ABSENCE OF THE PITUITARY GLAND IN A CASE OF CONGENITAL SACRAL AGENESIS

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We report for the first time the combination of congenital sacral agenesis and congenital absence of the pituitary gland. This rare association is described in a baby born to a diabetic mother. The baby died at the age of 11 weeks after a cardiorespiratory collapse. The findings at necropsy, which included unusual neurological and visceral anomalies, are reported. We draw attention to the increasing evidence that maternal diabetes is a factor in producing foetal malformations.

The aetiology of congenital abnormalities in the skeletal system remains obscure, although evidence is gathering that exogenous factors, such as maternal diabetes, may play a significant role. Stanley, Owen and Koff (1979) emphasised the high incidence of multiple abnormalities associated with the dysgenetic variety of congenital sacral defects. We report a case of congenital sacral agenesis with congenital absence of the pituitary gland in a child born to a diabetic mother.

Fig. 1
Radiograph of the lower spine and pelvis showing absence of the lower lumbar segments and sacrum.

CASE REPORT
The baby girl was born by elective caesarian section after 36 weeks' gestation. The mother had previously given birth to two normal children and a still-born child. She had been an insulin-dependent diabetic since her first pregnancy. During her most recent pregnancy, polyhydramnios had been diagnosed and serial serum oestriol levels had been low.

At birth it was noted that the baby's lower limbs were held in a fixed flexed, abducted and laterally rotated position characteristic of a child with high sacral agenesis. She also had bilateral talipes equinovarus.

Sensory testing showed no response below the level of the second lumbar nerve root. A radiograph of the spine showed complete absence of the lower four lumbar vertebrae and the sacrum (Fig. 1).

The neonatal period was complicated by hypoglycaemia, regurgitation of feeds and congestive cardiac failure. A loud pansystolic murmur over the praecordium and an enlarged liver were noted. The anus was patent but communicated anteriorly with the vagina. Cardiorespiratory collapse occurred at the eleventh week of life and the baby failed to respond to resuscitation.

At necropsy, a shallow posterior cranial fossa was found along with an abnormally shaped foramen magnum, atlas and axis. The pituitary gland was absent and the sella turcica was small and flattened. There was gross hypertrophy of the left ventricle with a widely patent ductus arteriosus. The right adrenal gland was absent and the left adrenal gland was hypoplastic. The intestinal tract was normal apart from the anus which communicated with the vagina. There was a bicornate uterus.

Fig. 2
Diagram of the dissected lower lumbar spine viewed anteriorly after excising the vertebral bodies.

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0301-620X/83/2025-0182 $2.00

THE JOURNAL OF BONE AND JOINT SURGERY
Dissection of the distal spine showed absence of vertebrae below the first lumbar level. Two cartilaginous plates spanned the gap between the first lumbar vertebra and the pelvis. The spinal cord ended at the eleventh thoracic vertebra and from there the cauda equina streamed distally to end in two large nodules (Fig. 2). Histological examination of the nodules showed well formed ganglia with bands of nerve tissue. A structure histologically resembling the filum terminale extended into the soft tissues anteriorly and distal to the spine.

**DISCUSSION**

We believe this to be the first reported case of the combined congenital absence of the pituitary gland and the distal lumbosacral spine. Both these anomalies are rare but have separately been described in the literature. Most patients with pituitary agenesis have died in infancy and necropsy has revealed a flattened sella turcica, an absent or vestigial pituitary gland with hypoplasia of the adrenal glands, thyroid glands and genitalia (Blizzard and Alberts 1956; Mosier 1956; Brewer 1957; Sipponen et al. 1978). These findings concur with those presented in this paper, but in previous reports there has been no mention of skeletal abnormalities, particularly in the spine. The aetiology of pituitary agenesis remains obscure. Sipponen et al. (1978) and Stoll et al. (1978) described pituitary agenesis occurring in siblings and have suggested an autosomal recessive mode of inheritance. Other reports are of sporadically occurring cases. Roux et al. (1979) induced pituitary agenesis experimentally in the offspring of rats fed with a cholesterol inhibitor during pregnancy.

The multiple visceral and skeletal abnormalities in our case are unusual in that widespread anomalies have previously been associated with sacral dysgenesis and not sacral agenesis. The aetiology of congenital sacral agenesis, like that of agenesis of the pituitary, remains obscure. Most cases are sporadic but a familial pattern has been reported by Kenefick (1973) and Stanley et al. (1979). Maternal diabetes appears to play a significant role; Renshaw (1978) reported 23 patients with sacral agenesis, five of whom had diabetic mothers, and Banta and Nichols (1969) reported sacral agenesis in the children of seven mothers, four of whom were diabetic. Congenital malformations are three to four times as common in the children of diabetic mothers (Pedersen, Tygstrup and Pedersen 1964), and poor control of diabetes in the first trimester of pregnancy increases the risk of foetal malformations still further (Watkins 1982).

Formation of the pituitary gland from Rathke’s pouch and the infundibular process occurs by the sixth week of gestation, which is when the distal spinal elements appear. The hypothesis is that an insult to the foetus occurring at or before the sixth week of gestation disturbs normal organogenesis. The dissection of our case showed both a neural and bony “cut off” in the mid-lumbar level indicating an arrest of caudal recession of somite formation. The concept of organisers is interesting in that synthetic compounds such as polycyclic hydrocarbons are known to affect their activity. Organisers, which are thought to be protein compounds, are produced from a relatively small area in the embryo and later come to reside in many tissues, inducing them to form specific structures (Harrison 1978).

There is increasing evidence that maternal hyperglycaemia exerts a teratogenic effect on the foetus although whether this occurs via alteration in the activity of the organisers is not known.

This large topic of disturbed embryonic development is outside the scope of orthopaedic surgeons but the purpose of this paper is to reaffirm the need to examine the whole child who presents with what appears to be a single congenital abnormality. We would also like to draw attention to the increasing evidence that maternal diabetes is a factor in producing foetal malformations and that good diabetic control in the early stages of pregnancy lessens this risk.

The authors wish to thank Dr P. H. Buxton and Professor R. G. Harrison for their expert help in preparing this paper.

**REFERENCES**
