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PHYSEO-EPIPHYSEAL INJURIES OF LOWER EXTREMITIES IN MYELOMENINGOCELE

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During the last few years the neurosurgical and urological treatment of children with myelomeningocele has completely changed the prognosis of patients with this congenital defect. Consequently, at present myelomeningocele is the outstanding cause of paraplegia in childhood, and due to the better control of hydrocephalus and urinary tract infections the number of patients surviving the hazards of early infancy is increasing steadily. In Sheffield, 73 per cent of such infants were still alive after 2–3 years, and within the next decade, therefore, myelomeningocele will rival trauma as a cause of paraplegia in the young adult (Stark 1972).

To the orthopedic surgeon this group of patients creates a series of problems which, although not unique in every respect, demand reasoning and solutions in ways with which the orthodoxly educated orthopedic surgeon is not familiar. Examples of such problems are the paralytic hip dislocation and club foot in these patients, as well as the osteoporosis and liability to fractures which occur without any warning by pain.

A "new" skeletal complication of patients with myelomeningocele has been encountered during the last two years, consisting in damage to the growth plate (physis) of the lower extremities, and, in one case, of the throclea tali. The lesion is characterized by a broadening and loosening of the physis, possibly due to repetitive trauma, and in one case proceeding to a virtual pseudarthrosis. This complication may prove to be of importance, since both growth rate and configuration of the affected bones are impaired.

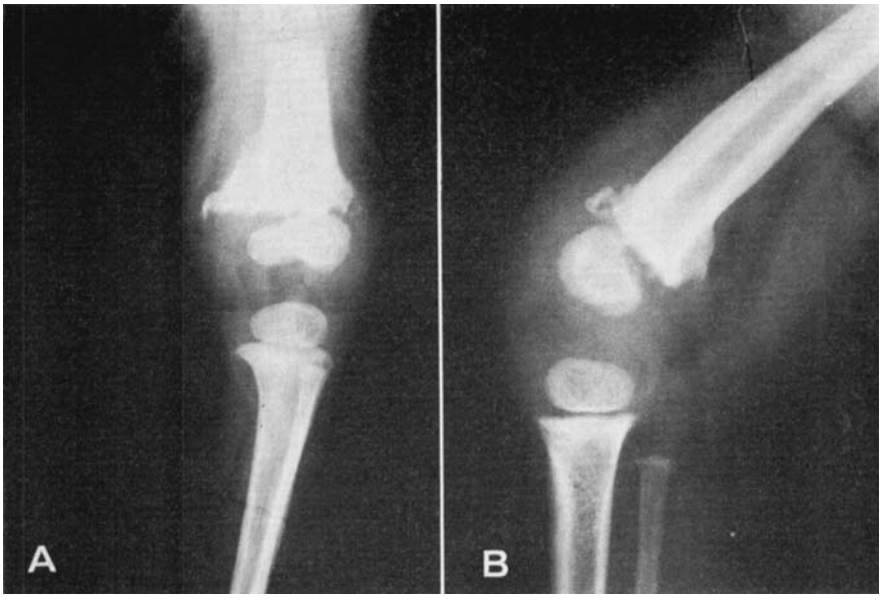

Figure 1. Case 1. Lesion of lower femoral physis in 2-year-old girl treated with passive movements of knees because of extension deficit. Posteromedial (A) and anterolateral (B) views.

MATERIAL

Out of a total of about 50 children under treatment for meningomyelocele, a lesion of one or more epiphyses of the lower extremities has been observed in 6. It should be stressed, however, that these observations are made more or less by chance, and that further investigations may reveal a greater number.

Case 1. (Girl AH 290864): Myelomeningocele with motor loss below L_5, sensory loss below L_4, subluxated hips and extension deficit of a few degrees of both knees, treated by physiotherapy. X-rays show loosening through lower femoral physis (Figure 1 A, B) at the age of two years. No walking.

Case 2. (Boy ØL 271066): Myelomeningocele with motor and sensory loss below L_3. Congenital talipes equino-varus, walking with crutches and braces. At the age of four years rotational osteotomy of leg was carried out, and weight-bearing resumed after 3 months (Figure 2 A). Nine months later on routine control injury to physis-epiphysis is evident (Figure 2 B).

Case 3. (Boy VM 221066): Myelomeningocele with motor and sensory loss below L_5 and talipes equinovarus. He was walking with crutches and braces. Evans operation performed at age of four (Figure 3 A). At removal of plaster X-rays show lesion of lower tibial epiphysis (Figure 3 B).

Case 4. (Girl GF 260164): Myelomeningocele with motor loss below S_1, sensory loss below L_5. Walking without aids. X-ray on account of swelling of ankle shows destruction of trochlea tali (Figure 4). No signs of infection.

Figure 2. Case 2. A shows lower right ankle at removal of plaster after rotational osteotomy 3 months previously. After resuming weight-bearing 8½ months later there is lesion of lower physis and epiphysis (B).

Case 5. (Girl KG 310363): Myelomeningocele and operated hydrocephalus. Motor loss below L_3–L_4, sensory loss below Th 12. Walking with short leg brace on the right foot, long brace on the left foot. X-rays at age of six show injury of upper tibial and lower femoral epiphysis on the right side (Figure 5).

Case 6. (Girl KS 210663): Motor loss below L_5, sensory loss below L_3. Walking with short leg braces. X-rays at age of seven show lesion and motility through upper tibial epiphysis (Figure 6 A, B) and healing after plaster bandage for 3 months (Figure 6 C).

COMMENTS

As seen from the case histories, the youngest patient was two and the oldest seven when the physeo-epiphyseal lesion was discovered. The youngest had not yet started walking, but was under treatment for an extension deficit of the knees. One lesion of lower tibial epiphysis had developed while the patient was wearing a plaster bandage after correction of club foot deformity, while another was observed when weight-bearing was resumed after rotational osteotomy. The three others were walking without external protection of the joints affected. All healed with sequelae during plaster immobilisation.

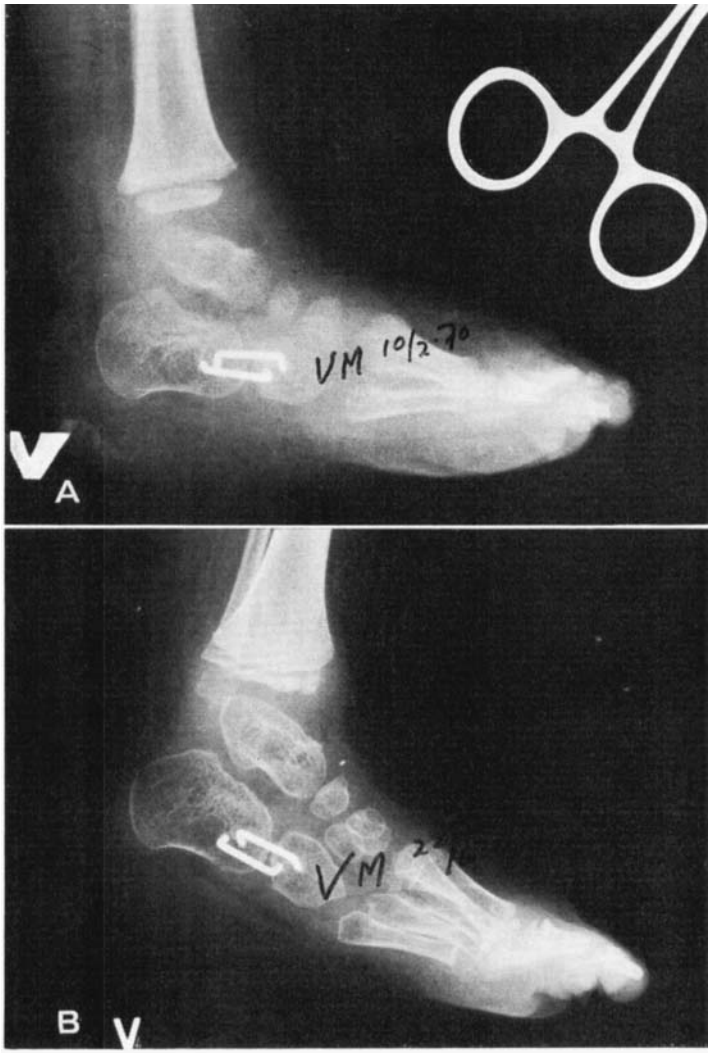

Figure 3. Case 3. Left ankle at completion of operation for club foot deformity (A) shows normal physis. After four months of plaster immobilisation physis is widened and epiphysis flattened with irregularity of joint space (B).

DISCUSSION

The present observations demonstrate that the growth plates and the epiphyses of the lower extremities of children with meningomyelocele can be severely traumatized during daily walking activities as well as by passive joint movements. Forced manipulation as part of the opera-

Figure 4. Case 4. Girl at the age of six walking without aids, swelling of left ankle. X-ray shows severe destruction of talus.

tive procedure in correcting the foot deformity was supposedly the reason for the damage encountered after the removal of the plaster in case 3. Moreover, it appears that even a cuboid bone such as the talus may be affected.

In 1965 Gyepes et al. reported on 6 patients with lesion of the physis of the knee and ankle regions. These patients were between 11 and 13 years of age, and used no braces on walking. With this background the authors postulated that the repetitive trauma of walking was the causative factor in the destruction. The present observations lend support to this view, but indicate, on the other hand, that the physis in myelomeningocele patients is even more sensitive to trauma than is indicated by the cited report and may also be injured by passive joint movements in patients without weight-bearing.

The pathological process taking place in the growth plate is apparently one of softening of the physeal cartilage, which in turn leads to changes in both the epiphysis and the metaphysis, although the broadening of the latter may be partly due to subperiostal bleeding.

The nature of the lesion, however, tends to disturb normal growth, and, hence, to increase the sequelae of these patients.

The susceptibility of the physes to suffer from trauma has a double background. Firstly, in the growing child the cartilage of the growth plate represents a barrier between the metaphysis and epiphysis, each having its own blood supply. The growing cartilage of the physis has its blood supply from the epiphysis (Vaughan 1970) and hence is liable to loss of its blood supply in conditions of trauma to joint surroundings. Secondly, the loss of sensation in patients with meningomyelocele is the physiological handicap which permits damage to the joint surroundings in the absence of protection by pain. This also explains the damage to a bone like the talus, and, as pointed out by Gyepes et al. (1965), is possibly the reason for all so-called "Charcot joints". Loss of afferent information, in the same way, may explain the secondary breakdown on attempted joint fusions in patients with meningomyelocele, as reported by Brooks & Saunders (1967).

Figure 5. Lesion of lower femoral and upper tibial physis in six-year-old girl walking with short leg brace on affected limb.

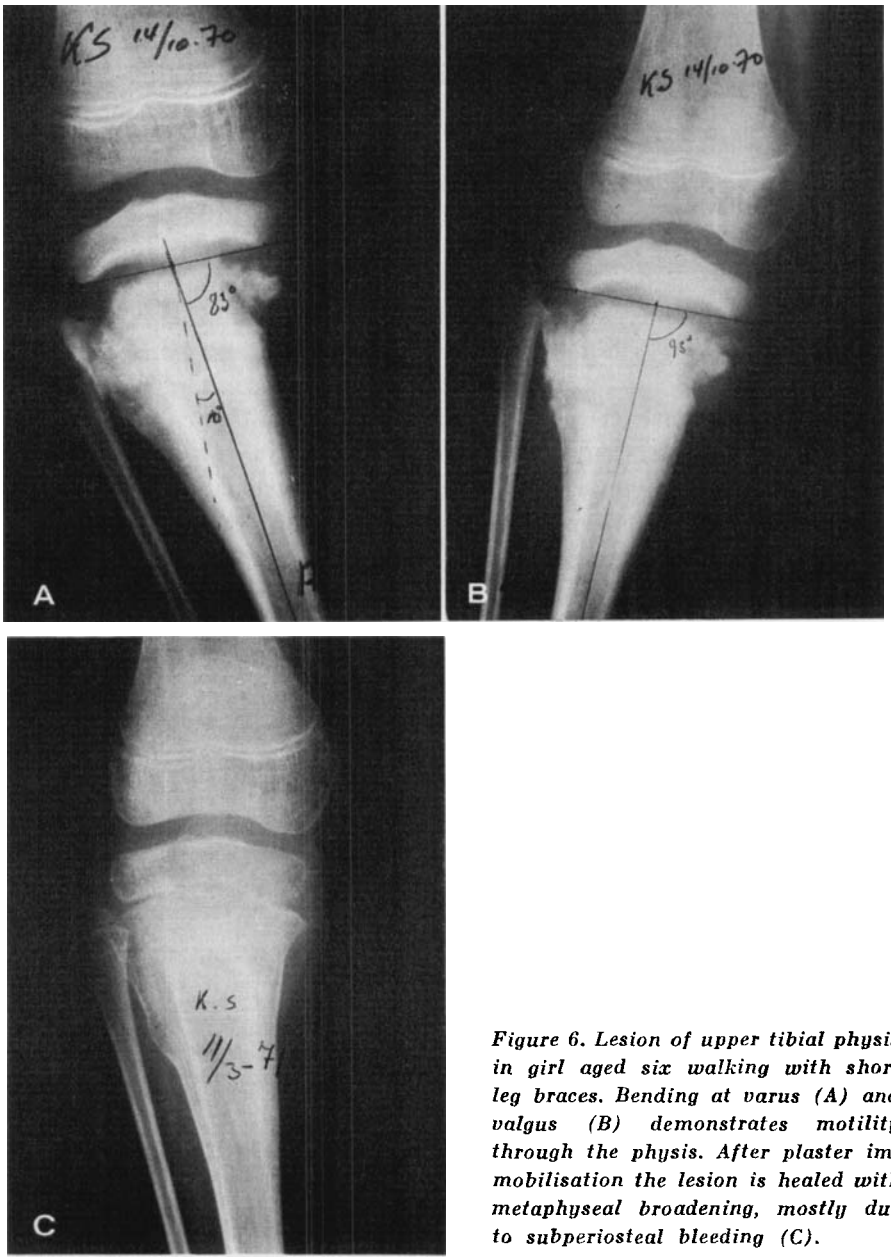

Figure 6. Lesion of upper tibial physis in girl aged six walking with short leg braces. Bending at varus (A) and valgus (B) demonstrates motility through the physis. After plaster immobilisation the lesion is healed with metaphyseal broadening, mostly due to subperiosteal bleeding (C).

CONCLUSION

1. Injury to the physis of the lower extremities in children with myelomeningocele is probably more likely to occur than is generally recognized.

2. The reason for the susceptibility to damage is a combination of anatomical and physiological factors, *viz.*, the blood supply to the growth plate and loss of pain sensation. Healing may always be expected on immobilisation and avoidance of weight-bearing.

3. To prevent serious effects of the injury on the bone growth, routine X-ray examination of weight-bearing epiphyses should be performed yearly until the physes have fused.

SUMMARY

Amongst about 50 children under treatment for meningomyelocele, injuries to some physis or other in the lower extremities were observed in five, and in one there was a destruction of the trochlea tali. Since these observations were done without any suspicion of growth plate injury, it may be assumed that such lesions are even more common than indicated by the observed cases. Routine X-ray examinations are indicated to prevent growth disturbances. Treatment consists of immobilisation and avoidance of weight-bearing.

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