Comparison *of In vivo / In vivo-in vitro* methods of Red blood cells labelled with ^{99m}Tc

J.J. Robles-Barba[1], A García-Mendoza[1], J.L. Gómez-Perales[2], R. Nieto-Serrano[1], R. Tendero-Gómez[1], M.A. Fernández-Mayorga[1], C. Dávila-Arias[1], J.J. Martínez-Sampere[1].
[1]UGC Medicina Nuclear. Hospital Universitario "San Cecilio". Granada.
[2]Servicio de Medicina Nuclear, Hospital Universitario "Puerta del Mar". Cádiz.

Introduction

Autologous red blood cells labelled with ^{99m}Tc (^{99m}Tc-RBCs) is the radiopharmaceutical of choice for evaluation of left ventricular ejection fraction (LVEF). There are three different methods for the preparation of this autologous radiopharmaceutical: *in vitro*, *in vivo* and *in vivo/in vitro*.

The aim of this study is the comparison of labelling efficiency (LE) of ^{99m}Tc-RBCs between *in vivo* and *in vivo – in vitro* methods.

Material and Methods

We have performed 81 evaluations of LVEF, 39 evaluations were performed following *in vivo* method and 42 evaluations were performed following *in vivo/in vitro* method. In every case LE was tested:

***In vivo-in vitro* method**: 0.05-0.10 mL ^{99m}Tc-RBC aliquots were added to 2 mL of NaCl 0.9% solution into sterile vacuum blood collection tubes (BD Vacutainer® SST II Advance). The tubes were centrifugated at 1300 *g* for 3 minutes and supernatant (cell-free plasma) was transferred into plastic test tubes. LE was calculated by measurement, both cell-free plasma and RBCs packed, activities using a dose calibrator (Capintec CRC®-15R).

***In vivo* method**: 4 mL whole-blood was withdrawn from a peripheral vein using a 5 mL heparinnized syringe. It was centrifuged at 1300 *g* for 5 minutes and supernatant (cell-free plasma) was transferred into plastic test tubes.

LE was calculated by measurement, both cell-free plasma and RBCs packed, activities using a well counter (Biodex Medical Mod. 187-246).

LE was expressed as percentage and the mean value and the standard deviation were calculated for each method.

Gammagraphics studies were performed in a double headed variable tangential Philips Axis gammacamera, and processed and tested by 2 different testers.

Results

Average LE of 39 99mTc-RCBs by *in vivo-in vitro* method was 98.45±2.19 % (low LE = 91.57 % and high LE = 100 %), on the other hand, the 42 99mTc-RCBs by *in vivo* method yielded an average LE of 93.26±2.24 %, in a range of 89.36 to 99.38 percent.

Methods	Labelling Efficiency (%)			Standard Deviation
	Low value	High Value	Average value	
In vivo - In vitro	91.59	100	97.45	2.19
In vivo	89.36	99.38	93.26	2.24

In each case, gammagraphics images were tested by two different independent testers, neither of them detected any undesirable uptake because of low quality of ^{99m}Tc-RCBs, or by any *in vivo* unlabelling.

Conclusions

According to our results, the LE using *in vivo* methods was slightly lower than LE by *in vivo-in vitro* method. Perhaps, both of them were into an acceptable range to be used for LVEF studies. Moreover, LVEF studies performed have not shown any significant difference, so both methods are useful to get ^{99m}Tc-RBCs

In fact, we think that the use of ^{99m}Tc-RBCs by *in vivo* method is preferable, because it is a simple system, easy to perform, safe and efficient to assess LVEF getting good results and image quality.