Severe elbow extension contractures are a common problem in infants and children with arthrogryposis multiplex congenita, and the management of these contractures remains a challenge. This paper describes the design and application of a dynamic elbow flexion splint for the management of severe elbow extension contractures in an infant with arthrogryposis.

**Etiology and Clinical Features**

The term *arthrogryposis* is derived from a Greek word meaning curved joint. Arthrogryposis is a non-progressive congenital disorder involving persistent joint contracture that can be identified at birth. Its etiology remains unknown, but possible causes include positional abnormality in utero, primary muscle involvement, and a joint and ligament disorder. Currently, degeneration or defective formation of the anterior horn cells of the spinal cord is believed to be involved.

The muscles of persons with arthrogryposis may be normal in size, small and contracted, or completely absent. The resultant multiple joint contractures are considered to be secondary to muscle imbalance. The shoulder girdle is usually narrow and the upper extremities are thin, with decreased muscle bulk. The elbows are often fixed in extension, with little passive flexion. Triceps strength is often of a normal to good grade, but biceps or brachioradialis strength is rarely greater than a poor grade (Bayne, 1982; Drachman & Banker, 1961; Williams, 1972).

**Patient's History**

A female infant with severe bilateral elbow extension contractures was referred for occupational therapy at 7 days of age. Her elbows were positioned in 20° hyperextension with passive correction to 20° flexion. A treatment program of gentle stretching and serial splinting with posterior long-arm elbow flexion splints was initiated. The infant wore the splints for 12 hr a day. When she was 6 months old, these splints were replaced with bivalve long-arm elbow flexion splints because her increasing triceps strength was overpowering the original splints. By the time she was 8 months old, the infant's passive elbow flexion had increased to 70°. Her increasing triceps strength quickly overpowered the bivalve splints, so a dynamic elbow flexion splint was designed and fabricated when she was 9 months old (see Figure 1). At that time, the infant's passive elbow flexion was 80°, and no active elbow flexion had been observed.

**Fabrication of the Dynamic Elbow Flexion Splint**

The dynamic elbow flexion splint consisted of a harness and two volar wrist splints. The materials used included thermoplastic splinting material, touch-fas-
tener straps, and latex tubing (see Figure 2). The steps required to fabricate the splint are discussed below.

Harness. The distance from the anterior–superior iliac spine over the infant's shoulder to the iliac crest was measured to determine the appropriate length for the harness. Two strips of splinting material (1½ in. wide) were cut to the desired length. One strip at a time was molded over the infant's trunk from the anterior–superior iliac spine to the iliac crest in a way that allowed full shoulder motion. For better purchase, a horizontal strip of splinting material was attached to the two vertical strips in the front of the harness, across the infant's chest. A touch-fastener hook was placed on the lower portion of each of the vertical strips, and a touch-fastener loop was attached to the harness to secure it on the infant.

Volar wrist splints. These were fabricated to allow the infant to have full finger and thumb motion.

Loops. Small loops were fabricated out of splinting material to secure the latex tubing between the harness and the volar wrist splints. The loops were attached to the harness above the clavicle and to the wrist splints above the radial styloid, with enough room left under each loop for the latex tubing.

Traction. Latex tubing was threaded between the loops on the harness and wrist splints to maintain the infant's elbows in flexion.

Application of the Splint and Results
The infant wore the dynamic elbow flexion splint at home for two 1½-hr periods a day. The splint successfully achieved progressive stretching of the elbow through traction. By the time the patient was 12 months old, her passive elbow flexion had increased to 100°. Not only was her range of motion increasing, but she was also beginning to use the dynamic component of the splint. She was actively extending her elbows against the splint's elastic traction and was using passive flexion by relaxing her triceps to bring objects closer to her body. Her mother reported that she showed greater interest and skill in manual play and was developing a hand-to-mouth pattern for self-feeding when wearing the splint.

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References