

The Use of a Carbon-fiber Ankle Foot Orthosis and Therapeutic Exercise for Managing Pain in an Adolescent with Severe Blood-induced Ankle Joint Arthropathy Secondary to Type 3 von Willebrand Disease

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Background

- 12- year-old male with Type 3 von Willebrand Disease
- Developed synovitis secondary to bleeding
- Right ankle open synovectomy in 2007
- 4 years post synovectomy: severe ankle pain interfering with activities



Objectives

- Reduce ankle pain
- Increase ankle ROM
- Increase ankle muscle strength
- Improve core muscle strength
- Improve gait speed and quality of gait
- Improve balance
- Increase activity/participation
- Improve quality of life



Methods / Intervention

3 month program of exercise combined with use of a floor-reaction carbon fiber AFO and custom fitted orthosis

- **Pain Reduction**
Floor –reaction, carbon fiber Functional foot orthosis
- **Education**
Necessity of prophylaxis
Prescription for Celebrex
Choosing low-impact activities
- **Aerobic conditioning**
Cycling or walking for warm-up
- **Therapeutic Exercise**
ROM, strengthening to LEs & core
- **Balance Activities**
Balance board, BOSU, gymnastic ball
- **Gait**
Mirror, foot position, weight shifting, cruising
- **Agility**
Cariocas, figure-8 drill, catching / throwing ball on unstable surface



Results

Outcome Measures	Pre-Intervention	Post-Intervention
Wong-Baker FPRS Change in level of 1 Face is clinically significant	Face 3 / 5	Face 1 / 5
Single Limb Stance Eyes Open	Left leg: 30 seconds Right leg : 10 seconds	Left leg: 60 seconds Right leg : 60 seconds
Eyes Closed		Left leg: 37 seconds Right leg: 7.9 seconds
Gait	Antalgic Gait	More even weight shift Better push-off
6-Minute Walk Test MCID: 68 meters	Without CF-AFO 437 m With CF-AFO 462 m	Without CF-AF 533 m With CF-AFO 543 m
Hemophilia Joint Health Score – HJHS MCID – not established	15	15
Right Ankle ROM	DF: 0° PF: 40°	DF: 1° PF: 43°
Muscle Strength: Right Ankle	DF: 4+/5 PF: 3/5 Inv: 4+/5 EV: 4+/5	DF: 5-/5 PF: 3+/5 Inv: 5-/5 Ev: 5 /5
Muscle Strength Hips Bilaterally	R Flexion: 5/5 Extension: 3+/5 Abduction: 3+/5	L R Flexion: 5/5 5-/5 Extension: 5/5 5-/5 Abduction: 5/5 5-/5
Abdominal Flexion	Supine: 3+ / 5	Supine: 4+ / 5
Participation - CAPE	Diversity 26 Overall Intensity 2.09 Overall with Whom 1.69 Overall Where 2.88 Overall Enjoyment 3.61	Diversity 18 Overall Intensity 1.69 Overall with Whom 1.78 Overall Where 2.6 Overall Enjoyment 3.66
Paediatric Haemophilia Activities List - PedHAL	Sit/Kneel/Stand 70 Leg Function 37 Arm Function 96.6 Use of transportation 100 Self-Care 95.5 Household tasks 80 Leisure / Sports 28	Sit/Kneel/Stand 92 Leg Function 62 Arm Function 93 Use of transportation 100 Self-Care 100 Household tasks 100 Leisure / Sports 100
Canadian Hemophilia Outcomes-Kids' Life Assessment Tool CHO-KLAT	Child 76.6 Mother 52.3	Child 87.1 Mother 66.1

Exercise Program

- **Core Strengthening**
Transversus abdominus
Lower abdominal controlled knee-to-chest
Trunk Curls
Gymnastic ball & quadruped activities
- **Hip Strengthening**
Bridging – 2-leg and single leg
abduction and adduction sidelying
Hip extension prone
- **Knee strengthening**
SLR – controlling core musculature
Sitting – knee extension
- **Ankle ROM**
Alphabet and towel scrunches
- **Ankle Strengthening**
Manual resistance, Level 2 theraband
- **Stretching**
Hamstrings
Quadriceps
Gastrocnemius / Soleus
- **Aerobic Exercise**
60 minutes – 5-7 days / week
Walking or cycling

Conclusions

Significant changes noted:
• Wong-Baker Faces Pain Rating Scale : change in one face level is clinically significant
• 6-Minute Walk Test : change in distance > 68 meters

No significant change noted in:
•Participation – not a good measure for hemophilia?
•HJHS – impairment measure, joint disease did not change

Showed slight improvement – not clinically significant:
•Single Limb Stance, Gait, CHO-KLAT and PedHAL (exception Activity for Leisure Sport ↑ 67%, and Leg Function ↑ 250%)

Therapeutic Exercise combined with a Carbon-fiber AFO may be effective in managing chronic ankle pain.

References

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