dislocation of the shoulder and another 19 an acromioclavicular dislocation.

There was a significant sex and age difference between patients with fractures of the proximal humerus and fractures of the clavicle. 70 men and 228 women, median age 73 years, had sustained a fracture of the proximal humerus while 94 men and 53 women, median age 17 years, had a clavicular fracture. In both fracture groups a fall on plain ground was the most frequent trauma cause but 20% of the clavicular fractures were sustained during sport acitivites in comparison to 7% of the fractures of proximal humerus. There were 12 men and 5 women, median age 55 years, with a fracture of the scapula. 41% of these were injuried in a traffic accident. There was also a difference in age and sex between glenohumeral and acromioclavicular dislocations. 28 men, median age 39 years, and 26 women, median age 68 years, had sustained a glenohumeral dislocation while 17 men and 2 women, median age 33 years had an acromioclavicular dislocation. 16% of the patients with glenohumeral dislocation and 32% of those with acromioclavicular dislocation were injuried during sport activities.

Our data suggest that the epidemiology of the different shoulder injuries is variable. Fractures of the proximal end of the humerus are old peoples' problem, most often caused by low energetic falls. The other shoulder injuries are more frequent in younger people, often caused by a higher trauma force.

208. Congenital malformations in Greece —a population based study

Elias Karanikas, Vasso Lekea-Karanika and Cryssa Tzoumaka-Bakoula

Athens Greece

In order to establish the birth prevalence of major congenital malformations in Greece, we analysed data on a total of 11048 births which occurred nationwide during April 1983. The population sample consisted of all babies—livebirths and stillbirths—with birthweight of 500g or more. A precoded questionnaire was used for data collection and approximately 98% of all births throughout the country during the survey month were recorded. The statistical packages SPSSX and BMDP were used to carry out the analysis.

The birth prevalence of all kinds of major congenital malformation was found to be 13.7 per 1000. Only 46.7% of the malformed babies survived to the age of 1 year, but among the newborns with skeletal abnormalities only one died (a case of osteogenesis imperfecta). Fetuses with congenital defects were significantly more likely than the rest of the population to present abnormally, to be growth retarded and to be delivered preterm. Significant factors associated with the birth of a malformed baby were the maternal ages at marriage, at first pregnancy and at delivery, the age difference between parents, parental education, father's occupation, marital status, the number of antenatal visits during the first and second trimesters, hospitalisation of the mother, highest systolic blood pressure and drugs taken during pregnancy. Logistic regression analysis showed only three of all the above factors as independently associated with the birth of a malformed baby: drugs taken during pregnancy (iron and vitamins—positive effect), mother's age at first pregnancy (the older the mother, the greater the risk) and father's education.

In conclusion, it seems that the routine prescription of iron and vitamin supplements during pregnancy has a favourable effect, while advanced maternal age at first pregnancy has an adverse one on the normal formation of the baby.

Tumors

209. Deep seated hemangioma, results of surgical treatment

Sven Inerot[1], Örjan Berlin[1], Lars-Gunnar Kindblom[2], Mats Geijer[3], Lennart Angervall[2] and Björn Gunterberg[1]

Departments of [1]Orthopedics, [2]Pathology and [3]Diagnostic Radiology, Sahlgren Hospital, University of Gothenburg, Sweden

Deep seated hemangiomas of the extremities and their girdles may pose considerable diagnostic and therapeutic problems. Frequently these tumors grow extensively involving different structures such as the subcutis, inter- and intra-muscular spaces, and sometimes engage the principal nerves and blood vessels, making curative surgery difficult. Recurrences are frequent when total surgical removal of the lesion has not been accomplished primarily.

Patients treated for deep seated hemangiomas in the greater Gothenburg area during 1960–1989—a total of 94 patients, 43 males and 51 females—were evaluated. The median age of the patients was 41 years—with an age span of 13–80 years. The preoperative diagnosis was based on history, physical examination and radiographic findings. The surgical treatment consisted of local resections. 30% of the lesions were in the upper part of the body and 70% in the lower part. Histologically some 80% of the patients had a hemangioma of large vessel (cavernous) type, 10% of small vessel (capillary) type and 10% of mixed type.

The patients were examined with plain roentgen, most also with angiography and/or computed tomography. Magnetic resonance imaging was performed in a small number of patients. This method proved superior to any of the previously used radiographic diagnostic procedures, in providing detailed information about the extent of tissue spread of the hemangiomas.

The patients were evaluated 2–30 years after primary surgery—median follow-up period 12.7 years. Two patients had died of other causes and six were lost to follow-up. 1/4 of the patients had experienced one or more recurrences of the hemangioma and 1/5 had a manifest recurrence. The results of the surgical treatment were evaluated as excellent or good in 60%, as satisfactory in 20% and as poor in 20% of the patients.

Primary surgery with wide margins is the treatment of choice, whenever possible. For the approx. 20% of patients with poor results there is a need for supplementary treatment, which has previously included steroid therapy, radiotherapy and infusion of sclerosing agents. So far none of these treatments have proven to be fully effective. In recurrent or inoperable hemangiomas an alternative is still to be found.

210. The cell mediated immunity tests in patients with bone tumors treated by large allografts

A. J. Aho, J. Eskola and T. Kouri

Departments of Surgery, Medical Microbiology and Clinical Chemistry, The Turku University Central Hospital, Turku, Finland

Allogenic bank bone as a half-joint or intercalary, diaphyseal blocks of large size has been utilized for the treatment of bone tumors in our department since the early 70s. Bone reconstruction of over thirty cases with aggressive benign or malignant bone tumors has been performed and the follow-up scheme (radiology, CT, isotope techniques, SPECT, biopsies) included determination of specific cell mediated immune response against saline and acetic acid extracts of donor derived bone and cartilage in 9 patients. In other patients, only mitogen (PHA and Con A) induced lymphocyte transformation responses were followed up for 3 months to 3 years after operation.

Results: Postoperatively there were no uniform changes in mitogen induced lymphocyte transformation responses. In three patients, cell mediated immune responses against bone graft were detected within 3 months after the transplantation. The stimulation indices in these patients varied between 4.1 and 14.5 (normal value <3.0). However, these values returned to normal level 3–6 months later. The clinical overall outcome, the incorporation of the osteoarticular allograft in three patients with some elevated values did not differ from those with normal values. Fatigue fractures e.g. and late degenerative changes occurred also in patients with normal values.

Conclusions: Slight cell mediated immune responses against donor derived antigens were detected in some patients with large osteoarticular allografts for treatment of aggressive and malignant bone tumors. However, signs of clinical rejection were not seen in any patient.

The controversial significance of immunological factors for the clinical outcome, metabolism, of massive bone allografts remains uncertain based on the results of this study.

211. Malignant fibrous histiocytoma of bone. The Navarra University experience using limb-preserving surgery combined with intraoperative radiotherapy

Luis Aguilella, Diego Sala, Carlos Barrios and Santiago Amillo

Department of Orthopedics, Navarra University Clinic, Pamplona, Spain

Limb-preserving surgery combined with intraoperative radiotherapy (IORT) is a boosting therapeutic modality which seems to provide an accurate control of disease in musculoskeletal sarcoma. IORT permits simultaneous radiotherapy and surgical debulking, involving less toxicity by protecting those structures sensitive to radiotherapy, e.g. peripheral nerves. Our experience using this combined therapy for treatment of malignant fibrous histiocytoma is reported.

Patients and methods: Over an 8-year period, 12 patients with primary malignant fibrous histiocytoma (MFH) of bone have been treated in our department by limb-preserving surgery. The series comprises 9 women and 3 men with a mean age of 45 (23–75) years. The tumor involved the pelvis in 5 cases, the femur in 6 (1 diaphyseal, 3 metaphyseal and 2 epiphyseal) and the humerus in one case. A preexisting bone pathology was encountered in 2 cases, one with bone infarction and the other with osteochondral exostosis. A further tumor located in the pelvis had previously been treated with radiocobalt therapy posthysterectomy.

The treatment protocol includes preoperative intraarterial neoadjuvant chemotherapy, surgical in-bloc resection combined with intraoperative radiotherapy, postoperative conventional external beam radiation and adjuvant chemotherapy.

As for surgical technique in tumors located at the extremities, reconstruction was performed with endoprosthesis in 5 cases, intercalary bone autograft in one and massive bone allograft in other. For pelvic tumors, radical or palliative resection followed by reconstruction with either total hip prosthesis or pelvic allograft and/or methylmetacrylate were the techniques applied.

Results: At a 3-year mean follow-up, 7/12 were still alive. Four of the 5 patients with pelvic tumors had died, one of metastatic disease, one due to local extension and two (both the older patients) because of complications related to treatment. Among patients with MFH at the extremities, one died of metastatic extension. The remaining six are free of disease. Only two patients need walking aids.

Conclusion: Our multidisciplinary approach including limb-preserving surgery and intraoperative radiotherapy provides highly satisfactory results in MFH located at the extremities. These tumors showed better prognosis than those located in the pelvic bones.

212. Long term follow up of leiomyosarcoma

Peder K. Jensen, Leif B. Hansen and Bjarne Lund

Department of Orthopedic Surgery, University of Copenhagen Rigshospitalet, Denmark

Between 1960 and 1990, 60 patients were treated for leiomyosarcoma at the Sarcoma unit in Rigshospitalet. The patients underwent a combined treatment with primary surgery—in some cases radiotherapy or chemotherapy were added. The material consists of 30 men and 30 women, age 22–96.

The study was retrospective. At follow-up, 40 patients were dead of their disease.

213. Vascular reconstruction of the extremity following bone tumor resection

Clement S. Trovik[1], Tore Haga[2] and Anders Walloe[1]

Departments of [1]Orthopedics and [2]Plastic Surgery, Haukeland Hospital, Bergen, Norway

Viable autografts have been used as an alternative in limb reconstruction during the last 15 years. Several authors report an 80% rate of bony union, in some cases after additional conventional bone transplantation. The functional results seems to be adequate.

Vascular grafting is mostly used after resection of tumors located in the middle part of the diaphyses of long bones—when the defect is greater than 6 cm, and in a younger patient. The need for soft tissue reconstruction is regarded an additional indication.

We present four patients: Case 1 demonstrates fibula graft used for reconstruction of the elbow joint following resection of the ulna including a desmoid tumor. Adequate healing and function but tumor recurrence in the soft tissue could not be controlled by radiation and the arm had to be amputated 17 months after the operation.

Case 2 is an illustration of transposition of a vascular fibula for reconstruction of the tibia after removal of the diaphysis containing a well differentiated fibrosarcoma. There was bony union after supplementary conventional transplantation.

In Cases 3 and 4, reconstruction is done after resection of highly malignant skeletal sarcomas in the femur. The patients received high-dose chemotherapy both pre- and post-operatively. The cases illustrate graft hyperthrophy and various methods of osteosyntheses.

214. Giant osteoblastoma of the femur—a case report

John Kalavritinos, Eleftherios Dounis, Antonios Tsibinos, Charalambos Stathakis and Elias Koulentianos

Athens Greece

Osteoblastoma is an exceedingly rare benign bone tumour. Although it has some constant features, it is often difficult to distinguish from osteoid osteoma or osteosarcoma.

We present the case of a patient with an osteoblastoma which demostrated many peculiarities. The patient was a 24-year old male weight lifter. He described a pain occurring over 10 months, appearing mainly at night time, and located in his right thigh. There was prompt relief after taking an aspirin. Both the appearance of the pain and its relief were quite unrelated to the typical clinical picture of an osteoblastoma. On radiographic examination, a huge neoplasmatic bone tumour was detected in the diaphysis of the femur. Its dimensions were 15 x 4 cm, that is, more than three times the size a usual osteoblastoma may reach (2–5 cm). Bone scanning demonstrated an increased local uptake, while CT-scan and digital angiography were suggestive of an osteosarcoma. The only abnormal finding from blood tests was an extremely high level of alkaline phosphotase. Next, we performed an open biopsy, which settled the diagnosis of an osteoblastoma. Consequently, we operated on the patient, performing just intralesional curetage. On the third postoperative day we noticed a great reduction in the alkaline phosphotase values from 1026 to 389 units, while a week later they returned to normal.

Four months have elapsed since then and the patient is free of any symptom and has resumed full athletic activities, while the phosphotase values are within the normal range. We conclude that the serum alkaline phosphotase level may be used as a useful index of osteoblastoma activity and as proof of complete excision of the tumour.

215. Aneurysmal bone cyst—spontaneous healing after biopsy

Dennis Verretas[1] and Telemachos Papaioannou[2]

[1]Alexandroupolis and [2]Xanthi Greece

We report a case of an 18-year old woman who complained of a hard swelling in her left upper thigh which had gradually increased in size during the six months before her admission.

Radiographs showed a large, multi-lobulated cyst with calcified walls, thinning, but not eroding, the cortex and

arising from the anteromedial aspect of the upper femur. The CT examination showed no extension of the lesion into the surrounding soft tissues and the lungs were clear, giving the provisional diagnosis of an aneurysmal bone cyst. Open biopsy of the lesion confirmed this diagnosis.

Because of the size of the lesion and the site from where it arose, it was decided not to proceed with curetage but to observe the patient closely, with regular clinical and radiological examinations.

Two years later the cyst had ossified almost completely and had regressed in size.

Only two other aneurysmal bone cysts with healing after biopsy have been documented in the literature.

216. Gigantic intraosseous Schwannoma

Constantinos Toptsis, Paraskevas Chatzidis, Demetrius Pouliopoulos, Panayotis Antonakakis and Afroditi Patzaki

Thessaloniki Greece

Schwannoma, a rare benign nerve sheath tumour, is even rarer in its intraosseous location. It is usually small, the largest reported not exceeding 4–6 cm in diameter.

We report on an unusually large tumour, 13cm in diameter in its spherical endothoracic portion. The tumour eroded nearly half of the Th11 vertebral body and its left pedicle and entered the spinal canal, embracing the cord. It expanded also and mainly in the left thoracic gutter. Here it attained a spherical shape, displacing the left Crus-diaphragm, left kidney and spleen forwards and caudally and the lung up and forwards. Although the tumour was studied extensively (blood cytology, chemistry, serology, plain radiographs, CT-scan, MRI), the diagnosis of Schwannoma was not suspected. Asymptomatic as such, the tumor was seen on the chest radiographs taken for mild tachycardia.

Through a posterolateral approach the tumour was found, encapsulated and easily removed. No relation of the tumour to the spinal cord or costal nerves was found. It was regarded as arising from inside the bone of the Th11 vertebra and, with time, expanding to areas of least resistance. Histology excluded malignancy.

After removal, a Th10–Th12 anterior spondylodesis was carried out. Eight months later the patient remains asymptomatic and well.

Leg distraction

217. Distraction osteogenesis and its clinical applications

Renato Spinelli

Instituto Ortopedico Rizzoli, Bologna, Italy

Distraction osteogenesis (DO) is the special regeneration which is the basis of the bone lengthening obtained in a bone, when two fragments, after osteotomy or fracture, are gradually pulled apart. Necessary conditions are the relative integrity of the periosteum and optimal mechanics of the fixation/distraction apparatus.

The experimental aspects of the regeneration during the lengthening period were studied by us before applying the methods to humans. Five subsequent stages can be recognized:

1) Hematoma; 2) Fibroblastic activity; 3) Osteoid; 4) Corticalization; 5) Remodelling.

Since 1975, when we first used distraction epiphyseolysis (DE) in adolescents, and after 1980, when we introduced Ilizarov's corticotomy (CT), we have performed 494 procedures of lengthening, from 3 to 27 cm in a single procedure in a single bone (mean 6.6). Including whole limbs up to 37 cm lengthenings were obtained (single lengthenings of tibia + femur).

Both DE and CT have mainly been used in cases of congenital shortness (65%) but also in other etiologies.

The patient's age has ranged between 5 and 36 years.

Cases treated to the end of 1990 are included here. Adverse events have been frequent but as a rule not severe, provided a constant surveillance was granted. Adverse events were divided: inconveniences, problems, complications and sequelae. There is a significant, rather long, learning curve. Distraction osteogenesis was used for other procedures than simple lengthenings, e.g. realignments under distraction of varus, valgus, pro-recurvatum, torsional deformities, associated distraction and compression modes in nonunions with shortening, filling bone defects with the "elevator" technique.

218. Treatment of large tibial defects by segmental callotasis with the Orthofix® apparatus

Klaus Bak, Sören W. Rasmussen, Cristen Krag[1] and Carsten Törholm

Departments of Orthopedics and [1]Plastic Surgery, Gentofte Hospital, University of Copenhagen, Hellerup, Denmark

Introduction: Callotasis is a new method for the treatment of bone defects which implies slowly controlled distraction thereby utilizing the patient's capability of osteogenesis. Segmental callotasis is preferred with large bone defects. Various types of external fixators have been used for this