Interstitial Lung Disease: Towards an early and accurate diagnosis

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Disclosures

• Grants to study Genomic Predictors of IPF Outcomes
  • National Institutes of Health (NHLBI)
  • American Thoracic Society
  • American Lung Association

• Grant to study early ILD detection
  • UC-Davis Gordon Wong endowment

• IPF Consulting
  • Genentech
  • Boehringer Ingelheim
Objectives

• Appreciate why an accurate ILD diagnosis is important

• Understand why appropriate ILD therapy is critical

• Improve early ILD detection at your institution
Do we really need to spend all this time and energy correctly classifying an ILD?

“They have pulmonary fibrosis: who cares what caused it.”

Yes!

Interstitial lung disease

Etiology known

Inorganic exposure
- Asbestos
- Silica
- Hard metals
- Coal dust

Organic exposure
- Birds
- Hay
- Mold
- Mycobacteria

Smoking
- DIP
- RB-ILD
- LCH

Rare forms of ILD
- LAM
- Vasculitis

Connective tissue disease
- Rheumatoid arthritis
- Polymyositis/dermatomyositis
- Scleroderma
- Sjögren syndrome

Granulomatous
- Sarcoidosis

Idiopathic interstitial pneumonias

IDIopathic
- IPF
- Non-IPF

NSIP
- COP
- LIP
- AIP


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Not all pulmonary fibrosis is created equal

Would you want to be told that you have:

~10 years to live, when you actually have ~3?

~3 years to live, when you have ~10?
Not even all UIP is created equal!

UIP is a pattern, not a diagnosis. Identifying the ILD subtype leading to UIP has prognostic importance and treatment implications.

IPF-UIP

RA-UIP

SSc-UIP

CTD-UIP

IPF-UIP

UCDAVIS

Strand et al. Chest 2015
Just give them steroids…
Outcomes of immunosuppressive therapy in chronic hypersensitivity pneumonitis

Ayodeji Adegunsoye¹, Justin M. Oldham², Evans R. Fernández Pérez³, Mark Hamblin⁴, Nina Patel⁴, Mitchell Tener⁴, Deepa Bhanot⁶, Lacey Robinson⁵, Sam Bullick², Lena Chen¹, Scully Hsu¹, Matthew Churpek¹, Donald Hederer⁶, Steven Montner⁷, Jonathan H. Chung⁷, Aliya N. Husain⁸, Imre Noth¹, Mary E. Strek¹,⁹ and Rekha Vij¹,⁹

**FIGURE 3** Trend of forced vital capacity (FVC) in the disease-modifying drug (DMD) subgroup by therapy administered. Within the DMD subgroup of chronic hypersensitivity pneumonitis patients who had previously received prednisone (PRED), administration of mycophenolate mofetil or azathioprine therapy significantly altered the slope of monthly FVC decline (−0.7% versus −0.2%, p=0.001). Data analysed using mixed regression model.
Use of Mycophenolate Mofetil or Azathioprine for the Management of Chronic Hypersensitivity Pneumonitis

Julie Morisset, MD; Kerri A. Johannson, MD; Eric Vittinghoff, PhD; Carlos Aravena, MD; Brett M. Elicker, MD; Kirk D. Jones, MD; Charlene D. Fell, MD; Helene Manganas, MD; Bruno-Pierre Dubé, MD; Paul J. Wolters, MD; Harold R. Collard, MD, FCCP; Christopher J. Ryerson, MD; and Brett Ley, MD

Figure 4 – Mixed-effects model estimates for FVC % predicted and DLCO % predicted before and after initiation of azathioprine. The gray shading indicates the 95% CI. See Figure 1 and 2 legends for expansion of abbreviations.
Azathioprine response in patients with fibrotic connective tissue disease-associated interstitial lung disease

Justin M. Oldham a,*, Cathryn Lee b, Eleanor Valenzi c, Leah J. Witt c, Ayodeji Adegunsoye c, Scully Hsu c, Lena Chen c, Steven Montner d, Jonathan H. Chung d, Imre Noth c, Rekha Vij c, Mary E. Strek c

a Department of Medicine, Division of Pulmonary, Critical Care and Sleep Medicine, The University of California at Davis, United States
b Department of Medicine, The University of Chicago, United States
c Department of Medicine, Section of Pulmonary and Critical Care Medicine, The University of Chicago, United States
d Department of Radiology, The University of Chicago, United States
e Department of Medicine, Division of Pulmonary, Allergy and Critical Care Medicine, The University of Pittsburgh, United States

Fig. 2. Longitudinal change in percent predicted FVC (a) and DLCO (b) in a cohort of patients with fibrotic CTD-associated ILD treated with azathioprine and mycophenolate mofetil.
Prednisone, Azathioprine, and N-Acetylcysteine for Pulmonary Fibrosis

The Idiopathic Pulmonary Fibrosis Clinical Research Network©
A Phase 3 Trial of Pirfenidone with Idiopathic Pulmonary Fibrosis

Talmadge E. King, Jr., M.D., Williamson S. Socorro Castro-Bernardini, M.D., Elionian Glaspole, M.B., B.S., Ph.D., Marilyn K. Glaspole, B.S., M.D., Peter M. Hopkins, M.D., David Karatzkern, M.D., David Lederer, M.D., Steven D. Nathan, M.D., Steven A. Sahn, M.D., Robert Sussman, L., and Paul W. Noble, M.D., for the A...

Efficacy and Safety of Nintedanib Pulmonary Fibrosis


The New England Journal of Medicine

Established in 1812

MAY 29, 2013

No. of Patients
Nintedanib 303 301 298 292 284 274 250
Placebo 202 198 200 194 192 187 165

Nintedanib, 150 mg twice daily

Mean Observed Change from Baseline in FVC (mL)

Adjusted mean difference, 109.9 (95% CI, 71.3–148.6)
P<0.001

Week

No. at Risk
Pirfenidone 276
Placebo 273

262 225 192 113
Ok fine, just give them anti-fibrotics…
48 year old female diagnosed with IPF and started on anti-fibrotic

Treated for 9 months with anti-fibrotic prior to evaluation at UCD; symptoms progressive during that time

Diagnosed with anti-synthetase syndrome (PMScl +, Raynauds, mechanics hands, ILD)

Taken off anti-fibrotic and treated with MMF and steroids
75 yo male with 10 year history of ILD diagnosed with IPF and started on anti-fibrotic

- Extensive mold in the home that he regularly cleaned
- Felt better on vacation
- HRCT showed upper lobe predominant disease with areas of central fibrosis and mosaic attenuation
- Bronchoscopy showed 40% lymphocytes

- Diagnosed with chronic HP 12 years after symptom onset and 10 years after initial ILD diagnosis
- Died 4 weeks after ILD center evaluation
Summary

• ILD subtypes progress at highly variable rates

• You will help some ILD subtypes by prescribing steroids/immunosuppression

• You will hurt some ILD subtypes by prescribing steroids/immunosuppression
Do we really need to spend all this time and energy correctly classifying an ILD?

Yes! Yes! Yes! Yes! Yes! Yes!

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- Asbestos
- Silica
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- Scleroderma
- Sjögren syndrome

Granulomatous
- Sarcoidosis

Drugs
- Nitrofurantoin
- Amiodarone
- Methotrexate
- Chemotherapy
Early Detection of ILD

• CT Screening in high-risk groups

• Pulmonary Function Testing in high-risk groups
Reduced Lung-Cancer Mortality with Low-Dose Computed Tomographic Screening

A Lung Cancer

B Death from Lung Cancer
LCS Study Baseline Characteristics

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>Low-Dose CT Group (N=26,722)</th>
<th>Radiography Group (N=26,732)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age at randomization</td>
<td></td>
<td></td>
</tr>
<tr>
<td>&lt;55 yr†</td>
<td>2 (0.1)</td>
<td>4 (0.1)</td>
</tr>
<tr>
<td>55–59 yr</td>
<td>11,440 (42.8)</td>
<td>11,420 (42.7)</td>
</tr>
<tr>
<td>60–64 yr</td>
<td>8,170 (30.6)</td>
<td>8,198 (30.7)</td>
</tr>
<tr>
<td>65–69 yr</td>
<td>4,756 (17.8)</td>
<td>4,762 (17.8)</td>
</tr>
<tr>
<td>70–74 yr</td>
<td>2,353 (8.8)</td>
<td>2,345 (8.8)</td>
</tr>
<tr>
<td>≥75 yr‡</td>
<td>1 (&lt;0.1)</td>
<td>3 (&lt;0.1)</td>
</tr>
<tr>
<td>Sex</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Male</td>
<td>15,770 (59.0)</td>
<td>15,762 (59.0)</td>
</tr>
<tr>
<td>Female</td>
<td>10,952 (41.0)</td>
<td>10,970 (41.0)</td>
</tr>
<tr>
<td>Smoking status</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Current</td>
<td>12,862 (48.1)</td>
<td>12,900 (48.3)</td>
</tr>
<tr>
<td>Former</td>
<td>13,860 (51.9)</td>
<td>13,832 (51.7)</td>
</tr>
</tbody>
</table>

IPF Baseline Characteristics

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>IPF Case Patients (n = 196)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age, y</td>
<td>68.1 ± 8.6</td>
</tr>
<tr>
<td>Male</td>
<td>146 (74.5)</td>
</tr>
<tr>
<td>Race/ethnicity</td>
<td></td>
</tr>
<tr>
<td>White</td>
<td>157 (80.1)</td>
</tr>
<tr>
<td>Black</td>
<td>16 (8.2)</td>
</tr>
<tr>
<td>Hispanic</td>
<td>18 (9.2)</td>
</tr>
<tr>
<td>Asian</td>
<td>5 (2.5)</td>
</tr>
<tr>
<td>BMI</td>
<td>30.2 ± 5.4</td>
</tr>
<tr>
<td>Ever smoker</td>
<td>145 (74)</td>
</tr>
</tbody>
</table>

Age 55-75
Male predominant
Smoking history

High probability that incidental ILD will be picked up by low-dose CT performed for lung cancer screening

Berg et al. NEJM 2011
Oldham et al. Chest 2015
**Evidence of Interstitial Lung Disease on Low-Dose Chest CT Images: Prevalence, Patterns, and Progression**

**TABLE 1: Participants With (n = 63) and Without (n = 888) CT Evidence of Interstitial Lung Disease by Sex, Age, Smoking History, and Degree of Emphysema**

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>Patients With Honeycombing (n = 51)</th>
<th>Patients With Interstitial Lung Disease (n = 47)</th>
<th>Patients Without Interstitial Lung Disease (n = 888)</th>
<th>Total (n = 951)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>No.</td>
<td>%</td>
<td>No.</td>
<td>%</td>
</tr>
<tr>
<td><strong>Sex</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Female</td>
<td>3</td>
<td>0.6</td>
<td>19</td>
<td>3.7</td>
</tr>
<tr>
<td>Male</td>
<td>13</td>
<td>2.9</td>
<td>28</td>
<td>6.3</td>
</tr>
<tr>
<td><strong>Age (y)</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>40–49</td>
<td>0</td>
<td>0.0</td>
<td>0</td>
<td>0.0</td>
</tr>
<tr>
<td>50–59</td>
<td>0</td>
<td>0.0</td>
<td>2</td>
<td>1.6</td>
</tr>
<tr>
<td>60–69</td>
<td>2</td>
<td>0.7</td>
<td>9</td>
<td>3.1</td>
</tr>
<tr>
<td>70–79</td>
<td>8</td>
<td>2.3</td>
<td>22</td>
<td>6.4</td>
</tr>
<tr>
<td>≥80</td>
<td>6</td>
<td>4.1</td>
<td>14</td>
<td>9.5</td>
</tr>
<tr>
<td><strong>Smoking history (pack-years)</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1–9</td>
<td>0</td>
<td>0.0</td>
<td>3</td>
<td>3.4</td>
</tr>
<tr>
<td>10–29</td>
<td>2</td>
<td>0.7</td>
<td>14</td>
<td>4.7</td>
</tr>
<tr>
<td>30–50</td>
<td>8</td>
<td>2.0</td>
<td>16</td>
<td>4.0</td>
</tr>
<tr>
<td>≥80</td>
<td>6</td>
<td>3.7</td>
<td>14</td>
<td>8.6</td>
</tr>
<tr>
<td><strong>Degree of emphysema</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>None</td>
<td>7</td>
<td>0.9</td>
<td>35</td>
<td>4.6</td>
</tr>
<tr>
<td>Any</td>
<td>9</td>
<td>4.9</td>
<td>12</td>
<td>6.6</td>
</tr>
<tr>
<td>Mild</td>
<td>7</td>
<td>4.5</td>
<td>12</td>
<td>7.7</td>
</tr>
<tr>
<td>Moderate</td>
<td>2</td>
<td>9.1</td>
<td>0</td>
<td>0.0</td>
</tr>
<tr>
<td>Severe</td>
<td>0</td>
<td>0.0</td>
<td>0</td>
<td>0.0</td>
</tr>
</tbody>
</table>

*aAll percentages are of the total cohort of 951.*
Interstitial Lung Abnormalities in a CT Lung Cancer Screening Population: Prevalence and Progression Rate

ILA = “early” ILD

ILA = “incidental” ILD

ILA = ILD

Table 1
Demographic Data of Study Participants

<table>
<thead>
<tr>
<th>Characteristics</th>
<th>Overall</th>
<th>No ILA</th>
<th>Equivocal ILA</th>
<th>ILA</th>
<th>$P$ Value*</th>
</tr>
</thead>
<tbody>
<tr>
<td>No. of participants</td>
<td>864</td>
<td>696 (78.7)</td>
<td>102 (11.5)</td>
<td>86 (9.7)</td>
<td>...</td>
</tr>
<tr>
<td>No. of men</td>
<td>524 (59.3)</td>
<td>401 (57.6)</td>
<td>61 (59.8)</td>
<td>92 (72.4)</td>
<td>.011</td>
</tr>
<tr>
<td>Age (y)†</td>
<td>61.5 ± 5.1</td>
<td>61.4 ± 5.0</td>
<td>62.3 ± 5.8</td>
<td>61.6 ± 5.2</td>
<td>.829</td>
</tr>
<tr>
<td>No. 55–59 years</td>
<td>37 (42.4)</td>
<td>297 (42.7)</td>
<td>43 (42.2)</td>
<td>35 (40.7)</td>
<td>...</td>
</tr>
<tr>
<td>No. 60–69 years</td>
<td>416 (47.1)</td>
<td>327 (46.9)</td>
<td>43 (42.2)</td>
<td>46 (53.5)</td>
<td>...</td>
</tr>
<tr>
<td>No. 70–75 years</td>
<td>93 (10.5)</td>
<td>72 (10.4)</td>
<td>16 (15.6)</td>
<td>5 (5.8)</td>
<td>...</td>
</tr>
<tr>
<td>Smoking status</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>.001</td>
</tr>
<tr>
<td>No. current</td>
<td>390 (44.1)</td>
<td>274 (39.4)</td>
<td>57 (55.9)</td>
<td>59 (68.6)</td>
<td>...</td>
</tr>
<tr>
<td>No. former</td>
<td>49 (55.9)</td>
<td>422 (60.6)</td>
<td>45 (44.1)</td>
<td>27 (31.4)</td>
<td>&lt;.001</td>
</tr>
<tr>
<td>Cigarette exposure (pack-years)†</td>
<td>51.9 ± 21.3</td>
<td>51.1 ± 20.4</td>
<td>50.9 ± 17.6</td>
<td>59.9 ± 29.1</td>
<td>.001</td>
</tr>
</tbody>
</table>

Note.—Numbers in parentheses are percentages. Current = current smoker at baseline who was persistent at 2 years, or a former smoker at baseline who restarted smoking at 2 years. Former = former smoker at baseline who was not smoking at 2 years, or a current smoker at baseline who was not smoking at 2 years.

* Comparison of demographic data of ILA with no ILA to equivocal ILA was performed by using an unpaired t test or \( \chi^2 \) with Fisher exact test. \( P < .05 \) indicates statistical significance.

† Mean ± standard deviation
Development and Progression of Interstitial Lung Abnormalities in the Framingham Heart Study

Tetsuro Araki1,2a, Rachel K. Putman3, Hiroto Hatabu1,2, Wei Gao4,6, Josée Dupuis1,5, Jeanne C. Latourelle6,7, Mizuki Nishino2,8, Oscar E. Zazueta3, Sila Kurugol9, James C. Ross4,9, Raúl San José Estépar2,8, David A. Schwartz10, Ivan O. Rosas3, George R. Washko3, George T. O’Connor4,11, and Gary M. Hunninghake1,3

1Center for Pulmonary Functional Imaging; 2Department of Radiology; 3Pulmonary and Critical Care Division; 4Surgical Planning Laboratory, Department of Radiology, and 5Channing Laboratory, Brigham and Women’s Hospital, Boston, Massachusetts; 6The NHLBI’s Framingham Heart Study, Boston, Massachusetts; 7Department of Biostatistics, Boston University School of Public Health, Boston, Massachusetts; 8Department of Medicine and 10Department of Neurology, Boston University, Boston, Massachusetts; 9Pulmonary Center, Department of Medicine, University of Colorado, Denver, Colorado; and 11Pulmonary Center, Department of Medicine, Boston University School of Medicine, Boston, Massachusetts

UCDAVIS

Araki et al. AJRCCM 2016
<table>
<thead>
<tr>
<th></th>
<th>No ILA</th>
<th>ILA without Progression</th>
<th>ILA with Progression</th>
<th>P Values</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>(n = 660; 35%) (1)</td>
<td>(n = 37; 2%) (2)</td>
<td>(n = 118; 6%) (3)</td>
<td>All† 1 vs. 2‡ 1 vs. 3§ 2 vs. 3‖</td>
</tr>
<tr>
<td>Age, yr</td>
<td>49 ± 10</td>
<td>58 ± 11</td>
<td>65 ± 11</td>
<td>&lt;0.0001</td>
</tr>
<tr>
<td>Sex, female, n (%)</td>
<td>296 (45)</td>
<td>20 (54)</td>
<td>53 (45)</td>
<td>0.6</td>
</tr>
<tr>
<td>Race, white, n (%)</td>
<td>660 (100)</td>
<td>37 (100)</td>
<td>118 (100)</td>
<td>0.3</td>
</tr>
<tr>
<td>Body mass index</td>
<td>28 ± 6</td>
<td>30 ± 6</td>
<td>28 ± 5</td>
<td>0.01</td>
</tr>
<tr>
<td>Pack-years smoking</td>
<td>16 ± 16</td>
<td>26 ± 19</td>
<td>24 ± 21</td>
<td>&lt;0.0001</td>
</tr>
<tr>
<td>Current smokers, n (%)</td>
<td>48 (7)</td>
<td>9 (25)</td>
<td>6 (5)</td>
<td>0.001</td>
</tr>
<tr>
<td>Former smokers, n (%)</td>
<td>263 (40)</td>
<td>14 (39)</td>
<td>61 (52)</td>
<td>0.004</td>
</tr>
<tr>
<td>Never smokers, n (%)</td>
<td>349 (53)</td>
<td>13 (36)</td>
<td>51 (43)</td>
<td>0.07</td>
</tr>
<tr>
<td>MUC5B genotype, n (%)</td>
<td></td>
<td></td>
<td></td>
<td>0.0003</td>
</tr>
<tr>
<td>G/G</td>
<td>529 (80)</td>
<td>27 (73)</td>
<td>78 (66)</td>
<td>0.5</td>
</tr>
<tr>
<td>G/T</td>
<td>125 (19)</td>
<td>10 (27)</td>
<td>36 (31)</td>
<td>&lt;0.0001</td>
</tr>
<tr>
<td>T/T</td>
<td>6 (1)</td>
<td>0</td>
<td>4 (3)</td>
<td>1</td>
</tr>
</tbody>
</table>

Definition of abbreviations: FHS-MDCT = Framingham Heart Study Multidetector Computed Tomography; ILA = interstitial lung abnormalities.

*Values are means ± SD unless otherwise indicated. For time-dependent covariates (e.g., age, body mass index, pack-years of smoking, and current smoking status) information obtained closest to the MDCT1 scan is included.

†P values are for the comparison among all groups. All P values are calculated using generalized estimating equations to account for familial relationships in the FHS.

‡P values are for the comparison between no ILA and ILA without progression.

§P values are for the comparison between no ILA and ILA with progression.

75% of patients with ILA develop progressive disease

ILA = ILD
Figure 3. Kaplan-Meier survival curves comparing participants without ILA, participants with ILA without progressive imaging, and participants with ILA with progressive imaging. Follow-up for the mortality analyses (time zero) begins at MDCT-2, the second computed tomography scan used for sequential comparisons. ILA = interstitial lung abnormalities; MDCT-2 = Framingham Heart Study Multidetector Computed Tomography 2 Study.
ILA/Incidental ILD

• Occurs in 7-10% of patients undergoing low-dose CT for lung cancer screening (LCS)

• Is associated with a high risk of progression

• Is associated with an increased risk of death

How is ILD being reported?
How are these patients being managed?
781 LCS-CTs Reviewed
UC-Davis (n=364)
UChicago (n=417)

ILD Present
7.6% (n=59)

ILD absent
92.4% (n=722)

ILD reported
64% (n=38)

- Impression/conclusion
  37% (n=22)

- Findings only
  27% (n=16)

ILD not reported
36% (n=21)
<table>
<thead>
<tr>
<th>Primary Care Physician Characteristics</th>
<th>UC-Davis (n=26)</th>
<th>UChicago (n=33)</th>
<th>Combined cohort (n=59)</th>
</tr>
</thead>
<tbody>
<tr>
<td>ILD mentioned in PCP notes, n (%)</td>
<td>5 (19.2)</td>
<td>2 (6.1)</td>
<td>7 (11.9)</td>
</tr>
<tr>
<td>PFT ordered by PCP, n (%)</td>
<td>4 (15.4)</td>
<td>3 (9.1)</td>
<td>7 (11.9)</td>
</tr>
<tr>
<td>Pulmonary Referral placed by PCP, n (%)</td>
<td>7 (26.9)</td>
<td>10 (30.3)</td>
<td>17 (28.2)</td>
</tr>
</tbody>
</table>
Table 2. Factors Associated with Pulmonology Referral

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>OR</th>
<th>p-value</th>
<th>95% CI</th>
</tr>
</thead>
<tbody>
<tr>
<td>ILD Reported by radiologist</td>
<td>2.4</td>
<td>0.019</td>
<td>1.15-4.98</td>
</tr>
<tr>
<td>Age</td>
<td>1.01</td>
<td>0.92</td>
<td>0.90-1.13</td>
</tr>
<tr>
<td>Male gender</td>
<td>2.32</td>
<td>0.25</td>
<td>0.55-9.87</td>
</tr>
<tr>
<td>Active smoker</td>
<td>0.22</td>
<td>0.04</td>
<td>0.05-0.96</td>
</tr>
<tr>
<td>Emphysema &gt;10%</td>
<td>2.65</td>
<td>0.18</td>
<td>0.65-10.95</td>
</tr>
</tbody>
</table>

* Adjusted for variables above, race and center
<table>
<thead>
<tr>
<th>Character</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age</td>
<td>95</td>
</tr>
<tr>
<td>Male</td>
<td>.92</td>
</tr>
<tr>
<td>STS</td>
<td>.14</td>
</tr>
<tr>
<td>Logis</td>
<td>.04</td>
</tr>
<tr>
<td>NYH</td>
<td>.68</td>
</tr>
<tr>
<td>Coronary artery disease — no. (%)</td>
<td>121 (64.3)</td>
</tr>
<tr>
<td>Previous myocardial infarction — no./total no. (%)</td>
<td>33/177 (18.6)</td>
</tr>
<tr>
<td>Previous intervention — no./total no. (%)</td>
<td></td>
</tr>
<tr>
<td>CABG</td>
<td>58/155 (37.4)</td>
</tr>
<tr>
<td>PCI</td>
<td>47/154 (30.5)</td>
</tr>
<tr>
<td>Balloon aortic valvuloplasty</td>
<td>25/154 (16.2)</td>
</tr>
<tr>
<td>Cerebral vascular disease — no./total no. (%)</td>
<td>48/175 (27.4)</td>
</tr>
<tr>
<td>Peripheral vascular disease — no./total no. (%)</td>
<td>54/178 (30.3)</td>
</tr>
<tr>
<td>COPD — no. (%)</td>
<td></td>
</tr>
<tr>
<td>Any</td>
<td>74 (41.3)</td>
</tr>
<tr>
<td>Oxygen-dependent</td>
<td>38 (21.2)</td>
</tr>
</tbody>
</table>
Chest CT in trans-catheter aortic valve replacement (TAVR) recipients

623 patients referred for TAVR were screened

92 (14.3%) with ILD
62 ILD cases received TAVR

Risk factor and outcome analysis

531 (85.7%) without ILD
124 age and gender matched controls received TAVR
Survival among TAVR recipients stratified by the presence of ILD

![Graph showing survival rates over time for non-ILD controls and ILD cases.](UCDAVIS)
Early Detection of ILD

• CT Screening in high-risk groups

• Pulmonary Function Testing in high-risk groups
Pulmonary Function Tests: High Rate of False-Negative Results in the Early Detection and Screening of Scleroderma-Related Interstitial Lung Disease

Can individual and composite PFT metrics predict ILD among the general population?
1690 unique patients completed PFT from 1/1/15-12/31/15

653 patients completed chest CT within 6 months of 2015 PFT

14,156 Chest CTs performed 7/1/14-6/30/16

121 (18.5%) patients with ILD
532 (81.5%) patients without ILD

Clinical and PFT predictors of ILD

Age
Gender
Race
BMI
TLC % predicted
FVC % predicted
FEV1 % predicted
DLCO % predicted
Early ILD Detection – PFT

• Predictors of ILD
  • Increasing age
  • Increasing FEV1 % predicted
  • Decreasing TLC % predicted
  • Decreasing DLCO % predicted
    • Replicated in 2016 cohort (n=680)

• An ILD risk score using above predictors of ILD explained ~80% ILD risk

• >3 points has sensitivity and specificity of ~75%

Prospective validation completed January 1, 2018
Early detection is possible...is it necessary?

Without intervention, progression is common in most ILD irrespective of baseline pulmonary function
Summary

• There is no such thing as “mild ILD”
  • Think of these patients as having ILD that you caught in the early stage!

• Early recognition is critical
  • Listen for crackles on lung exam (crackles are never normal)
  • Screen high risk populations
    • Smokers undergoing CT for LCS and other indications
    • Patients with DOE, cough undergoing PFT

• Early recognition = earlier diagnosis & earlier treatment
References

Thank You!