Dried Blood Spot sampling in practice

Clinical Validation of Simultaneous Analysis of Tacrolimus, Cyclosporine A and Creatinine in Dried Blood Spots in Kidney Transplant Patients

H. Veenhof1, R.A. Koster1, J.W.C. Alffenaar1, S.P. Berger2, S.J.L. Bakker2, D.J. Touw1,3

1 University of Groningen, University Medical Center Groningen, Department of Clinical Pharmacy and Pharmacology, Groningen, 2University of Groningen, University Medical Center Groningen, Division of Nephrology, Groningen, The Netherlands, 3University of Groningen, Department of Pharmacy, section Pharmacokinetics, Toxicology and Targeting, Groningen, The Netherlands.

Monitoring of creatinine and immunosuppressive drug concentrations is important in the follow-up of kidney transplant recipients. Dried Blood Spots (DBS) provide patients the opportunity to sample a drop of blood from a fingerprick at home, which can be send to the laboratory by mail.

Objective

To clinically validate our method for analyzing creatinine, tacrolimus and cyclosporine A in a single bloodspot to implement DBS in routine outpatient care.

Methods

- Paired venous whole blood and DBS fingerprick samples were obtained during regular visit of patients to the hospital using the method described at vingerprik.umcg.nl
- DBS and whole blood samples were analyzed using a previously described LC-MS/MS method.1,2
- Method comparison was done using Passing & Bablok, bias was measured using Bland-Altman.

Results

- 210 paired samples were collected from 181 patients. 10 DBS were excluded for poor quality, 2 for other reasons.
- For creatinine, tacrolimus and cyclosporine A resp. 199,104 and 58 samples were available for validation.
- For creatinine regression line was y = 0.73x – 1.55 (95%CI slope 0.71,0.76; intercept -4.58,1.65) with a significant bias of -2.1 µmol/L (95%CI -3.7,-0.5).
- Creatinine conversion formula: [creatinine plasma concentration in µmol/L] = [creatinine concentration in DBS in µmol/L] / 0.73

Fig. 1: Method comparison between plasma creatinine levels and Dried Blood Spot creatinine levels (n=199). The dotted line is the line of identity, the continuous line is the Passing & Bablok regression line.

Fig. 2: Method comparison between venous whole blood tacrolimus levels and Dried Blood Spot levels (n=104). The dotted line is the line of identity, the continuous line is the Passing & Bablok regression line.

Fig. 3: Method comparison between venous whole blood cyclosporin A levels and Dried Blood Spot levels (n=58). The dotted line is the line of identity, the continuous line is the Passing & Bablok regression line.

Results

- For tacrolimus regression line was y = 1.00x – 0.23 (CI slope 0.91,1.08 intercept -0.69,0.30) with a bias of -0.28 µg/L (95%CI -0.45,-0.12 µg/L)
- For cyclosporin A regression line was y = 0.99x – 1.86 (95%CI slope 0.91,1.08; intercept -8.31,3.64) and no significant bias.
- For ciclosporin A, tacrolimus and creatinin (using the conversion formula), DBS analytical results are interchangeable with venous whole blood analytical results.

Conclusion

Dried Blood Spot sampling can replace conventional venous sampling in daily routine for the simultaneous analysis of immunosuppressants and creatinine.

References


Correspondence to:

University Medical Center Groningen
Dep. of Clinical Pharmacy and Pharmacology
attn. H. Veenhof MSc
PO Box 30.001
9700 RB, Groningen
The Netherlands
Email: h.veenhof@umcg.nl

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