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ACCURACY OF ESTIMATED GLOMERULAR FILTRATION RATES BASED ON CREATININE OR CYSTATIN C FOR PATIENTS WITH CHRONIC SPINAL CORD INJURY.

Hypothesis / aims of study
Estimated serum creatinine (Cre)-based glomerular filtration rates (eGFRcre) are commonly used to evaluate renal function; however, Cre has been reported to be an unreliable indicator of renal function in some patients with chronic spinal cord injury. The objective of this study was to compare the accuracy of eGFRcre and serum cystatin C (Cys-C)-based eGFR (eGFRcys) for determining renal function in such patients.

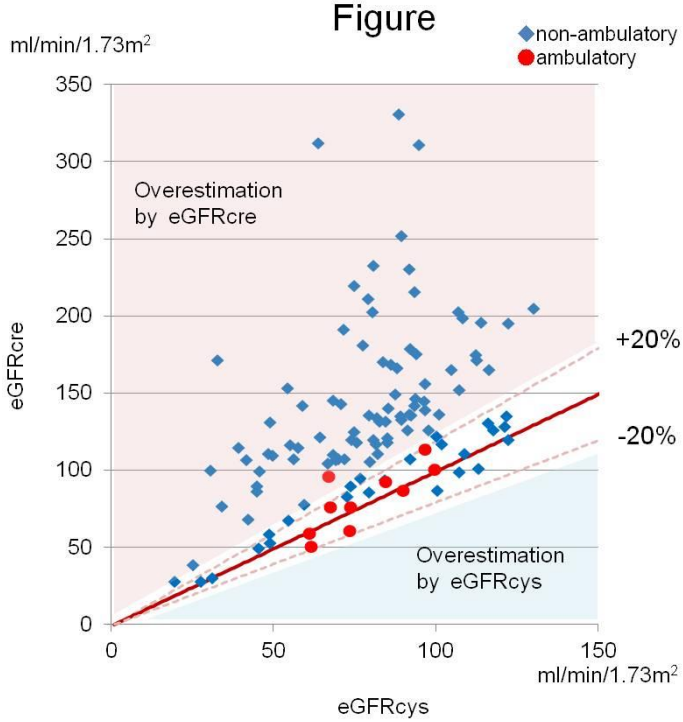
Study design, materials and methods
Male patients with spinal cord injury more than 5 years post injury who were undergoing urination management in our hospitals were eligible for inclusion in this study. Renal function in all patients was assessed using eGFRcre and eGFRcys. Cre and Cys-C were measured using an enzymatic method and colloidal gold agglutination, respectively. eGFRcre and eGFRcys were calculated using the following formulas, as defined by the Clinical Practice Guidebook for Diagnosis and Treatment of Chronic Kidney Disease 2012 in Japan: $eGFRcre = 194 \times Cre^{-1.094} \times age^{-0.287}$; $eGFRcys = (104 \times Cys\text{-}C^{-0.1019} \times 0.996^{age}) - 8$. We considered eGFRcre and eGFRcys to be equal when the eGFRcre/eGFRcys ratio was between 0.8 and 1.2. For all patients, demographic data, degree of spinal cord damage, type of urination management, post-injury period and ambulatory status were also evaluated.

Results
A total of 115 male patients (median age, 66 years; age range, 30–84 years) were followed for a median of 23.3 years (range, 6.8–54.3 years) after spinal cord injury. Among all patients (57 with cervical injury, 58 with thoracic or lumbar injury), 76 (66.1%) had progressed to complete paralysis. Sixteen patients had recovered spontaneous micturition, while 50 required self-catheterization and 49 required urinary catheterization. Mean (± standard deviation [SD]) Cre and Cys-C levels were 0.58±0.29 and 1.07±0.44 mg/dL, respectively, and mean±SD eGFRcre and eGFRcys were 130.6±54.7 and 79.2±24.4 mL/min/1.73m^2, respectively. Based on eGFRcre/eGFRcys ratios, eGFRcre overestimated renal function in 87 (75.7%) patients with chronic spinal cord injury (Figure). According to chi-square test renal function by eGFRcre was overestimated significantly in non-ambulatory patients ($P<0.0001$), in complete paralysis ($P=0.0001$) and in patients with indwelling bladder catheter ($P=0.045$).
And cervical injury or another site injury was not an independent factor impacted on eGFR based on Cre or Cys-C ($P=0.21$) (Table).

Interpretation of results
In our study renal function evaluated by eGFRcre is not recommended not only for complete paralysis nor non-ambulatory patients but also for patients with indwelling bladder catheter.

Concluding message
Our results demonstrate that eGFRcre overestimates renal function in patients with chronic spinal cord injury. Estimated glomerular filtration rates should be evaluated based on cystatin C especially in non-ambulatory patients, in those with complete paralysis and in those with indwelling bladder catheter.

Figure



Factors in the overestimation of renal funciton using eGFRcre

	Odds ratio	95%CI	P
Non-ambulatory	40.74	4.87 - 341.06	<0.0001
Complete paralysis	5.66	2.26 - 14.13	0.0001
Indwelling bladder catheter	2.41	1.01 - 5.76	0.045
Cervical spine injury	1.73	0.73 - 4.13	0.21
Post-injury period >26 years	3.21	1.24 - 8.34	0.01

References
1. SA Thomassen et al. Spinal Cord 2002; 40: 524-528.
2. EJ Erlandsen et al. Spinal Cord 2012; 50: 778-783.
3. M Elmelund et al. Spinal Cord 2014; 52: 368-372.

Disclosures
Funding: None **Clinical Trial:** Yes **Public Registry:** No **RCT:** No **Subjects:** HUMAN **Ethics not Req'd:** it is retrospective study and It has been kept anonymous.
I am applying to the ethics committee for approval. **Helsinki:** Yes **Informed Consent:** No