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Motions of the carpal bones during flexion and deviation of the hand

A. de Lange, R. Huiskes and J. Kauers

Department of Orthopaedics (Division of Biomechanics) and Department of Anatomy and Embryology, University of Nijmegen.

Using an accurate radiophotometric measuring system, the three-dimensional motion characteristics of each carpal bone segment were determined in flexion and deviation of the hand, both in pronation and in supination. Five wrist models have so far been tested. The results have been described in terms of Euler rotation angles and translation vectors, and show that in palmar and dorsal flexion the distal carpals can be regarded as a single fixed group, unlike the proximal carpals. In ulnar and radial deviation of the hand the carpal bone segments perform individual, different motions in such a way that neither row (distal or proximal) can be regarded as a single fixed group.

The results demonstrate the need for a precise measuring system to measure three-dimensional motions of carpal bone segments. Findings thus obtained can improve our understanding of the carpal mechanism and also serve as data base for wrist models to be developed in future.

The role of Nuclear Magnetic Resonance Imaging (NMRI) in orthopaedic diagnosis

J. A. M. Lemmens, J. R. van Horn, J. Ruys and Th. J. G. van Rens

St. Radboud Hospital, University of Nijmegen

Nuclear Magnetic Resonance Imaging (NMRI) is the latest and most advanced of the modern imaging

techniques. Without making use of ionizing rays it can provide images in any random section through the human body, and also give further information on the type of tissue and its composition. So far, however, tissue specificity can be determined for protons but not for potassium, sodium or phosphorus. The choice of the measuring technique depends largely on the surgical problem, the duration of the examination, and the clinical changes in the patient examined. The limited relevant literature mainly describes the value of NMRI in the diagnosis of bone tumors and soft tissue lesions. The results obtained by NMRI in a group of 25 patients indicate that the total duration of NMRI should not exceed one hour, lest the risk of motion artefacts become too great and the inconvenience to the patient too pronounced. Given the question of whether the contents of a cystic bone lesion are liquid or contain solid tissue, measurements in the three principal directions with 4 echoes and one T2 image are sufficient. When the lesion is a tumour of obscure origin, the multiple slice technique can be used which permits only two echo measurements. It is advisable to use this technique in the principal directions other than the CT-scan gives. The most common artefacts originate from pulsating vessels, respiratory movements and involuntary movements made by the patient.

The role of Nuclear Magnetic Resonance Imaging (NMRI) in orthopaedics

J. van Horn, J. Lemmens, Th. van Rens and J. Ruys

St. Radboud Hospital, University of Nijmegen

Nuclear Magnetic Resonance Imaging (NMRI) is an asset in the non-invasive diagnosis of lesions of the bones and soft tissues. Although the structure of

bone tissue does not contribute to the NMR image, changes in its composition are readily demonstrable. This applies in particular to bone lesions which can be visualized using conventional radiographic techniques. NMRI measurements can be performed in such a way that an osteolytic process can be identified with certainty as containing a liquid or solid tissue. This was demonstrated in a number of patients with juvenile bone cysts, aneurysmal bone cysts and fibrous dysplasia. Another possible application of NMRI is to demonstrate differences in tissue within soft tissues, e.g. in malignant tumors. The boundary between the reactive tissue surrounding the tumour and normal tissue can be determined with accuracy. This enhances preoperative assessment of the resectability of a malignant process – an aspect discussed with reference to an osteosarcoma, a Ewing sarcoma and a malignant fibrous histiocytoma. The third possibility with NMRI is to obtain images in any section through the body. In actual practice this means that serial sections in or parallel to each of the principal planes are sufficient. This possibility is discussed with reference to a patient with a low-grade chondrosarcoma of the pelvis. A total of 25 patients with various osteolytic processes or tumours were correlated with those of conventional radiological techniques and verified by puncture, biopsy or operation. The essential contributions of NMRI to diagnosis are discussed.

The Hanausek board in the treatment of congenital dislocation of the hip

P. J. T. M. Jaspers, L. A. M. Schulte and M. Woltjer

Oudernijn Hospital, Utrecht and St. Antonius Hospital, Nieuwegein

Since 1979, 30 children with congenital dislocation of the hip have been treated by fixation of the hips on a Hanausek board during the retention phase. Reduction was achieved by 3–4 weeks' traction. The patient was then immobilized on a Hanausek board in 80° flexion and 60° abduction, leaving rotation unrestricted. The advantages of the Hanausek board over a plaster cast are: better hygiene, the knees and feet are free, rotation in the hip is unrestricted and the child is able to sit up and lie down. Radiographic interpretation poses no problems and redislocation, if any, can be diagnosed immediately. A follow-up study was made of 16 patients with 20 dislocated hips, treated between 1st January 1979 and 31st December 1981. The age at diagnosis ranged from 1 to

11 months. Reduction was achieved in all cases after an average of 28 days' traction. Redislocation of the hip occurred in three children during the retention phase and was immediately diagnosed in all. Another complication was a pronounced skin rash resulting from hygienic problems. In no case did necrosis of the femoral head develop. The mean duration of treatment on the board was 14 weeks. Treatment on the board was followed by a considerable period in a removable abduction apparatus during the night. The mean follow-up period was two years after discharge from hospital (range 6–36 months). Clinical findings were normal. Radiographic examination revealed adequate reduction of the hips in the acetabuli without deformation of the femoral head. Only one child showed acetabular dysplasia with an acetabular roof angle of 30°. Prior to treatment the mean acetabular roof angle of the dislocated hip was 40°. The mean angle after treatment was 19°. Conclusion: treatment on a Hanausek board does not necessarily give better results than the proper use of a bilateral plaster hip spica but it is simpler, both for the therapist and for the mother, and less uncomfortable for the child.

Ultrasonography in the diagnosis of a plica syndrome in the knee

W. J. H. Derks

Diaconessen Hospital, Utrecht

From December 1983 through January 1985 ultrasonography was performed in all patients with peripatellar and retropatellar symptoms or suspected of having a plica syndrome. The study comprised 169 persons whose medial and lateral patello-femoral spaces were visualized with the aid of a mechanical sector scanner with a 7.5 MHz transducer. Controls were arthroscopies of 113 knees. A total of 107 patients (including six with bilateral symptoms) were submitted to this procedure. Of 70 patients with an ultrasonographically suspected plica, 66 showed a plica at arthroscopy while four did not. Arthroscopy revealed a plica in 12 out of 42 patients who showed no plica at ultrasonography. In this application, therefore, the sensitivity of ultrasonography is 84 percent and its specificity is 94 percent. The predictive value in the case of a negative test is 70 percent, versus 94 percent in the case of a positive test. The conclusion is that ultrasonographic examination of the medial and lateral patello-femoral spaces of patients suspected of a plica has a diagnostic reliability of 85 percent.

A follow-up on chemonucleolysis

S. M. Haarsma and M. A. P. Kooyman

St. Maarten Clinic, Nijmegen

In a retrospective clinical study of 75 patients treated by chemonucleolysis, factors influencing the results were considered. The duration of symptoms received special attention. The results obtained were good-to-excellent in 64 percent of the 75 patients, moderate in 6 percent and poor in 30 percent. The results in the 31 patients whose back and leg symptoms existed no longer than nine months were much better than those in the other patients. In three of these 31 patients the symptoms failed to disappear; laminectomy revealed a sequestrum in two of these cases. 90 percent of the patients in this group were completely or almost completely free from symptoms; nearly all these patients fulfilled the McCulloch criteria. Results were far inferior in the 44 patients whose symptoms (particularly back symptoms) were of long standing (sometimes as long as 20 years). Good-to-excellent results were obtained in 45 percent; 10 percent showed a moderate result and 45 percent had a poor result (no improvement at all). No complications of any significance were observed.

Chymopapain – a lasting alternative

M. J. Setteur and C. M. T. Plasman

Onze Lieve Vrouwe Hospital, Amsterdam

The result obtained with chymopapain in 128 patients were analysed after a mean follow-up period of 18.6 months. The clinical and radiographic diagnosis disc prolapse was unequivocal in group 1, less so in group 2 and least in group 3. The results were related to these differences. The success rate in group 1 was 88.3 percent; that in group 2 was 66.7 percent. In group 3 (true discopathies with secondary osseous changes) there is no indication for chymopapain injection; bony decompression is often the solution to the problem.

With successful treatment, leg pain in groups 1 and 2 mostly disappears within a month, while back symptoms persist a little longer. Recurrence of these symptoms – often due to facet pain and sometimes associated with poor posture – was successfully treated by plaster cast correction and immobilization for two weeks.

In groups 1 and 2, minor neurological changes such as sensory disorders and reduced strength disappeared in about 75 percent of the cases. In 89 patients in these groups the height of the disc treated was measured in a standardized way after 6 months

and again after 12 months. Moderate disc regeneration was observed after a year in 40 and 35 percent of cases respectively.

Chemonucleolysis in the treatment of juvenile lumbar disc prolapse

T. S. Wilms, J. G. Konings and R. Deutman

Roman Catholic Hospital and University Hospital, Groningen

A consecutive series of 408 patients treated by chemonucleolysis included 18 male and female patients younger than 20 years (4.4 percent). The average duration of symptoms in these 18 patients was 46 weeks. All showed a positive Lasègue test. The diagnosis "prolapsed disc" was confirmed by caudography and/or CT-scan. Discography and subsequent chemonucleolysis were performed under general anaesthesia. The average stay in hospital was 4.6 days. No postoperative complications developed. The pain disappeared after a few days to three months. Some patients suffered a temporary setback which disappeared without specific measures. Work/school resumption was after an average of 10 weeks. These 18 patients were examined after a mean follow-up period of 24 months; 17 described the result as good or excellent. With a longer follow-up period the function of the vertebral column and elevation of the extended leg improved further. Radiography after six weeks showed reduction of the intervertebral disc treated by an average of 68 percent of its original height. At follow-up, 11 of the 24 discs treated showed re-expansion. A subsequent operation was not indicated in any of these patients. It is concluded that chemonucleolysis is an excellent method of treating young patients with prolapsed lumbar disc.

Selective root sheath blockade

P. F. van Akkerveeken and W. H. M. Castro

Military Hospital "Dr H. Mathijssen", Utrecht

In 1971 Macnab described selective lumbar root sheath blockade with the aid of lidocaine as a diagnostic aid in cases with radiographic evidence of compression of more than one root (myelography and/or CT-scan) and in cases presenting confusing clinical features suspected of root involvement. A prospective study was performed in an effort to determine the sensitivity as well as the predictive value of this test.

In order to determine the sensitivity of the test, 25 patients with a classical root compression syndrome

were studied. All had positive root sheath blockade of the root involved. In two patients another root – one level up – was infiltrated without any effect. Of these 25 patients, 21 were treated by interlaminar discectomy, one was treated by bed rest and three by chemonucleolysis. In all patients the root compression disappeared after treatment. The sensitivity of the test therefore seems to approximate 100 percent – although it should be noted that a very small series was studied.

In order to determine the predictive value of the test, a study was made of 30 patients who either showed radiological evidence of compression of more than one root or confusing clinical features suggestive of root compression (e.g. neurogenic claudication). Root sheath blockade proved to be technically unfeasible in two cases. Twentysix patients had a positive test, and 16 of these responded well to surgery. Two had a negative test but both were nevertheless operated on in view of the radiographic findings; both operations were unsuccessful. On the basis of these findings the predictive value of the test proves to be 72 percent.

Complications: two out of more than 250 root sheath blockades caused epidural anaesthesia, without residual symptoms.

Conclusion: selective root sheath blockade is a valuable aid in the evaluation of radicular pain in the leg which is not readily interpretable.

School screening for scoliosis in the province of Utrecht and the municipality of Hilversum

J. E. H. Pruijs, R. van der Meer, W. Keessen and J. C. van Wieringen

Wilhelmina Children's Hospital, Utrecht

Several authors mentioned a decrease in the number of patients with severe scoliosis as a result of the institution of an effective school screening programme. Early non-operative intervention has also reduced the number of operations for scoliosis.

However, there is no consensus about the optimal form of such a programme. Several screening methods have been described (bending test, measurement of gibbus height and of vertebral rotation, Moiré topography).

This report discusses experiences gained during the first year of a three-year semi-longitudinal school screening project in the province of Utrecht

and the municipality of Hilversum, encompassing 25,000 school children. Data collected during this first year concerned not only the prevalence of scoliosis but also the validity of the various methods used. The correlation between the values measured by the individual methods and the scoliosis angle measured according to Cobb proved to be low in the normal population (coefficient of correlation ranging from 0.10 to 0.26). In addition, data were collected on intra-observer and inter-observer variation with the various methods; they revealed that measurement of the vertebral rotation seems most reliable (coefficient of correlation 0.70). Finally the administrative procedure was tested. It was found that every phase of referral – from school doctor to family doctor and from family doctor to orthopaedist – entailed a significant loss of data.

Operative therapy of pseudo-tumors in haemophiliacs

S. Sybrandy

University Hospital, Utrecht

Despite the modern use of clotting factor concentrates in the treatment of haemophilia, patients may develop severe lesions such as pseudo-tumors (haemophilic cysts). These expanding cysts may cause extensive bone destruction as well as serious damage of soft tissues, especially in the pelvis and the long bones.

Three patients were given the clotting factors they lacked and were then successfully treated by an operation. In two cases the expansive growth of the pseudo-tumour in the thigh had led to an extensive femoral bone lesion which entailed a risk of spontaneous fracture. The femoral bone recovered spontaneously after resection of the pseudo-tumour. In another patient the calcaneus was largely destroyed and the pseudo-tumour threatened to perforate the skin of the heel. The calcaneus was reconstructed using bone chips and cancellous bone, whereupon an uneventful recovery was made.

In a fourth patient who produces antibodies against factor 8 (inhibitor), a cyst of the psoas muscle developed into a football-sized pseudotumour on the back, which finally perforated. This patient has so far been inoperable despite administration of large doses of clotting factors; the prognosis is therefore uncertain.

Preliminary results of bolt-nail osteosynthesis in the treatment of femoral shaft fractures

T. V. S. Klos and P. J. M. Konings

Gemini Hospital, Den Helder

Patients treated by the new method of bolt-nail osteosynthesis (according to Kempf-Grosse) were evaluated in retrospect. During the period 1981 through 1984, 22 femoral shaft fractures in 21 patients were treated in this way. The specific indications for bolt-nail osteosynthesis are: comminuted proximal and distal fractures. Depending upon the localization and degree of comminution of the fracture, screws are passed through the proximal and/or distal part of the nail. Using an extension table, stable osteosynthesis can be achieved by a closed method.

The therapeutic results after a mean follow-up period of two years were good. In the 18 patients who presented for follow-up, flexion and extension limitations of the hip or knee were rarely seen. Only two patients showed a leg length loss of 2–2.5 cm.

The operative technique with wire traction through the distal femur and suspended lower leg prevents rotation disorders.

The literature also reports good results. Consolidation problems are encountered less often than after plate osteosynthesis. Particularly comminuted fractures heal through substantial callus formation. The number of reoperations is smaller than after plate osteosynthesis.

A modified Pirogoff amputation

E. L. F. B. Raaymakers

Academic Medical Centre, Amsterdam

Lower leg amputations for severe foot injuries have become more popular since the introduction of lighter prosthesis material and, of the patella tendon bearing (PTB) prosthesis. Although the prosthetic management of an amputation stump in the posterior part of the foot can never equal the cosmetic result of a lower leg prosthesis, this amputation is superior in the functional sense of good weight-bearing capacity and almost normal leg length. A stump in the posterior part of the foot should meet the following requirements.

1. It should be long enough to permit weight-bearing walking without a prosthesis, and short enough to provide room for a prosthesis.
2. Its final weight-bearing capacity should be sufficient; the only skin suitable in this case is the patient's own plantar skin, which should be mobile and sensitive.
3. With the loss of foot elevators, toe extensors and peroneal muscles the soleus/gastrocnemius group becomes dominant. In preparing a posterior foot stump, care should be taken to restore muscular balance.

Of the three classical amputations – Chopart, Syme and Pirogoff – only the Pirogoff procedure meets the above requirements. Between 1979 and 1984 this amputation was performed twice as an emergency operation and twice as elective surgery. All patients finally had a weight-bearing stump and minimal loss of leg length.