

Session II

Moderator: Thomas E. Hartman, MD

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| 4:40 PM | 30 | Low-Dose Volumetric Helical CT: Image Quality, Radiation Dose and Usefulness in the Evaluation of Airway Diseases
<i>Kyung J. Jung, MD, Kyung S. Lee, MD, S. Y. Kim, T. S. Kim, Y. S. Pyun, J. Y. Lee</i> |
| 4:50 PM | 31 | Spectrum of CT Findings in <i>P. aeruginosa</i> Pneumonia
<i>Rosita M. Shah, MD, Richard J. Wechsler, MD, Ana M. Salazar, MD,
Paul W. Spirn, MD</i> |
| 5:00 PM | 32 | Diffuse Pulmonary Neuroendocrine Cell Hyperplasia: Radiologic and Clinical Features
<i>Jin S. Lee, MD, K. Brown, C. Cool, David A. Lynch, MB</i> |

Grande Hall

- 5:30–6:30 Benjamin Felson Memorial Lecture: Willy Loman, Death of a Salesman...Some Lessons to Be Learned
Edward T. Creagan, MD

Monday, cont.

Survival in Patients with Usual Interstitial Pneumonitis as Determined by a CT-Derived Composite Physiologic Index. SR Desai, DM Hansell, MB Rubens, RM du Bois, AG Nicholson, AU Wells (Departments of Radiology, Histopathology and the Interstitial Lung Diseases Unit, Royal Brompton Hospital, London SW3 6NP, England; sujald@hotmail.com).

Introduction: The aim of the present study was to determine whether a combination of physiological indices, validated against the extent of disease on CT, is superior to isolated pulmonary function indices in predicting survival in usual interstitial pneumonitis (UIP).

Materials/Methods: CT scans in 219 patients with cryptogenic fibrosing alveolitis (CFA) (161 males; age 61.8 ± 10.8 years) were quantified by two radiologists. A composite score was generated by fitting functional indices to the extent of disease on CT, using split-sample multivariate techniques. The composite score was then calculated, using the derived formula, in a separate group of 36 patients (26 males, age 55.8 ± 9.9 years) with histologically-proven UIP; the prognostic significance of the composite score was compared to that of individual lung function indices.

Results: In the initial cohort, the derived formula for the composite score was "extent of disease on CT = $91.2 + (0.35 \times FEV1) - (0.53 \times FVC) - (0.66 \times DL_{CO})$ ". The composite score correlated more strongly with disease extent ($r=0.71$, $p<0.0005$) than did any single functional index, including DL_{CO} ($r=-0.61$, $p<0.0005$). In the 36 patients with UIP, the composite score predicted mortality ($p<0.0005$) more strongly than did individual lung function tests.

Conclusion: A composite score, derived from routine pulmonary function indices, is a more robust indicator of CT disease extent and, importantly, prognosis in UIP than individual functional parameters.

Comparison of Semiquantitative HRCT Scoring in NSIP Patients Versus UIP at Initial Presentation. E Kazerooni, K Flaherty, B Gross, G. Toews, JP Lynch III, A Flint, T Colby, WD Travis, F Martinez. (Univ of Michigan Medical Center, Ann Arbor, MI 48109-0326; ellakaz@umich.edu; Mayo Clinic, Scottsdale, AZ; Armed Forces Institute of Pathology, Washington, D.C.)

Purpose: Recent reports have suggested that patients with non-specific interstitial pneumonitis (NSIP) have a better prognosis than patients with usual interstitial pneumonitis (UIP). We reviewed the semiquantitative HRCT scores of patients with UIP and NSIP to determine if they are different at the time of initial diagnosis.

Methods: Three experienced pulmonary pathologists examined open lung biopsies in 95 patients initially characterized as having UIP. Twenty-one patients were reclassified as fibrotic NSIP (NSIP-fib), 8 as cellular NSIP (NSIP-cell) and 66 as UIP. Each lobe of the lungs was scored on HRCT scans by two radiologists for the presence and extent of ground glass opacity on a scale of 0 (no ground glass) to 5 (>75% of the lobe) representing the HRCT- alveolar score, and linear opacity on a scale of 0 (none), 1 (septal lines) and 2-5 (increasing profusion of honeycombing) representing the CT-fibrosis score. The presence or absence of bronchiectasis was also recorded. The CT scores were compared among the UIP, NSIP-cell and NSIP-fib groups.

Results: There was no difference in HRCT-alveolar between the three groups ($p=0.70$). The HRCT-fib scores were lower for both NSIP subsets than UIP (1.86 ± 0.09) ($p<0.001$), although no difference is noted between the NSIP-fib (1.0 ± 0.1) and NSIP-cell (0.73 ± 0.22) ($p=0.63$) groups. In addition, patients with UIP were more likely to have bronchiectasis than either form of NSIP ($p=0.001$).

Conclusion: Patients with NSIP, of either subtype, have less linear/honeycomb abnormality, less bronchiectasis and equal ground glass opacity to patients with UIP at initial presentation. HRCT scoring has demonstrated prognostic value in patients with UIP. Further study of the prognosis of NSIP vs. UIP patients should consider not only the disease type, but the HRCT findings, as potentially independent prognostic variables.



Usual Interstitial Pneumonitis versus Non-Specific Interstitial Pneumonitis:

Morphological-Physiological Relationships. S R Desai, DM Hansell, MB Rubens, AU Wells (Department of Radiology and The Interstitial Lung Disease Unit, Royal Brompton Hospital, London SW3 6NP, England; sujald@hotmail.com).

Introduction: The aim of the present study was to compare computed tomographic (CT)-functional relationships in patients with usual interstitial pneumonitis (UIP) and non-specific interstitial pneumonitis (NSIP).

Materials/Methods: Thin-section CT scans in 24 patients (males=18; mean age=54.6± 9.1 years) with UIP and 29 patients (males=9; mean age 47.6± 12.2 years) with NSIP were independently reviewed by two radiologists; the extent and severity of CT patterns were quantified. Functional indices were correlated with CT features.

Results: Patients with UIP had more extensive disease on CT ($p<0.0005$) but a lower ratio of ground-glass opacification (GGO) to a reticular pattern ($p=0.02$); predominant GGO was recorded in 10/29 NSIP patients and 2/24 UIP patients ($p=0.04$). In the combined group of UIP and NSIP patients the percent predicted DLCO correlated most strongly with disease extent on CT ($r=-0.78$; $p<0.0005$) closely followed by TLC ($r=-0.63$) and FVC ($r=-0.62$). There were no independent functional differences between UIP and NSIP for a given CT disease extent.

Conclusion: In patients with NSIP there is a greater prevalence of GGO on CT, but there is an overlap in appearance with UIP. Despite reported difference in prognosis there were no *independent* functional differences between UIP and NSIP.

The discriminatory value of high resolution CT in obstructive lung disease. S.J.Copley, A.U.Wells, N.L.Müller, M.B.Rubens, J.Cleverley, N.J.Hollings, D.M.Hansell. (Royal Brompton Hospital, Sydney St., London SW3 6NP England. s.copley@rbh.nthames.nhs.uk)

Introduction: Establishing the cause of significant airflow obstruction on clinical grounds and on pulmonary function testing can be difficult. The aim of the study was to evaluate the accuracy of HRCT in differentiating between causes of obstructive lung disease.

Methods/Materials: The CT scans of 138 patients (35 asthma, 31 centrilobular emphysema, 20 α_1 -antitrypsin deficiency, 19 obliterative bronchiolitis and 33 normal) were assessed independently by two observers. The most likely diagnosis and confidence rating (confident versus uncertain) was recorded. A second choice diagnosis was stated when the first choice diagnosis was uncertain.

Results: In 240/276 (87%) of observations the correct diagnosis was either first or second choice, and in 199/276 (72%) of observations the first choice diagnosis was correct. A confident diagnosis was made in 161/276 (58%): diagnostic accuracy was higher with a confident diagnosis (127/161, 79%) than with a non-confident diagnosis (71/115, 62%), $p<0.005$. For first choice CT observations the negative predictive value was 71% and positive predictive value 73%. Interobserver agreement in first choice diagnosis was good overall ($K=0.68$). Observer agreement was highest in distinguishing between obliterative bronchiolitis and centrilobular emphysema ($K=0.74$) and lowest in distinguishing between centrilobular emphysema and α_1 -antitrypsin deficiency ($K=0.45$) and between asthmatics and normal controls ($K=0.50$).

Conclusion: HRCT is accurate in distinguishing between diseases causing airflow obstruction, particularly in separating small airways from emphysematous disease.

The HRCT and Pathologic Findings in Drug-induced Lung Disease

Ellis S, Cleverley J, Flint J, Müller N L, (NLM, Vancouver Hospital and Health Sciences Centre, Department of Radiology, Vancouver, BC, V5Z 1M9, e-mail address: nmuller@vanhosp.bc.ca)

Introduction

The aim of our study was to review the high-resolution CT (HRCT) and histologic findings of drug-induced lung disease.

Methods

The pathological and CT records of the hospital over the last 10 year period were reviewed to identify all the patients with histologically proven drug-induced lung disease who had undergone HRCT. Twenty six patients were identified. The histologic specimens were obtained at open lung biopsy in 23 patients and at transbronchial biopsy in 3 patients. HRCT scans were performed using 1-1.5mm collimation and an edge enhancing algorithm. The HRCT scans were reviewed retrospectively by 2 independent observers and assessed for the presence and distribution of abnormalities.

Results

Ground glass attenuation was the predominant parenchymal abnormality in 11 (42%) cases, consolidation in 7 (27%), interlobular septal thickening in 5 (19%), centrilobular nodules in 2 (8%) and pleural effusions in 1 (4%). The histologic findings consisted predominantly of interstitial pneumonitis in 14 (54%), BOOP in 8 (31%), diffuse alveolar damage in 3 (11%) and pleural fibrosis in 1 (4%). These histologic reactions could not be distinguished on HRCT. The HRCT and histologic findings of reactions to chemotherapeutic drugs (n=15) were similar to that seen with other drugs.

Conclusion

The HRCT manifestations of drug-induced lung disease are variable and non-specific. HRCT is of limited value in predicting the histologic findings in this group of patients.

Low-Dose Volumetric Helical CT : Image Quality, Radiation Dose and Usefulness in the Evaluation of Airway Diseases.

Jung K-J, Lee KS, Kim SY, Kim TS, Pyun YS, Lee JY (Samsung Medical Center, Sungkyunkwan Univ School of Medicine, Seoul 135-710, Korea, kslee@smc.samsung.co.kr)

PURPOSE: To assess the image quality, radiation dose and clinical applicability of low-dose volumetric helical CT in the evaluation of airway diseases.

MATERIALS AND METHODS: Helical volumetric CT scans (120kVp, 3-mm collimation, pitch of 2, and reconstructed with 2-mm thickness) were obtained through the thorax in 12 patients of similar body weight with four kinds of milliamperages (150, 100, 70 and 40mA, three in each). Five radiologists assessed and compared image quality of volumetric helical CT scans. Radiation doses of four kinds of helical CT and thin-section CT (1-mm collimation, 10-mm intervals and through the thorax) technique were measured. In 52 patients with known or suspected airway diseases, diagnostic usefulness of low-dose (40mA) helical CT was compared with that of thin-section CT by two independent observers.

RESULTS: At helical CT, there was no significant difference in image quality among scans with four different kinds of milliamperage ($p > .05$ in the images of airways and pulmonary vessels, respectively). Radiation doses of 40, 70, 100 and 150mA helical techniques were 3.21mGy (range; 3.02 - 3.57), 4.81 (range; 3.89 - 5.93), 6.46 (range; 6.01 - 7.31) and 10.4 (range; 8.93 - 12.1), respectively, while that of thin-section CT was 2.17mGy (range; 1.90 - 2.67). Of 52 patients, 44.5 and 47 patients were diagnosed to have bronchiectasis at thin-section and low-dose helical CT, respectively. Of 928 segments, bronchiectasis was seen in 146.5 segments at thin-section CT and in 193.5 segments at helical CT. The interobserver agreement (K value) was excellent in both techniques without significant difference.

CONCLUSION: With acceptable images and similar radiation dose, low-dose volumetric helical CT with 40mA may offer better information than thin-section CT in the evaluation of airway diseases.



Spectrum of CT Findings in P. Aeruginosa Pneumonia Shah RM, Wechsler RJ, Salazar AM, Spirn PW (Thomas Jefferson University Hospital, Philadelphia, PA 19107, USA)

Purpose

Describe CT features of Pseudomonas aeruginosa pneumonia (PAP) in hospitalized patients.

Compare findings of PAP in patients with isolated P. aeruginosa cultures to those with coexistent cultures.

Methods/Materials

Study population consists of hospitalized patients retrospectively identified over 12 months with positive P. aeruginosa blood or respiratory cultures and thoracic CT's performed within six days of sample collection. CT's were reviewed by two pairs of chest radiologists, noting the presence or absence and distribution of air space consolidation, ground glass opacity, nodules, peribronchial infiltration, necrosis and pleural enhancement. Coexistent respiratory cultures were recorded and the frequency of nodularity and necrosis in patients with and without other positive respiratory cultures was compared.

Results

26 patients, 17 women, 12 men, mean age 57.3 years, underwent thoracic CT. Air space consolidation was present in all patients. Two or more lobes were involved in 24 (83%) with bilateral involvement in 19 (66%). Five (17%) had single lobe involvement and 5 (17%) had multilobar involvement in one lung. Associated ground glass opacity was seen in 9 (31%) and peribronchial infiltration in 17 (59%). Nodularity including tree-in-bud configurations and acinar opacities or discrete nodules, occurred in 14 (48%). Necrosis was noted in 9 (31%). Thirteen (15%) bilateral and 5 (17%) unilateral pleural effusions were present with enhancement occurring in 2 (1%). Coexistent positive respiratory cultures were identified in 14 patients. There was no significant difference ($p=.300$) in the frequency of necrosis ($p=.300$) between patients with and without other positive respiratory cultures or in the frequency of nodularity, $p=.092$.

Conclusions

At CT, PAP is characterized by multilobar air space consolidation. Nodular features were identified in nearly half and unsuspected necrosis in almost one-third of cases. Patients with and without other respiratory isolates did not differ in the frequency of nodularity and necrosis.

Diffuse Pulmonary Neuroendocrine Cell Hyperplasia: Radiologic and Clinical Features. Lee JS, Brown K, Cool C, Lynch DA (DAL, Univ of Colorado, Denver, CO 80262, David.Lynch@UCHSC.edu)

Introduction : The purpose of this study was to define the radiologic features of pulmonary neuroendocrine cell hyperplasia and correlate them with clinical findings.

Materials / Methods : The authors retrospectively reviewed medical records, chest radiography, and computed-tomography (CT) obtained in six patients who were diagnosed as pulmonary neuroendocrine cell hyperplasia between 1992 and 1999. All six patients were women, and ranged in age from 45 to 72 years (median = 58 yr). Two radiologists assessed the presence and extent of airway wall thickening, mosaic pattern, air-trapping, ground-glass opacity, nodular opacity, and centrilobular opacity on high-resolution CT. The CT findings were compared with physiologic data and histologic features.

Results : On CT scans, mosaic pattern was the predominant finding in all patients. The upper lobes were more severely involved in two patients, and lower lobes were more severe in three patients. One patient showed equal involvement. This mosaic pattern was accentuated on expiratory CT scans. The extent of mosaic pattern was correlated with the FEV1/FVC ratio ($r = 0.8508$, $p = 0.0317$). Nodular lesions were noted in three patients. The maximum size of the nodules ranged from 0.2 cm to 1.5 cm and the number of nodules ranged from 4 to 26. Airway walls were thickened in four patients. In one patient, ground glass opacity and centrilobular opacity were also noted in high resolution CT.

Conclusion : Diffuse pulmonary neuroendocrine hyperplasia is characterized by mosaic perfusion due to air-trapping, airway wall thickening and occasional small nodules on HRCT scans. The extent of mosaic perfusion correlates with the physiologic evidence of airway obstruction.



Willy Loman, Death of a Salesman... Some Lessons to Be Learned

Edward T. Creagan, MD

American Cancer Society Professor of Clinical Oncology

John and Roma Rouse Professor of Humanism in Medicine

Professor of Medical Oncology, Mayo Medical School

President of the Staff, Mayo Clinic

I. BACKGROUND

- A. Explosive Information Technology
 1. The World Wide Web as currently known did not commercially exist until 1993. There are now ten million web sites and the number is doubling every 26 weeks.
 2. Medical knowledge doubles every 24 to 36 months—every seven days 12,000 biomedical papers are published. Health-related web sites ~ 15,000!
- B. Consequences
 1. 70% of workers, “used up at day’s end.”
 2. 50%, “highly stressed.”
 3. 25%, stress-induced illnesses.
- C. Expectations of the Consumer and the Patient
 1. An attitude of entitlement. “I pay for my education; therefore, you educate me. I pay for my healthcare, you restore my health. I paid for this car, so I expect no hassles.”
 2. The assertive, informed consumer can effectively spar with the provider of goods and services. The argot of the professional is being deciphered by a highly motivated and assertive buying public.
- D. Job Security
 1. Mergers, acquisitions, consolidations, restructuring. Long-term employment is a phenomenon of the past. It is unlikely that an entire career will be spent under one corporate umbrella.
 2. Willy Loman, “Death of a Salesman.” 50th anniversary.
 - Isolated sixty-something, sedentary, carnivorous journeyman
 - No support system
 - Mistakes we can avoid
 3. Regardless of one’s current status, the skills required to maintain that position will be obsolete in five to seven years.
- E. Pack Your Own Parachute
 1. Career resiliency will reside in personal

power and professional relationships rather than in positional power.

2. Think more in terms of a portfolio of values, interests, and skills which are portable, marketable, and “sellable.”
3. The high-priced free agent of the athletic community is becoming the model for the corporate/university environment.

II. The Biology of Survival

A. Diet

The “Reader’s Digest” version of an adequate diet: weight in pounds x 10. Therefore, at 180 pounds, one would require approximately 1800 calories per day. A sedentary individual may feel comfortable with this number, whereas a laborer may require more calories, but at least it’s a starting point.

A general guideline would divide these 1800 calories as follows:

- 15-20% protein;
- 55-60% carbohydrates;
- 25-30% fat.

This means 360 calories of protein; 1,000 calories from carbohydrates; and 450 calories from fats. Saturated fats such as butter and lard are factors in coronary artery disease. Best: mono-unsaturated fats – olive, canola, peanut oils.

Since there are 9 calories per gram of fat,

Food	Fat	Calories	Sodium
<i>McDonald's Burger</i>	<i>10 grams</i>	<i>260</i>	<i>460 mg.</i>
<i>McDonald's Quarter Pounder with cheese</i>	<i>30 grams</i>	<i>520</i>	<i>1150 mg.</i>
<i>Burger King Whopper with cheese</i>	<i>43 grams</i>	<i>711</i>	<i>—</i>
<i>Jack In The Box Ultimate Cheeseburger</i>	<i>69 grams</i>	<i>942</i>	<i>1176 mg.</i>
<i>Wendy's Triple Cheeseburger</i>	<i>70 grams</i>	<i>1040</i>	<i>1848 mg.</i>
<i>McDonald's McChicken</i>	<i>26 grams</i>	<i>490</i>	<i>780 mg.</i>
<i>Taco Bell Steak Fahita</i>	<i>11 grams</i>	<i>234</i>	<i>485 mg.</i>



$450 \div 9 = 50$ grams of fat as maximum for that individual. Best keep fats at < 60 gms/day.

B. Sleep

We are a sleep-deprived society. We have lost approximately 60 to 90 minutes of sleep per night compared with prior generations. Four of the greatest human-related disasters of the past several decades all occurred at approximately 3 o'clock in the morning: the Three Mile Island nuclear leak; the crash of the Exxon Valdez off the coast of Alaska; the Chernobyl nuclear accident; the Buphal cyanide leak in India, and the sinking of the Titanic.

There is a school of thought among herbalists/Eastern healers—if you wake up in the night:

1. Midnight – 2 a.m. = anger
2. 2 a.m – 4 a.m. = fear
3. 4 a.m. – 6 a.m. = sadness

Some practical suggestions:

1. Attempt to go to bed and get up at the same hour each day, even on a weekend. For one night of the week, go to bed at 9 p.m. Trust me, you'll feel better.
2. Decrease caffeine, alcohol, and nicotine, especially during the early evening hours.
3. Establish regular and predictable nighttime habits, such as a warm glass of milk, cookies (just like Grandma advised) or a warm shower.

C. Exercise

The last high school student to break a 4-minute mile was Marty Liquori of New Jersey. The year – 1967!

Long-term studies of Harvard graduates and longitudinal studies of aging in Baltimore unequivocally demonstrate that a sedentary lifestyle is a risk factor for early death, much like smoking, high cholesterol, and high blood pressure.

How much? 200 minutes or walking per week. The benefits in terms of improved self-esteem, positive body image, and a sense of wellness can be spectacular.

D. Strength

Muscle mass decreases 1% per year after age 30. By age 65, 35% of muscle mass is lost without weight training. Evidence: compare the physique of the high school athlete with that of the 65-year-old retiree. Solution: see below. Warning: By age 70, 70% of women and 25% of men cannot lift 10 lbs.

Solution: We need to lift weights. Read "Strong Women Stay Young," M. Nelson

III. Mechanics of Survival Strategies

A. "Time lost is never found again." - Ben Franklin.

Rule #1: Time is not a renewable resource.

Rule #2: See Rule #1.

B. Five of the worst mistakes of time management:

- Spending time on issues that are not your priority.
- Underestimating the time a task consumes. Nothing is simple.
- Permitting interruptions.
- Saying "yes" without thinking.
- Not asking for help.

C. The psychological "moat"

- Buffer of time between commitments
- Zone to switch gears, to psychologically prepare for the next challenge.
- For the tennis or golf match of your life, you would not show up a few minutes before the event

D. Meetings

- Most are held for historical or informational purposes only. Your input is not elicited. Right?
- Little is accomplished.
- Insist on an agenda plus prompt start and end times.
- 90% accomplish nothing (Harvard Business School).

E. Lists

- Plan the week, not just the day.
- Make one each day or evening.
- Writing tasks down greatly increase the chance of getting it done.
- Checking things off your list is empowering!

IV. The Psychology of Survival

A. The Three Big Questions

- What gives your life enduring meaning?
- What is the purpose of life?
- What gets you out of bed on a Monday morning?

B. Attitude

- Creates reality
- What we say about circumstances determines its impact on us
- Proof: "I will have a lousy day." Repeat three times. Guess what happens?
- Don't sweat the small stuff...it's all small stuff
- Caution: Stay away from negative people. Whining is contagious. It may give you a bad attitude and erode the lining of your stomach.



C. William James

The greatest discovery of my generation is that...a human being can alter his (sic) life by altering his attitude.

D. The End of the Journey

Funerals and retirements of colleagues are somber occasions to reflect on the purpose of our lives. If there is a mark which we hope to leave on this earth, it would be a good idea to start today. There is not such thing as "some-day." Average applause at annual staff dinner for retirees: 6 seconds! (trust me, I counted)

- Know that you have made a difference.
- Know that the world is a better place because of you.

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