The peritoneal equilibration test (PET) – Comment on the 8th GPDP-SIN 2022 Census data

Census

Vincenzo La Milia

Nefrologia e Dialisi, Ospedale A. Manzoni, Lecco

Corresponding author:
Vincenzo La Milia
Ospedale Alessandro Manzoni,
Via Dell'Eremo 9/11, 23900 Lecco
E-mail: v.lamilia@asst-lecco.it

The data relating to 2022 confirm the trend which began in 2010 of a gradual, continuous increase in the use of 3.86% glucose solution for the performance of PET, and a parallel, mirrored reduction in the use of 2.27% glucose solution: in 2010, 70.5% of Dialysis Centers were using the 2.27% solution, and only 15.6% the 3.86% solution, whereas in 2022 only 20% of the Dialysis Centers used the 2.27% solution for the performance of PET, while 57.8% used the 3.86% solution.

Let's examine the reasons for this change.

As long ago as 2000 [1], the International Society of Peritoneal Dialysis (ISPD) was suggesting the use of 3.86%-PET instead of 2.27%-PET, as the former provided the same information on small solute transport and the classification of patients into groups of transporters on the basis of creatinine D/P, and more information on the ultrafiltration (UF) capacity of the peritoneal membrane. In addition, it highlighted so-called sodium sieving, an indicator of peritoneal free water transport (FWT) through aquaporin-1 (AQP-1) channels, an aspect which would subsequently take on considerable importance. So, a 3.86%-PET with assessment of the concentration of sodium in the dialysate 60 minutes after the start of PET provides greater information on the functionality of the peritoneal membrane.

Studies into sodium sieving then led to the quantification of FWT [2], the predictive value of sodium sieving in relation to encapsulating peritoneal sclerosis (EPS) [3], and the identification of AQP-1 genotypes and their correlation with peritoneal dialysis outcomes [4]. The reference values of characteristics of peritoneal transport relating to creatinine D/P, UF capacity and sodium sieving have been defined thanks in part to a SIN Peritoneal Dialysis GdP study on a large population of PD incident patients [5], underlining the interindividual variability of these peritoneal transport characteristics already at the start of peritoneal dialysis treatment; part of this variability was recently explained with the identification of at least 4 genetic loci associated with peritoneal transport which are responsible for approximately 20% of the interindividual variability in peritoneal transport at the start of PD [6].

Unfortunately, although they highlight the undoubted advantages of 3.86%-PET compared to 2.27%-PET, recent ISPD guidelines [7] do not clearly recommend greater use of 3.86%-PET. The main reason for this is that the guidelines are global recommendations, and though the indication for the use of 3.86%-PET for the functional assessment of the peritoneal membrane remains strong in most countries in the world, there are some – in particular low-income – countries where the 3.86% glucose solution is not available.

The 2022 Census provides us with further interesting information:

1. More than 10% (11.6%) of Centers do not perform any kind of peritoneal membrane functionality assessment test; they are the Centers with a lower incidence and prevalence of patients on PD. Along with other data, this certainly reflects the difficulty for small Centres to provide high quality PD. It is therefore necessary to give these Centers tools to improve their clinical practice by providing specific training courses and/or the support of larger Centers in performing and interpreting 3.86%-PET through a HUB-Spoke organization.
2. Although the number is constantly coming down, 20% of Centers are continuing to use 2.27%-PET; these are also Centers with a low incidence and prevalence of patients on PD. It would help to understand the reasons for this (conviction? routine? difficulty in introducing change and innovation?). In this case too, the support of more expert Centers with a greater number of patients on PD could be useful.
3. The Centers using 3.86%-PET are those with a higher incidence and prevalence of patients on PD. This certainly reflects their greater expertise, which probably extends to all aspects of managing patients on PD. These Centers could be involved in both providing support to smaller Centers and in an ongoing updating and improvement process which – as regards the assessment of peritoneal membrane transport, for example – could lead to the use of ionic conductivity [8] as a screening test for functional assessment of the peritoneal membrane.
4. The Centers using 3.86%-PET are those with a lower percentage of drop-out from the method due to insufficient dialysis adequacy and/or a loss of peritoneal membrane UF capacity. While this certainly reflects their greater expertise, as mentioned above, it could also indicate that the use of 3.86%-PET helps these Centers implement corrective measures (for example, the use of APD in patients who are rapid transporters, the use of icodextrin in patients with a reduction/loss of sodium sieving, etc) which prevent or delay drop-out to haemodialysis.
5. Finally, over 10% (10.7%) of the Centers use other tests (Mini-PET, Double Mini-PET or unspecified tests); it would be interesting to understand whether these Centers use these highly specialized tests in addition to and integration of the 3.86%-PET or on their own (losing, in this case, some important information provided by the 3.86%-PET).

In conclusion, the 2022 Census data confirm that there is a gradual, constant increase in the use of the 3.86%-PET, which is a more complete functional assessment test than 2.27%-PET, especially when associated with assessment of sodium sieving at 60 minutes. The use of 3.86%-PET should be further encouraged, as the PET is costly and time-consuming (nurses and doctors), so with the same resources it would therefore be preferable to use the test which provides us with more information. In any case, smaller Centers need to be given support by the Peritoneal Dialysis GdP in the best use of PD, including the use of 3.86%-PET.

BIBLIOGRAFIA

1. Kawaguchi Y, Kawanishi H, Mujais S, Topley N, Oreopoulos DG. Encapsulating peritoneal sclerosis: definition, etiology, diagnosis, and treatment. International Society for Peritoneal Dialysis Ad Hoc Committee on Ultrafiltration Management in Peritoneal Dialysis. Perit Dial Int. 2000;20 Suppl 4:S43-55. https://pubmed.ncbi.nlm.nih.gov/11098928/.
2. La Milia V, Di Filippo S, Crepaldi M, Del Vecchio L, Dell'Oro C, Andrulli S, Locatelli F. Mini-peritoneal equilibration test: A simple and fast method to assess free water and small solute transport across the peritoneal membrane. Kidney Int. 2005 Aug;68(2):840-6. https://doi.org/10.1111/j.1523-1755.2005.00465.x.
3. Morelle J, Sow A, Hautem N, Bouzin C, Crott R, Devuyst O, Goffin E. Interstitial Fibrosis Restricts Osmotic Water Transport in Encapsulating Peritoneal Sclerosis. J Am Soc Nephrol. 2015 Oct;26(10):2521-33. https://doi.org/10.1681/ASN.2014090939.
4. Morelle J, Marechal C, Yu Z, Debaix H, Corre T, et al. *AQP1*Promoter Variant, Water Transport, and Outcomes in Peritoneal Dialysis. N Engl J Med. 2021 Oct 21;385(17):1570-1580. https://doi.org/10.1056/NEJMoa2034279.
5. La Milia V, Cabiddu G, Virga G, Vizzardi V, Giuliani A, Finato V, Feriani M, Filippini A, Neri L, Lisi L; Ultrafiltration Failure Assessment (UFFA) Study* of the Italian Society of Nephrology Peritoneal Dialysis Study Group. Peritoneal Equilibration Test Reference Values Using a 3.86% Glucose Solution During the First Year of Peritoneal Dialysis: Results of a Multicenter Study of a Large Patient Population. Perit Dial Int. 2017 Nov-Dec;37(6):633-638. https://doi.org/10.3747/pdi.2017.00004.
6. Mehrotra R, Stanaway IB, Jarvik GP, Lambie M, Morelle J, Perl J, Himmelfarb J, Heimburger O, Johnson DW, Imam TH, Robinson B, Stenvinkel P, Devuyst O, Davies SJ; Bio-PD Consortium. A genome-wide association study suggests correlations of common genetic variants with peritoneal solute transfer rates in patients with kidney failure receiving peritoneal dialysis. Kidney Int. 2021 Nov;100(5):1101-1111. https://doi.org/10.1016/j.kint.2021.05.037.
7. Morelle J, Stachowska-Pietka J, Öberg C, Gadola L, La Milia V, Yu Z, Lambie M, Mehrotra R, de Arteaga J, Davies S. ISPD recommendations for the evaluation of peritoneal membrane dysfunction in adults: Classification, measurement, interpretation and rationale for intervention. Perit Dial Int. 2021 Jul;41(4):352-372. https://doi.org/10.1177/0896860820982218.
8. La Milia V, Pontoriero G, Virga G, Locatelli F. Ionic conductivity of peritoneal dialysate: a new, easy and fast method of assessing peritoneal membrane function in patients undergoing peritoneal dialysis. Nephrol Dial Transplant. 2015 Oct;30(10):1741-6. https://doi.org/10.1093/ndt/gfv275.