

Routine follow-up is unnecessary after intramedullary fixation of trochanteric femoral fractures – analysis of 995 cases

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Tiivistelmä - Referat – Abstract <p>Suomessa operoidaan noin 2000 pertrokanteerista lonkkamurtumaa vuosittain. Nämä murtumat kuormittavat huomattavasti terveydenhuoltojärjestelmää ja murtuman saaneita yksilöitä. Nykyisten suositusten mukaan lonkkamurtuman luutumista tulisi seurata kuuden viikon välein otetuilla röntgenkuvilla, kunnes luutuminen on tapahtunut. Murtumien rutiininomaista seurantaa on kuitenkin kyseenalaistettu useammassa eri murtumatyypissä. Tämän tutkimuksen tarkoitus on selvittää, onko intramedullaarisesti korjattujen pertrokanteeristen murtumien rutiininomaisesta seurannasta hyötyä.</p> <p>Analysoimme retrospektiivisesti kaikki 995 Töölön sairaalassa vuosina 2011-2016 intramedullaarisesti korjatut pertrokanteeriset murtumat. Potilaita seurattiin potilastietojärjestelmistä minimissään kaksi vuotta tai kuolemaan asti. Kaikki operaation jälkeiset lonkkamurtumaan liittyvät suunnitellut ja suunnittelemattomat käynnit analysoitiin.</p> <p>Aineiston potilaiden keski-ikä oli 81 vuotta ja heistä 67 % oli naisia. Potilaiden kolmen kuukauden kuolleisuus oli 14 % ja kahden vuoden 35 %. Kaikkiaan 9 potilaalla (0,9 %) suunniteltu seurantakäynti johti muutokseen potilaan hoitolinjassa. Näistä 6 johtui mekaanisista komplikaatioista, 2 murtuman luutumattomuudesta ja 1 periproteettisestä murtumasta. 64 potilaalla (6,4 %) tehtiin hoitolinjan muutos suunnittelemattoman käynnin takia. Näiden potilaiden käynneistä 28 johtui infektiosta, 15 mekaanisesta komplikaatiosta, 14 periproteettista murtumasta, 6 painehaavasta ja 1 avaskulaarisesta nekroosista.</p> <p>Rutiininomaiset seurantakäynnit ovat rasite sekä terveydenhuoltojärjestelmälle että potilaille. Lonkkamurtumapotilaat ovat keskimäärin huonokuntoisia ja seurantakäynneille saapuminen vaatii usein erityisjärjestelyjä. Silti alle 1 % suunnitelluista seurantakäynneistä johtaa muutoksiin hoitolinjassa. Ehdotuksemme on antaa potilaille ja kuntoutuslaitoksille kattavat ohjeet hoitoon hakeutumisesta rutiininomaisen seurannan sijaan.</p>			
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Routine follow-up is unnecessary after intramedullary fixation of trochanteric femoral fractures – analysis of 995 cases

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Abstract

Background and purpose - Approximately 2000 trochanteric fractures are operated in Finland annually. These fractures make a major burden to health care system and affected individuals. The role of routine follow-up has been questioned in multiple fracture types.

Patients and methods - We analyzed routine follow-up visits after intramedullary fixation of trochanteric fractures (n=995). Patients were followed up from patient registries until 2 years or death. Planned and unplanned follow-up visits were analyzed.

Results – Altogether, 9 patients (0.9 %) had a change in treatment at planned outpatient visit. 6 of these were due to mechanical complication, 1 due to refracture and 2 due to delayed unions. 64 (6.4 %) patients had a change in treatment plan because of an unplanned visit: 28 infections, 6 pressure sores, 15 mechanic complications, 14 refractures and 1 AVN, respectively.

Interpretation - Routine follow-up visits are a burden both to the patients and health care system, with less than 1 % leading to changes in treatment. Our suggestion is to give good instructions to patients and rehabilitation facilities instead of routine follow-up.

Introduction

Hip fractures are typical geriatric fractures which burden the health care systems (Leal et al. 2016) and estimates have been done that the number of hip fractures will increase significantly in the future (Rosengren and Karlsson 2014) (Kannus et al. 2018). The mean annual health care cost of a single hip fracture is approximately € 30 000 leading to an annual total cost of approximately 200 million euros in Finland. (PERFECT). Therefore, large scale efforts should be conducted to optimize the hip fracture postoperative treatment.

Clinical and radiographic follow-ups have been traditionally scheduled to monitor appropriate fracture alignment, the position and integrity of hardware and fracture healing. AO Foundation recommends routine x-rays six weeks after the internal fixation of proximal femoral fractures and subsequently every-six weeks until the fracture has healed. (AO Trauma 2016) However, the role of routine follow-up visits has been questioned in many different fracture types. (Hacking et al. 2010; Ghattas et al. 2013; Ovaska et al. 2016; Stenroos et al. 2019; Kuorikoski and Söderlund 2017). Thus, the clinical significance of these follow-ups is somewhat unclear.

Aim of our study was to assess the clinical significance of planned visits at outpatient clinic with routine radiographs after intramedullary fixation of trochanteric fractures. Our hypothesis was that routine follow-up visits rarely lead to changes in the primary treatment protocol.

Patients and methods

We did a chart review of all patients with a trochanteric fracture treated with an intramedullary nail in Helsinki University Central hospital trauma unit, a level 1 trauma center, from 1.1.2011 to 31.12.2016. All patients were identified from the hospital surgery database, by querying our operating theatre database for ICD-10 diagnoses coded as trochanteric fracture (S72.1) and with a procedure code for intramedullary fixation of proximal femoral fracture (NFJ54) by Nordic Classification of Surgical Procedures (NCSP). In total, 995 consecutive fractures on 973 patients were analyzed. None of the patients had simultaneous bilateral fractures.

A standardized operative and postoperative protocol was used during the study period. Intramedullary nailing was performed based on AO-principles (AO Trauma 2016). PFNA trochanteric nail (DePuy Synthes) was used to treat all the fractures operated at the time period. Operations were performed by an orthopedic surgeon on call, either consultant or senior resident (4-6 years of orthopedic training). Postoperatively full weight bearing was allowed, and radiographs were obtained before hospital discharge. Our follow-up protocol consisted of visits at 6 and 12 weeks after surgery and additional planned follow-up visits according to treating surgeons' preference. Skin staples were removed two weeks after the operation.

Patients were followed from the patient registries for minimum of two years or until death. All visits related to the fracture were recorded and divided to either planned or unplanned follow-up visits. These visits were further divided based on whether they led to a change in treatment protocol (Table 1).

Permission for the study was obtained from the research committee of the University of Helsinki and all acquired data was processed as required by European Union regulations. An ethics committee opinion was not sought, since study was a retrospective analysis of data without interaction with the patients.

Results

The mean age of patients was 81 years (range 21-104 years) and 68% of patients were females. The basic patient characteristics are presented in Table 1. The early mortality (< 3months) rate was 14 % and 2-year mortality was 35 %.

607 follow-up visits were scheduled at 6 weeks, of which 526, (53% of study group) were present at this visit. 230 patients (23 %) attended follow-up visit at 12 weeks and 73 (7 %) patients attended a third follow-up visit.

Altogether, 9 of 995 (0.9 %) patients required a change in treatment plan due to the findings on planned visits of which 5 were on the first follow-up visit and 4 after additional follow-up. (Table 1) The causes for a change in treatment plan at routine follow-ups were due to clinical and radiographic findings. 6 changes were due mechanical complications and all these lead to a re-operation. Additionally, 112 patients solicited an unplanned visit due to emerging problems related to fractures, of which 64 (56 %) led to a deviation in treatment plan (Table 2). Reason for change in treatment plan at emergency department were most likely due to acute emergencies such as wound infection (43 %) or a refracture (22 %).

Discussion

Our results showed that in only 9 of 995 (0.9%) operatively treated patients, did a planned follow-up visit lead to a change in treatment. Previously, Kuorikoski et. al suggested that routine early follow-ups after proximal femoral fractures are unnecessary (Kuorikoski and Söderlund 2017). Based on these findings, routine follow-up seems to be futile. As the hip fracture incidence is increasing, surgeons should focus on optimizing the resources and cost-effectiveness of given treatment.

Similar results have been reported for several other fractures. Ovaska (2016) and Stenroos (2019) have questioned the role of early radiographs among adult and pediatric patients with ankle fractures. Ghattas (2013) noted that after fixation of an acute fracture, early radiographic controls rarely lead to a change in treatment plan. These unnecessary visits lead to extra costs for the patient and the health care system. AO Foundation recommends routine x-rays six weeks after the internal fixation of proximal femoral fractures and subsequently every-six weeks until the fracture has healed, but there is little or no evidence supporting the benefit of this recommendation. Previous studies have shown that early radiographic follow-ups seem unnecessary and the present study displays that even the subsequent planned follow-up visits don't affect the treatment.

Fixation failures are associated with two-fold increase in hospital stay together with doubling of healthcare costs. (Broderick et al. 2013) The complications of trochanteric fractures can be divided to technical and patient related complications. Blade cut off, blade migration, nail breakage and locking bolt loosening are surgeon related technical complications which can be avoided with meticulous planning and execution. The cutout rate has varied in the literature between 2 and 7% (Adams et al. 2001; Herrera et al. 2002; Pajarinen et al. 2005; Füchtmeier et al. 2011; Caruso et al. 2017; Kim et al. 2018), while in the present study the cut-out rate was only 1.2 %.

Based on the present study, patients should be instructed to contact operating unit if experiencing any postoperative problems. As our results present, 11 % of patients contacted the hospital because of having postoperative problems. We believe that patient education is the key to find these adverse events occurring after hospital discharge. Proper instructions would also save the resources of health care system. Overall there were 73 complications (7.3 %) and vast majority of the patients contacted the outpatient clinic or the emergency department before the scheduled outpatient visit. None of the infections or pressure sores and only one refracture were caught in routine outpatient clinic visits. We believe that properly instructed patients and rehabilitation facilities will contact hospital if problems occur. We noted that only three patients with symptoms and a mechanical complication didn't seek care before the first scheduled visit. The other three patients with mechanical complications that were noted at planned visit didn't express notable symptoms.

This study has several limitations due its retrospective nature. Some patients with superficial infections might have sought treatment at health centers or on private clinics. However, all the major infections requiring revision surgery are included. Also, part of the follow-up radiographs was taken in rehabilitation facilities. However, these radiographs did not change the treatment plan of given patients. The strengths of this study include the large number of patients within a single institute. To our knowledge, this is the first analysis of the value of the outpatient visits following trochanteric fracture surgery.

Conclusion

We discourage the use of routine follow-up visits for patients with an intramedullary fixation of a trochanteric fracture. We suggest to rather give patients and their rehabilitation facilities comprehensive information regarding when to contact the treating center if they are having problems with rehabilitation. In the light of the results from the present study we are going to implement a new written protocol: After intramedullary fixation of trochanteric fractures, patients are not going to be routinely followed up, if they are allowed full weight bearing post-operatively.

References

- Adams CI, Robinson CM, Court-Brown CM, McQueen MM. Prospective randomized controlled trial of an intramedullary nail versus dynamic screw and plate for intertrochanteric fractures of the femur. *Journal of Orthopaedic Trauma*. 2001 Aug;15(6):394–400.
- Broderick JM, Bruce-Brand R, Stanley E, Mulhall KJ. Osteoporotic hip fractures: the burden of fixation failure. *ScientificWorldJournal*. Hindawi; 2013;2013(425):515197–7.
- Caruso G, Bonomo M, Valpiani G, Salvatori G, Gildone A, Lorusso V, et al. A six-year retrospective analysis of cut-out risk predictors in cephalomedullary nailing for pertrochanteric fractures: Can the tip-apex distance (TAD) still be considered the best parameter? *Bone & Joint Research*. The British Editorial Society of Bone and Joint Surgery London; 2017 Aug;6(8):481–8.
- Füchtmeier B, Gebhard F, Lenich A. [Complications after pertrochanteric fractures]. *Unfallchirurg*. Springer-Verlag; 2011 Jun;114(6):479–84.
- Ghattas TN, Dart BR, Pollock AGA, Hinkin S, Pham A, Jones TL. Effect of initial postoperative visit radiographs on treatment plans. *J Bone Joint Surg Am*. 2013 May 1;95(9):e57–S1.
- Hacking C, Weinrauch P, Whitehouse SL, Crawford RW, Donnelly WJ. Is there a need for routine follow-up after primary total hip arthroplasty? *ANZ Journal of Surgery*. John Wiley & Sons, Ltd (10.1111); 2010 Oct;80(10):737–40.
- Herrera A, Domingo LJ, Calvo A, Martínez A, Cuenca J. A comparative study of trochanteric fractures treated with the Gamma nail or the proximal femoral nail. *Int Orthop*. 2002;26(6):365–9.
- Kannus P, Niemi S, Parkkari J, Sievänen H. Continuously declining incidence of hip fracture in Finland: Analysis of nationwide database in 1970–2016. *Archives of Gerontology and Geriatrics*. Elsevier; 2018 Jul 1;77:64–7.
- Kim K-H, Han KY, Kim KW, Lee JH, Chung MK. Local Postoperative Complications after Surgery for Intertrochanteric Fractures Using Cephalomedullary Nails. *Hip Pelvis*. 2018 Sep;30(3):168–74.

- Kuorikoski JM, Söderlund TP. Evaluation of a routine follow-up visit after an internal fixation of proximal femoral fracture. *Injury*. 2017 Feb;48(2):432–5.
- Leal J, Gray AM, Prieto-Alhambra D, Arden NK, Cooper C, Javaid MK, et al. Impact of hip fracture on hospital care costs: a population-based study. *Osteoporos Int*. Springer London; 2016 Feb;27(2):549–58.
- Ovaska MT, Nuutinen T, Madanat R, Mäkinen TJ, Söderlund T. The role of outpatient visit after operative treatment of ankle fractures. *Injury*. 2016 Nov;47(11):2575–8.
- Pajarinen J, Lindahl J, Michelsson O, Savolainen V, Hirvensalo E. Pertrochanteric femoral fractures treated with a dynamic hip screw or a proximal femoral nail. A randomised study comparing post-operative rehabilitation. *Journal of Bone and Joint Surgery - British Volume*. 2005 Jan;87(1):76–81.
- Rosengren BE, Karlsson MK. The annual number of hip fractures in Sweden will double from year 2002 to 2050: projections based on local and nationwide data. *Acta Orthopaedica*. Taylor & Francis; 2014 Jun;85(3):234–7.
- Stenroos A, Kosola J, Puhakka J, Laaksonen T, Ahonen M, Nietosvaara Y. Routine radiographic follow-up is not necessary after physeal fractures of the distal tibia in children. *Acta Orthopaedica*. 5 ed. Taylor & Francis; 2019 Dec;90(6):610–3.
- Principles of Fracture Management [Internet]. AO Foundation. Available from: https://aotrauma.aofoundation.org/aotrauma/documents/education_pdf
- Perfect Lonkkamurtuma [Internet]. Terveiden ja hyvinvoinnin laitos. Available from: <https://thl.fi/tutkimus-ja-kehittaminen/tutkimukset-ja-hankkeet/perfect/osahankkeet/lonkkamurtuma>

Table 1. Patient characteristics.

	No change	Change at planned visit	Change at unplanned visit	All
Patients	922 (92.7%)	9 (0.9%)	64 (6.4%)	995
Age	81 (29-104)	83 (67-95)	81 (53-104)	81 (29-104)
ASA*	3.2 (1-5)	2.9 (2-4)	3.2 (2-4)	3.2 (1-5)
CCI**	4.8 (0-11)	3.7 (0-6)	5.0 (2-10)	4.8 (0-11)
LOS (days)***	7.2	8.2	7.3	7.2
Female/Male	632/290	6/3	42/22	680/315

* ASA: American Society of Anesthesiologists, physical status classification system

** CCI: Charlson comorbidity index

*** LOS: Length of stay

Table 2. Complications (n=73, 7 % of patients) leading to a change in treatment protocol in the study group

	Change at planned visit	Change at unplanned visit	Total
Infection	-	28	28
Pressure sore	-	6	6
Mechanical complications	6	15	21
Blade cut off	4	8	12
Blade migration	1	4	5
IMN breakage		3	3
Locking bolt loosening	1		1
Refracture	1	14	15
AVN	0	1	1
Delayed union	2	0	2
Total	9	64	73