Journal Club of Boston Medical Center for Radiology Nonspecific Interstitial Pneumonia and Usual Interstitial Pneumonia: Comparative Appearances at and the Diagnostic Accuracy of Thin-Section CT; Radiology December 2001

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Citation

A Gupta. *Journal Club of Boston Medical Center for Radiology Nonspecific Interstitial Pneumonia and Usual Interstitial Pneumonia: Comparative Appearances at and the Diagnostic Accuracy of Thin-Section CT; Radiology December 2001*. The Internet Journal of Radiology. 2001 Volume 2 Number 2.

Abstract

WHAT IS THE QUESTION BEING ASKED?

In patients clinically diagnosed with “interstitial pulmonary fibrosis” can thin-section CT distinguish between Nonspecific Interstitial Pneumonia (NSIP) and Usual Interstitial Pneumonia (UIP) histologic subtypes?

WHY IS THIS IMPORTANT?

The different histologic subtypes of idiopathic pulmonary fibrosis have different prognoses. Being able to distinguish between the various types based on thin-section CT would theoretically predict patient prognosis better than simply giving a more generic diagnosis of IPF.

4 HISTOLOGICAL SUBTYPES OF CLINICALLY DIAGNOSED IDIOPATHIC PULMONARY FIBROSIS

Usual Interstitial Pneumonia (UIP) – most common. Bad prognosis. Nonspecific interstitial pneumonia (NSIP) – Best prognosis Desquamative interstitial pneumonia (DIP) Acute interstitial pneumonia (AIP)

WHAT IS THE BACKGROUND WORK?

- The technology of thin-section CT. Not a new invention, but not ancient either
- The establishment of various histological subtypes and diagnostic criteria of IPF.
- The discovery that different histopathologic subtypes carry different prognoses.

WHAT IS THE NULL HYPOTHESIS?

The null hypothesis states that thin-section CT is not capable of distinguishing the various subtypes of IPF.

WHO IS THE TEST POPULATION?

Patients who were given the diagnosis of Idiopathic pulmonary fibrosis by clinical grounds: (bibasilar crackles, restrictive defect by PFTs, absence of known cause of IPF.)

Of these, some received the diagnosis of either NSIP or UIP by lung biopsy. This group was further refined into a group that underwent thin-section CT scan within 12 months of biopsy. 53 patients were included –all 53 had thin-section CT and lung biopsy with a histologic diagnosis of either UIP or NSIP, and all were diagnosed with IPF based on clinical grounds.

WHAT ARE THE METHODS USED?

PATHOLOGY:

2 pathologists, basing final diagnosis on predominant histologic findings. Certain histopath criteria was given for the diagnosis of either UIP or NSIP. NSIP patients were further subdivided into cellular or fibrotic subtypes. Indeterminate cases settled by concensus.

CT SCANNING:

1.5mm slices, 100 msec acquisition, same w/l

SCORING OF CT SCANS:

2 staff chest radiologists and 2 chest fellows scoring the

scans independently, without clinical information. They were asked to categorize these as either UIP or NSIP based on

thin-section criteria in the literature. NSIP further subclassified into cellular or fibrotic types.

Readers asked to assess the lung parenchymal abnormalities : ground glass, reticular or mixed. If reticular, they were asked to score the fineness or coarseness of the reticular pattern.

Observers were asked to score the location of abnormality. Degree of confidence was rated as "possible" or "confident."

STATISTICAL ANALYSIS:

Sample size of 53 as described above

Sensitivity/specificity/accuracy calculations

Student t-test

P values of less than or equal to 0.05 are understood to be statistically significant.

WHAT ARE THE RESULTS?

TABLE 1:

Ability of Thin-section CT for discrimination between NSIP and UIP
Sensitivity: 70%
Specificity: 63%
Accuracy: 66%

"confident" – sensitivity increased to 78%; specificity increased to 69%, accuracy increased to 72%

All 4 radiologists in agreement: sensitivity increased to 89%, specificity increased to 80%, accuracy increased to 83%.

TABLE 2:

Extent and distribution of disease in NSIP and UIP

Of the listed criteria, only proportion of ground glass attenuation was a statistically significant discriminator between NSIP and UIP. (47% vs. 27%).

TABLE 3 AND TABLE 4:

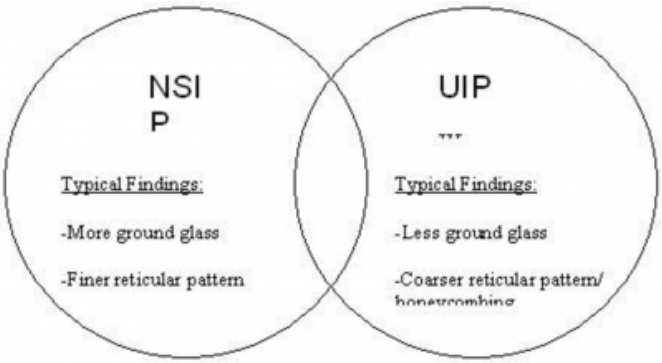
The overlap in CT findings between NSIP and UIP makes the distinction less straightforward, and is a factor in misdiagnosis.

Table 3: all are path proven NSIP. NSIP patients that were misdiagnosed with UIP by CT had fewer of the "classic" CT findings of NSIP.

Table 4: all are path-proven UIP. The path-proven UIP patients that were misdiagnosed with NSIP by CT likewise showed fewer classic CT findings of UIP:

Figure 1

Two Histopathologic Subtypes Of IPF



Depending on the CT criteria for assessing NSIP vs. UIP based on location, degree of fibrosis, etc. may therefore be misleading.

WHAT ARE THE LIMITATIONS OF THE STUDY?

Pathologic distinction between NSIP vs. UIP is not definitive. Therefore, pathology is not a reliable "gold standard" in this paper.

The histologic distinction between UIP and NSIP (especially fibrotic NSIP) carries significant inter and intraobserver variability among pathologists. (low interobserver kappa of 0.57)

Relatively low agreement between the two pathologists

Younger sample population in this study – these patients may be less debilitated and more likely to undergo lung biopsy. In reality, these patients may actually be more likely to have the less aggressive NSIP form rather than UIP. This may overrepresent the incidence of NSIP.

In routine practice, the patients may be older, with more aggressive histologic subtypes of IPF – such as UIP or fibrosing NSIP, rather than the less severe cellular NSIP. These patients may not get biopsied due to poor pulmonary reserve. Does this study therefore represent a true cross section of patients presenting with IPF?

Only the NSIP and UIP subtypes were included. DIP and AIP were excluded.

What is the next question to be raised?

What is the exact relationship between CT findings and patient prognosis?

What is the exact relationship between path findings/histologic subtypes and patient prognosis?

References

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