

Glomerular filtration rate estimation using β -trace protein: external validation of three equations

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Introduction and aims

- Beta-trace protein (BTP) is a low-molecular-weight protein emerging as a novel endogenous glomerular filtration rate (GFR) marker.
- Different BTP-based equations are proposed to estimate GFR (eGFR) in populations with mild to moderate CKD¹⁻³, and more recently in patients with end-stage renal disease⁴ (ESRD – CKD stage 5) (**Table**).
- We initially evaluated three BTP-based equations in a population merely constituting of CKD stage 5 patients. Additionally, the agreement of the newly released formula⁴ with measured GFR (mGFR) in ESRD was evaluated.

Methods

- Plasma BTP was measured in 710 subjects (*N Latex BTP, Siemens*) (**Table**)
- For the entire cohort, level of agreement of 3 BTP-based formulas with eGFR MDRD was assessed.
- Agreement with mGFR, calculated as *iohexol clearance* or *mean of urea and creatinin clearance*, was assessed in CKD stage 3-4 and HS (n=123) and CKD stage 5 (n=298) respectively.

Study subjects (n=710)

CKD stage 3-4 (n=86)
 CKD stage 5 on HD (n=217)
 CKD stage 5 on PD (n=83)
 CKD stage 5 without RRT (n=279)
 Healthy controls (HS; n=45)

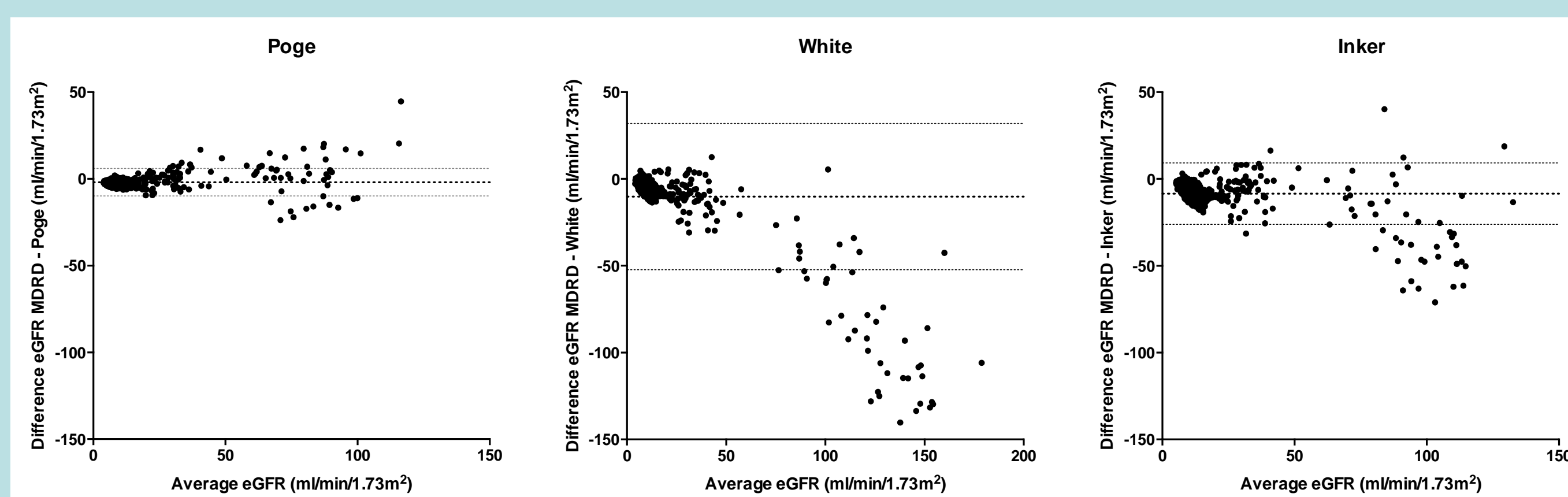
Author	Formula
Poge (1)	$GFR = 974.31 \times BTP^{-0.2594} \times creatinine^{-0.647}$
White (2)	$GFR = 167.8 \times BTP^{-0.758} \times creatinine^{-0.204} (\times 0.871 \text{ if female})$
Inker (3)	$GFR = 55 \times BTP^{-0.695} \times 0.998^{age} (\times 0.899 \text{ if female})$
Shafi (4)	$GFR = BTP^{-2.16} (\times 1.652 \text{ if male})$

Results

- Among 665 pts (age 59 ± 14 yrs; 63% male, 1% African), mean eGFR MDRD was 13.4 ± 19.5 ml/min/1.73 m².
- BTP levels appeared to be independent of age and gender.

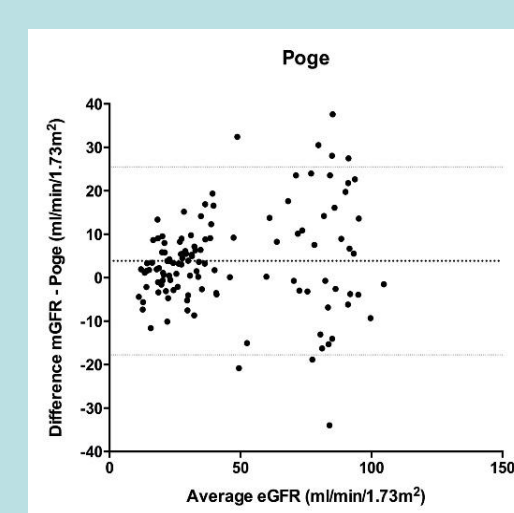
Entire cohort: agreement with eGFR MDRD

Overestimation of GFR with BTP-based formulas



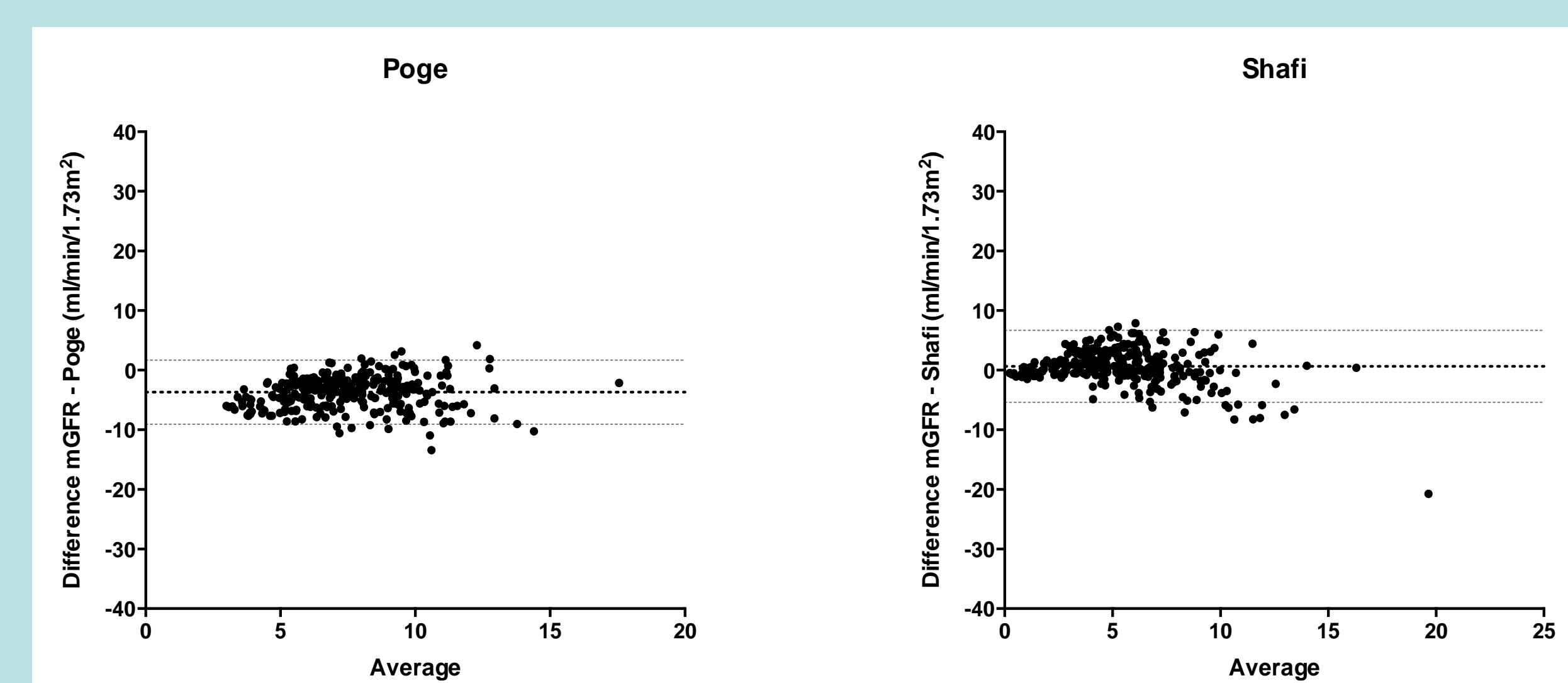
CKD stage 3-4 and HS: agreement with mGFR

Only fair agreement with Poge's formula



CKD stage 5: agreement with mGFR

Fair agreement of both Poge's and Shafi's formula



Conclusion

- In the studied population, the Poge formula, using combination of both creatinine and BTP levels, appears as the most accurate BTP-based GFR estimation across the whole range of GFR.
- In ESRD patients, BTP-based equations are promising, but further validation against the gold standard is warranted.

REFERENCES

1. Poge U et al, *Clin Chem*, 2008
2. White CA et al, *Clin Chem*, 2007
3. Inker LA et al, *Am J Kidney Dis*, 2015
4. Shafi T et al, *Kidney International*, 2016



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