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Letter to the Editor

LETTER TO THE EDITOR

Neutrophil gelatinase-associated lipocalin dipstick test in peritoneal dialysis patients with peritonitis

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Neutrophil gelatinase-associated lipocalin (NGAL) is a ubiquitous lipocalin that plays a role in the defence of the organism against pathogens [1, 2]. NGAL is significantly elevated in the plasma and dialytic effluent (PDE) of peritoneal dialysis (PD) patients with peritonitis [3, 4], and the quantitative peritoneal laboratory-based NGAL test has already been demonstrated to be a useful tool for the early and accurate diagnosis of peritonitis [3, 5, 6]. In the Vicenza PD centre, since 2011, peritoneal NGAL is used as a marker of peritonitis, in addition to the traditional criteria suggested by the International Society of Peritoneal Dialysis [4, 7].

In our centre, the quantitative determination of peritoneal NGAL is performed by the particle-enhanced turbidimetric immunoassay (BioPorto test). Recently, a point-of-care test for the rapid NGAL (NGALds) assay was developed using semi-quantitative colorimetric test strips (Figure 1a). Many studies proved that NGALds performs similarly to the quantitative test in urine samples [8, 9].

In this small case–control study, we compare the NGALds with the laboratory-based NGAL test currently available in our clinical practice and with other laboratory markers of peritonitis. Secondary, we evaluated the assessment of the NGALds as a diagnostic tool to help physicians with the identification of peritonitis.

In particular, we enrolled 30 PD patients: 17 with peritonitis and 13 without peritonitis. We excluded patients with relapsing and recurrent peritonitis. For the control group, we excluded patients with previous peritonitis or any history of systemic inflammation 30 days before enrollment. Table 1 reported characteristics for case and control groups.

Peritoneal NGAL was evaluated in all patients using the two different methods (mentioned previously). For the reproducibility of data, the NGALds was measured by two different trained lab operators on all patients, in a blinded manner.

According to the previous findings in urine samples [8, 9], our analysis showed that even in the peritoneal effluent, the diagnostic performance is the same between NGALds and laboratory-based NGAL (Spearman's rho = 0.88, $P < 0.01$). Furthermore, we observed a strong positive correlations between peritoneal NGALds and white cell count in PDE (Spearman's rho = 0.82, $P < 0.01$). These findings confirm that NGAL is a key player in innate immunity and that it is rapidly detectable in PDE in the case of peritonitis, even if measured with a semi-quantitative colour-categorized test.

Furthermore, peritoneal NGALds levels were significantly higher in PD patients with peritonitis compared with PD patients without peritonitis, reflecting the different immunological profiles of the two groups (Figure 1b). The peritoneal laboratory-based NGAL results matched with the peritoneal NGALds categories. These similar results corroborated that both these two NGAL tests can be used in combination with white cell count in PDE, as an additional marker of peritonitis [4].

In our study, two trained laboratory technicians performed the novel test under blinded conditions, and we demonstrated a high agreement between the two operators ($k = 0.786$, $P < 0.01$). This finding supports that NGALds is reproducible and easy to perform. As reported by Bjornstad *et al.*, we confirm that NGALds can be performed easily including in low-resource settings [8]. In addition, other studies suggested that NGALds could be conducted at the bedside of

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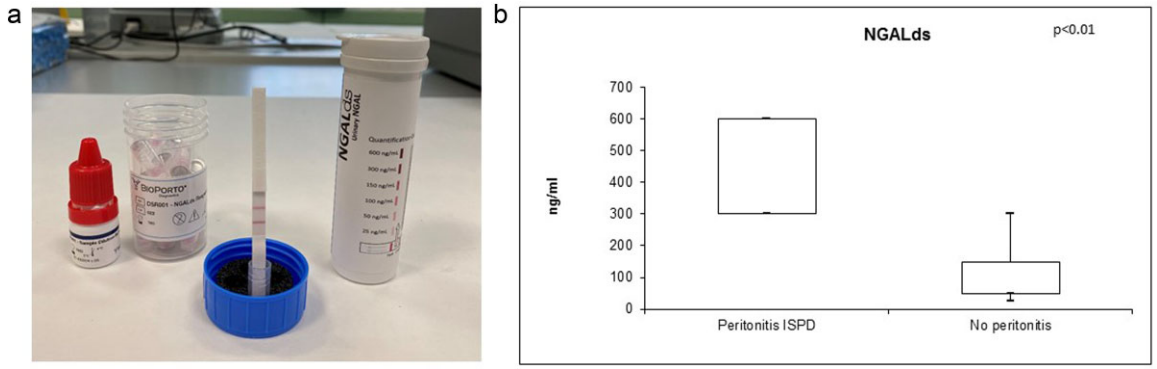

FIGURE 1: (a) NGALds test kit and quantification guide. Color-categorized NGAL values were 25 ng/mL, 50 ng/mL, 100 ng/mL, 150 ng/mL, 300 ng/mL and 600 ng/mL. **(b)** Peritoneal NGALds values in patients with and without peritonitis.

Table 1. Baseline characteristics of patients with (case group) and without (control group) peritonitis

Baseline characteristics	Case group ($N = 17$)	Control group ($N = 13$)	P-value
Age (year), median (IQR)	73 (55–80)	56 (55–72)	0.34[a]
Dialysis vintage, mean ± SD	49 (17–49)	17 (11–49)	0.14[a]
Gender, men and number (%)	13 (73)	7 (53)	0.2[b]
BMI, mean ± SD	23.6 ± 4.8	26.9 ± 6.2	0.13[c]
Hemoglobin (g/L), mean ± SD	109 ± 24.8	113 ± 14.8	0.69[c]
Total weekly (Kt/Vurea), median (IQR)	1.8 (1.6–1.9)	1.7 (1.6–1.9)	0.81[a]
Total wCCr, median (IQR)	53.5 (45.5–70.6)	55 (45.7–66.8)	0.91[a]

Values represent numbers (N), percentages (%), means ± SD (SD, standard deviation) or medians (IQR, interquartile range); BMI, body mass index; wCCr, weekly creatinine clearance.
[a]Mann–Whitney U-test.
[b]Chi-squared test.
[c]T- test.

the patient by trained study nurses, providing a real-time result.

In conclusion, peritoneal NGALds resulted consistent with the peritoneal laboratory-based NGAL and other laboratory markers of peritonitis, in particular white cell count in PDE. Furthermore, it is a user-friendly test that provides timely results. NGALds could be an additional innovative marker of peritonitis that is useful in particular at the bedside of the patient or if the laboratory-based NGAL assay is not available.

CONFLICT OF INTEREST STATEMENT

NGALds kits were donated by BioPorto Diagnostics. BioPorto Diagnostics did not participate in the protocol development, analysis, or interpretation of the results.

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