ULTRASOUND IN THE DIAGNOSIS OF THE EARLY STAGES OF HEMOPHILIC ARTHROPATHY OF THE KNEE

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We have studied the knees of 50 patients with hemophilia A, using ultrasound (US) when conventional radiology did not detect any secondary osseous changes. The sonographic images were compared with those obtained from 50 healthy controls. The mean age of this series was 14.6 years.

Our results suggest that sonography as a diagnostic technique in the initial stages of hemophilia permits differentiation between suprapatellar effusion and synovial thickening. It also reveals early cartilaginous involvement.

Keywords : ultrasound ; diagnosis ; hemophilia ; knee.

Mots-clés : échographie ; diagnostic ; hémophilie ; genou.

INTRODUCTION

Different techniques have been employed for the diagnosis of hemophilic arthropathy of the knee : TAC (1), xeroradiography (1, 2), osseous scintigraphy (3, 4, 5), conventional radiology (1) and nuclear magnetic resonance (6, 7).

It has been well shown than after the first hemarthrosis and its reabsorption, the patient usually develops severe deformity and even articular destruction and a stiff joint (8, 9). US has proved to be a safe and precise diagnostic technique for such cases, because it does not cause radiation or other dangerous side effects (1, 10, 12). The aim of this study is to emphasize the usefulness of US in the initial stages of hemophilic arthropathy of the knee.

PATIENTS AND METHODS

Fifty hemophilia A patients were studied, aged between 12 and 18 years (mean, 14.6 years). None presented hemarthrosis or clinical symptomatology at the time of the study. Fifty healthy volunteers formed the control group, aged between 13 and 18 years (mean, 12.2 years). The results obtained in the hemophilic group were compared to this group.

Each individual was scored with zero points in the radiological scale advocated by the Orthopaedic Advisory Committee of the World Federation of Hemophilia (1) (table I). Thus the knees were considered free of abnormal findings in the examination made by an orthopedic surgeon.

The ultrasound study was carried out by a radiologist who did not know the clinical conditions of the individuals. Ultrasound examination was made with a 5-MHz probe focused at 3 cm in real time. Transverse and longitudinal sections were performed systematically at 0.5 cm, from the upper pole of the patella to the center of the intercondylar notch.

The knees were studied in complete extension and in maximal flexion (at least 90°, depending on the clinical condition of the patient) with the patient lying supine.

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Table I. — Radiologic evaluation recommended by the Orthopaedic Advisory Committee of the World Federation of Haemophilia

Type of change	Findings	Score (points)
Osteoporosis	Absent Present	0 1
Enlarged epiphysis	Absent Present	0 1
Irregular subchondral surface	Absent Partially involved Totally involved	0 1 2
Narrowing of joint space (JS)	Absent JS > 1 mm JS ⩽ 1 mm	0 1 2
Subcondral cyst formation	Absent 1 cyst > 1 cyst	0 1 2
Erosions of joints margins	Absent Present	0 1
Gross incongruence of articulating bone ends	Absent Slight Pronounced	0 1 2
Joint deformity (angulation and/or displacement between articulating bones)	Absent Slight Pronounced	0 1 2
Possible joint score : 0-13 points		

The study was based on two types of findings :

1. Synovial thickening, shown as irregular echoes projected inside the suprapatellar effusion space, from anterior and posterior surfaces (fig. 1).
2. Existence or absence of articular cartilage damage, shown by obliteration of the smooth and uniform cartilage band placed over the knee surface (fig. 2).

This technique is also useful to visualize the existence of hemarthrosis, but due to the conditions of our study, in only two cases was it detected. It is diagnosed by the presence of a well-defined space, filled with liquid, above the patella, anterior to the distal femoral shaft and posterior to the quadriceps tendon (fig. 3).

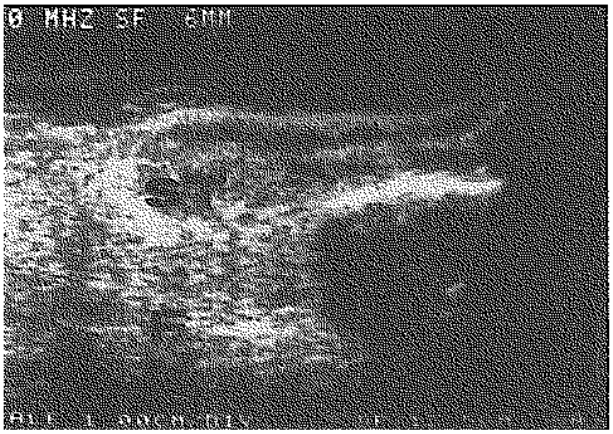

Fig. 1. — Longitudinal section by US : knee with synovial thickening (ST). P = Patella, F = Femur, T = Tibia.

Fig. 2. — Transverse US section over the patellar level : left, normal knee ; right, with suprapatellar effusion.

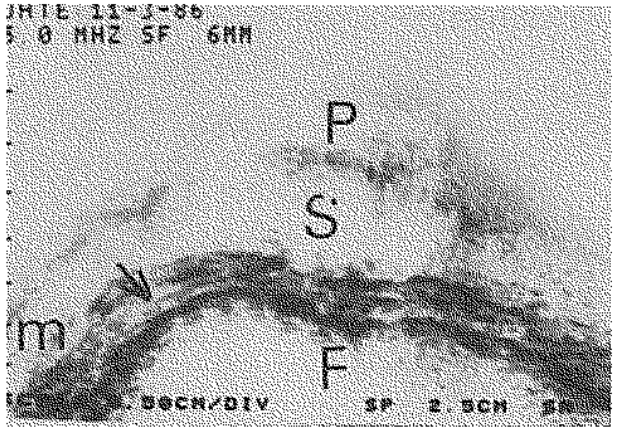

Fig. 3. — Transverse US section at the level of the intercondylar notch. The arrow indicates the abnormal irregularity of the involved cartilage.
P = Patella, S = Soft Tissues, F = Femur, m = Medial.

RESULTS

Our results are shown in table II. We found an isolated suprapatellar effusion in two cases. In 27 patients there was isolated synovial thickening, and in 11 cases both findings were noted, As was expected, none of the healthy volunteers showed any of these findings. On the other hand, cartilage damage was seen in 46 individuals from the hemophilic group and in two individuals from the control group.

Table II. — Distribution of the main US findings in hemophilic patients and healthy controls

		Hemophilic 50	Healthy 50
Longitudinal Section	Suprapatellar Effusion	2	0
	Synovial thickening	37	0
	Both	11	0
Transverse Section	Articular cartilage involvement	46	2
	No abnormal findings	4	48

DISCUSSION

Until recently, conventional radiology was the most common technique to obtain information about the articular destruction of the hemophilic knee, but it cannot show synovial and cartilage pathology, except through indirect findings (1).

TAC reveals cartilaginous changes, but it has two main disadvantages : it has limited spacial resolution and it only offers images from transverse sections (10). Furthermore, we must keep in mind the possible damage caused by repetitive radiation in this kind of patient. Nuclear magnetic resonance has been successfully employed in a small number of knees (6, 7), but it is not a routinary technique in our unit. Other diagnostic methods such as arthrography or arthroscopy have the disadvantage of invasiveness. On the other hand, US is a simple, accurate method that permits diagnoses and differentiation between synovial thickening and suprapatellar effusion. It also gives information about the early changes in the articular cartilage of the knee (1, 10, 11).

In conclusion, we suggest that the findings obtained through US should be utilized to clarify the early stages of hemophilic arthropathy of the knee when conventional radiology can not detect them.

REFERENCES

1. Petterson H., Gilbert M. S. Haemophilic arthropathy. In Diagnostic Imaging in Haemophilia, Springer Verlag, New York, 1985, p. 23.
2. Ruffato C., Pedoja C., Traldi A. Xeroradiographic study of haemophilic arthropathy. Diagnostic Imaging, 1979, 48, 103.
3. Cambouroglu G., Papathanassiou B., Koutoulidis C., Bossinakou I., Mandalaki T. Haemophilic arthropathy surveyed with the whole body gamma-camera scintigraphy. Acta Orthop. Scand., 1976, 47, 607.
4. Forbes C. D., Greig W. R., Prentice C. R. M., McNicol G. P. Radioisotope knee joint scans in haemophilia and Christmas disease. J. Bone Joint Surg., 1972, 54-B, 468.
5. Forbes C. D., James W., Prentice C. R. M., Greig W. A comparison of thermography, radioisotope scanning, and clinical assessment of the knee joint in haemophilia. Clin. Radiol., 1975, 26, 41.
6. Döhring S., Schulitz K. P. Magnetic resonance imaging (MRI) in haemophilic arthropathy. Res. Clin. Lab., 1986, 16, 197.
7. Petterson H., Kitchens C., Samuelsson L. Magnetic resonance imaging of the haemophilic knee. Res. Clin. Lab., 1986, 16, 151.
8. Arnold W. D., Hilgartner M. W. Haemophilic arthropathy. Current concepts of pathogenesis and management. J. Bone Joint Surg., 1977, 59-A, 287.
9. De Palma A. F. Haemophilic arthropathy. Clin. Orthop., 1967, 52, 145.
10. Aisen A. M., McCune W. I., McGuire A., Carson P. L., Silver T. M., Jafri S. Z., Martel W. Sonographic evaluation of the cartilage of the knee. Radiology, 1984, 153, 781.
11. Forbes C. D., Lowe G. D. U., Prentice C. R. N. Ultrasonography in haemophilia. Lancet, 1977, 1604.
12. Galindo E., Merchan E. C. R., Gago J., Orbe A. Ultrasonics in the diagnosis and assessment of effect of treatment of intra-muscular haematomas in haemophiliacs. In Döhring S., Schulitz K. P., ed. Orthopaedic Problems in Haemophilia, W. Zuckschwerdt Verlag, Munich, 1986, p. 56.

SAMENVATTING

E. C. R. MERCHAN, A. DE ORBE en J. GAGO. Echografie bij de vroegtijdige diagnose van hemofilische arthropathie van de knie.

De auteurs hebben de knie van 50 patiënten met hemofilie A echografisch onderzocht, na een voor botletsels negatief standaard radiologisch onderzoek. De beelden werden vergeleken met de gegevens van 50 niet pathologische controles. De gemiddelde leeftijd van deze serie was 14,6 jaar.
De resultaten tonen aan dat de echografie in een vroeg-stadium van hemophilie een differentiatie mogelijk maakt tussen subquadricipitale hydrops en synoviale verdikking. Het odnerzoek toont ook beginnende kraakbeenletsels aan.

RÉSUMÉ

E. C. R. MERCHAN, A. DE ORBE et J. GAGO. L'échographie dans le diagnostic précoce de l'arthropathie hémophilique du genou.

Les auteurs ont étudié l'échographie des genoux de 50 patients, souffrant d'hémophilie A, après que l'examen radiologique conventionnel n'eut mis aucune lésion osseuse secondaire en évidence. Les images furent comparées à celles obtenues chez 50 sujets sains. L'âge moyen de cette série était de 14,6 ans.
Les résultats montrent que l'échographie est un moyen de diagnostic fiable dans les stades précoces d'arthropathie hémophilique, permettant une différentiation entre un épanchement sous-quadricipital et un épaississement synovial. L'examen met également en évidence une éventuelle atteinte cartilagineuse débutante.