Open Lung Biopsy for Diffuse Disease in Patients With and Without Previously Transplanted Solid Organs

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Background. **Studies on whether surgical lung biopsy (SLB) modifies the treatment of patients with diffuse lung disease are conflicting, and information is limited on whether it alters treatment in solid-organ transplant recipients. Our objective was to determine and compare the rate of treatment change after SLB for diffuse lung disease in patients with and without a history of solid-organ transplantation.**

Methods. **Patients undergoing SLB for diffuse lung disease between March 2004 and March 2009 were identified. A retrospective review was performed.**

Results. **Sixty patients had SLB. Thirty-four patients (57%) had solid-organ transplantation. Twenty of 60 patients (33%) had a change in treatment as a result of the findings of the SLB. No significant differences in the treatment change rate were found between the transplant and nontransplant groups (10 of 34 versus 10 of 26; $p = 0.46$). Transplant patients were more likely to be on mechanical ventilation at the time of SLB (12 of 34 versus 3 of 26; $p = 0.03$). Mechanical ventilatory support at the time of SLB was associated with increased postoperative complications (odds ratio, 6.20; 95% confidence interval [CI], 1.70 to 22.66; $p = 0.006$) and in-hospital mortality (odds ratio, 9.75; 95% CI, 2.54 to 37.38; $p = 0.001$). Being on mechanical ventilation (hazard ratio, 3.91; 95% CI, 1.40 to 10.93; $p = 0.009$), a diagnosis of cancer (hazard ratio, 13.20; 95% CI, 2.87 to 60.78; $p = 0.001$), and a history of solid-organ transplantation (hazard ratio, 5.52; 95% CI, 1.08 to 28.14; $p = 0.04$) were independent predictors of survival.**

Conclusions. **Surgical lung biopsy changes treatment in one third of patients, with no significant difference between patients without transplantation and solid-organ transplant recipients. Patients who undergo SLB while on mechanical ventilation have a significantly increased risk of postoperative complications and death.**

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Diffuse lung disease (DLD) includes a wide variety of heterogeneous lung diseases characterized by lung injury and varying patterns of inflammation and fibrosis. Causes include infectious, inflammatory, neoplastic, drug-induced, environmental, and other conditions [1]. According to the American Thoracic Society and European Respiratory Society joint statement on idiopathic interstitial pneumonias, surgical lung biopsy (SLB) is advised when the clinical picture and high-resolution computed tomography (CT) are not typical of idiopathic pulmonary fibrosis [2]. However, studies have not consistently shown whether SLB is useful to define the treatment of patients with DLD [3–5]. Furthermore, little data have been published about the value of SLB in adult patients with DLD and a history of solid-organ transplantation [6–8]. Surgical lung biopsy could be useful to define treatment in patients who underwent solid-organ transplantation and also have DLD as they can present a wide variety of causes of DLD. Because SLB has been associated with significant morbidity and mortality rates [9, 10], it is of utmost importance to recognize to what extent it alters the treatment of patients with DLD and to determine whether there is any difference in solid-organ transplant patients.

The primary objective of our study was to determine the rate of treatment change after SLB for DLD and compare the results between two groups: patients who underwent solid-organ transplantation and patients without organ transplantation.

Patients and Methods

The study was approved by the institutional review board at the Favaloro Foundation.

The medical records of all patients who underwent SLB between March 2004 and March 2009 were reviewed. Data collected and analyzed included patient demographics, radiographic findings, operative reports, patho-

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logic and microbiologic results, and change in therapy after SLB.

Radiology

Computed tomography scans were reviewed by a team composed of a chest radiologist, a pulmonologist, and a thoracic surgeon and were classified into five different patterns: (1) reticular pattern, characterized by diffuse linear opacities with or without associated honeycombing; (2) nodular pattern, in which micronodules were seen in association with linear opacities along the bronchovascular bundles; (3) cystic changes, in cases in which cystic air-filled spaces predominated in the radiology; (4) ground glass opacities described as hazy opacities of the lung that still allow visualization of the pulmonary vessels; and (5) consolidation pattern that was defined as opacity obscuring the underlying vessels [11]. More than one pattern could coexist in the same patient.

Operative Procedure

Surgical lung biopsy was performed in the operating room under general anesthesia. Patients with prior surgical procedures in the thorax were biopsied by thoracotomy, whereas patients without prior lung surgery were operated on by means of video-assisted thoracoscopic surgery (VATS). Surgical staplers were used to perform the biopsies, and two lung biopsies from different lobes were taken. Zones with honeycombing were avoided. Patients were extubated in the operating room, except for those who were on mechanical ventilation before the procedure.

Histopathology

Biopsy specimens were fixed in formaldehyde solution, serially sectioned, and stained with hematoxylin and eosin. According to the findings on these sections, cytomegalovirus immunoperoxidase, acid-fast bacilli, Orcein-Giemsa stains for elastic tissue, and trichrome stains for collagen tissue were used. Lung tissue was also sent for microbiologic analysis.

Surgical lung biopsy slides were reviewed by two pathologists (C.V. and P.G.) without knowledge of clinical or radiographic data. Diagnoses were made by using criteria outlined in the American-European consensus statement on idiopathic interstitial pneumonias when applicable [2].

Definition of Change in Therapy

Change in therapy was defined as a new treatment started as a consequence of the pathologic or microbiologic findings in the SLB. The discontinuation of therapy was not considered a change in therapy.

Follow-Up

Patients were observed from the time of surgery until death or until May 2009. Follow-up information was obtained during routine ambulatory visits, but also by telephone contact with patients.

Definition of Mortality

Perioperative mortality was defined as mortality within 5 days of SLB. In-hospital mortality was defined as deaths that occurred after postoperative day 5 and before hospital discharge. Survival was calculated using the time of death or last time seen on follow-up.

Statistical Analysis

Continuous variables were presented as mean (±standard deviations) or median (25th to 75th interquartile ranges) and categorical variables as percentages of all patients. Differences between continuous variables were assessed with the Student's t test or Mann-Whitney U test, when applicable. The χ^2 or Fisher's exact test were used to compare categorical variables.

Logistic regression was performed to identify predictors of complications and perioperative and in-hospital mortality. Univariate Cox proportional hazards regression analyses were used to calculate the hazard ratios with 95% confident intervals (CI) for factors associated with survival. The starting date for this analysis was postoperative day 6. Variables identified in the univariate analysis with a probability value of 0.05 or less were included in the multivariable model. The Kaplan-Meier survival method was used to estimate patient survival, and the log-rank test to assess associations between potential risk factors and survival [12, 13]. We considered probability values of less than 0.05 to be statistically significant. SPSS software, version 17.0 (SPSS Inc, Chicago, IL) was used for all analyses.

Results

Sixty patients underwent SLB during the study period. Baseline demographics are shown in Table 1. Thirty-four patients (57%) had a history of a solid-organ transplant. Fourteen were lung transplants (41%), 8 patients had kidney transplants (23%), 6 had heart transplants (18%), 5 had heart-lung transplants (15%), and 1 patient had a liver transplant (3%). The median elapsed time from the time of transplantation to SLB was 1,290 days (279 to 2,043 days). The median follow-up time was 164.64 days (35 to 696 days).

Change in Therapy, Radiologic and Histopathologic Findings

Twenty of 60 patients (33%) had a change in their treatment after SLB. There was no significant difference in the rate of change in therapy between patients without transplantation and patients who underwent solid-organ transplantation. Differences between the two groups are shown in Table 2. Change in therapy was less likely in patients on mechanical ventilation at the time of the SLB (2 of 15 or 13% versus 18 of 45 or 40%; $p = 0.05$).

The radiographic patterns are shown in Table 1. A trend to initiate a new treatment was found when the radiologic pattern was nodular (7 of 13 or 54% versus 13 of 47 or 28%; $p = 0.07$). Infectious pneumonia was associated with a consolidation pattern (4 of 7 or 57% versus 6 of 53 or 11%; $p = 0.01$). Pathologic results are presented in Table 3.

Table 1. Demographics

Characteristic	All Patients (n = 60)	Patients Without History of Solid-Organ Transplantation (n = 26)	Patients With History of Solid-Organ Transplantation (n = 34)	*p* Value
Demographic variable				
Age (y), mean ± SD	48.3 ± 16.7	48.1 ± 16.8	48.5 ± 16.8	0.93
Sex (females), n (%)	33 (55)	16 (48)	17 (51)	0.26
CT scan findings				
Reticular pattern, n (%)	25 (42)	9 (35)	16 (47)	0.33
Nodular pattern, n (%)	13 (22)	5 (19)	8 (23)	0.68
Cystic pattern, n (%)	5 (8)	5 (100)	0 (0)	0.01
Ground glass opacities, n (%)	19 (32)	9 (35)	10 (29)	0.66
Consolidation, n (%)	7 (12)	1 (4)	6 (18)	0.12
Symptoms				
None, n (%)	2 (3)	2 (8)	0 (0)	0.18
Fever, n (%)	24 (40)	6 (23)	18 (53)	0.01
Dyspnea, n (%)	43 (72)	17 (65)	26 (76)	0.34
Cough, n (%)	9 (15)	3 (11)	6 (18)	0.71
Bronchorrhea, n (%)	5 (8)	1 (4)	4 (12)	0.37
Pneumothorax, n (%)	4 (7)	4 (15)	0 (0)	0.03
Onset of symptoms to surgery, median in days (range 25–75)	20 (10–75)	90 (10–180)	15 (10–20)	0.01
Indication for surgery				
Need for diagnosis, n (%)	42 (70)	24 (92)	18 (53)	0.001
No improvement on implemented treatment, n (%)	18 (30)	2 (8)	16 (47)	0.001
Mechanical ventilation at the time of surgery, n (%)	15 (25)	3 (11)	12 (35)	0.03

CT = computed tomography.

Postoperative Complications, Perioperative and In-Hospital Mortality

Postoperative complications were observed in 11 of 60 patients (20%; Table 2). They were more common in patients on mechanical ventilation at the time of the biopsy (6 of 13 or 46% versus 5 of 43 or 12%; $p = 0.01$). Logistic regression analysis identified mechanical ventilation as the only factor associated with postoperative complications (odds ratio, 6.20; 95% CI, 1.69–22.65; $p = 0.006$). Perioperative mortality was 7% (4 of 60). None of

Table 2. Surgical Outcomes

SLB Outcomes	All Patients (n = 60)	Patients Without History of Solid-Organ Transplantation (n = 26)	Patients With History of Solid-Organ Transplantation (n = 34)	*p* Value
VATS-SLB, n (%)	36 (60)	21 (81)	15 (44)	0.004
Infection as a diagnosis from SLB, n (%)	14 (23)	1 (4)	13 (38)	0.002
Cancer as a diagnosis from SLB, n (%)	7 (12)	5 (19)	2 (6)	0.22
Change in treatment after SLB, n (%)	20 (33)	10 (38)	10 (29)	0.46
Perioperative mortality (within 5 days of SLB), n (%)	4 (7)	2 (8)	2 (6)	1
In-hospital death (perioperative deaths excluded), n (%)	11 (20)	2 (8)	9 (28)	0.09
Postoperative complications, n (%)	11 (20)	2 (8)	9 (28)	0.09
Respiratory failure, n (%)	3 (5)	0 (0)	3 (9)	0.25
Sepsis, n (%)	3 (5)	0 (0)	3 (9)	0.25
Prolonged air leak, (%)	3 (5)	1 (4)	2 (6)	1
Pneumothorax, (%)	3 (5)	1 (4)	2 (6)	1
Other complications, n (%)	3 (5)	0 (0)	3 (9)	0.25
Length of stay, median in days (range 25–75)	7 (4–16)	4 (3–7)	15 (7–36)	<0.001

SLB = surgical lung biopsy; VATS = video-assisted thoracoscopic surgery.

Table 3. Pathologic Results

Pathology	All Patients (n = 60)	Patients Without History of Solid-Organ Transplantation (n = 26)	Patients With History of Solid-Organ Transplantation (n = 34)	*p* Value
Pneumonia				
Viral pneumonia, n (%)	7 (12)	0 (0)	7 (21)	0.01
Bacterial pneumonia, n (%)	3 (5)	0 (0)	3 (9)	0.25
Mycobacterium pneumonia, n (%)	1 (2)	0 (0)	1 (3)	1
Organizing pneumonia, n (%)	21 (35)	4 (15)	17 (50)	0.005
Unspecific inflammation, n (%)	6 (10)	2 (8)	4 (12)	0.68
Granulomatous				
Tuberculosis, n (%)	2 (3)	1 (4)	1 (3)	1
Histoplasmosis, n (%)	1 (2)	0 (0)	1 (3)	1
Sarcoidosis, n (%)	1 (2)	1 (4)	0 (0)	0.43
Idiopathic interstitial pneumonias				
Interstitial fibrosis, n (%)	9 (15)	9 (35)	0 (0)	<0.001
Other forms of DLD				
Histiocytosis X, n (%)	1 (2)	1 (4)	0 (0)	0.43
Lymphangioleiomyomatosis, n (%)	1 (2)	1 (4)	0 (0)	0.43
Cancer				
Lymphoma, n (%)	3 (5)	2 (8)	1 (3)	0.57
Carcinoma, n (%)	3 (5)	2 (8)	1 (3)	0.57
Neuroendocrine, n (%)	1 (2)	1 (4)	0 (0)	0.43
Lung transplant pathology				
Acute rejection, n (%)	9 (15)	0 (0)	9 (26)	
Obliterans bronchiolitis, n (%)[a]	8 (13)	0 (0)	8 (23)	
Others, n (%)	3 (5)	3 (11)	0 (0)	0.076

[a] Although bronchiolitis obliterans is recognized in patients without a history of transplantation, all our cases were in lung transplant patients.

DLD = diffuse lung disease.

the factors analyzed by logistic regression were associated with perioperative mortality. In-hospital mortality occurred in 11 patients (20%) and it was significantly higher in patients on mechanical ventilation (7 of 13 or 54% versus 4 of 43 or 9%; $p = 0.002$). Transplant patients had higher in-hospital mortality, but the difference was not statistically significant (9 of 32 or 28% versus 2 of 24 or 8%; $p = 0.09$). Surgical lung biopsy in transplant patients on mechanical ventilation had an in-hospital mortality of 45% (5 of 11 versus 6 of 45; $p = 0.02$). The presence of mechanical ventilation was the only factor associated with in-hospital mortality at logistic regression (odds ratio, 9.75; 95% CI, 2.54–37.37; $p = 0.001$).

The thoracotomy patient group had higher number of postoperative complications (7 of 22 or 32% versus 4 of 34 or 12%; $p = 0.06$) and in-hospital mortality (7 of 22 or 32% versus 4 of 34 or 12%; $p = 0.06$) than the VATS patient group, but the differences were not statistically significant.

Survival

The mean survival was 2.95 years (95% CI, 2.37 to 3.54; Fig 1A) and was significantly longer for patients without organ transplantation (3.93 years; 95% CI, 3.3 to 4.56 versus 2.36 years; 95% CI 1.60 to 3.13; $p = 0.03$; Fig 1B). Patients who were on mechanical ventilatory support at the time of SLB had worse mean survival than patients who were not (1.17 years; 95% CI, 0.22 to 2.11 versus 3.49 years; 95% CI, 2.89 to 4.08; $p < 0.001$; Fig 1C) as well as patients with postoperative complications (1.71 years; 95% CI, 0.32 to 3.10 versus 3.23 years; 95% CI, 2.61 to 3.85; $p = 0.04$; Fig 1D). There was not a significant difference in survival between patients who had their treatment changed as a result of the SLB and those who did not.

Univariate analysis identified the following as adverse prognostic factors of survival: presence of solid-organ transplantation, consolidation pattern on CT scan, being on mechanical ventilatory support at the time of the SLB, and pathologic diagnosis of cancer. Multivariate analysis reveled that being on mechanical ventilation, a diagnosis of cancer, and the presence of solid-organ transplantation were the only three independent adverse predictors of survival (Table 4).

Comment

Surgical lung biopsy is considered the best method for reaching a correct and specific diagnosis in DLD [14]. However, despite advances in surgical techniques, particularly the adoption of thoracoscopy, SLB still has substantial morbidity and mortality [9, 10]. The rate of treatment change after SLB varies in the literature from 8% to almost 85% [3–5, 8, 15]. However, none of the series reported in the literature have compared the rate of

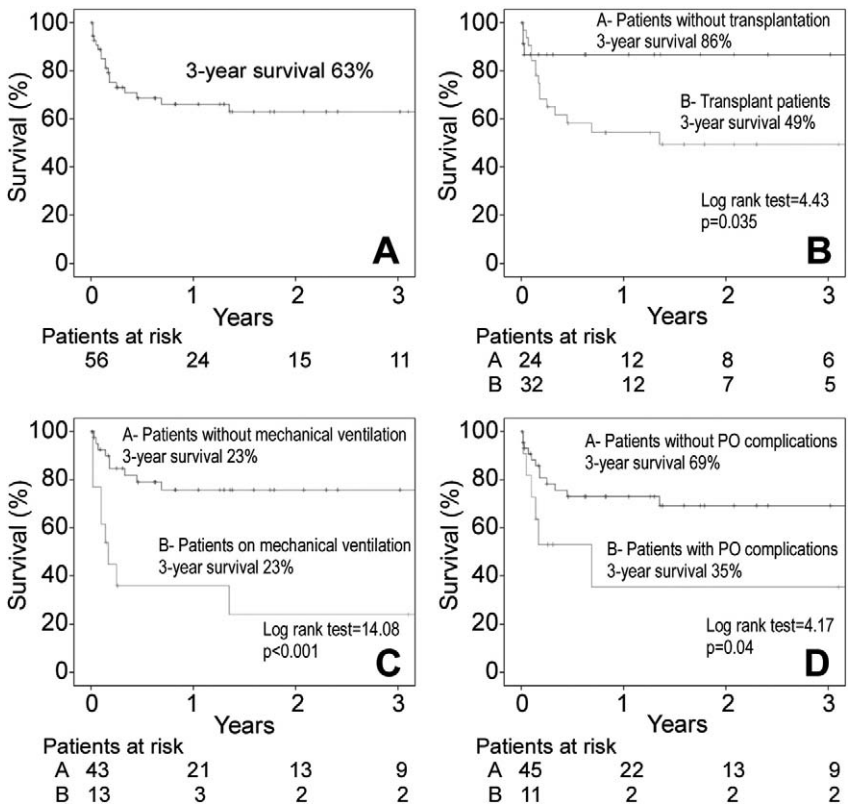

Fig 1. Survival curves. (A) Overall survival. (B) Survival in patients with and without a history of solid-organ transplantation. (C) Survival in patients with and without mechanical ventilation at the time of surgical lung biopsy. (D) Survival in patients with and without postoperative (PO) complications.

treatment change in solid-organ transplant recipients and patients without transplantation.

We hypothesized that SLB was useful to define and select an appropriate treatment in transplant patients as they could have a wide variety of lung diseases that can manifest as DLD. Surgical lung biopsy changed therapy in 33% of our patients. However, there was not a significant difference in the rate of treatment change between transplant patients and patients without transplantation. Lee and colleagues [5] reported a treatment change in 84.2% of 196 patients after SLB, with no significant differences between immunocompromised patients and those who were not immunocompromised. However, few patients listed as immunocompromised were transplant recipients; most of them were patients with neoplastic diseases. Kramer and associates [4] reported a change of therapy 29% of the times in immunocompromised patients from a variety of conditions versus 8% in those who were not immunocompromised, and Chaparro and coworkers [8] described a 30% treatment change after SLB in a cohort of lung transplant patients. Several new points emerged from our study as none of the other previous reports addressed treatment change after SLB in solid-organ transplantation [16, 17]. Solid-organ transplant patients in our series were pharmacologically immunosuppressed and they represent a different subset of patients from those with neoplastic diseases, granulomatous disorders, and other conditions that could also cause immunosuppression.

Solid-organ transplant recipients are frequently receiving several medications for different conditions they may experience, a situation that makes a treatment change less likely. We did not consider stopping a medication or a treatment change owing to the significant morbidity SLB could cause [9, 10, 18]. We do not think surgery should be done routinely to discontinue a medication. Special cases must be considered, as for example stopping a toxic drug, but we did not have any case like this in our series.

The different rates in treatment change and pathologic findings after SLB reflect a selection bias of patients referred for biopsy at each institution. At the Favaloro Foundation, high-resolution CT scan is routinely performed on every patient with a history of organ transplantation and new respiratory symptoms. If high-resolution CT findings are positive, bronchoscopy is usually carried out, and the treatment is tailored and initiated according to the findings and possible causes. If the microscopic and microbiologic studies in the lung samples are negative and no improvement is observed in the patient's symptoms or radiology, SLB is performed. For this reason, the duration of symptoms was significantly lower in transplant patients. In contrast, SLB is performed later in the course of the disease in patients without transplantation. They usually present with chronic or subacute symptoms, and SLB is considered later in the evolution of the disease. Therefore, pathologic results should be interpreted having these considerations in mind as they reflect local patterns of practice.

Littieri and colleagues [18] reported a 90-day mortality of 60% in patients who were on mechanical ventilatory support at the time of SLB, and these patients were 21.9

Table 4. Prognostic Variables of Mortality

	Univariate (Cox)		Multivariate (Cox)	
Variable	HR (95% CI)	*p* Value	HR (95% CI)	*p* Value
Clinical characteristics				
Age	0.99 (0.97–1.03)	0.88		
Sex (male)	1.26 (0.50–3.20)	0.62		
History of solid-organ transplantation	3.46 (1–11.97)	0.05	5.68 (1.10–29.40)	0.038
VATS-SLB	0.42 (0.16–1.08)	0.07		
CT scan findings				
Reticular pattern	1.97 (0.77–5.01)	0.15		
Nodular pattern	0.03 (0–2.46)	0.11		
Cystic pattern	0.042 (0–30.97)	0.34		
Ground glass opacities	1.70 (0.65–4.41)	0.27		
Consolidation pattern	3.01 (1.06–8.52)	0.03	1.67 (0.54–5.17)	0.370
Mechanical ventilatory support at the time of surgery	5.02 (1.96–12.8)	0.001	3.42 (1.17–9.95)	0.024
Pathologic diagnosis				
Pneumonias	1.43 (0.55–3.69)	0.45		
Unspecific inflammation	0.72 (0.097–5.5)	0.76		
Granulomatous	0.045 (0–167)	0.45		
Interstitial fibrosis	0.38 (0.05–2.88)	0.35		
Cancer	3.37 (1.09–10.36)	0.03	14.51 (3.01–70.06)	0.001
Acute rejection	1.89 (0.67–5.32)	0.22		
Bronchiolitis obliterans	1.01 (0.29–3.51)	0.97		

CI = confidence interval; CT = computed tomography; HR = hazard ratio; SLB = surgical lung biopsy; VATS = video-assisted thoracoscopic surgery.

times more likely to die after surgery. Other series have not included patients on mechanical ventilation for SLB [5, 10, 19]. However, some reports have shown that SLB is relatively safe in patients with diffuse pulmonary infiltrates on mechanical ventilatory support and even led to a change in treatment in 64% of patients [20]. In our study, mechanical ventilation was significantly associated with increased rates of postoperative complications, in-hospital mortality, and a 3-year survival of only 23%. Transplant patients on mechanical ventilation had an in-hospital mortality of 45%. Moreover, the likelihood of affecting treatment in patients on mechanical ventilation was considerably lower than in those without it. For these reasons, we believe that SLB should be discouraged in a patient on mechanical ventilation, especially in the transplant patient.

A consolidation pattern on CT scan was associated with pneumonia and was identified as an adverse prognostic factor of survival in univariate analysis. The diagnostic possibilities and outcomes should be taken into account when considering SLB in a patient with consolidation pattern in CT. Micronodules could be the nest for fungi, mycobacteria, or some other infection. Our data suggest that SLBs should be targeted to these sites whenever possible, as starting a new treatment was more likely when the radiologic pattern was nodular.

Organizing pneumonia was the most frequent microscopic diagnosis in transplant patients. Organizing pneumonia is a nonspecific histopathologic pattern characterized by polypoid intraluminal plugs of proliferating fibroblasts and myofibroblasts within alveolar ducts and airspaces [21]. Although organizing pneumonia could represent a prior infection, we were not able to identify any specific cause in most of our patients. Similarly, other authors have reported the majority of the organizing pneumonia cases as being cryptogenic [21, 22]. The most frequent diagnosis in patients without transplantation was interstitial fibrosis. This is similar to what other investigators have reported [3].

We found three variables to be independent adverse factors of survival: patients on mechanical ventilation at the time of SLB, a history of solid-organ transplantation, and a diagnosis of cancer from the SLB. The first variable reflected the seriousness of DLD in a patient with respiratory failure requiring ventilatory support and also predicted in-hospital mortality, whereas the second and third variables affected the long-term prognosis of these patients. Of note, there was no significant difference in the survival of patients who had their treatment changed after SLB and those who did not.

With the advent of VATS-SLB, the referrals for SLBs have increased [3, 23, 24]. This may reflect the referring clinicians' belief that with a less-invasive surgical technique, there may be reduced pain and improved lung function in the postoperative period. Video-assisted thoracoscopic surgery may also be perceived to have a lower risk of postoperative complications and mortality. However, the literature does not report any significant differences between thoracotomy and VATS-SLB [24]. Although our study was not intended to compare VATS

versus thoracotomy, the complication rate and in-hospital mortality were lower with VATS. The thoracotomy patients were more likely to be transplant or mechanically ventilated patients. We think these accounted for the higher complication rate and in-hospital mortality observed rather than the surgical approach itself.

The limitations of our study include the retrospective nature, the small number of patients, and the selection bias that is a consequence of our practice. These limitations should be recognized when interpreting our results. A prospective trial designed to address how many times SLB changes the treatment of patients with DLD and whether it affects long-term survival would be useful to formulate specific recommendations regarding patient selection for SLB.

In summary, SLB alters treatment in one third of the patients, with no significant difference between patients with and without a history of solid-organ transplantation. Surgical lung biopsy is not recommended for patients on mechanical ventilatory support, especially if they are transplant patients. A judicious clinical evaluation is necessary to decide whether to perform SLB. The potential benefits of having useful information to affect the treatment should be carefully weighed against the risks of the procedure.

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DISCUSSION

DR SCOTT J. SWANSON (Boston, MA): In your abstract it suggests that you more often got a specific diagnosis with transplanted patients, I think 59 versus 35, at a 0.06 level, so that's almost significant.

DR DEFRANCHI: Can you repeat those numbers again? Maybe I mentioned that and I was not explicit in the numbers.

DR SWANSON: In the abstract it says a specific diagnosis was made in 59% of transplanted patients versus 35%.

DR DEFRANCHI: Yes.

DR SWANSON: So it seems like the transplanted patients more often got a specific diagnosis.

DR DEFRANCHI: It was almost significant, but in those patients finding a specific diagnosis does not always translate into a treatment change; I think this is because when those patients get their biopsy, they are already treated for everything that is likely. So you may find a specific diagnosis on them, but . . .

DR SWANSON: It's already treated.

DR DEFRANCHI: That's correct.

DR ARA VAPORCIYAN (Houston, TX): This is a great paper for a very difficult problem. In our cancer center we obviously see a lot of this problem.

I have two questions. One interpretation or definition of a change in therapy may be the withdrawal of therapy to allow the patient to die. Was that included in the definition of a change in therapy?

DR DEFRANCHI: That's a very good question. We didn't consider discontinuing therapies as a change in treatment. We did consider a change in therapy when the treatment to be discontinued was especially toxic, but we didn't have any of those cases. We don't think surgery should be done just to adjust an antibiotic treatment or to withdraw a treatment to allow a patient to die. We try to define those cases without the need of surgical lung biopsy.

DR VAPORCIYAN: The second question has to do with the impact of a change in therapy. Did you see a difference in survival in the patients whose biopsy resulted in a change in therapy, or was it irrelevant for the overall survival?

DR DEFRANCHI: That's another very good question too. We didn't find any difference in survival between patients who did have a change in therapy and the ones who did not.

DR VAPORCIYAN: Thank you.

The Society of Thoracic Surgeons: Forty-Seventh Annual Meeting

Mark your calendars for the Forty-Seventh Annual Meeting of The Society of Thoracic Surgeons (STS) to be held at the San Diego Convention Center, San Diego, California, from January 31–February 2, 2011. Come to San Diego to learn from the experts, network with colleagues from around the world, and prepare for whatever the future may hold. This pre-eminent educational event in cardiothoracic surgery is open to all physicians, residents, fellows, engineers, perfusionists, physician assistants, nurses, or other interested individuals. Meeting attendees will be provided with the latest scientific information for practicing cardiothoracic surgeons. Attendees will benefit from traditional Abstract Presentations, as well as Surgical Forums, Breakfast Sessions, Surgical Motion Pictures, and Wet Lab sessions. Parallel sessions on Monday and Tuesday will focus on specific subspecialty interests.

An advance program with a registration form, hotel reservation information, and details regarding spouse/guest activities will be mailed to STS members this fall. Nonmembers may contact the Society's secretary, David A. Fullerton, MD, to receive a copy of the advanced program; however, detailed meeting information will be available on the STS website at www.sts.org.

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