Ectopic bone formation in a child with a head injury: complete regression after immobilisation

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Summary. A girl aged 3 years was struck by an automobile and admitted to hospital unconscious with a head injury and a right hemiparesis. Pelvic and left femoral fractures were managed with skin traction. Three weeks after the injury the range of motion of the right hip joint was reduced and movements were painful. Radiographic examination two weeks later revealed heterotopic bone formation around the hip joint. Immobilisation was the only treatment offered. One year after injury, the ectopic ossification around the hip had resolved spontaneously, and she was able to walk independently.

Résumé. Les auteurs rapportent un cas d'ossification ectopique au niveau de la hanche chez une fillette de 3 ans. L'enfant a été victime d'un accident de la voie publique et fut admise à l'Hôpital inconsciente avec une hémiparésie droite. Elle présentait une fracture pelvienne et une fracture du fémur gauche qui furent traitées par traction collée. 3 semaines après le traumatisme, la hanche était douloureuse avec une mobilité réduite. Les radiographies ont montré l'existence d'une formation ectopique osseuse dans les parties molles. Il n'y a pas eu d'autre traitement que l'immobilisation. Un an après le traumatisme, l'ossification ectopique s'était résorbée spontanément et l'enfant avait retrouvé une marche normale.

Introduction

Traumatic myositis ossificans has been extensively documented [5, 12, 13], but there are surprisingly few reports of ectopic bone formation following a head injury in children [7, 11]. In this form of ossification the process is likely to be extensive and often no history of trauma is obtained [2, 16].

The authors have observed ectopic ossification around the hip joint in a girl aged 3 years who sustained a head injury. The outcome one year after the injury is described and the literature pertaining to diagnosis, treatment and prognosis is reviewed.

Case report

A girl aged 3 years was hit by a car and was deeply unconscious when admitted to hospital in November 1994. She was found to have a right hemiparesis, multiple abrasions, a pelvic fracture which involved the right ischiopubic ramus and a left femoral fracture. No injury to the right hip was detected. The severity score was 16 points according to the Modified Abbreviated Injury Severity Scale (MAISS) and 7 points according to the Glasgow Coma Scale (GCS). On the fourth day, she regained consciousness. After a period of three weeks in skin traction, radiological studies revealed periosteal healing of the pelvic and left femoral fractures. By this time, her clinical condition had improved considerably, and she had useful active movement in the right arm and leg.

In the fourth week local discomfort developed around the right hip, with painful limitation of internal rotation and abduction. Her temperature was elevated (37.4 ° Celsius). Laboratory studies revealed a leucocyte count of 11,200 cells/mm³, with 58% polymorphonuclear cells, 35% band cells, and 7% monocytes. The erythrocyte sedimentation rate (ESR) was 39 mm in the first hour (normal 0–10 mm) and the serum alkaline phosphatase level was 472 IU/l (normal 185–425 IU/L). Radiographs were indicative of extensive oedema of the soft tissues surrounding the right hip joint (Fig. 1a).

Fig. 1. **a** Anteroposterior radiograph three weeks after the injury. Extensive soft tissue oedema in the area of the right hip and healing fractures of the right ischiopubic ramus and left femoral shaft are apparent. **b** Ectopic bone was present in the region of the right hip five weeks after the injury. Traces of bone appear to be mature but other regions have a hazy outline

Her clinical status deteriorated rapidly during the next two days. Movements of the right hip joint became painful and significantly limited to the extent that the joint became almost fixed. Traction was removed and a double-sided hip spica cast was applied under anaesthesia. Serial determinations of the ESR and ALP levels revealed progressive elevation which had reached 53 mm/h and 722 IU/l respectively, two weeks later.

Five weeks after the injury, when the plaster was changed, there was almost total loss of movement in the right hip joint. Radiographs revealed immature new bone with traces of ossification at the tip and above the greater trochanter of the right femur in the abductor compartment, as well as in the region between the medial capsule and the external rotator muscles of the hip (Fig. 1b).

The child was kept in plaster for five weeks. No anti-inflammatory agents were prescribed. Periodic radiological assessment showed more clearly demarcated margins but with no extension of the ectopic bone. Serial determinations of ESR

and ALP serum levels were undertaken weekly. Both parameters dropped progressively and two months after injury they had fallen to 19 mm/h and 497 IU/l respectively.

The patient remained in skin traction for a further two months. No forceful manipulations or passive stretching movements were attempted. Gentle active assisted exercises were gradually introduced when the acute phase seemed to have subsided.

Four months after injury the girl started weightbearing and six months later she was able to walk independently as the range of movement in the right hip and the muscle strength gradually returned to normal. Radiographic follow-up indicated that the ectopic bone followed a self-limited course with total resorption by one year after the injury (Fig. 2).

Discussion

Trauma is the leading cause of childhood mortality and is second only to acute infection as the major cause of morbidity. The severity of injury in the paediatric polytrauma patient is classified according to the MISS system which combines the GCS score to assess neurologic injury. Patients with a MISS score of 25 points or more have an increased risk of permanent impairment, while children with a GCS score over 5 points tend to recover fully [9, 10].

Periarticular ossification may appear in children and adults with brain injuries [11, 14]. An idiopathic neurogenic factor, in some way related to coma and not to local soft tissue and bone trauma, seems to be the underlying cause [3, 8, 18].

In the early phase of development of the ectopic bone, there are no radiographic changes, and at a clinical level the lesion may be mistaken for an inflammatory process or a sarcoma [1, 15]. Normal serum ALP levels are age and sex related [6]. We have found that in children with long bone fractures there is a significant increase in the serum

Fig. 2. Anteroposterior and lateral radiographs one year after the injury. The ectopic bone has resorbed and the fractures have healed

ALP levels before radiographic appearance of callus formation; thereafter the ALP levels fall rapidly. In the reported case the progressive rise in ALP concentration after the radiographic evidence of periosteal fracture healing was a sensitive indicator of ectopic bone formation.

Conservative management of small lesions and those in the upper limb is very satisfactory, since these are often self-limited and frequently tend to resorb [4]. Ectopic ossification around the hip following traumatic dislocation with or without concomitant head injury may sometimes undergo a mild regression, but without disappearing [3]. Whenever the ectopic bone is incompletely removed during its early proliferative phase, it may continue to progress. For this reason, surgical excision should be considered only for large lesions or when the origin or insertion of a muscle is involved and the function of a joint is severely impaired [17]. The indications and optimal timing for surgery in the patient with multiple injuries appear to be when the individual is no longer comatose and shows progressive neurological and physical recovery and when the ectopic bone presents an impediment to rehabilitation [11].

The reported incidence of ectopic ossification in children is very low, and most diagnostic and treatment plans are based upon the literature concerning the adult population. We believe that the child with a head injury and ectopic ossification who we describe in this paper is the youngest reported. With increased clinical suspicion, the diagnosis of ectopic ossification can be made prior to an extensive radiological work-up or unnecessary surgery. In our patient immobilisation was the only treatment offered during the active phase of ectopic bone formation. Complete resorption followed within the first year of follow up. We consider that conservative management is the most appropriate approach to ectopic ossification in children with head injuries.

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