

1 **Nasal swab sampling for SARS-CoV-2:**
2 **A convenient alternative in time of nasopharyngeal swab shortage**

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35 **Running title:** Nasal swab for SARS-CoV-2 molecular detection

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52 Nasopharyngeal swab is the reference sampling method to detect SARS CoV2, as
53 recommended by world Health Organization (WHO) (1). However, the collection of nasal
54 specimens may have a slightly lower sensitivity than nasopharyngeal specimens (2, 3). We
55 herein validated an alternative procedure to collect nasal secretions with swab routinely used
56 in medical bacteriology for which there is no risk of supply disruption, in order to perform the
57 molecular diagnosis of SARS-CoV-2 infection.

58 Patients who were suspected of COVID-19 attending the Hôpital Européen Georges
59 Pompidou, Paris, France, were for their own care according to medical decision prospectively
60 included and subjected to SARS-CoV-2 molecular testing using nasopharyngeal swab [Xpert®
61 Nasopharyngeal Sample Collection Kit, Cepheid, Sunnyvale, CA, USA] and nasal swab
62 (Copan Transystem®, Copan, Brescia, Italy).

63 Nasal and nasopharyngeal swabs were inserted in the nostril until they hit an obstacle
64 (the inferior concha and the back of the nasopharyngeal cavity, respectively), rotated 5 times
65 and removed. The test was conducted in only one nostril per patient. After sampling,
66 nasopharyngeal swab was inserted into a vial containing 3 mL of virus transport medium
67 (Xpert® Viral Transport medium, Cepheid), and nasal swab was placed in a 15 mL tube
68 containing 3 mL of saline solution (NaCl 0.9%). SARS CoV-2 was detected using Allplex™
69 2019-nCoV Assay (Seegene, Seoul, Korea).

70 A total of 44 patients were prospectively included up to the end of March 2020. Their
71 median age was 63.0 years, ranging from 18 to 94 years. There were 23 (52.3%) male and 21
72 female patients. A total of 37 (84.1%) patients showed laboratory-confirmed SARS-CoV-2
73 infection using nasopharyngeal swab, 7 remaining negative (15.9%) (Table 1).

74 Out of 37 patients that were positive for SARS-CoV-2 by nasopharyngeal swab
75 testing, 33 were also tested positive with nasal sampling. All SARS-CoV-2-negative patients
76 with nasopharyngeal swabs (n=7) tested negative using nasal swabs (Table 1).

77 By reference to nasopharyngeal sampling, the detection of SARS-CoV-2 by nasal
78 sampling provided 7 (15.9%) true SARS-CoV-2-negative specimens, 4 (9.1%) false negative
79 specimens and 33 (75.0%) true SARS-CoV-2-positive specimens. Thus, the sensitivity of
80 SARS-CoV-2 RNA detection by multiplex real-time PCR from nasal secretions was 89.2%
81 [95% confidence interval (CI); 75.3-95.7] and its specificity was 100.0% (95% CI; 94.6–
82 100.0). The κ index was 0.72, indicating substantial concordance between nasal and
83 nasopharyngeal swabbing to detect SARS-CoV-2 according the Landis and Koch's rank. The
84 Youden's J index was calculated at 89.2%, demonstrating good efficiency to detect SARS-
85 CoV-2 RNA.

86 Ct (mean \pm SD) values for *E*, *RdRP*, and *N* genes by nasopharyngeal (*E*: 23.9 \pm 4.9;
87 *RdRP*: 26.3 \pm 5.5; *N*: 28.9 \pm 6.1) and nasal (*E*: 22.3 \pm 5.2; *RdRP*: 24.6 \pm 5.9; *N*: 27.9 \pm 6.1) swabs
88 testing were of similar levels. Differences in Ct values for the *E*, *RdRP*, and *N* genes were not
89 statistically significant ($p = 0.56, 0.84, \text{ and } 0.57$ respectively).

90 We herein report that the molecular detection of SARS-CoV-2 using nasal swab
91 specimens was nearly equivalent to the detection using nasopharyngeal swab considered as
92 the gold standard. SARS-CoV-2 detection from nasal samples showed high sensitivity and
93 specificity. Agreement and accuracy of test results using nasal sampling by reference to gold
94 standard nasopharyngeal sampling were estimated as substantial and good, respectively.
95 Taken together, these observations demonstrate that nasal sampling could be used to screen
96 SARS-CoV-2 in times of nasopharyngeal swab shortage.

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100 care for the patients.

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Table 1. Comparison of nasopharyngeal *versus* nasal sampling for SARS-CoV-2 detection by molecular biology.

Nasopharyngeal sample/Nasal sample results	n (%)
Concordant results	
Positive/Positive	33 (75.0%)
Negative/Negative	7 (15.9%)
Discordant results	
Positive/Negative*	4 (9.1%)
Total	44 (100.0%)

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* Out of the 4 discordant results, 2 had very low viral loads ($C_t=38$ on the N gene).