Precise glucose monitoring in CF patients

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Background

Annual screening for CF diabetes (CFD) is recommended from 10 years of age. UK guidelines recommend both Oral Glucose Tolerance Test (OGTT) & Continuous Glucose Monitoring (CGM) as suitable methods of screening[1].
There is no consensus on diagnostic criteria for CGM.
Data on incidence of the prediabetic stage of impaired glucose tolerance (IGT) is limited.
Early detection of CFD allows for timely treatment, which is essential to avoid deterioration in lung function, weight and clinical status[2,3,4,5].

Objective

Review single centre experience of using CGM.
Investigate utility of OGTT vs CGM.

Method

Retrospective review of OGTT & CGM data from 2019-2022.

DIAGNOSTIC CRITERIA:

OGTT (based on single response to glucose load 1.75g/kg to a maximum of 75g)[6]:

Cystic Fibrosis Diabetes (CFD)
2 hr blood glucose (BG) reading of >11.1 mmol/L

Impaired Glucose Tolerance (IGT)
BG of ≥ 7.8 mmol/L AND < 11.1mmol/L at 2h or ≥ 11.1mmol/L at 1h[8,9]

CGM (7-day diagnostic criteria)[7]:

CFD
>1 BG peak >11.1mmol/L & BG >10% of time >7.8 mmol/L

IGT
max 1 peak >11.1mmol/L &/or BG >10% of >7.8mmol/L

Indeterminate Hyperglycaemia (IH)
BG 4.5-10% of time >7.8 mmol/L

Key findings

n = 28 (17 males, mean age 12.75)

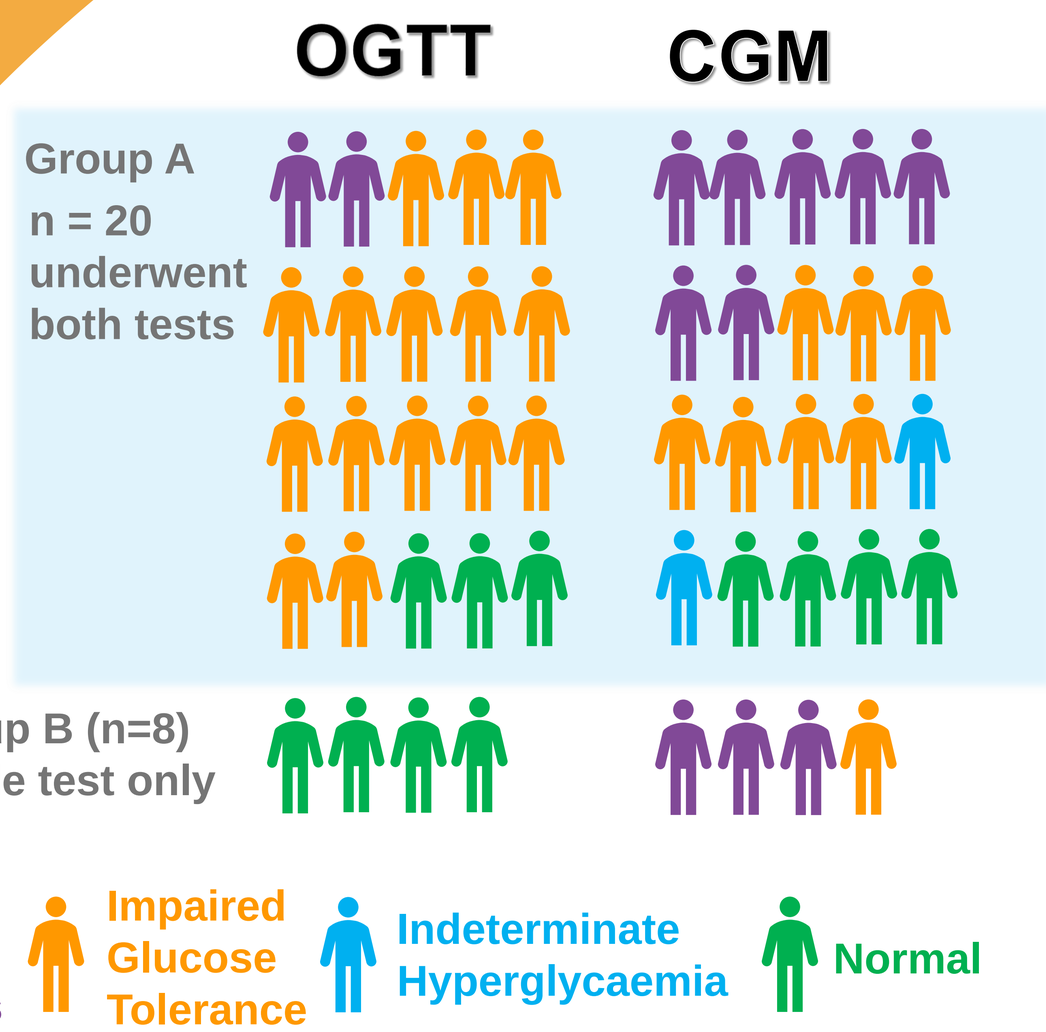

Table 1. Utility of OGTT vs CGM in diagnosis of CFD (n=20)

	CGM +ve	CGM -ve
OGTT +ve	2	0
OGTT -ve	5	13

OGTT +ve = OGTT diagnostic of CFD, OGTT –ve = IGT or normal
CGM +ve = CGM diagnostic of CFD, CGM –ve = IGT, IH or normal

Sensitivity 29% (2/7)

Specificity 100% (13/13)

Conclusion

1. OGTT whilst specific is poorly sensitive.
2. Recognition of CFD is more precise with CGM.
3. Continuous glucose monitoring allows for real-life monitoring in relation to dietary intake.

We recommend moving away from OGTT to annual CGM to facilitate granular understanding of glycaemic control & facilitating earlier diagnosis of CFD.

References: 1) Cystic Fibrosis Trust (2022) *Management of Cystic Fibrosis Diabetes*. Available at: https://www.cysticfibrosis.org.uk/sites/default/files/2023-04/CF%20Trust%20Diabetes%20Consensus.pdf 2) Milla, C.E., Warwick, W.J., Moran, A. (2000) 'Trends in pulmonary function in patients with cystic fibrosis correlate with the degree of glucose intolerance at baseline.' *Am J Respir Crit Care Med*; 162: 891-5. 3) Rolon, M.A., Benali, K., Munck, A., Navarro, J. et al. (2001) 'Cystic fibrosis-related diabetes mellitus: clinical impact of prediabetes and effects of insulin therapy' *Acta Paediatr*; 90: 860-7. 4) Nousia-Arvanitakis, S., Galli-Tsinopoulou, A., Karmouzis, M. (2007) 'Insulin improves clinical status of patients with cystic-fibrosis-related diabetes mellitus' *Acta Paediatrica*; 90: 515-519. 5) Terliesner, N., Vogel, M., Steighardt, A. et al. (2017) 'Cystic-fibrosis related-diabetes (CFRD) is preceded by and associated with growth failure and deteriorating lung function.' *J Pediatr Endocrinol Metab*; 30: 815-821. 6) WHO (2006) *Definition and diagnosis of diabetes mellitus and intermediate hyperglycaemia.* Available at: https://www.who.int/publications/i/item/definition-and-diagnosis-of-diabetes-mellitus-and-intermediate-hyperglycaemia 7) Balfour-Lynn, I. (2020) *Clinical Guidelines Care of Children with Cystic Fibrosis*. United Kingdom: Royal Brompton Hospital. 8th Edition. 8) Brodsky, J., Dougherty, S., Makani, R., Rubenstein, R.C., Kelly, A. (2011) 'Elevation of 1-hour plasma glucose during oral glucose tolerance testing is associated with worse pulmonary function in Cystic Fibrosis'