Flexor to extensor tendon transfer for curly toes

43 children reviewed after 8 (1–25) years

Ashok Biyani[1], Dai Anthony Jones[1] and Judith M. Murray[2]

43 children treated by flexor-to-extensor transfer for a total of 130 curly toes were retrospectively reviewed after a mean period of 8 years. According to an objective scoring system, 37 patients had a satisfactory result and 6 patients had a poor result of one or more toes. We now recommend that children with mild to moderate curly toes should be observed until the age of 6 years, by which time the majority will have had spontaneous correction. The remaining patients should be operated on at that stage because children operated on later had poor results. Attention should be paid to the surgical technique because the long flexor tendons are often bipartite.

Departments of [1]Orthopedics, Morriston Hospital, Swansea, and [2]East Glamorgan Hospital, Pontypridd, Mid Glamorgan, United Kingdom
Correspondence: Mr. D. A. Jones, Department of Orthopedics, Morriston Hospital, Swansea SA6 6NL, UK
Tel +44–792 703090. Fax +44–792 703632
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The curly toe deformity in childhood is a common condition characterized by flexion, external rotation and apparent varus deformity of the interphalangeal joints of the affected toes. One or several lesser toes may be affected, frequently bilaterally. They usually self-correct by the age of 6 years. However, there is a small but significant percentage of cases which do not correct, and for these further treatment has to be considered. The management varies from expectant treatment (Sweetman 1958) or strapping (Trethowan 1925, Giannestras 1973, Jordon and Caselli 1978) to surgical treatment in the form of flexor tenotomy (Ross and Menelaus 1984, Turner 1987) or flexor-to-extensor transfer (Taylor 1951). The usefulness of flexor-to-extensor transfer has not been fully evaluated.

The purpose of this paper is to describe the long-term results of flexor-to-extensor transfer for curly toe deformity in children.

Patients and methods

Between 1965 and 1989, 53 children were operated on for flexor-to-extensor transfer of one or more toes with moderate to severe curly toe deformity. 8 patients had moved out of the area and 2 patients could not keep their review appointments. Thus the remaining 43 patients (19 girls and 24 boys) were available for this study. A total of 130 lesser toes (13 second, 48 third, 58 fourth and 11 little toes) were operated on at an average age of 8 years (range 3–16 years).

All these children had moderate to severe deformity. A moderate deformity was classified as one which worsened on weight bearing, but was completely correctable passively, and the child did not have pain, callosity or difficulty with footwear. A deformity was considered severe when the patient had either pain, callosity or difficulty with foot wear, and the deformity was quite significant in resting position, with stiffness and incomplete passive correction. Children with mild deformity (no pain, minimal deformity which did not significantly worsen on weight bearing) were treated conservatively.

15 patients gave a history of a first degree relative having a curly toe deformity including a pair of identical twins. Parents of 12 of these children sought advice because of this close familial history. An additional 26 children were brought for consultation to avoid trouble in later life, as the parents had either known or heard of adults with painful toe deformity who had not been treated during childhood. 21 patients had some trouble with their shoes and had experienced pain at one time or another, but none of them had consulted primarily for painful toes. Two patients were originally seen for some problem unrelated to the toe deformity, which was only noticed at the time of consultation and the operation was advised. One patient had been referred by the school physician. 18 children gave more than one reason for seeking advice.

Table 1. Assessment criteria

	Score
Pain	
No pain	5
Occasional discomfort on prolonged walking or running	3
Usually painful, requiring shoe alteration	0
Deformity	
None	10
Mild on weight bearing	6
Mild even in the resting foot which accentuates on weight bearing callosity	3
Gross even in the resting foot	0
Stiffness	
None	5
Mild	3
Moderate or severe	0
Patient/parent satisfaction	
Pleased	5
Satisfied, but could have been better	3
Dissatisfied	0
Results	
Excellent	22–25
Good	18–21
Fair	14–17
Poor	< 14

Table 2. Results at final review

	Toes				Total
	II	III	IV	V	
Excellent	6	29	8	2	45
Good	2	12	32	4	50
Fair	5	3	15	2	25
Poor	0	4	3	3	10
Total	13	48	58	11	130

Operative technique

A dorsolateral incision is made over the corresponding toe and the extensor expansion identified. The flexor tendon sheath is then exposed and incised, taking care to avoid injury to the digital neurovascular bundle. The long flexor tendon is isolated and hooked out by flexing and internally rotating the toe at the interphalangeal joints. The long flexor tendon is divided close to its insertion, and transferred dorsally slightly distal to the extensor expansion, under correct tension, thus correcting flexion, external rotation and varus deformities of the curly toe. The long flexor tendon is often bipartite, and both slips should be transferred to the extensor tendon.

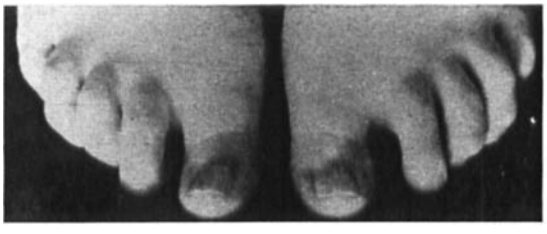
Flexor digitorum brevis tendon slips were not divided in any of the cases. In the curly second toes, dorsomedial long flexor transfer is performed through a dorsomedial incision, as the second toe almost always has a valgus deformity.

Postoperatively, wool and bandages are applied, followed 2–3 days later by a plaster bootee for 4–6 weeks, the sole of which is extended beyond the toes to give support.

Results

The patients were reviewed 1–25 years after the operation, the average follow-up being 8 years.

The operated toes were assessed at follow-up using a scoring system that takes into account pain, deformity, stiffness and patient/parent satisfaction (Table 1). The final results were graded as excellent, good, fair, or poor and are presented in a grid form (Table 2). 95 toes (73 percent) had excellent or good results (Figure 1). 30 toes in 16 patients obtained the maximum score of 25. The third and the fourth toes had a similar number of excellent and good results, but there were more excellent results following surgery of the third



Preoperative photograph showing severe curly toe deformity of 3rd, 4th, and 5th toes bilaterally along with claw toe deformity of second toes.

2 years postoperatively after dorsolateral flexor to extensor transfer of 2nd, 3rd, 4th, and 5th toes bilaterally. Excellent result in 3rd and 4th toes with fair result in both little toes. (Claw toe deformity of second toes was nicely corrected but not included in this study).

Figure 1.

toe as compared to the fourth toe. 25 toes (19 percent) achieved fair results. 4 patients with fair results in 6 toes were not entirely happy with the outcome.

Poor results were obtained in 10 toes (8 percent) in 6 patients with severe original deformity. They all had varying degrees of deformity, pain, and stiffness at the final review and were dissatisfied with the results. One patient who was operated on for the deformed third left toe at the age of 10 years, required PIP fusion 3 years later due to significant painful deformity. This case was classed as a poor result without assigning any score. Another patient was given no score following surgical correction of the right third and fourth toes at the age of 16 years, as significant sympathetic changes and painful, severe deformities were noted at the time of review. 5 out of 15 toes in 5 children older than 11 years at operation had poor results in comparison with 5 poor results out of 115 toes in the remaining 38 children. 17 children who were 6 years old or younger at the time of operation of 47 toes had 14 excellent, 22 good, 10 fair and only 1 a poor result. 3 out of 11 little toes showed poor results following surgery. 7 second toes in 5 patients who had been treated nonoperatively were still uncorrected.

Discussion

Curly toes have often been considered a benign condition and the value of treatment of mild curly toe deformities is disputed. Corrective strapping has been advocated by Trethowan (1985) for mild cases and by Jordon and Caselli (1978). Sweetman (1958) reviewed the long term results of strapping and found no difference between the conservatively treated children and the untreated controls. Recently, Turner (1987) concluded that strapping produces short-term improvement in two thirds of the patients with curly toes and the deformity tends to recur once strapping is discontinued.

Surgery is preferred for moderate to severe curly toe deformity. Pollard and Morrison (1975) and Ross and Menelaus (1984) reported good results following open flexor tenotomy but they did not clearly outline the criteria used for analyzing the results. Our series is not comparable to the previous two studies, as the assessment is different. Moreover, Ross and Menelaus (1984) included hammer toes also in their series, while our study included curly toes only.

We agree with Ross and Menelaus (1984) that open flexor tenotomy may be the procedure of choice for hammer toes, which is a uniplanar deformity. On the other hand, curly toe is a triplanar deformity and we recommend flexor-to-extensor transfer for it, as dorsolateral transfer of the flexor tendons has the biomechanical advantage of providing a dynamic corrective force. The point of flexor transfer to extensor should be made distal to the extensor expansion over the PIP joint, thus providing better correction of varus and rotational elements. This technical difference in point of flexor-to-extensor transfer in treatment of curly toes, as compared to claw toes, is crucial for a successful result. The long flexor transfer also preserves the short flexor tendons, although most patients are not aware of any active flexion of the PIP joint. In the second toe, there is usually a valgus deformity, which requires dorsomedial transfer of the long toe flexor.

The long flexor tendon is often bipartite and it is clearly important that both halves of the tendon are transferred, failing which, the deformity may be incompletely corrected or may recur. This may have been a contributory factor in some of the toes with poor results. Other identifiable factors associated with poor results were age at operation, toe "number" and severity of original deformity. One third of the surgically treated curly toes in children 12 years or older at operation had unsatisfactory results. Secondly, little toe deformity responds poorly to surgical correction, 3 out of 11 toes being unsatisfactory at the review. Finally, the more severe the initial deformity, the more difficult it is to correct.

Based on our experience, we now recommend the following policies for curly varus toes:

1. The child with mild to moderate curly toe deformity should be observed and the parents advised about adequate width of shoes and the avoidance of tight socks until the age of 6 years.

2. After the age of 6 years, anything other than the mild deformities should be operated on with flexor-to-extensor transfer, because uncorrected toes may pose problems with footwear, besides being cosmetically disturbing.

3. We now apply a small forefoot plaster postoperatively which is completed into a below the knee walking plaster on the following day. This allows the child to be discharged from hospital on the second postoperative day. The forefoot plaster extends beyond the toes and is shaped to support the toes.

4. Flexor-to-extensor transfer may not be a suitable operation for correcting fifth toe deformities, probably because the available length of the long flexor tendon is frequently not sufficient and it cannot be brought dorsally around the proximal phalanx as far distally as the extensor expansion over the proximal interphalangeal joint.

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