A Prospective Study of Surgical Outcomes After Minimally Invasive Repair of Stroke Related Equinovarus Contracture

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STATEMENT OF PURPOSE

Disabling equinovarus contracture is common after stroke. Cerebrovascular accident (CVA) is a major risk factor for equinovarus and has a high prevalence of up to 60% in stroke patients. The resultant disability is frequently a progressive condition due to muscle imbalance. Long standing equinovarus deformities are difficult to treat due to altered muscle tone, altered posture and the presence of a stroke-affected foot. The success of treatment is often difficult with bracing and pressure sores (Figure 1). Traditional reconstructive approaches for equinovarus deformity requiring either tendon transfer, equinus correction or both, are frequently not physically capable of rehabilitation after major reconstruction. Boffeli and Collier have reported their experience with minimally invasive techniques (14). The purpose of this study was to report the outcomes of a minimally invasive repair of stroke-related equinovarus, with special emphasis on how much improvement in foot position was achieved on the immediate postoperative and at the last follow-up. Two groups of stroke patients were compared: 1) those who were treated surgically and 2) those who were treated with splinting and equinus casting. Procedures

The specific surgical technique used to treat the series of patients in this investigation, was first described in detail by Collier et al (1). Briefly, the surgical approach was: 1) an anterior incision over the metatarsal heads was made, 2) muscle contractures were released using a horizontal incision as described by Cawthorne (15) and under tension, 3) an extra-articular, osteotomy of the foot was performed at the second metatarsal head, 4) a transverse excision of the lesser toes and 5) the PT tendon was fixed with 4.0 suture to redirect the tendon to a new position. The options that were used included: 1) equinus correction and 2) tendon transfer, equinus correction, and tendon transfer. The postoperative program included: 1) the patient was placed in a side-sole or equivalent and lasted for 3-4 weeks. 2) the incision was dressed after every 3-4 days and the wounds were healed by secondary intention. 3) physical therapy was started on the first postoperative day. 4) the patient was ambulatory on the second postoperative day. Statistical Analysis

The data were analyzed with a focus on type and distribution, and descriptive statistical methods were used to describe the series. Continuous variables were described in terms of the median; standard deviation (SD), as well as the median (minimum, maximum range), and categorical variables were described in terms of frequency and percentages. Tests of the null hypothesis were used to compare the preoperative to postoperative to investigate if there were differences in the studied parameters. The preoperative data were compared to the postoperative data and the analyses were carried out by an untrained statistician (DSF), who did not participate in the care or clinical assessment of the patients described in this report.

RESULTS

A statistical description of the cohort is depicted in Table 1. A total of 11 patients were included, 8 females and 3 males, ranging in age from 67 to 77 years (mean age 72 years). The mean duration of follow up was 1.7 years (range 1 to 4 years). 9 (81%) patients underwent follow up examination in a supervised setting and 2 (18%) patients did not participate in the follow up examination. The group consisted of patients with equinovarus deformity and were analyzed without regard to the presence of other deformities. The mean age was 7.45 (age range 2 to 16 years). All patients had undergone surgery. The mean follow-up was 7.5 years (range 5.5 to 10 years). The mean duration of follow up was 1.7 years (range 1 to 4 years). 9 (81%) patients underwent follow up examination in a supervised setting and 2 (18%) patients did not participate in the follow up examination. The group consisted of patients with equinovarus deformity and were analyzed without regard to the presence of other deformities. The mean age was 7.45 (age range 2 to 16 years). All patients had undergone surgery. The mean follow-up was 7.5 years (range 5.5 to 10 years). The mean duration of follow up was 1.7 years (range 1 to 4 years). 9 (81%) patients underwent follow up examination in a supervised setting and 2 (18%) patients did not participate in the follow up examination. The group consisted of patients with equinovarus deformity and were analyzed without regard to the presence of other deformities. The mean age was 7.45 (age range 2 to 16 years). All patients had undergone surgery. The mean follow-up was 7.5 years (range 5.5 to 10 years).

Figure 2. Soft Tissue Release of Stroke Contracture

Figure 3. Six Week Postoperative Healing Progress

Figure 4. Postoperative Ankle Foot Orthotic Bracing Needs

Outcomes of Interest

Table 2. Clinical Description of the Case Series (N = 11 patients)

Table 3. Comparison of Outcomes of Interest between the Invasive Cohort and Nonoperative (non-stroke) Cohort (N = 22 patients)

Table 4. Postoperative outcome parameters by groups (N = 11 patients)

Table 5. Preoperative and Postoperative Ankle-foot orthoses

Figure 5. Illustration of procedure of surgical approach for stroke patient with equinovarus deformity.

Figure 6. Illustration of procedure of surgical approach for stroke patient with equinovarus deformity.

Figure 7. Illustration of procedure of surgical approach for stroke patient with equinovarus deformity.

Figure 8. Illustration of procedure of surgical approach for stroke patient with equinovarus deformity.

Figure 9. Illustration of procedure of surgical approach for stroke patient with equinovarus deformity.

Figure 10. Illustration of procedure of surgical approach for stroke patient with equinovarus deformity.

Figure 11. Illustration of procedure of surgical approach for stroke patient with equinovarus deformity.

Figure 12. Illustration of procedure of surgical approach for stroke patient with equinovarus deformity.

Figure 13. Illustration of procedure of surgical approach for stroke patient with equinovarus deformity.

Figure 14. Illustration of procedure of surgical approach for stroke patient with equinovarus deformity.

Figure 15. Illustration of procedure of surgical approach for stroke patient with equinovarus deformity.

Figure 16. Illustration of procedure of surgical approach for stroke patient with equinovarus deformity.

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Figure 19. Illustration of procedure of surgical approach for stroke patient with equinovarus deformity.

Figure 20. Illustration of procedure of surgical approach for stroke patient with equinovarus deformity.

Figure 21. Illustration of procedure of surgical approach for stroke patient with equinovarus deformity.

Figure 22. Illustration of procedure of surgical approach for stroke patient with equinovarus deformity.

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Figure 25. Illustration of procedure of surgical approach for stroke patient with equinovarus deformity.

Figure 26. Illustration of procedure of surgical approach for stroke patient with equinovarus deformity.

Figure 27. Illustration of procedure of surgical approach for stroke patient with equinovarus deformity.

Figure 28. Illustration of procedure of surgical approach for stroke patient with equinovarus deformity.

Figure 29. Illustration of procedure of surgical approach for stroke patient with equinovarus deformity.

Figure 30. Illustration of procedure of surgical approach for stroke patient with equinovarus deformity.

Figure 31. Illustration of procedure of surgical approach for stroke patient with equinovarus deformity.