ANTERIOR RELEASE FOR FIXED FLEXION DEFORMITY OF THE HIP IN SPINA BIFIDA

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We reviewed the results of anterior hip release for fixed flexion deformity in 57 hips in 38 children with spina bifida at an average follow-up of 8.9 years (2 to 22). The indication for this operation was a fixed flexion deformity of more than 30° which interfered with function.

In 43 hips there was a good outcome in that the fixed flexion deformity remained less than 30° at follow-up. Four hips had a good initial result but deteriorated after an average of five years, and ten had a poor outcome with deformity of over 30°. Six hips required a repeated anterior hip release and two of these were successful.

The success of anterior hip release could not be related to the neurological level or the age at operation. Successful surgery correlated with the walking ability of the child at the latest follow-up.

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Fixed flexion deformity of the hip is common in children with spina bifida. Between 9 and 11 years of age, the hip shows an average fixed flexion deformity of 22° in children with a thoracic neurosegmental level, of 33° in those with an L1/2 level, of 11° for an L3 level and of 9° for an L4 level (Broughton et al 1993).

This deformity of the hip makes walking difficult (Stillwell and Menelaus 1983; Carroll 1987), and when it is severe the use of reciprocating gait orthoses and para-

walkers is precluded (Phillips et al 1995). An untreated fixed flexion deformity may increase and reach 90° in adult life (Menelaus 1980). These severe contractures produce excessive lumbar lordosis, which can itself become fixed and require surgical treatment. There are also problems of poor sitting posture, ischial pressure sores, transfer difficulties and intertrigo of the groin (Lindseth 1976; Menelaus 1980).

It is important to prevent or reduce fixed flexion deformity of the hip. We have reviewed those of our patients treated for this by a simple anterior hip release.

PATIENTS AND METHODS

At the Royal Children's Hospital, Melbourne, 297 children with spina bifida born between 1960 and 1987 have been studied prospectively. Information has been collected about them at regular reviews (Broughton et al 1993); the inter-observer error on the measurements made has previously been reported (Bartlett et al 1985).

From this data base we selected 70 hips which had been treated by anterior hip release and had at least two years' follow-up. Thirteen of the releases had been performed in association with open reduction of a dislocated hip, acetabuloplasty, iliopsoas transfer or femoral osteotomy; these were excluded, leaving 57 hips in 38 patients who had been treated for fixed flexion deformity only by an anterior hip release.

To determine the factors which influenced outcome after surgery, we recorded the age at operation, the presence of scoliosis, long-term follow-up and hip dislocation at the time of operation. The neurosegmental level was determined by a modification of Sharrard's classification (Sharrard 1964; Broughton et al 1993) and walking ability at the latest follow-up was assessed according to Hoffer et al (1973).

The outcome was defined as good if there was less than 30° of fixed flexion deformity at the latest follow-up. Some patients had good initial results but relapsed to 30° or more of fixed flexion after more than three years. A poor outcome was defined as recurrence of 30° or more of fixed flexion deformity within three years which did not improve.

Surgical technique. The patient is placed supine with a folded towel under the buttocks. A steri-drape is used to

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cover the genitalia and perineum and this and the skin are painted with iodine from the waist to below the knee on both legs, even for a unilateral procedure, so that the Thomas test can be performed during the operation to check on complete correction of the deformity. Bilateral operations, when necessary, are performed at one session, since this greatly simplifies postoperative management.

We prefer the approach described by Salter (1961) for innominate osteotomy. The iliac apophysis is split and each half is detached with the periosteum of the inner and outer surfaces of the ilium posteriorly to the level of the mid-point of the hip. In patients with high-level lesions, the glutei, tensor fascia lata and iliacus muscles are often represented by fibro-fatty tissue. Sartorius, or equivalent fibro-fatty tissue, is generally displaced medially. Dissection continues down the anterior ilium to the anterior inferior iliac spine; both heads of rectus femoris are detached and retracted distally. The psoas tendon is pulled from its sheath and 1 cm of the tendon is excised. The anterior capsule of the hip is exposed and divided transversely from as far posterolaterally to as far posteromedially as can be reached. The operation site is then carefully palpated while the Thomas test is performed by flexing the opposite thigh; any additional tight bands are divided.

The hip may dislocate at this stage; the tendency to dislocation should not be discouraged provided that the opposite hip is also dislocated by the procedure or is already dislocated. Such dislocation occurs only in patients with flexion deformity in excess of 50°; the parents must be warned before operation of this possibility and told that it has no functional significance.

Table I. Duration of follow-up related to flexion deformity at latest review in 57 hips

Follow-up (yr)	Correction		
	Good <30°	Good then relapse	Poor >30°
2 to 4	12	0	1
5 to 9	14	3	7
10 to 14	5	1	1
Over 14	12	0	1
Total	43	4	10

Table II. Outcome related to neurosegmental level in 57 hips

Level	Correction		
	Good <30°	Good then relapse	Poor >30°
Thoracic	23	2	6
L1/2	7	2	2
L3 and below	13	0	2

At the end of the operation the only tight structures crossing the anterior aspect of the hip are the femoral nerves and vessels: full correction is achieved. At this stage, the anterior superior iliac spine and the adjacent part of the iliac wing protrude forwards in front of the periosteum and muscles which lie posteriorly and inferiorly. This protruding part of the iliac wing is excised and the deep fascia is closed as are the fat and the skin over a suction drain.

Postoperatively, the patient is placed on a Bradford frame and nursed in a prone position for as long as can be tolerated each day. This or a supine position with the hips in full extension is continued for six weeks. In the last four weeks of this period, patients are allowed to stand for up to one hour a day, using a gait orthosis which allows the hips to be locked in full extension.

RESULTS

The results are shown in Table I; there was no obvious deterioration with time in most cases, but six hips required a repeated release operation for recurrence. This was successful in only two of the six. Table II confirms the lack of correlation of the results with neurosegmental level. We also found no clear correlation between outcome and age at surgery: there were some good results at under four years and also after six years of age (Table III). We cannot

Table III. Outcome related to age at surgery in 57 hips

Age (yr)	Correction		
	Good <30°	Good then relapse	Poor >30°
0 to 1	7	1	1
2 to 3	20	3	3
4 to 5	2	0	6
6 and over	14	0	0

Table IV. Outcome related to scoliosis at time of surgery in 57 hips

	Correction		
	Good <30°	Good then relapse	Poor >30°
Scoliosis	17	1	4
No scoliosis	26	3	6

Table V. Outcome related to dislocation of the hip at time of surgery in 57 hips

	Correction		
	Good <30°	Good then relapse	Poor >30°
Dislocated	6	1	5
Not dislocated	37	3	5

Table VI. Outcome of deformity related to level of ambulation at latest follow-up in 57 hips (Hoffer et al 1973)

Walking ability	Correction		
	Good <30°	Good then poor	Poor >30°
None	15	2	10
Non-functional	2	0	0
Household	14	0	0
Community	12	2	0

explain the large number of poor results in the four-to-five year group but consider that it occurred by chance. Table IV shows that scoliosis at the time of surgery did not influence the outcome. The results were worse in hips which were dislocated at operation (Table V). Not surprisingly, almost all the patients who were walking at the time of the latest review had a good outcome in terms of reduced flexion deformity, with worse results in those with limited walking ability (Table VI).

DISCUSSION

Most children, including those with spina bifida, have a flexion contracture of the hip at birth (Hoffer et al 1973; Broughton et al 1993), but this resolves over the first six months of life in normal infants. The fixed flexion deformity in spina bifida tends to decrease in children with lower neurosegmental levels, but not in those with lesions at the thoracic level (Shurtleff et al 1986). In these cases the average fixed flexion deformity increases after the age of two years; between the ages of 9 and 11 years the average deformity is 22°. In children with L3 levels it is 11°, with L4 levels 9°, and with L5 levels 5° (Broughton et al 1993). We consider that muscle imbalance is not the major factor in producing a fixed flexion deformity.

We accept that it is desirable to divide the psoas and release the hip flexors for fixed flexion deformity of the hip, but the recognition that muscle imbalance is not the major cause of the deformity makes us reluctant to perform more extensive procedures, such as iliopsoas transplantation, in attempts to prevent recurrence of deformity. No such tendon transfers have been performed in our department for the last five years.

There is an improvement in the fixed flexion deformity of the hip in a child with spina bifida in the first two years of life, irrespective of treatment by posture in the prone position or passive stretching of the iliopsoas. There is no evidence to suggest that these methods are beneficial and we do not advocate their use.

De Souza and Carroll (1976) have shown that patients with fixed flexion deformity of over 25° have difficulty in walking, and the consequent development of extreme lumbar lordosis with a horizontal sacrum leads to an increased

incidence of backache and poor transfer ability. Such patients also have a significant incidence of intertrigo in the groin. We advise operative correction of fixed flexion deformity of over 30° in all children who are likely to be able to walk with or without reciprocating gait orthoses (Phillips et al 1995). For patients with high-level lesions and significant scoliosis or lordosis, we advise the correction of deformity of over 30° before starting any spinal surgery. In our experience, the long lever of the fixed flexed femur will tend to rock the pelvis and sacrum into a lordotic posture and cause failure of any spinal instrumentation into the pelvis.

The method of soft-tissue release which we describe is adequate to correct deformities of up to 70°. More severe deformities, especially in children over the age of ten years, may require, in addition, an extension osteotomy of the femur. In a few patients with a minor degree of fixed flexion deformity who require other surgery such as urological or neurosurgical procedures, we have performed closed tenotomy of the sartorius and of any palpable bands in front of the hip (Menelaus 1980).

We could find no substantial reports of the follow-up of soft-tissue release for flexion contracture at the hip in spina bifida. Jones and Lovett (1923) referred to a less radical anterior release operation described by Soutter for fixed flexion contractures after poliomyelitis. Our results indicate that anterior release is effective, and that good early results are maintained on longer follow-up, although a few patients develop recurrence. The results were not influenced by age or by the neurosegmental level of the lesion: the deformity is as likely to recur in patients with completely flail hips as in those with a functioning psoas muscle before operation. The relationship between walking ability and fixed flexion deformity is not clear. Patients may be unable to walk because of the recurrence of the deformity; equally, it is possible that failure to walk has led to recurrence.

Conclusions. We describe satisfactory results after a simple anterior release for fixed flexion deformity of the hip in spina bifida and do not recommend the addition of any muscle transfers.

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