GAIT ALTERATION AND FOOT DEFORMITIES IN CHILDREN LIVING WITH TYPE 1 DIABETES

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There is limited evidence on the biomechanical effects of Type 1 Diabetes Mellitus (T1DM) on children's feet

Children with Type 1 DM may be at a greater risk of developing foot pathology than non-diabetic children

Aim of this study was to investigate foot deformity, foot type (mainly foot posture), and inter-segmental movement of the foot during ambulation in an adolescent T1DM population.

INCLUSION CRITERIA:

Group A: children aged from 10-16 years, with no gross gait impairment as determined by an experienced gait analyst with no chronic health conditions.

Group B: children with Type 1 DM aged between 10-16 years, with no gross gait impairment as determined by an experienced gait analyst and no other chronic health conditions.

EXCLUSION CRITERIA:

- neurological disorders such as ataxia, scissor gait, Trendelenburg gait, toe walking, spastic gait, antalgic gait and circumduction gait,
- fractures of the foot
- systemic disorders such as juvenile rheumatoid arthritis, neuropathy and neuromuscular disorders
- history of lower limb surgery
- active ulceration or history of ulceration.

METHODOLOGY:

Ethical approval sought and granted by University Research Ethics Committee. All participants signed informed consent and were treated according to Declaration of Helsinki

CLINICAL EXAMINATION included:

clinical biomechanical examination to determine which foot type the participant was living with, as well as any foot deformities (claw toes, hammer toes and hallux abducto valgus) and foot joint ranges of motion.

Foot posture was assessed utilizing the Foot Posture Index (FPI)

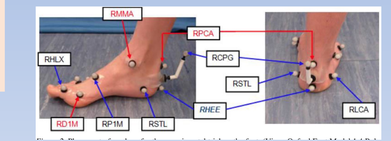
The ranges of motion of the
ankle
subtalar
midtarsal joints
assessed with participants in a supine position with extended legs







Motion capture was performed utilizing an optoelectronic motion capture system (Vicon, United Kingdom) consisting of 16 infra-red cameras surrounding a 9-metre walkway.

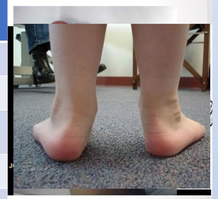




THE OXFORD FOOT MODEL

Foot types/deformities

	Healthy Children (n =16)	Type 1 DM Children (n =18).
Claw Toes	0	6
Hammer Toes	0	4
Hallux Abducto Valgus	0	2
Pronated feet	8	13
Supinated feet	0	0



RESULTS

	Healthy Controls	T1DM children
Ankle joint		
Rigid	18.75% (n=3)	33.3% (n=6)
Mobile	75% (n=12)	61.1% (n=11)
Hypermobile	6.25% (n=1)	5.5% (n=1)
Subtalar joint		
Rigid		11.1% (n=2)
Mobile	93.75 (n=15)	83.3% (n=15)
Hypermobile	1(6.25% (n=1)	
Midtarsal Joint		
Rigid		11.1% (n=2)
Mobile	93.75% (n=15)	72.2% (n=13)
hypermobile	6.25% (n=1)	16.6% (n=3)

Significant motion analysis results
A significant difference was found in the HTFB Angle, the Hindfoot to Tibia Angle in the sagittal plane representing ankle dorsiflexion/plantarflexion, at heel strike and toe-off, denoting reduced range of motion at these stages of the stance phase of the gait cycle
Results concur with those of the physical examination for range of movement of the ankle joint

CONCLUSION:
A higher incidence of toe deformities and joint restrictions was found in T1DM children
The limitation of sagittal plane movement at the ankle joint, possibly due to soft tissue glycosylation, is bound to produce significant effects on foot structure since limited ankle joint mobility is well known to produce detrimental effects on the foot, including foot and toe deformities and alterations in gait..

eventually T1DM children enter adulthood having already significant foot deformities and altered foot function, which could be precursors to the myriad of conditions that affect the adult diabetic foot