Conjunctiva-Upper Respiratory Tract Irrigation for Early Diagnosis of Severe Acute Respiratory Syndrome

We devised a method for self-obtaining nasopharyngeal specimens. Patients were given detailed written or verbal instructions. Materials included a 5-ml syringe filled with injectable normal saline, a specimen container, and facial tissues. The process involved the application of normal saline eye drops and expectoration of irrigate that ran into the throat.

Anatomically, the conjunctival sac is connected to the nasal cavity by the nasolacrimal duct. Contraction of the palpebral fibers of the orbicularis oculi muscles during blinking opens the normally collapsed, elastic, lacrimal sacs, which return to their collapsed state after blinking; secretions are sucked in through the lacrimal canaliculi and discharged into the nasolacrimal ducts (1, 2). The mucosal folds in the nasolacrimal ducts ensure one-way traffic to the nose. The lipid content of the meibomian gland secretions makes the lid margins water repellent. Unless too much is applied, the irrigate does not spill from the conjunctival sacs. These anatomical features are exploited in the technique of conjunctiva-upper respiratory tract irrigation (CURTI). With this technique, patients self-apply 1 drop of normal saline per eye at a time. They are asked to blink repeatedly, tilt their heads backward, and sniff to facilitate the drainage of fluid into the nasopharynx. Patients must not swallow the liquid; instead, it should be spat into a specimen container. Patients are told that there is a time lag of up to a minute or two before the fluid begins to run into the throat, and that after one stops applying the eye drops, fluid will continue to run into the throat for a minute or two. Fluid that drains into the throat even after stopping the eye drops should be collected. Specimens reported to be salty were deemed adequate.

We tested CURTI with four patients with confirmed severe acute respiratory syndrome (SARS) soon after admission. By using an immunofluorescence assay for SARS coronavirus (4), all patients were found to have seroconverted 13 to 21 days after admission (titer rose from <25 to 200 to 1,600). When real-time PCR (3) and primers Cor-1 and Cor-2 (5) were used, two of the four patients tested positive for the CURTI specimens. By comparison, none of the nose/throat swab (NTS) and stool specimens were positive.

Although we cannot compare the sensitivity of CURTI with that of nasopharyngeal aspiration (NPA) since the use of NPA was rejected in our hospital, we found CURTI to be more

sensitive than NTS in the four patients we studied. Analysis of data (ongoing) revealed an unsatisfactory sensitivity of 60% with NTS in confirmed cases of SARS (based on seroconversion). CURTI, therefore, has a potential sensitivity in excess of 60%.

CURTI is simple and well tolerated, as shown by the results with our volunteers. It compares favorably with NPA and NTS in terms of patient comfort and staff safety because it does not provoke sneezing. The CURTI process irrigates the nasopharynx, whereas saliva comes mostly from the three pairs of salivary glands which drain into the anterior oral cavity. Throat gargle does not wash the nasopharyngeal region because the soft palate is competent in most individuals. If CURTI does have a sensitivity comparable to that of NPA, it should replace NPA because of its enhanced patient comfort and safety.

REFERENCES

1. **McMinn, R. M. H.** 1994. Head and neck, p. 470–472. In R. M. H. McMinn (ed.), *Last's anatomy—regional and applied*. Churchill Livingstone, New York, N.Y.
2. **McMinn, R. M. H.** 1994. Spine, p. 506–508. In R. M. H. McMinn (ed.), *Last's anatomy—regional and applied*. Churchill Livingstone, New York, N.Y.
3. **Poon, L. L. M., O. K. Wong, W. Luk, K. Y. Yuen, J. S. M. Peiris, and Y. Guan.** 2003. Rapid diagnosis of a coronavirus associated with severe acute respiratory syndrome (SARS). *Clin. Chem.* **49**:953–955.
4. **World Health Organization.** Accession date, 19 August 2003. Severe acute respiratory syndrome (SARS): laboratory diagnostic tests. [Online.] <http://www.who.int/csr/sars/diagnostictests/en/>.
5. **World Health Organization.** Accession date, 19 August 2003. PCR primers for SARS developed by WHO network laboratories. [Online.] <http://www.who.int/csr/sars/primers/en/>.

Tommy R. Tong*
Bosco H. Lam
Tak-keung Ng
Sik-to Lai
Matthew K. Tong
Tai-nin Chau
Princess Margaret Hospital
Laichikok, Kowloon
Hong Kong Special Administrative Region
People's Republic of China

*Phone: (852) 2990-1808
Fax: (852) 2990-3377
E-mail: tommy.tong@members.nyas.org