

RSV ANTIGEN TEST AND VIRAL ISOLATION RESULTS USING RESPIRATORY SPECIMENS COLLECTED BY MID-TURBINATE FLOCKED SWABS VERSUS NASOPHARYNGEAL ASPIRATES.

Rangaraj Selvarangan, Mary Moffat, Thomas Tryon, Christopher Harrison, Shirlee Rusk, Tiffany Heffner, David Abel and Steve Hiraki.
Children's Mercy Hospitals and Clinics, Kansas City, MO 64108

ABSTRACT

Background and Aim: Nasopharyngeal aspiration is one of the best methods to collect respiratory specimens for laboratory testing. However, the procedure to obtain nasopharyngeal aspirates (NPA) is more cumbersome for the caregiver and uncomfortable for the pediatric patient when compared to specimen collected by mid-turbinate nasal swab (MTS). The aims of the current study were to compare yield of specimens collected by MTS or NPA method by using respiratory syncytial virus (RSV) antigen test and viral isolation and to assess preference for respiratory specimen collection method.

Method: Prospective study of children evaluated for respiratory viral infection during emergency department or urgent care center visits at Children's Mercy Hospitals and Clinics. Two respiratory specimens were collected from each patient; first specimen was obtained from one nostril by MTS, Copan Diagnostics (small swab for infants <2yrs; cat # 56780CS01.US, and a medium swab for children > 2yrs; cat# 56380CS01.US) and suspended in 2 ml universal transport medium from Copan Diagnostics. Then a NPA was collected from the other nostril and suspended in 3ml M4RT viral transport medium from Remel. A questionnaire was used to assess nurses' preference and opinion of patient tolerance. Both specimen types were tested by Binax NOW RSV antigen test and inoculated in to Rmix shell vial for viral isolation and identification.

Results: 200 MTS and NPA specimens were evaluated. 64 MTS specimens tested positive for RSV antigen (63 confirmed by RSV culture) compared to 75 NPA specimens that tested positive for RSV antigen (65 confirmed by RSV culture). RSV was isolated by culture from a total of 97 specimens; 73 from both MTS and NPA, 14 from NPA only and 10 from MTS only. When RSV antigen test results from MTS and NPA were compared with RSV culture results from the same specimen the sensitivity, specificity, PPV and NPV for MTS was 76%, 99%, 98% and 85% as compared to NPA with 75%, 91%, 87% and 82% respectively. When RSV antigen test results from MTS and NPA were compared with RSV culture results from either specimen the sensitivity, specificity, PPV and NPV for MTS was 66%, 100%, 100% and 77% as compared to NPA with 70%, 93%, 91% and 77% respectively. By Rmix shell vial culture, 5 Adenovirus (AdV), 1 influenza A, 2 human metapneumovirus, 1 parainfluenza 2 and 73 RSV were isolated from both MTS and NPA specimens; no virus was isolated in 87 MTS and NPA specimens. 6 AdV were isolated from NPA only and 1 AdV was isolated from MTS only. On nurse evaluations, 96% indicated MTS to be an easier method than NPA, 66% indicated that the patient tolerated the MTS method better than NPA, 92% indicated that MTS collection was not technically demanding and 92% indicated that MTS collection was the preferred method.

Conclusions: Respiratory specimens collected by either MTS or NPA are comparable in detection of RSV by rapid antigen test or culture. Respiratory viral isolation was comparable for specimens obtained by either MTS or NPA. The slight increase in AdV isolation rates from NPA versus MTS needs further investigation. Nurses preferred the MTS over the NPA collection method as the MTS device affords ease of use and improved patient comfort during specimen collection

INTRODUCTION

The performance of viral diagnostics tests are in part determined by the type of respiratory specimen collection method employed. Although nasopharyngeal aspiration and nasal washes are generally considered superior to nasopharyngeal/nasal swabs due to better sampling of the upper respiratory airway; they are cumbersome for the caregiver and uncomfortable for the patient. Flocked swabs are designed to adequately capture respiratory epithelial cells and secretions and spontaneously elute them in viral transport medium. A recent study by Abu-Diab *et al* demonstrated that nasopharyngeal flocked swabs were comparable to nasopharyngeal aspirates with respect to respiratory viral detection (1). Subsequently a study by Allen *et al* showed that nasopharyngeal flocked swab were comparable to a less invasive mid-turbinate flocked swab for detection of respiratory viruses (2).

The aim of the current study is to compare the performance of mid-turbinate swab to nasopharyngeal aspirate using Binax NOW RSV antigen test and R-Mix shell vial culture for isolation of influenza A, B, RSV, Parainfluenza1, 2, 3, Adenovirus and human metapneumovirus.

MATERIALS AND METHODS

Study Design: Prospective enrollment of 200 patients during December 2008 to January 2009 at the Children's Mercy Hospitals and Clinics; Emergency Room and North Urgent Care Center. Study packets containing NPA kit, small and large MTS and nurse evaluation form were distributed to the sites. First the MTS specimen (small <2yr, large >2yr) was obtained from one nostril and suspended in 2ml UTM (Copan). Second NPA was performed from other nostril and suspended in 3ml M4RT (Remel). Nurse forwarded the evaluation form with the specimens.

Laboratory Testing: Lab tested NPA with Binax RSV and reported results per clinical protocol. Both NPA and MTS specimens were forwarded to clinical virology lab for the clinical study. Clinical virology laboratory performed Binax RSV on the paired MTS specimen and recorded results and intensity. Both NPA and MTS specimens were inoculated in to 3 R-Mix vials for viral isolation.

Mid-Turbinate Flocked Swabs: *Figure A:* Small swab for infants <2yrs; cat # 56780CS01.US, and *Figure B:* Medium swab for children > 2yrs; cat# 56380CS01.US



RESULTS

Table 1: BinaxNOW® RSV antigen results: Swab Versus NPA

Swab-Binax RSV	NPA- Binax RSV		Total
	Neg	Pos	
Neg	110	26	136
Pos	15	49	64
Total	125	75	200

Table 2: BinaxNOW® RSV antigen result intensity : Swab Versus NPA

Intensity	1+	2+	3+	4+	5+	Total
Swab	26	14	15	7	2	64
NPA	9	17	20	22	7	75

Table 3: R-Mix™ culture results: Swab Versus NPA

Swab Culture	NPA Culture							Total
	NEG	ADENO	FLUA	MPV	PIV2	RSV		
NEG	87	6				12	105	
ADENO	1	5				2	8	
FLUA			1				1	
MPV				2			2	
PIV2					1		1	
RSV	10					73	83	
Total	98	11	1	2	1	87	200	

Table 4: Turn-Around-Time for R-Mix™ culture results: Swab Versus NPA

R-Mix™ Culture TAT	Day1	Day2	Day3	Total
Swab	67	26	2	95
NPA	80	16	6	102

Table 5: BinaxNOW® RSV antigen and culture results : Swab

Swab- Binax RSV	Swab -R-Mix™ Culture						Total
	NEG	ADV	FLUA	MPV	PIV2	RSV	
Negative	104	8	1	2	1	20	136
Positive	1					63	64
Total	105	8	1	2	1	83	200

Table 6: BinaxNOW® RSV antigen and culture results : NPA

NPA-Binax RSV	NPA - R-Mix™ Culture						Total
	NEG	ADENO	FLUA	MPV	PIV2	RSV	
Negative	89	10	1	2	1	22	125
Positive	9	1				65	75
Total	98	11	1	2	1	87	200

Table 7 A & B: RSV antigen test performance using Swab Versus NPA specimen

	Compared to RSV culture from same specimen			
	Sensitivity	Specificity	PPV	NPV
Swab	76%	99%	98%	85%
NPA	75%	91%	87%	82%

	Compared to RSV culture from either specimen			
	Sensitivity	Specificity	PPV	NPV
Swab	66%	100%	100%	77%
NPA	70%	93%	91%	77%

Nurse Evaluations:

1. Is swab collection easier than aspirate = **96% YES**
2. Did the patient tolerate swab collection better than the aspirate collection = **66% YES**
3. Is swab collection technically demanding = **92% NO**
4. Do you prefer swab over NPA collection = **92% YES**

CONCLUSIONS

1. RSV antigen test results were comparable between MTS and NPA specimens.
2. Subjective scoring of Binax RSV antigen test reaction intensity suggests a trend towards higher intensity readings in NPA specimens when compared with MTS. Irrespective of the RSV antigen intensity, the results were clearly discernable for both specimen types.
3. Viral isolation results were comparable between MTS and NPA specimens except for a slightly increased trend of adenovirus isolation from NPA versus MTS (6 Vs 1).
4. When a virus was isolated, about 70% of MTS and 78% of NPA specimens were detected on day 1 post inoculation.
5. About 31 MTS and NPA specimens had discrepant viral culture results (Table 3). RSV and Adenovirus PCR will be performed on these discrepant specimens.
6. Nurses preferred the MTS over the NPA collection method as the MTS device affords ease of use and improved patient comfort during specimen collection

REFERENCES

1. Abu-Diab *et al*. Comparison between pernasal flocked swabs and nasopharyngeal aspirates for detection of common respiratory viruses in samples from children. JCM 2008; 46:2414
2. Allen *et al*. Comparison of a mid-turbinate flocked swab to nasopharyngeal flocked swab for respiratory virus detection in children. CVIS 2008. Poster M28.

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