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Anterior fusion insufficient for scoliosis in myelomeningocele

8 children 2–6 years after the Zielke operation

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8 children with a mean age of 13 years with paralytic scoliosis due to myelomeningocele (MMC) were operated on according to Zielke with anterior fusion and instrumentation. There were no infections. All fusions healed. The postoperative mean follow-up was 4 years. The average correction of the primary curve was 62°. In 5 cases proximal curve progression required reoperation; posterior fusion with Harrington rods was also done. Our last 2 patients, primarily operated on with both an anterior and posterior fusion, had no postoperative progression.

Anterior fusion according to Zielke as the only procedure cannot be recommended in the treatment of severe paralytic scoliosis due to MMC. We advise a combined anterior and posterior approach in these cases.

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Operative correction of paralytic scoliosis due to myelomeningocele (MMC) is technically demanding. Harrington instrumentation alone is unsatisfactory, with a high incidence of pseudarthrosis and post-operative wound infection (Sriram et al. 1972). The failure of this method has an anatomical explanation: the spinal posterior elements are absent or deficient, and the scoliotic curve often includes the lower lumbar spine. To correct these malformations, it seems necessary to fuse to the sacrum. On the other hand, in MMC it is important to avoid sacral fusion which may disturb the activities of daily living (Kumar 1991), e.g, making it hard to sit. We have therefore performed the anterior fusion and instrumentation according to Zielke (Zielke and Berthet 1978, Zielke 1982) for MMC. We report the results of this method in 8 children.

Patients and methods

From 1986 to 1989, 5 girls and 3 boys, with myelomeningocele and paralytic scoliosis were treated with anterior fusion and internal fixation according to Zielke at our hospital. In all cases the level of the arch defect was lumbar and varied from L1 to L5. The mean age at surgery was 13 (7–19) years. The mean time from the first examination to the operation was 4 (0–9) years.

All the children had a severe progressive spinal deformity with loss of sitting balance, necessitating the use of the arms for support. In all cases there was a restriction of ventilation. The range of hip motion allowed sitting postoperatively. 3 children had a unilateral and 4 a bilateral hip dislocation. All were under pediatric supervision for their urinary tract problems and for their hydrocephalus shunts.

Surgery was performed through a combined transthoracic and retroperitoneal approach, with the patient placed on the concave side of the curve. General anesthesia and controlled hypotension were used. Dicloxacillin was given as antibiotic prophylaxis for 3 days. The patients were mobilized after 10 days in a plaster body jacket and wheelchair. After 9 months the mobilization was free. The level of fusion and instrumentation extended from Th9 to L4 (Table 1).

There were no infections or pseudarthroses. No implant loosening was noted, except in Case 3 a screw loosened during the spinal instrumentation.

The mean follow-up time was 4 (2–6) years after surgery. The preoperative, postoperative and follow-up radiographs were obtained in a sitting position. The angles of scoliosis, lumbar lordosis and pelvic obliquity were measured.

Results

All spines had a solid radiographic and clinical fusion at follow-up. During 2 years before the surgery, the progress of the scoliotic curve averaged 54° (38°–82°). The primary surgical correction averaged 62° (37°–94°). The correction and deterioration of the pel-

Table 1. Observations in 8 patients with myelomeningocele and scoliosis operated on according to Zielke

A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U	V	X	Y	Z	AA
1	1	4	7	13	2	L2	Th5–L5	1	Th12	Th10–L4	Th10–L4	50	100	50	85	25	40	17	30	20	35	20	25	1	1
2	2	4	9	14	2	L3	Th11–S1	2	L2	Th10–L3	Th10–L3	55	90	10	10	14	50	14	14	15	15	5	0	1	0
3	2	9	11	16	1	L4	Th7–L3	2	Th10	Th10–L2	Th10–L2	52	90	40	66	40	63	35	35	0	0	0	0	1	2
4	1	13	15	20	1	L1	Th7–L5	2	Th12	Th9–L3	Th9–L3	63	145	51	70	0	0	0	30	30	30	5	0	1	2
5	1	13	15	20	2	L3	Th6–L4	1	Th11	Th9–L3	Th9–L3	28	90	33	90	21	45	30	45	15	15	0	12	1	2
6	2	9	18	21	0	L5	Th11–L4	1	L2	Th11–L3	Th11–L3	45	80	43	53	40	50	38	45	0	0	0	0	1	2
7	2	6	12	14	1	L1	Th5–L3	1	Th10	Th9–L2	Th9–L2	30	95	30	30	0	50	18	18	12	30	12	12	2	0
8	2	19	19	21	2	L1	Th6–L3	1	Th12	Th9–L2	Th9–L2	–	110	46	46	–	20	10	10	–	10	5	5	2	0

A Case
B Sex
  1 male
  2 female
C Age at first exam
D Age at surgery
E Age at follow-up
F Hip dislocation
  0 no
  1 unilat
  2 bilat
G Level of arch defect
H Extent of scoliosis I
Convexity
  1 right
  2 left
J Apex
K Level of implant
L Level of fusion
M Scoliosis main curve (SMC) first exam
N SMC preop
O SMC postop
P SMC follow-up
Q Scoliosis secondary curve (SSC) first exam
R SSC preop
S SSC postop
T SSC follow-up
U Pelvic obliquity (PO) first exam
V PO preop
X PO postop
Y PO follow-up
Z Primary surgery
  1 anterior
  2 combined
AA Secondary surgery
  0 none
  1 already performed
  2 planned

vic obliquity followed those of the scoliotic curve (Table 1). During the follow-up, there was a loss of correction due to curve progression of 10°–57° above the fused area in all cases but one. This made us add posterior fusion and instrumentation according to Harrington in Cases 7 and 8, performed 2 weeks after the Zielke procedure. The posterior fusion and instrumentation was longer than the anterior and included the proximal secondary curve, in Case 7 from Th4 to L3 and in Case 8 from Th4 to L4.

Case 1 was reoperated on (Th5–L2) 2 years after the anterior fusion, and we plan further surgery for Cases 3–5. Case 2 was the only case without curve progression during the follow-up time.

Discussion

Severe progressive paralytic scoliosis can be impossible to correct or even protect against progression by plaster body casts and surgical treatment (Piggot 1980, Mayfield 1981). Our findings support this opinion. During a 2-year-period before the surgery we found a considerable scoliosis progression. A more offensive attitude in timing the surgery can be recommended. Early surgery with a long spinal fusion can result in torso shortening at maturity. This fact should, however, not prevent surgical treatment in cases with a progressive curve. In addition, according to clinical experience, myelomeningocele patients reach pubertal maturity earlier than a normal child. Short fusions are said to be associated with failure and progression of the deformity (Mayfield 1981).

Using the anterior approach we were able to avoid the two major obstacles in posterior surgery alone, pseudarthrosis and wound infection (Sriram et al. 1972, Osebold et al. 1982, Mazur et al. 1986). With the anterior approach and Zielke instrumentation we attained a good primary correction of the scoliosis including a well balanced spine and regression of the pelvic obliquity; the latter seems to be secondary to the primary scoliotic curve. Thus, a complementary lumbosacral fusion in addition to a thoracolumbar one can be avoided in order not to diminish the functional capacity of these severely handicapped patients. Regrettably, the good results did not last due to curve progression cranially to the fused area with an imbalance of the spine as a result. This is in accordance with the results of Mayfield (1981). A combined anterior and posterior approach is the best method in these cases, as recommended among others by Mayfield (1981) and Mazur (1986). That is what we did in the last two cases of this series.

In conclusion our study demonstrates that an anterior fusion according to Zielke as the only procedure is not sufficient for the treatment of paralytic scoliosis due to MMC. The fusion in this procedure is too short to prevent a further curve progression of the unfused area. A fast progression of the scoliosis could be demonstrated. For these cases, we therefore recommend a combined anterior and posterior fusion at an early stage. Technically, it can be done as an anterior release with or without instrumentation and a posterior fusion with instrumentation.

References

Kumar S J. Personal communiation. 1991.

Mayfield J K. Severe spine deformity in myelodysplasia and sacral agenesis: an aggressive surgical approach. Spine 1981; 6 (5): 498–509.

Mazur J, Menelaus M B, Dickens D R, Doig W G. Efficacy of surgical management for scoliosis in myelomeningocele: correction of deformity and alteration of functional status. J Pediatr Orthop 1986; 6 (5): 568–75.

Osebold W R, Mayfield J K, Winter R B, Moe J H. Surgical treatment of paralytic scoliosis associated with myelomeningocele. J Bone Joint Surg (Am) 1982; 64 (6): 841–56.

Piggott H. The natural history of scoliosis in myelodysplasia. J Bone Joint Surg (Br) 1980; 62 B (1): 54–8.

Sriram K, Bobechko W P, Hall J E. Surgical management of spinal deformities in spina bifida. J Bone Joint Surg (Br) 1972; 54 (4): 666–76.

Zielke K. Ventrale Derotationsspondylodese. Behandlungsergebnisse bei Idiopathischen Lumbalskoliosen. Z Orthop 1982; 120 (3): 320–9.

Zielke K, Berthet A. VDS Ventrale Derotationsspondylodese Vorlaufiger Bericht über 58 Falle. Beitr Orthop Traumatol 1978; 25 (2): 85–103.