A software for automatic calculation of tubular extraction rate

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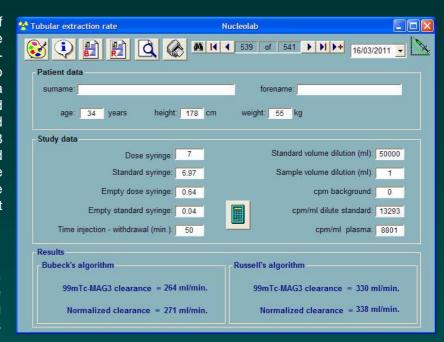
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INTRODUCTION

Although the renal clearance of 99mTc-MAG3 is about 60% of the ¹³¹I-hippurate clearance, ^{99m}Tc-MAG3 clearance may be useful to estimate effective renal plasma flow. Russell's algorithm Bubeck's algorithm are widely used calculation of ^{99m}Tc-MAG3 clearance with a single blood sample. The calculation of the ^{99m}Tc-MAG3 clearance using these algorithms is not very complex, but tedious and time-consuming.

OBJETIVE

The goal of this work is to develop a software to automatically calculate ^{99m}Tc-MAG3 clearance, using Russell's algorithm and Bubeck's algorithm.



MATERIALS AND METHODS

For developing a software incorporating these calculations we have used Visual Basic 6.0 and Visual Studio Installer. The equations used in the calculations are:

Russell's algorithm:

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where: c = fraction of dose per liters plasma (l-1) t = \text{time between injection and withdrawal of sample (min.)} Fmax = 0.04 \ t^2 - 8.2 \ t + 915 \quad (ml/min.) \alpha = 6.5 \cdot 10 - 6 \ t^2 - 8.6 \cdot 10 - 4 \ t + 0.0391 \quad (l^{-1}) Vlag = -0.0015 \ t^2 + 0.01 \ t + 8.79 \quad (l) Bubeck's \ algorithm: TER(MAG3) = A + B \cdot Ln(ID/Cnt) \ (ml \cdot min^{-1} \cdot 1.73 \ m^{-2}) where: A = -517 \ exp(-0.011 \ t) \ (ml.min^{-1} \cdot 1.73 \ m^{-2}) B = 295 \ exp(-0.016 \ t) \ (ml.min^{-1} \cdot 1.73 \ m^{-2}) ID = injected \ dose \ (MBq) t = time \ of \ blood \ sampling \ post-injection \ (min.) Cnt = normalized \ plasma \ concentration \ at \ time \ t \ (\% \ dose \ . \ l^{-1} \cdot 1.73 \ m^{-2})
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MAG3 clearance = Fmax $(1 - \exp(-\alpha (1/c - Vlag)))$ (ml/min.)

RESULTS

We have developed a software for automatic calculation of ^{99m}Tc-MAG3 clearance using Russell's method and Bubeck's method. This software relies on a database to store, manage and retrieve the data of ^{99m}Tc-MAG3 clearance studies. Moreover, the software offers the possibility of print a detailed report of each study. This software is included in a comprehensive software called Nucleolab, which is available at www.radiofarmacia.org/nucleolab-english

CONCLUSION

The software we have developed has an easy-to-use interface, that makes the calculation complexity of ^{99m}Tc-MAG3 clearance studies completely hidden for users, saving the time previously spent on these laborious calculations and reducing the risk of error.