

surgery. We believe that surgery offers the best option for the prompt removal of the tumor, together with a low morbidity rate and a better chance of survival. We are currently on the verge of starting an intergroup study that will examine in a randomized Phase III design the efficacy of adding local cone down radiation therapy to the resection margins after limited surgical resection in high-risk patients with peripheral T1 NSCLC.

Regarding the biology of lung cancer, we believe that it is likely that therapeutic modalities successfully applied to breast and rectal cancer can be implemented with similar efficiencies for lung cancer, just as the argument for Halstedian techniques of radical surgery have given way to less extensive procedures. It is possible that wedge resection with staging with or without radiation therapy based on the stage of cancer may prove to be the procedure of choice not only for patients at high risk from radical surgery, but also for all patients with T1NO lung cancer. Until carefully designed studies address these issues and prove them, we would recommend wedge resection by video-assisted thoracoscopic techniques only in patients who would not otherwise be eligible for major lung resection.

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## Discussion

DR. JAMES B. D. MARK (Stanford, California): Dr. Shennib, I enjoyed your presentation. I think it is worth noting that this series of patients came from several institutions.

Dr. Shennib, Dr. Landreneau, Dr. Mack, and others have done this with several kinds of problems treated by thoracoscopy. I think it is quite worthwhile because in that way they can gather a larger number of patients over a shorter period of time and bring more information to us quickly.

There is no question that thoracoscopy is upon us. In about one-third of our patients who go to the operating room, thoracoscopy is at least part of that operation. Sometimes it replaces an open technique such as an open lung biopsy. Sometimes it is a supplement to other techniques.

Now we have to decide just when and where to use it. Remember, you are comparing it to limited thoracotomy in high-risk patients that, as you note, has been carried out over the years with significant success. And it is going to have to be that good. I think it is not a leap forward to consider this an adequate operation for patients who are good risks and who have stage 1 lung cancer.

I'd like to ask Dr. Shennib what he does if on computed tomography scanning he finds that there are enlarged mediastinal nodes with a small peripheral lung cancer.

Additionally, I'd like to ask if you have carried out this operation for lesions that turned out not to be lung cancer? Clearly, some of the small lesions are not going to be diagnosed preoperatively. I think a long hospitalization and an air leak up to 30 days wouldn't be good for these benign lesions.

A third question is, has there ever been tumor contamination of the exit wound when you pull that specimen out through a small incision?

Again, I enjoyed the presentation and I appreciate the privilege of discussing the paper.

DR. JOSEPH MCLAUGHLIN (Baltimore, Maryland): (Slide) During a similar period over the past 2 years, we have performed video-assisted thoracoscopy on 143 patients. Sixty of these patients at our institution had resection of pulmonary tissue for a variety of reasons, 20 because of pulmonary nodules that we were unable to diagnose specifically preopera-

tively. Eleven of these patients had malignant lesions, but only 2 of the 11 had malignant lesions that were primary, all of the rest were metastatic malignant lesions. During this same period of time, we have performed 140 lobectomies or segmentectomies through a posterior lateral thoracotomy or, in those patients with poor pulmonary function, through a limited thoracotomy. I believe it's apparent that we think that thoracotomy is still the way to go in patients with lung cancer, virtually all of whom we diagnose preoperatively.

One step further! We have performed thoracoscopy staging on nine patients. One was found to have a subcarinal tumor that had not been identified on computed tomography scan and that would not have been identified at mediastinoscopy, which is in keeping with the 10% or 15% negative computed tomography correlation generally noted in the literature.

A number of questions come to mind. Rhetorically, is this an adequate procedure in general? I think the answer is "no." But, is this an adequate procedure in this group of patients? Are these patients staged by mediastinoscopy preoperatively? Were the patients staged at the time of the operation? I heard that biopsy of the hilum was performed, but how about the mediastinum? Is this routinely biopsied?

Finally, what happens if you come up with a positive node or if you come up with a positive mediastinal biopsy in these patients? Do you then revert to a thoracotomy? It wasn't done in this series, but would this be what one would do?

I think this is a very important paper in this particular field and I congratulate Drs. Shennib, Landreneau, and Mack on their work and on their presentation.

**DR. ALDEN H. HARKEN (Denver, Colorado):** I also applaud these kinds of studies and would echo the sentiments of the previous two discussants.

You indicated that you demonstrated no mediastinal lymph node involvement by computed tomography scan and so, much like the previous discussant, I would request your indications for mediastinoscopy or mediastinal staging by mediastinoscopy. Did you, at the time of thoracoscopic evaluation, ever attempt to evaluate regional lymph nodes?

Ultimately, I think we're going to be held accountable to try and determine whether this is or isn't better or more effective therapy. If you can take this kind of patient and resect pulmonary nodules with a hospital stay of 6.5 days, I think we're going to have to ask, "What's the trade-off and is this an adequate resection?"

My sense is with that kind of hospital stay, we're going to be encouraged or pushed into this kind of minimalist therapy. If so, what is your control group? You indicate that the 5-year survival rate for T-1, NO, MO, stage 1 lung cancer is 68%; there is perhaps a 5-year survival rate of 20% if radiation therapy is the only therapy. Is it permissible to say that the radiation therapy really didn't do anything, and therefore that's the control group?

How many of those patients died of their lung cancer? My worry is that many patients of this high-risk group are dying of something else. If they've got end-stage lung disease/end-stage cardiac disease and the reason for your therapy is to prolong life from the lung cancer, how many members of the high-risk

group really have their quality of life modified by a T-1, NO, MO lung cancer?

Again, I think this is a very important outcome investigation.

**DR. TOM R. DEMEESTER (Los Angeles, California):** I rise to comment regarding the study that the authors referred to, that is, the study by the Lung Cancer Study Group on the randomized comparison between open lobectomy and wedge resection for carcinoma of the lung. There are findings from this study that are applicable to the authors' report beyond what they have alluded to. I wish Dr. Ginsberg were here to comment on this.

I think there are three findings that came out of that study that are pertinent to the procedure that the authors have reported. They alluded to one: the higher incidence of local recurrence in those who had a wedge resection. The authors seem to accept this higher incidence on the basis that the technique is useful for people who have poor pulmonary function. But there were two other important factors that came out in the study by the Lung Cancer Study Group.

First, there were a number of patients who were selected to enter the study who were subsequently found, despite extensive preoperative studies, to have at open operation hilar lymph node involvement and were excluded from the study. They accounted for a high percentage of those who were accepted into the study. If we implement this kind of technology, it is critical we just don't accept patients for this type of procedure without thorough operative staging. How will that be done thoroscopically is of concern. I wish the authors would comment on this.

The second observation that came out of the study was that, after a year's time, there was no difference in pulmonary function between those who had a lobectomy and those who had a wedge resection. So, long-term, there appears to be no real benefit in doing a lesser procedure as far as pulmonary function is concerned. Perhaps there is a benefit in the immediate post-operative recovery period, but certainly not long-term. I'd like to have the authors comment on this.

**DR. GEORGE A. HIGGINS (Santa Barbara, California).** Almost 20 years ago we published our experience with a small number of patients having minimal pulmonary resection for small peripheral lung cancer. In more than 3000 resections for lung cancer done by the Veterans Administration Surgical Oncology group, 40 patients had minimal resection (wedge or segmental) mostly because of marginal pulmonary function contraindicating more extensive resection (Shields TW, Higgins GA. Minimal pulmonary resection in treatment of cancer of the lung. *Arch Surg* 1974; 108: 420-422). In the 29 resections considered potentially curative, 8 patients survived for more than 5 years and an additional 9 died during that interval without evidence of recurrent tumor (survival figures similar to the entire series). This led us to conclude that minimal pulmonary resection may be considered an acceptable procedure in rigidly selected patients, and also that minimal but complete resection of small peripheral lung cancer lesions could be curative in good risk patients. There are a number of reports in the literature citing similar results.

This is certainly a radical reversal of the early teaching that even small lesions should be treated by pneumonectomy and,

at first glance, this concept would seem to violate all traditional concepts of cancer surgery. However, the evolution, or possibly better the revolution, of thinking in the management of breast cancer from routine radical mastectomy to lumpectomy might suggest careful consideration and assessment of this approach suggested by Dr. Shennib and his associates for lung lesions.

DR. H. SHENNIB (Closing discussion): I appreciate the amount of discussion that this paper has brought up.

I appreciate the comment by Dr. Higgins in which he emphasizes that the crux of the matter is the biology of the cancer that will determine the long-term outcome rather than the interventions that one would do.

I don't like to read too much out of this article. I think this is a study that specifically addresses the role of wedge resection in a selected population that is high risk and that otherwise would not have had a better treatment option (*i.e.*, radiotherapy or expectant therapy). At this point, I would not advocate limited resection for patients who would otherwise tolerate a larger lung resection, simply because we don't have any data to suggest that it would be better.

In regard to Dr. DeMeester's question relating to the associated mortality and morbidity, I think one recognizes clearly that even though pulmonary functions level off and become the same on long-term, it is the early morbidity that determines which operation a patient can tolerate. I believe that earlier on, at least from this study, these high-risk patients have tolerated this procedure quite well with a mortality rate of about 3.3%.

This substantiates its safe role in the treatment of those patients.

I think it is very important to stage the patients properly. I agree that in this group of patients we've attempted to assume that computed tomography scan would stage the mediastinum and then we went on to do sort of an ipsilateral thoracoscopic exploration and sampling. I do not believe that this would give us all the answers as far as staging, and if a study is attempted to address this very carefully, it has to include proper mediastinal staging. Nevertheless, I think we always will have a problem staging intralobar and lobar lymph nodes in any type of limited procedure that we're addressing.

The next question I'd like to address is what type of lesions we are dealing with.

It is quite true that not all of those nodules that we've taken out were cancers. In fact, we have identified 36 patients who are high risk and who underwent the thoracoscopic resection. The mortality and the morbidity are the same. If anything, they should be even less with the higher risk group of patients. One can see from the slide that only 31 lung cancers were identified; the remainder were granulomas and one was a lymphoid aggregate. So again, the procedure is relatively safe and can address both the issue of diagnosis and definitive resection.

I don't know if I've answered all the questions, but I believe that we could advocate this procedure only for high-risk patients. I would not propose it for patients who could tolerate a larger operation. This is only a technique that would be added to our armamentarium as surgeons, it is not an alternative to thoracotomy and resection at this time.