MO693  EXERCISE TOLERANCE AND NUTRITIONAL STATUS PREDICTS ALL-CAUSE MORTALITY IN OLDER ADULTS ON PERITONEAL DIALYSIS: A SINGLE-CENTER PROSPECTIVE OBSERVATIONAL COHORT STUDY

Hiroki Yabe1, Yuto Imoto2, Sayaka Ito2, Ayaka Onoyama2, Keiko Okada3, Hirotake Kasuga3

1School of Rehabilitation Sciences, Seirei Christopher University, Department of Physical Therapy, Hamamatsu, Japan, 2Nagoya Kyoritsu Hospital, Department of Rehabilitation and 3Nagoya Kyoritsu Hospital, Department of Nephrology, Japan

BACKGROUND AND AIMS: Peritoneal dialysis (PD) is beneficial for older adults with end-stage renal disease (ESRD) because it allows for dialysis treatment in their own homes. The risk factors associated with specific prognoses in elderly PD patients need to be explored to continue stably without adverse events. However, the risk of adverse events specific to older adults on PD has not been thoroughly investigated. The critical risk factor for ESRD and aging is decreased physical function. The purpose of this study was to assess the association between physical function and outcomes in older adults on PD.

METHODS: This was a single-center, prospective observational cohort study. Stable, ambulatory patients undergoing PD between April 1, 2014, and September 31, 2016, were enrolled. Six-minute walk distance (6MWD), short physical performance battery (SPPB), lower extremity muscle strength (LES), and 10-meter walk speed were measured for each patient. Laboratory data were also collected. All subjects were followed up until death or the end of the follow-up period (December 31, 2019). This ethical institution at the Seirei Christopher University approved all procedures performed in this study. Informed consent was obtained from all the patients.

Baseline patient characteristics and physical function were compared using an unpaired t-test or Mann-Whitney U test. Receiver operating characteristic curve analysis on mortality prediction was performed to calculate the area under the curve in the significant value of the unpaired t-test or Mann-Whitney U test. We used the Youden index to determine the optimal cut-off point, and patients were categorized into 2 groups by each cut-off value. The relationship between all-cause mortality and exercise tolerance and nutritional status was assessed.

Conclusions: Low exercise tolerance and malnutrition may represent an important therapeutic target in this population.

MO694  SWELLING OF PERITONEAL TISSUE DURING PERITONEAL DIALYSIS: COMPUTATIONAL ASSESSMENT USING POROELASTIC THEORY

Jacek Waniewski1, Joanna Stachowska-Pietka2, Roman Cherniha2, Bengt Lindholm3

1Institute of Biocybernetics and Biomedical Engineering, Warsaw, Poland, *Instytut Matematyki Nauk Ukraïny, Kyiv, Ukraine and 3Karolinska Institute, Sweden

BACKGROUND AND AIMS: Experimental studies and computational modeling show increased hydration of peritoneal tissue close to peritoneal surface after intraperitoneal (ip) administration of hypertonic dialysis fluid. This overhydration - due to fluid inflow from peritoneal cavity (driven by increased intraperitoneal pressure) and from blood (due to high interstitial concentration of osmotic agent diffusing from the cavity) - may lead to tissue swelling, as observed in experiments and in disturbed physiological conditions. We estimated the degree of swelling using linear poroelastic theory with fluid and solute transport parameters obtained from clinical studies.

METHOD: The spatially distributed model of peritoneal transport was extended by equations for tissue deformation and stress derived from linear poroelastic theory. The model describes also fluid and osmotic agent flows across tissue and capillary wall. We assumed that transport and deformation occur across a layer of tissue with initial intact width L0 and deformed width L; the deformation is described as the ratio L/L0. Transport parameters are assumed as average values estimated for intact tissue by Stachowska-Pietka (2019). As tissue stiffness (Lame coefficient) for muscle is not known, we examined stiffness ranging from 110 mmHg (connective tissue; interstitium) to 700 mmHg (solid tumor). We assumed that for initial periods of peritoneal dialysis when osmotic pressure of dialysis fluid is high: 1) osmotic pressure gradient across the capillary wall prevails over the combined Starling forces, 2) spatial
The profile of osmotic agent concentration in tissue (interstitial fluid) can be approximated by an exponential function with the penetration depth $L_0$. The model yields an equation for $L/L_0$ to be solved numerically, but an approximated closed formula works well for typical dialysis conditions.

**RESULTS:** The model predicts that swelling of peritoneal tissue depends on factors such as tissue stiffness, tissue width, solute penetration depth, and transport parameters for tissue and capillary wall, and on the forces that induce fluid transport: intraperitoneal pressure and the increment of osmolality of dialysis fluid over plasma osmolality. Examples of $L/L_0$ yielded by the model - with use of glucose 1.36% dialysis fluid and for two levels of ip hydrostatic pressure (Pip) - are shown. In Figure, left panel, for $L_0 = 1$ cm representing human abdominal muscle, and solute diffusional penetration $AS=AD=0.055$ cm, or lower, as due to diffusion against fluid flow, $AS/AD=2=0.027$ cm, is plotted versus the tissue stiffness; the dialysis fluid with glucose 1.36% is applied (osmolality increment of 60 mmol/L, at the beginning of peritoneal dwell, Waniewski et al, 1996) and Pip is 15 mmHg. As stiffness of abdominal and bowel muscles may be expected around 300 mm Hg, swelling might be up to 15%; it decreases with lower ip hydrostatic and osmotic pressures. Hypothetical dialysis at Pip = 0 (isobaric with interstitial fluid) would reduce swelling by factor 2, see Figure, right panel. The depth of osmotic agent penetration into the tissue impacts tissue hydration and swelling, see Figure 1 for $L/L_0$ with twice reduced AS. The model and its approximation by the closed formula provide practically the same outcomes for clinical peritoneal dialysis, see Figure 1, but some discrepancy between them may occur for thin tissue, as rat abdominal wall. The approximate formula for $L/L_0$ works well if $AS$ is much shorter than $L_0$. Nevertheless, for high degree of swelling a nonlinear theory should be constructed.

**CONCLUSION:** In peritoneal dialysis, exposure of peritoneal tissue to hypertonic dialysis fluid at increased hydrostatic pressure contributes to overhydration and swelling (by 5-15% after fluid infusion) of the tissue. The extent by which this swelling may contribute to changes in peritoneal tissue structure and function warrants further studies.