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SKELETAL CHANGES IN THE «CRI DU CHAT» SYNDROME *

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SUMMARY

A radiological investigation was carried out in a group of patients with the " cri du chat " syndrome. The most striking skeletal abnormalities associated with the 5p- chromosome anomaly include microcephaly hypertelorism, narrowing of the wings of ilia, which often appear rectangular in shape. In older patients additional consistent radiological features include large frontal sinuses, malocclusions, scoliosis, shortness of some metacarpal and metatarsal bones. The radiological investigations in the " cri du chat " syndrome, although of small diagnostic aid, appear to be useful for a detailed characterization of the malformations.

The radiographic features found in the syndromes of trisomy 13, 18, and 21, are rather constant and specific; therefore, they give valuable information for the selection of patients to be referred to cytogenetic analysis.

On the contrary, until now, little is known about other autosomal-aberration syndromes and radiological anomalies. Systematic studies in this field are lacking, and much of the information currently available can be derived from a review of the clinical and cytogenetic descriptions of single patients, in which the results of radiological studies are often, but not always, reported.

A notable exception is the " cri du chat " syndrome. The radiological signs of the disease have been analyzed by at least two different groups of investigators in France (Labrune et al. 1967), and the United States (James et al. 1969). Further information has been collected by Breg et al. (1970) in a group of older patients. All these studies failed to show major or constant radiologic anomalies. However, a larger variability in the skeletal changes and bone morphology seems to be present in older individuals, according to the findings of Breg and coworkers; but also in these cases there are no constant or noticeable variations from normal.

The present paper reports the results of a systematic radiologic investigation, limited to the skeleton, carried out in a group of patients with the cri du chat syndrome.

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MATERIAL AND METHODS

Eleven patients, carrying simple deletion of the short arm of chromosome 5, have been studied. They included 8 females, respectively aged 2 months (3 cases), 3 months, 5 months, and 2, 7, and 8 years; and 3 males, respectively aged 6 months, 1 year, and 3 years. The sex distribution reflects the generally reported prevalence of female cases.

Since most of the clinical abnormalities reported involve the cephalic segment and include brachycephaly, round face, broad-flattened nasal bridge, hypertelorism, oblique downward-slanting palpebral fissures, microcephaly, micrognathia, low-set ears, and epicanthus, we have studied more attentively the cranial morphology and volume, and the interorbital distance. Another skeletal segment specifically investigated was the pelvis, on account of the high concentration of anomalies reported at this level.

The cranial volume was calculated from the measurement of three diameters: bitemporal (from inner table to inner table), longest anteroposterior (from internal occiput protuberance, to the inner table of frontal bone), superoinferior (from bregma to foramen magnum). The interorbital distance was measured at the level of unguis on anteroposterior views, keeping the focus to film distance at one meter.

RESULTS

The results, when compared with those obtained from a control sample of 80 normal individuals, show the existence of a constant microcephaly (Fig. 1) and of higher interorbital-distance age mean values (Fig. 2). It should be noted, however, that the values obtained in patients up to 6 months of age could reflect a misinterpretation, because of the difficulty to decide exactly where the interorbital margin lies.

In addition to microcephaly and hypertelorism, the radiologic investigations of the skull did not show the existence of other consistent or major anomalies. The head shape was quite variable: some patients were dolicocephalic, other mesocephalic or even brachycephalic. A low craniofacial-vault ratio, presence of large frontal veins and large frontal sinuses, dislocation and delayed closure of bregmatic fontanel, smooth appearance of the internal cranial table, large sphenoidal fissures, have been detected in some cases (Fig. 4).

This apparently great variability of findings in the cephalic segment seems to indicate the inability of X-ray investigations to find out consistent skeletal changes, with the exception of those which are already recognizable during the patient's clinical examination.

The radiologic investigation of the pelvis failed to show any abnormality in the acetabular angle. On the contrary, the iliac angle was increased in 7 out of 11 patients, resulting in an increase in the iliac index in most cases (Fig. 3).

A bilateral hip dislocation was detected in one patient; in another-one, there was a valgus deformity of the femural neck, with an external displacement of femural heads. In some patients the iliac wings are poorly developed, with an absence of normal flaring, appearing rectangular in shape. Therefore, their morphology is opposite to the very well known " elephant ear " deformity of trisomy 21, and often assumes a peculiar " antimongoloid " slant (Fig. 5).

Scoliosis was apparent in two patients. No other significant deformities were appreciated in the spine, with the exception of a large sacral schisis in one case, and an incomplete hemisacralisation from the presacral metamere, in another one.

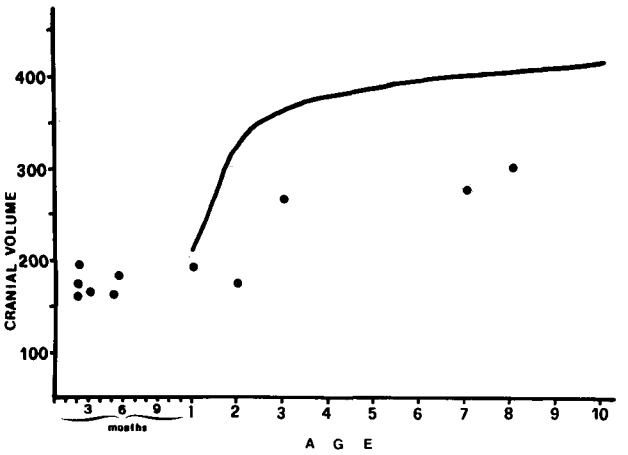

FIG. 1. *Lower cranial volumes in patients than controls.*

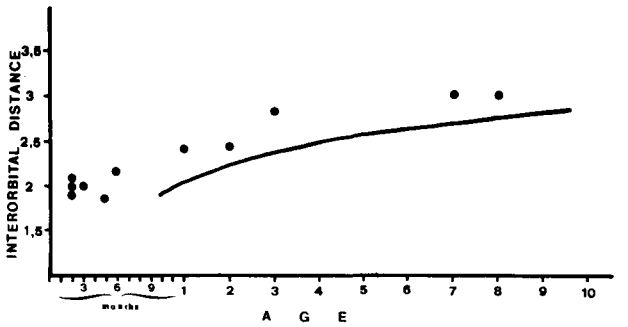

FIG. 2. *Increased interorbital distance in patients than controls.*

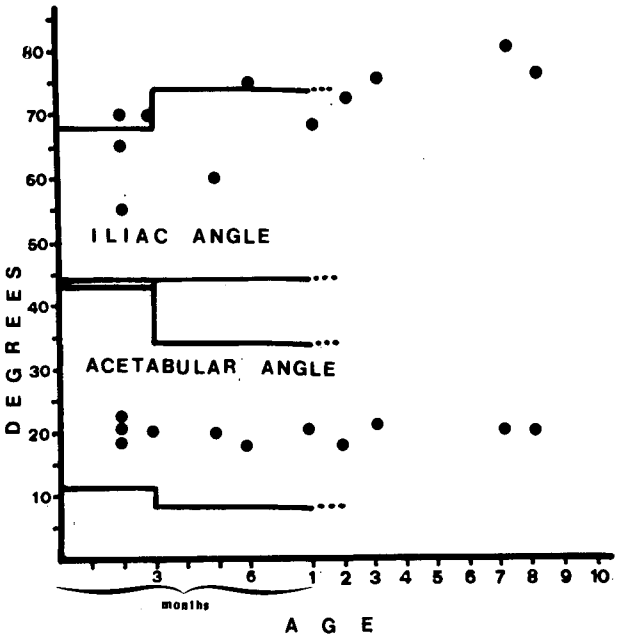

FIG. 3. *Increased iliac index in patients than controls. The acetabular angle fails to show any abnormality.*

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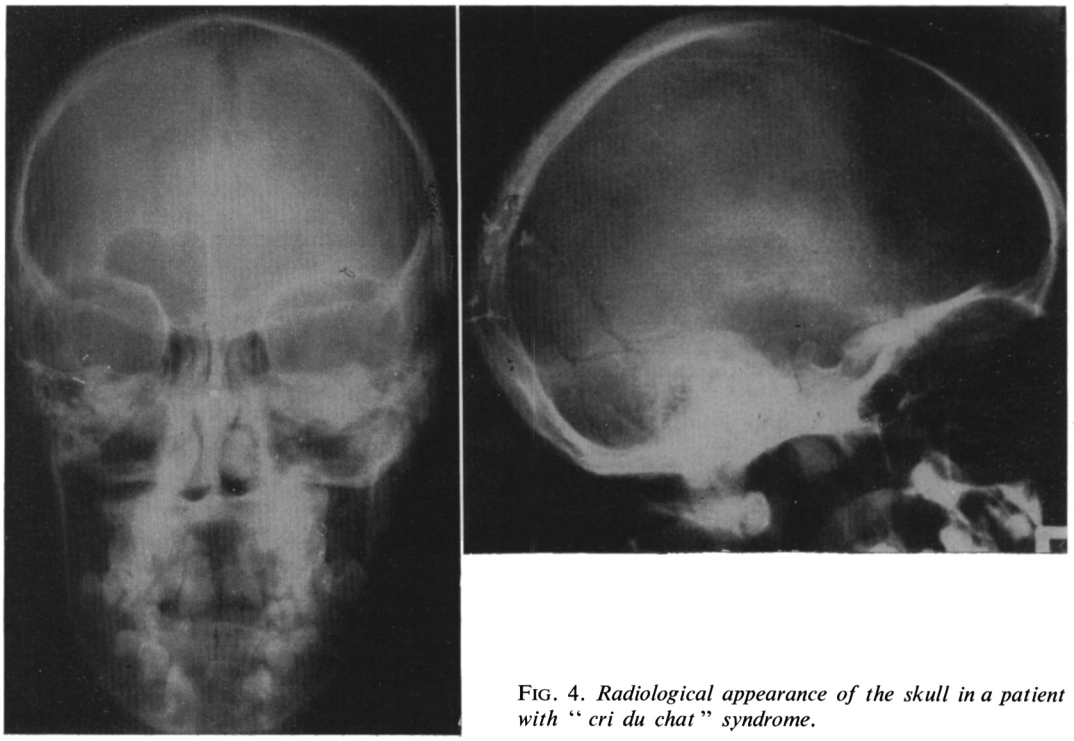

FIG. 4. *Radiological appearance of the skull in a patient with "cri du chat" syndrome.*

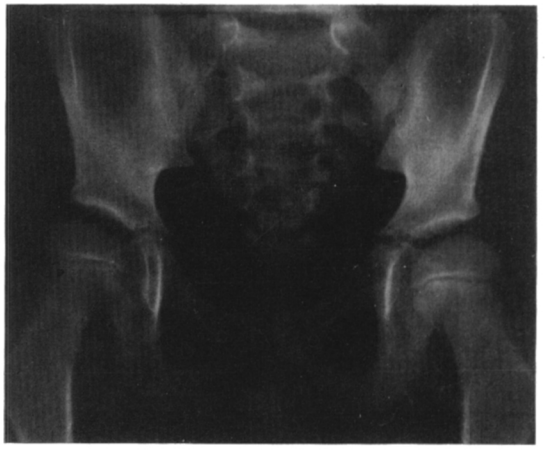

FIG. 5. *"Antimongoloid" slant of the pelvis in a patient with "cri du chat" syndrome.*

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The rib cage was not consistently malformed: a mild hypoplasia of singular ribs, particularly the first and the twelfth, was detected in few subjects.

A faulty long-bone development, secondary to muscle hypotonia, has been observed in the majority of patients.

The radiologic appearance of the hand is not peculiar: however, the clinodactyly of the fifth fingers is a rather constant feature, but only in two cases it was associated to a hypoplasia of the second phalangeal bone. A partial syndactyly was observed in one subject. Shortness of some metacarpals or metatarsals, associated to proximal or distal pseudoepiphyses, was detected in the two older patients. Apart from these findings, no additional unusual skeletal configurations were seen. The bone age was consistent with chronological age in all cases.

CONCLUSIONS

The radiographic features of the " cri du chat " syndrome, as shown by the present investigation and by previous reports, do not seem to be as specific as those found in trisomy 13, 18, and 21.

A considerable number of skeletal changes was apparent in our series of patients. Most of the radiographic findings are inconstant and may be regarded as an expression of physiological variability, more than a deviation from the normal basic pattern. In the absence of any constant or major anomaly in bone morphology, the only noticeable variations are microcephaly, hypertelorism, and increase in the iliac index. The first two signs can be directly recognized during clinical examination; the increase in the iliac index, associated to the smallness of the wing of the ilia, is aspecific, since it appears a rather common finding in other syndromes, such as " antimongolism ", trisomy 8, trisomy 4p, XXXXY males, and XXXXX females.

Thus, the radiographic investigations in the 5p- syndrome, although useful for a detailed characterization of the malformations, appear to be of small diagnostic aid, and one must depend greatly upon clinical findings.

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RIASSUNTO

È stata condotta un'indagine radiologica in un gruppo di pazienti con sindrome " cri du chat ". Le anomalie scheletriche qui rilevate, associate con l'aberrazione cromosomica 5p-, comportano microcefalia, ipertelorismo, e ipoplasia delle ali iliache, che appaiono spesso di forma rettangolare. Nei pazienti piú adulti si sono anche riscontrate, di norma, caratteristiche radiologiche quali larghi seni frontali, malocclusioni, scoliosi brevità di alcune ossa del metacarpo e del metatarso. Le indagini radiologiche nella sindrome del " cri du chat ", benché di scarso ausilio diagnostico, sono utili per una dettagliata caratterizzazione delle malformazioni.

RÉSUMÉ

Une étude radiologique a été conduite chez 11 sujets atteints de syndrôme du cri du chat. Les principales anomalies squelettiques associées avec l'aberration chromosomique 5p- comprennent microcéphalie, hypertélorisme, et hypoplasie des ailes iliaques, qui paraissent souvent de forme rectangulaire. Chez les patients plus âgés, ont aussi été généralement trouvées des caractéristiques radiologiques telles que larges sinus frontaux, malocclusions, scoliose, brévité de quelques os du métacarpe ou du métatarse. Tout en donnant une aide diagnostique limitée, les études radiologiques sur le syndrôme du cri du chat sont utiles afin d'en caractériser les malformations de façon plus détaillée.

ZUSAMMENFASSUNG

Die Röntgenuntersuchung einer Gruppe Patienten mit " cri du chat " -Syndrom (5p-Chromosom-Aberration) ergab folgende Skelettanomalien: Mikrozephalie, Hypertelorismus und Verengung der Beckenschaufeln, die oft viereckig erscheinen. Bei etwas erwachseneren Patienten wiesen die Röntgenbilder gewöhnlich noch andere Merkmale auf: breite Stirnhöhlen, Malokklusionen, Verkürzung einiger Mittelhand- und Handknochen. Obwohl die Röntgenuntersuchung des " cri du chat"-Syndroms nur wenig zur Diagnose beiträgt, ist sie jedoch für eine eingehende Kennzeichnung der Missbildungen nützlich.

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