Department of Orthopaedic Surgery

Keishi Marumo, *Professor*
Hajime Sugiyama, *Associate Professor*
Hiroki Funasaki, *Associate Professor*
Mitsuru Saito, *Associate Professor*
Mamoru Yoshida, *Assistant Professor*
Hideki Fujii, *Assistant Professor*
Kazuo Asanuma, *Associate Professor*
Takuya Otani, *Associate Professor*
Shigeru Soshi, *Associate Professor*
Makoto Kubota, *Assistant Professor*
Yutaka Ueno, *Assistant Professor*

General Summary

Basic Research

Our research, ranging from connective tissue cells to clinical research, has been widely acknowledged both from within Japan and overseas. We have identified a risk factor for severe vertebral compression fractures and are proposing tailor-made therapies to improve both bone density and bone quality.

Clinical Research

There is a variety of specialties within orthopaedics, but since the appointment of Professor Marumo our department has created a clinical environment for treating all motor disorders. Clinics have been separated into various specialties, including the knee, hip, spine, shoulder, hand, foot, trauma, bone metabolism, and rheumatoid disease, to meet patient needs. The diverse clinical treatment environment, without the tendency to focus on one specialty, is our philosophy that will continue into the future. Our clinical research, such as the patient-specific templating technique for knee replacement and navigation surgery with real-time computed tomography (CT), is directly connected to the improvement of surgical techniques. The development of surgical techniques is important for surgical outcomes and is an essential aspect of research at this university hospital.

Research Activities

Comparison of magnetic resonance findings before and after nonsurgical treatment in patients with full-thickness tears of the rotator cuff

The purpose of this study was to compare magnetic resonance (MR) findings before and after nonsurgical treatment in 18 patients with full-thickness tears of the rotator cuff. The relationships between improvements in MR findings, age, tear size, interval between follow-up MR studies, pain score, and range of motion were evaluated retrospectively. Thirteen patients had no changes in MR findings. The other 5 patients showed improvements of the subacromial bursa, glenohumeral joint, and the sheath of the tendon of the long head of the biceps. The improvements in symptoms were not directly associated with the MR findings. The improvement in MR findings was suspected to appear more than 6 months after the improvement in symptoms.

Usefulness of navigation-assisted surgery for spinal deformities using intraoperative 3-dimensional CT images
Navigation-assisted surgery for spinal deformities was performed with single-time multilevel registration using intraoperative 3-dimensional CT images (Artis zeego, Siemens AG, Erlangen, Germany). The clinical results and the accuracy of navigation were satisfactory.

The correlation between curve progression and peak height velocity in adolescent idiopathic scoliosis
The peak height velocity and growth period values in adolescent girls with idiopathic scoliosis were higher and shorter, respectively, than those in healthy girls. The patterns of height velocity curves in girls with idiopathic scoliosis differed from those in healthy girls, suggesting that curve progression is associated with the magnitude of the peak height velocity and the length of the growth period.

Clinical outcomes of multilevel spinal fixation with the minimally invasive spine stabilization technique
We investigated clinical outcomes of multilevel fixation (3 or more levels) in patients who were treated with minimally invasive spine stabilization. The results were satisfactory with no complications. Therefore, the minimally invasive spine stabilization procedure for multilevel fixation is effective for decreasing invasiveness.

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 carrying out a comparative study against the 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 comparative analysis of the accuracy of different patient-specific cutting guides is carried out in a prospective manner.

A rotation-free modular femoral stem in primary total hip arthroplasty for hip dysplasia
Short-term clinical results were evaluated for 219 primary total hip arthroplasty procedures performed with a rotation-free modular femoral stem on secondary osteoarthritis resulting from developmental dysplasia of the hip. The results showed that this modular system has the morphological advantage of an infinite ability to correct rotational deformity of the proximal femur, which is frequently seen in patients with developmental dysplasia of the hip. Rotational alignment of the stem neck was corrected so that the stem anteversion was decreased in 56% of patients by up to 60° and was increased in 18% of patients by up to 45°. The results also revealed functional advantages, with an extremely high probability (99.5%) of obtaining secure bone ingrown fixation of the stem on radio-

graphs and an extremely low incidence (0.9%) of postoperative dislocation.

Review of symptomatic accessory navicular in patients with acquired progressive flatfoot
We reviewed symptomatic accessory navicular in patients with acquired progressive flatfoot. The patients had an accessory navicular, but there was no degeneration of the tibialis posterior tendon. We performed excision of the the accessory navicular, reattachement of the tibialis posterior tendon, and correction osteotomy. The flat feet were corrected, and the pain was reduced. Recent studies have shown that the presence of an accessory navicular causes rupture of the plantar calcaneonavicular ligament and the progression of flatfoot. We believe that the disruption of the connection between the navicular and the accessory navicular leads to ineffective force transmission of the tibialis posterior, which results in the progression of flatfoot. We suggest that in such cases, flatfoot must be treated and the symptomatic accessory navicular should be resected.

A new system for evaluating beta-tricalcium phosphate resorbability in opening wedge high tibial osteotomy
The purpose of this study was to assess bone formation and β-tricalcium phosphate (TCP) resorption after implantation of β-TCP blocks with 60% and 75% porosity in opening high tibial osteotomy (HTO). Several studies have evaluated TCP resorption in opening HTO. However, the results were analyzed only with X-rays. We have recently developed a new evaluation system. We measured CT values of 60% and 75% porosity TCP blocks in the center of CT images at 2 weeks and 6 years. The CT images at 6 years showed that in all cases most of the β-TCP with 75% porosity had been resorbed but that β-TCP with 60% porosity had not been uniformly resorbed. This result indicates that measurement of only certain regions of interest of TCP is inadequate for evaluating TCP resorption. The open-source imaging software program, OsiriX, enabled the whole area to be scanned to measure CT values. This system is useful for evaluating β-TCP resorption and bone formation in any β-TCP-implanted area.

Plasma homocysteine levels associated with severity of vertebral fracture in postmenopausal women
Purpose: The aim of this cross-sectional study was to clarify additional risk factors for severe vertebral fractures in postmenopausal Japanese women.
Methods: At the registration of this cohort, age, body-mass index, bone mineral density (BMD), and present illness were investigated. Biochemical variables, including urinary levels of type I collagen cross-linked N-telopeptides (NTX) and pentosidine and plasma levels of homocysteine, were measured. Measurements were compared with different vertebral fracture grades (grade 0 to 4). Independent risk factors for severity of vertebral fracture were evaluated by multiple logistic analysis.
Results: A total of 1,475 participants (66.6±9.0 years) were included. Distribution of vertebral fracture grades was grade 0, 1,052 cases (71.3%); grade 1, 137 cases (9.3%); grade 2, 124 cases (8.4%); and grade 3, 162 cases (11.0%). Age, lumbar BMD, urinary NTX, urinary pentosidine, serum homocysteine, and presence of hypertension were significantly increased in accordance with vertebral fracture severity. When comparing

vertebral fracture grade 0 versus grade 2 to 3, pentosidine and homocysteine levels were significant risk factors for vertebral fracture severity (odds ratio [OR]: 1.03, 95% confidence interval [CI]: 1.00–1.06, P=0.042; OR: 1.06, 95% CI: 1.00–1.06, P=0.013, respectively). Homocysteine levels were also a significant risk factor when comparing vertebral fracture grade 0 versus grade 3 (OR: 1.08, 95% CI: 1.02–1.15, P=0.006).
Conclusion: Levels of pentosidine and homocysteine are independently associated with the severity of vertebral fracture. In particular, homocysteine levels play an important role in the severity of vertebral fracture.

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