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Brief Clinical Report: Apert Syndrome With Frontonasal Encephalocele

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We describe a female infant with Apert syndrome (acrocephalosyndactyly, type I) and a frontonasal encephalocele with unremarkable family history.

Key words: Apert syndrome, frontonasal encephalocele, new mutation

INTRODUCTION

Problems in syndrome diagnosis can arise when a previously unreported finding accompanies a well-defined syndrome. Here we describe an infant with Apert syndrome (acrocephalosyndactyly, type I) who had a frontonasal encephalocele.

CLINICAL REPORT

C.S. was born at term after an uncomplicated gestation. At delivery, her mother was a 25-year-old, healthy, gravida 2, para 1 woman who denied illnesses and use of drugs or medications during pregnancy. Both parents and another older brother were normal. At birth, the infant was noted to have a skin-covered mass bulging from the metopic suture extending externally to the tip of her nose, marked hypertelorism, and syndactyly involving all four limbs. She weighed 2,990 gm, was 49 cm long, and had a head circumference (OFC) of 34.5 cm. A cranial CT scan showed a large defect in the frontal bone and a basifrontal encephalocele. At age 3 weeks, part of the frontal mass was removed.

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Histologically, the excised tissue was considered dysplastic brain. Postoperatively, she did well with no feeding problems or neurological dysfunction. However, the frontal mass gradually reappeared, and at 6 weeks she was referred to the C.S. Mott Children's Hospital.

The anomalies of this black female infant are illustrated in Figures 1 and 2. Vital signs were normal. Weight was 4.8 kg and OFC 39 cm. Skin was normal with a well-healed surgical incision on her forehead. A soft frontal mass protruded through a widely open metopic suture. She had marked hypertelorism with mild proptosis and was unable to fix on an object with both eyes. Her ears appeared to be normally formed and placed. Her mouth was normal and her palate was intact. No other physical abnormalities were detected except for the extensive syndactyly of fingers and toes.

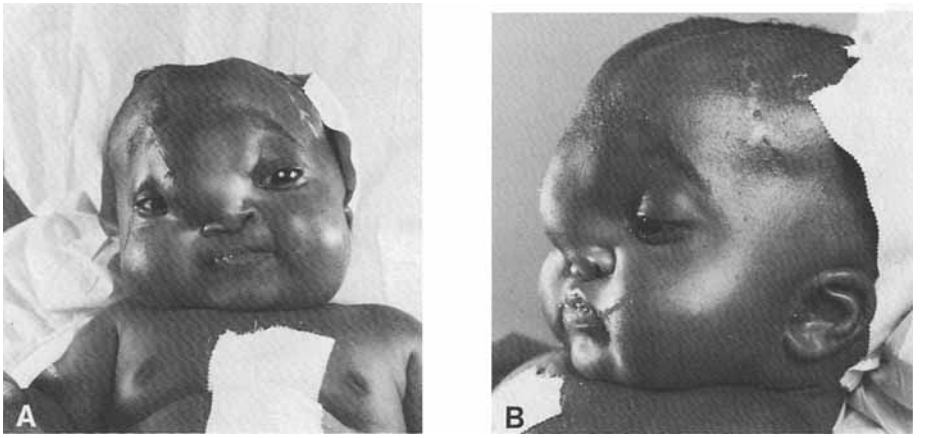

Fig. 1. A,B) Facial appearance of patient. These photos were taken shortly after the VP shunt was placed.

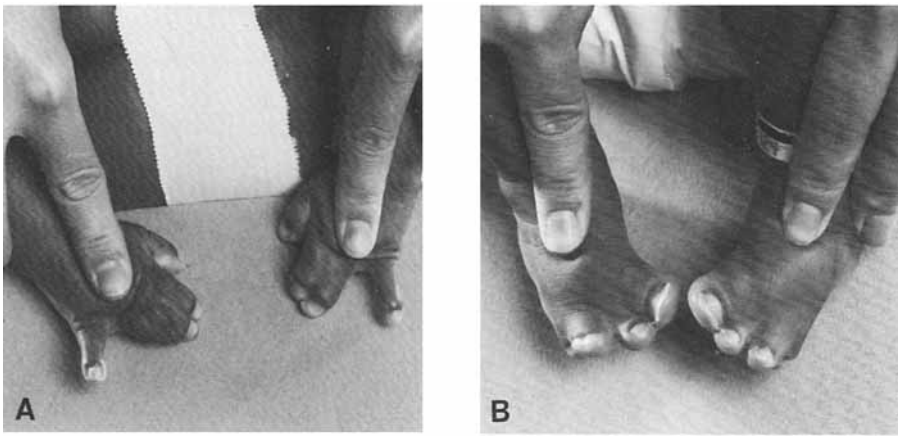

Fig. 2. Views of A) hands and B) feet.

Because of increasing head size, a ventriculoperitoneal (VP) shunt was placed. The size of the frontal mass decreased and then stabilized. She did well and was discharged from the hospital with normal neurologic function and growth. One month later she died suddenly. No autopsy was obtained and the cause of death could not be determined.

RADIOLOGIC AND LABORATORY FINDINGS

The radiologic findings are described in detail in Figures 3–5. Chromosomes (G-banded) were normal: 46,XX.

DISCUSSION

Children with Apert syndrome have variable degrees of craniosynostosis primarily involving the coronal sutures and severe syndactyly of hands and feet. In addition to the syndactyly, synostosis, espcially of the distal phalanges, and proximal symphalangism are noted on radiographs [Temtamy and McKusick, 1978]. The limb anomalies are reasonably symmetrical [Mafee and Valvassori, 1981].

The coronal, sphenofrontal, and sphenoethmoidal sutures form a continuous growth ring [Ebel, 1974; Friede, 1981; Seeger and Gabrielsen, 1971], which has great influence on the growth of the skull, especially the normal elongation of the anterior cranium [Friede, 1981]. Fusion of the sutures results in the high brachycephalic skull typical of Apert syndrome. However, the craniofacial malformations may vary due to differences in the synostosis of the cranial sutures and in the degree of maxillary hypoplasia [Kreiborg and Pruzansky, 1981; Temtamy and McKusick, 1978]

Other radiologic findings in Apert syndrome include steep shallow orbita, a short frontal fossa, hypertelorism, and a hypoplastic maxilla with relative prognathism resulting from the sphenoethmoidal-maxillary hypoplasia. In addition, the lesser wings of the sphenoid bone swing outward and upward and the petrous pyramids are deeper (more inferior) laterally than medially [Mafee and Valvassori, 1981; Ebel, 1974]. Often the coronal synostosis continues inferiorly to include the sphenofrontal suture [Seeger and Gabrielsen, 1971; Kreiborg and Bjork, 1981].

In our patient, both the coronal sutures and the sphenofrontal suture appeared open. However, the high, shallow orbita and short maxilla in our patient (Fig. 3B) indicate that sutures were functionally closed. It is known that sutures may appear to be open radiographically, yet be functionally fused [Mafee and Valvassori, 1981; Harwood-Nash and Fitz, 1976].

In addition, our patient had the maxillary hypoplasia, shallow steep orbita, elevated lesser sphenoidal wings, low petrous pyramids, and bulging temporal squamosa that are all part of the craniofacial malformation complex included in the Apert syndrome. Even though the coronal and sphenoidal sutures appeared to be open radiographically, we still think that our patient had good radiological evidence for Apert syndrome.

Complicating our case is the fact that much of the frontal bone was missing as a part of the large encephalocele (cranium bifidum). This distorted the shape of the skull and gave a facial appearance atypical for Apert syndrome. Also, the frontal skull markings in our case were not the convolutional markings that are often seen in

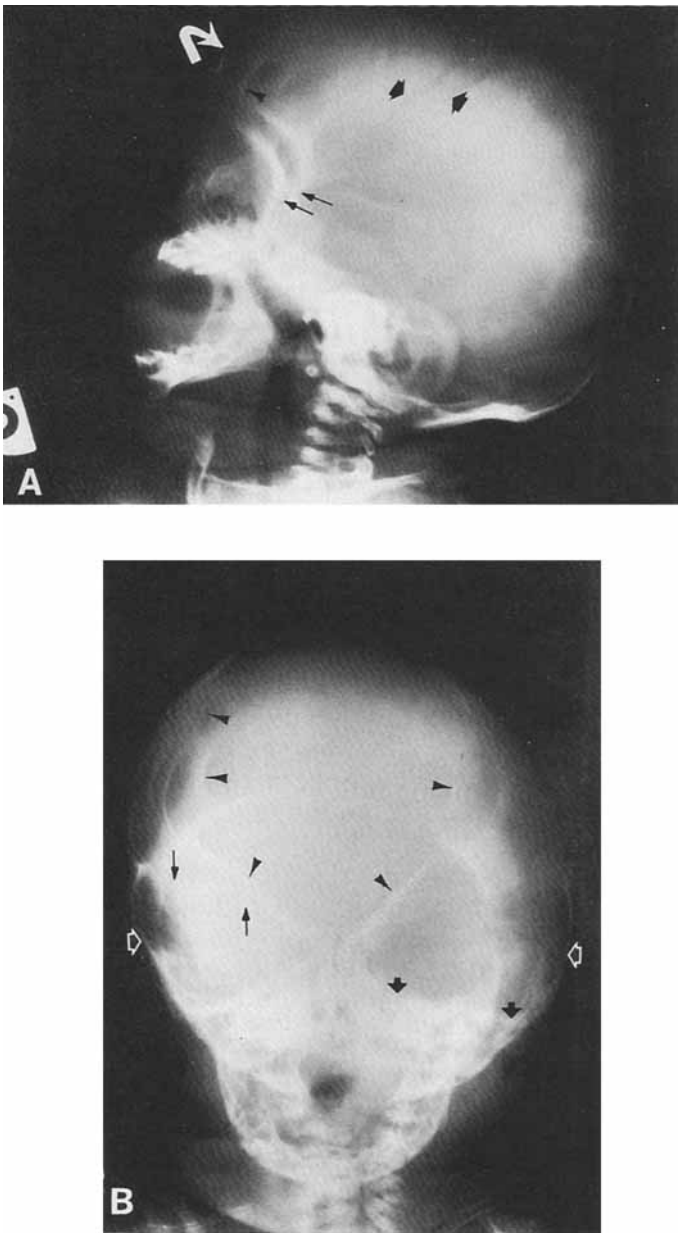

Fig. 3. A) Lateral view of the skull. Midface hypoplasia is evident by the short maxilla and relative prognathism. Both coronal sutures are well seen superiorly (thick arrows) but are indistinct inferiorly. Both frontosphenoidal sutures (thin arrows) and the frontal bone defect (curved arrow) with accompanying lacunar skull changes are noted (arrowhead). The overall height of the skull is increased. The orbita are shallow and their roofs steep. B) AP view of the the skull. Cranium bifidum of the frontal bone with a large V-shaped defect at its base and accompanying lacunar changes (arrowheads) [Pendergrass et al, 1956; Harverson et al, 1974]. The V-shaped defect seems to merge with the steep orbital roofs. The lesser sphenoidal wings are only faintly seen (thin arrows) and are elevated. Both temporal squamosa bulge laterally (open arrows). Both petrous pyramids are lower laterally than medially (thick arrows).

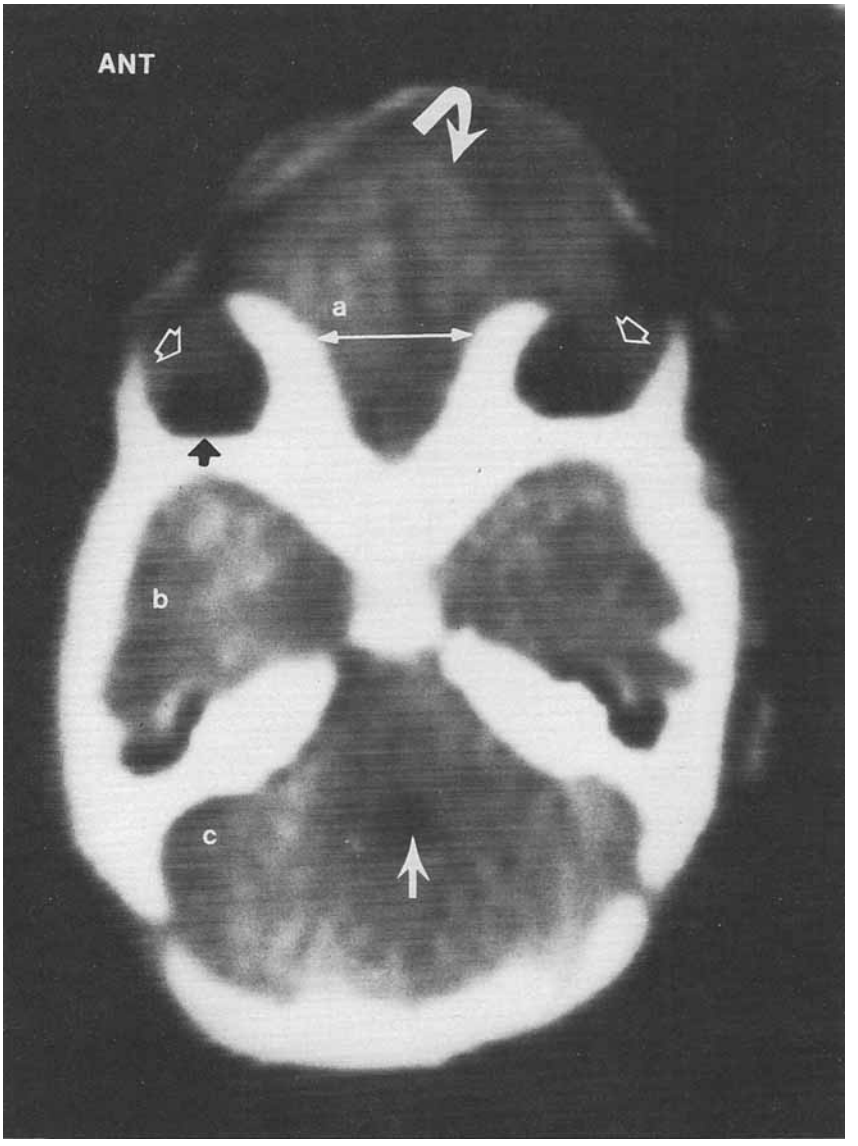

Fig. 4. CAT scan. This axial section includes frontal (a), middle (b) and posterior (c) fossae. Note the extension of brain into the encephalocele (curved arrow) and the wide separation of the orbita (double-headed arrow). Superior aspect of both globes (open arrows). Note the coronal orientation of the back of the orbita instead of the normal "apex of the triangle" configuration (closed arrow) [Mafee and Valvassori, 1981]. This results in shallow orbita and is due to undergrowth of the sphenoid bone related to the coronal synostosis. The white arrow shows the 4th ventricle.

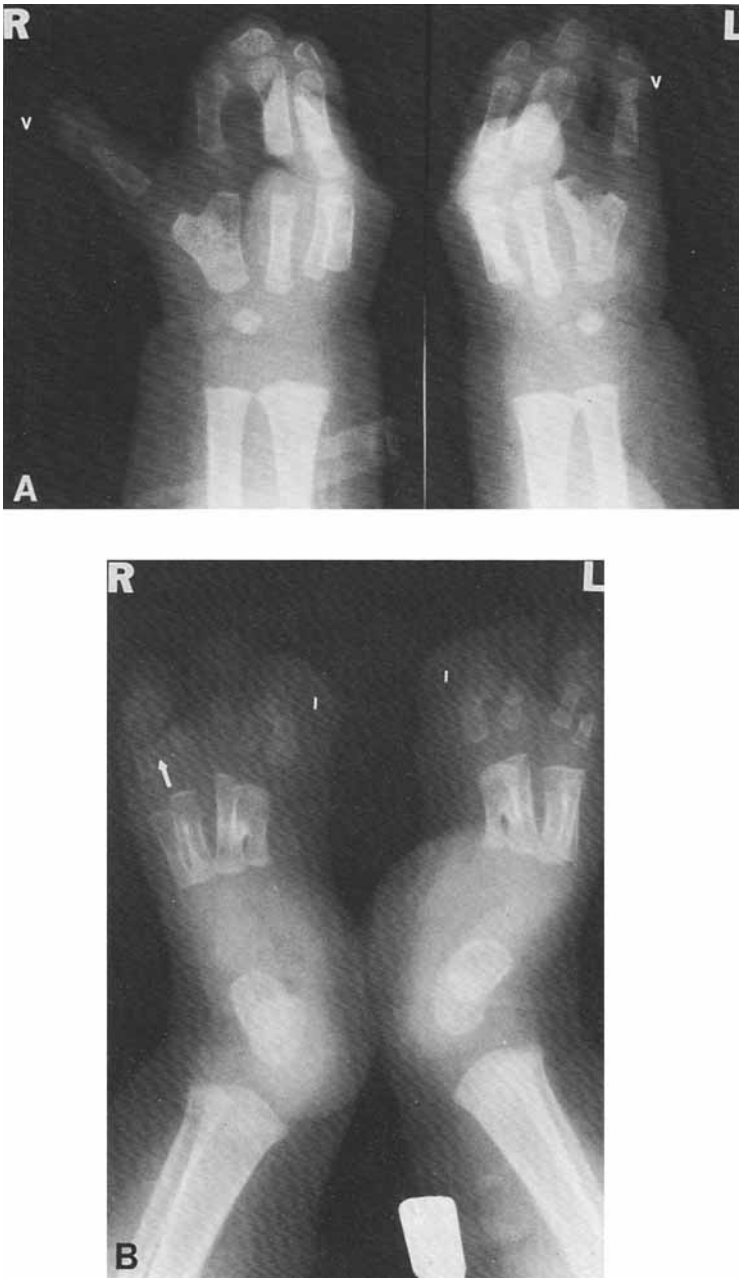

Fig. 5. A) AP view of both hands. The findings are nearly symmetrical with 1) nearly complete synostosis of metacarpals IV–V bilaterally; 2) synostosis of the left III–IV digits (note that it is broader than its counterparts); 3) synostosis of right III–IV distal phalanges; and 4) proximal symphalangism of all digits except left V. B) Oblique view of both feet. Only four distinct metatarsals with synostoses are apparent bilaterally. Proximal symphalangism of digit I bilaterally and digit II on the left is present. A rudimentary extra phalanx is noted on the right (arrow).

the area of premature sutural closures [Seeger and Gabrielsen, 1971], but were the lacunar skull defects seen with all forms of midline "dysraphia" of the craniospinal axis [Harwood-Nash and Fitz, 1976]. Such markings do not conform to the sulci.

To our knowledge, this is the first well-documented case of Apert syndrome with an anterior encephalocele. At least one other case of Apert syndrome with an encephalocele has been cited in the literature [Cohen and Lemire, 1982] lending further evidence to the fact that encephaloceles may be a low frequency anomaly in this syndrome. Slover and Sujansky [1979] reported on a pedigree with dominantly inherited frontonasal "dysplasia" with coronal craniosynostosis, mild soft tissue syndactyly of the hands, and broad toes. Cohen [1979] has also reported on a dominantly inherited syndrome he termed craniofrontonasal dysplasia with frontonasal dysostosis, coronal craniosynostosis, and mild soft tissue webbing in the hands and feet. Clinically, these cases appear more similar to each other and not like our case. In particular, our patient's hand and foot anomalies are more severe, involving bony and cutaneous syndactyly. We conclude that our patient had the Apert syndrome with frontonasal encephalocele as a secondary complication.

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