UNILATERAL DISLOCATION OF THE HIP IN SPINA BIFIDA

A LONG-TERM FOLLOW-UP

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We reviewed 16 patients with spina bifida and unilateral dislocation of the hip at an average age of 17 years. Nine had a high neurological level (thoracic to L3) and seven a low lesion (L4 to sacral).

We assessed the influence of unilateral dislocation of the hip on leg-length discrepancy, hip pain, hip stiffness and pressure sores of the ischial tuberosity. In non-walking patients with high-level lesions, unilateral dislocation gave little functional disability and did not appear to require reduction. In walking patients with low-level lesions, leg-length discrepancy led to a poor gait and functional problems which could be prevented by reduction of the dislocation. In all patients with low lesions, surgery was successful in maintaining reduction; in two of five patients with high lesions it was unsuccessful.

J Bone Joint Surg [Br] 1995;77-B:615-9.

Received 20 October 1994; Accepted 25 November 1994

The indications for the reduction of bilaterally dislocated hips in patients with spina bifida have become more selective as the factors influencing function and the complications of surgery have become more clearly defined (Menelaus 1976; Carroll 1987). Unilateral dislocation of the hip is uncommon in patients with spina bifida and we could find no long-term assessment of its outcome.

Carroll (1987) recommended that all unilaterally dislocated hips, irrespective of the neurological level of the patient, should be reduced to avoid leg-length discrepancy, altered sitting balance, secondary trophic ulceration of the buttock, and pelvic obliquity with associated scoliosis. Other authors have reported that the incidence of these

problems, with the exception of a leg-length discrepancy, is not significantly influenced by unilateral dislocation of the hip (Crandall, Birkebak and Winter 1989; Sherk et al 1991). We have reviewed our experience with unilateral dislocation of the hip in patients with spina bifida.

PATIENTS AND METHODS

In the 23 years from January 1961 to December 1984, a total of 21 patients with spina bifida and unilateral dislocation of the hip were seen at the Royal Children's Hospital. Of these, 16 (76%) could be contacted and were recalled for examination. One patient had a dislocation of the left hip which had been successfully treated by surgery at the age of four years, but later developed a dislocation of the right hip. She had never had bilateral dislocation but her sequential unilateral dislocations both appear in Table I.

The average age of the patients at review was 17 years (7 to 30); there were nine females and eight males. The neurological level in the ipsilateral limb according to the criteria of the International Myelodysplasia Study Group (Broughton et al 1993) was thoracic in three limbs, at L1 in four, L3 in three, L4 in five, S1 in one and S2 in one. Patients with quadriceps muscle power of grade 3 or less were grouped as upper neurological level patients (high lesions) while those with quadriceps power grade 4 or 5 were recorded as having lower neurological levels (low lesions) (Smith and Smith 1973). All L3 level patients in this review were in the high-lesion group.

The patients were asked whether they had any hip pain or stiffness, trophic ulceration of the buttock or problems attributable to limb-length inequality. Their gaits were observed, and the range of hip movement and the leg-length discrepancy were recorded. Full-length sitting AP radiographs of the spine and an AP radiograph of the pelvis were taken to assess hip stability and pelvic obliquity. Dislocation of the hip was recorded when the femoral head was completely displaced out of the acetabulum. Pelvic obliquity was assessed on the AP sitting radiograph as the angle between a line joining the most proximal points on the iliac crests and another line parallel to the lower edge of the radiograph (Osebold et al 1982). Pelvic obliquity was considered to be present if this angle exceeded 10°.

The ability to walk was assessed according to the criteria of Hoffer et al (1973). Those able to walk outdoors (community ambulators) were called 'walkers'; all the others

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0301-620X/95/41019 \$2.00

Table I. Details of the management of 17 unilaterally dislocated hips in 16 patients with spina bifida

Case and side	Level	Age at surgery (y m)		Age at follow-up (y m)		Hip surgery*	Interface pressure (mm Hg)		Walking ability†	Comments
							R	L		
Surgery successful										
1 L	L1	4	1	22	1	OR IPT P	22	110	N	Scoliosis. Pelvic obliquity (R side up 35°) then developed dislocation of (R) hip
2 L	L1	1	9	30	7	FO	124	127	N	Supracondylar femur fracture (after POP removal)
3 R	L3	2	8	28	6	CR IPT	130	258	W	2 cm LLD‡
4 R	L4	3	4	12	2	IPT P	150	120	W	—
5 R	L4	2	3	9	10	IPT P	70	92	W	—
6 L	L4	13	3	24	4	Ch	90	70	W	4 cm LLD
7 L	L4	1	10	8	5	OR APR P	150	100	W	2.5 cm LLD
8 L	S1	3	3	16	7	OR IPT	115	95	W	—
9 R	S2	1	2	7	2	OR Prolonged cast	25	85	W	Scoliosis. Pelvic obliquity (R side up)
Surgery unsuccessful										
10 R	L3	3	11	10	10	OR APR P	22	95	N	5 cm LLD scoliosis. Pelvic obliquity (R side up) Ischial pressure sore left buttock
11 R	L3	5	5	14		OR APR P	190	165	N	5 cm LLD
No surgery										
12 R	T10	—		20		—	185	150	N	Scoliosis. 3 cm LLD
13 R	T12	—		12	5	AHR	50	58	N	Scoliosis
14 L	T12	—		21		AHR	200	60	N	Pelvic obliquity (L side up). Scoliosis. 2 cm LLD. Ischial pressure sore right buttock
15 L	L1	—		17	11	—	20	60	N	Scoliosis. Pelvic obliquity (R side up). 5 cm LLD
16 R	L1	—		22	1	—	22	110	N	Scoliosis. Pelvic obliquity (R side up). 5 cm LLD
17 L	L4	—		18		AHR (right hip)	90	100	W	4 cm LLD. Ischial pressure sore right buttock

* AHR, anterior hip release; APR, adductor and psoas release; Ch, Chiari osteotomy; CR, closed hip reduction and capsular plication; FO, femoral variorotation osteotomy; IPT, iliopsoas transfer; OR, open reduction; P, Pemberton osteotomy

† N, not walking; W, walking

‡ leg-length discrepancy

were graded as 'non-walkers' (Stillwell and Menelaus 1983). At review, only one of the high-level patients was a walker while eight were non-walkers; all seven of the low-level patients were walkers (Table I).

The interface pressure transmitted through the ischial tuberosities was measured with an electropneumatic sensor (Talley Skin Pressure Evaluator; Talley Medical Equipment Ltd, Borehamwood, UK) using a standard technique. The patient sat erect on a hard board with the minimum support necessary, the sensor was placed under the ischial tuberos-

ity in direct contact with the skin and inflated. Three consecutive readings were made for each tuberosity and the average pressure calculated. The pressure transmitted through each tuberosity was recorded as a percentage of the total through both. A difference between the two tuberosities of more than 30% was regarded as significant (Drummond, Breed and Narechania 1985).

Operative treatment. Eleven of the hips had undergone operative reduction of the unilateral dislocation. Open or closed reduction with a Pemberton osteotomy had been

Fig. 1a

Fig. 1b

Case 7. Figure 1a – Radiography of the pelvis at the age of 18 months. There is dislocation and gross acetabular dysplasia. Figure 1b – The appearance at age of eight years. There is persistent acetabular dysplasia which is improving.

performed in six, of which three also had had an iliopsoas transfer and three division of the adductors and psoas. Two hips had had open or closed reduction with an iliopsoas transfer. One hip had an open reduction and plaster immobilisation, one a varus derotation osteotomy and one a Chiari osteotomy.

Two of the three hips which had had open reduction, Pemberton osteotomy and adductor and psoas division redislocated. None of these 11 hips had had any other surgery.

Two of the patients who had not had operative reduction of the dislocated hip had anterior hip release to correct fixed-flexion deformity. Three had required surgery for scoliosis.

RESULTS

Influence of level of lesion

High lesions. Of the ten hips with high lesions, five had

had previous surgery. This had been unsuccessful in maintaining reduction in two hips, and of the other three, one had had a supracondylar femoral fracture after surgery, one a leg-length discrepancy of 2 cm but remained the only 'walker' in the high-lesion group, and the third had later developed dislocation of the opposite hip in association with scoliosis and pelvic obliquity.

The two patients with unsuccessful reductions both had a leg-length discrepancy of 5 cm and one had developed scoliosis and pelvic obliquity.

All of the five patients with high lesions who had not had surgery developed scoliosis. Three had pelvic obliquity and four a leg-length discrepancy between 2 and 5 cm. In the three with pelvic obliquity, the dislocated hip was on the high side in two.

Low lesions. Of the seven patients with low-level lesions, six had had successful surgery (Fig. 1) and one had had no surgery. Of those who had successful operations, one developed a scoliosis and pelvic obliquity, another two had leg-

length discrepancies of 2.5 and 5 cm respectively and three had no significant abnormalities. The child who had no surgery was a 'walker', had no scoliosis or pelvic obliquity but a leg-length discrepancy of 4 cm.

Pressure sores, pelvic obliquity and abnormal interface pressures. Three of the eight patients with dislocated hips developed ischial pressure sores on the ipsilateral side. Two of these had high-level lesions with pelvic obliquity and abnormal pelvic interface pressures but the other had a low-level lesion, had not been operated upon and had normal pelvic interface pressures. Two of these ischial pressure sores healed rapidly with dry dressings and one required a rotational flap.

Six patients had pelvic obliquity, two of the nine with reduced hips and four of the eight with a dislocated hip.

All six patients with pelvic obliquity had abnormal pelvic interface pressure readings but only one who did not have pelvic obliquity had an abnormal reading. Only two of the six with pelvic obliquity developed pressure sores; it is not possible to state from our data whether the pressure sore, always on the low side, was simply due to the dislocation or was related more closely to the pelvic obliquity.

Leg-length discrepancy. Leg-length inequality which would be unacceptable in the general population is manageable in patients with the poor gait patterns seen in spina bifida and we found that up to 3 cm had no significant effect on gait and did not require a raise. Seven patients had discrepancy of more than 3 cm; six of the eight patients with a dislocated hip and one of the nine with no hip dislocation. Of the nine 'walkers', two had more than 3 cm of leg-length inequality.

Pain and stiffness. No patient complained of hip pain at review and there was no significant restriction of range of hip movement in any patient, whether or not surgery had been performed successfully or unsuccessfully as regards reduction.

DISCUSSION

The categorisation of patients into a high-level group with quadriceps power of grade 3 or less and a low-level group is useful. It can readily be determined and is of prognostic significance: walking outdoors is unlikely in the first group but is usual in the second (Smith and Smith 1973). Our study also indicates that patients with high-level lesions are more likely to have postoperative complications and that operation is likely to fail to maintain reduction. Surgery in patients with low-level lesions was always successful.

Leg-length discrepancy was considerably less after reduction of a unilaterally dislocated hip, but this is of no functional significance in patients with high lesions who cannot walk. In ambulant low-level patients, however, this results in a poor gait with functional problems if the discrepancy exceeds 3 cm. Contrary to our findings, Sherk et al (1991) reported that reduction of a unilaterally dis-

located hip seldom resulted in an improvement in the leg-length discrepancy as there was often either an associated congenital shortening of the limb or femoral shortening was required to reduce the dislocated hip. Femoral shortening was not necessary in any of our patients, possibly because of their younger age at the time of surgery. The decision to reduce a dislocation should preferably be made in the first three years of life; paralytic dislocation seldom requires femoral shortening in this age group.

Crandall et al (1989) reported a 7.5% incidence of hip pain in spina bifida patients, irrespective of whether the hip was dislocated or not. A number of their patients developed pain after hip surgery, but none of our patients complained of hip pain. Our findings are more in keeping with those of Feiwell, Sakai and Blatt (1978) and of Sherk et al (1991).

Our review indicates that operation to reduce a unilateral hip dislocation is not always successful and that problems may persist despite successful surgery. We cannot recommend any particular operation since the choice will depend on the presence or absence of acetabular dysplasia and other factors. The variety of procedures which we used and the small total number of patients in our series prevent valid comparison of the effectiveness of the various surgical procedures.

The Pemberton osteotomy has been used to provide stability and to reduce the need for postoperative immobilisation for more than six to 10 weeks, since prolonged immobilisation leads to a higher incidence of postimmobilisation fractures.

The reduction of a unilaterally dislocated hip may not mean that more surgery is being used; many patients in our series would suffer increasing flexion deformity for which operation would be inevitable. Four patients already had increasing flexion deformity (Broughton et al 1993). Patients with spina bifida should have a minimum of surgery, preferably only one procedure for the hip. This was true for all the patients in this series, whether or not the hip remained reduced.

For patients with low lesions, relocation was always successful. These children also had fewer postoperative problems, but pelvic obliquity and leg-length discrepancy could develop despite success in maintaining hip reduction. Even patients with pelvic obliquity and abnormal pelvic pressure had few significant ischial pressure sores.

Our numbers were necessarily small, but the following conclusions can be drawn:

- 1) Unilateral hip dislocation in spina bifida is associated with leg-length inequality and increased pressure through the lower ischial tuberosity. Leg-length inequality impairs but does not preclude walking.
- 2) Surgery was successful in maintaining reduction of the hip in patients with low-level lesions, and there were no significant complications. Attempts at operative reduction in high-level patients were often unsuccessful. Pelvic obliquity and scoliosis often developed even after successful hip reduction.

We feel that unilateral hip dislocation should be reduced only in patients with low-level lesions. The final decision depends on many factors including the motivation of the child and family, the presence of other anomalies such as hydrocephalus, the age of presentation of the child, the presence of limb-length inequality unrelated to the hip dislocation and the presence of other deformities in one or both legs.

No benefits in any form have been received or will be received from a commercial party related directly or indirectly to the subject of this article.

REFERENCES

- Broughton NS, Menelaus MB, Cole WG, Shurtleff DB.** The natural history of hip deformity in myelomeningocele. *J Bone Joint Surg [Br]* 1993;75-B:760-3.
- Carroll NC.** Assessment and management of the lower extremity in myelodysplasia. *Orthop Clin North Am* 1987;18:709-24.
- Crandall RC, Birkebak RC, Winter RB.** The role of hip location and dislocation in the functional status of the myelodysplastic patient. *Orthopedics* 1989;12:675-84.
- Drummond DS, Breed AL, Narechania R.** Relationship of spine deformity and pelvic obliquity on sitting pressure distributions and decubitus ulceration. *J Pediatr Orthop* 1985;5:396-402.
- Feiwell E, Sakai D, Blatt T.** The effect of hip reduction on function in patients with myelomeningocele: potential gains and hazards of surgical treatment. *J Bone Joint Surg [Am]* 1978;60-A:169-73.
- Hoffer MM, Feiwell E, Perry R, Perry J, Bonnett C.** Functional ambulation in patients with myelomeningocele. *J Bone Joint Surg [Am]* 1973;55-A:137-48.
- Menelaus MB.** The hip in myelomeningocele: management directed towards a minimum number of operations and a minimum period of immobilisation. *J Bone Joint Surg [Br]* 1976;58-B:448-52.
- Osebold WR, Mayfield JK, Winter RB, Moe JH.** Surgical treatment of paralytic scoliosis associated with myelomeningocele. *J Bone Joint Surg [Am]* 1982;64-A:841-56.
- Sherk HH, Uppal GS, Lane G, Melchionni J.** Treatment versus non-treatment of hip dislocations in ambulatory patients with myelomeningocele. *Dev Med Child Neurol* 1991;33:491-4.
- Smith GK, Smith ED.** Selection for treatment in spina bifida cystica. *Br Med J* 1973;4:189-97.
- Stillwell A, Menelaus MB.** Walking ability in mature patients with spina bifida. *J Pediatr Orthop* 1983;3:184-90.