

## Department of Orthopaedic Surgery

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### General Summary

#### *Basic Research*

The research activities of the Department of Orthopaedic Surgery range from experiments on connective tissue cells to clinical studies and have been highly regarded by both Japanese and international orthopaedic societies. This regard is reflected by the participation of department members in the development of treatment guidelines in Japan. Moreover, members of the department continue to win competitive research grants for their ongoing research projects.

#### *Clinical Research*

Undertaking clinical research firmly grounded in basic studies and performed in collaboration with many academic and clinical institutions is a well-established and proven standard of high-quality scientific projects carried out at our department. The social and educational imperative of The Jikei University Hospital has been basic and epidemiological studies and the development of new operative methods. The members of our department participate in this assignment, and their efforts have been highly valued.

### Research Activities

#### *Arthroscopic surgery for traumatic anterior instability of the shoulder with general joint laxity*

The purpose of the present study was to investigate clinical features and results of arthroscopic surgery in 12 patients with traumatic anterior instability of the shoulder complicated by general joint laxity. Eight patients had sustained an initial dislocation owing to minor trauma. Arthroscopic examination showed a poorly developed anterior band of the inferior glenohumeral ligament and medial glenohumeral ligament and a shallow Hill-Sachs lesion in all cases and showed a Bankart lesion with minimal detachment in 9 cases. The mean Japan Shoulder Society Shoulder Instability Score was 55 points before surgery and 84 points after surgery. Postoperative recurrence was observed in 1 patient. The range of motion after surgery was satisfactory in most cases, in which an early recovery was obtained, although the apprehension sign remained, especially in athletes, even 1 year after surgery.

*Pathogenesis of the axial symptoms following cervical laminoplasty*

Although cervical laminoplasty has been the standard surgical procedure for cervical spondylotic myelopathy, axial symptoms often remain after surgery. We examined the causes of axial symptoms in a prospective controlled study and found that preserving the C7 spinous process could reduce their occurrence.

*Patient-specific templating method in total knee arthroplasty: A prospective study of accuracy of different patient-specific bone cutting guides*

Preoperative and intraoperative patient-specific templating has gained attention as the next technological development after computer-assisted surgery navigation systems in knee surgery. In our department, we have been evaluating the accuracy of implant positioning during total knee arthroplasty with patient-specific bone cutting guides and have been carrying out a prospective study comparing the accuracy of patient-specific templating with that of a computer-assisted navigation system. The evaluation also includes a comparative trial against conventional surgery, analysis of 3-dimensional reconstructions, and the development of more-precise preoperative planning software.

*The establishment of new operation method for flatfoot*

We examined results of a new operative method for the treatment of middle-aged patients with flatfoot, in whom the progressive planovalgus deformity developed due to the accessory navicular. In these patients, the connections between the navicular bone and the accessory navicular were extremely loose, and the flatfoot was thought to have developed owing to dysfunction of the tibialis posterior tendon. In 2 cases, in which the accessory navicular was removed and the tibialis posterior tendon reattached, pain remained, and flatfoot did not improve. In 1 case, in which additional lateral column lengthening was adopted, pain decreased comparatively early, and the flatfoot was adequately corrected. We believe that treatment of the accessory navicular is not sufficient and that measures to correct flatfoot should be undertaken to reduce symptoms in such patients.

*Femoral reconstruction with a distal interlocking stem following excision of a metastatic tumor in the proximal part of the femur*

We examined the effectiveness of a distal interlocking stem for femoral reconstruction in 14 patients who had undergone excision of a metastatic tumor in the proximal part of the femur. The postoperative complications were early death in 1 case and deep tissue infection in another case. In regard to postoperative functional mobility, ambulation was possible in 12 of 13 cases (after excluding a case of early death), and use of a wheelchair was necessary in 1 case. Owing to strengthening of the reconstructed soft tissue, 12 patients were able to elevate their extended leg in the supine position, and 11 patients could elevate their leg in abduction in the lateral position. We conclude that femoral reconstruction with a distal interlocking stem produces satisfactory functional results and is an effective treatment method in patients following excision of the proximal part of the femur due to bone metastasis.

*Use of an injectable complex of  $\beta$ -tricalcium phosphate granules, hyaluronate, and fibro-*

*blast growth factor-2 in the repair of unstable intertrochanteric fractures*

We evaluated the effects of an injectable complex of  $\beta$ -tricalcium phosphate ( $\beta$ -TCP) granules, hyaluronate, and recombinant human fibroblast growth factorfactor-22 (rhFGF-2) on the repair of unstable intertrochanteric fractures in elderly patients. Twenty-one patients (age range, 76–91 years) having 31.A2 fractures (AO classification) were treated with an injection of the complex followed by intramedullary nail placement. Fractures with a displaced lesser trochanter resulted in posteromedial cortical defects. Treatment was performed within 8 days after fracture. Bone regeneration and  $\beta$ -TCP resorption, unions of intertrochanteric fractures and displaced lesser trochanters to the shaft, and varus deformity of the femoral neck were assessed with X-ray films and computed tomography scans. Fracture union occurred in all cases, and union of the displaced lesser trochanter to the shaft was obtained in 20 cases by 12 weeks. Interestingly,  $\beta$ -TCP granules were completely replaced by bone, and new bone formation was observed around the lesser trochanter in all cases, unlike cases not treated with the complex. This complex is a paste-like material that is easy to handle and can make a considerable contribution to the treatment of both unstable intertrochanteric fractures and other cortical bone defects with minimal surgical invasion.

*Biological markers of bone ageing and the link to osteoporosis: The possible role of bisphosphonates and selective estrogen receptor modulators in the underlying pathophysiology*

With aging of the bone collagen fibers, advanced glycation and oxidation end products (AGEs, pentosidine) accumulate in the collagen matrix, and excessive induction of AGEs exacerbates bone fragility. We found that an atherosclerosis risk factor, hyperhomocysteinemia, contributes to the induction of AGE formation. In a study of a Nagano cohort (1,300 cases), we found that high levels of urine AGEs and serum hyperhomocysteinemia may serve as common risk markers of osteoporosis and osteoarthritis.

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