Valgus Knee Deformities in Children with Juvenile Chronic Polyarthritis Treated by Epiphysial Stapling

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Ansell, B. M., Arden, G. P., and McLennan, I. (1970). Archives of Disease in Childhood, 45, 388. Valgus knee deformities in children with juvenile chronic polyarthritis treated by epiphysial stapling. Stapling of the epiphysis to the diaphysis on the medial aspect of the lower end of the femur and the upper end of the tibia has been shown to correct valgus deformities of the knees in 3 children with juvenile chronic polyarthritis, whose growth had been considerably retarded during prolonged corticosteroid therapy. Satisfactory correction was obtained in all 3 without loss of function.

We stress the need for supervision in the immediate post-operative period, as well as later, since over-rapid correction of the deformity may occur during the growth spurt after stopping corticosteroid therapy, requiring removal of the staples after a few months. To obtain similar correction in those whose growth rate is slower, the staples should be left in situ for longer.

Children with juvenile chronic polyarthritis who are treated with even small doses of corticosteroids over a prolonged period fail to grow in height (Ansell, 1965). These children may develop severe valgus deformities of the knees, while bone age is frequently retarded. When corticosteroid therapy is reduced or withdrawn growth is resumed. In 1945 Haas presented evidence that differential growth could be obtained in dogs by fixing the epiphyses to the diaphyses with wire loops. Subsequently, Blount and Clarke (1949) applied this principle to children using staples to halt epiphysial growth. This paper reports the results of stapling the epiphysis to the diaphysis on the medial aspect of both the lower end of the femur and the upper end of the tibia in 3 children in an attempt to improve their valgus deformities when growth was resumed, after stopping or reducing corticosteroid therapy.

Case Reports

Case 1. This girl had suffered from juvenile chronic polyarthritis from the age of 4, which had been treated with systemic corticosteroids to the age of 13. When transferred to Taplow for further management because of severe joint deformities and continuing activity, there were flexion contractures of the hips and knees, and these were associated with marked genu valgum (Fig. 1a) and both subtalar joints tended to go into valgus on standing. The disease activity was controlled with enseal aspirin 3 g. daily and indomethacin 75 mg. daily. Flexion contractures of the hips were treated with active exercises in the hydrotherapy pool, and in slings, alternating with prone lying. Serial splinting corrected the flexion deformities of the knees, and valgus insoles prevented the subtaloid valgus on standing. The epiphyses were still open, and in order to overcome the persisting valgus deformity staples were inserted on the medial side of the upper tibial and lower femoral epiphyses of both knees (Fig. 2). The operation was performed under general anaesthesia without corticosteroid cover but careful post-operative observations were made for signs of steroid deficiency. The need for administration of hydrocortisone did not arise. Post-operatively, quadriceps exercises were performed without knee flexion from day 3. Knee flexion was started at 14 days and walking at 21 days. During the next 8 months she grew 7.5 cm., with marked reduction of knee valgus (Fig. 1b). Staples were removed at 8 months because of a tendency to genu varus deformities, particularly on the left side, which have, subsequently, corrected (Fig. 1c).

Case 2. This girl experienced onset of juvenile chronic polyarthritis at the age of 18 months. After 14 months of continuous activity, prednisone was given for 3 months with benefit but relapse occurred on...
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Fig. 1.—Case 1. (a) Age 13½ years, 3 months after stopping corticosteroid and 4 months before stapling; (b) age 14½ years, 8 months after stapling and immediately before removal of staples; (c) age 16 years.

Fig. 2.—Case 1. Knee x-ray: (a) before stapling showing that epiphyses are still widely open at the age of 13½; (b) 8 months after staples have been inserted, epiphyses on medial aspect are narrowing satisfactorily compared to lateral aspect.
Fig. 3.—Growth chart of Case 2 showing marked growth spurt when corticosteroids were stopped.

Fig. 4.—Case 2. (a) Age 3 years, shortly after start of maintenance corticosteroid therapy; (b) age 11½ years, one month after stapling; (c) age 12½ years, at time of removal of staples.
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Fig. 5.—Growth chart of Case 3 showing poor growth rate.

Fig. 6.—Case 3. (a) At 2½ years; (b) at 10½ years showing increase in valgus deformity together with impaired growth; (c) at 14½ years, 18 months after staples had been inserted.
stopping. As this was repeated on two occasions, maintenance prednisone therapy at 4 mg. daily was started (Fig. 4a). Because of obesity, one year later this was changed to triamcinolone 3 mg. daily. She remained on between 2 and 3 mg. triamcinolone for the next 4 years (Fig. 3). She was weaned off corticosteroids, with the help of sodium aurothiomalate, and later developed a rash followed by typical psoriasis. Despite a marked growth spurt (Fig. 3) valgus deformity of the knees did not decrease and bilateral stapling operations were undertaken on the medial aspect of the lower femoral and upper tibial epiphyses. During the following 16 months she grew 3·2 cm. with correction of the deformity; the staples were then removed. Though there has been excellent improvement in the position of the legs, psoriasis has recurred around some of the scars (Fig. 4b and c).

**Case 3.** This girl developed juvenile chronic polyarthritis at the age of 19 months. Because of severe iridocyclitis, as well as very active joint disease, corticosteroid therapy was started. After 8 years on 5 mg. prednisone daily, because of failure to grow in height she was given human growth hormone (10 x 2 weekly) for 1 year during which time her growth rate did not improve (Ward, Hartog, and Ansell, 1966). It was, therefore, decided to reduce her prednisone to a level compatible with growth, and at the time of stapling she was on 3 mg. prednisone daily, later reduced to 2 mg. daily. As her disease became more active, she was changed to alternate day single dose (10 mg.) regimen. Her growth rate, illustrated in Fig. 5, was considerably less than that expected for her age, being barely 2·5 cm. in the year following stapling, and 2·5 cm. in the 2nd year after stapling. Correction of her valgus deformities was very much slower and the staples were left in situ for 18 months. Despite the slow growth rate, satisfactory correction of the valgus deformity was achieved (Fig. 6).

**Discussion**

The introduction of staples to control epiphysial growth (Blount and Clarke, 1949) has enabled surgeons to correct knock-knee deformities in growing children with precision, over a period of 6-9 months; after removal of the staples, normal epiphysial growth at the operated site restarts. The operation is simple to perform and full knee function soon returns.

In juvenile chronic polyarthritis, corticosteroid therapy, as well as causing failure to grow in height, may aggravate valgus deformity of the knees and delay epiphysial union. When growth is resumed after the cessation or reduction of corticosteroid dosage, if there is no improvement in the valg deformity, stapling should be considered. Or the staples are inserted the child must be watch carefully as rapid correction can take place during the growth spurt which occurs immediately after therapy has stopped (Fig. 3). In Case 1 when staples were inserted 8 months after stopping prednisone they had to be removed 8 months later because of incipient varus deformity. In Case where this stage had already been passed and the ch was growing more slowly, it took 16 months, a in Case 3, where growth was even slower, 18 months to get satisfactory correction.

Despite the suggestion of Poirier (1968) that instability can arise, none was seen in any of the knees post-operatively, and the range of movement returned to that of the pre-operative state (Tabl

**TABLE**

| Intermalleolar Distance and Range of Movement Knees Before and 1 Year After Operation |
|---------------------------------|-----------------|----------|----------|----------|
| Intermalleolar Distance (cm.) | Range of Movement at Knee (degrees) | |          |          |
| Pre-op. | 1 yr. | Right | Pre-op. | 1 yr. | Left | Pre-op. | 1 yr. |
| Case 1   | 12·5  | 0·0  | 20/100  | 0/95  | 10/100  | 0/95  |          |         |
| Case 2   | 9·5   | 1·25 | 0/90   | 0/100  | 0/90   | 0/90   |          |         |
| Case 3   | 15·0  | 3·75 | 5/130  | 0/100  | 10/130  | 0/11  |          |         |

**REFERENCES**


**Addendum**

Since this paper was prepared, satisfactory correction of the valgus knee deformities has been carried out in further cases using this technique.

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