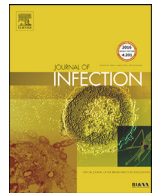




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Letter to the Editor

SARS-CoV-2 IGM and IGG rapid serologic test for the diagnosis of COVID-19 in the emergency department

Dear Editor,

We read with interest the article by Pan et al.¹ on the performance of a serological immunochromatographic assay for SARS-CoV-2 diagnosis. As discussed by the authors, there is an urgent need for rapid tests for SARS-CoV-2 in the supplement to the current diagnosis. The gold standard is the molecular testing of upper or lower respiratory tract samples by reverse transcription polymerase chain reaction (RT-PCR),² which suffers from several limitations³: long turnaround times and up to 30% of false negatives, due to technical errors and time sampling.^{4,5} The serologic assays to detect antibodies against SARS-CoV-2 are of great interest⁶ as high levels of IgM and IgG can be detected from the second week of symptom's onset, although IgM can be positive from the fourth day and IgG after 8 days.^{3,6} In the French emergency departments (ED) there was a rising number of suspected cases of COVID-19 from mid-march and a huge effort was made in order to isolate these suspected patients to avoid hospital SARS-CoV spread and transmission. Molecular tests and classic serology immunoassays have a relatively long turnaround times, which are not suitable for EDs to take fast disposition decisions. The recent development of rapid antibody detection tests for Sars-CoV2 (lateral flow immunoassay, LFI) can be very useful in this context.

The present study collected prospective data of 164 patients admitted in April 2020 to the ED of two academic hospitals in Paris, France, if: 1) COVID-19 was suspected on presenting symptoms and 2) a nasopharyngeal swab was prescribed for SARS-CoV-2 RT-PCR. Waived informed consent was obtained because of the routine care design. The LFI used for evaluation was SGTi-flex COVID-19 IgM/IgG (Sugentech, republic of Korea) which is a nanoparticle-based immunochromatographic test kit for qualitative determination of COVID-19's IgM and IgG antibodies in human whole blood (finger prick or venous), serum or plasma. The results can be observed within 10 min after applying the sample and 3 drops of diluent. At the same time of first ED blood collection, a sample was also drawn in parallel for SARS-CoV-2 IgG detection with a chemiluminescent microparticle immunoassay (CMIA) in serum (Abbott Architect).

Seven patients were excluded because the result of either RT-PCR or LFI missed. The 157 remaining patients were divided in two groups according to the SARS-CoV-2 RT-PCR test results: positive or negative.

Table 1 shows the demographic characteristics, symptoms, laboratory and imaging test results in the ED. There were 20 (13%) patients tested positive for SARS-CoV-2 RT-PCR, of which 15 (75%)

were positive for the LFI (2 for IgM, 3 for IgG and 10 for IgM + IgG) and 5 (25%) tested negative (Table 2). Among the 13 patients for whom the LFI showed an IgG band, 12 had IgG detected by CMIA. Three of the RT-PCR $\pm$ /LFI- patients had their first symptoms in the 7 days and the 2 last before 14 days. These 5 false negative LFI were explained by either too early tests, a low antibody level below the detection limit of this LFI, or the immune response variability in individual antibodies production.³

Among the 137 patients who tested negative for RT-PCR, there were 27 (20%) with a positive LFI, of whom 16 (59%) exhibited an IgM band, 4 (15%) an IgG band and 7 (26%) both bands. Among the 42 positive LFI, 18 (42.8%) were positive for IgM with symptoms onset varying from 0 to 21 days; 7 (16.7%) were positive for IgG, all with symptom's onset within the first 7 days; and 17 (40.5%) were positive for both, with symptoms onset varying from 0 to 30 days (9 had first symptoms in 7 days and 4 between 7 and 14 days).

Concordance between LFI and CMIA IgG calculated on 155 samples with conclusive results was 94.8% Globally, in these 157 suspected COVID-19 cases attending the ED, LFI had (Table 2) a sensitivity of 75% [95% CI 69.5–80.5], specificity 80.3% [95% CI 75.2–85.4], positive predictive value 35.7% [95% CI 29.6–41.8] and negative predictive value 95.7% [95% CI 93.1–98.3], compared to RT-PCR as the gold standard.

Cassaniti et al.⁷ compared a rapid IgM/IgG test with RT-PCR in the ED and reported that 8.3% exhibited a positive result for IgM/IgG LFI while RT-PCR was negative. Other studies found similar rates of 11%,⁸ which are slightly lower than our results but still suggesting an added value of LFI to identify some COVID-19 positive patients with negative RT-PCR.

There are few peer-reviewed publications that have reported the accuracy of COVID-19 diagnostic results obtained by LFI with respect to RT-PCR tests.^{3,7–10} Sensibility and specificity varied from a study to another: Li et al. found 88.66% and 90.63%, respectively while Shen et al. found 71.1% and 96.2%.^{3,10} In our study the sensitivity and specificity are slightly lower than what was described by previous studies and that's the reason why we recommend to use LFI together with RT-PCR in order to have the lowest false negative's number of patients.

In conclusion, although LFIs cannot confirm the virus presence and replace RT-PCR, they may be sensitive and specific enough to be used as a complementary assay to the existing RT-PCR in the ED. It has the advantage, in comparison with RT-PCR, of saving time without necessitating any extensive equipment; it is simple to use and requiring minimal training.

From our point of view, LFIs should be used in the ED as a complementary assay to the existing SARS-Cov-2 RT-PCR, to better and quicker qualify COVID-19 patients.

Table 1
Emergency Department's patient's characteristics according to group (RT-PCR positive or negative).

Characteristics	Total (n = 157)	RT-PCR negative (n = 137)	RT-PCR positive (n = 20)
Sex			
Male	83 (52.9%)	74 (46%)	9 (45%)
Female	74 (47.1%)	63 (54%)	11 (55%)
Median	70	71	62.00
Age (years)	(54–80)	(54–81)	(52.5–75.8)
Symptoms onset			
0–7 days	115 (73.3%)	101 (73.7%)	14 (70%)
8–14 days	16 (10.2%)	12 (8.8%)	4 (20%)
15–21 days	14 (8.9%)	12 (8.8%)	2 (10%)
> 21 days	12 (7.6%)	12 (8.8%)	0 (0%)
Symptoms			
Fever	39 (24.8%)	32 (23.4%)	7 (35%)
Cough	57 (36.3%)	45 (32.8%)	12 (60%)
Myalgia	17 (10.8%)	12 (8.8%)	5 (25%)
Dyspnea	68 (43.3%)	57 (41.6%)	11 (55%)
Chest pain	39 (24.8%)	34 (24.8%)	5 (25%)
Diarrhea	22 (14%)	20 (14.6%)	2 (10%)
Vomiting	25 (15.9%)	23 (16.8%)	2 (10%)
Ageusia	6 (3.8%)	5 (3.6%)	1 (5%)
Anosmia	5 (3.2%)	3 (2.2%)	2 (10%)
Asthenia	40 (25.5%)	36 (26.3%)	4 (20%)
Falling	11 (7%)	11 (8%)	0 (0%)
Headache	21 (13.4%)	16 (11.7%)	5 (25%)
Chest CT scan	106 (67.51%)	90 (65.7%)	16 (80%)
Chest CT scan evocative COVID-19	n = 106	n = 90	n = 16
	26 (24.5%)	15 (16.7%)	11 (68.8%)
Median Leucocytes (Giga/L)	8.33	8.33	8.46
	(6.44–10.85)	(6.46–11.15)	(5.35–9.59)
Lymphocytes (Giga/L)	1.31	1.27	1.79
	(0.88–1.78)	(0.83–1.59)	(1.27–2.21)
Protein-C-reactive (mg/L)	16	16	27.5
	(3–54)	(3–54)	(14–71.1)

Table 2
Comparison of SARS-CoV-2 RT-PCR and LFI's results .

		RT-PCR		Rapid IgM/IgG	
		Positive	Negative	Sensitivity (95% CI)	75% (69.5–80.5)
LFI IgM/IgG	Positive	15	27	Specificity (95% CI)	80.3% (75.2–85.4)
	Negative	5	110	Positive predictive value (95% CI)	35.7% (29.6–41.8)
	Total	20	137	Negative predictive value (95% CI)	95.7% (93.1–98.3)

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