How UCLA's Pioneering Integration of Radiology and Pathology Services Delivers More Diagnostic Value to Physicians and Patients

W. Dean Wallace, MD
Corey Arnold, PhD
Current Paradigm

• The diagnosis of cancer is a complex process involving many healthcare specialists.
• The specialties at the center of initial cancer diagnosis are radiology and pathology.
• The collective findings and interventions are responsible for subsequent cancer patient treatment and outcome.
• Is there value in coordinating the interpretations to give a unified diagnosis in one format?
Discordance studies


Value of Integrated Reporting

• Collaboration of findings and coordination of diagnosis through close communication can lead to diverse benefits.
  
  • Improved information flow downstream to end users and upstream to diagnosticians
  • Improve speed and accuracy of diagnosis
  • Improve the ability of both specialties to develop evidenced based technologies to further the healthcare enterprise
  • Combined report facilitates ease of data retrieval
    • Tumor size, location, clinical stage
    • Tumor type, histologic grade
    • Molecular profile
  • Create minable repository of data and tissue samples for research
UCLA RadPath

- All diagnostic studies pertinent to a specific disease process may be accessed from a single and secure web-based portal.
- This dynamic report display can emphasize the most important details of a disease and provide access to the imaging studies.
- Correlation functionality formalizes radiology-pathology integration.
- Direct links to email facilitates contextualized and quick communication between clinician-and-diagnostician (radiologist or pathologist) and clinician-and-clinician.
New RadPath case

Select primary report

MRN: 1234567

Find Reports

Please Contact ISS Helpdesk at 4HELP (794-4357) for any issues/questions regarding RadPath.

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Pathology

LEFT UPPER LOBE NODULE (U15-02773) 04-08-2015

Final Diagnosis  Molecular Diagnostics  Other Fields  Source Report

Histologic Grade
- Moderately differentiated

COMMENT:
Mutational analyses for EGFR and cytogenetic analysis for ALK are pending.
Preliminary results were communicated to Dr. R. Cameron at 10:55 Am. on 4/9/2015.


Added by [redacted] on Apr 10, 2015 4:53:23 PM
*This individual may not be the diagnosing physician

Radiology

CT BIOPSY LUNG (41286607) 04-08-2015

Conclusions  Other Fields  Source Report

Conclusions

Impression
IMPRESSON:
1. Successful core needle biopsy of nodule a in left upper lobe under CT-guidance with conscious sedation.
Print includes all information from all reports
Share allows the report to be emailed to other caregivers
I would like to share this RadPath report with you

https://radpath.mednet.ucla.edu/RadPath/main/dualView/520ad0cdaee74910a2c1887ad166f5fa
Final Diagnosis: LUNG NODULE, LEFT UPPER LOBE (NEEDLE CORE BIOPSY): * 
- Adenocarcinoma with acinar and lepidic subtypes

Histologic Grade
- Moderately differentiated

COMMENT:
Mutational analyses for EGFR and cytogenetic analysis for ALK are pending.

*This individual may not be the diagnosing physician
Final Diagnosis

LUNG MASS, RIGHT UPPER LOBE (NEEDLE CORE BIOPSY)*
- Adenocarcinoma, primarily non-invasive (lepidic) with very focal invasion (acinar)

Histologic Grade
- Well differentiated

References

- Lung adenocarcinoma classification
Final Diagnosis: Molecular Diagnostics

Final Diagnosis:
LUNG NODULE, LEFT UPPER LOBE (NEEDLE CORE BIOPSY):
- Adenocarcinoma with acinar and lepidic subtypes

Histologic Grade
- Moderately differentiated

COMMENT:
Mutational analyses for EGFR and cytogenetic analysis for ALK are pending.

Added by [redacted] on Apr 10, 2015 4:53:23 PM

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<td>No EGFR mutation detected</td>
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*This individual may not be the diagnosing physician*
Image access for tumor board
**Radiology**

**Conclusions**

**CT ANGIOGRAM CHEST W WO CONTRAST**

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<td><strong>IMPRESSSION:</strong></td>
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<tr>
<td>1. No PE</td>
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<td>2. Irregularly shaped part-solid lesion in RUL. A second ground glass nodule in the superior RLL may represent adenomatous hyperplasia or adenocarcinoma in situ. Although morphologically atypical, in the setting of age and former smoking history, primary lung cancer is suspect. If this were a primary lung neoplasm, CLINICAL STAGE would be T2AN0M0, Stage IB, with probable synchronous lesion in RLL. This lesion is amenable to percutaneous biopsy.</td>
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**07-25-2013**

**Full Study**
Radiologic stage in front of report

Conclusions:

1. No PE
2. Irregularly shaped part-solid lesion in RUL. A second ground glass nodule in the superior RLL may represent adenomatous hyperplasia or adenocarcinoma in situ. Although morphologically atypical, in the setting of age and former smoking history, primary lung cancer is suspect. If this were a primary lung neoplasm, CLINICAL STAGE would be T2AN0M0, Stage IB, with probable synchronous lesion in RLL. This lesion is amenable to percutaneous biopsy.
Conclusions

1. History of melanoma with 4 pulmonary nodules, the largest 15 mm in the right lower lobe with 3 subcentimeter nodules in the left lower lobe, concerning for metastatic disease. The largest nodule in the right lower lobe is amenable to CT-guided biopsy.

2. Left upper lobe focus of ground glass is nonspecific; differential includes pulmonary adenocarcinoma in situ. Based on morphologic appearance, this is not likely metastatic.

Are there potentially discordant conclusions between radiology and pathology? Yes

Enter comments

Select a reason for discordance
- Other: see comments

Share report? Yes

Finalize
Conclusions

1. History of melanoma with 4 pulmonary nodules, the largest 15 mm in the right lower lobe with 3 subcentimeter nodules in the left lower lobe, concerning for metastatic disease. The largest nodule in the right lower lobe is amenable to CT-guided biopsy.

2. Left upper lobe focus of ground glass is nonspecific, differential includes pulmonary adenocarcinoma in situ. Based on morphologic appearance, this is not likely metastatic.

Are there potentially discordant conclusions between radiology and pathology?  

- Yes
- No

In light of the known diagnosis of melanoma, accurate staging of this patient will likely require sampling of the other known lung nodules.
Entire study access for tumor board and patient evaluation or education
UCLA *RadPath* Functionality

- **Single report solution**
  - Combines radiology with pathology and molecular diagnostics
  - Streamlines clinical workflow, shortens clinical preparation time

- **Image viewer**
  - Allows easy access to important studies, especially for tumor board
  - Necessary diagnostic studies for surgeons and radiation oncologists
  - Valuable educational tool for trainees

- **Communication tool**
  - Allows easier/quicker contextualized communication between clinicians
  - Allows for quicker triaging of potential patients in informed setting
    - May function as virtual tumor board
  - Important educational tool for patients
Implementation questions

• What is the workflow?
• What reports get correlated?
• Who performs the correlation?
What is the Workflow?

• Radiologist initiates after diagnostic scan
  • Patient may not ever get biopsy
• Radiologist initiates after biopsy
  • No pathology results to correlate to yet
• Pathologist initiates after exam
  • Enters results, shares with radiologist for correlation
Workflow diagram

Overall workflow

Current workflow
- Radiologist completes diagnostic interpretation
- Patient undergoes biopsy procedure
- Pathologist completes diagnostic interpretation

RadPath workflow
- AD
- RIS
- PACS
- LIS
- LDAP
- DICOM
- DICOM
- SQL

RadPath web application
- Pathologist review A
- Radiologist review B
- Radiologist correlation C

Downstream users
- Referring clinician
- Surgeon
- Oncologist
- Scheduler

David Geffen
School of Medicine

UCLA Health
What Gets Correlated?

- Diagnostic (CT, PET-CT)
- Biopsy
- Path
- RadPath Report

- History of melanoma
- Likely metastases
- Multiple lung nodules

- Successful biopsy without complication
- Lung Adenocarcinoma

(UCLA Health)
Which Radiologist Correlates with Pathology?

- **Original diagnostic radiologist?**
  - May not be on service
  - Possibly have not reviewed case in weeks
  - Possibly no knowledge of biopsy procedure outcome

- **Biopsy radiologist?**
  - Last from Radiology to see patient
  - Last to review diagnostic interpretation
  - Knowledge of biopsy procedure outcome
Technical Infrastructure

**RadPath**
- J2EE Groovy / Grails
- Regular expressions for document sectioning
- Report is linked to from EMR (PDF also available)

**Interfaces**
- Active Directory
- PACS - DICOM
- Radiant - DICOM
- PowerPath – SQLServer stored procedure
- Epic – HL7
Current RadPath reports

- Awaiting Radiology: 11 (13.1%)
- Awaiting Pathology: 5 (6.0%)
- Finished: 68 (81.0%)
Correlations

- Combined findings suggest sampling error: 1 (1.5 %)
- Defer to pathology diagnosis: 3 (4.4 %)
- Radiology and pathology correlates: 64 (94.1 %)
Future directions

• Evaluate effectiveness in clinical setting
  • Audit use, email use
  • Analyze differences in time from diagnosis to definitive care, before and after implementation of RadPath

• Expand to incorporate other service areas

• Build inclusive platform that may easily incorporate latest testing modalities

• Enhance access to radiology and pathology imaging studies
Development Team

• The senior leadership:
  • Dieter Enzmann (Chair, Radiology),
  • Scott Binder (Senior Vice Chair, Pathology)

• The development team:
  • Department of Pathology
    • Dean Wallace
    • Greg Fishbein
  • Department of Radiology
    • Scott Genshaft
    • Fereidoun Abtin
    • Antonio Gutierrez
  • UCLA Medical Imaging Informatics
    • Corey Arnold
    • Shawn Chen
Questions?