Department of Orthopedics in the Waldkrankenhaus St. Marien gGmbH

Chair of Orthopedics and Orthopedic Surgery

Address
Rathsbergerstraße 57
91054 Erlangen
Phone: +49 9131 8223303
Fax: +49 9131 8523565
www.orthopaedie.med.uni-erlangen.de

Director
Prof. Dr. med. Raimund Forst

Contact
PD Dr. med. Albert Fujak
Phone: +49 9131 8223303
Fax: +49 9131 8523565
elke.jalladi@ortho.med.uni-erlangen.de

Research Focus
• Radiostereometric analysis (RSA) for quality control in total hip and knee arthroplasty
• Neuromuscular disorders
• Computer assisted surgery of the hip joint
• Computertomography-assisted periprosthetic osteodensitometry after total hip arthroplasty (THA)

Structure of the Department
Professorships: 1
Personnel: 8
• Doctors (of Medicine): 4
• Graduate students: 47

Clinical focus areas
• Hip knee and shoulder arthroplasty
• Knee and shoulder surgery
• Arthroscopic surgery
• Foot surgery
• Pediatric orthopedics
• Neuromuscular disorders
• Conservative and technical orthopedics
• Orthopedic pain management

Research
The clinical and experimental investigations of total hip and knee arthroplasty form the main focus of the research at the Department of Orthopedics. Another main focus is research for neuromuscular disorders. Information and experiences about seldom neuromuscular disorders are collected and analyzed in clinical studies. Another important area is the development of diagnostic procedures like e.g. of mobile gait and posture analysis.

Radiostereometric analysis (RSA) for quality control in total hip and knee arthroplasty
Pl: Prof. Dr. R. Forst, Dr. S. Sesselmann

Typical RSA radiography of an artificial knee joint
On the left picture the contour of the implant is marked red for model-based RSA purpose, on the right picture the 3D model of the implant coincides the contour. The various colored circles focus on small tamanal markers that serve calibration on the one hand and function as bone and implant markers for marker-based RSA on the other hand.

Neuromuscular disorders
Pl: Prof. Dr. J. Forst, Prof. Dr. A. Fujak, Prof. Dr. R. Forst
The research group for neuromuscular disorders is engaged in an evaluation of orthopedic symptoms, conservative and operative treatment in children and adult patients with neuromuscular disorders. The aim of research is the optimization of orthopedic treatment, improvement of the medical care and quality of life of these patients. The studies are particularly focused on anterior horn cell diseases, spinal muscular atrophies, post-polio syndromes, Duchenne muscular dystrophy, spinal muscular atrophies, and muscular dystrophies. Although knowledge of the gene defect and the coded protein – the dystrophin – is given, there is no causal therapy of Duchenne muscular dystrophy (DMD) – the most common neuromuscular disease. The natural history of this disease includes beside the obligatory restrictive respiratory insufficiency the contractures of the extremities and progressive scoliosis in almost all patients.

The results of operative treatment of contractures of lower extremities particularly in early course of the disease are investigated in a prospective study in a collective of more 500 patients with genetically confirmed diagnosis of DMD. Positive effect of this treatment could be proven, and a stage-oriented therapy concept could be developed.

In close cooperation with the Department of Anesthesiology, the special features in anesthesiology and pain therapy in patients with the neuromuscular disorders are investigated. In common projects with the Division of Pediatric Cardiology and the Institute of Radiology, the participation of the heart musculature in DMD is examined.

Mobile gait and posture analysis
Pl: Prof. Dr. R. Forst, Prof. Dr. S. Sesselmann
Video-based gait and posture analysis gains importance in diagnostics and therapeutic monitoring of gait and posture disturbances. Well-established systems for gait and posture analysis in general are expensive and installed stationary in special laboratories. Therefore such laboratories mostly are built up in special research centers. Hence, applying gait and posture analysis in routine is currently hardly realizable.

The main goal of this study is to establish a cost-efficient (less than 10,000 Euro) system for gait and posture analysis that can be set up easily in diverse surroundings.

The mobile gait and posture measurement system allows accuracy values of 0.46° for angles, 0.21 cm for lengths and 0.24 cm for heights. Changes of gait and posture caused by orthopedic devices are quantified and standards for therapeutic monitoring are set up to realize a routine use for gait and posture analysis in future.
für Lehre of FAU, a „Scientific Speed Dating“ is arranged to bring students in contact to researchers and companies of the health care sector. Interdisciplinary lectures and seminars are held for medical students and students of medical engineering. Bachelor’s and Master’s theses of the Faculty of Engineering and doctoral theses are supervised.

Selected Publications


Teaching

The Department of Orthopedics organizes compulsory and elective subjects for medical students. Supported by the Deutsche Arthrose-Hilfe, „Orthopädie Summer/Winter Schools“ are organized each semester. In cooperation with the Central Institute of Medical Engineering (ZiMT) and supported by the Innovationsfonds

Scene of a gate analysis video sequence with the mobile equipment installed in the patients’ yard of the hospital

The flexion angle between the elongated femur axis and the shank axis was determined.

Computedtormography-assisted periprosthetic osteodensitometry after total hip arthroplasty (THA)

Pl: Prof. Dr. R. Forst, Dr. S. Sesselmann

The reaction of the bone which occurs after THA is important for the stability of the implant and thus the long term prognosis. This study was designed to analyze the changes of femoral and periacetabular bone after THA, introducing a novel method of CT-assisted bone density measurement in vivo. A special software tool is used (CAPPa postOP, CAS Innovations AG Erlangen) which allows for a separate view of femoral and acetabular bone. CT-investigations are performed ten days, one, three, five, and ten years post-operatively. Cortical and cancellous bone density as well as bone area and bone-implant contact are measured. Bone density measurements are undertaken in respect to fixation methods (cemented/uncemented), coating (e.g. hydroxyapatite), and design (collum femoris preserving/standard).