Interpretation of COVID-19 PCR testing- what surgeons need to know

Editor

We write with respect to the re-introduction of surgery during the COVID-19 pandemic and the need for hospitals to have detailed context-specific pandemic preparedness plans for surgical services[1]. The unfavourable outcomes associated with COVID-19 even after some routine surgical operations[2] has led to recommendations for preoperative testing designed to reduce the risk of inadvertently operating on a patient with COVID-19. Understanding and being able to accurately interpret SARS-CoV-2 real time PCR (RT-PCR) results is an important aspect of this process.

RT-PCR detects viral RNA and when positive (cycle threshold (CT) value < 35-40) is highly suggestive of the presence of infection. False positive results are rare but can occur through mislabelling, transcription errors, sample contamination and amplification of nonspecific products. Results with high CT values close to the maximum number of cycles (35-40) need to be interpreted more carefully. Detection of virus in asymptomatic individuals may represent asymptomatic or pre-symptomatic infection or detection of RNA following clinical recovery (the median duration of detection in respiratory samples is around 18 days (13-29 days))[3].

Clinically, false negative results are well recognized. They can occur if samples are collected inadequately, through mislabelling or if the wrong site is sampled (for example lower respiratory tract samples recommended if pneumonia present). The sensitivity of the assay established by the 95 per cent lower limit of detection determines the ability of the test to detect virus at low levels. Viral levels typically decrease over the course of the infection. At any stage, however, patients can be negative one day and positive the next, suggesting that expression of virus is not uniform[4]. Consequently, a negative test does not completely exclude infection. The exact rate of clinically false negative results from a single swab is not known and is even less well understood if used to screen asymptomatic individuals. Estimates from the literature suggest that the sensitivity is somewhere around 89 per cent[5].

The negative predictive value (NPV) of a test is dependent on the prevalence of disease in the population being tested. Prevalence should be low in individuals attending for elective surgery and, as such, a negative PCR test in this context is likely to have a high negative predictive value.

Pre-operative work-up may include a CT thorax. Studies have demonstrated increased sensitivity of CT (circa 94 per cent[5]) compared to PCR in patients presenting with disease. It is important to recognize that CT may not perform in the same way when used in an asymptomatic pre-surgical population. The positive predictive value of CT chest is uncertain and difficult to determine precisely. A meta-analysis of studies in symptomatic patients demonstrated a specificity of CT chest of 37 per cent and a positive predictive value (PPV) of 1·5 per cent to 30·7 per cent[5]. Positive predictive value decreases with disease prevalence.

We envisage that presurgical patients will have a low prevalence of COVID-19 and as such, the performance of both RT-PCR and CT chest need to be monitored in this group and the process reviewed in due course.

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