

A comparison of single-use bronchoscopes and reusable bronchoscopes for interventional pulmonology applications

J. Kurman¹, A. Wagh², B. Benn¹, S. Islam³

¹ Medical College of Wisconsin, Milwaukee, United States; ² University of Chicago, Chicago, United States; ³ Medical College of Georgia, Augusta, United States

Pulmonx Zephyr 5.5 EDC Valve



Olympus BF-1TH190

Ambu aScope 5

Large Capacity 2.8mm Forceps



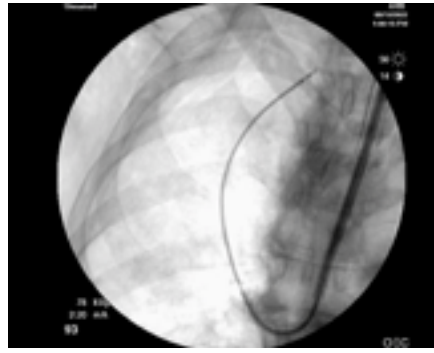
Olympus BF-1TH190

Ambu aScope 5

FLUOROSCOPY CADAVERIC IMAGES



Olympus BF-1TH190

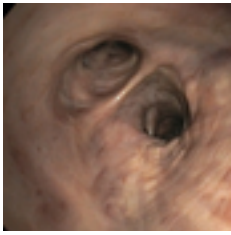


Ambu aScope 5

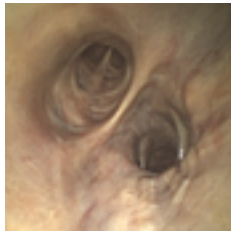


Drs. Jonathan Kurman and Ajay Wagh
Cadaver Evaluation

ENDOSCOPY CADAVERIC IMAGES (COLOR WAS NOT ADJUSTED)



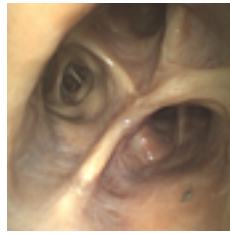
Olympus BF-1TH190



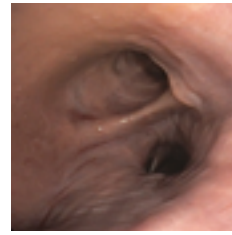
Ambu aScope 5



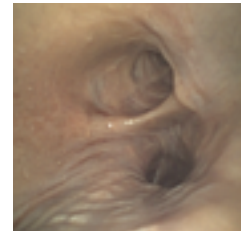
Olympus BF-1TH190



Ambu aScope 5



Olympus BF-1TH190



Ambu aScope 5

Conclusion: No Single-use flexible bronchoscope (SUFB) or Reusable flexible bronchoscope (RFB) was superior in every category evaluated. At least one SUFB was better than or equivalent to the RFB in each category. Among the SUFB, the Ambu aScope 5 was either superior or equivalent to the RFB in the most categories.

The latest generation of SUFB are a significant advancement over their predecessors. Many of their attributes are comparable to or even superior to RFB. SUFB may represent a viable alternative to RFB for interventional pulmonology procedures in the bronchoscopy suite, operating room, and intensive care unit.

| SPECIFICATION | REUSABLE | SINGLE-USE FLEXIBLE BRONCHOSCOPES | | | |
|-----------------------------------------------------------|-----------|-----------------------------------|--------------------|---------------------|--------------|
| | | | | | |
| Brand | Olympus | Ambu | Olympus | Boston Scientific | Verathon |
| Model | BF-1TH190 | aScope 5 Therapeutic | H-Steriscope Large | EXALT Model B Large | B-Flex Large |
| Working channel diameter (mm) | 2.8 | 2.8 | 2.8 | 2.8 | 2.8 |
| Flexion/Extension (Without tools) | 180/130 | 195/195 | 210/210 | 180/180 | 140/135 |
| Flexion/Extension (degrees) 2.8mm forceps | 143/92 | 168/169 | 144/145 | 123/122 | 67/73 |
| Flexion/Extension (degrees) 2.0mm forceps | 156/117 | 193/193 | 181/177 | 162/162 | 90/101 |
| Flexion/Extension (degrees) Pulmonx Zephyr Valve Catheter | 161/114 | 195/184 | 181/176 | 151/153 | 86/94 |
| Flexion/Extension (degrees) 2.3mm straight fire APC probe | 156/118 | 195/189 | 185/180 | 165/165 | 94/89 |
| Suction 60mL (seconds) - Water | 4.10 | 5.35 | 5.55 | 3.05 | 4.41 |
| Suction 60mL (seconds) - Viscous material | 7.44 | 8.25 | 14.94 | 5.42 | 9.11 |
| Optics - Depth of field (mm) | 3-100 | 3-100 | 6-50 | 6-50 | 5-50 |
| Optics - Field of view (degrees) | 120 | 120 | 110 | 90 | 120 |

Background

Single-use flexible bronchoscopes (SUFB) have existed for a number of years but have generally been considered to be inferior to reusable flexible bronchoscopes (RFB). As such, SUFB have largely been relegated to use in the intensive care and operating room for simpler procedures, such as airway inspection and bronchoalveolar lavage. Interventional pulmonologists have long preferred RFB given their superior operating characteristics. Recently, there has been a proliferation of new SUFB from several different manufacturers. This latest generation of SUFB may be suitable for use during advanced bronchoscopy or interventional pulmonology procedures. In this study, we compare the characteristics and maneuverability of SUFB and RFB.

Methods

Two sizes of SUFB from four different manufacturers were compared to their RFB counterparts on a cadaver model, benchtop fixturing and artificial plastic lung model. Characteristics assessed included bending capability, scope rigidity, maneuverability, handling, optics, channel shape and size, and suction. Accessory devices included in the articulation testing included biopsy forceps, transbronchial needle aspiration (TBNA) needle, dilation balloon, Argon Plasma Coagulation (APC) and cryoprobes, bronchial thermoplasty catheter and valve catheter. All tests were performed by experienced, board-certified interventional pulmonologists.

Results

3 of 4 SUFBs had better flexion and extension without tools vs. RFB. The aScope 5 (Ambu) had more degrees of flexion and extension with all accessory tools compared to other SUFBs or RFB. The aScope 5 and RFB had similar depth of field and field of view versus other SUFB. The aScope 5 and RFB were able to reach the same anatomical location with biopsy forceps in the right upper lobe apical segment during cadaveric testing. aScope 5 and RFB were rated similar (score of 5 each, 1-5 scale) in image sharpness, near field resolution and far field resolution and better than other SUFB evaluated in the model (Verathon BFlex, Boston Scientific EXALT B, Ambu aScope 4). No SUFB or RFB was significantly better in suction performance of 60mL of water or 60mL of viscous material.

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