University Hospital

Department of Trauma and Orthopedic Surgery

Chair of Trauma and Orthopedic Surgery

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Research Focus
- 3-D-Imaging, Navigation, Robotics
- Immune Response after Trauma and during Sepsis
- Geriatric Trauma Surgery
- Cartilage Research/ Regeneration
- Biomechanics
- Healthcare Research/ Clinical Studies

Structure of the Department

Professorships: 3
Personnel: 47
- MD: 30
- Graduate Students: 10

Clinical Focus Areas
- Acute Trauma
- Geriatric Trauma Surgery
- Arthroscopic Surgery
- Pelvic Surgery
- Berufsgenossenschaftliches Heilverfahren
- Endoprosthetics
- Pediatric Trauma Surgery
- Septic Surgery
- Spine surgery

Research

The research activities of the Department of Trauma and Orthopedic Surgery are wide-ranging and include both clinical and experimental studies. The focus lies on the diagnosis and therapy of diseases of the musculoskeletal system. The following areas represent the focal points of our scientific commitment.

3-D-Imaging, Navigation, Robotics
PI: Dr. Keil, Prof. Perl
Computer-assisted surgery offers solutions to assist the surgeon pre- or intraoperatively in planning and performing surgery. This includes innovative approaches to intraoperative imaging, especially 3D imaging, as well as automated analysis of the acquired image data. Based on these image data, radiation-free visualization of implants and instruments can be realized with surgical navigation. These data can also be used for robotically assisted surgery, in which individual steps of operations are automated. The research group is concerned with the analysis of these techniques with regard to objectifiable advantages for the patient and the surgical team, as well as with further development in close cooperation with industry.

Immune Response after Trauma and during Sepsis
PI: Prof. Kalbitz, Dr. Lackner, Prof. Perl
The immune response after trauma is being investigated in several clinical studies in the Department of Trauma and Orthopedic Surgery. Close immune monitoring is performed on site in polytraumatized patients. This is closely linked to preclinical research.
The Department of Trauma and Orthopedic Surgery also participates in the stocking of the national serum bank as part of the Trauma Research Network (NTF). In which serum and clinical data of polytrauma patients are collected at different time points. Due to the distribution of study centers throughout Germany, a large number of serum samples can thus be collected and evaluated decentrally on the basis of a wide variety of questions. In another collaborative research project of the Department of Trauma and Orthopedic Surgery biomarkers for the follow-up of immune dysfunction and therapy after blast injuries or pulmonary contusion are being investigated. This is a particularly relevant field of research, since almost half of all severely injured patients have chest trauma.
With the appointment of Professor Kalbitz to the W2 professorship in Traumaimmunology, research of systemic inflammation after trauma and during sepsis and its effects on various organs and organ systems will be further expanded. One focus here lies on post-traumatic and septic cardiac dysfunction.

Geriatric Trauma Surgery
PI: Prof. Palm, Dr. Kopschina
Geriatric traumatology is one focus in the daily routine of the Department of Trauma and Orthopedic Surgery. The clinic is involved in two multicenter studies, including research of the treatment of pertrochanteric femur fractures. We expect that the clinical care of geriatric patients can be further improved by the new gained knowledge and the establishment of specialized interdisciplinary multi-professional therapy concepts.

Cartilage Research/ Regeneration
PI: Dr. Söllner, Dr. Schmidt, Prof. Gelse
In the clinical field of trauma surgery and orthopedics, patients present with a wide variety of joint problems. A large part of the symptoms can often be attributed back to wear and tear of the articular cartilage substance. Clinical and experimental research on cartilage cells and endogenous regeneration processes of the body's own cartilage are the basis for a promising alternative therapy to artificial joint replacement or other invasive interventions.

Biomechanics
PI: Dr. Schmidt, Prof. Palm
Through basic and application-oriented research in the field of (trauma)orthopedic biomechanics, the Department of Trauma and Orthopedic Surgery aims to ensure the best possible care for our patients. The research of movement sequences and the associated mechanical forces, taking into account the anatomical conditions, enables patient-oriented, individual therapy from sports injuries to joint replacement.

Healthcare Research/ Clinical Studies
PI: Prof. Perl, Prof. Palm, U. Perl, Dr. Pressmar
As a supraregional trauma center of the German Society for Trauma Surgery and SAV Clinic of the German Social Accident Insurance Institutions, the Department of Trauma and Orthopedic Surgery attaches great importance to health care research. Therefore, we conduct - concertedly via our clinical study center - various clinical studies to achieve an optimal, state-of-the-art quality of care for our patients.
In the future, pediatric traumatology will also be integrated into health services research with various projects.

Teaching

The Department of Trauma and Orthopedic Surgery participates in curricular teaching and offers numerous required and elective courses in human and dental medicine and medical technology. Particularly noteworthy is the interdisciplinary teaching in the context of the exam preparation courses. In recent years, the digitization of teaching in particular has been advanced. For example, the block practicum and EKM course as well as the lecture are provided in online format. In addition, various examination videos are available online.
Of course, numerous medical doctorates are constantly supervised.

Selected Publications
1. Wenzel L, von Rüden C, Thannheimer A, Becker J, Brand A, Augat P, Perl M. The Pararectus Approach in Acetabular Surgery: Radiological and Clinical Outcome. J Orthop Trauma. 2020 Feb; 34(2): 82–88.

2. Graul I, Marintschev I, Hackenbroch C, Palm HG, Friemert B, Lang P. Modified therapy concepts for fragility fractures of the pelvis after additional MRI. PLoS One. 2020; 15(10): e0238773.

3. Keil H, Luxenhofer M, Vetter Y, Beisemann N, Grützner PA, Franke J. Evaluation of image quality and assessability of a new flat-panel 3D C-arm compared to mobile and fixed computed tomography in posterior spinal fixation. Int J Med Robot. 2020 Oct 13;e2181.

4. Culemann S, Grüneboom A, Nicolás-Ávila JA, Weidner D, Lämmle KF, Rothe T, Quintana JA, Kirchner P, Krljanac B, Eberhardt M, Ferrazzi F, Kretzschmar E, Schicht M, Fischer K, Gelse K, Faas

M, Pfeifle R, Ackermann JA, Pachowsky M, Renner N, Simon D, Haseloff RF, Ekici AB, Bäuerle T, Blasig IE, Vera J, Voehringer D, Kleyer A, Paulsen F, Schett G, Hidalgo A, Krönke G. Locally renewing resident synovial macrophages provide a protective barrier for the joint. Nature. 2019 Aug 1; 572(7771): 670–675.

5. Halbgebauer R, Kellermann S, Schäfer F, Weckbach S, Weiss M, Barth E, Bracht H, Kalbitz M, Gebhard F, Huber-Lang MS, Perl M. Functional immune monitoring in severely injured patients-A pilot study. Scand J Immunol. 2020 Feb;91(2):e12837.