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Theme : Peritoneal Transport and Ultrafiltration

The effects of an experimental peritoneal dialysis solution on the peritoneum in an uremic rat model

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Background: Long-term peritoneal dialysis (PD) with conventional glucose-based, lactate buffered (L) PD fluids (PDF) may lead to morphological and functional alterations of the peritoneal membrane. The use of a different buffer and a mixture of osmotic agents may be effective while causing less peritoneal complications. Aim: To investigate the potential of a bicarbonate/lactate buffered (B/L) PDF with a mixture of osmotic agents, glycerol 1.4%/amino acids 0.5%/dextrose 1% (GLAD), pH 7.4, 512 mosmol/L and low amount of glucose degradation products (GDPs) in an uremic rat model. Methods: All rats received a peritoneal catheter implantation and a 70% nephrectomy (Nx). Thereafter the rats were randomly divided into four groups: GLAD (n=6): experimental group; PG (Physioneal, n=5): 3.86 % glucose, B/L, low GDPs, pH 7.4, 486 mosmol/L; D (Dianeal; positive control n=7): 3.86% glucose, L, high GDPs, pH 5.2, 486 mosmol/L; PF (negative control n=5): glucose-free, B/L, no GDPs, pH 7.4 and 266 mosmol/L. All rats were infused daily for 16 weeks post Nx with the appropriate PDF prior to a peritoneal permeability analysis, morphometric determination and sacrifice. Results: The remnant kidney weight and renal creatinine clearance were similar in all groups therefore the groups were comparable. In contrast with expectation the small solute transport was higher and fluid kinetics were lower in GLAD when compared to the other groups. However vessel density and fibrosis were similar to PF [Fig. 1]. These functional results may be due to vasodilatation. This remains to be investigated. Conclusion: Peritoneal transport characteristics were not superior after long-term exposure to GLAD when compared to Dianeal. However GLAD better preserved the peritoneal morphology.

Figure:

Fig. 1

parameter	GLAD	PG	D	PF
MTACcreat (mL/min)	0.17±0.04**	0.10±0.00*	0.11±0.15*	0.11±0.02
Gluc abs (%)	74.2±3.7**	71.8±6.9	72.1±2.1**	65.2±4.9
TCUFR (mL/min)	0.08±0.01	0.12±0.03*	0.08±0.01	0.09±0.00
NUFR (mL/min)	0.04±0.01	0.05±0.02	0.04±0.01	0.05±0.01
FWT 60' (% of total ultrafiltration)	27.1±9.6	32.4±1.4	27.4±5.0**	36.2±5.3
Total fibrosis+	5.25±0.65	5.90±1.8	7.36±1.8**	4.50±0.87
Number of vessels/field++	15.0±8.2	21.9±13.0	25.1±15.4**	15.8±7.7

*p<0.04 vs GLAD, **p<0.04 vs PF, +PSR, ++CD31 staining of the omentum
(FWT 60': Free Water Transport at 60 min)