Accuracy of creatinine and Cystatin C eGFR versus iohexol mGFR in an older adult Cystic Fibrosis Population

**Introduction**

Primary renal disease in cystic fibrosis (CF) is rare, however secondary renal dysfunction may become apparent with increasing survival due to the emergence of age-related comorbidities such as CF-related diabetes mellitus (CFRD), systemic hypertension, nephrolithiasis and cardiovascular disease. Inaccuracies in estimations of renal function using creatinine-based glomerular filtration rate (GFR) methods are evident in CF and will have implications for monitoring renal decline, dosing nephrotoxic medication and quantifying cardiovascular risk in an ageing CF population. This study aims to explore renal function and reliability of estimated GFR in an older CF cohort.

**Methods**

CF patients aged 40 years and above attending MACFC were recruited. Prospective sampling for serum creatinine, serum cystatin C, urine albumin-creatinine ratio (ACR) and 24-hour urinary creatinine clearance was performed during periods of clinical stability. Estimated GFR (eGFR) was calculated using MDRD and CKD-EPI equations. A subgroup of 9 patients underwent iohexol clearance ‘measured’ GFR (mGFR), using a three-point, one compartment protocol. Estimated GFR methods were compared to iohexol GFR to determine their accuracy in this population.

**Results**

Nine patients were recruited for iohexol GFR analysis. The mean age of this smaller cohort was 48.3 (±6.4) years. Seven (77.8%) had a diagnosis of CFRD. Mean ppFEV1 was 46.3(±20.2)%, mean BMI was 25.4(±2.0) kg/m2. Mean iohexol GFR of the subgroup was well preserved at 116.1(±20.1) ml/min/1.73m2. Estimated GFR methods using both serum creatinine and cystatin C underestimated GFR significantly in this population. However, using iohexol mGFR as gold standard, CKD-EPIcreat and CKD-EPIcysC+creat were the most accurate with 77.8% of values within 30% of measured GFR.

There was a significant difference in GFR results between iohexol mGFR and all eGFR methods using T-testing (p<0.001), with underestimation of GFR for all patients using estimated methods. Bland Altman plots were constructed for each eGFR method and iohexol GFR for assessment of bias and the extent of inaccuracy between methods.

1. **Iohexol vs MDRD**



1. **Iohexol vs CKD-EPIcreat**

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1. **Iohexol vs CKD-EPIcys**



1. **Iohexol vs CKD-EPIcreat+cys**



**Discussion**

Although patient numbers are small, we can see that the vertical spread of data points is larger at higher mean GFR values. This indicates that the difference between methods, and hence the bias, becomes more apparent with increasing mean GFR for all eGFR methods compared to iohexol. Small patient numbers also produce large limits of agreement (LOA) for each method comparison, leading to a high systematic difference between methods, indicating that, in this patient group, each eGFR method underestimates GFR compared to iohexol. We cannot confidently assess the degree of proportional bias with regression analysis due to small patient numbers and lack of significant correlation between iohexol GFR and eGFR methods.