Discordant Nasopharyngeal and Tracheal COVID-19 RT-PCR Results in Tracheostomy Patients

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Abstract

OBJECTIVE: To compare The discordance of positivity rate of Covid-19 between two sites of specimen collection in patients with a tracheostomy.

SETTING : A single tertiary academic institution in Thailand

METHODS:
This study is a prospective cross-sectional study. The nasopharyngeal swab and tracheal secretion samples were collected from 100 patients with a tracheostomy who underwent RT-PCR at Thammasat University Hospital. The participants were aged between 1 and 96 years old, not previously diagnosed with COVID-19 or with symptoms of respiratory distress. prior to the test nor having oxygen desaturation. The detection result, and Ct value from each site was analyzed using McNemar's test with a 95% confidence interval.

RESULTS:
Four participants had positive results. Two of the four had discordant results. One patient tested positive only for the nasopharyngeal swab while the other tested positive only from the tracheal secretion sample. Among the discordant and concordant groups, no statistically significant difference was found (p = 1). The average Ct ratio (ORF1Ab/N gene) of the nasopharyngeal swab and tracheal secretions were 31.67/30.76 and 22.24/24.22 respectively.

CONCLUSION:
This study showed a discordance of COVID-19 RT-PCR screening results for samples from nasopharyngeal and tracheal sites in patients with an indwelling tracheostomy. Multiple site sampling from both the upper and lower respiratory tract is suggested in highly suspicious patients with tracheostomy

Methods and materials

This study is a prospective cross-sectional study. The nasopharyngeal swab and tracheal secretion samples were collected from 100 patients with a tracheostomy who underwent RT-PCR at Thammasat University Hospital. The participants were aged between 1 and 96 years old, not previously diagnosed with COVID-19 prior to the test nor having oxygen desaturation. The detection result, and Ct value from each site was analyzed by McNemar's test and Cohen's Kappa coefficient and agreement with a 95% confidence interval

Results

Table 1 The indication for RT-PCR COVID 19 testing

Indication for RT-PCR COVID 19	Case (%)
Admission, intervention	85 (85.00%)
Respiratory symptoms	9 (9.00%)
Person under investigation (PUI)	6 (6.00%)

Table 2 The results of RT-PCR COVID 19 testing

Tracheal secretion (%)	Nasopharyngeal swab (%)		
	Positive	Negative	Total
Positive	**2 (2.00)**	1 (1.00)	3 (3.00)
Negative	1 (1.00)	**96 (96.00)**	97 (97.00)
Total	3 (3.00)	97 (97.00)	100 (100.00)
P-value = 1.0. (McNemar's test)			

The percent of agreement = 98% (95%CI 93-100)
Cohen's kappa coefficient = 65.64 % (p-value <0.001) (95% CI 21.1-100.0)

Table 3 The Ct-value (Cycle threshold value) from each site

Case	Ct ratio (ORF1Ab/N gene)	
	NP (1)	Tracheal swab (2)
1	34.57/35.55	Negative
2	23.86/23.55	15.91/17.70
3	31.57/33.18	27.11/29.17
4	Negative	23.7/25.8
Average	31.67/30.76	22.24/24.22

Discussion

Since March 11, 2020, the novel Coronavirus disease (COVID-19), had been declared to be a pandemic by the World Health Organization (WHO) [1] Nasopharyngeal swab RT-PCR was and is currently the gold-standard in the diagnosis of COVID-19. The accuracy of screening and diagnostic testing is imperative in disease control, however, it is not clearly understood which site of. Specimen collection is ideal in the patient with an indwelling tracheostomy.

A retrospective study by Joshua & et al in 2021 [2,3] reported that 13 (28.9%) COVID-19 patients with tracheostomies had at least one discordant SARS-CoV-2 detection results in the nasopharynx versus the trachea.

Discussion

In our study, among four positive cases from a total of 100 patients were diagnosed with COVID-19, we found two discordant results. One patient was tested positive only for the nasopharyngeal swab while the other was tested positive only from the tracheal secretion sample. The percent of agreement in our study was 98 and the Kappa coefficient value was 65.64% with p-value of <0.001. In accordance to the agreement and Cohen kappa value, we recommend that one sample from the nasopharynx or indwelling tracheostomy tube should be adequate enough to determine the COVID-19 status low risk patients. Meanwhile, for highly suspicious case, multiple site sampling should be indicated.

The limitations in this study included the small amounts of positive cases. Since the majority of the cases tested for required for routine inpatient admission and surgical pre-op, 96% had negative results. Further studies must be done in setting with a higher prevalence of COVID-19 infection to include a larger sample size to increase the incidence of positive cases.

References

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