

did not show any tumour in the abdomen, chest, neck, adrenal glands, or central nervous system. On microscopical examination, the brain, lung, thyroid, liver, adrenal glands, and intestinal tract were normal. Post-mortem blood culture yielded pneumococci.

Discussion

The investigation of failure to thrive in infancy includes a search for organic, environmental, and emotional causes (Illingworth, 1963; Luzzatti, 1964). Hannaway (1970) studied 100 infants with 'failure to thrive': 51% were found to have non-organic causes such as feeding problems, environmental deprivation, constitutional dwarfism, and rumination; 49% proved to have organic causes, urinary tract infection and central nervous system, gastrointestinal, cardiovascular, endocrine diseases, and in the case of one patient familial dysautonomia.

Our patient had severe growth retardation with no identifiable cause. On five occasions urinary HVA and VMA were raised. The urinary values of catecholamine metabolites of healthy children are well established (Voorhess, 1967; Gitlow *et al.*, 1968; Hakulinen, 1971). Transient increased urinary catecholamine metabolite excretions have been observed in children in four conditions (Hakulinen, 1971): after surgical procedures; congenital heart disease with heart failure; acute bronchial asthma; and after exchange transfusion. The finding of persistently raised catecholamine metabolites in our patient prompted us to look for a neural crest tumour. However, the clinical, surgical, and necropsy findings did not disclose such a neoplasm *in situ*.

Familial dysautonomia is the only non-neoplastic disorder in which peripheral catecholamine metabolism is disturbed, the urinary VMA value is less than normal, and the HVA concentration is raised (Gitlow *et al.*, 1965; Moskowitz and Wurtman, 1975). In our patient this possibility was ruled out by the normal histamine skin test.

Our patient had either increased synthesis or excessive destruction of catecholamines, but the relation of this biochemical abnormality and the failure to thrive is unclear. We are unaware of a comparable case. Should a similar case be encountered, detailed balance studies would be of interest.

Summary

A case of failure to thrive in an infant with persistently raised urinary levels of homovanillic and vanillylmandelic acids is described. No neural crest tumour was discovered at surgical exploration or at necropsy. The relation of this biochemical abnormality and failure to thrive is unclear.

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MOSHE HIRSCHBERGER and FREDRIC KLEINBERG*
Department of Pediatrics, Mayo Clinic and Mayo Foundation, Rochester, Minnesota, USA.

*Correspondence to Dr. F. Kleinberg, Mayo Clinic, 200 First Street SW, Rochester, Minnesota 55901, USA.

Childhood actinomycosis

Report of 3 recent cases

The diagnosis of actinomycosis in 3 children presenting during an 18-month period at one hospital is uncommon, and raises the possibility that the reported incidence (*British Medical Journal*, 1973) of this disease in childhood does not reflect its true occurrence. These cases were diagnosed by prompt microscopy of fresh pus followed by anaerobic and aerobic cultures. The causative organism was described a century ago by Israel, and its frequent appearance with other organisms, as occurred in Cases 1 and 2, was reported by Glahn (1954).

Actinomyces israeli is classified in an intermediate position between the bacteria and fungi, and is included in the order actinomycetales with the mycobacteria, *Nocardia* and *Streptomyces*. It is commonly found as a commensal in the mouth and pharynx and its pathogenicity is probably related to dental caries and the coexistence of anaerobic streptococci. It spreads by direct invasion into tissues but not via lymphatic vessels. Blood-borne infection has been described.

Materials and methods

Freshly aspirated pus was mixed with sterile water and poured in a thin layer into a sterile Petri dish; the characteristic fluffy yellowish-white granules were recognized macroscopically and these colonies taken up in a pipette to prepare slides. Stained by Gram's method, they were seen microscopically as a felted mass of weakly Gram-positive filaments. Granules were cultured anaerobically with CO₂ on 5% horse blood agar plates for 48 hours; others inoculated into freshly de-aerated Brewer's thioglycolate broth and incubated aerobically at 37°C. *A. israeli* was identified as small raised colonies adherent to the agar surface, opaque and creamy-white in appearance; they failed to grow on blood agar aerobically or at room temperature, produced no catalase, and slowly produced acid from xylose and mannitol serum water sugars incubated anaerobically. In each case primary antibacterial sensitivity tests were made with discs, and the high sensitivity to benzylpenicillin was confirmed in liquid titration under anaerobic conditions.

Case reports

Case 1. A 3-year-old girl with a 6-week history of swelling on the left side of the neck, unaltered by 7-day courses of ampicillin and tetracycline. The swelling was hard, not tender, and not fluctuant. She had healthy teeth and a low grade pyrexia.

Case 2. A 5-year-old girl with an 8-week history of a swelling on the left side of the neck, unaltered by a 7-day course of cloxacillin. The swelling was firm and not tender. Three dental cavities were noted and she had a low grade pyrexia.

Case 3. A 7-year-old boy with a 3-week history of pain and a swelling in the lower left thoracic wall. This swelling was tender, poorly delineated, and the overlying skin became erythematous while under observation for a further week. Two dental cavities were noted and he had a pyrexia. His chest x-ray was clear.

Investigations

The haematological findings are shown in the Table.

At operation, Cases 1 and 2 had superficial abscess cavities containing thick purulent material. The third had a thick-walled abscess cavity in the chest wall superficial to the underlying ribs and also containing thick pus. Immediate microscopy of fresh pus showed Gram-positive filamentous organisms in all cases. Culture of the pus from Case 1 grew *A. israeli* with a microaerophilic streptococcus and from Case 2 *A. israeli* with an anaerobic streptococcus. Pus from Case 3 grew a pure culture of *A. israeli*. All three isolates were fully sensitive to benzylpenicillin requiring minimal inhibitory concentrations of 0.05–0.1 µg/ml. The streptococci were also sensitive to benzylpenicillin.

Treatment consisted of surgical drainage with curettage of the abscess cavity, followed by chemotherapy with a 10-day course of intramuscular benzylpenicillin 80 mg/kg per day, followed by oral phenoxymethylpenicillin 1 g daily for 3 months.

After 2 months of therapy all patients had made a full recovery and no recurrences were noted in a 12-month follow-up.

Discussion

The world-wide importance of actinomycosis has been reviewed by Bronner and Bronner (1971), and the reported series from Poland suggests that the disease is more common in Eastern Europe. The epidemiology of actinomycosis is that of an endogenous infection (Davies and Keddie, 1973).

Cases 1 and 2 illustrate the commonest clinical presentation with a cervicofacial abscess; the third patient had a superficial chest wall abscess which is rarely reported (Kapur *et al.*, 1974). Clinically there are no pathognomonic features, the patient often presenting with a chronic swelling which mimics other inflammatory and neoplastic diseases such as tuberculosis and the reticulososes. Multiple fistulae occur late in the natural history of the illness, more often after surgical intervention with inadequate chemotherapy.

In adult series males are affected more than twice as frequently as females, but comparable figures

TABLE
Haematological findings at presentation

Case no.	Hb (g/dl)	White blood count mm ³ (× 10 ⁹ /l)	Differential counts (%)				ESR (mm in 1st h)
			Neutrophils	Lymphocytes	Mono-cytes	Eosino-phils	
1	11.3	17 600 (17.6)	73	19	6	2	31
2	12.1	7900 (7.9)	52	44	2	2	—
3	10.1	7900 (7.9)	69	26	5	0	65

are not immediately available for children. Reported series and case reports (Bronner and Bronner 1971; Virgala, Prekop, and Beño, 1970) suggest that in childhood the sexes are equally affected.

Recommended treatments have included iodine, vaccines, radiotherapy, chemotherapy, and surgery. Although vaccines still enjoy a reputable place in European medical practice, only chemotherapy and surgery are now recommended in Great Britain and North America. Penicillin is the antibiotic of choice, although the organism is sensitive to a wide range of antimicrobial agents. Fucidic acid and lincomycin, both of which are highly active against *Actinomyces*, must be considered because of their powers of tissue penetration (Garrod, Lambert, and O'Grady, 1973). The dose and duration of systemically administered penicillin should be related to the degree of induration and fibrosis in surrounding soft tissues and to the extent of the infection at the time of diagnosis. Differing schedules have been reported and recommended (Hylton, Samuels, and Oatis, 1970; Moses, Bonomo, and Wenlund, 1967). The cervicofacial infection, which in some instances is a self-limiting disease, responds rapidly to treatment. Intrathoracic and intra-abdominal infection requires more intensive chemotherapy and carries a high mortality if undiagnosed or inadequately treated.

Summary

Three cases of childhood actinomycosis are reported, 2 with the commonest presentation of cervicofacial abscess and the third with a rarely

reported superficial chest wall abscess. The importance of prompt bacteriological diagnosis and adequate treatment with surgical drainage and chemotherapy is stressed. Though in adults males are affected more frequently than females, the sexes are probably equally affected in childhood.

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D. P. DRAKE and R. J. HOLT*
Queen Mary's Hospital for Children, Carshalton.

*Correspondence to Dr. R. J. Holt, Department of Microbiology, Queen Mary's Hospital for Children, Carshalton, Surrey SM5 4NR.