- 2 Somerville AL, Wright DH, Rotschafer JC. Implications of vancomycin degradation products on therapeutic drug monitoring in patients with end-stage renal disease. *Pharmacotherapy* 1999;19:702-7.
- 3 Wilson JF, Davis AC, Tobin CM. Evaluation of commercial assays for vancomycin and aminoglycosides in serum: a comparison of accuracy and precision based on external quality assessment. *J Antimicrob Chemother* 2003;52:78-82.
- 4 Smith PF, Petros WP, Soucie MP, et al. New modified fluorescence polarization immunoassay does not falsely elevate vancomycin concentrations in patients with end-stage renal disease. *Ther Drug Monit* 1998;20:231-5.
- 5 Tobin CM, Darville JM, Thomson AH, et al. Vancomycin therapeutic drug monitoring: is there a consensus view? The results of a UK National External Quality Assessment Scheme (UK NEQAS) for Antibiotic Assays Questionnaire. *J Antimicrob Chemother* 2002;50:713-8.

Analysis of cerebrospinal fluid for suspected subarachnoid haemorrhage is improved by built-in spectrophotometer software

The spectrophotometric analysis of cerebrospinal fluid has an important role in the diagnosis of subarachnoid haemorrhage.¹ The presence of bilirubin, which is the basis for the laboratory identification of in vivo haemorrhage, is assessed by calculating the net bilirubin absorbance (NBA). Guidelines for this practice have recently been published.² To calculate the NBA, several measurement steps are required: locating the tangential points to construct a baseline; locating the 476-nm position on the scan to construct a perpendicular line; and measuring the distances between the baseline and peak, and correlating this with the distance measurement and absorbance magnitude on the y axis. When combined, these measurements will have a cumulative effect on the imprecision of the final NBA estimate.³

We recently investigated the imprecision of the NBA, having found a relatively large within-operator coefficient of variation of 17% at the medical decision level of 0.007 arbitrary units (AU).⁴ This would lead to a remarkable number of predicted misclassifications.⁴ Measurements were made using a ruler. Millimetre differences in measurement could lead to substantial propagated differences in the derived NBA values.

We subsequently investigated the software-aided NBA measurement of the Super Aurius

3000 (Cecil Instruments, Cambridge, UK) spectrophotometer. Six samples with mean NBA in the range of 0.002–0.02 were scanned 10 times and the results printed after each scan. The wavelength data points that were entered into the software program were determined manually after each print. The program then constructed the baseline as recommended² and automatically calculated the NBA. The within-operator imprecision for deriving the NBA was calculated and an imprecision profile was drawn up. As shown in fig 1, we observed substantially lower levels of imprecision with the software-assisted Super Aurius 3000 than with the previously investigated Uvikon 922,⁴ which did not use a software-assisted measurement. Importantly, at the medical decision level of 0.007 AU, the within-operator imprecision was 6.6% compared with 17%.⁴ Our findings are in keeping with the excellent precision of NBA measurement that has recently been shown by using a different spectrophotometer and aided software.⁵

In addition, we investigated the between-operator imprecision and predicted the patient misclassification error. When we used another two people, who were blinded to each other's results, the mean between-operator variation was calculated to be 6.8% at 0.0059 AU compared with 19% at 0.0062 AU. By assuming that no bias was present, none of the 84 previously submitted patient samples scanned would have led to patient misclassification compared with previous findings of 5 out of 84 when the spectrophotometer without software assistance was used.⁴

The software-aided spectrophotometric derivation of the NBA significantly minimises the imprecision of measurement. This is also reflected by an estimated reduction in the diagnostic error rate. It also simplifies and improves the practicability of the measurement. Several software-assisted NBA measurement options have now become available and these should be considered by laboratories that perform spectrophotometric measurements for suspected subarachnoid haemorrhage.

A Viljoen

Department of Clinical Biochemistry and Immunology, Addenbrookes Hospital, Cambridge, UK

K S Walker, C Ho

Department of Clinical Biochemistry, Royal Infirmary of Edinburgh, Edinburgh, UK

P J Twomey

Department of Clinical Biochemistry, Ipswich Hospital, Ipswich, UK

Figure 1 Imprecision profile with the software-assisted Super Aurius 3000.

Correspondence to: A Viljoen, Department of Clinical Biochemistry and Immunology, Addenbrookes Hospital, Hills Road, Cambridge CB2 2QQ, UK; adie.viljoen@addenbrookes.nhs.uk

doi: 10.1136/jcp.2005.028191

References

- 1 Petzold A, Keir G, Sharpe LT. Spectrophotometry for xanthochromia. *N Engl J Med* 2004;351:1695-6.
- 2 UK National External Quality Assessment Scheme for Immunochemistry Working Group. National guidelines for the analysis of cerebrospinal fluid for bilirubin in suspected subarachnoid haemorrhage. *Ann Clin Biochem* 2003;40:481-8.
- 3 Challand GS. Lies, damned lies and algorithms. *Ann Clin Biochem* 2000;37:741-50.
- 4 Viljoen A, Walker SW, Walker KS, et al. Imprecision of cerebrospinal fluid net bilirubin absorbance. *Clin Chem* 2004;50:1266-8.
- 5 O'Connell DM, Watson ID. Precision of computed spectrophotometric scans for heme pigments in subarachnoid haemorrhage makes interpretation reliable. *Clin Chem* 2005;51:793-4.

BOOK REVIEW

Pathology illustrated

Edited by R Reid, F Roberts. Published by Elsevier, 2005, £39.99. ISBN 0-443-07337-6

Many a medical student is reminded early on of the apodictic statement, "As goes your Path, so goes your Medicine." To master the trade, students need a clear, concise understanding of pathology, and *Pathology illustrated* is truly to my liking in this regard. With many undergraduate medical curriculums integrating pathology into the core clinical specialties, there is an ever-increasing need for a book presented in a format that is easy to refer to within the appropriate block, and yet, is sufficiently cleverly designed to serve as a precursor for the pursuit of a career in pathology. Had this book been prescribed in my first two years of medical school training, I would have been drawn to the discipline much sooner. This book aims at enticing students, and it does this well.

Faithful to the general layout and style of all books in the Illustrated series, this volume is a visual presentation of pathology, emphasising "simple yet comprehensive". The book begins with a general overview of pathology, followed by six chapters focusing on the general pathological principles of cell and tissue damage, inflammation, healing, infection, immunity and neoplasia. The last nine chapters cover the classic pathological entities of the major body systems. The subject matter is in the form of concise text, combined with many useful lists and tables. Unlike most books on histopathology which tend to be profusely illustrated with colour photographs, this book purposefully uses cartoon sketches to visually complement and assimilate the text. The cartoons are well illustrated, extremely apt and informative and remind me of my histology professor's similar and effective approach of teaching medical students about microscopic entities through hand-drawn sketches. I recommend the use of two to three colours, as used by my professor, in the sketches for future editions, to provide greater visual stimulation and facilitate a grasp of concepts. In this