Advances in Field of Pulmonology Provide Promise for Lung Cancer Patients Interventional Pulmonology Brings Effective New Way

According to the Centers for Disease Control (CDC), lung cancer is the leading cause of cancer deaths for men and women today. In fact, despite massive preventive efforts over the past two decades, more than 200,000 new cases of lung cancer will be diagnosed in the U.S. this year alone. Although lung cancer prognosis is often bleak - six in ten patients die within a year of diagnosis - an emerging field of lung care offers patients hope for better diagnostics, a wider range of treatment options and improved quality of life.

"Interventional pulmonology combines technologies and techniques that enable us to use non-invasive and minimally-invasive options at each step of the way in treating lung cancer patients," explains Dr. Arthur Sung, MD, the Director of Interventional Pulmonology at New York Methodist Hospital and one of the foremost experts in the field. After completing his fellowship under the world's leading expert in Interventional Pulmonology, Dr. Sung established Brooklyn's first Interventional Pulmonology program as part of NYM's Complex Airway Center. In addition to practicing and training other physicians, Dr. Sung plans to engage in scientific studies regarding interventional pulmonology's potential to benefit lung cancer patients. "We are expanding the limits of this field, which is in its infancy, to be able to diagnose faster and more accurately, treat more effectively, decrease painful invasive procedures, increase quality of life and, ultimately, cure more lung cancer patients," Dr. Sung adds.

Earlier, more accurate diagnostics

Using interventional techniques, Dr. Sung confirms that doctors can now stage lung cancers more accurately with ultrasound, and identify lung cancer in its earliest and most curable stages using advanced imaging techniques. In both cases, the bronchoscope - a small, handheld device that allows pulmonologists to view the airway and lungs through the mouth, rather than through a surgical incision - is used to access lung tissue for sampling and study. The bronchoscope can be fitted with small ultrasound devices, biopsy tools, imaging tools, other devices for diagnostic purposes.

In addition, the development of bronchoscopic techniques is leading to other promising techniques for early diagnosis of lung cancer, Dr. Sung notes. "A key reason for the poor prognosis in lung cancer is that the majority of patients present with late-stage disease which has already spread to other parts of the body," he explains. "There are very few treatments available today that are effective against advanced stage lung cancer."

However, a report in the March, 2007 issue of Nature Medicine1 reveals that a new test, made possible through interventional bronchoscopy, may be able to forewarn smokers that they are experiencing early cancerous changes to their airways and lungs - information that can facilitate

early diagnosis and improved prognosis. The test involves analyzing "brushings" of the trachea and lungs acquired during a bronchoscopy for up to 80 different genetic tissue changes, all of which are associated with the development of the disease. In the Boston University study, the test returned a 95% chance of detecting cancerous changes in smokers, and a 90% chance of finding the cancer at its earliest, most treatable stage. While the technique is in its earliest stages and requires clinical study to perfect, Dr. Sung believes such breakthroughs represent a key benefit of interventional pulmonology. "With the right tools and knowledge, we can explore fully the potential to improve the lives of lung cancer patients," he points out.

More tolerable - and more effective - treatments

Interventional pulmonologists can now work with oncologists, radiologists and surgeons to provide a wider range of treatment options to lung cancer patients as well. "Prior to the advent of many interventional techniques, invasive surgical procedures were the only option for removing or reducing tumors…and often these tumors were considered inoperable, which left us simply with palliative measures," Dr. Sung explains. Today, interventional pulmonology enables the following new treatment procedures:

-Interventional pulmonology can converge with other emerging medical fields, such as molecular medicine, to deliver experimental gene therapies to patients with genetic-based lung cancers

-Bronchoscopes fitted with lasers can be used to reduce or obliterate previously inoperable malignant tumors, particularly those that obstruct a patient's airway. This technique, while not curative, is effective in improving a patient's quality of life by facilitating easier breathing without the need for ventilation or intubation. "What's more, these procedures enable patients to comply with chemotherapy and radiation treatment schedules, which increases their chance of a successful outcome," Dr. Sung confirms.

-Stents can also be inserted to keep airways open in patients with tracheal obstructions; using interventional bronchoscopy allows pulmonologists to insert stents, sparing invasive surgery or lengthy hospital stays - all of which can pose risks to lung cancer patients.

-In a procedure called endobronchial brachytherapy, interventional pulmonologists can treat lung cancer with radioactive seeds implanted at the tumor site.

1. Spira, A. Nature Medicine, advance online publication, March 5, 2007

Bio:

Arthur Sung, MD is the Director of Interventional Pulmonology at New York Methodist Hospital. Dr. Sung received a BS from University of California, San Diego and an MD from New York Medical College. Dr. Sung completed fellowships in Pulmonary and Critical Care Medicine at Stanford University Medical Center and in Interventional Pulmonology at Beth Israel Deaconess Medical Center training under Armin Ernst, MD and Kevin Kovitz, MD. Licensed in Internal Medicine, Critical Care Medicine and Pulmonary Disease Certified, Dr. Sung received recognition of medical care provided for victims during Hurricane Katrina, New Orleans and was honored at the 8th Annual Leadership Development Program for Academic Physicians, American College of Chest Physicians in October 2007. Dr. Sung is a member of the American Thoracic Society, the American College of Chest Physicians and the American Association of Bronchology.

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Interventional pulmonology

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In 2002, the European Respiratory Society (ERS)/American Thoracic Society statement on interventional pulmonology was published in the *European Respiratory Journal* 1. Thoracoscopy was not dealt with in this statement, but discussed separately in the ERS Monograph on Pleural Diseases, which was published in September 2002 2.

Over the past 4 yrs, many articles have been published in the field of interventional pulmonology. An important new development is the use of ultrasound in the diagnostic work-up of enlarged mediastinal lymph nodes in lung cancer patients. Real-time ultrasound-guided fine-needle aspiration of lymph nodes is now possible by the oesophagoscopic (EUS-FNA) as well as the bronchoscopic route.

It is now time for an update on the state-of-the-art procedures in both interventional bronchoscopy and thoracoscopy. In the present issue of the *ERJ*, the article by Bolliger *et al.* 3 is the first in a series of six review articles.

Three of these articles will be dedicated to examining the following areas in interventional bronchoscopy: therapeutic procedures with immediate effect; therapeutic procedures with delayed effect; and the site of bronchoscopic and oesophagoscopic needle aspiration of mediastinal lymph nodes using transbronchial needle aspiration (TBNA), endobronchial ultrasound, and EUS-FNA.

The remaining three articles will deal with thoracoscopy and pleural disease to provide: a general overview of the site of thoracoscopy in the diagnosis and management of pleural effusions; an update on the treatment of pneumothorax and the place of pleurodesis; and information on advanced thoracoscopic procedures, such as treatment of empyema, lung biopsy and sympathectomy.

The purpose of this review series is to provide an update on the subject of interventional pulmonology. As not all pulmonologists are skilled in interventional techniques, it is important to recognise the indication for a timely intervention, and to have knowledge about interventions that can alleviate or cure a disease at a certain stage. We would also like to provoke some questions, such as the following: Is interventional pulmonology underdeveloped or underutilised in my hospital or my area? If so, how can we improve services to our patients, and where shall we start? Should every pulmonologist have interventional skills to a certain extent? 4

The answer to this last question is yes, depending on the field of pulmonology you are working in. A pulmonologist who currently deals with lung cancer should be able to perform bronchoscopic aspiration of enlarged lymph nodes, which may provide a diagnosis of lymph node metastasis in the majority of cases, and, thus, prevent unnecessary mediastinoscopies in a number of patients 5. However, it is not necessary that every pulmonologist dealing with oncology should learn oesophagoscopy in order to be able to perform EUS-FNA, as TBNA is diagnostic in >70% of cases and this latter procedure is still underutilised 6.

However, major interventional procedures, such as endobronchial desobstruction and stent placement, should be concentrated in specialised centres. It is not possible to have the facilities and trained staff in every hospital. Besides, the number of indications for these interventions is limited, and skills and experience are best concentrated in a tertiary referral centre.

In the field of pleural diseases, we think that pulmonologists who treat pleural effusions should be able to perform diagnostic thoracoscopy. In the era of invasive procedures under visual guidance, a blind pleural biopsy is no longer an acceptable option after a nondiagnostic thoracocenthesis. Pulmonologists in Europe are well aware of these developments, and hands-on courses are provided in Europe and supported by the ERS School (for more information, visit www.ersnet.org/ers/default.aspx?id = 1900). In addition, there is growing interest in thoracoscopy in the UK, after a long period of underutilisation. According to a recent questionnaire, the number of centres performing thoracoscopy grew from 11 in 1999 to 17 in 2004, and 54 centres intend to start providing a service 7. For the past 3 yrs, a successful hands-on thoracoscopy course has been provided yearly in Mansfield (Nottinghamshire, UK).

Should every interventional procedure be available in a centre of interventional pulmonology?

The answer is no. Some centres will specialise in bronchoscopic procedures, others in pleural procedures, and some centres will carry out both.

In a centre for bronchoscopic intervention, one technique for rapid bronchial desobstruction should be available (electrocautery or laser), as well as a technique for delayed desobstruction (brachytherapy, cryotherapy or photodynamic therapy) and stent placement facilities. As a consequence, the pulmonologists in these centres are skilled in rigid bronchoscopy. Although some stents can be placed using flexible bronchoscopy, the rigid bronchoscope is indispensable for handling complications and stent removal if indicated.

In a pleural disease centre, all facilities for diagnostic thoracoscopy in case of pleural effusion will be available. Advanced pleural procedures, such as thoracoscopy for empyema, hyperhidrosis, pulmonary biopsy and pneumothorax, are performed in these centres by skilled pulmonologists, or by a thoracic surgeon trained in minimal invasive procedures.

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Bronchoscopy Training and Competency

How Many Are Enough?

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Elsewhere in this issue of *CHEST* (see page 625), Haponik et al report the results of a survey of 59 senior pulmonary and critical care medicine fellows who attended an industry-sponsored bronchoscopy course in conjunction with CHEST 1998, the annual American College of Chest Physicians meeting.[1] The authors found wide discrepancies in bronchoscopy training between institutions, in areas such as numbers of procedures performed, ancillary techniques instruction (for example, transbronchial needle aspiration), and fellows' subjective assessments of their program's bronchoscopy training quality. Rather than getting distracted by the obvious scientific limitations and possible biases of the survey, I will focus my comments on the authors' primary conclusion that "an effort to apprise and enhance the quality of bronchoscopy training is necessary."

In 1964, Ikeda et al developed standards for the flexible fiberoptic bronchoscope (bronchofiberscope),[1] and in 1968 it was described as a diagnostic instrument.[2] Over the ensuing years, medical equipment manufacturers worked with pulmonary physicians to develop amazing advances in bronchoscope flexibility and optics, a dazzling array of bronchoscopic instruments, and new applications of the procedure. The bronchoscopist of today can perform laser therapy, cryotherapy, brachytherapy, stenting, localization of areas of dysplasia and carcinoma *in situ* using tissue autofluorescence, and ultrasound localization of mediastinal nodes for transbronchial needle aspiration, all procedures that were unimagined or impossible 20 years ago. There is no question that by enabling pulmonologists to gather tissue biopsies from the lower respiratory tract, Ikeda's invention greatly improved the scientific underpinnings of pulmonary medicine. Most modern-day pulmonologists perform flexible fiberoptic bronchoscopy,[3] [4] which has become the key procedure defining our specialty.

Therefore, it is surprising that despite the substantial literature on teaching bronchoscopy referenced by Haponik et al, pulmonary and critical care medicine training programs have not adopted minimal essential numeric thresholds for bronchoscopy training.[5]) I believe it most logical that pulmonary and critical care medicine program directors, who meet biannually at the American College of Chest Physicians and American Thoracic Society annual meetings, accept the important, though controversial, task of defining such criteria. After our academic leaders have established the requirements, they should be presented to the pulmonary disease and pulmonary and critical care medicine residency review committees for approval as the standards necessary to receive and maintain programmatic accreditation.

I offer the following suggestions, based on my long interest in fiberoptic bronchoscopy, my experience as a former pulmonary disease program director at Walter Reed Army Medical Center, and my modifications of the guidelines of Prakash and Stubbs[6] for bronchoscopy training: (1) trainees will perform a minimum of 50 bronchoscopies/yr, and at least 100 procedures during fellowship training; (2) bronchoscopies will be performed on ambulatory patients and at least 10 patients receiving mechanical ventilation; (3) instruction

and experience in the techniques of endobronchial biopsy, bronchial brushings, bronchial washings, BAL, transbronchial needle aspiration, transbronchial lung biopsy, and quantitative culture of the lower respiratory tract will be required (five each); (4) experience using fluoroscopy during bronchoscopy will be provided (five patients); and (5) experience with bronchoscopic intubation will be obtained (five patients). Current program directors will use available scientific evidence and their best judgment to decide the threshold numbers of bronchoscopies and associated procedures needed to ensure competency for individual trainees. Future reports will undoubtedly modify these initial recommendations.

I propose that pulmonologists follow the lead of the other procedure-intensive internal medicine subspecialties. Using evidence-based medicine to establish threshold numbers of supervised procedures needed to achieve competence,[7] [8] gastroenterologists require that their fellows perform 25 flexible sigmoidoscopies, 100 colonoscopies, and 100 upper-GI endoscopies, before being allowed to "scope" patients unsupervised.[5]) Similarly, cardiologists selected minimal numbers such as 100 cardiac catheterizations, 50 exercise stress tests, 150 echocardiography studies, 3,500 ECGs, and 75 ambulatory ECG recordings.[5]) The fact that previous pulmonary disease, pulmonary and critical care medicine, pediatric pulmonology, and thoracic surgery residency review committees failed to establish thresholds should not dissuade us from taking on this task.[5]) I disagree with the position of the American Board of Internal Medicine that because "manual dexterity and competence of trainees vary, the Board does not dictate the number of times a procedure must be done to assure competency ... to fulfill some arbitrary quota."[9]

Conversely, I recommend against requiring training programs to teach rigid bronchoscopy, which I consider a surgical procedure. The few pulmonologists desiring to master this skill, to become credentialled, and to compete for operating room time should be encouraged to obtain training from expert thoracic surgeons or pulmonologists. In addition, advanced therapeutic applications of bronchoscopy, such as laser therapy and stenting, should be performed at specialized centers. Trainees interested in learning these techniques should arrange elective rotations staffed by recognized experts. Concentrating these procedures in specialized centers will reduce the risk patients face when undergoing techniques rarely performed by the bronchoscopist or by bronchoscopy suite personnel.

The knowledge and technical skills we pulmonologists possess about performing flexible fiberoptic bronchoscopy ensure that our patients are subjected to the safest, most efficacious, and lowest risk procedures possible. The report by Haponik et al shows that we must improve training efforts to attain the related goals of graduate competence and patient safety. I challenge our academic leaders to respond quickly; our patients deserve nothing less.

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