

# THE PD-BIOSENSOR: A NEW, QUICK AND EASY METHOD TO ASSESS THE FUNCTIONS OF THE PERITONEAL MEMBRANE.

Vincenzo La Milia, Giuseppe Pontoriero, Francesco Locatelli

A. Manzoni Hospital, Lecco, Italy

## INTRODUCTION AND AIMS

To evaluate the functions of peritoneal membrane we use the peritoneal equilibration test (PET). The PET is complicated and requires a considerable expenditure of time and resources.

During peritoneal dialysis (PD) glucose is absorbed from dialysate to blood and the others solutes as urea, creatinine, etc, diffuse from blood to dialysate. During a dwell with a high osmolarity PD solution a marked reduction in the dialysate sodium concentration ( $\Delta Na$ ) may occur.

Ionic conductivity (Cd) of an electrolyte solution is defined as a measure of its ability to conduct electricity. Cd is extensively used in hemodialysis to prepare in correct proportions the dialysate, to check the correct electrolyte concentration of the dialysis fluid and also to quantify the dialysis dose.

The PD-Biosensor is based on the Cd.

Since the Cd of a solution is a function of electrolytes concentration and of viscosity, due the glucose concentration, it is possible to evaluate changes in the Cd of the PD solution during a dwell with a 3.86% glucose concentration, during which there is a dilution of the electrolytes and glucose absorption present in PD solution. This difference in Cd are measured by the PD-Biosensor and can be used to evaluate the functions of peritoneal membrane.

## METHODS

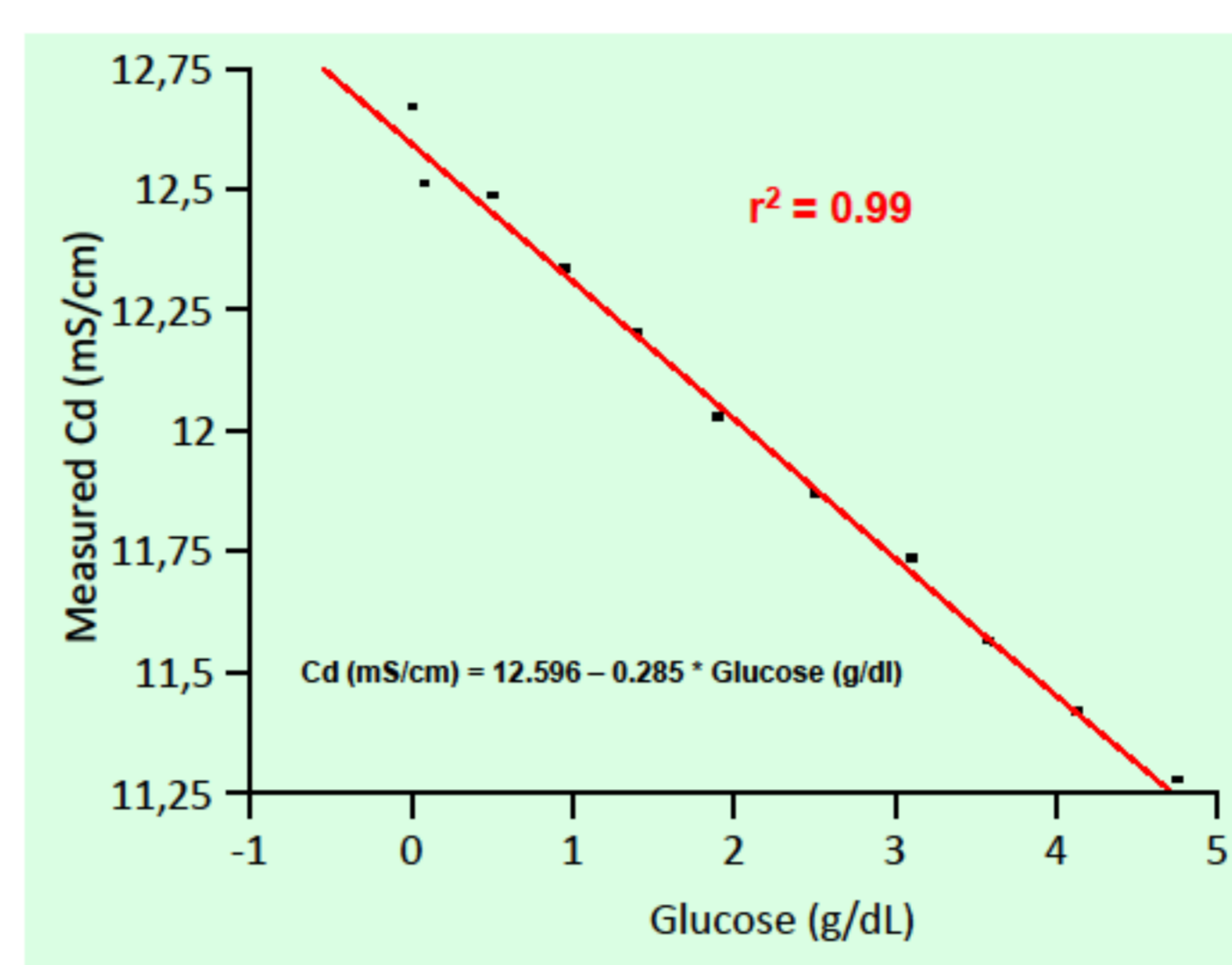
We evaluate the functions of peritoneal membrane during a 3.86%-modified-PET by the PD-Biosensor and the classical PET parameters in 69 PD pts (38 M, 31 F), median age of 62.0 (47.0-71.5) years, median PD vintage of 37.8 (19.7-62.9) months and a median interval between the start of PD and the PET of 28.8 (10.4-53.5) months.

In addition, to evaluate the influence of high concentrations of glucose on Cd, in vitro, we added glucose powder in the fluid for PD. All Cd measurements were made by the PD-Biosensor, a prototype, with a conductivity meter 90XL Meter TM (Mesa Laboratories, Inc., Lakewood, Colorado, USA). The PD-Biosensor can be used either directly connected to the drain line of the patient (Figure) that in the laboratory.

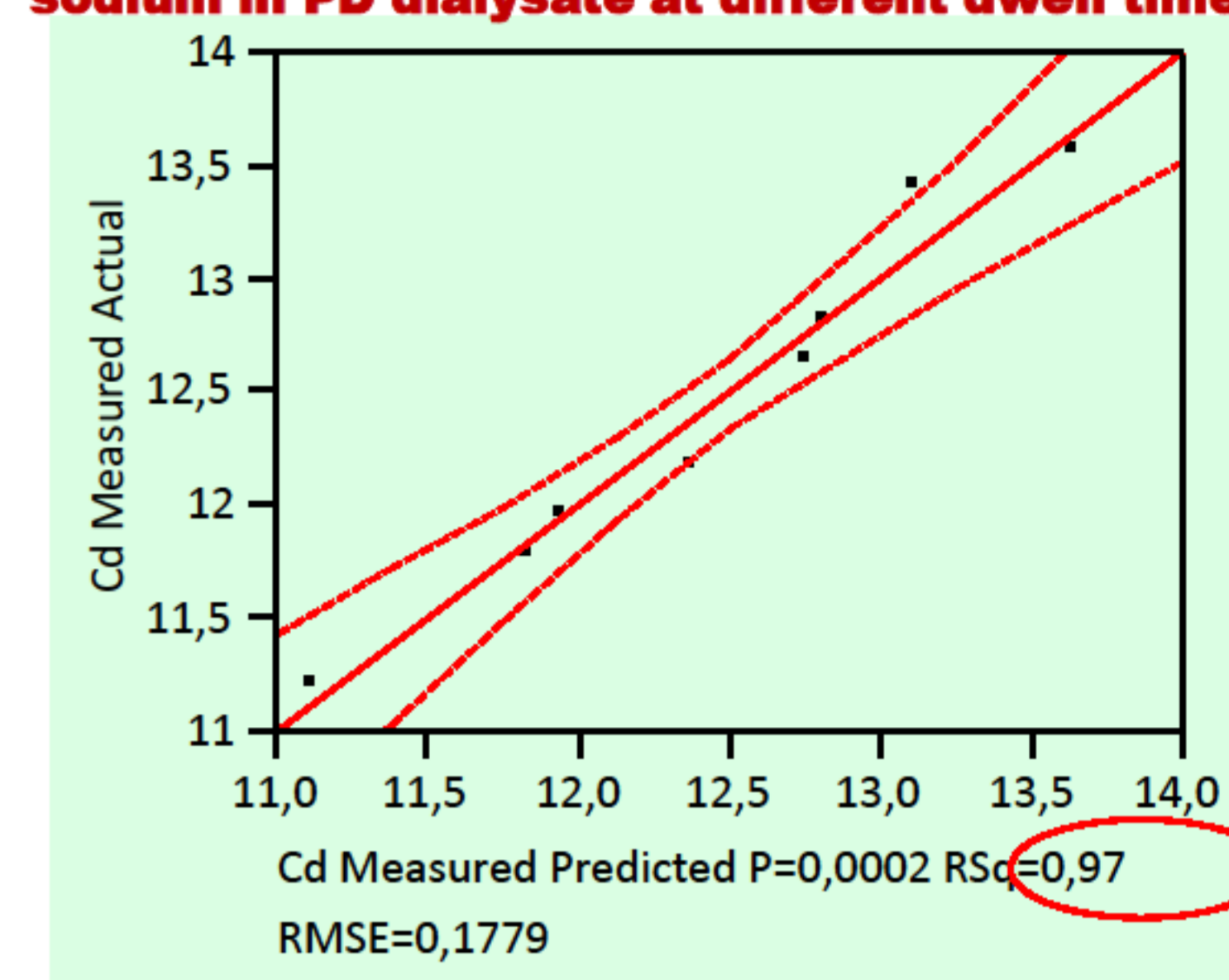


## RESULTS

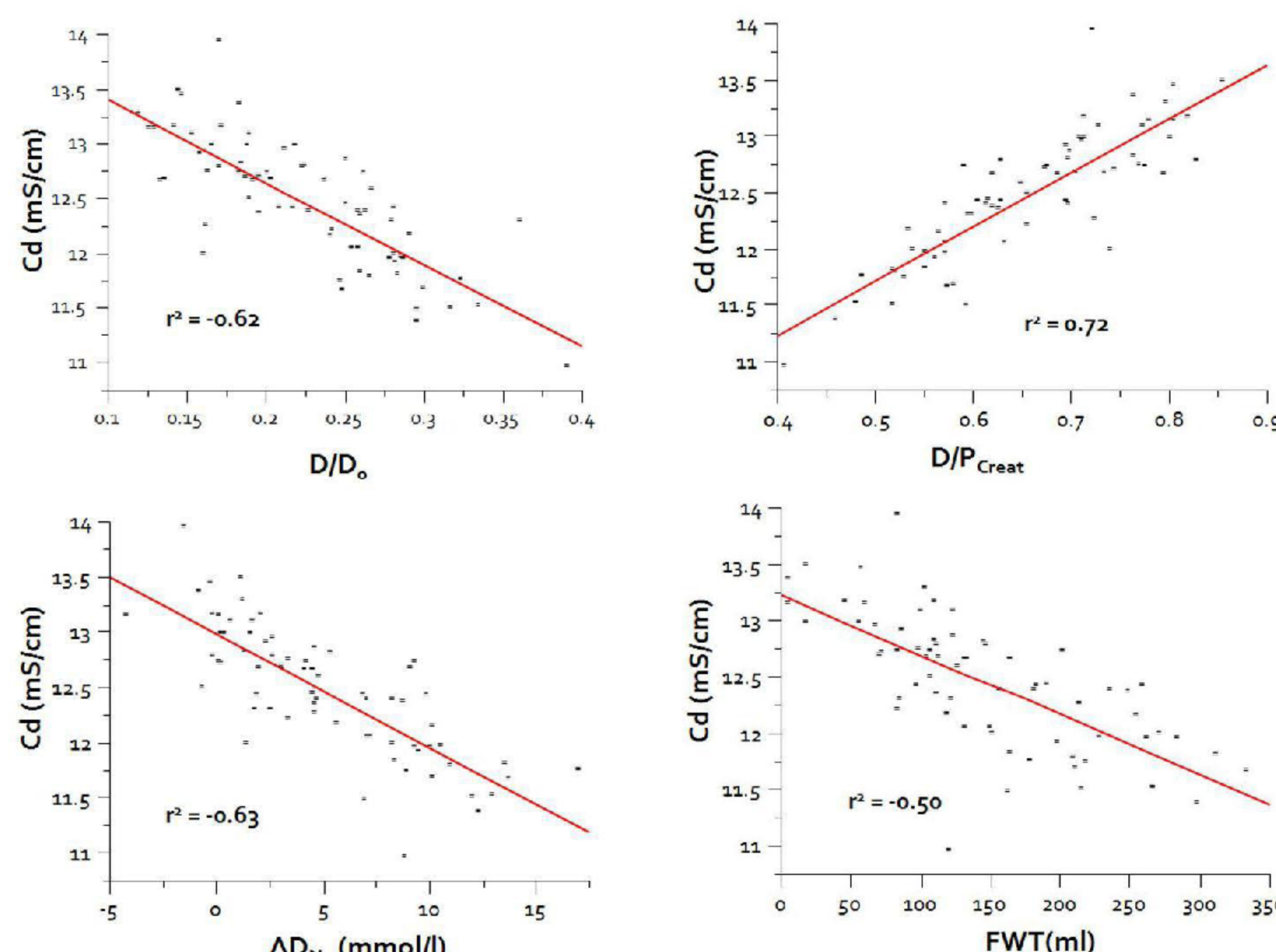
Conductivity measured in the C compartment of Gambro Trio bag adding progressively glucose (powder)



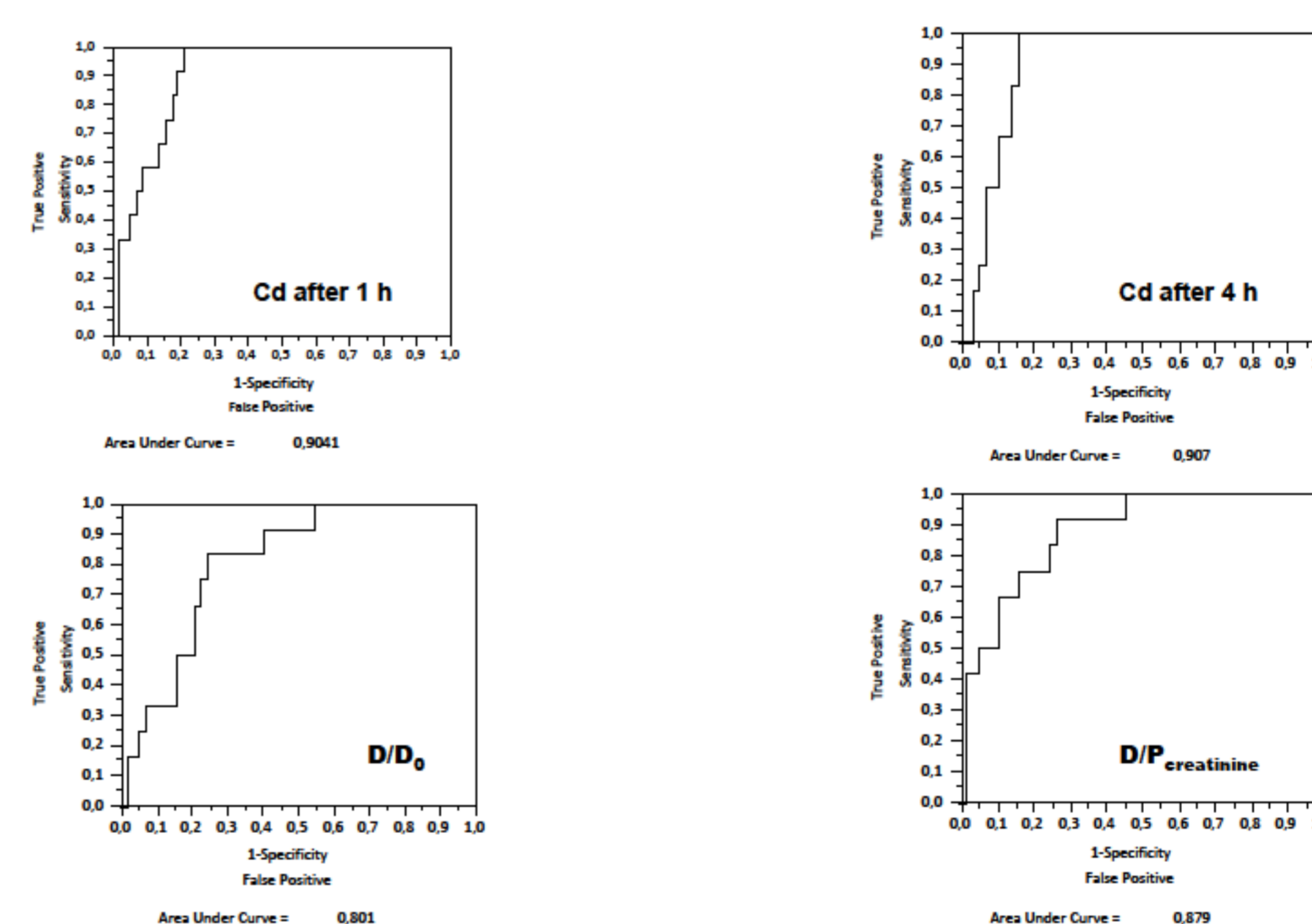
Relationship between conductivity and glucose and sodium in PD dialysate at different dwell times



Relationship between Conductivity of peritoneal dialysate and the classical PET parameters  $D/D_0$  and  $D/P_{creat}$ ,  $\Delta Na$  and FWT after 4 hours of dwell with 3.86% glucose concentration



ROC Curve of Ultrafiltration Failure (UFF) for Conductivity (Cd) and the classical parameters of the PET  $D/D_0$  and  $D/P_{creatinine}$



## CONCLUSIONS

The changes of Cd, measured by PD-Biosensor, during a PET, are expression of changes in the peritoneal transport of glucose, small solutes (Cr) and Na: all these parameters can be measured together and with a single numeric parameter. The changes of Cd, measured by PD-Biosensor, are predictive of UFF. The PD-Biosensor is a new, inexpensive and easy method to evaluate the functions of peritoneal membrane in real time without laboratory assay, calculation and interpretation of data. The PD-Biosensor can be used to evaluate the functions of peritoneal membrane more frequently, also at home, and may open new perspectives in PD.

