OTC
Osteosynthesis & Trauma Care Foundation

OTC RESEARCH PROGRAM
2011 - 2014

OTC Research Program 2011-14

RESEARCH COMMITTEE INTRODUCTION

The Osteosynthesis and Trauma Care Foundation is an educational and scientific professional organization dedicated to the advancement of musculoskeletal trauma treatment.
The OTC Foundation recognizes the importance of scientific discovery and has committed funding to promising research projects since its inception. In particular, the organization has supported the work of young and less experienced investigators, as well as the scientific studies of established researchers and their teams.
This book presents highlights of the basic and clinical research supported by the OTC Foundation over the last four years. Many of these research projects have gone on to garner additional funding from other private and public agencies, and have resulted in multiple presentations and publications. We expect that the results of this research will stimulate future discoveries, and we look forward to the further dissemination of this interesting work.
The OTC Research Committee (RECO) oversees this program which is supported by a grant from Stryker to the Foundation for this purpose.

PETER PATKA
Past President

ESTHER VAN LIESHOUT
Scientific Coordinator

THEODORE MICLAU
President

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OTC RESEARCH PROGRAM 2011-2014

Research Program History

The objective of Research Grants is to encourage investigators by providing seed and start-up funding for promising research projects in the field of orthopaedic trauma surgery through Grants of up to US$ 50,000 for a research project extending over a maximum of two years.

The **Mission of OTC** is to foster evidence-based research that increases knowledge to solve clinical problems and improve orthopaedic trauma care. Through the OTC Research Grant Program funding support is provided on topics such as:

- Promotion of fracture healing, including treatment and enhancement of fracture repair
- Treatment of fractures in osteoporotic bone
- New technologies in fracture fixation, including computer-assisted surgery
- Prophylaxis and treatment of infections in fracture
- Prospective clinical trials in fracture care
- Numerical methods in trauma surgery
- Translational, pre-clinical and experimental research
- Biomechanical studies

The target groups addressed through the program are senior researchers who are eligible to research grants of up to US$ 50,000. Until 2011 also young investigators were eligible who could obtain grants of up to US$ 10,000.

RESEARCH COMMITTEE 2014

The evaluation and selection of grant projects is strictly based upon blinded proposals submitted by applicants, in accordance with OTA criteria. The OTC Research Committee, with currently six members of high academic standing, oversees and directs the program. This committee identifies research topics to be covered, develops the procedures for reviewing proposals, and establishes the criteria for approving proposals and awarding grants.

Further information on the OTC Research Grant Program can be obtained under
www.otcfoundation.org
by clicking on ‘Research Grants’.

The budget for OTC Grants is limited and applicant’s submissions are often three times higher than the total grant volume. Therefore the OTC is not able to fund all of the research proposals. The number of funded proposals varies from year to year depending on the availability of funds.

During the years 2005, 2006 and 2007 the Research Grants were administered by the AIOD. With the transition from AIOD to the OTC Foundation at the beginning of 2008, such grants are provided as OTC Research Grants. The essence of the program has been maintained, including the Research Committee. Due to a transitional period for the OTC Foundation administration and governance in 2012 there were no research grants awarded in that year. The grant program resumed in 2013 with the funding of three research projects per annum, and a streamlined application and review process.

Research Committee Members

VOLKER ALT, MD PHD, GERMANY
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University California San Francisco, San Francisco, USA)

PETER PATKA, MD PHD, THE NETHERLANDS (RECO CHAIR UNTIL 2011)
Rotterdam University Chair in Trauma Surgery (Dept. of Surgery-Traumatology, Erasmus MC, University Medical Center
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ESTHER M.M. VAN LIESHOUT, PHD, THE NETHERLANDS (RECO SCIENTIFIC COORDINATOR)
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Rotterdam, the Netherlands)

Supporting Researchers Worldwide

Through a Young Investigator Grant or a Research Grant, OTC supported researchers active in areas related to trauma care:

- For the 2011 grants, 29 Pre-proposal applications were received and 16 were invited for submitting a Full-length proposal. Of these, eight were accepted, following a well-defined review and selection process. The approval rate was 50% with a total amount of USD 270'722 granted
- In 2012 the grant process was suspended for one year, and the pre-proposal step eliminated
- For the 2013 grants, 13 full proposals were received. Following the RECO review process, three were accepted. The approval rate was 23% with a total amount of USD 150'000 granted
- For the 2014 grants, 10 full proposals were received. Of these, three were accepted with a total amount of USD 150'000 representing an approval rate of 30%
- Currently, the OTC is following up on 16 unfinished grant projects from 2008 till 2014. Since its inception in 2005, the program awarded a total USD 2'519'709 to research grant projects.
- Biological research in areas like bone healing and clinical research accounted for the majority of projects. In recent years, the number of biomechanical research grants was increasing and translational research added to the agenda

PROPOSALS AND GRANTS 2005-2014

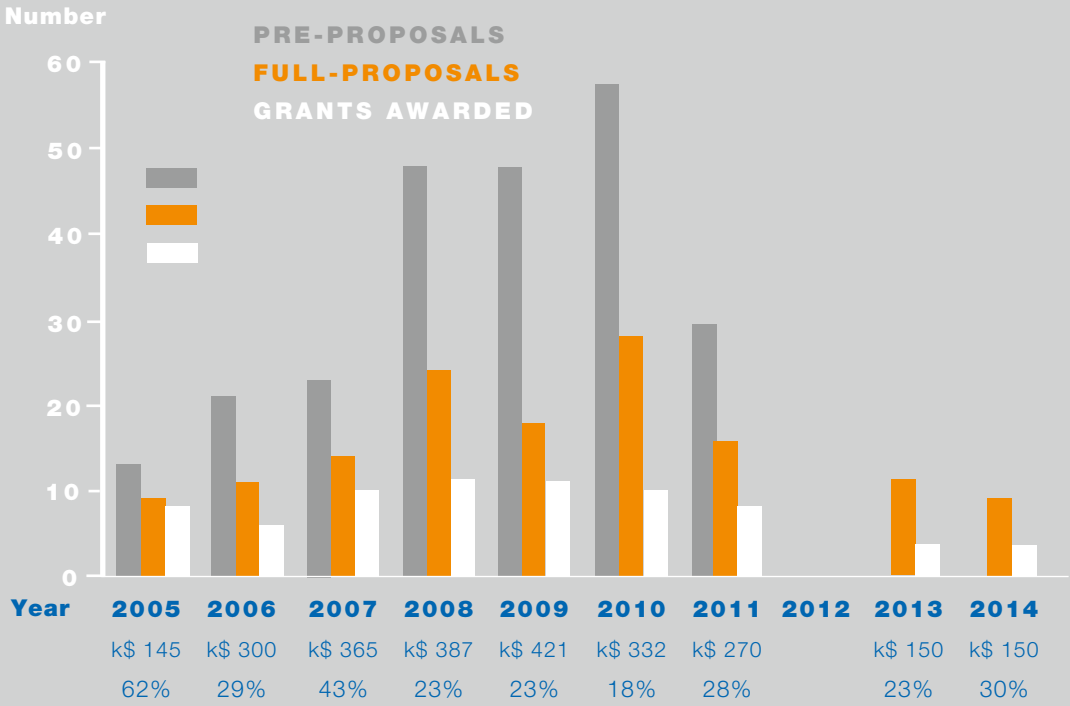


DIAGRAM of 2009/10 to be extended up to 2014; The numbers needed are all in the text above and a PPT version of the diagram is on next page. This diagram 2005-2014 will also be used later on for the TEN YEAR RECO BROCHURE.

Grant Application And Review Process

GENERAL ADMINISTRATION

1. **Objective:** The objective of Research Grants is to encourage orthopedic trauma surgeons and basic scientists by providing seed and start-up funding for promising research projects in the field of orthopedic trauma surgery through Grants of up to US$ 50,000 for a research project extending over a maximum of two years. Both laboratory and clinical projects are suitable, but in either case clinical relevance must be explicitly and clearly described.
2. **Eligibility:**
   - A trauma or orthopedic surgeon must serve as either the principal or co-principal investigator. Non-trauma/orthopedic surgeon, M.D.'s, Ph.D.'s or D.V.M.'s may serve as the principal or co-principal investigator, as long as they are affiliated with a trauma/orthopedic department with an orthopedic surgeon as the co-principal investigator.
   - Candidate may not submit a proposal if a grant awarded previously has not been completed.
   - Candidate may receive only one OTC Grant per institution in each year.
3. **Deadline** for submission of Application Form: **April 15 of each year.**
4. **Period of Grant:** Maximum two years.
5. **Amount:** Up to US$ 50,000 during Period of Grant.
6. **Application Procedure:** The original submission as per grant application form is to be accompanied by a **Research Plan is not to exceed four pages.**
7. **Application Items Required:**
   - Electronic application (e-mail) must arrive by the **April 15** deadline. Original application **(with all signatures)** must arrive in the OTC office by **May 15, 2013.**
   - Provide Animal IACUC approval, or equivalent according to your national regulations, if applicable.
   - Provide Human IRB / Ethical Committee statement, or equivalent according to your national regulations, if applicable.
   - Provide statement clarifying the role of the orthopedic surgeon in the project.
8. **Notification of Award and Contracts:** The OTC Foundation will notify each applicant by email until **July 15**. Contracts will be offered immediately thereafter.

REVIEW PROCESS

Pre-proposal applications (only until 2011 grant cycle):
Preliminary screening of application is based on a pre-proposal application, containing a brief (maximum three pages) description of the research idea. Pre-proposals are reviewed in a blinded fashion by all research committee members, and are rated and ranked based on scientific merit and orthopaedic trauma impact. For those proposals receiving an average rate of three or higher (on a scale of 1 to 5) are invited to submit a full-length proposal. Applicants or proposals that do not meet this threshold receive feedback on their proposal.

Full-length proposals (direct submission as of 2013 grant cycle):
Full-length proposals are evaluated in a non-blinded fashion for their scientific merit, orthopaedic trauma impact, methodology, feasibility, experience of the research team, and the budget requirements. For each application, three appointed RECO reviewers provide an in-depth review, which is discussed with all research committee members. Committee members are absent during discussion of projects in which they have a conflict of interest. The best-rated applications are offered a Grant contract. Applicants of unsuccessful applications receive feedback on their proposal, which may help them improving the quality of their proposal or the design of their study.

Young Investigator Grants 2011

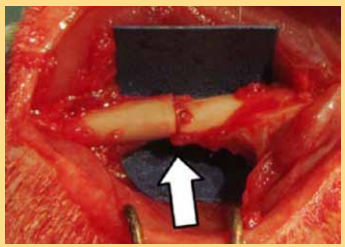
ENHANCEMENT OF EXPERIMENTAL FRACTURE HEALING: ROLE OF LOCAL SOFT CALLUS

DR. J. DANOFF
Principal Investigator
Columbia University Medical Center, New York, NY, USA

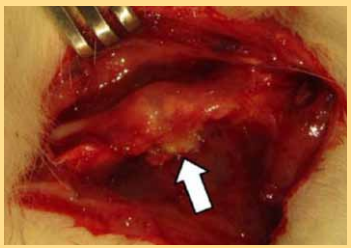
Abstract: 6.2 million fractures occur in the USA each year. Despite our excellent understanding of fracture treatment, certain fractures continue to show poor outcomes. Thus, it is critically important to continue investigations into the biology of fracture healing, in order to develop improved strategies for ensuring normal repair of the skeleton. During open reduction and internal fixation (ORIF) of a long bone fracture, the formed soft tissue callus is removed allowing for application of the orthopedic hardware across the bony injury. The callus is discarded despite the fact that it contains many osteoprogenitor cells and may serve as an autograft to accelerate fracture healing. Some surgeons prefer to reapply the callus after hardware implantation, as it is believed that the soft tissue callus can serve as a kind of osteogenic graft. This theory has yet to be further studied. The goal of this study is to investigate whether soft callus can serve as an autograft to enhance bone healing. This theory may have a beneficial role for treatment of fractures and delayed bone healing. We hypothesized that local fibrocartilage callus re-applied to a transverse femur fracture in a rat model will lead to an improved fracture outcome as compared to fractures with adjunct removed. The primary outcome is bone fracture strength, and secondary outcomes include bone mineral content of the fracture callus, as well as bending stiffness and energy to failure.

A transverse femur fracture will be created in 45 rats and stabilized with an intramedullary K-wire (15 rats/group comprising Group A, B, C). 21 days later, the fracture will be surgically exposed. Group A will serve as control and the callus will not be manipulated. Group B's callus will be removed and not replaced and group C's callus will be removed and immediately replaced. After 21 days for healing, the rats will be sacrificed and femurs removed. A combination of fluoroscopy, and 3D CT performed will allow for volumetric calculation of the callus size. Histology will allow for analysis of the callus mineral content. 3-point bending, as the primary outcome, will serve to compare bone bending strength and demonstrate the differences in healing strength of each group. The data collected will potentially affect the way operations to treat fractures are performed. This study can stimulate further studies to be performed in humans looking at the effect of replacing the soft callus at ORIF.

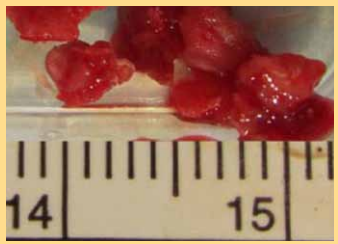
Images from Pilot Study



(A) Transverse, diaphyseal femur fracture created



(B) Fracture callus in situ at 3 weeks

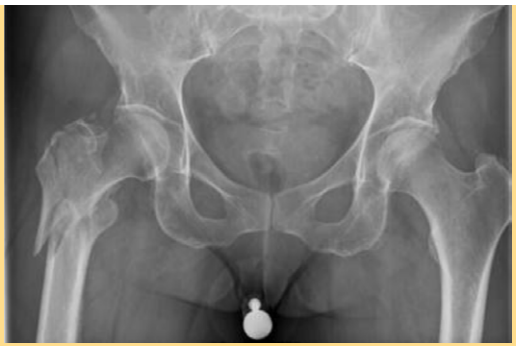


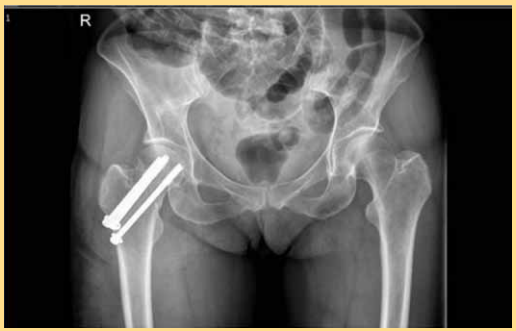
(C) Fracture callus removed

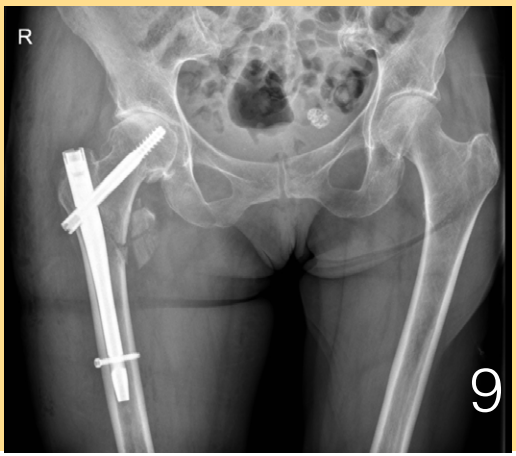
EXTENSIVE EVALUATION OF FOUR PATIENT REPORTED FUNCTIONAL OUTCOME INSTRUMENTS ON MEASUREMENT PROPERTIES VALIDITY, RELIABILITY, RESPONSIVENESS IN PATIENTS WITH A HIP FRACTURE.

DR. T. NIJMAN
Principal Investigator
Onze Lieve Vrouwe Gasthuis, Amsterdam, The Netherlands

Abstract: In clinical follow up of our trauma surgery and care it becomes increasingly important to evaluate outcome from the patient's perspective. For patients with hip fractures several patient reported outcome (PRO) measures are available to assess outcome from the patient's perspective. However, the quality of these instruments in the hip fracture population is often barely assessed. This limits our knowledge on how to interpret these PRO outcomes and evaluate our effectiveness of trauma surgery. The quality of a PRO instrument is determined by its measurement properties. It is currently not known which of these PRO instruments has the best measurement properties (validity, reliability and responsiveness). The specific aim of the current prospective cohort study is therefore to examine which PRO instrument has the best measurement properties for evaluation of functional outcome in patients after hip fracture. Four PRO instruments, the Oxford Hip Score (OHS), Lower Extremity Measure (LEM), Hip disability and Osteoarthritis Outcome Score (HOOS) and Western Ontario and McMaster Osteoarthritis Index (WOMAC) will be assessed at 6 time points from hospitalization to 29 weeks postoperative. The measurement properties will be assessed according to the recently formulated guidelines by the COnsensus-based Standards for the selection of health Measurement Instruments (COSMIN) group. In summary, although hip fracture has major impact on patients and trauma departments, we are actually not able to accurately assess its outcome and thereby indirectly not capable to evaluate our interventions. As a long term objective this research could potentially contribute to a more accurate and valid evaluation of trauma surgery and care.







Young Investigator Grants 2011

THE EFFECT OF SYSTEMIC INFLAMMATION ON THE COMPOSITION OF THE FRACTURE HEMATOMA

DR. T.J. BLOKHUIS
Principal Investigator
University Medical Center Utrecht, Utrecht, The Netherlands

Abstract: Fractures in multitrauma patients have a higher rate of non-unions than isolated fractures. Severe injury is often accompanied by systemic inflammation, and the healing impairment may therefore be caused by the systemic inflammation, as this leads to local and systemic changes. Animal studies indicate indeed that systemic inflammation impairs fracture healing. However, the mechanism behind this healing impairment remains unknown.
The proposed study will focus on clarifying this mechanism by comparing the cellular composition of fracture hematomas between patients with and without systemic inflammation. Differences in cellular composition of the fracture hematoma between these patient groups may shed light on a mechanism through which systemic inflammation impairs fracture healing. Our study could therefore contribute to development of strategies that prevent nonunion after major trauma caused by systemic inflammation.
The rationale behind this study is based on the following. Systemic inflammation is present at the initial phase of fracture healing, and during this phase leukocytes infiltrate the fracture hematoma and produce several growth and differentiation factors that regulate essential downstream processes of fracture healing. The numbers and characteristics of peripheral leukocytes are altered during systemic inflammation and we hypothesize that these changes are maintained in tissue leukocytes and will lead to impairment of fracture healing. Systemic inflammation induces neutrophilia and neutrophil priming. Primed neutrophils are prone to home towards inflammatory sites and systemic inflammation may therefore lead to an increased or prolonged influx of neutrophils into the fracture hematoma. A detrimental effect of neutrophils on fracture healing is suggested by animal studies that show improved bone repair after systemic depletion of neutrophils. Our previous in vitro research has revealed a detrimental effect of high neutrophil concentrations on osteogenic differentiation of multipotent stromal cells. Based on these findings, we hypothesize that systemic inflammation impairs fracture healing by an increased or prolonged influx of neutrophils into the fracture hematoma.

the effect of neutrophils on ostheogenic differentiation of MSCs.

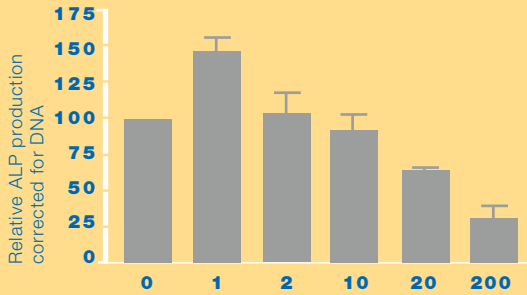


Fig. 1: Low neutrophil concentrations stimulate osteogenic differentiation of multipotent stromal cells (MSCs) while high concentrations of neutrophils inhibit osteogenic differentiation.

the effect of neutrophils on chondrogenic differentiation of MSCs.

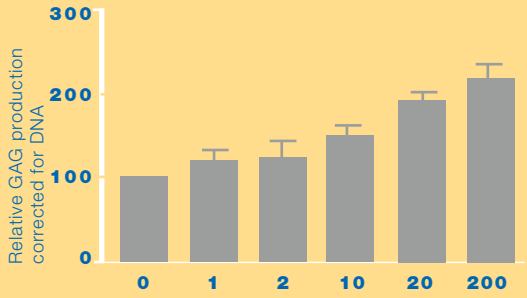


Fig. 2: High neutrophil concentrations stimulate chondrogenic differentiation of MSCs.

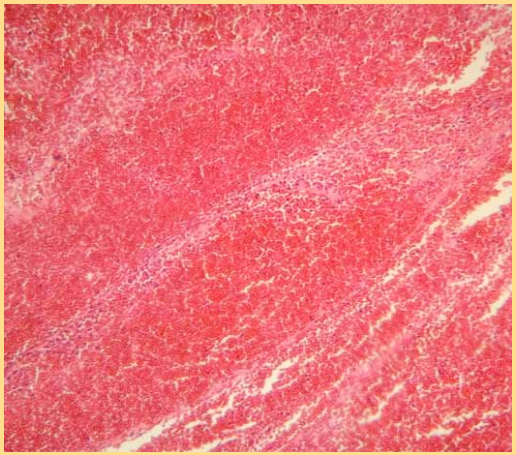


Fig. 3: Structural organization of leukocytes in the 3 day old fracture hematoma.

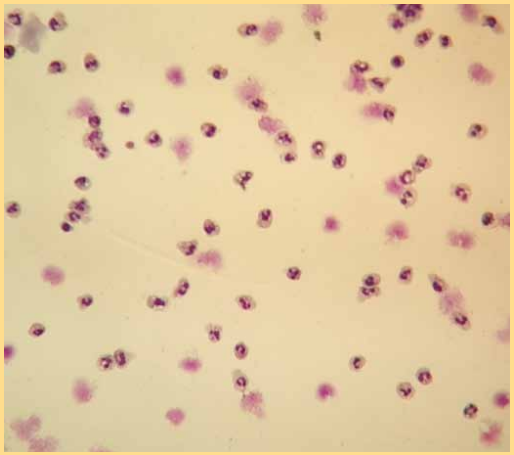


Fig. 4: 10% (young) banded neutrophils in cytospins of the fracture hematoma from multitrauma patients.

Research Grants 2011

TARGETING THE FGF PATHWAY TO ENHANCE FRACTURE REPAIR

DR. C. COLNOT
Principal Investigator
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Abstract: Although bone exhibits high regenerative capacities, it is estimated that delayed healing occurs in 5 to 10% of all fractures. Hence, there is a need to develop new biological methods to enhance repair, such as growth factors, small molecules and stem cells. The only growth factors used therapeutically in this context are Bone Morphogenetic Proteins (BMPs), with a number of recognized limitations in their clinical and cost-effectiveness. BMPs are involved at various stages of bone formation during skeletal development and repair. Our previous work has shown that BMP2 can stimulate repair by changing the fate of skeletal progenitors within the periosteum and inducing healing via endochondral ossification. The BMP signaling pathway acts in coordination with many other signaling pathways including Wnt, Fibroblast Growth Factor (FGF), Indian Hedgehog (IHH) and Parathyroid Hormone/Parathyroid Hormone related Peptide (PTH/PTHrP). BMP and FGF pathways have been shown to have opposite effects during long bone development. FGFs and their receptors are involved in bone formation through the regulation of osteoblast and chondrocyte proliferation and differentiation. The interactions between the BMP and FGF pathways during bone repair in the adult have not been explored. We hypothesize that activation of the BMP signaling pathway concomitant with regulation of the FGF signaling pathway accelerates bone repair. We propose to examine the combined roles of FGFR3 and BMP2 in mouse models of fracture repair. First, we will analyze mice carrying the fgfr367C/+ activating mutation to determine the effects of the FGF pathway on fracture repair via intramembranous and endochondral ossification. Second, we will determine the extent to which BMP2 and FGFR3 exert opposite effects on fracture healing. To do so, we will test the possibility that specific FGFR3 inhibitors (tyrosine kinase inhibitors) counteract the constitutive activation of the receptor and enhance the efficacy of BMP2 during bone repair. It is expected that such inhibitors will have clinical applications for orthopaedic trauma.

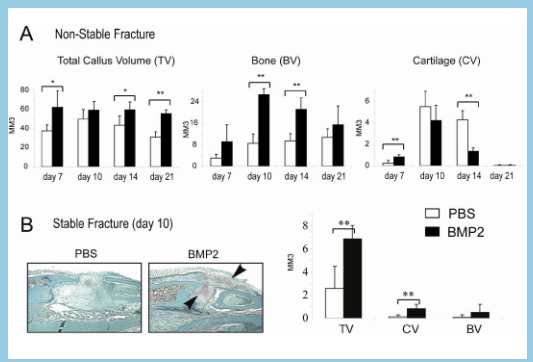


Fig. 1: BMP2 accelerates endochondral ossification and regulates cell fate decisions during fracture healing. Histomorphometric and histological analyses of wild type non-stabilized (A) and stabilized (B) fractures treated with PBS or rhBMP2. *p<0.05; **p<0.01 [5].

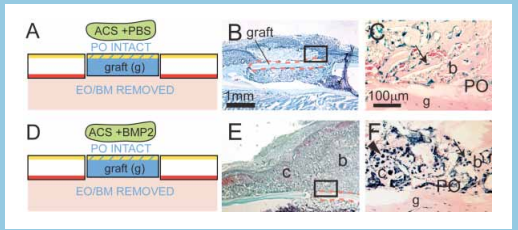


Fig. 2: BMP2 stimulates cartilage formation within periosteum during bone graft healing. (left) Schematic representation of bone grafts (g) isolated from Rosa26 mice after removal of endosteum (EO) and bone marrow (BM). (middle, right) Adjacent sections through the bone graft stained with (B, E) SO and (C, F) X-gal [5].

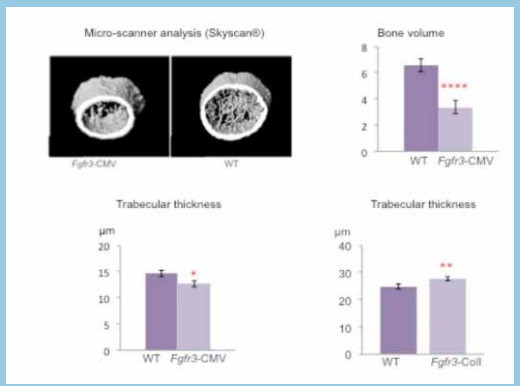


Fig. 3: Bone phenotypes due to ubiquitous (CMV) and osteoblast (Col1)-specific activation of FGFR3. Micro-CT analyses of long bones in wild type mice and mice carrying the fgfr3Y367C/+ mutation. (Top) Decreased bone volume in CMV- fgfr3Y367C/+ mice ($p<0.01$). (Bottom) Decreased trabecular thickness in CMV- fgfr3Y367C/+ mice ($p<0.05$) and increased trabecular thickness in Col1- fgfr3Y367C/+ mice at three weeks of age in femurs ($p<0.003$).

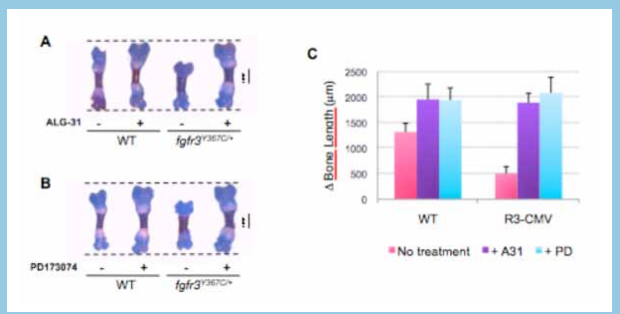


Fig. 4: Inhibition of FGFR3 increases bone length. The TK inhibitors A31 and PD173074 rescue the achondroplasia phenotype in the long bones of fgfr3Y367C/+ mice. Femurs from E16.5 fgfr3Y367C/+ and wild type embryos were cultured for 5 days in the presence or absence of TK inhibitor. Bone length of A31 and PD173074 (positive control) treated femurs were increased compared to untreated femurs ($p<0,005$).

Research Grants 2011

HEALING OF A CRITICAL SIZE DEFECT IN THE RAT FEMUR GRAFTED WITH A NOVEL TITANIUM FOAM

DR. H. WEINANS
Principal Investigator
Erasmus University, Rotterdam, The Netherlands

Backround: Large defects as well as delayed unions and non-unions often require bone grafting in order to stimulate bone healing. Porous metallic scaffolds gained interest because of their biomechanical strength and fatigue resistance over extended periods. We have developed a titanium foam graft with >90% porosity, which has the shape of the cortical bone of a rat femur. In large defects, bone healing may be dependent on an osteoconductive matrix in combination with an osteoinductive agent. Fibrin has neovascularizing properties, which are more evident in high-molecular weight (HMW) fibrin. The added value of (HMW) fibrin in bone healing seems promising, but requires adequate studies.
Aims: The aims of the proposed project are to assess the biologic properties of porous titanium foam after implantation in a critical-size bone defect, and to assess if adding (HMW) fibrin increases bone healing.
Methods: A critical size defect will be made in the mid-diaphysis of male Wistar rats. Rats will be randomly allocated to the following treatment groups: (A) negative (empty defect) control; (B) titanium foam; (C) titanium foam with unfractioned fibrin; (D) titanium foam with HMW fibrin. Following grafting, the defect will be stabilized with a 23mm AO RatFix PEEK plate. Defect healing will be monitored using in vivo micro-CT scanning (t=7, 10 and 13 weeks). Animals will be sacrificed as soon as full defect bridging is seen in at least one experimental group. Bone regeneration within the defect area will be measured by determining the bone-interface microarchitecture (micro-CT scanning). The mineral apposition rate and bone formation rate within the defect will be determined using in vivo incorporation of the fluorescent dyes tetracycline hydrochloride and calcein. Bone formation will be determined histologically using Goldner's trichrome and basic fuchsin-methylene blue staining. Neovascularization will be assessed by immunostaining (anti-CD31 antibody).
Clinical Relevance: Clinicians rely on the availability of grafting material with adequate biomechanical support and osteoinductive potential when treating large bone defects. Titanium foam has superior biomechanical properties compared with traditional void fillers such as hydroxyapatite and calcium phosphates. Adding (HMW) fibrin as neovascularizing agent may enhance bone healing. If titanium foam with (HMW) fibrin accomplished better and faster defect healing, this can affect many patients annually.

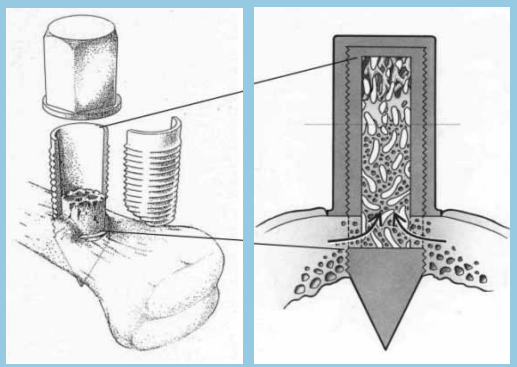


Fig. 1: schematic drawing of the Bone Conduction Chamber (BCC). The chamber is implanted bilaterally in the tibiae of rats. The openings at the lower end of the chamber are placed just below the periosteum. Tissue grows into these openings (arrows).

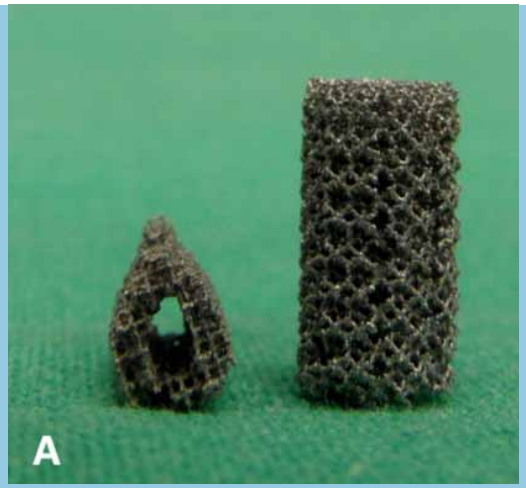


Fig. 2: Rat femur defect model including titanium foam graft

A: Dodecahedron-based titanium foam structure, fabricated in the shape of a rat femur (left). Sizes of the cylinder are 4x8mm (right).

B: Defect is fixated by a PEEK plate with three proximal and three distal bicortical screws.

Research Grants 2011

MEASURING RECOVERY IN OPEN LOWER LIMB FRACTURES: THE DEVELOPMENT OF A NOVEL PATIENT CENTRED RECOVERY SCALE FOR LOWER LIMB TRAUMA

DR. I. PALLISTER
Principal Investigator
Abertawe Bro Morgannwg University Health Board, Swansea, UK

Abstract: Open fractures represent a broad spectrum of injury and a major health care burden worldwide. Modern limb salvage techniques have enabled union and soft tissue cover to be restored in previously hopeless circumstances. Consequently interest in assessing outcome has moved towards a more patient-centred focus. To date, there is no reliable validated trauma patient-derived outcome tool; long-term functional effects are currently assessed using tools developed for other patient populations. The weaknesses in applying scoring systems derived from other populations with completely different problems are all too obvious. Such tools cannot be used to monitor progress and thus cannot play a part in establishing optimum rehabilitation regimens or assist in facilitation of return to work. However, a tool which is patient-derived and validated will prove helpful in both of these respects.

This project will follow the standard processes required for the development of a new tool including in-depth qualitative interviews for item generation; piloting for appropriate scaling responses; item reduction through second phase piloting; confirmatory steps to ensure reliability, repeatability and standard forms of validity. Such a tool will be invaluable in increasing awareness of the impact of such injuries on the quality of patient outcomes. The final tool will be prospectively assessed as part of a multi-centre assessment of outcomes following severe lower limb injuries.

This study will translate qualitative data into a robust and reliable patient-centred, clinically relevant scoring system. The qualitative interviews have generated over 10 hours of discussion from which themes for the scale have been drawn. The item generation phase will result in cross-sectional information on patient performance that will enhance our understanding of these outcomes. Results from each of the development stages will be suitable for dissemination amongst health-care professionals via peer-reviewed publications.

The final tool will be rigorously developed to ensure it is clinimetrically sound so the tool can be made available for existing and new therapy evaluations, for clinical end users and for the healthcare industry. The final tool would be available for wide spread use leading to the establishment of norms for the UK population and opportunities for translation and revalidation across Europe for use in pan-European trials.

HUMERAL SHAFT FRACTURES: MEASURING RECOVERY AFTER OPERATIVE VERSUS NON-OPERATIVE TREATMENT (HUMMER) - MULTICENTER COHORT STUDY TO ASSESS RISK FACTORS FOR IMPAIRED HEALING

DR. D. DEN HARTOG
Principal Investigator
Erasmus MC, University Medical Center Rotterdam, Rotterdam, The Netherlands

Abstract: Humeral shaft fractures are associated with profound temporary (in the elderly sometimes permanent) impairment of independence and quality of life. The best treatment is an unresolved problem. Operative treatment allows for earlier mobilization, which may lead to earlier functional recovery, and thus sooner ADL and work resumption. But it is also associated with surgical complication risks. Non-operative treatment is non-invasive, but may evoke functional limitation due to longer immobilization. Operative and non-operative treatment are associated with adverse events like nonunion and radial nerve palsy. Determinants for failure of treatment (i.e., impaired healing) are unresolved.

The primary aim of this study is to compare the DASH score during one year after operative versus non-operative treatment in adult patients who sustained an AO type 12A or 12B humeral shaft fracture. Secondary aims include the identification of risk factors for impaired healing, evaluation of the effect of treatment on the Constant score, pain, secondary interventions and complications, health-related quality of life and cost-effectiveness. We expect faster recovery after operative treatment.

The proposed study will be a multicenter observational comparative study of 400 patients with a humeral shaft fracture. At least 25 hospitals will participate. Treatment (operative or non-operative) will be left to the treating surgeon. Outcome will be monitored regularly over the subsequent 12 months (2 and 6 weeks, and 3, 6, and 12 months). Data will be analyzed using univariate and multivariable analyses.

Research Grants 2011

HOW DOES OPTIMUM LOCKING PLATE CONFIGURATION VARY WITH BONE QUALITY

DR. P. PANKAJ
Principal Investigator
The University of Edinburgh, Edinburgh, UK

Abstract: It is well recognised that to promote fracture healing an appropriate mechanical environment at fracture sites is essential (e.g. micro-movement is important for secondary healing with callus especially for diaphyseal fractures). It is also accepted that the optimum environment depends on the physiological loading and the stiffness of the bone-fixator construct. There has been very little work carried out on the contribution of bone of varying quality and in particular the role of bone-screw interaction in the overall response of the bone-fixator construct. The proposed study aims to investigate locking plates which are being extensively promoted as having better fixation in osteoporotic bone. Currently there appears to be no accepted methodology for selecting plates and their configuration for different bone properties to attain an optimum mechanical environment. This study aims to develop an understanding of the osteoporotic bone-screw interaction and in particular test the hypothesis: for a given fracture there is an optimum locking plate configuration which is dependent on the degree of osteoporosis. The study will examine the mechanical behaviour of the bone-locking plate construct using computer simulations which will be validated using in vitro experiments. The numerical simulations will incorporate nonlinear response arising due to bone yielding and screws sliding or loosing contact with bone. Improved understanding of the mechanical response of osteoporotic bone to components used in fracture fixation could help in reducing patient suffering and the associated cost burden. The study will provide information on the best configuration of screws and plate placement to optimise the mechanical environment for fracture healing in bone with varying levels of osteoporosis.

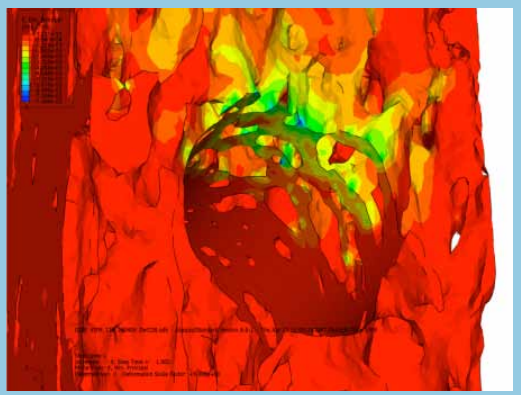


Fig. 1: An example illustrating strains in cortical bone due to forces from an Ilizarov wire. In this case a micro-FE model (with complete bone micro-structure) was employed for analysis.

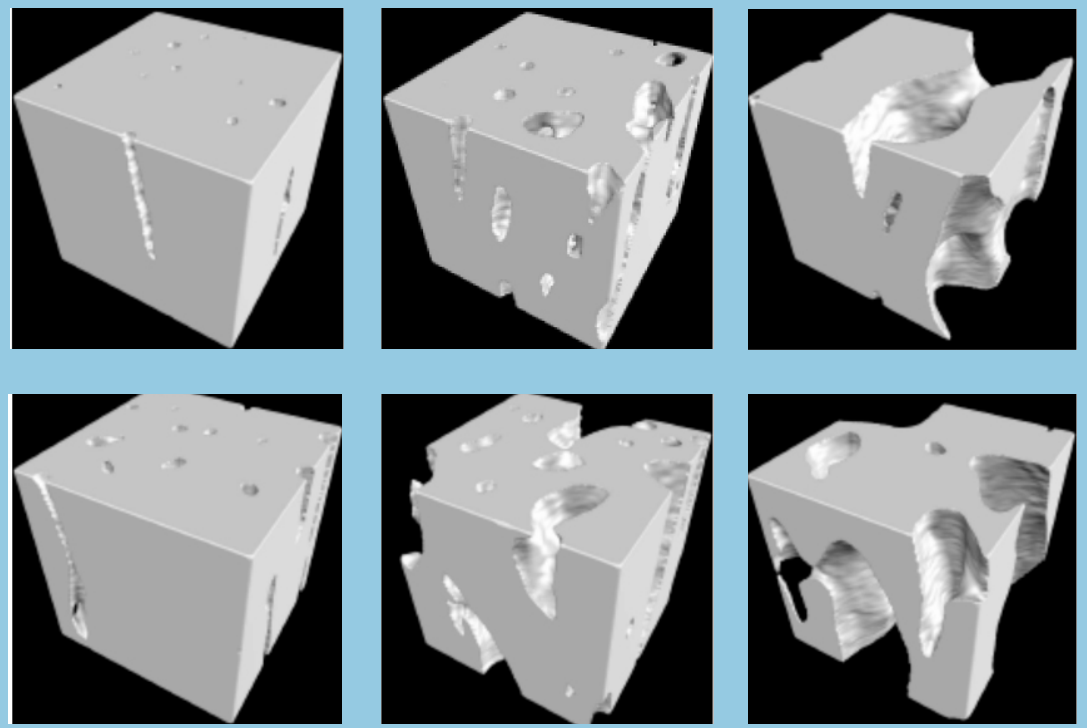


Fig. 2: Typical cortical bone samples. The upper row are samples from periosteal aspects, the lower row shows samples from endosteal aspects for **(a)** 20-year old female, **(b)** 61-year old female, and **(c)** 84-year old female.

Research Grants 2011

MODELING OF HIP FRACTURE AND REPAIR: CONSIDERATIONS OF INTERSUBJECT AND SURGICAL ALIGNMENT VARIABILITY

DR. P. LAZ
Principal Investigator
University of Denver, Denver, CO, USA

Abstract: Based on the significant number of occurrences and the resulting postsurgical outcomes, hip fractures are a major public health concern. The purpose of this project is to improve the realism and fidelity in computational models of hip fracture and to develop an approach to consider the effects of implant alignment and patient factors on hip fracture repair with an osteosynthesis implant.

The specific aims of the project are:
1. To predict the fracture patterns in femurs under common injury loading conditions for a series of subjects with varying geometry and bone quality representative of the population
2. To model the repair of hip fractures with intramedullary osteosysnthesis devices for the population of subjects from Specific Aim 1, including the impact of variability in implant alignment.
3. To utilize the subject-specific hip fracture repair models to investigate surgical practice: short vs. long intramedullary nail and distal locking screws vs. unlocked nail, and post-operative weight-bearing protocols: non-weight-bearing vs. partial weight-bearing vs. full weight-bearing

The computational models will implement a novel fracture approach to simulate the formation and propagation of a crack in the femur. To account for intersubject variability, the study will use a series of subject-specific models developed from an existing, published statistical shape and intensity model of the femur. The effects of surgical repair with alignment variability will be considered using a probabilistic analysis to quantify the changes in load distribution within the bone-implant construct.

The clinical benefits of the proposed study are multifold. The study proposes to characterize the implant alignment parameters that most significantly influence the bone strain and implant stress distributions, and to recommend implant selection and alignment based on specific patient features in order to realize more optimal load transfer conditions. Additionally, the model findings can aid the surgical community by providing guidance on how implant selection, locking, and rehabilitation protocol influence the distribution of load in the construct. Lastly, the natural modeling can also aid in identifying at-risk populations by identifying the shape and bone quality characteristics of subjects most susceptible to hip fracture.

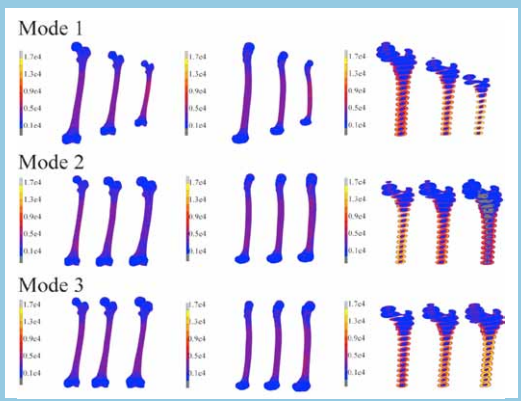


Fig.1: Statistical shape intensity model depicting changes in shape and density for the first three modes at +/-3 standard deviations [Bryan et al., 2010].

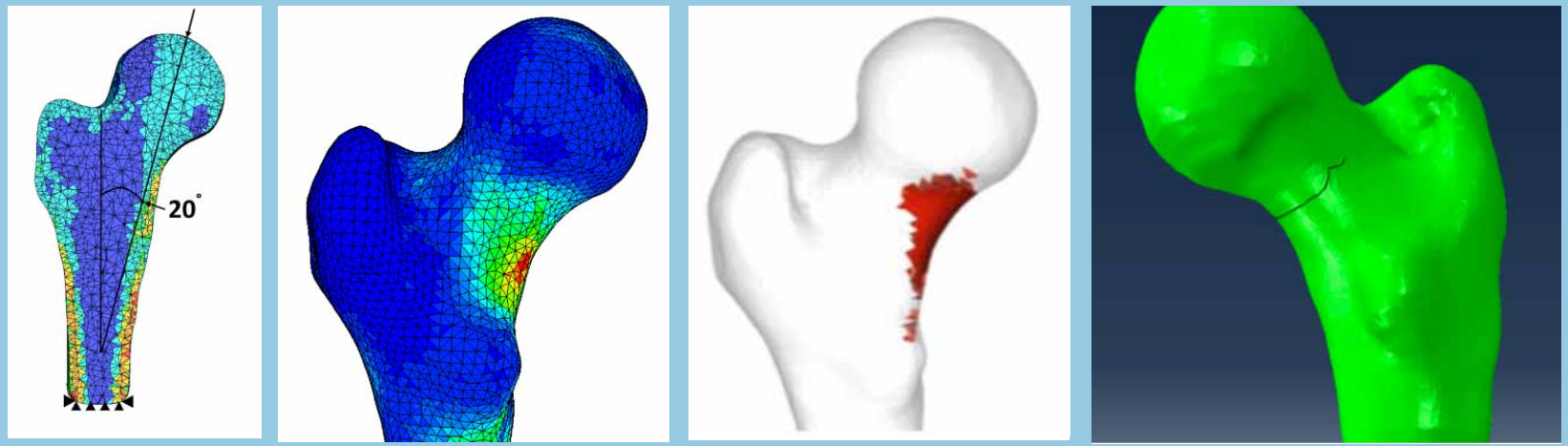


Figure 2. Distribution of modulus in sectioned femur **(a)** stress contours under stance loading **(b)** and locations of highest risk **(c)** from Laz et al. [2007]. Example of neck cracking in a femur using XFEM capability in Abaqus **(d)**.

Research Grants 2013

PHYSICAL ACTIVITY AND FUNCTION IN PATIENTS AFTER TIBIA FRACTURES

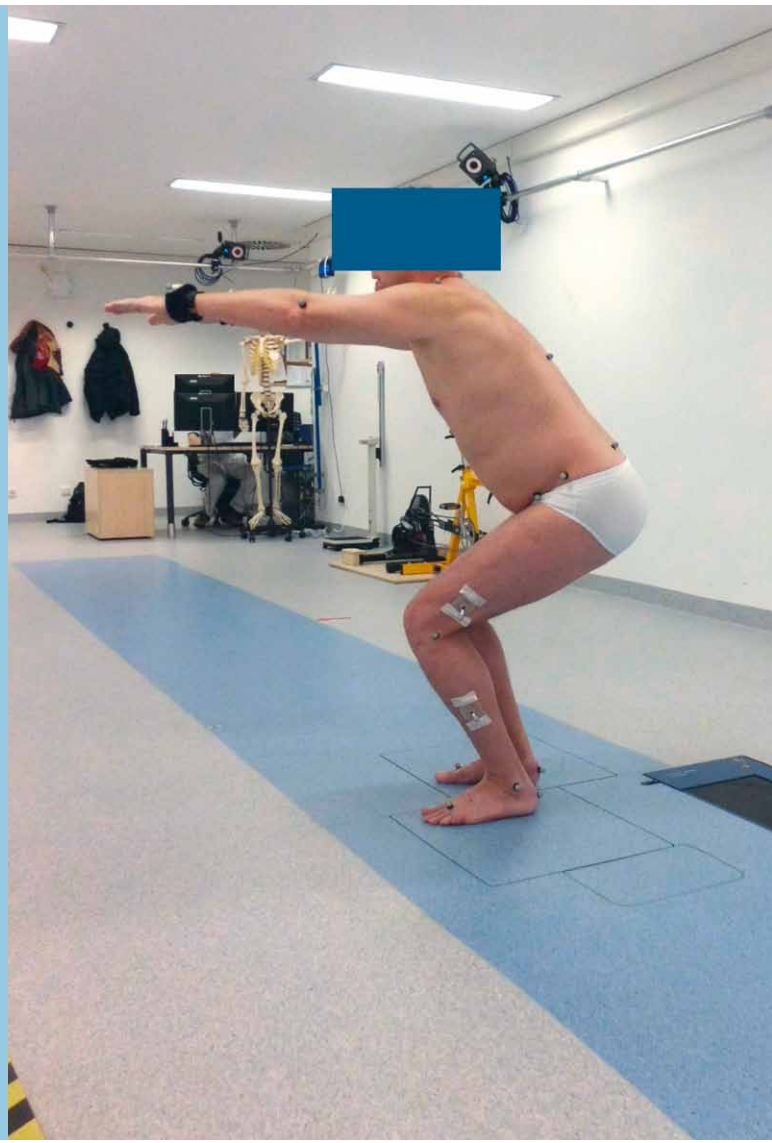
DR. P. AUGAT
Principal Investigator
Trauma Center Murnau, Murnau, Germany

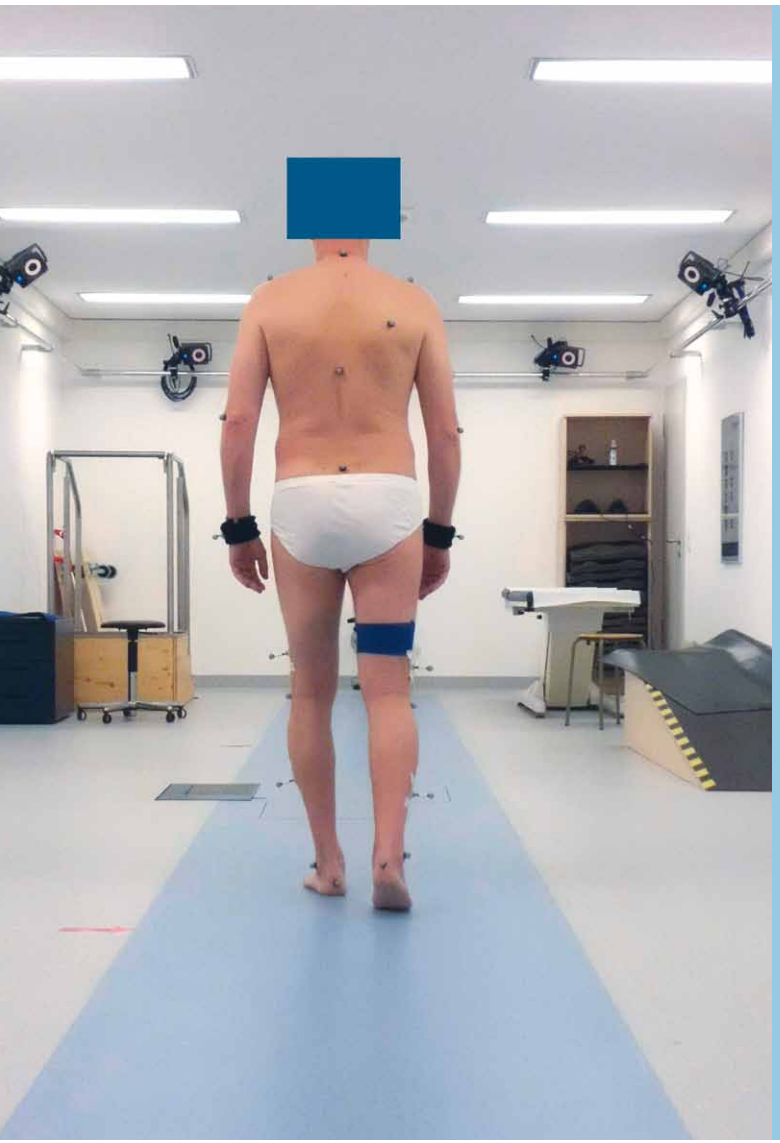
Abstract: Non-unions in tibia fractures constitute a serious complication and can potentially be avoided by early detection of a delay in the healing process. Modern osteosynthesis techniques usually provide a stable and nearly painless fracture fixation, impeding the early detection of healing delays. Challenging gait tasks and long term walking activities, however may enable identification of gait limitations after fracture fixation.

The primary goal of this project therefore is the development of reliable tools for the quantification of the fracture healing progress in tibia fractures.

In a prospective case series in patients with isolated fractures of the tibial shaft we want to test our primary hypothesis, that early functional gait performance under challenging gait tasks and early overall functional activity will predict return to function. Instrumented gait analysis, patient reported outcome measures and straightforward functional assessment tools will be employed to assess functional performance.

The findings will indicate which functional gait parameters are most sensitive for changes in functional performance in patients with tibia fractures. Furthermore, we will be able to identify if any of the early assessment methods of functional performance will be predictive of late functional outcome. This could then be employed in daily clinical practice to assess progress in functional performance during the process of fracture healing. It may further enable the design of adequately powered trials to identify functional performance parameters for the identification of delayed healing or non-unions.





Research Grants 2014

INFLUENCE OF SARCOPENIA ON OSTEOPENIC FRACTURE HEALING – INTERVENTIONAL STUDY OF LOW-MAGNITUDE HIGH-FREQUENCY VIBRATION

DR. W.H. CHEUNG
Principal Investigator
The Chinese University of Hong Kong, Hong Kong, China

Abstract: Sarcopenia is a disease or geriatric syndrome with degenerative loss of skeletal muscle mass, quality and strength due to aging. According to the latest definition by EWGSOP (European Working Group on Sarcopenia in Older People) in 2010, sarcopenia is diagnosed based on the loss of both skeletal mass and function (strength or performance). The prevalence of sarcopenia in normal elderly ranges 22-53%, but it was recently reported that up to 58% of hip fracture patients were sarcopenic. This figure is surprisingly high but the current clinical practice of orthopaedic surgeons basically does not consider sarcopenia in the treatment or rehabilitation protocols. The investigators also showed that fast-twitched type II muscle fibers decreased with age and type IIB muscle fibers showed significant association with hip bone mineral density (BMD). Therefore, there is a need to study the influence of sarcopenia on osteopenic fracture healing and explore potential treatments.

Previous research on low-magnitude high-frequency vibration (LMHFV) indicated that this is useful to improve BMD in normal elderly and enhance fracture healing in both animal and human. Investigators recently also reported a significant reduction of 39% in fall rate and improvement on muscle strength and balancing ability by LMHFV in a RCT involving 710 elderly. These provide strong evidences on the efficacy of LMHFV on both muscle performance and fracture healing that may be helpful for fragility fracture patients with sarcopenia.

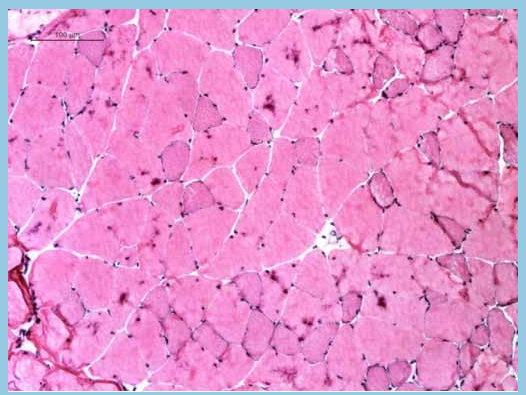
Based on the above scientific evidences, we hypothesize that (1) sarcopenia may delay osteopenic fracture healing and (2) LMHFV can enhance the osteopenic fracture healing with sarcopenia. These are justified by our findings on (1) association between muscle and BMD and (2) enhancement of LMHFV on muscle and fracture healing.

The objectives of this study are to investigate the influence of sarcopenia on osteopenic fracture healing by comparing our established animal models of senescence-accelerated mouse-prone 8 (SAMP8) and its normally aging control senescence-accelerated mouse-resistant 1 (SAMR1). Our previous study already proves that sarcopenia onsets at month 8 in SAMP8. Their fracture healing will be monitored using radiography, microCT, histomorphometry and mechanical testing at 2, 4 and 6 weeks post-fracture. The findings will help us understand the effect of sarcopenia on osteopenic fracture healing and the potential treatment effect of LMHFV.

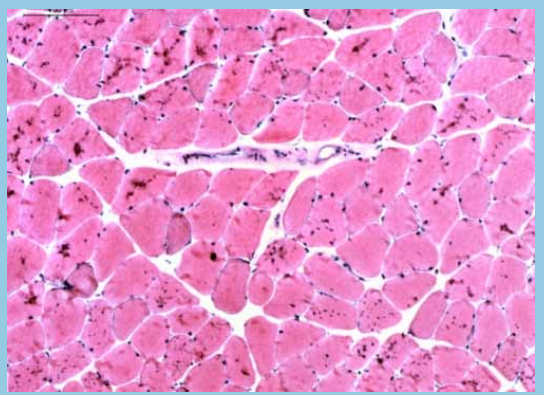
	Mth 3	Mth 6	Mth 7	Mth 8	Mth 9	Mth 10	Mth 11
Muscle mass (g)	0.128 ±0.001	0.130± 0.013	0.137± 0.007 *	0.136± 0.011	0.124± 0.006	0.120± 0.005 *	0.116± 0.011
Tetanic force (g)	54.13± 4.38	62.56± 11.31	93.83± 12.67#	91.35± 8.29	92.22± 11.69	76.99± 4.69#	68.79± 8.45
Twitch force (g)	22.25± 3.18	31.24± 8.34	42.62± 12.58	45.14± 7.90▫	44.06± 6.44	37.53± 4.66▫	31.94± 7.15
Fatigue rate (%)	13.26± 1.18	20.31± 10.47	26.46± 1.88^	21.20± 5.83	21.01± 2.54	17.33± 5.34^	15.39± 3.26

* represents significant difference of muscle mass between month 7 and 10 ($p<0.01$).
\# represents significant difference of tetanic force between month 7 and 10 ($p<0.01$).
▫ represents significant difference of twitch force between month 8 and 10 ($p<0.05$).
^ represents significant difference of fatigue rate between month 7 and 10 ($p<0.05$).

Table 1 Changes of muscle parameters (muscle mass, tetanic force, peak of twitch force, fatigue rate) from month 3 to 11 in Senescence-Accelerated Prone Mouse (SAMP8)



(A) Month 7



(B) Month 10

Fig. 1 Changes of muscle physiology of SAMP8 model from month 7 (A) to month 10 (B). H&E staining indicates the shrinkage of muscle fibers and increase of connective tissues obviously.

Research Grants 2014

MUSCLE ATROPHY IN HIP FRACTURE PATIENTS: A POSSIBLE OUTCOME MEASURE?

DR. I.F. KRAMER
Principal Investigator
Maastricht University Medical Centre+, Maastricht, The Netherlands

Abstract: The involution of skeletal muscle mass and strength with aging results in impaired mobility, thereby increasing the risk of falls and (hip)fractures in the elderly population. Hip fractures are a common cause of morbidity and mortality in the elderly. During hospitalization, immobilization and stress-inducing events such as trauma and operative treatment potentially increase the rate of muscle loss, with adverse functional outcomes as a result. However, it is unclear to what degree loss of muscle mass occurs during hospitalization and in what extent muscle mass could be a predicting factor for (functional) outcomes in the elderly hip fracture patients. In order to maintain muscle mass, nutritional interventions have proven to be an effective manner to reduce the loss of muscle mass by stimulating muscle protein synthesis. In addition, the role of nutritional support with high protein drinks after surgery will be performed to overcome the loss of muscle mass.

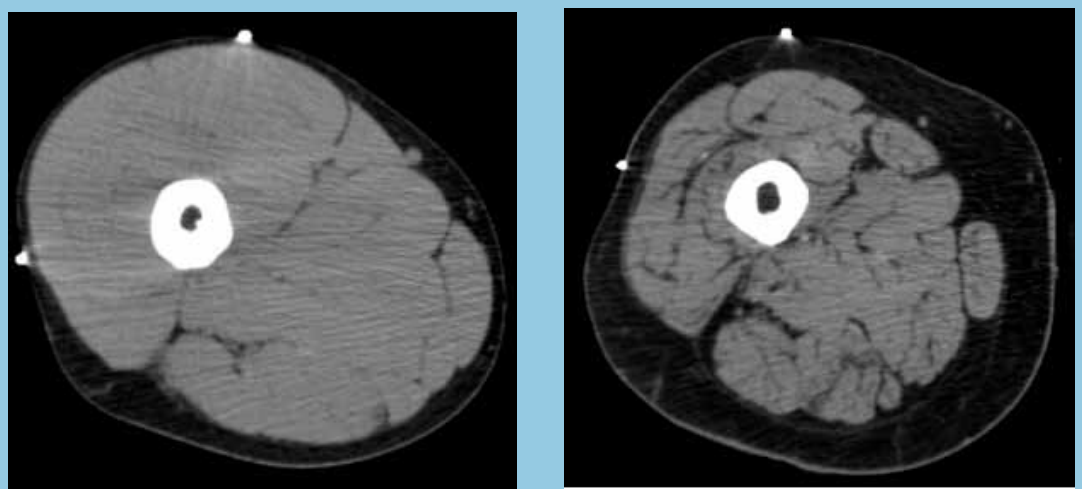


Fig. 1 Cross-sectional area of the quadriceps muscle of a young (left) and old (right) men, matched for height and weight. Sarcopenia leads to loss of muscle mass.

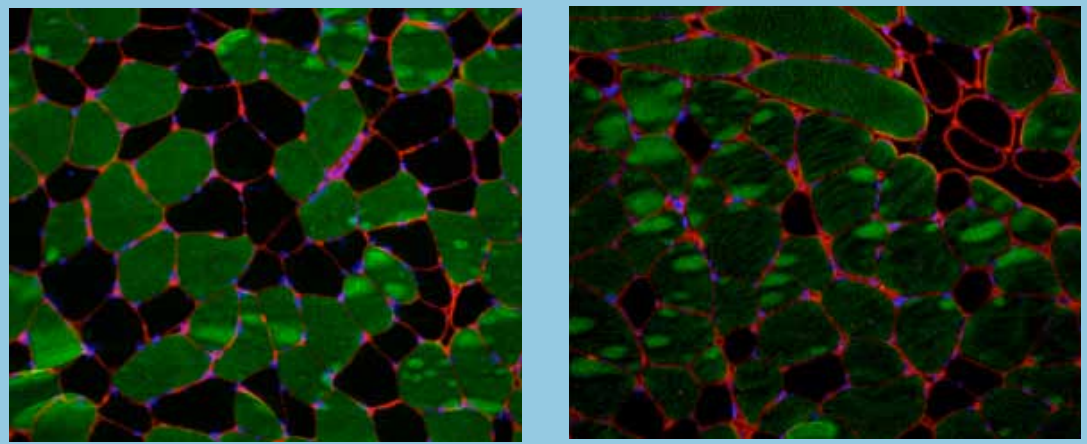


Fig. 2 Cross-sectional area of the type I and type II skeletal muscle fibers in a young (left) and old (right) woman. The green fibers are type I fibers. The black fibers are type II fibers. Sarcopenia results in loss and atrophy of type II muscle fibers.

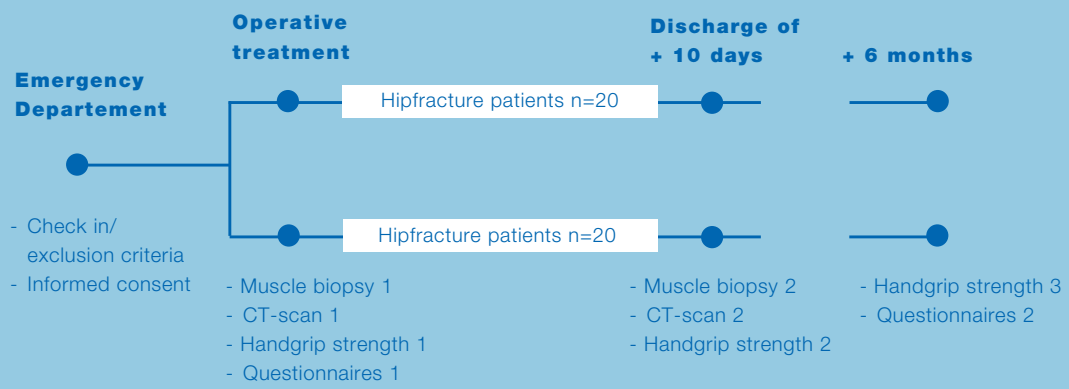


Fig. 3 Study timeline

Research Grants 2014

EARLY IDENTIFICATION OF NON-UNION

DR. T. MACGILLIVRAY
Principal Investigator
University of Edinburgh/Royal Infirmary of Edinburgh, Edinburgh, UK

Abstract: Despite the massive burden of fractures (over 1 million each year in the UK alone), there is at present no early marker of delayed healing or non-union, which causes massive patient morbidity and costs society and health care deliverers billions of dollars/euros each year. 3D freehand ultrasound is a versatile imaging modality with the potential to address this unmet clinical need. With development it could become a clinical tool for the early identification of problematic fracture healing, which could be readily available in the fracture clinic setting. This will improve patient care and save on healthcare costs. The current advances in ultrasound technology - i.e. improvements in image quality, sensitivity to blood flow, and contrast agents - makes this application to develop 3D freehand ultrasound particularly exciting. Non-union is not diagnosed by X-ray until very late (at least 12 weeks) by which time the patient has suffered considerable morbidity. For many non-unions (e.g. clavicle) the surgical procedure at an early stage is of less magnitude than the procedure required at a later stage. We will compare diagnoses from 3D ultrasound scans with those derived from X-ray. This will enable us determine if 3D freehand ultrasound can improve the monitoring of fracture repair by allowing earlier detection of bridging callus, non-union and complications compared to X-ray. It is our intention to establish whether 3D freehand ultrasound represents a viable imaging modality for clinical fracture examinations.

To achieve this objective we will scan 60 patients who have sustained a closed fracture of the clavicle and 40 patients with tibial fractures. We have chosen these bones because our data from over 4,500 non-unions demonstrates that these are the most common sites of non-union in the upper and lower limbs (rates of 9% and 6%, respectively). An early diagnosis of a failure of healing would change the patient's management, as patients would be offered early fixation. Operation at this stage has a far lower complication rate than on established clavicle non-unions.

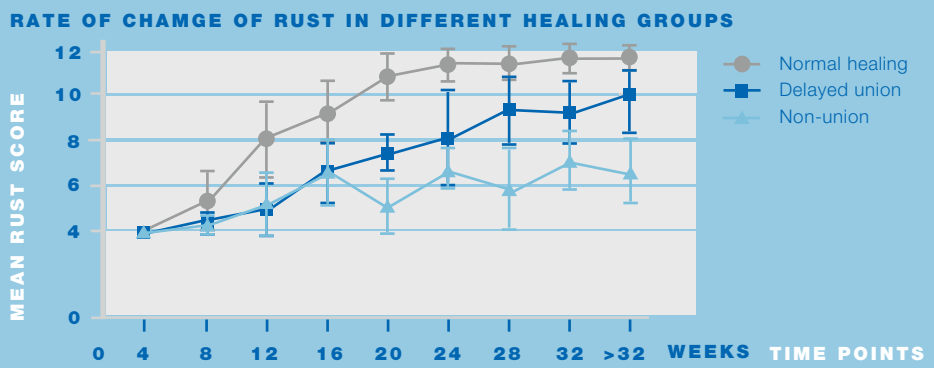


Fig. 1 Minimum RUST score for 3 of 4 cortices to be bridged is 10. This was not achieved until a mean of 16 weeks. Even at 12 weeks X-rays were not reliable for predicting non-union.

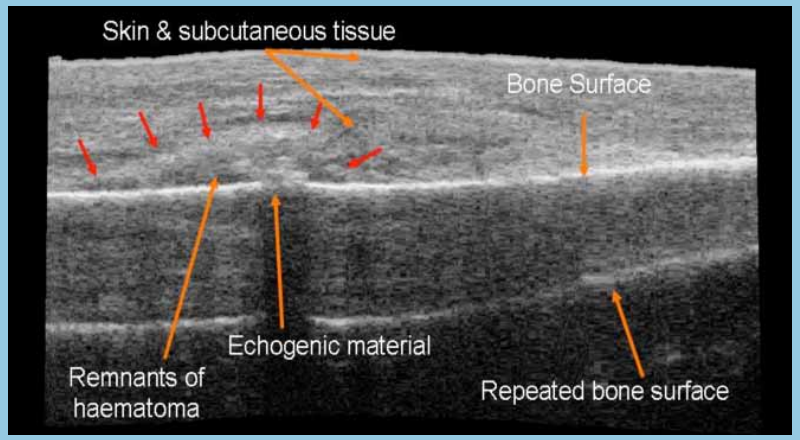


Fig. 2 2D Ultrasound of Healing Osteotomy

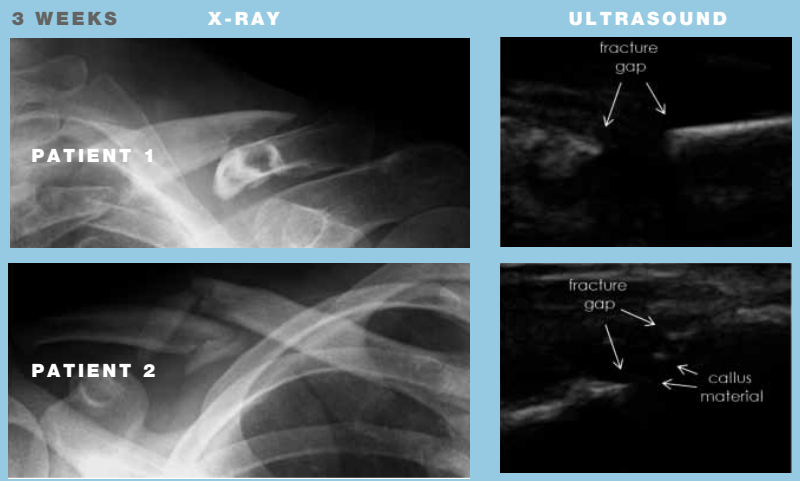


Fig. 3 X-ray and 2D ultrasound at 3 weeks post clavicle fracture. Ultrasound for patient 1,shows no callus material in the fracture gap, and this patient suffered non-union. For Patient 2, ultrasound shows signs of callus material, and this fracture healed satisfactorily. No signs of callus or healing were observed on X-ray for either patient at this early stage.

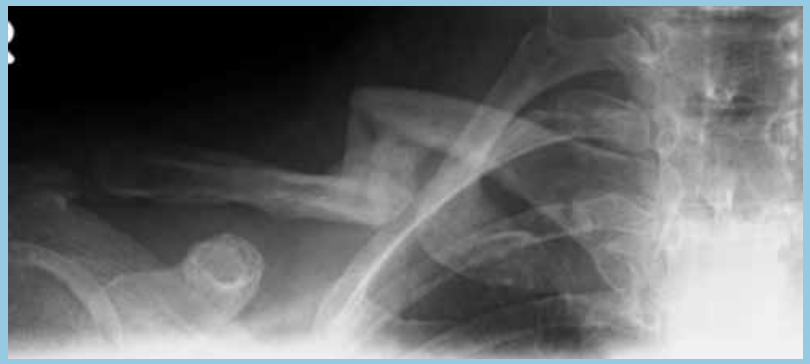


Fig. 4 X-Ray at 4 months of Patient 2 showing solid Union. Patient 1 had plating for an established non-union

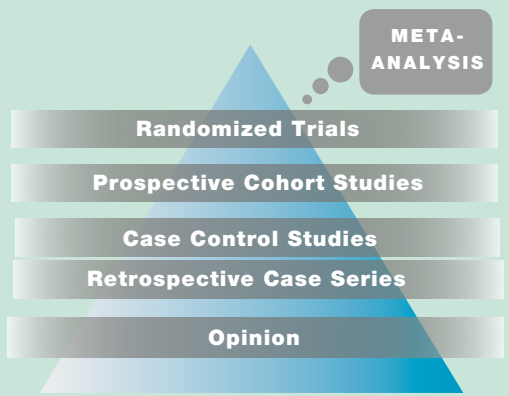
OTC Research Courses 2011-2014

HAVANA, June 1-2, 2011: Forum Sobre las Investigaciones Clinicas en Ortopedia
Organized jointly with the Centro de Investigaciones Medico Quirurgicas (CIMEQ), Ciudad de La Habana, Cuba
Two national and four international faculty members
More than 100 participants

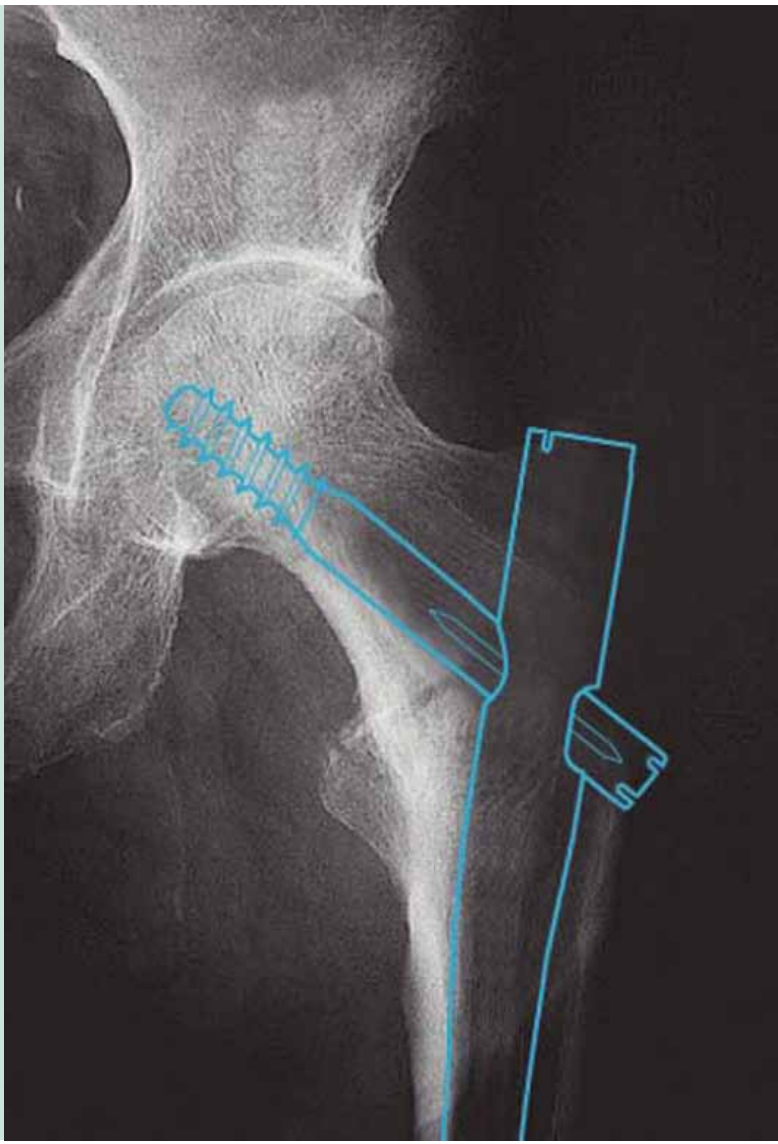
SAN FRANCISCO, ..., 2011 : OTI and IGOT Second International Annual Flap Course and Clinical Pre-Course
Organized jointly with the San Francisco General Hospital Foundation
Faculty drawn from Orthopaedic Trauma Institute San Francisco General Hospital
Participants from developing countries were trained to appropriately manage injuries requiring wound coverage

MURNAU, November 7-8, 2011: Principles of Clinical Research
Organized jointly with the Trauma Center (BGU) Murnau, Germany
Eight faculty members were teaching this OTC course on how to design, analyze and participate in skeletal trauma research
39 participants from various European countries attended this course

AARHUS, September 3-4, 2012: Principles of Clinical Research
Organized jointly with the Aarhus University Hospital, Denmark
Eight faculty members were teaching this OTC course on how to design, analyze and participate in skeletal trauma research
More than 30 participants from Scandinavian countries attended this course



Strategic approach to clinical research studies



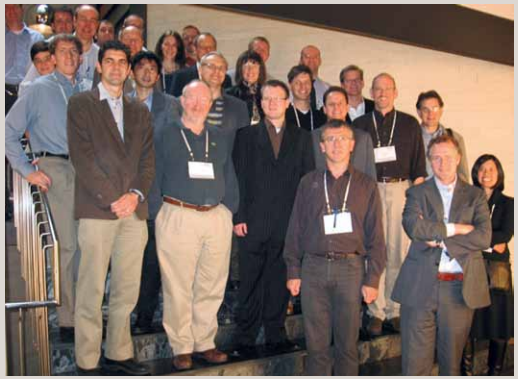
Murnau Course at BGU Trauma Center 2011

Aarhus Course at Helnan Marselis Hotel 2012

OTC „Hot Topics“ Workshops 2011-2012

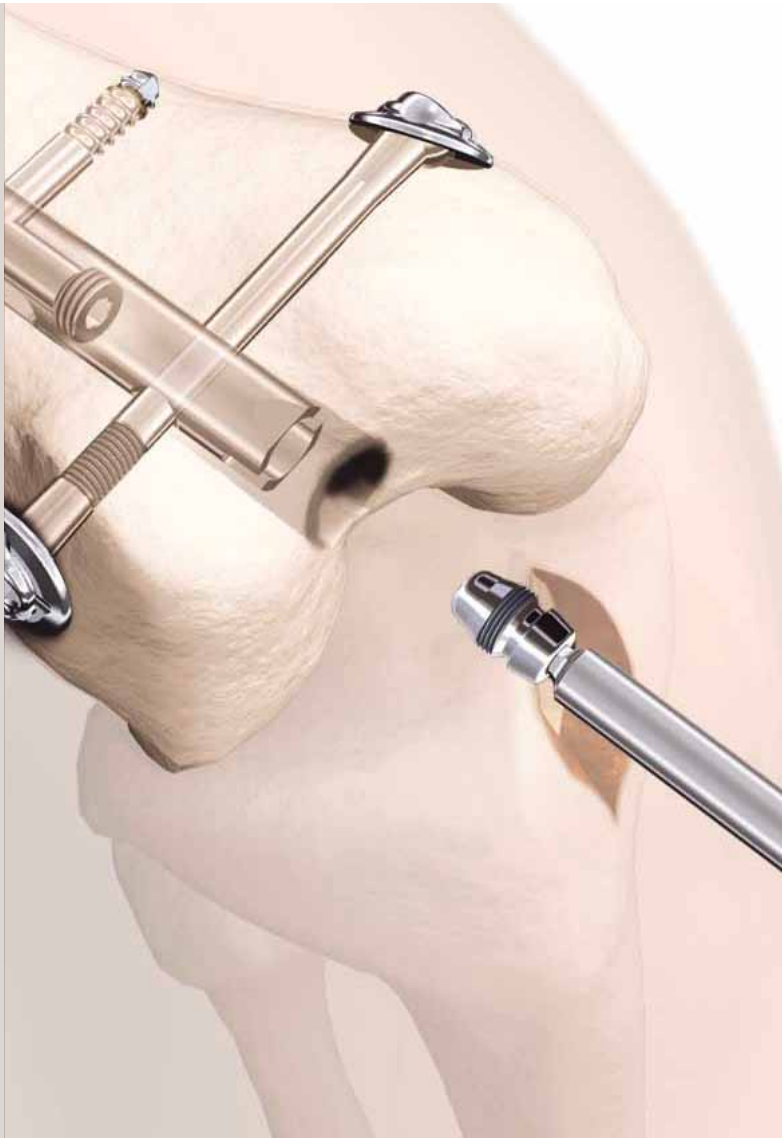
Assessment Of Fracture Healing (2011-2012)
Two workshops on “Functional Assessment of Fracture Healing” were held in consecutive years; one to define the scope of the problem, and one to come to conclusions on future work needed in this area.
The workshop topic was selected to address the persistent subjectivity and variability in clinical assessment of fracture healing. The consequential uncertainty continues to hinder efforts to evaluate clinical outcomes in studies that investigate the effect of osteosynthesis constructs on fracture healing.
The goals of these interdisciplinary workshops were three-fold:

1. Define clinical methods and challenges in fracture healing assessment.
2. Share innovative approaches to improve fracture healing assessment.
3. Discuss strategies to implement novel approaches in clinical trials and practice.



Barcelona 2011 Workshop

First OTC Workshop on Functional Assessment of Fracture Healing
BARCELONA, Spain, October 21-22, 2011
Under the chairmanship of Peter Augat, Murnau, and Michael Bottlang, Portland, a total of 30 invited participants attended the workshop and made presentations.



BOSTON, Second OTC Workshop on functional Assessment of Fracture Healing, December 3-4, 2012

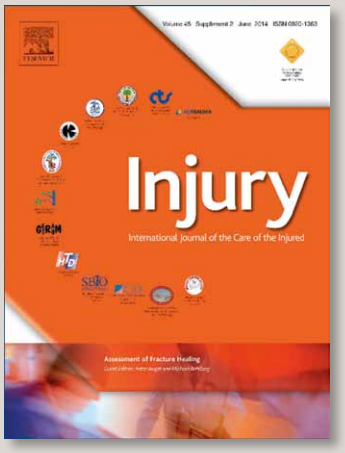
Under the chairmanship of Peter Augat, Murnau, and Michael Bottlang, Portland, a total of 22 participants attended and made presentations.

Boston Workshop 2012

Presentation of conclusions and recommendations of the two workshops on Assessment of Fracture Healing

The presentations prepared by 19 clinicians and 20 scientists with distinguished expertise pertinent to fracture healing assessment were summarized in a supplement to the journal INJURY. Three broad categories were addressed: **(1)** clinical aspects of fracture healing assessment; **(2)** technologies for fracture healing assessment and simulation; and **(3)** outcome assessment for clinical trials.

The full text of this INJURY supplement can be seen in eBook form on the OTCF website **www.otcfoundation.org** under Publications, or obtained in paper form by contacting **research@otcfoundation.org.**



OTC Workshops 2013-2014

OSTEOPOROTIC FRACTURES (2013-2014)
The problem of Osteoporotic Fractures became the "hot topic" for two consecutive workshops, each one covering a key aspect: Biology and Biomechanics.

OTCF Workshop on Osteoporotic Fractures – The Biological Perspective, LONDON, November 14-15, 2013
Under the chairmanship of Theodore Miclau and Volker Alt, a total of 23 participants attended and made presentations. These are being summarized in an INJURY supplement in 2015 addressing:

1. Experimental Approaches: Animal models for fracture healing and osteoporosis
2. Systemic osteoporosis treatment and its effects on bone metabolism and fracture healing
3. Local treatment for enhancement of osteoporotic fracture healing
4. Fragility fracture programs: Are they effective?

London Workshop Chairmen 2014

London Workshop Participants 2014

OTCF Workshop on Osteoporotic Fractures – The Mechanical Perspective, BOSTON, November 17-18, 2014

Under the chairmanship of Peter Augat and Jörg Goldhahn a total of 25 participants attended and made presentations under the main headings:

- Osteoporotic bone, is it different from normal bone?
- Fracture fixation in osteoporotic bone
- Is augmentation the solution?
- If fracture fixation fails in osteoporotic bone

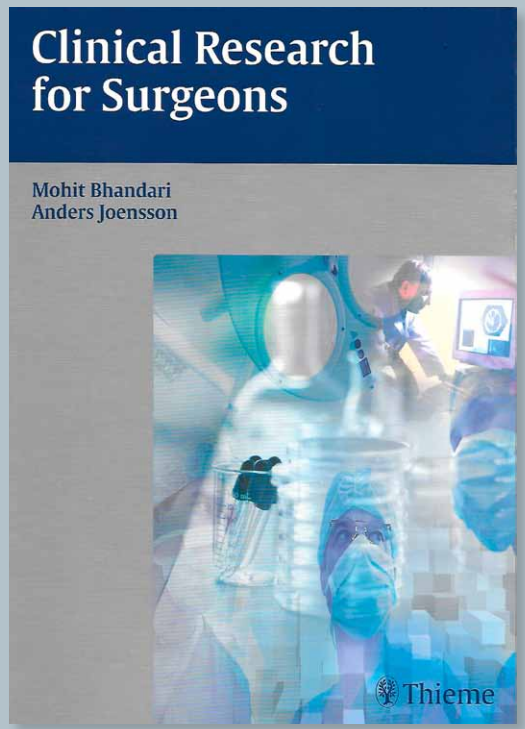
The presentations and discussion results will be published in a supplement to the journal INJURY in 2016.

Boston Workshop Presentation 2014

Boston Workshop Participants 2014

Books

BOOKS PUBLISHED UNDER THE AUSPICES OF THE RESEARCH PROGRAM OF OTC FOUNDATION



CLINICAL RESEARCH FOR SURGEONS
Editors: Mohit Bhandari and Anders Joensson

Summary Features:
Clinical Research for Surgeons is a practical guide for understanding, planning, conducting, and evaluating surgical research. It covers the principles of evidence-based surgery, the standard benchmark guiding clinical practice, and applies these principles to the design of suitable research studies. The reader will come to fully understand important concepts such as case-control study, prospective cohort study, randomized trial, and reliability study. The book provides valuable discussions of the critical appraisal of published clinical studies, allowing the reader to learn how to evaluate the quality of such studies with respect to measuring outcomes and to make effective use of all types of evidence in patient care.

Highlights:
- Insights from experienced surgeons and veteran researchers
- Easy-to-reference text boxes with Key Concepts, Jargon Simplified, and Examples from the Literature
- Coverage of both open and minimally invasive surgical procedures
- 105 illustrations demonstrating key points

GETTING YOUR RESEARCH PAPER PUBLISHED – A Surgical Perspective

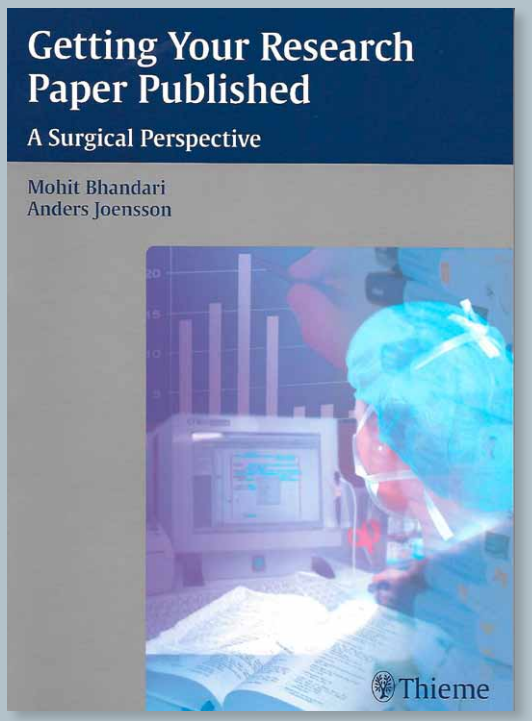
Editors: Mohit Bhandari and Anders Joensson

Summary Features:

Getting Your Research Paper Published is written from the perspective of experienced surgeons and veteran researchers. This succinct, how-to manual provides readers with everything they need to prepare, publish, and present a scientific research paper. The expert authors address every aspect of the publication process, including quality and ethics in academic writing, the rules of authorship, grammar, formatting, style, and much more. Each consistently organized chapter begins with a brief summary and introduction and ends with up-to-date references and carefully selected suggestions for further reading.

Highlights:

- Numerous hints and tips appear throughout the text, such as advice on writing abstracts and information on how to get one's paper accepted at an international meeting
- Valuable examples of good and bad introductions, recommendations for using statistical data, and common pitfalls in the reporting of surgical results
- Easy-to-reference text boxes present Key Concepts, Jargon Simplified, and Reality Checks
- Detailed diagrams help readers visualize complex points



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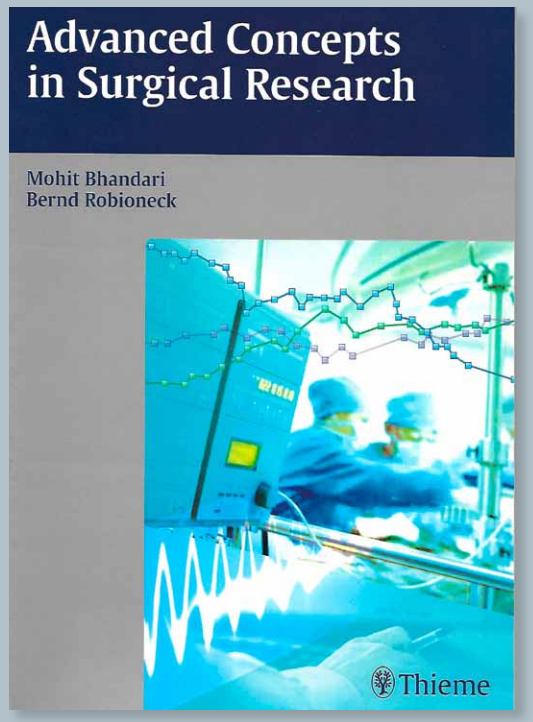

ADVANCED CONCEPTS IN SURGICAL RESEARCH
Editors: Mohit Bhandari and Bernd Robioneck
c) 2012 Georg Thieme Verlag

Summary Features:
Advanced Concepts in Surgical Research is a practical, reader-friendly guide to planning, conducting, and evaluating solid, evidence-based research that leads to high-quality results. Geared to the investigator who has already mastered basic principles, this book focuses on more advanced topics such as randomized controlled trials, survey design, observational studies, meta analysis, statistical concepts, reporting of data, and much more.

Highlights:
- Includes tips and insights from experienced surgical researchers on how to conduct an effective clinical study and avoid pitfalls
- Supplies hard-to-find information on current topics such as randomization systems and technology and publication bias
- Provides standardized, easy-to-reference text boxes with highlighted key concepts, on-the-spot definitions of terminology in Simplified Jargon sections, and real-world case examples from the literature
- Numerous illustrations and tables help the reader to visualize key concepts

Publications

Atesok K, Li R, Stewart DJ, Schemitsch EH. Endothelial Progenitor Cells Promote Fracture Healing in a Segmental Bone Defect Model. J Orthop Res 2010;28(8):1007-1014.

Den Hartog D, Van Lieshout EMM, Tuinebreijer WE, Polinder S, Van Beeck EF, Breederveld RS, Bronkhorst MWGA, Eerenberg JP, Rhemrev S, Roerdink WH, Schraa G, Van der Vis HM, Van Thiel TPH, Patka P, Nijs S, Schep NWL. Primary hemiarthroplasty versus conservative treatment for comminuted fractures of the proximal humerus in the elderly (ProCon): A Multicenter Randomized Controlled trial. BMC Musculoskeletal Disorders 2010;11:97.

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Atesok K, Li R, Schemitsch EH. Endothelial progenitor cells promote fracture healing in a segmental bone defect. American Academy of Orthopaedic Surgeons, New Orleans, Louisiana, March 2010. Oral Presentation.

Atesok K, Li R, Schemitsch EH. Endothelial progenitor cells promote fracture healing in a segmental bone defect. Orthopaedic Research Society, New Orleans, Louisiana, March 2010. Poster Presentation.

Atesok K, Li R, Schemitsch EH. The Use of Endothelial Progenitor Cells to Promote Bone Healing. A Rat Model Study. American Academy of Orthopaedic Surgeons 2010. New Orleans, LA. Poster Presentation.

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Bronkhorst MWGA, Patka P, van Lieshout EMM. Single Nucleotide Polymorphisms in MBL2 predispose to infectious complications in polytrauma patients. Deutscher Kongress für Orthopädie und Unfallchirurgie, Berlin, October 26-29, 2010. Oral Presentation.

Chow DHK, Cheung WH, Qin L, Leung KS. Enhanced bone remodeling mechanism in fracture healing by low-magnitude high-frequency vibration treatment. 56th Annual Meeting of the Orthopaedic Research Society. New Orleans, Louisiana. March 6-9, 2010. Poster Presentation.

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Diachkova GV, Stepanov RV, Diachkov KA, Korabelnikov MA. MRI Characteristics of Lower Leg Vessels and Muscles in Patients that Underwent Treatment with the Method of Transosseous Osteosynthsis for Closed Diaphyseal Tibial Fractures. Genij Ortopedii, Russia 2010. Oral Presentation.

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Fajardo M. Quantitative Assessment of the Bone Morphogenetic Protein Expression from Alternate Bone-Graft Harvesting Sites. AAOS Annual Meeting 2010, New Orleans, LA USA. Poster Presentation.

FLOW Investigators. Fluid Lavage of Open Wounds (FLOW): A Multicenter, Blinded, Factorial Pilot Trial Comparing Alternative Irrigating Solutions and Pressures in Patients with Open Fractures. American Academy of Orthopaedic Surgeons Annual Meeting, March 2010. Oral Presentation

FLOW Investigators. Fluid Lavage of Open Wounds (FLOW): A Multicenter, Blinded, Factorial Pilot Trial Comparing Alternative Irrigating Solutions and Pressures in Patients with Open Fractures. Canadian Orthopaedic Association Annual Meeting, June 2010. Oral Presentation

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Gonzalez Lizán F, Ruiz Ibán MA, Díaz Heredia J, et al. Liberación continua de factor de crecimiento endotelial vascular mediante una matriz de polímero de acido cítrico en un modelo de defecto óseo segmentario en tibia de conejos: 11º Congreso EFORT. Madrid, June 2-5, 2010. Oral presentatrion.

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Leung KS, Cheung WH, Tang N. A biomechanical study of the possible cause of atypical fractures in patients after long-term bisphosphonate treatment. The 12th Bienniel Conference International Society for Fracture Repair, London, UK, Sep 25-28, 2010. Oral presentation.

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Li R, Atesok K, Nauth A, Qamirani E, Wright D, Whyne CM, Schemitsch EH. Endothelial Progenitor Cells for Healing of Segmental Bone Defects: A Biomechanical and MicroCT Analysis. 2010 annual meeting of the Orthopaedic Trauma Society, Oct 2010 , Baltimore, MD. Oral Presentation.

Li R, Atesok K, Nauth A, Qamirani E, Wright D, Whyne CM, Schemitsch EH. Endothelial Progenitor Cells for Healing of Segmental Bone Defects: A Radiographic, Biomechanical, and MicroCT Analysis. 2010 annual meeting of the International Society for Fracture Repair, Sept 2010, London, England. Oral Presentation.

Li R, Atesok K, Nauth A, Wright D, Qamirani E, Whyne CM, Schemitsch EH. Effect of EPC-based therapy on fracture healing: a Radiographic, MicroCT and Biomechanical study in rats. ISFR, September 2010, London, UK. Oral Presentation.

Li R, Atesok K, Wright D, Nauth A, Whyne C, Schemitsch EH: Endothelial progenitor cells for healing of segmental bone defects: A radiographic, Micro CT, and biomechanical study in rats. Canadian Orthopaedic Association, Edmonton, Alberta, Jun 2010. Oral Presentation.

Li R, Nauth A, Qamirani E, Atesok K, Schemitsch EH. Endothelial Progenitor Cell Characterization and Growth Factor Expression in a Bone Defect Model. 2010 annual meeting of the International Society for Fracture Repair, Sept 2010, London, England. Oral Presentation.

Li R, Qamirani E, Atesok K, Aaron A, Wang X, Schemitsch EH. Endothelial Progenitor Cells for Fracture Healing: Expression of VEGF mRNA ISFR, September 2010, London, UK. Oral Presentation.

Li R, Schemitsch EH: The use of endothelial progenitor cells to promote bone healing in a segmental bone defect. International Society for Fracture Repair, London,UK, Sep 2010. Oral Presentation.

Nauth A, Li R, Atesok K, Wright D, Whyne C, Schemitsch EH. Endothelial progenitor cells for healing of segmental bone defects: a radiographic, microCT, and biomechanical study in rats. 12th Biennial Conference of the International Society for Fracture Repair, September 2010, London, England. Oral Presentation.

Nauth A, Li R, Qamirani E, Atesok K, Schemitsch EH. Expression of VEGF gene isoforms in a rat segmental bone defect model treated with endothelial progenitor cells. 12th Biennial Conference of the International Society for Fracture Repair, Sept 2010, London, England. Oral Presentation.

Nauth A, Li R, Schemitsch EH. Endothelial Progenitor Cells for Healing and Angiogenesis in a Segmental Bone Defect Model: A Comparison With Mesenchymal Stem Cells. Annual meeting of the Orthopaedic Trauma Society, Oct 2010, Baltimore, MD. Oral Presentation.

Nauth A, Li R, Schemitsch EH. Endothelial Progenitor Cells for Healing and Angiogenesis in a Segmental Bone Defect Model: A Comparison With Mesenchymal Stem Cells. Annual meeting of the International Society for Fracture Repair and Winner of Best Scientific Paper, Sept 2010, London, England. Oral Presentation.

Nauth A, Li R, Schemitsch EH. Endothelial Progenitor Cells for Healing and Angiogenesis in a Segmental Bone Defect Model: A Comparison With Mesenchymal Stem Cells. 56th annual meeting of the Orthopaedic Research Society, March 2010, New Orleans, LA. Oral Presentation.

Nauth A, Li R, Schemistsch EH. Endothelial Progenitor Cells for Healing and Angiogenesis in a Segmental Bone Defect Model: A Comparison With Mesenchymal Stem Cells. Annual meeting of the American Academy of Orthopaedic Surgeons, March 2010, New Orleans, LA. Oral Presentation.

Nauth A, Li R, Schemitsch EH. Endothelial progenitor cells (EPCs) for fracture healing and angiogenesis: A comparison with MSC's. American Academy of Orthopaedic Surgeons, New Orleans, Louisiana, March 2010. Oral Presentation.

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Nauth A, Schemitsch EH, Li R. Endothelial progenitor cells for healing and angiogenesis in a segmental bone defect model: A comparison with mesenchymal stem cells. Canadian Orthopaedic Association, Edmonton, Alberta, June 2010. Oral Presentation.

Kann in der 3. Spalte gekürzt werden?

Presentations

Qamirani E, Atesok K, Schemitsch EH: Expression of VEGF gene isoforms in a rat segmental bone defect model treated with endothelial progenitor cells. Combined Orthopaedic Research Society, Tokyo, Japan, October 2010. Oral Presentation.

Qamirani E, Atesok K, Schemitsch EH: Expression of VEGF gene isoforms in a rat segmental bone defect model treated with endothelial progenitor cells. International Society for Fracture Repair, London, UK, September 2010. Oral Presentation.

Ru L, Atesok K, Nauth A, Qamirani E, Wright D, Whyne C, Schemitsch EH: Endohelial progenitor cells for healing of segmental bone defects. Orthopaedic Trauma Association, Baltimore, Maryland, October 2010. Oral Presentation.

Ruiz Ibán M. Lecture in 11º Congreso EFORT / 47 Congreso SECOT. Madrid. 2-5 de junio de 2010. Uso de factor de crecimiento endotelial vascular en liberación continua para conseguir la integración de un aloinjerto cortical de tibia en un modelo de conejo. Oral Presentation.

Sanders DW, Tieszer C, Corbett B, COTS. Operative versus Nonoperative Treatment of Unstable Lateral Malleolar Fractures: A Randomized, Multi-Centre Trial. Orthopedic Trauma Association Meeting, Baltimore, MD, USA. October 2010. Podium Presentation.

Slobogean GP, Sanders D, COTS. When is Plate Fixation for Undisplaced, Unstable Fibular fractures Cost Effective? Results from a Multicentre Randomized Control Trial. Orthopedic Trauma Association Meeting, Baltimore, MD USA. October 2010 Poster Presentation.

Van Raaij T. Same level fibular plating versus not plating in distal metaphyseal tibia fractures treated with intramedullary nails: a randomized trial OTC Research Symposium (June 2010, Amsterdam, the Netherlands). Oral Presentation.

Boyce B, Lindsey B, Clovis NB, Smith ES, Hubbard D, Li B. Synergetic effects of exogenous IL-12 supplementation and antibiotic treatment in prophylaxis of implant-associated infection. Orthopaedic Research Society (ORS) Annual Meeting, Long Beach, California, January 2011. Oral presentation.

Bronkhorst MWGA, Patka P, van Lieshout EMM. MBL2 gene polymorphisms influence infectious outcome in polytrauma patients. 12th European Congress of Trauma & Emergency Surgery, Milan, Italy, April 27-30, 2011. Oral Presentation.

Diachkova GV, Mitina YuL, Diachkov KA, Barardzieva AN, Stepanov RV, Skripkin EV, Alexandrov YuM, Akulenko AV. Clinical aspects of current radiological diagnosis in traumatology and orthopaedics. Ilizarov Readings: scientific and practical conference with international participation, Kurgan, Russia, June 8-10, 2011. Oral Presentation.

Dishowitz M, Bostics SA, Terkhorn SP, Combs JA, Hankenson KD. Notch Signaling is Enhanced During Endochondral Bone Regeneration Relative to Intramembranous Regeneration. Tansactions of the Orthopaedic Research Society, Long Beach, CA, 2011. Oral Presentation.

Hamza T, Pham D, Dietz M, Tidwell J, Jones A, Clovis N, Smith S, Li B. Intracellular Staphylococcus aureus infection: In vivo evidence for chronic osteomyelitis disease. Orthopaedic Research Society (ORS) Annual Meeting, Long Beach, California, January 2011. Poster presentation.

Henkenbehrens C, Alt V, Lips K, Muhrer D, Sommer U, Domann E, Schnettler R. A new animal model for implant-associated infected non-unions of the tibia and bacteria detection with fluorescence in situ hybridization. eCM Meeting, Davos 2011. eCM Young Investigator Conference Award. Oral Presentation.

Kuzyk PR, Schemitsch EH, Davies JE. A Biodegradable Scaffold for the Treatment of a Diaphyseal Bone Defect of the Tibia. Osteosynthesis and Trauma Care Foundation Leadership Forum. Madrid, Spain, June, 2011. Oral Presentation.

Li R, Qamirani E, Atesok K, Nauth A, Wang S, Li C, Schemitsch EH. Expression of VEGF mRNA in a rat segmental bone defect model treated with endothelial progenitor cells. Canadian Orthopaedic Association, St. John's, Newfoundland, July 2011. Oral Presentation.

Li R, Qamirani E, Nauth A, Atesok K, Schemitsch EH. VEGF mRNA expression in EPC local therapy for a rat segmental bone defect. Orthopaedic Trauma Association, San Antonio, Texas, October 2011. Oral Presentation.

Meylaerts SAG. Polsen en platen, resultaten van de Minimax studie. Gevorderden symposium Traumachirurgie "Once upon a time in the West…" June 9-10, 2011, Noordwijk, The Netherlands. Oral Presentation.

Mok JM, Hansen EN, Kandemir U: Measurement of Intramuscular Tissue Oxygenation During Compartment Syndrome in a Dog Model. Podium Presentation. Society of Military Orthopaedic Surgeons 53rd Annual Meeting, San Diego, California, December 12-16, 2011. Oral Presentation.

Nauth A, Li R, Qamirani E, Atesok K, Schemitsch EH. Expression of VEGF isoforms in a rat segmental bone defect model treated with EPCs. Paper presentation at the 27th Annual Meeting of the Orthopaedic Trauma Association, October 2011, San Antonio, TX. Oral Presentation.

Nauth A, Li R, Atesok K, Wright D, Whyne C, Schemitsch EH. Endothelial progenitor cells for healing of segmental bone defects: a radiographic, microCT, and biomechanical study. Paper presentation at the 2011 Annual Meeting of the American Academy of Orthopaedic Surgeons, February 2011, San Diego, CA. Oral Presentation.

Nauth A, Li R, Qamirani E, Atesok K, Schemitsch EH. Expression of VEGF and BMP gene isoforms in a rat segmental bone defect model treated with endothelial progenitor cells. Paper presentation at the 2011 Annual Meeting of the American Academy of Orthopaedic Surgeons, February 2011, San Diego, CA. Oral Presentation.

Sanders DW, Tieszer C, Corbett B, COTS. Operative versus Nonoperative Treatment of Unstable Lateral Malleolar Fractures: A Randomized, Multicenter Trial. 27th Annual Meeting of AOFAS, Keystone, CO, July 13-16, 2011. Oral Presentation.

Presentations

Slobogean G, Sanders DW. Cost Effectiveness of Plate Fixation for Unstable but Undisplaced Lateral Malleolus Fractures. 77th Annual Meeting of the American Academy of Orthopaedic Surgeons, San Diego, CA, February 15-19, 2011. Poster Preseantation,

Van der Stok J, De Haas MFP, Van der Jagt OP, Van Lieshout EMM, Patka P, Verhaar JAN, Weinans H. Titanium foam in segmental defects of rat femora. 2011 EORS Annual meeting. Oral Presentation.

Wai Ching Chin, Kwok Sui Leung, Gang Li, Ling Qin, Wing Hoi Cheung. The Systemic Recruitment of Mesenchymal Stem Cells (MSCs) is Accelerated by Low Intensity Pulsed Ultrasound (LIPUS) to Enhance Fracture Healing. The 31st Annual Congress of the Hong Kong Orthopaedic Association (Hong Kong, China, November 19-20, 2011). Poster Presentation.

Wai Ching Chin, Kwok Sui Leung, Gang Li, Ling. Increased Systemic Recruitment of Mesenchymal Stem Cells (MSCs) And Enhanced Fracture Healing Augmented by Low Intensity Pulsed Ultrasound (LIPUS). 6th International Congress of Chinese Orthopaedic Association. (Beijing, China, December 1-4, 2011). Poster presentation.

Aurégan JC, Danoff JR, Coyle R, Burky R, Akelina Y, Rosenwasser MP. Consequence of Soft Callus Preservation During Open Reduction and Internal Fixation in a Rat Model of Fracture. Annual Meeting of the French Society of Orthopedic Surgery and Traumatology (SOFCOT), Paris, France, November 2012. Award: Prix editorial Elsevier Masson (2nd place). Oral Presentation.

Ali A, Burks B, Kim R, Taylor M, Laz PJ. Modelling hip fracture considering intersubject variability in shape and intensity. European Society of Biomechanics, Lisbon, Portugal, 2012. Oral Presentation.

Keizer J, Moojen M, Meylaerts S. Resultaten van de Minimax studie; volaire plaatosteosynthese versus externe fixateur als behandeling van een type C distale radius fractuur bij de oudere patiënt in Nederland. Traumadagen 2012, 1 november 2012, Amsterdam, The Netherlands (oral presentation).

Li R, Nauth A, Li C, Atesok K, Schemitsch EH: BMP-2 mRNA expression after endothelial progenitor cell therapy for fracture healing. American Academy of Orthopaedic Surgeons, San Francisco, California, February 2012. Oral Presentation.

Li R, Nauth A, Gandhi R, Syed K, Schemitsch EH. BMP-2 mRNA expression after endothelial progenitor cell therapy for fracture healing. Orthopaedic Trauma Association, Minneapolis, Minnesota, October 2012. Oral Presentation.

MacLeod A, Pankaj P, Simpson H. Choosing An Appropriate Screw Configuration For Osteoporotic Long Bone Fractures. European Society of Biomechanics, Lisbon, 2012. Oral Presentation.

MacLeod A, Pankaj P, Simpson H. A Finite Element Comparison of Locking Plate and Compression Plate Fracture Fixation, Computer Methods in Biomechanics and Biomedical Engineering, Berlin, 2012. oOal Presentation.

MacLeod A, Pankaj P, Simpson H. Screw-Bone Interface Modelling in Locking Plate FE Models. Computer Methods in Biomechanics and Biomedical Engineering, Berlin, 2012. Oral Presentation.

McKee MD, Pelet S, Vicente MR, Canadian Orthopaedic Trauma Society (COTS). Operative versus Nonoperative Treatment of Acute Dislocations of the Acromioclavicular Joint: Results of a Multi-centre Randomized, Prospective Clinical Trial. OTA Annual meeting, October 2012, Minneapolis, MN. Oral Presentation.

McKee MD, Pelet S, Vicente MR, Canadian Orthopaedic Trauma Society (COTS). Operative versus Non-operative Treatment of Acute Dislocations of the Acromio-clavicular Joint: Results of a Multi-centre Randomized, Prospective Clinical Trial. ASES Annual Meeting (Closed), Sea Island, Georgia, October 2012. Oral Presentation.

Mok JM, Hansen EN, Kandemir U: Measurement of Intramuscular Tissue Oxygenation During Compartment Syndrome in a Dog Model. Podium Presentation. American Academy of Orthopaedic Surgeons Annual Meeting, San Francisco, California, February 7-11, 2012. Oral Presentation.

Nauth A, Li R, Purushuttam R, Qamirani E, Schemitsch EH: Fracture healing with endothelial progenitor cells (EPCs) in a bone defect model: A micro CT and biomechanical comparison with mesenchymal stem cells (MSCs). Canadian Orthopaedic Association, Ottawa, Ontario, Jun 2012. (oral)

Nauth A, Li R, Ghandi R, Syed K, Schemitsch EH. BMP-2 mRNA Expression during Endothelial Progenitor Cell Therapy for Fracture Healing. 28th Annual Meeting of the Orthopaedic Trauma Association, Oct 2012, Minneapolis, MN. Oral Presentation.

Nauth A, Li R, Li C, Atesok K, Schemitsch EH. BMP-2 mRNA Expression during Endothelial Progenitor Cell Therapy for Fracture Healing. Annual Meeting of the American Academy of Orthopaedic Surgeons, Feb 2012, San Francisco, CA. Oral Presentation.

Schmidt U, Bachmaier S, Penzkofer R, Augat P. Analysis of four different distal femur locking plates. 13th biennial conference of ISFR (International society of fracture repair). November 6-9, 2012, Kyoto, Japan. Oral presentation.

Van der Stok J, De Haas MFP, Van der Jagt OP, Amin Yavari S, Zadpoor AA, Waarsing JH, Van Lieshout EMM, Patka P, Verhaar JAN, Weinans H. Porous titanium as a treatment for large segmental bone defects. 2012 ORS Annual meeting. Poster Presentation.

Wai Ching Chin, Kwok Sui Leung, Gang Li, Ling Qin, Wing Hoi Cheung. Low Intensity Pulsed Ultrasound (LIPUS) Accelerates Systemic Recruitment of Mesenchymal Stem Cells (MSCs) for Fracture Healing. Annual Meeting Orthopaedic Research Society. San Francisco, California, USA, February 4-7, 2012). Oral Presentation.

Abou-Khalil et al. and Colnot. Role of Muscle Stem Cells in Skeletal Regeneration“ American Society of Bone and Mineral Research, Baltimore, USA, 2013 (New Investigator Award). Oral Presentation.

Aurégan JC, Danoff JR, Coyle R, Burky R, Akelina Y, Rosenwasser MP. Influence of Soft Callus Protection and Replacement During Open Reduction and Internal Fixation: An Experimental Study in a Rat Model of Fracture. 14th European Federation of National Associations of Orthopaedics

Presentations

and Traumatology (EFORT) Congress, Istanbul, Turkey, June 2013. Oral Presentation.

Ali AA, Cristofolini L, Schileo E, Kim RH, Rullkoetter PJ, Laz P. Subject-specific modeling of hip fracture and repair using the extended finite element method. Proceedings of the 11th International Symposium, Computer Methods in Biomechanics and Biomedical Engineering, April 2013, Salt Lake City, Utah, USA. Oral Presentation.

Ali A, Kim R, Taylor M, Rullkoetter PJ Laz PJ. Computational Framework for Subject-Specific Evaluations of Hip Fracture and Repair. Transactions of the Annual Meeting of the Orthopaedic Research Society, San Antonio, TX, 2013. Poster Presentation.

Bastian O, A. Kuijer, L. Koenderman, W. Van Solinge, T. Blokhuis, L. Leenen. A decreased peripheral blood leukocyte count during the first two weeks after major trauma is associated with impaired fracture healing. European Congress of Trauma and Emergency Surgery, Lyon, France May 2013. Oral Presentation.

Bastian O, A. Kuijer, L. Koenderman, W. Van Solinge, T. Blokhuis, L. Leenen. A decreased peripheral blood leukocyte count during the first two weeks after major trauma is associated with impaired fracture healing. Symposium of Dutch Experimental Research in Surgical Specialties (SEOHS) 2013. Oral Presentation.

Bastian O, A. Kuijer, L. Koenderman, W. Van Solinge, T. Blokhuis, L. Leenen. A decreased peripheral blood leukocyte count during the first two weeks after major trauma is associated with impaired fracture healing. Dutch Society of Immunology Symposium (NVVI) 2013. Poster Presentation.

Chung SL, Leung KS, Mok HW, Hung WY, Choy TK, Cheung WH. Long-term bisphosphonate intake suppressed bone remodelling markers in osteoporosis patients. 2013 Annual Meeting of Orthopaedic Research Society. San Antonio, USA. Jan 26-29, 2013. Poster Presentation.

Colnot et al. Cellular and Molecular Bases of Skeletal Regeneration: what can we learn from mouse models? French Society of Rehabilitation Medicine, Montpellier, France, 2013. Oral Presentation.

Epari DR. Mechanical Testing of Locked Plate Fracture Fixation Constructs: Limitations of Previous Methodologies. Australian Orthopaedic Association, Annual Scientific Meeting, Darwin, October 2013. Oral Presentation.

Iordens GIT, Van Lieshout EMM, Schep NWL, Tuinebreijer WE, De Haan J, Patka P, Den Hartog D. Een dynamische fixateur in de behandeling van complexe elleboogdislocaties. NVT Assistentensymposium, January 25, 2013, Soestduinen, The Netherlands. Oral Presentation.

Iordens GIT, Schep NWL, Van Lieshout EMM, Tuinebreijer W, De Haan J, Patka P, Verhofstad MHJ, Den Hartog D. Een dynamische fixateur, een goede behandeling voor een complexe ellebooglуxatie. Annual Meeting of the Dutch Trauma Society, November 7-8, 2013, Amsterdam, The Netherlands. Oral Presentation.

Keizer J, Meylaerts SAG. A multicenter randomized trial for displaced C-type fractures of the distal radius in an elderly population; external fixation versus locked volar plating. 14th European Congress of Trauma & Emergency Surgery, May 4-7 2013, Lyon/France. Oral Presentation.

McKee MD, Pelet S, Vicente MR, Canadian Orthopaedic Trauma Society (COTS). Operative versus Nonoperative Treatment of Acute Dislocations of the Acromioclavicular Joint: Results of a Multi-centre Randomized, Prospective Clinical Trial. AAOS: OTA Specialty day, March 2013, Chicago, IL. Oral Presentation.

McKee MD, Pelet S, Vicente MR, Canadian Orthopaedic Trauma Society (COTS). Operative versus Non-operative Treatment of Acute Dislocations of the Acromio-clavicular Joint: Results of a Multi-centre Randomized, Prospective Clinical Trial. AAOS Annual Meeting, March 2013, Chicago, IL. Poster Presentation.

Nauth A. Stem Cell Populations for Fracture Healing: Which Ones are Most Useful? Annual Meeting of the Orthopaedic Trauma Association, October 2013, Phoenix, AZ. Oral Presentation

Nauth A. Fracture Healing With Endothelial Progenitor Cells (EPCs) in a Bone Defect Model: A Comparison with Mesenchymal Stem Cells (MSCs). Founders Medal Award Presentation at the 2013 Annual Meeting of the Canadian Orthopaedic Association, Jun 2013, Winnipeg, MB. Oral Presentation.

Nauth A, Li R, Purushuttam R, Qamirani E, Schemitsch EH. Fracture Healing With Endothelial Progenitor Cells (EPCs) in a Bone Defect Model: A MicroCT and Biomechanical Comparison with Mesenchymal Stem Cells (MSCs). Annual Meeting of the Orthopaedic Research Society, Jan 2013, San Antonio, TX. Oral Presentation.

MacLeod A, Pankaj P, Simpson H. Axial compression tests of plated bone: A numerical study to investigate the effect of loading conditions on the mechanical response, European Society of Biomechanics, Patras, 2013. Oral Presentation.

MacLeod AR, Pankaj P, Simpson AHRW. Finite Element Modelling of the Femur and Implant Failure Prediction: the Sensitivity to Restraint Conditions at the Hip, Institution of Mechanical Engineers: Knee surgery and rehabilitation in 2013. November 2013, London, UK. Oral Presentation.

Abou-Khalil et al. and Colnot. Role of muscle stem cells during bone regeneration. International Bone and Mineral Society, Brugge, Belgium, March 2014. Oral Presentation.

Ali AA, Hu H, Cristofolini L, Schileo E, Kim RH, Rullkoetter PJ, Laz PJ. Variability in load transfer in specimen-specific models of repaired hip fractures. Annual Meeting of the Orthopaedic Research Society, New Orleans, LA, 2014. Poster Presentation.

Danoff JR, Auregan JC, Coyle R, Burky R, Rosenwasser MP. Augmentation of Fracture Healing Using Soft Callus. 16th Annual OREF/ORS Northeast Regional Resident Research Symposium, New York, NY, June 2014. Podium Presentation.

Iordens GIT, Den Hartog D, Van Lieshout EMM, Tuinebreijer WE, De Haan J, Patka P, Verhofstad MHJ, Schep NWL (On behalf of the Dutch Elbow Collaborative*). Functional recovery of complex elbow dislocations treated with a hinged external elbow fixator; results of a multicenter prospective study. SECEC 2014, September 17-20, 2014, Istanbul, Turkey. Poster Presentation.

Presentations

Iordens GIT, Den Hartog D, Van Lieshout EMM, Tuinebreijer WE, De Haan J, Patka P, Verhofstad MHJ, Schep NWL (On behalf of the Dutch Elbow Collaborative*) Functional recovery of complex elbow dislocations treated with a hinged external elbow fixator; results of a multicenter prospective study. OTA 2014, October 15-18, 2014, Tampa, Florida, US. Poster Presentation.

Keizer J, Meylaerts SAG. "A multicenter randomized trial for displaced C-type fractures of the distal radius in an elderly population; external fixation versus locked volar plating." Medical Center Haaglanden, Research day 2014, November 2014, The Hague, The Netherlands. Oral Presentation.

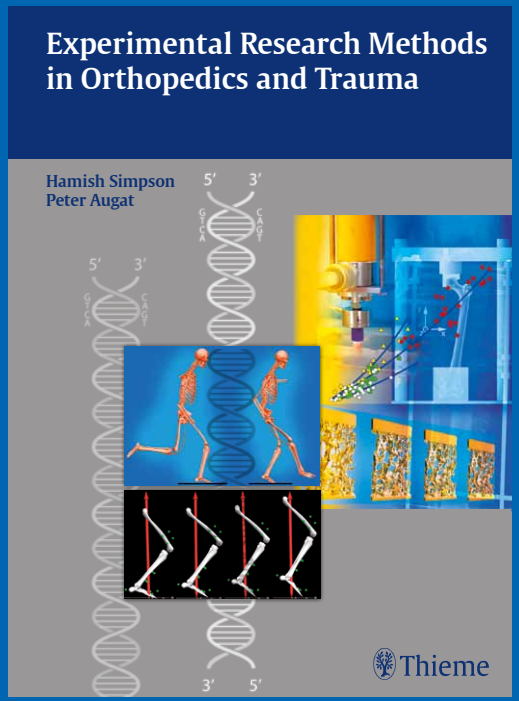
Kuijer A, O. Bastian, L. Koenderman, W. Van Solinge, T. Blokhuis, L. Leenen. Impaired bone healing in multitrauma patients is associated with an altered systemic immune response to severe injury. International Student Congress of Medical Sciences (ISCOM) 2014, June 5th, Breaking News Session. Oral Presentation.

Alisdair R. MacLeod, Pankaj Pankaj, A. Hamish R.W. Simpson. A simple analytical tool to optimise locking plate configuration. 7th World Congress of Biomechanics, July 2014, Boston, USA. Poster Presentation.

Pankaj P. Patient-specific modelling of bone and bone-implant systems: The challenges. 7th World Congress of Biomechanics, July 2014, Boston, USA. Oral Presentation.

Rosenwasser MP, Danoff JR, Aurégan JC, Coyle R, Burky R. The Impact of Fracture Hematoma on Healing. Scientific Symposium, Department of Trauma and Experimental Surgery, University Hospital of Giessen and Marburg GmbH, Giessen, Germany, September 2014. Podium Presentation.

OTCF Research Program Outlook 2015-2016



2015 BOOK PUBLICATION PROJECT OF THE RESEARCH COMMITTEE

OTCF Research Program Outlook 2015-2016

OTCF RESEARCH WORKSHOPS IN PREPARATION

A new two-year cycle of workshops is being organized around the "hot topic" of two alternative surgical interventions: IM Nailing and Plating.

OTCF WORKSHOP ON COMPLICATIONS OF IM NAILING: EVOLUTION OF TREATMENT, NOV 2-3, 2015, ZÜRICH

The workshop organizers are Theodore Miclau, Volker Alt and Hamish Simpson. They invite interested surgeons and scientists on these topics:

- Infection
- Malalignment
- Systemic
- Technique-related complications
- Nonunion
- New applications for IM nailing

The summary and conclusions of the workshop will be published as an INJURY supplement. These will also determine the research areas eligible for the 2016 research grant cycle.

Those interested kindly contact research@otcfoundation.org

OTCF WORKSHOP ON COMPLICATIONS OF PLATING: EVOLUTION OF TREATMENT, NOV 2016, PLACE TO BE CONFIRMED

The workshop will be organized by Research Committee members. List of topics to be advertised in due course.

OTCF RESEARCH GRANT CYCLE 2015

Emanating from the OTCF Workshop on "Osteoporotic Fractures – The Mechanical Perspective" held in Boston, 17-18 November 2014, the Research Committee invites proposals for the 2015 Research Grants cycle in the following areas of research:

- Assessing Failure Risk of Fracture Fixation in Osteoporotic Bone
- Augmentation of Fixation in Osteoporotic Bone
- Modeling of Fracture Fixation in Osteoporotic Bone
- Evaluation of Healing in Aging and Osteoporosis

Timelines for the 2015 grant process:

- **December 15, 2014:** OTC website opens for download of 2015 Administrative Procedures and 2015 Proposal Application Forms
- **April 15, 2015: Deadline for submission of Proposals**
- **July 15, 2015:** Grant award notifications

For more information on the application process please consult the OTCF website at **www.otcfoundation.org.**

For further question please contact **research.grants@otcfoundation.org.**

OTC Foundation at a Glance

The OTC Foundation (OTCF) is a non-profit Swiss Foundation incorporated in the Canton of Solothurn, Switzerland. In 2007 Stryker Trauma SA founded OTCF and has been its main sponsor ever since. With funding based primarily on grants and related donations and as a legally independent entity, OTCF complies with all restrictions and/or financial limitations. Such funding may contain very specific allocations or restrictions regarding how the funding may be spent or allocated. All funding is tied to specific work plans and budgets that were independently generated by the Health Care Professionals who participate in OTC Foundation Activities.

Today the OTC is an interactive global network of surgeons and scientists, dedicated to the advancement of osteosynthesis and trauma care through education, research and professional networking. The common goal is to attract both, younger and experienced professionals, that strive to be competent in the fields of fragility fractures and osteoporosis and related surgical interventions.

Activities of the OTC Foundation
The program objective of the OTC Foundation is to undertake, support and promote the global advancement of osteosynthesis and trauma care through, but without limitation to, education, training, research, scientific studies, symposia, publications, and evidence-based clinical practices. All activities are designed to reflect, fulfill and advance the stated mission of the OTC Foundation to advance Osteosynthesis and Trauma Care.

The OTC Chapter Presidents through the General Assembly mechanism oversee educational activities in their chapters and support their educational programs. Courses take place worldwide at local hospital centers. Other activities include an annual Leadership Forum and regional events, and a visiting travel grant program.

The OTCF Research Committee (RECO) guides significant global research grants, research courses and international symposia pertaining to osteosynthesis and trauma care. Research activities cover methodology publications such as books, and research supplements to international journals.

The OTC Global Alliance is made up of the OTC Foundation and 20 independent Chapters located around the world. The OTC Chapters are mainly locally-funded entities that focus on education, offering a wide array of established local courses. Where needed, the OTC Foundation provides direct support to OTC Chapters in their activities. The General Assembly of Chapter Presidents oversees this program.

The OTCF Research Program
The objective of this program is to stimulate scientific studies in support of evidence-based research in surgical practice. Knowledge expansion is considered as key to solving clinical problems and improving outcomes in orthopaedic trauma care. Support of pre-clinical, basic, biomechanical, experimental, and translational research is the main focus of the program.
The trends in development of trauma care technology are governed by the increase in the aging population, particularly in industrialized countries. The OTCF Research Program aims at mobilizing more resources being allocated to pre-clinical musculoskeletal research.

The translational research program develops around selected “Hot Topics” and consists of four key activity components:

- Reviews and analysis of the scientific literature on the selected topic
- Symposia convened on an annual basis as multidisciplinary workshops focusing on the selected “hot topic” and bringing together surgeons and scientists
- Provision of research grants for funding scientific studies related to that topic
- Stimulation of publications, individual books or in form of supplements to scientific journals

!!! Textüberhang

OTC Osteosynthesis & Trauma Care Foundation

www.otcfoundation.org

The OTC Research program is supported by a grant from Stryker.

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