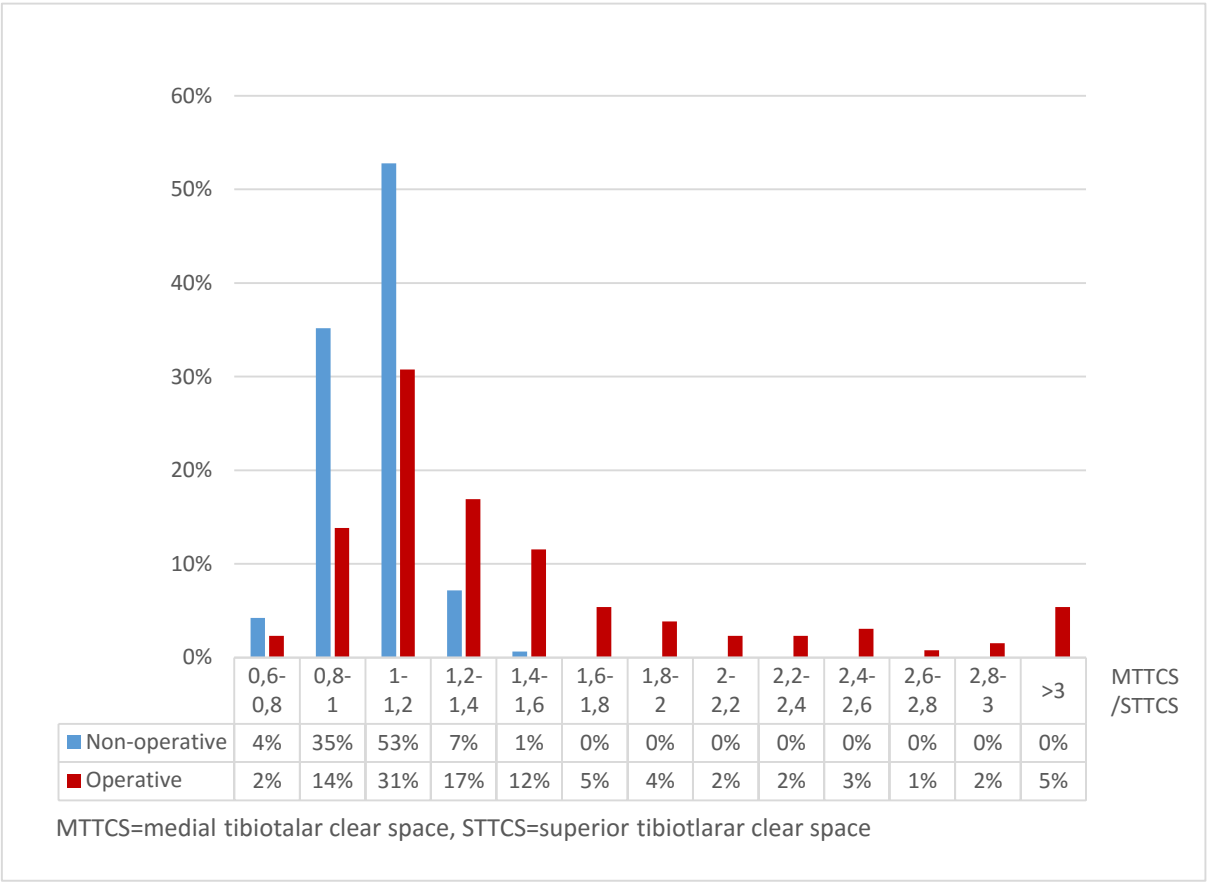


Figure 10. Dislocation in the fracture on the lateral radiographic view in patients with a non-operatively respective operatively treated B1-fracture, registered in SFR at SU between 12-04-01 and 14-03-31.

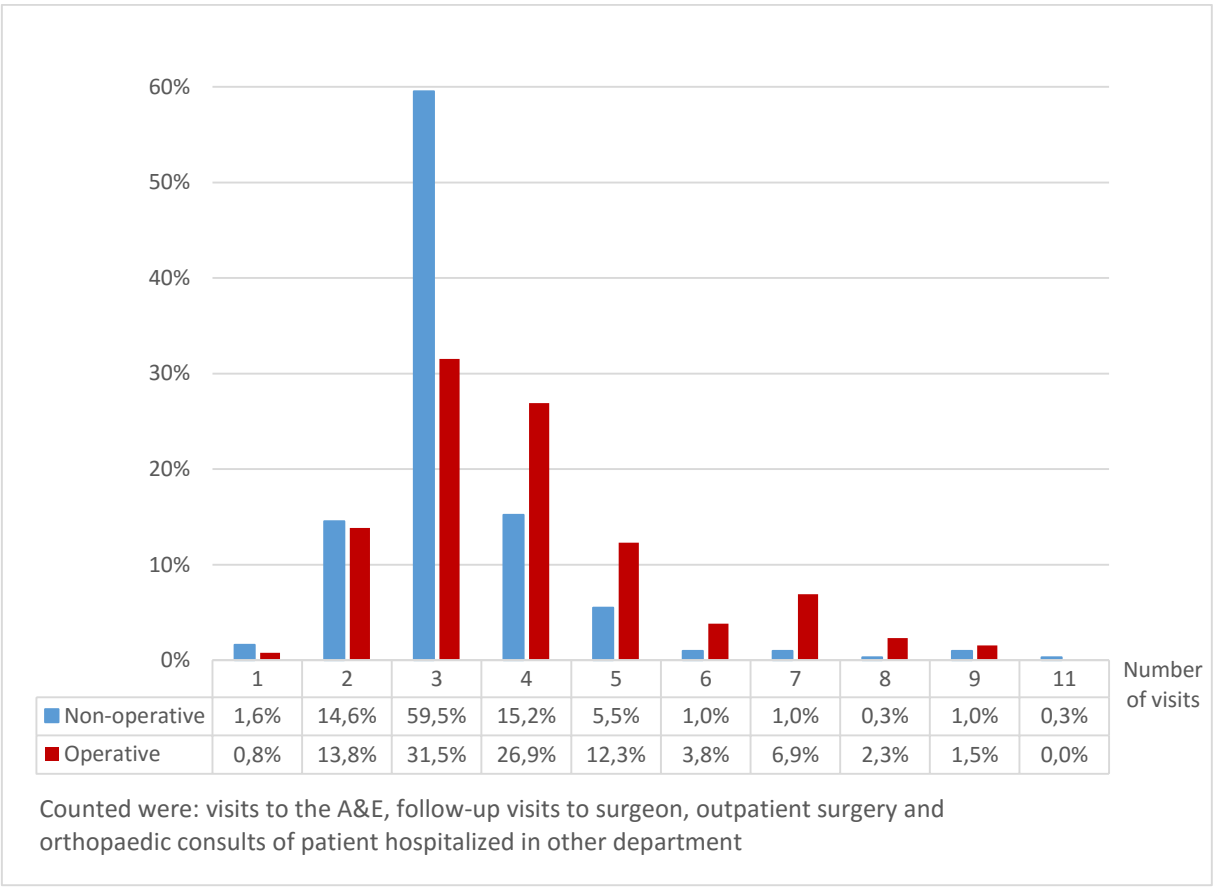


MTTCS /STTCS	0,6-0,8	0,8-1	1-1,2	1,2-1,4	1,4-1,6	1,6-1,8	1,8-2	2-2,2	2,2-2,4	2,4-2,6	2,6-2,8	2,8-3	>3
Non-operative	4%	35%	53%	7%	1%	0%	0%	0%	0%	0%	0%	0%	0%
Operative	2%	14%	31%	17%	12%	5%	4%	2%	2%	3%	1%	2%	5%

Figure 11. Tibiotalar clear space quotation on the mortise radiography view in patients with a non-operatively respective operatively treated B1-fracture, registered in SFR at SU between 12-04-01 and 14-03-31.

Usage of healthcare resources

The average non-surgically treated patient made 3.3 visits to a surgeon (Figure 12), 2.1 visits to an assistant nurse for applying, changing or removing a cast or orthosis (Figure 13) Twenty-four of the patients were admitted to hospital and together all non-operatively treated patients had on average 0.2 days inpatient care (Figure 14). The surgically treated patient had on average 4.0 visits to surgeon, 1.8 visits for applying, changing or removing a cast or orthosis and was hospitalised on average 2.6 days.

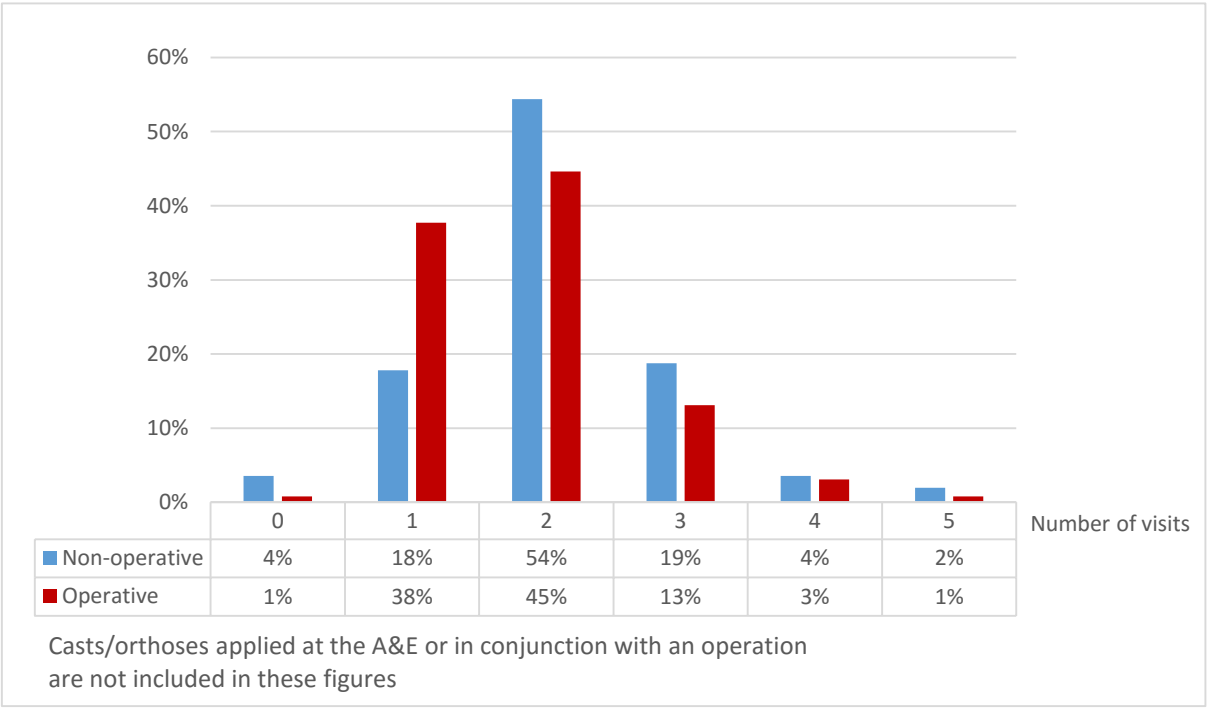


	1	2	3	4	5	6	7	8	9	11
Non-operative	1,6%	14,6%	59,5%	15,2%	5,5%	1,0%	1,0%	0,3%	1,0%	0,3%
Operative	0,8%	13,8%	31,5%	26,9%	12,3%	3,8%	6,9%	2,3%	1,5%	0,0%

Number of visits

Counted were: visits to the A&E, follow-up visits to surgeon, outpatient surgery and orthopaedic consults of patient hospitalized in other department

Figure 12. Number of visits to surgeon for patients with a type B1-fracture, non-operatively respective operatively treated, registered in SFR at SU between 12-04-01 and 14-03-31.

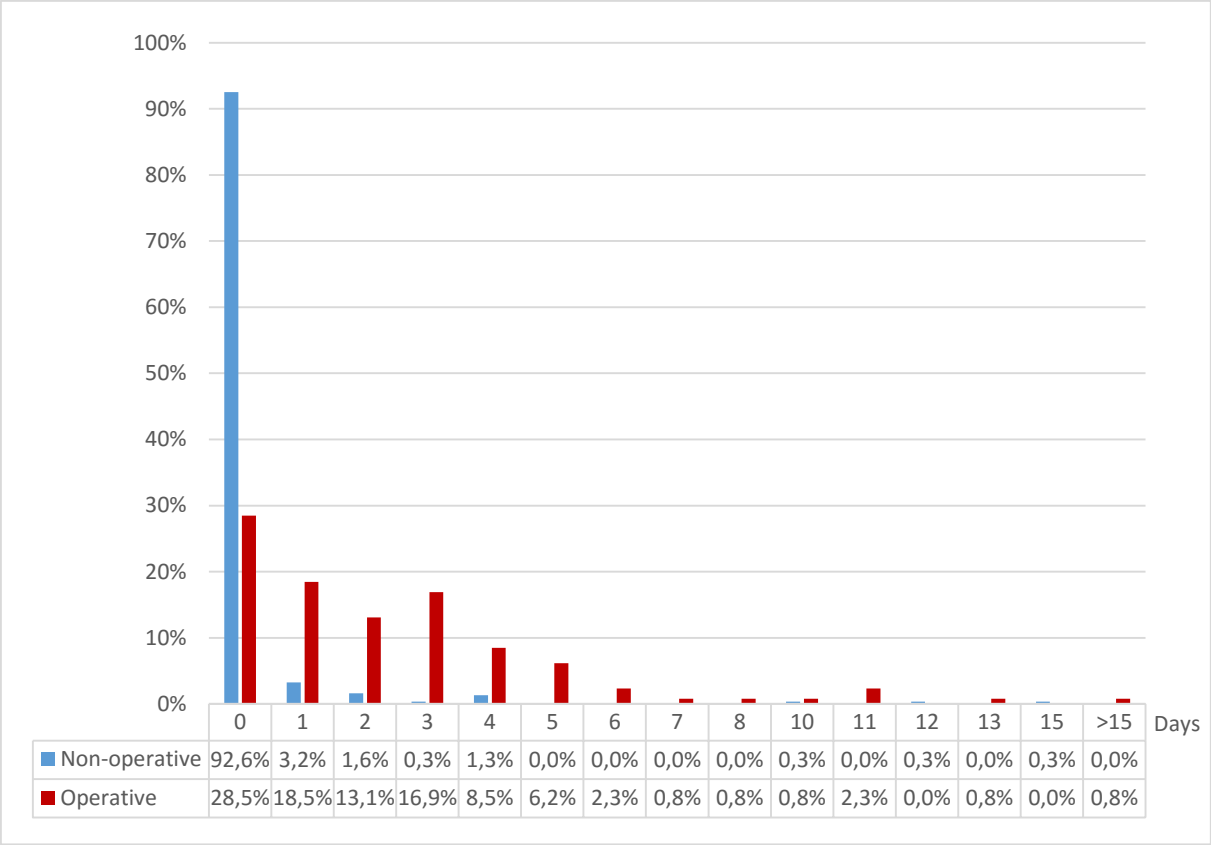


	0	1	2	3	4	5
Non-operative	4%	18%	54%	19%	4%	2%
Operative	1%	38%	45%	13%	3%	1%

Number of visits

Casts/orthoses applied at the A&E or in conjunction with an operation are not included in these figures

Figure 13. Number of visits for applying/changing/removing cast/orthosis for patients with a type B1-fracture, non-operatively respective operatively treated, registered in SFR at SU between 12-04-01 and 14-03-31.



	0	1	2	3	4	5	6	7	8	10	11	12	13	15	>15
Non-operative	92,6%	3,2%	1,6%	0,3%	1,3%	0,0%	0,0%	0,0%	0,0%	0,3%	0,0%	0,3%	0,0%	0,3%	0,0%
Operative	28,5%	18,5%	13,1%	16,9%	8,5%	6,2%	2,3%	0,8%	0,8%	0,8%	2,3%	0,0%	0,8%	0,0%	0,8%

Figure 14. Days of inpatient care for patients with a type B1-fracture, non-operatively respective operatively treated, registered in SFR at SU between 12-04-01 and 14-03-31.

Surgical treatment was managed with outpatient surgery in 38 (29 %) of the operatively treated patients. The remaining 92 (71 %) surgically treated patients had either postoperative inpatient care after planned outpatients surgery or inpatient surgery (Table 7).

Table 7. Frequency of outpatient and inpatient surgery among patients with a type B1-fracture registered in SFR at SU between 12-04-01 and 14-03-31.

	Number of patients
Outpatient surgery*	38
Outpatient surgery with postoperative inpatient care**	28
Inpatient surgery**	67

*At primary operation and reoperation (if a reoperation has been made)
**At primary operation or reoperation

Surgical treatment

The time from the injury to surgery, in patients primarily treated surgically, ranged from 0 to 59 days (Figure 15). The median time to surgery was only one day. The primary surgical procedure was fixation with a fibular plate in 65 % and in 31 % the fibula plating was combined with fixation of the syndesmosis (Figure 16). In other words 96 % of the operations were fibular plating with or without syndesmosis fixation.

The surgically treated patients were reoperated in 15.4 % of the cases (Figure 17). The most frequent reported reoperation was due to other reasons. None of the patients had more than one reoperation. The most common reason for reoperations was removal of plates and screws. Patients treated non-surgically had an operation performed at late stage in 1.3 %.

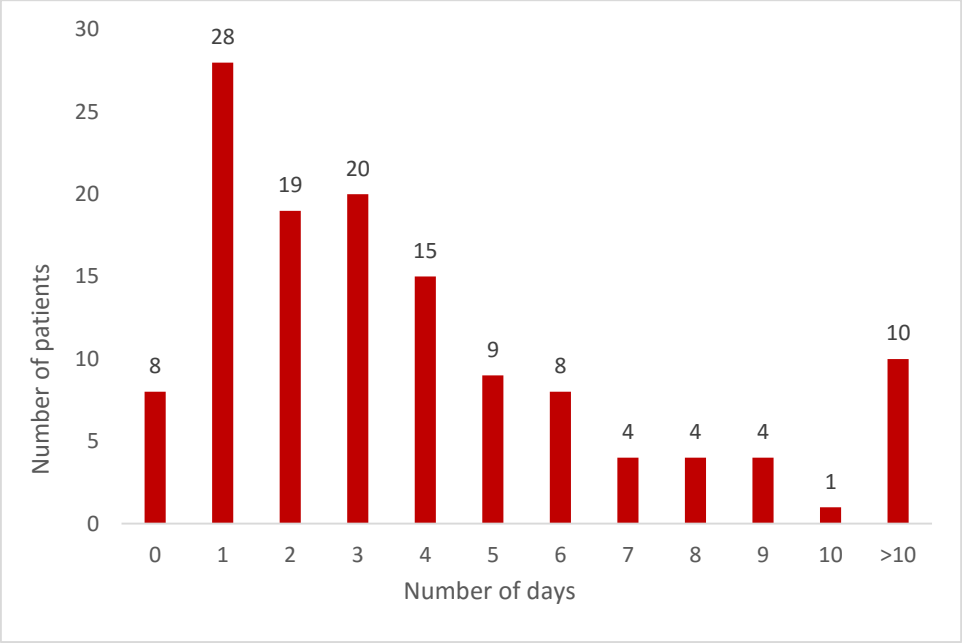


Figure 15. Days from injury to surgery in patients with an operatively treated B1-fracture registered in SFR at SU between 12-04-01 and 14-03-31.

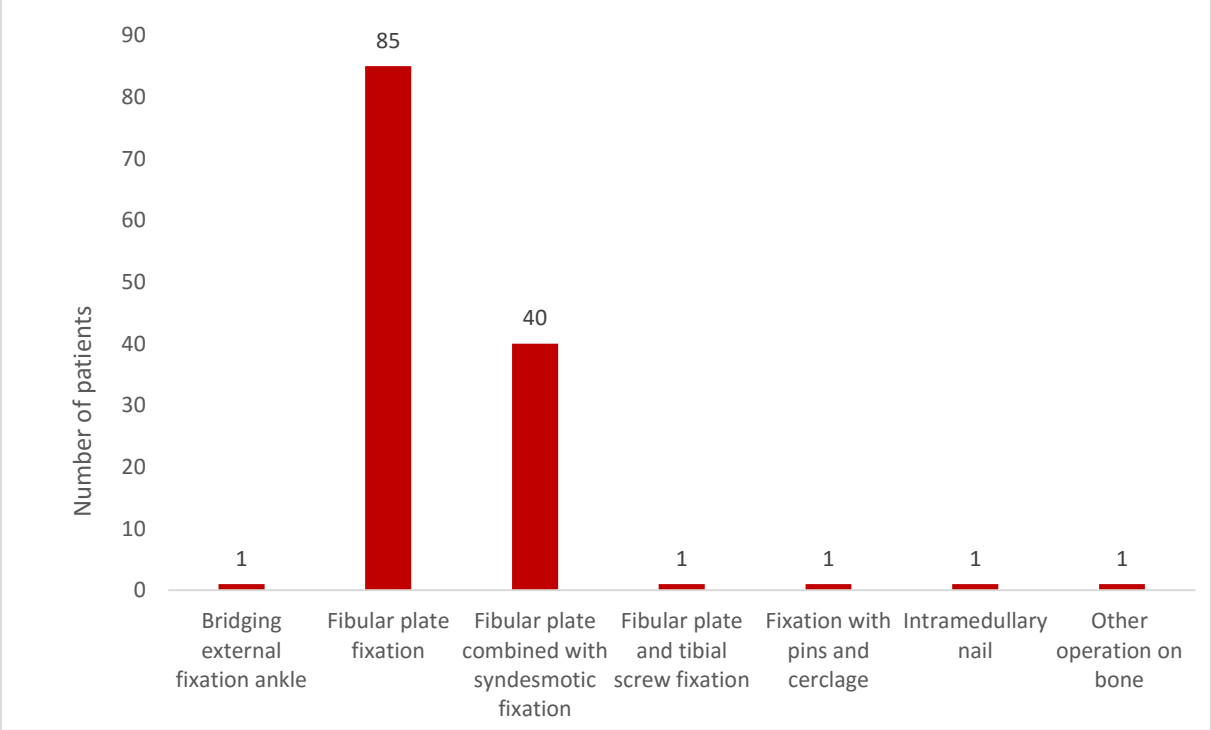


Figure 16. Type of surgical treatment for patients with an operatively treated B1-fracture registered in SFR at SU between 12-04-01 and 14-03-31.

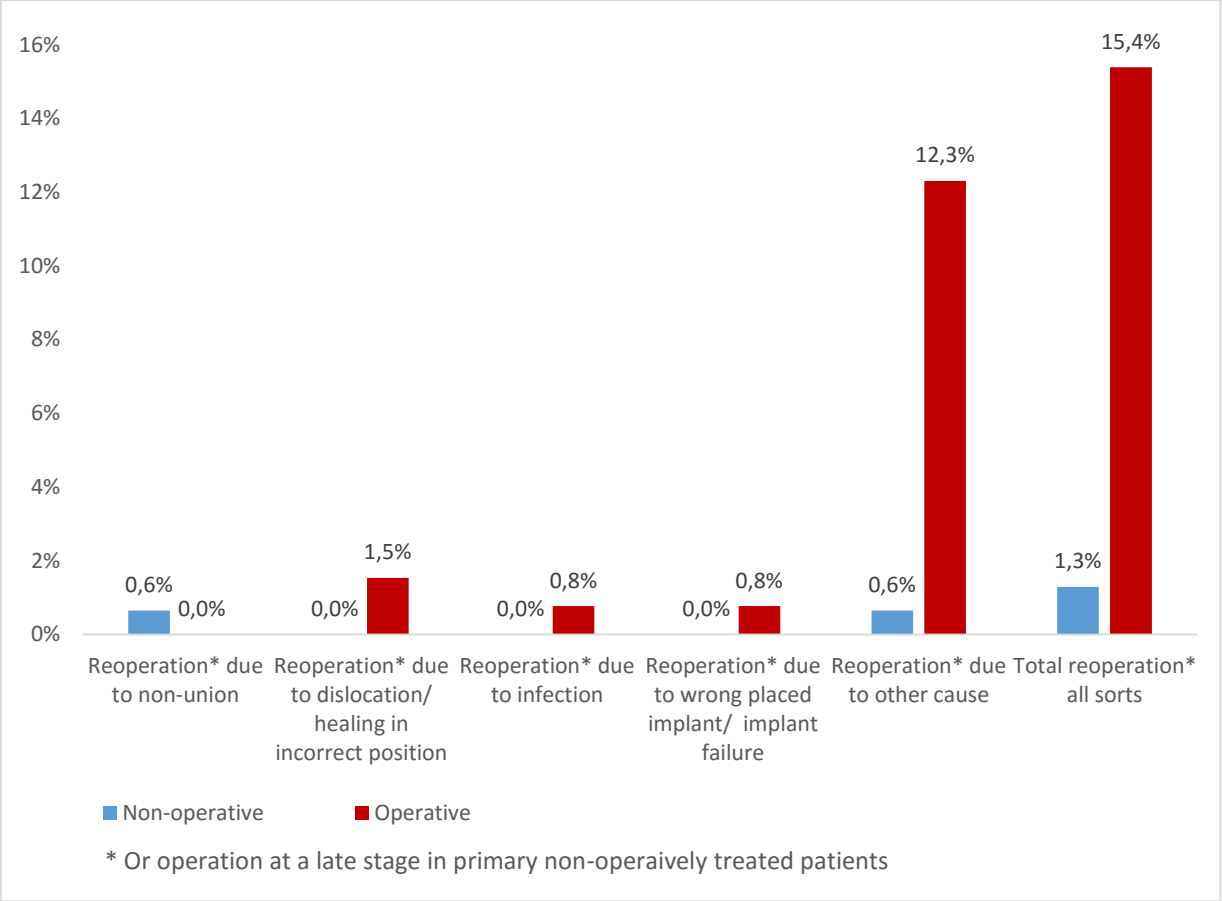
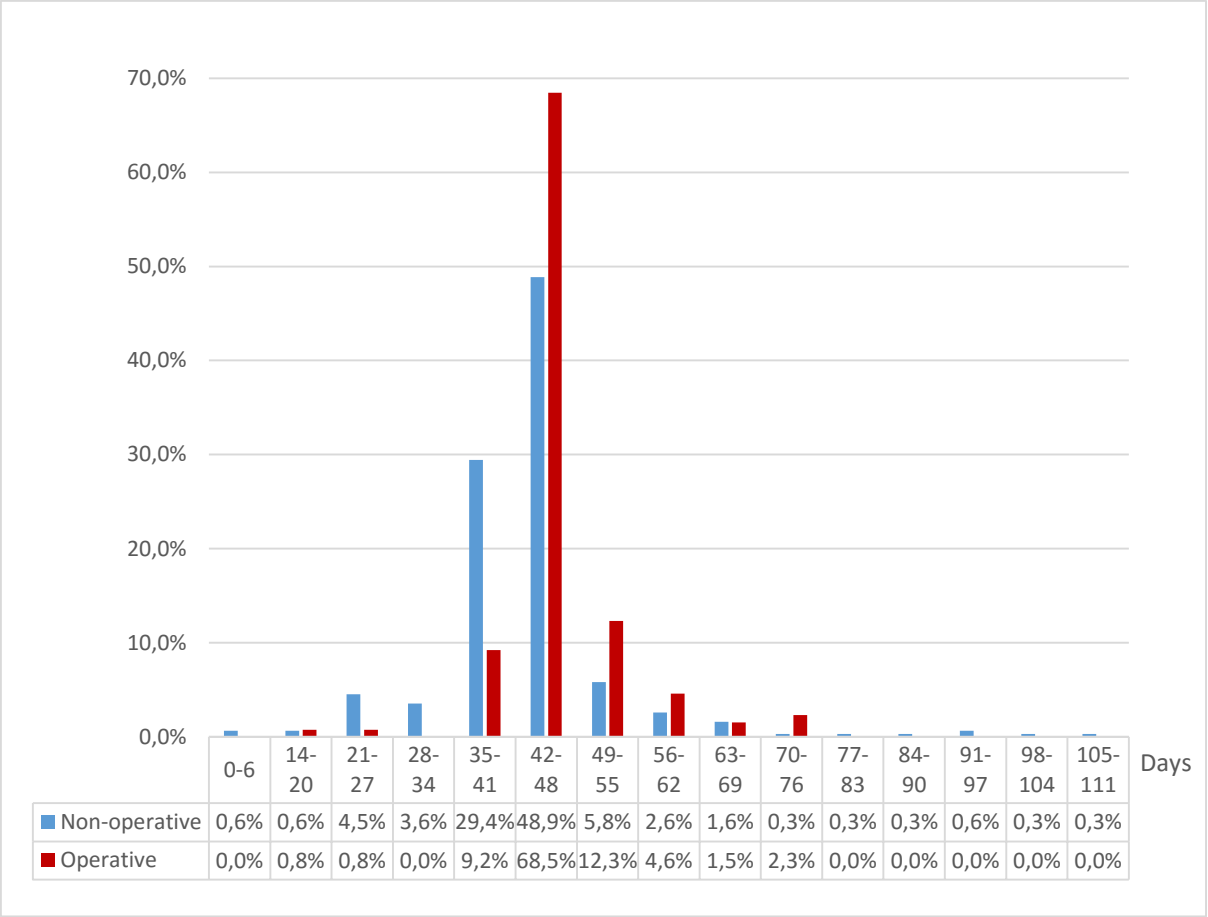


Figure 17. Per cent of non-operatively and operatively treated patients respectively with a B1-fracture who had the different types of reoperations and the total percentage in respective group who had any type of reoperation. Patients registered in SFR at SU between 12-04-01 and 14-03-31.

Five of the primarily non-surgically treated patients were converted to surgical treatment at an early stage. In two cases a slight lateralisation of the talus at the one week follow-up was confirmed as an unstable situation at stability tests in the operating theatre. In the remaining three cases doubt on fracture classification and dislocation arouse due to the radiology reports and the patients were surgically treated. However the evidence for that these three fractures really needed surgical treatment is in doubt when examining the radiographs at a later stage.

Immobilization and weight bearing

The average number of days immobilized were more in the group of primary operative treatment compared to the group of primary non-operative treatment (46.2 days compared to 42.7 days). The most common length of immobilization was however in the interval 42-48 days for both groups (Figure 18). In 69 of all the 439 cases were there an uncertainty concerning the exact date the immobilization was concluded.



	0-6	14-20	21-27	28-34	35-41	42-48	49-55	56-62	63-69	70-76	77-83	84-90	91-97	98-104	105-111
Non-operative	0,6%	0,6%	4,5%	3,6%	29,4%	48,9%	5,8%	2,6%	1,6%	0,3%	0,3%	0,3%	0,6%	0,3%	0,3%
Operative	0,0%	0,8%	0,8%	0,0%	9,2%	68,5%	12,3%	4,6%	1,5%	2,3%	0,0%	0,0%	0,0%	0,0%	0,0%

Days

Figure 18. Number of days immobilized for patients with a non-operatively and operatively treated B1-fracture respectively, registered in SFR at SU between 12-04-01 and 14-03-31.

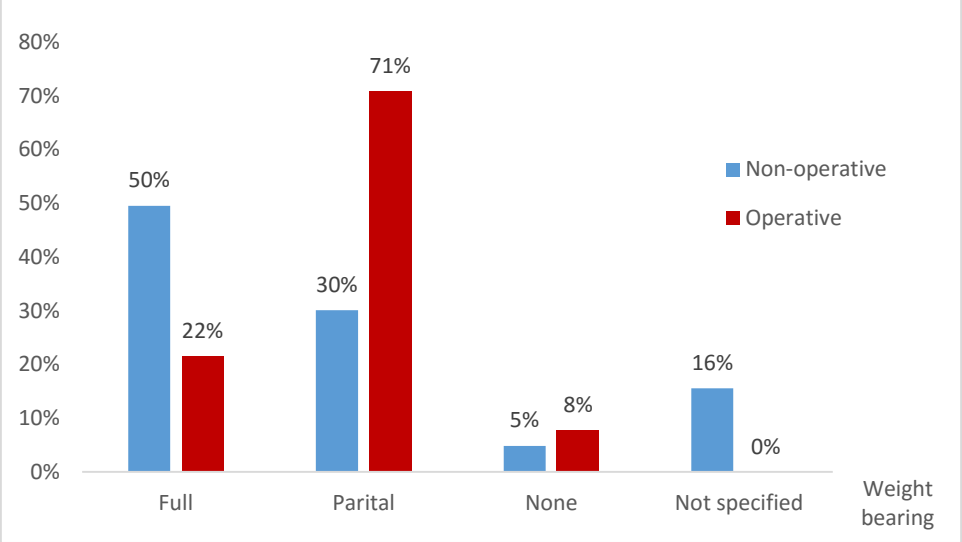


Figure 19. Allowance to weight bear for patients with a non-operatively and operatively treated B1-fracture respectively, registered in SFR at SU between 12-04-01 and 14-03-31.

Despite the surgical treatment of the fracture and postoperative immobilisation in a cast, the majority (79 %) of the patients had in addition some kind of weight bearing restriction (Figure

19). In contrast, full weight bearing was allowed for half of the patients treated non-operatively. Noteworthy is however, that in 16 % of the non-operatively treated patients no weight bearing advice was mention in the medical record.

Patient reported outcome measure

The EQ-5D health-related quality of life questionnaire could be calculated for 113 of the non-operatively treated and 53 of the operatively treated patients. For all patients comparisons were made between the preoperative values given with recall-technique and the values after one year. The average EQ-5D-index was equal (0.85) day zero and after one year for the non-operatively treated patients (Figure 20). For the operatively treated patients did the average EQ-5D-index on the other hand indicate that the patients had lower health-related quality of life one year after the ankle fracture compared to day zero.

The dysfunction-index and bothersome-index of the SMFA was also calculated for day zero and after one year. A number of 92 of the non-operatively treated patients respective 48 of the operatively treated patients filled out the questionnaires. The median dysfunction-index and bothersome-index, indicates a slightly increased dysfunction as well as slightly increased bother one year after the injury compared to day zero (Figure 21). This applies for both non-operatively and operatively treated patients.

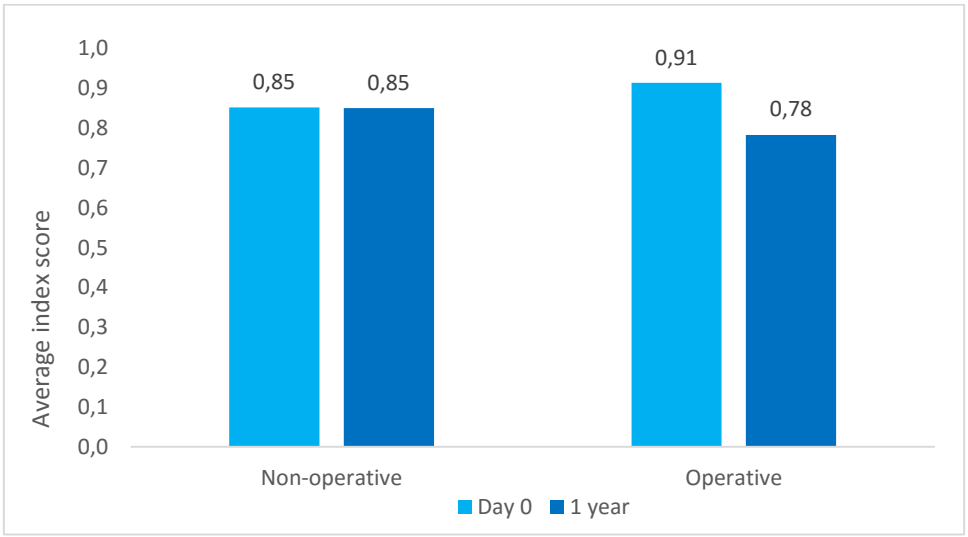


Figure 20. Average EQ-5D-index day zero (preoperative values given with recall-technique) and one year after the injury for non-operatively and operatively treated patients with a B1-fracture.

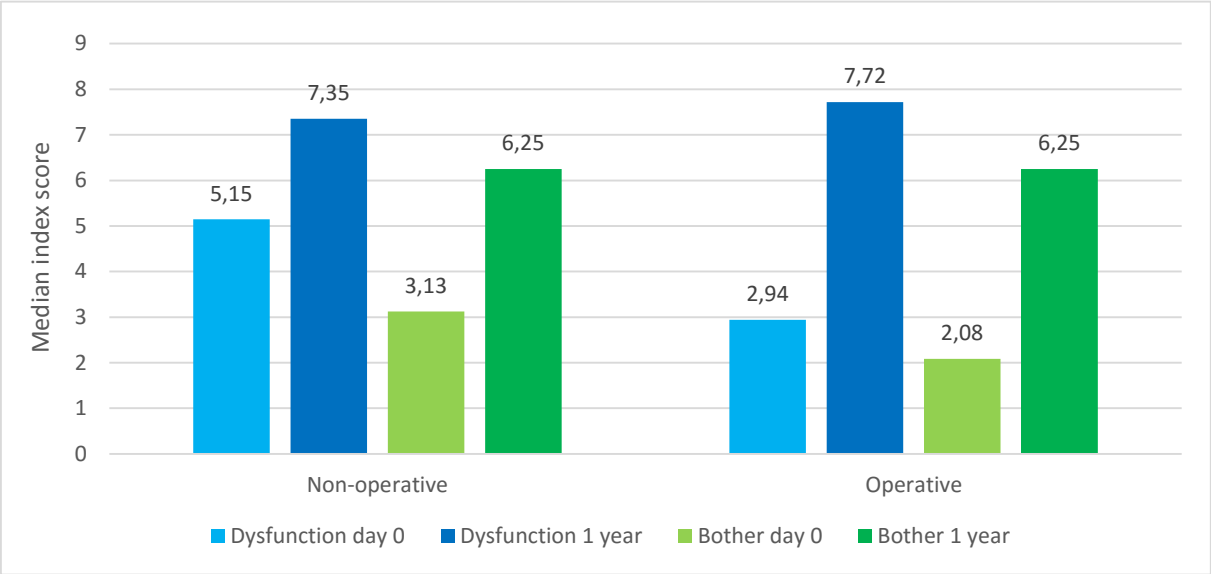


Figure 21. Median SMFA-score in dysfunction-index and bother-index, day zero (preoperative values given with recall-technique) and one year after the injury, for non-operatively and operatively treated patients with a B1-fracture.

Discussion

The main focus for this study was on the type B1-fractures (n=439) and the differences between operatively and non-operatively treated patients. We hypothesized that there is room for improvement to the diagnosing and management of these fractures. In the current study 309 patients were treated non-operatively. Among them five were in an early stage converted to surgical treatment. In three of these patients, however, the medical charts and radiographs do not reveal a clear indication for operative treatment. In the two other patients a slight lateralisation of the talus at the one week follow-up was found and stability tests in the operating theatre confirmed an unstable situation. Pakarinen HJ et al used an algorithm based on stability in decision-making for method of treatment and treated 66 fractures non-operatively with no late displacment or need for operative fixation in any case. (36) Michelson JD et al reviewed 104 non-operatively treated lateral malleolar fractures. (37) Lateralisation of talus equal to or more than two millimetres, in the presense of medial tenderness, was indication for surgical treatment, but did not appear in any case. These studies indicate that it might be possible to reduce the number of patients, requiring surgery as a consequence to failure of the non-operative treatment, to zero. However both these studies included fewer patients than our and other fracture types, even though B1 fractures accounted for most of the fractures. Jain N et al implemented guidelines in their clinic, aiming to reliably diagnose stable ankle fractures and manage these with no follow-up radiographs. Sixty six patients were non-operatively treated without any case of subsequent surgery as a

consequence of treatment failure. (21) This indicates that if decision concerning treatment of B1-fractures is based on strict guidelines the non-operatively treated patients might not have to be controlled with follow-up radiographs. As suggested by Michelson JD et al (37) and demonstrated by Jain N et al (21) significant financial savings can be attained if patients treated non-operatively do not have to undergo follow-up radiographic examination. With the current practice non-operatively treated patients at Sahlgrenska University Hospital undergo on average 2.2 radiographic examinations. That figure can be reduced by almost half (approximately 155 fewer radiographic examinations per year) if no routine one-week follow-up radiographs are done.

In all three above mentioned studies were medial tenderness taken into consideration in the process of deciding treatment. Medial tenderness is commonly used in the decision-making at Sahlgrenska University Hospital as well. However, information in the medical records about the presence or absences of medial tenderness were missing in 25 % of the non-operatively and 34 % of the operatively treated patients respectively.

Pakarinen HJ et al's found that their non-operatively treated patients had less pain and a better functional score compared with those who had surgery. (36) Bauer M et al had approximately 30 year follow-up for 49 patients with Lauge-Hansen supination-eversion stage II injuries (commonly referred to as equivalents to AO 44 B1 fractures with no deltoid ligament injury). They found only one patient who had developed osteoarthritis and three who had subjective complains. This despite that some displacement of the lateral malleolus (up to 3 mm) had been accepted in most of the cases. (38) Our PROM data gives an indication in the same direction as these studies. In other words, it seems likely that the best results for the patients are achieved by non-operative treatment, provided that they have a stable B1-fracture. However, we have to take into consideration that a selection based on the fracture's severity was made in the treatment decision, when comparing treatment results between non-operatively and operatively treated patients. More severe injuries should more frequently be found in the operatively treated group.

A further implication of this, if a practice with no follow-up radiograph for non-operatively treated patients is to be implemented, is that a reliable algorithm for deciding the stability is a necessity. In unclear cases will otherwise the risk for surgical treatment "for safety's sake" increase and in other words might more operations, that was not necessary, be performed. Perhaps a more frequent use of stability tests in the operating theatre can be useful in unclear cases.

The amount of resources for operative treatment seems, in accordance with the non-operative treatment, to be possible to reduce through a decrease in number of radiographic examinations. Operatively treated patients should have one radiographic examination at the A&E and one postoperative examination. However, 48 % (63 patients) underwent a radiographic examination at more than two occasions. Further radiographs is indicated in some cases where a complication is suspected. The difference between 63 patients with excess radiographs and 20 patients who underwent a reoperation is quite big. It makes it reasonable to suspect that follow-up radiographs in many cases are taken for no special reason in connection with the follow-up appointments to surgeon. Thus, potentially the number of radiographic examinations can in many cases be reduces.

The weight bearing restrictions is another subject that should be addressed. The fact is that 79 % of the surgically treated patients had some kind of weight bearing restriction despite postoperative immobilisation in cast. The concept of immobilisation despite ORIF is to render the possibility to full weight bearing. Exceptions exists, however, most likely not in 79 % of the patients. For the non-operatively treated patients it is instead the 16 % with no weight bearing advice mentioned in the medical record that deserve to be discussed. Hundred per cent of the operatively treated patients medical records contained information regarding the allowed weight bearing. There is no reason why this would not be possible for non-operatively treated patients as well.

Methodological considerations

This is an observational study on prospectively collected register data. One of the strengths with SFR, which made this study possible, is that data is collected for non-operatively as well as operatively treated patients. Completeness in registration of reoperations is a challenge for all quality registers. In order to get accurate data for the current study reoperations were therefore controlled in the medical records. Only the B1-fractures were controlled, because of limited time and resources. Thus, we have accurate data concerning B1-fractures, but less precise data regarding the other fracture types. Hence, we have to be careful with what conclusions we make based on comparisons between the B1-fractures and the other fracture classes.

Since the main focus of the study was to describe and eventually improve the routines for diagnosis and treatment of patients with B1-fractures treated at Sahlgrenska University Hospital, the study included patients treated there during two years. That gives us a representative study group, since the aim is to look over and improve the established practice

for this very group of patients. Even though no patients are excluded due to any patient characteristics, the patient group is well specified, because it consists of individuals who have sustained a single subtype of fracture.

The frequency of fractures sustained varies with the seasons. Two years were therefore studied. We waited with the study until at least one year had passed for all the patients since the date for the injury. This ensured that all PROM results for one year follow-up had been received. The review of the medical records however, showed that the treatment was not finished in four patients. Consequently is it likely that the true number of appointments to surgeon, radiographs etc. will end up slightly higher for these patients. Though, four patients are unlikely to have any major impact on the results of the larger groups.

We have, as mentioned earlier, accurate data with respect to the number of reoperations. In addition the patient reported outcome measure gives us useful information concerning the short term outcome. However, the response rate was only around 30-45 %. One limit concerning the outcome measures is that we do not have data regarding long term results.

Since the standard ankle trauma radiograph series does not include calibration we used a tibiotalar clear space quotation to assess the congruity of the ankle mortise. The spread of the x-rays that occurs during their path to the detector results in a slight magnification. This magnification differ somewhat between different radiographs, which we believe make comparisons of the MTTCS between different radiographs unreliable. The magnification is less likely to vary between the MTTCS and the STTCS on the same radiograph. We believe that the quotation MTTCS/STTCS is more reliable and varies less. However, since we have not found any other studies using a tibiotalar clear space quotation, our possibilities to interpret the results are limited.

Clinical implications and future research

This study has given descriptive data concerning the management of B1-fractures at Sahlgrenska University Hospital. These data can be used to draw up evidence-based guidelines for the management of B1 ankle fractures at SU. A few years after the implementation can the result of the new practice be studied in a similar manner to this, whereupon a comparison of the management and results before and after the change in practice can be made. Hopefully a significant improvement in the management for the patients will be found, as well as a decreased consumption of healthcare resources. A similar

study approach may additionally be used in future studies for other fracture types and at other departments.

We believe that tibiotalar clear space quotation is a more accurate way to assess the congruity of the ankle mortise. However, there are no other studies of this quotation known to us. Hence, further research is required if the tibiotalar clear space quotation is to be used clinically.

Further studies of the long term outcome would be desirable as well.

Conclusion

We were able to produce a description of the management of AO 44 B1 fractures based on data from SFR and a review of the medical records. Our results can be utilized to improve the treatment for this very common type of ankle fracture and to render a more effective use of the healthcare resources.

We found that information regarding medial tenderness, as well as allowed weight bearing for non-operatively treated patients, too often is missing in the medical records.

The routines for follow-up radiographs might be possible to change in order to avoid unnecessary radiation and achieve financial savings.

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Populärvetenskaplig sammanfattning på svenska

Fotledsfrakturer är vanliga och delas in i olika frakturklasser efter hur skadan ser ut på röntgen och hur den ter sig vid undersökning. Klassificeringen är en hjälp i valet av behandling. Den vanligaste typen av fotledsfraktur (brott på yttre fotledsknölen), benämns B1-fraktur, kan vara antingen stabil (ingen ledbandsskada kring inre fotledsknölen) eller instabil (ledbandsskada finns kring inre fotledsknölen), vilket är viktigt att veta när man väljer behandling. De stabila frakturerna är lämpliga för icke-kirurgisk behandling, medan de instabila frakturerna bör behandlas kirurgiskt. Rätt klassificering är viktigt för att kunna välja den för patienten optimala behandlingen och minimera risken för komplikationer. Exempelvis infektion eller sårläkningsproblem efter operation som inte hade behövt genomföras eller utebliven läkning eller felläkning vid icke-kirurgisk behandling av patienter som borde ha opererats. Det som komplicerar diagnostik och val av behandling vid B1-frakturer, är att ledbandsskador kring den inre fotledsknölen som kan finnas och göra frakturen instabil, inte alltid syns på röntgen. För att kunna ge korrekt behandling krävs såväl korrekt undersökning som korrekt bedömning av röntgenbilder.

Vi misstänkte att det finns rum för förbättring vad det gäller handläggningen och behandlingen av patienter med fotledsfrakturer av typ B1. Den här studien gjordes med syftet att skapa ett faktaunderlag för arbetet att optimera handläggningen av dessa patienter.

Utgångspunkten är data från Svenska Frakturregistret (SFR), ett nationellt kvalitetsregister som samlar in data om skadeorsak, frakturtyp och behandling, samt resultatmått i form av antal fall där man behövt genomföra ytterligare operationer efter den initiala behandlingen och resultat rapporterat av patienterna i frågeformulär. Studien omfattar två år, 2012-04-01 till 2014-03-31, under vilka 1332 fotledsfrakturer registrerades vid Sahlgrenska Universitetssjukhuset (SU). Av dessa var 512 av typen B1 och 439 patienter uppfyllde våra kriterier för att inkluderas i studien och studerades vidare genom fördjupande journalgranskningar. Data sammanställdes i Excel och sedan skapades tabeller och grafer som statistiskt beskriver olika aspekter av den studerade frakturtypen och patienterna som drabbas av den.

På detta sätt kan vi nu beskriva patienterna som behandlas vid SU för olika typer av fotledsfrakturer, samt ange i vilken frekvens olika typer av behandling ges. Bland annat kan vi fastslå, att det vanligast sättet att ådra sig en fotledsfraktur var fall i samma plan. Ser vi på alla typer av fotledsfrakturer, var det något fler kvinnor än män som drabbades. Den största

åldersgruppen var 56-65 år, även om personer i alla åldrar kan drabbas. Detta gällde även patienterna med B1-frakturerna, av vilka 309 behandlades icke-kirurgiskt och 130 kirurgiskt.

En närmare kartläggning av diagnostik och handläggningen av patienter med B1-frakturer har också utförts. Denna kartläggning kan användas för att identifiera förbättringsmöjligheter i behandlingen av patienter med B1-fraktur. Det kan resultera i nya behandlingsrutiner för B1-frakturer, och dessa behandlingsrutiner kan sedan två år efter implementering utvärderas genom en ny studie med likartat upplägg som denna. En jämförelse kan då utföras och förhoppningsvis visa en förbättring i behandlingen av patienter med B1-frakturer och ett effektivare utnyttjande av sjukvårdens resurser.

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