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Comparison of Midturbinate Flocked-Swab Specimens with Nasopharyngeal Aspirates for Detection of Respiratory Viruses in Children by the Direct Fluorescent Antibody Technique[▽]

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Paired nasopharyngeal aspirate (NPA) and midturbinate flocked-swab specimens from 153 children with respiratory symptoms were examined by the direct fluorescent antibody (DFA) technique. Seventy-four infants (49%) had a viral infection documented by DFA. The flocked-swab specimens had 93% sensitivity and 96.7% agreement with the NPA specimens, with a kappa coefficient of 93.4% (95% confidence interval, 0.877, 0.991).

The direct fluorescent antibody (DFA) technique revolutionized the rapid detection of respiratory viruses. Since its inception in 1968, it has been one of the mainstays in clinical virology laboratories throughout the world (4). The ability of DFA to detect respiratory viruses depends on many things, but it all begins with good specimen collection. The nasopharyngeal aspirate (NPA) has been considered the best specimen to detect respiratory viruses in infants (4). However, it is difficult to collect because it requires special equipment, such as a catheter, trap, and vacuum source, and specialized training. A traditional nasopharyngeal swab is the next best specimen, especially in older children or adults, because it utilizes common supplies; however, the collection end of the swab, comprised of wound Dacron fibers, has limited absorbent capacity to trap virus-infected exfoliated epithelial cells. A nylon nasopharyngeal flocked swab with enhanced absorptive properties introduced in 2006 compared favorably to the NPA for the detection of respiratory viruses by DFA (2). Recently, a midturbinate flocked swab developed by Smieja, et al. (7), and marketed by Copan, Inc., has offered a more intuitive approach for the collection of nasopharyngeal specimens (1). It has compared favorably to the NPA and the flocked nasopharyngeal swab in the diagnosis of respiratory viruses by culture, antigen detection, and PCR, none of which require intact exfoliated epithelial cells for visualization; there is no published experience of midturbinate flocked swabs with DFA in children (1, 5, 6). The midturbinate flocked swab differs from the nasopharyngeal swab. It has a sampling depth indication gauge and also has a larger absorptive capacity than the smaller nasopharyngeal swab.

The present study was designed to compare the efficacy of the midturbinate flocked swab with the NPA in the detection of respiratory viruses by DFA.

The study was conducted from 5 January 2010 through 11 March 2010. All children 2 years of age or less admitted to the infant's floor of the hospital with respiratory symptoms were enrolled. The study was reviewed by the Children and Youth Institutional Review Board, who waived the need for a formal review because the study was deemed an evaluation comparing a new specimen collection device to the standard nasopharyngeal aspirate; parents were allowed to opt out of the use of the new specimen device. A nasopharyngeal aspirate specimen was collected through one nostril. A second specimen was collected through the other nostril with a midturbinate FLOQ swab (Copan Diagnostics, Inc., Murrieta, CA) designed for children 2 years of age or less; the swab was inserted up to the collar on the shaft. Both specimens were placed in 3 ml of Copan UTM transport medium, transported to the virus laboratory, and processed within 6 h. The suspension was centrifuged, and the cellular pellet washed. The cells were then spotted to glass slides. The cells were stained for DFA using a D3 Ultra respiratory screening identification kit (Diagnostic Hybrids, Inc. [DHI], Athens, OH). The kit screened for respiratory syncytial virus (RSV), influenza viruses (IFV) A and B, parainfluenza viruses (PFV) 1, 2, and 3, and adenovirus (AdV). An additional stain for human metapneumovirus (hMPV) (DHI) was included. The DFA readers were not blinded to the specimen source. The degree of DFA agreement between specimens collected by NPA and midturbinate flocked swabs was calculated with Cohen's kappa coefficient of agreement.

One hundred fifty-three infants entered the study. Paired specimens were collected from every infant. Respiratory viruses were identified in 74 (48.6%). Respiratory syncytial virus was most frequent, found in 47 patients (30%), with hMPV in 25 (16.3%), PFV in 1 (0.7%), AdV in 1 (0.7%), and IFV in none (0.0%). The 2009 H1N1 influenza A virus had last been identified in the laboratory in November 2009, more than 1 month before the start of the study. DFA of NPA specimens identified all the viruses. DFA of the flocked-swab specimens failed to detect 4 RSV and 1 hMPV isolate that had been detected in the NPA specimens. The negative DFA test results

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on flocked-swab specimens agreed with the negative DFA test results on NPA specimens. Overall, the positive and negative DFA test results on flocked-swab specimens had 96.7% agreement with the DFA test results on NPA specimens, with a Kappa coefficient of 93.4% (95% confidence interval [CI], 0.877, 0.991; $P < 0.00001$). The sensitivity of the flocked swab was 93.2% (95% CI, 0.849, 0.978).

The midturbinate flocked swab proved to be comparable to the NPA for the detection of common respiratory viruses, such as RSV and hMPV, in a DFA test in the present study. The absence of IFV and the low numbers of AdV and PFV isolates in specimens prevented an assessment of the swab's utility in detecting these viruses; however, earlier studies with nasopharyngeal flocked swabs suggested that the midturbinate swab would give similar results (3). In an earlier study, the sensitivity of the NPA in detecting either IFV or RSV was greater than the sensitivity of flocked nasopharyngeal swabs, although the difference was not statistically significant; the differences may be attributed to the greater number of respiratory epithelial cells available for examination in NPA specimens (2). The advantage of the midturbinate collection over nasopharyngeal collection resides in the relative ease of collection and the resultant patient cooperation, especially among the very young; however, the observations made in the present study may not extend beyond the pediatric population.

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