257 Challenges in CFRD: The advantages of continuous glucose monitoring (CGM)

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Introduction: With survival increasing in CF, CF-related diabetes (CFRD) and its assocated complications are more common. Achieving optimal glycaemic control can be particularly difficult despite traditional management methods. CGM provides greater insight into glycaemic trends through the day, and helps determine the benefits of treatment changes. We routinely use CGM for optimisation of diabetic control at our large CF centre (n = 282; 40% CFRD), and have explored its utility in the management of this CF complication.
Method: We evaluated CGM traces in 29 CFRD patients over a 20 month period, along with any subsequent changes in weight, pulmonary function, HBA_1C and antibiotic treatment. Food and exercise diaries completed during CGM were also evaluated.
Results: See Table [Mean (SD)]: 69% gained weight, 72% improved their lung function ($p < 0.0001$) and 62% improved HBA_1C ($p < 0.0001$). Overall, 45% required less IV antibiotic therapy ($p < 0.0001$) and 34% required fewer oral antibiotic courses. 90% of subjects had dietary adjustments following review of food and exercise diaries. 34% had a change in the type of insulin prescribed following CGM.
Conclusion: This study demonstrates the utility of CGM to improve clinical status and optimize treatment including the dosage and type of insulin therapy. CGM used in conjunction with good education, support and the concurrent mapping of food and exercise diaries is of educational benefit allowing the fine-tuning of any adjustments of treatment.

Group	FEV1 (%)	Weight (kg)	HBA1C (IFCCmmol/mol)	Oral Antibiotics (n courses)	IV Antibiotics (n courses)
Pre-CGM	56 (29)	58 (12)	63 (28)	0.69	1.1
Post-CGM	61 (28)	59 (12)	55 (16)	0.41	0.64

Values are mean (SD).

258 Has the age of diagnosis of cystic fibrosis related diabetes (CFRD) changed over the last 10 years?

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Introduction: Glucose intolerance is a universal feature in CF, and an early diagnosis of CFRD is essential to prevent the clinical deterioration that occurs before standard definitions of diabetes mellitus are reached. As part of this, we have put in place a robust system to assess glucose intolerance, and wished to assess the effect this has had on the diagnosis of this common complication of the CF condition in our large adult clinic (280 patients).
Methods: We monitored the prevalence of CFRD in our clinic between 2002 and 2012, looking for trends in age at diagnosis and the proportion with the disease.
Results: See table. Over the decade, our clinic has almost doubled in size and the proportion with CFRD has increased year on year from 13.5% to over 40%, and in total 155 had CFRD (76 male). There was no difference in age at diagnosis (males: median 24 years (SD 7.80); females 23 (6.62); $p = 0.58$).

Table: Median age of CFRD diagnosis, 2000–2012

	2002	2004	2006	2008	2010	2012
Median age at diagnosis	31	22	22.5	26	23.5	24
% of clinic with CFRD (number)	13.5 (20)	26.3 (45)	31.1 (63)	32 (76)	38 (99)	43.6 (120)
Proportion of eligible patients diagnosed in-year (%)	3.9	14.3	5.8	6.2	6.8	8.1

Conclusion: There has been an increase in the percentage of patients with CFRD over the last decade which is likely to be due to our increased vigilance for significant glucose intolerance. Furthermore, the variation in the median age at diagnosis indicates that this has occurred throughout the age range of our clinic. It is important that a diagnosis of CFRD is made in a timely fashion due to the potential for intervention and effect on patient outcomes.

259 The diurnal variation in glucose handling in CF – Is a change in guidance needed?

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Objectives: Glucose intolerance later in the day may be an early sign of diabetes [1] and this may be particularly important in CF, where glucose handling is deficient even in those without established CF-related diabetes (CFRD). However, the recommended single point diagnostic test, the OGTT, is not physiological and a CF diet often exceeds this glucose load. We used continuous glucose monitoring (CGM) to study any diurnal variation of glucose handing in CF in normal daily life.
Method: 72-hour CGM tracings from 17 CF patients not known to have CFRD were reviewed for variation in glycaemic levels (hypoglycaemic [$\leqslant 3.5$], normo [3.5–7.7] and hyper [$\geqslant 7.8$]) for consecutive 6-hourly periods throughout the day, during which time they carried out their usual daily activities.
Results: The table summarises the % time spent during each quarter. Subjects had greater overall glucose levels in the evening ($p = 0.03$). Furthermore, the proportion of normoglycaemic time decreased ($p = 0.002$) through the day.
Conclusions: This study confirms glucose intolerance increases as the day progresses and demonstrates the utility of CGM to capture information not available with a standard OGTT. This questions whether the guidance for the diagnosis of CFRD should be updated to include tests that can capture evidence of diminished pancreatic endocrine function later in the day.

Table: Diurnal variation of glycaemic levels

Time (hrs)	% time [mean (SD)] spent		
	hypo (%)	normo (%)	hyper (%)
0600–1200	10 (16)	80 (16)	9 (11)
1200–1800	5 (7)	78 (17)	17 (18)
1800–0000	6 (11)	68 (22)	25 (17)
0000–0600	7 (9)	81 (18)	12 (17)

Reference(s)

[1] Jarrett, R. BMJ 1(5794): 199–201.

260 Insulin release responses to a mixed meal and standard oral glucose tolerance test in CF

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Objectives: Non-glucose dietary constituents influence the phases of insulin secretion in response to a glycaemic load, and although the early insulin response to different meal types are well described in normal and diabetic subjects, there have been no studies comparing both phases in CF. We compared the first (1-Ph) and second (2-Ph) phase insulin responses to a standard mixed meal test (MMT) and OGTT in CF subjects.
Methods: Following an overnight fast 13 exocrine pancreatic insufficient CF (without known CFRD) and 10 healthy matched control subjects underwent on different days a standard OGTT and MMT. 1-Ph and 2-Ph phase were determined from plasma glucose and insulin.
Results: CF subjects had lower 1-Ph (OGTT: $p = 0.002$, MMT: $p = 0.0002$) and 2-Ph (OGTT: $p = 0.002$, MMT: $p < 0.0001$) responses compared to controls. Although the 1-Ph response correlated in both groups (Controls: $r = 0.67$, $p = 0.04$; CF: $r = 0.92$, $p \leqslant 0.0001$), this only correlated with 2-Ph in the CF group ($r = 0.63$, $p = 0.02$).
Conclusions: Adult CF patients without known CFRD have diminished first and second phase insulin release. The MMT provides a more physiological alternative to the OGTT in CF subjects and can be used to assess glucose handling. The clinical application of the MMT as a standard test for diagnostic purposes in CF merits further investigation for the early assessment of β-cell function.