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ePoster #9

Arthroscopic Release and Hindfoot Fusion for the Spastic Equinovarus Foot: An All-Inside Technique

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Disclosures / Commercial Support

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Senior author is an Arthrex consultant

Device Disclosures

All referenced medical devices and pharmaceuticals in this presentation are FDA approved and were used for their described purposes

Introduction

- Acute brain injuries (ABI) affect more than 2 million patients per year in the United States.
- Spastic equinovarus foot (SEF) deformities are the most common foot deformity seen in adults who have sustained an ABI.
  - These neurologic foot contractures are a challenging pathology for Orthopaedic Surgeons and patients alike.
  - These deformities lead to long standing functional change and contribute to decreased quality of life.

Purpose

- To determine if arthroscopic tenotomies in addition to tibio-talo-calcaneal (TTC) fusion in the setting of spastic equinovarus foot deformity is an effective treatment option with satisfactory functional outcomes based on a surgeon log retrospective review compared to a standard open technique.

Objectives

- Primary endpoint(s)
  - Identify functional outcomes following arthroscopic tenotomies and tibio-talo-calcaneal (TTC) fusion.
- Secondary endpoint(s)
  - To compare outcomes of arthroscopic verses standard open techniques for management of spastic equinovarus foot deformity including rate of complications, failure of fusion, ability to reach anatomic neutral positioning and ability to go without braces post operatively.

Methods

- Surgeons log retrospective study (10 patient cases)
- Underwent primary arthroscopic assisted, minimally invasive contracture tenotomies paired with a tibio-talo-calcaneal (TTC) arthrodesis for reconstruction of spastic equinovarus foot deformities within our institution (Ohio State University).
  - Inclusion criteria: Over the age of 18, anoxic brain injury, developed spastic equinovarus foot contracture, failed conservative treatment
  - Exclusion criteria: Under the age of 18, do not have at least 3 months of follow up data.

Data Points

- Age, gender, height, weight, body mass index
- Nicotine use, illegal drug use
- Vitamin D levels
- Ambulation ability pre/post-operatively, modified Ashworth Scale, Functional Ambulation Scale pre/post operatively
- Years from brain injury, mechanism of injury
- Tourniquet time, tenotomy (if/which tendon involved), transfers (if/which tendon involved), alignment restoration, tibio-talo-calcaneal (TTC) arthrodesis, complications
- Physical function, FADI (Foot and Ankle Disability Index) score 3 months, VAS (Visual Analogue) scores at 3/6/12 months, evidence of fusion mass at 3 months, x-rays, need for bracing

Data Analysis

- Paired t-test for FADI and VAS scores to determine improvement.
- Multivariate logistic regression used to determine the influence, if any, that variables (data points as described above) have on failure rates.
- Any correlation between type of procedure, radiographic findings scores and VAS/FADI scores will be examined using Pearson's correlation coefficient at 3 months.
- p-value less than 0.05 considered significantly different.

Analysis was performed with Microsoft Excel

Results

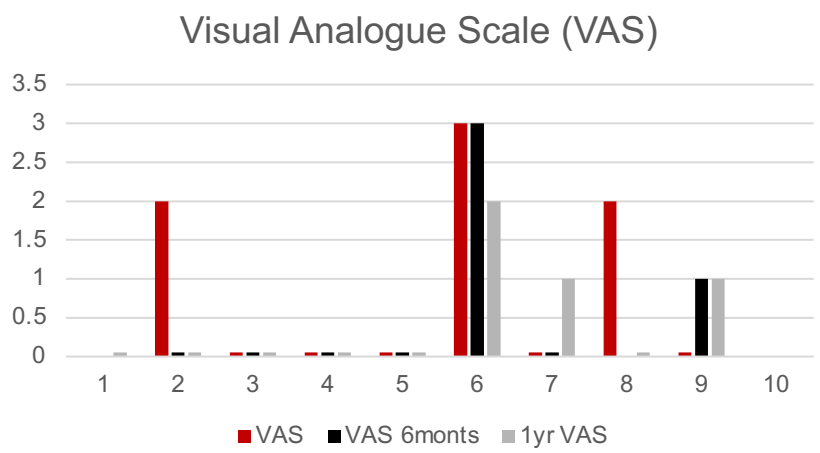
- **100% of patients went on to fusion at 3 months**
  - 10 patient received TTC nail in conjunction with tenotomies
  - 0 patients underwent tendon transfers
- **50% had minor complications**
  - 4 patient had skin tears
  - 1 patient had drainage treated with antibiotics from a surgical site
  - 0% of patients had major complications
- **0% of patients were using braces post op at 1 year**
  - 3 patients had improvement in physical function
  - 5 had stable physical function

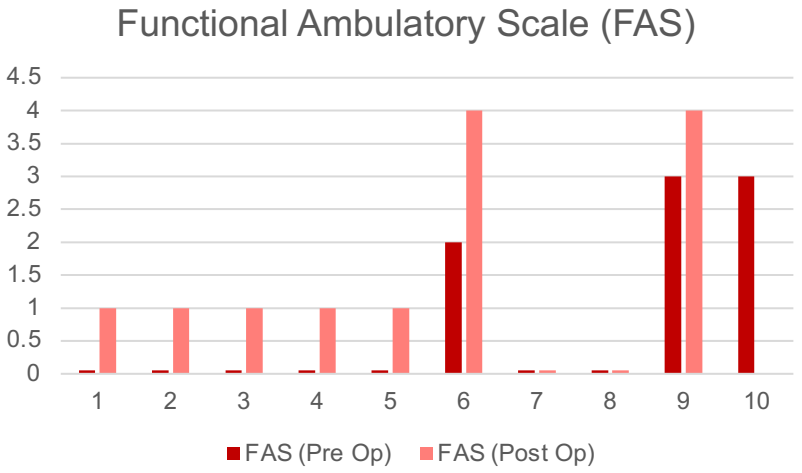
Characteristics	Frequencies
Age, in years	
Mean [SD]	37 [10.2]
Gender	
Male	6 (60%)
Female	4 (40%)
BMI	
Mean [SD]	141.5 [30.4]
Tobacco/Nicotine use	2 (20%)
Illicit drug use	0 (0%)
Pre-op Ambulatory status	
AFO or walker	2 (20%)
Crutches	1 (10%)
Non-ambulatory for at least 2 years	7 (70%)
Years from injury	
Mean [SD]	6.1 [5.3]
Mechanism of injury	
Drug induced	2 (20%)
Fall	2 (20%)
MVA	3 (30%)
CVA	1 (10%)
Crush injury at work	1 (10%)
ABI	1 (10%)
Tourniquet time, in mins	
Mean [SD]	120.2 [5.0]
Tenotomy performed?	10 (100%)
Tendon transfer?	0 (100%)
TTC placed?	10 (100%)
Baseline modified Ashworth scale	
0	2 (20%)
1	0 (0%)
2	0 (0%)
3	3 (30%)
4	5 (50%)
5	0 (0%)

Results

- **7 patients had improvement in their FAS at 1 year post op** *(2 had no change, 1 had incomplete data)*
- **3 patients had improvement in their VAS at 1 year post op** *(3 had no change, 3 had incomplete data, 1 had worsened scores)*
- **FAS difference preop and post op were statistically significant (p value 0.001)**

Parameter	Pre-op	Post-op	P-value
Visual Analogue Scale (VAS)	0.88 [1.25]	0.5 [0.78]	0.207
Functional ambulatory scale (FAS)	**0.56 [1.13]**	**1.44 [1.51]**	**0.001**





Values of 0 were implemented as 0.05 to allow for graphical representation

Results

Patient Case	Ambulation Pre Op	Ambulation Post Op
1	None x 2 years	Maximal assist pivot
2	None x 2 years	Stand Pivot
3	None x 2 years	Max assist walking
4	None x 2 years	Standing frame
5	None x 2 years	Standing frame
6	AFO and walker	Cane only
7	None > 5 years (wheelchair bound)	Wheelchair bound
8	None > 5 years (wheelchair bound)	Wheelchair bound
9	AFO	Walking w/o braces
10	Crutches	Walking w/o braces

Conclusion

- **Functional Ambulatory Score differences between pre operative and post operative results were statistically significant (p value 0.001)**
- 0% of patients had major complications
- 100% of patients went on to fusion at 3 months post op
- 100% of patients had restored alignment post operatively
- 0% of patients required a brace post operatively
- 0% of patients failed (defined as lack of fusion at 3 months)

Significance

- Acute brain injuries lead to neurologic impairments which fall on a spectrum of severity. These drastically limit activities of daily living.
- After failed conservative management, surgical treatments are focused on obtaining a balanced, brace-able and functional lower extremity with a plantigrade foot.
- **Based on our review, patients who undergo surgical treatment have improved functionality based on FAS scores and ambulatory status pre and post op.**
- We acknowledge our study has a small sample size and is not universally generalizable, however provides a solid foundation for further investigation in this field.
- Additional research is required to help determine optimal non-operative treatment as well as timing of surgical treatment to provide the most favorable outcomes while minimizing complications.

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