GAIT DEVIATIONS IN CHILDREN WITH SEVERE HAEMOPHILIA FOLLOWING BLEEDING INTO THE ANKLE JOINT

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INTRODUCTION

Haemophilia is an inherited bleeding disorder in which the blood does not clot normally and is characterised by spontaneous and traumatic musculoskeletal bleeding into joints and muscles [1,2]. This paper provides for the first time a description of the gait pattern of children with severe haemophilia who have experienced at least 3 episodes of bleeding into the ankle joint and how this gait pattern deviates from normal gait.

METHODS

Five children, (mean ± SD, age 10.02 ± 2.82 years) with severe haemophilia and 4 age-matched normal controls, (10.05 ± 2.53 years) volunteered to take part in this pilot study. Kinematic and kinetic data for the pelvis and lower limb was collected using a 10 camera Vicon 612 Motion Analysis System (Oxford Metrics Ltd, UK) and 2 Bertec Force Platforms (Model MIE Ltd, Leeds, UK). The force platforms were positioned in the middle of a 7.5 metre walkway and subjects walked barefoot at a self-selected comfortable walking speed. Mean and peak angles and moments in the gait cycle, initial contact and toe off were analysed for differences between the haemophilia subjects and healthy matched controls using the Mann-Whitney U independent t-test for non parametric data. Spearman rank correlations were also used to investigate the relationship between an established clinical haemophilia assessment score [3] and gait changes.

RESULTS AND DISCUSSION

Children with a history of bleeding into the ankle joint adopted a gait pattern which differed from that of normal children. Table 1 shows the differences seen in the ankle and knee angles, while Figure 1 shows the significantly greater ankle plantarflexion (p=0.01) and smaller ankle dorsiflexion moments (p=0.05). Significantly greater knee flexion moments (p=0.01), greater knee flexion angles (p=0.01), smaller ankle adduction angles (p=0.02), smaller ankle external rotation angles (p=0.04) were also found in children with haemophilia.

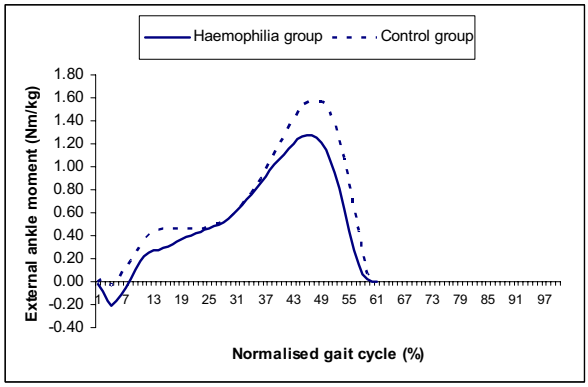

Figure 1. Graph showing sagittal plane ankle moments

Gait velocity was significantly reduced (p=0.02) in the children with haemophilia with no apparent relationship was shown between velocity and the clinical haemophilia score [3].

Increased flexion and loading at the knee joint may lead to greater susceptibility to haemarthrosis and disability at the knee joint for these children that may affect lower limb muscle function.

CONCLUSIONS

The results of this pilot study demonstrate that children with haemophilia alter their walking possibly to protect and decrease the load and forces at the ankle joint and increase the load and forces at the knee joint that may affect lower limb muscle function. The subtle gait abnormalities in these children were undetected in either clinical examination or the clinical assessment score.

REFERENCES

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Table 1: Means (± SD) sagittal plane joint angles and maximum joint moments during level walking.

		Haemophilia Group	Normal Group
Mean Joint Angles (degrees)	Ankle	2.63 (± 4.08)	1.44 (± 3.28)
	Knee **	24.85 (± 5.84)	15.98 (± 5.03)
	Hip	12.61 (± 6.57)	15.25 (± 4.66)
Max Joint Moments (Nm/kg)	Ankle *	1.30 (± 0.27)	1.59 (± 0.26)
	Knee *	0.79 (±6.57)	0.36 (± 0.27)
	Hip	1.68 (± 0.51)	2.11 (± 0.70)

* $p \leq 0.05$ ** $p \leq 0.01$