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How was the management of patients scheduled for surgical biopsy through a multidisciplinary approach to the diagnosis of interstitial lung diseases? Was a pathological diagnosis alone enough?

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Abstract:

OBJECTIVE: The present study examines the clinical and radiological findings and pathological diagnoses of patients undergoing surgical biopsy with an multidisciplinary team (MDT) decision and investigates whether final diagnoses change on the reevaluated of pathological diagnoses at MDT meetings.

MATERIALS AND METHODS: A total of 416 patients were discussed at MDT meetings held at the University of Health Sciences Istanbul Sureyyapasa Chest Diseases and Thoracic, Surgery Training and Research Hospital January between January 2016 and May 2019, with surgical biopsy decisions made for 50 (12%) patients.

RESULTS: Among the 50 patients, 26 (52%) were female, with a mean age of 53 ± 12 years. The most common locations of the surgical biopsy were the right lung ($n = 27$, 54%), lower lobe ($n = 38$, 76%) and single lobe ($n = 35$, 70%). A definitive pathological diagnosis was established in 41 (82%) patients following the biopsy. The most common diagnoses were usual interstitial pneumonia (UIP; $n = 19$, 38%), sarcoidosis ($n = 11$, 22%), unclassifiable fibrosis ($n = 9$, 18%), (non-specific interstitial pneumonia; $n = 5$, 10%), (hypersensitivity pneumonitis; $n = 2$, 4%) and others ($n = 4$, 8%), respectively. Diagnoses of 13 (26%) such patients were revised. The revision was most common in the unclassifiable fibrosis and UIP subgroups. The radiological appearance was classified based on the high-resolution computed tomography parameters for idiopathic pulmonary fibrosis (IPF). The final diagnosis was IPF in eight of 14 patients with "probable" diagnoses, all four patients with "indeterminate" diagnoses and three of the 28 patients with "alternative" diagnoses.

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CONCLUSION: Diagnosing interstitial lung diseases is difficult, and while surgical biopsy provides the most definitive diagnosis, it is not enough by itself. IPF may vary in radiology. Patients diagnosed with UIP and unclassifiable fibrosis after biopsy should be reevaluated, and the final diagnosis should be established through a multidisciplinary approach.

Keywords:

Interstitial lung disease, multidisciplinary team, surgical lung biopsy

Introduction

Interstitial lung diseases (ILDs) have various pathophysiological, clinical, and radiological characteristics.[1] Due to the different prognoses and treatment modalities of the subgroups, an accurate diagnosis is clinically important.[2] Idiopathic pulmonary fibrosis (IPF) is the most common subgroup with the highest mortality among interstitial lung diseases, making it important to differentiate it from other interstitial lung diseases.[3,4] Immunosuppressive therapies are the basis of treatment for non-IPF patients, but increase mortality and morbidity in IPF patients.[5] An accurate diagnosis is also important for the administration of antifibrotic therapies, which are reported to slow disease progression. In 2013, the American Thoracic Society/European Respiratory Society (ATS/ERS) updated the diagnostic guidelines for idiopathic ILDs and reported that reaching an accurate diagnosis requires a dynamic process involving a multidisciplinary team (MDT) of clinicians, radiologists, and pathologists.[4]

Several studies have demonstrated the importance of a multidisciplinary approach to the diagnosis of interstitial lung diseases (ILDs).[6-9] MDT-made decisions have been reported to be safer and to provide a higher rate of diagnosis than those made by clinicians alone.[10] It has been shown further that guidelines are being taken into consideration more, and advanced invasive examinations are not needed with a multidisciplinary approach.[6]

For ILDs, a surgical biopsy is recommended for an accurate diagnosis when clinical and radiological findings are inconsistent.[4] Nevertheless, several previous studies have reported thoracic or non-thoracic invasive procedures to induce acute exacerbations in ILDs and to cause mortality in 3–4%.[11,12] Therefore, a biopsy decision should be made considering the benefit-to-harm ratio. Even when a biopsy is performed, the pathological results alone may remain insufficient for the establishment of diagnosis due to the possible shifts in histological patterns.[1,13] In conclusion, the most accurate diagnosis is one that is established through a multidisciplinary approach.[4]

The management of ILDs has been performed by an MDT in our center since 2016. The present study made an examination of patients for whom a surgical biopsy was decided by the MDT. It was investigated whether the patient's diagnosis changed after the pathological results were re-assessed by the MDT, and final diagnoses were established.

Materials and Methods

This single-center retrospective study examined 416 patients whose cases were discussed at ILD meetings between January 2016 and May 2019.

Multidisciplinary team

The study center is a tertiary hospital that has been organizing weekly MDT meetings for ILDs since 2016. The MDT involves 12 pulmonologists and one radiologist. A pathologist is included in the team when necessary. The MDT examined the patients' detailed history, symptoms, physical examination findings, all exposures (smoking, drugs used, hobbies, environmental and occupational), comorbidities, pulmonary function tests, autoimmune antibodies, fiberoptic bronchoscopy (FOB), bronchoalveolar lavage (BAL) findings, and skin, pleura, peripheral lymph node and other organ biopsy results. The computed tomography (CT) and/or high-resolution computed tomography (HRCT) findings of the patients were assessed. The rheumatology department was consulted when necessary, and for all patients scheduled for surgical biopsy.

Thoracic computed tomography/high-resolution computed tomography findings

For all patients, the CT/HRCT patterns (reticular pattern, traction bronchiectasis, ground-glass, mosaic perfusion, consolidation, cyst, honeycomb) and distribution of lesions (right-left, central, subpleural localization, basal-apical involvement) were recorded.

The HRCT findings were classified as "UIP (usual interstitial pneumonia)," "probable UIP," "indeterminate for UIP" and "alternative UIP" as per the 2018 IPF guidelines.[14]

Surgical procedure

Patients were hospitalized 1 day before the biopsy, and written consent was obtained from all patients. As the surgical technique, a video-assisted thoracic surgery (VATS) was performed on all patients. The localization and the number of biopsy samples were determined based on the patient's CT findings and surgeon's decision during the procedure. The mean hospital stay, postoperative morbidity, and in-hospital mortality were recorded.

Assessment after surgical biopsy

The patients were re-assessed by MDT, together with their pathology results. A second pathologist re-examined the specimens of patients with pathology results that were inconsistent with the clinical and radiological findings. The final diagnosis was established by the MDT.

The study was approved by the local scientific committee (21 August, 2019/074).

Statistics

For descriptive statistics, mean ± standard deviation, minimum and maximum were used for quantitative variables, whereas the numbers and percentages were used for qualitative variables. For the analytical statistics: a Chi-square test and a Fisher's exact test were used to assess the differences in the frequency of qualitative variables. The Mann–Whitney *U* test was used to compare non-normally distributed measures and the *t*-test was used for normally distributed measures. All statistical analyses were made using SPSS version 22.0 for Windows (SPSS Inc., Chicago, IL). Differences were considered statistically significant when the $P < 0.05$.

Results

The MDT discussed a total of 416 patients, 1328 times. Sarcoidosis was the most common (n = 180) diagnosis to be established without a surgical biopsy, followed by IPF (n = 84), hypersensitivity pneumonitis (HSP) (n = 35), connective tissue disease-related ILD (n = 14), tuberculosis (n = 11), pneumoconiosis (n = 10), non-specific interstitial pneumonia (NSIP) (n = 9), organizing pneumonia (n = 5) and others (n = 18), respectively. Others included histiocytosis (n = 3), alveolar hemorrhage (n = 2), silicosarcoidosis (n = 4), silicosis (n = 2), anthracosis (n = 4), tuberculosis sequel (n = 1) and lung cancer-associated sarcoidosisrxn (n = 2). A total of 50 (12%) patients could not be diagnosed through clinical, radiological and bronchoscopic examinations, and so a surgical biopsy was decided for a histological diagnosis [Figure 1].

Among the patients undergoing biopsies were 26 (52%) females and 24 (48%) males, with a mean age of 53 ± 12 (min 27, max 74) years. The most common symptoms were cough (54%, n = 27), dyspnea (44%, n = 22) and constitutional symptoms (36%, n = 18) (not shown in the table). There was at least one comorbidity in 36% (n = 18) of the patients. Table 1 presents the demographic characteristics and comorbidities of the patients.

The most common findings on preoperative thoracic CT/HRCT were reticular pattern (n = 41, 82%), traction bronchiectasis (n = 34, 68%) and ground-glass (n = 30, 60%). The rate of honeycombing was 10% (n = 5) [Table 2].

Prior to VATS, 74% (n = 37) of patients had FOB and 60% (n = 30) had BAL. The right lung was sampled more with VATS (n = 27, 54%). The biopsy was conducted on a single lobe in 35 (70%), and in more than one lobe in 15 (30%)

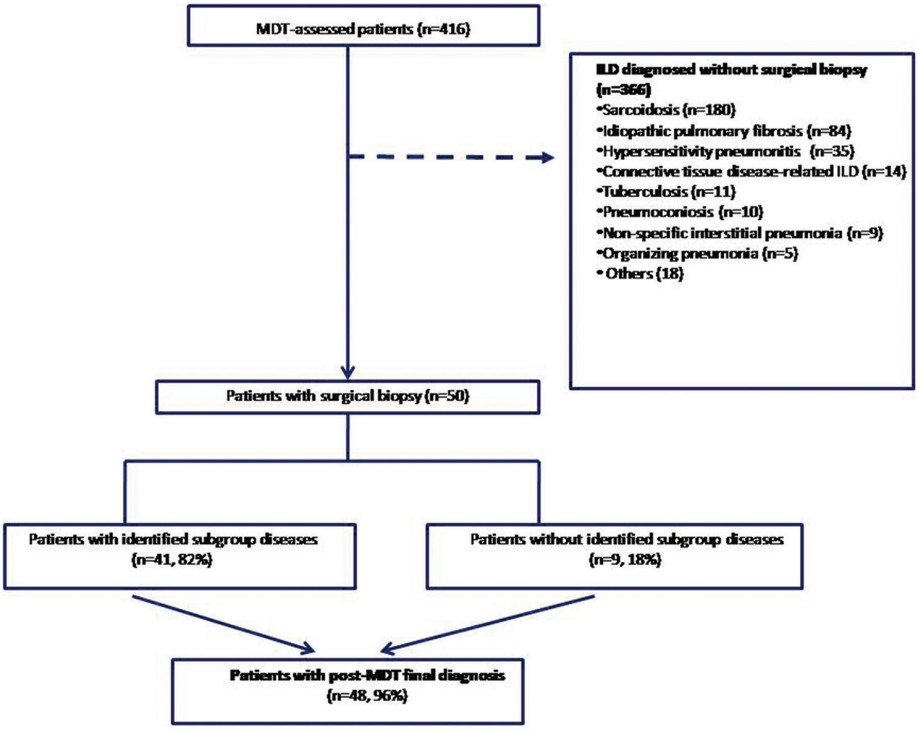

Figure 1: Flowchart. MDT: Multidisciplinary team, ILD: Interstitial lung diseases ILDs

Table 1: Demographics and comorbidities among interstitial lung disease patients diagnosed after surgical biopsy (*n*=50)

	All (*n*=50)	IPF (*n*=19)	Sarcoidosis (*n*=11)	NSIP (*n*=5)	Unclassifiable fibrosis (*n*=9)	HSP (*n*=2)	Other (*n*=4)
Gender, female/male	26/24	8/11	6/5	4/1	5/4	2/0	1/3
Age, years, mean±SD	53±12	57±10	33 (27-62)*	47±6	58±11	60±2	59±4
Comorbidities, *n* (%)	18 (36)	8 (42)	1 (9)	2 (40)	5 (56)	2 (100)	-
Chronic respiratory disease	6 (12)	0 (0)	1 (9)	1 (20)	3 (33)	1 (50)	-
Immunosuppressive disease	4 (8)	3 (16)	-	-	1 (11)	-	-
Diabetes mellitus	5 (10)	1 (5)	-	1 (20)	2 (22)	1 (50)	-
Hypertension	10 (20)	3 (16)	1 (9)	2 (40)	3 (33)	1 (50)	-
Coronary artery	2 (4)	2 (10)	-	-	-	-	-
Heart failure	1 (2)	1 (5)	-	-	-	-	-

*Median (25%-75%). Data shown are *n* (%), mean±SD. IPF: Idiopathic pulmonary fibrosis, NSIP: Nonspecific interstitial pneumonia, HSP: Hypersensitivity pneumonitis, Others: Lymphocytic interstitial pneumonia 1, lung cancer 1, tuberculosis 1, cryptogenic organizing pneumonia 1, SD: Standard deviation

Table 2: Patients' computed tomography findings before surgical biopsy (*n*=50)

	n (%)
Reticular pattern	41 (82)
Traction bronchiectasis	34 (68)
Ground-glass	30 (60)
Mosaic perfusion	13 (26)
Consolidation	11 (22)
Cyst	10 (20)
Honeycomb	5 (10)
Subpleural localization	26 (52)
Central localization	23 (46)
Basal involvement	31 (62)
Apical involvement	28 (56)

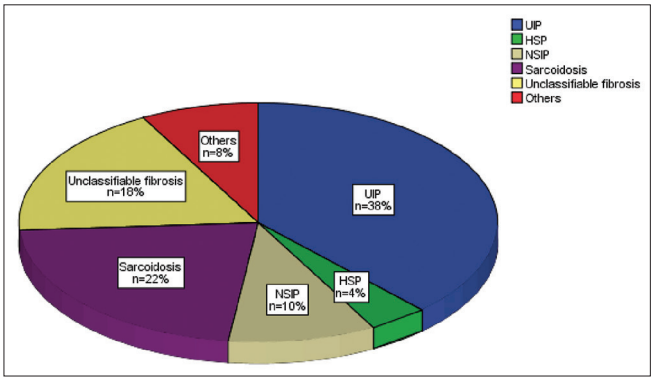

Figure 2: Pathological diagnoses after video-assisted thoracic surgery

patients. The most common biopsy location was the lower lobe (*n* = 38, 76%), while the middle lobe (*n* = 6, 12%) and lingula (*n* = 2, 4%) were the least common. The median length of hospital stay of patients was 4 (range: 1–8) days. No in-hospital mortality was observed in any patient, and there were no serious complications other than prolonged air leak in one patient. This patient stayed in the hospital for 8 days and was discharged with full recovery [Table 3].

Video-assisted thoracic surgery results

Figure 2 shows the pathological diagnoses after VATS. A specific diagnosis was achieved in 41 (82%) patients, while nine (18%) patients could not be classified. The most common diagnosis was UIP (38%), followed by sarcoidosis (22%), NSIP (10%), HSP (4%), and others (8%), respectively. Male gender was common in the UIP, while the female gender was common in the non-UIP subgroups. The age range was 29–72 in IPF, 38–55 in NSIP, 27–62 in sarcoidosis, and 44–74 in unclassifiable fibrosis [Figure 3].

Change of diagnosis by multidisciplinary team after video-assisted thoracic surgery

The VATS pathological results were re- reevaluated by the MDT. A second pathologist re-examined the specimens of the 18 patients with pathology results inconsistent with the clinical and radiological findings. The diagnosis was changed in 13 (26%) of these patients. The most common diagnostic change was in the unclassifiable fibrosis and UIP groups [Figure 4]. Details are provided in Table 4. Of the patients (*n* = 9) with unclassifiable fibrosis, four were accepted as IPF, two as HSP and one as respiratory bronchiolitis-associated interstitial lung (RB-ILD), while no specific diagnosis could be established in the other two patients. The diagnosis was changed in four of the 19 patients diagnosed with UIP, while the diagnosis of 15 patients remained unchanged. The diagnoses changed were as NSIP = 2, HSP = 1 and RB-ILD = 1. Of the five patients diagnosed with NSIP, the diagnosis remained as NSIP in four, while one patient was accepted as having Langerhans cell histiocytosis. The final diagnosis was sarcoidosis in one of the two HSP patients [Table 4].

In the classification of the 50 patients undergoing VATS based on HRCT patterns, three of the 28 patients with an "alternative" diagnosis, eight of the 14 patients with "probable UIP" and all four of the patients with "indeterminate for UIP" and "UIP" diagnoses were accepted as IPF [Figure 5].

Table 3: Details of invasive procedures performed on patients

	All (*n*=50)	IPF (*n*=19)	Sarcoidosis (*n*=11)	NSIP (*n*=5)	Unclassifiable fibrosis (*n*=9)	HSP (*n*=2)	Other (*n*=4)
FOB, *n* (%)	37 (74)	13 (68)	10 (91)	5 (100)	6 (67)	1 (50)	2 (50)
BAL, *n* (%)	30 (60)	12 (63)	8 (73)	3 (60)	6 (67)	1 (50)	-
Biopsy side, *n* (%)							
Left	23 (46)	12 (63)	4 (36)	3 (60)	2 (22)	-	1 (50)
Right	27 (54)	7 (37)	7 (64)	2 (40)	7 (78)	2 (100)	1 (50)
Biopsy lobe, *n* (%)							
Single	35 (70)	16 (84)	5 (45)	5 (100)	6 (67)	1 (50)	2 (50)
More than one	15 (30)	3 (16)	6 (55)	-	3 (33)	1 (50)	2 (50)
Biopsy localization, *n* (%)							
Upper lobe*	23 (46)	8 (42)	8 (73)	1 (20)	3 (33)	1 (50)	3 (75)
Middle lobe	6 (12)	1 (5.3)	-	-	3 (33)	1 (50)	-
Lower lobe	38 (76)	13 (68.4)	8 (73)	4 (80)	8 (89)	1 (50)	3 (75)
Length of hospital stay (days)**	4 (1-8)	4 (1-8)	3 (2-5)	4 (3-5)	3 (2-6)	4 (4-5)	4 (3-7)

*Included lingula (2 patients), **Median (IQR). Data shown are *n* (%). IPF: Idiopathic pulmonary fibrosis, NSIP: Nonspecific interstitial pneumonia, HSP: Hypersensitivity pneumonitis, Others: Lymphocytic interstitial pneumonia 1, lung cancer 1, tuberculosis 1, cryptogenic organizing pneumonia 1, FOB: Fiberoptic bronchoscopy, BAL: Bronchoalveolar lavage, IQR: Interquartile range

Table 4: Change in interstitial lung disease diagnosis after multidisciplinary discussion (*n*=50)

	Final diagnosis established with multidisciplinary team								
	HSP	NSIP	COP	LHH	IPF	Unclassifiable fibrosis	RB-ILD	Sarcoidosis	Others
VATS diagnosis									
IPF (*n*=19)	1	2			15		1		
NSIP (*n*=5)		4		1					
Unclassifiable fibrosis (*n*=9)	2				4	2	1		
Sarcoidosis (*n*=11)								11	
HSP (*n*=2)	1							1	
Others (*n*=4)									4

IPF: Idiopathic pulmonary fibrosis, HSP: Hypersensitivity pneumonitis, NSIP: Nonspecific interstitial pneumonia, COP: Cryptogenic organizing pneumonia, LHH: Langerhans cell histiocytosis, RB-ILD: Respiratory bronchiolitis-associated interstitial lung disease, Others: 1 each patient for lung cancer, tuberculosis, organizing pneumonia, lymphocytic interstitial pneumonia, VATS: Video-assisted thoracoscopic biopsy

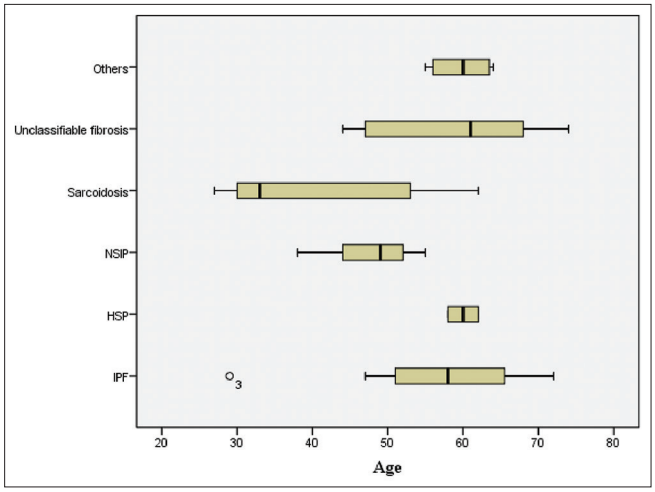

Figure 3: Age distribution in interstitial lung diseases. IPF: Idiopathic pulmonary fibrosis, HSP: Hypersensitivity pneumonitis, NSIP: Nonspecific interstitial pneumonia

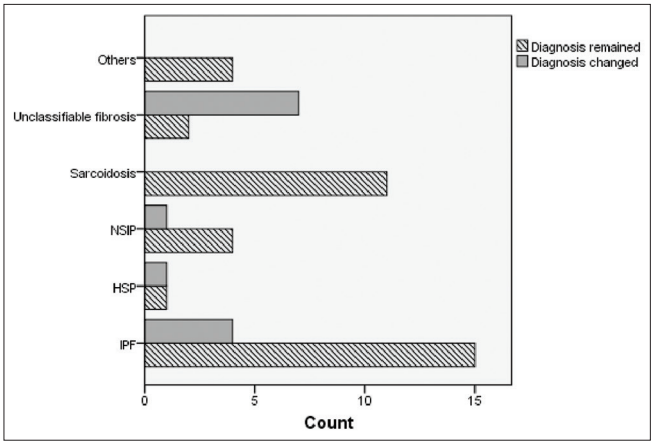

Figure 4: Interstitial lung diseases with change in diagnosis after multidisciplinary council. IPF: Idiopathic pulmonary fibrosis, HSP: Hypersensitivity pneumonitis, NSIP: Nonspecific interstitial pneumonia

Table 5 compares the CT findings of the patients with a final diagnosis of IPF and non-IPF by the MDT. Accordingly, reticular pattern ($P < 0.009$) and honeycomb ($P < 0.005$) were found statistically significantly more frequently in IPF patients than in non-IPF patients. Non-IPF patients were observed to have significantly more consolidation and multiple nodules than IPF patients ($P < 0.035$, $P < 0.031$, respectively). Traction bronchiectasis was more common in IPF patients than in non-IPF patients (84% vs. 58%), although the difference was not statistically significant ($P = 0.054$). The rates of both basal and apical involvements were significantly higher in IPF patients

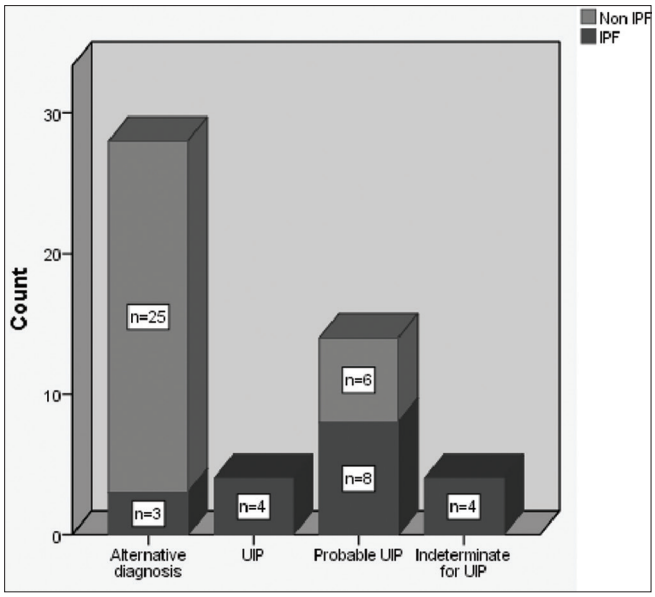

Figure 5: Final diagnosis of IPF according to HRCT patterns. IPF: Idiopathic pulmonary fibrosis, UIP: Usual interstitial pneumonia, HRCT: High-resolution computed tomography

than in the other group ($P < 0.001$, $P < 0.010$, respectively). The non-IPF patients had more centrally-located lesions than IPF patients (52% vs. 37%), although the difference was not significant ($P = 0.30$).

Table 6 compares the demographic and biopsy characteristics of patients with and without a final diagnosis of IPF by the MDT. The age of the IPF patients (59 ± 12) was significantly higher than that of the non-IPF patients (49 ± 12) ($P = 0.006$). Biopsy specimens were obtained mostly from a single lobe in the IPF group (90% vs. 58%), while more than one lobe was used (42% vs. 10%) for the biopsy in the non-IPF group ($P = 0.019$). There was no statistically significant difference in the length of hospital stay between the IPF and non-IPF patients ($P = 0.72$).

Discussion

The present study examined the experience of our center related to patients discussed at MDT meetings who were scheduled for surgical lung biopsy. A biopsy was decided for 12% of the discussed patients, and a specific diagnosis was established in 82%. The diagnoses were IPF (38%), sarcoidosis (22%), and unclassifiable fibrosis (18%), respectively. When these pathological diagnoses were re-assessed by the MDT, a revision was made in 26% and a specific diagnosis was achieved in 96%. The most commonly revised subgroups were those of IPF and unclassifiable fibrosis.

In their 2013 guidelines for idiopathic interstitial lung diseases, the ATS/ERS recommended an MDT rather

Table 5: Comparison of patients with and without a final diagnosis of idiopathic pulmonary fibrosis by the multidisciplinary team, based on computed tomography findings computed tomography findings (*n*=50)

	IPF (*n*=19), *n* (%)	Non-IPF (*n*=31), *n* (%)	*P*
Reticular pattern	19 (100)	22 (71)	0.009
Centrilobular nodules	2 (10)	8 (26)	0.28
Traction bronchiectasis	16 (84)	18 (58)	0.054
Ground-glass	11 (58)	19 (61)	0.81
Mosaic perfusion	4 (21)	9 (29)	0.74
Consolidations	1 (5)	10 (32)	0.035
Cysts	4 (21)	6 (19)	0.88
Honeycombing	5 (26)	0 (0)	0.005
Multiple nodules	2 (10)	12 (39)	0.031
Subpleural localization	18 (95)	8 (26)	0.001
Central localization	7 (37)	16 (52)	0.30
Peripheral involvement	18 (95)	13 (42)	0.001
Basal involvement	18 (95)	13 (42)	0.001
Apical involvement	15 (79)	13 (42)	0.010

Tested by Fisher's exact test. IPF: Idiopathic pulmonary fibrosis

Table 6: Comparison of patients with a final diagnosis of idiopathic pulmonary fibrosis and non-idiopathic pulmonary fibrosis by the multidisciplinary team, based on demographic and biopsy characteristics

	IPF (*n*=19)	Non-IPF (*n*=31)	*P*
Age, years, mean (SD)	59 (12)	49 (12)	0.006[a]
Gender (female/male)	8/11	18/13	0.27[b]
Biopsy side, *n* (%)			
Right	7 (37)	20 (65)	0.057[b]
Left	12 (63)	11 (35)	
Biopsy lobe, *n* (%)			
Single lobe	17 (90)	18 (58)	0.019[b]
More than one lobe	2 (10)	13 (42)	
Biopsy localization, *n* (%)			
Only upper lobe	6 (32)	6 (19)	0.095[b]
Only lower lobe	11 (58)	13 (42)	
Upper lobe/ lower lobe	2 (10)	12 (39)	
Length of hospital stay*	4.11 (1-7)	3.94 (2-8)	0.72[c]

[a]Analysis by Student's *t*-test, [b]Analysis by Chi-square test, [c]Analysis by Mann-Whitney U-test, *Median (25%-75%). MDT: Multidisciplinary team, IPF: Idiopathic pulmonary fibrosis, SD: Standard deviation

than histology approach to ILD diagnosis,[4] which has been supported by various studies in the literature.[15,16] The incidence of subgroups that do not require surgical biopsy varies from center to center where MDT studies are performed. In a new study involving 150 patients reported connective tissue disease-related ILD ($n = 48$, 32%) as ranking first in a series in which rheumatic patients were referred to and the MDT also included a rheumatologist. The study reported that other ILDs were IPF ($n = 35$, 23%) and HSP ($n = 20$, 13%), respectively, while the sarcoidosis rate was only 6% ($n = 9$).[9] In our study, sarcoidosis ($n = 180$, 43%) diagnosed without biopsy by MDT was ranked

first among IPF (n = 84, 20%) and HSP (n = 35, 8%). subgroups. These findings are consistent with the findings of epidemiological research in our country.[17]

The guidelines recommend the surgical biopsy decision made with MDT when a specific diagnosis cannot be made from clinical and radiological findings.[4] Studies reported that biopsy was decided in 9-43% of the cases after MDT meetings, and this rate was 12% in our study.[9,18]

There are numerous studies describing an increasing number of definitive diagnoses after an MDT discussion. Considering only the histological evaluation, the rate of diagnosis is 67–87% and reaches 88–100% after MDT discussion.[7,10,13] While IPF ranks first in histological diagnoses in these studies, non-IPF diagnoses vary. In a study by Sigurdsson *et al*., 32% for IPF, 23% for OP and 16% for unclassified fibrosis, Theegarten *et al*. reported 35% for IPF, 24% for NSIP, and 16% for RB-ILD.[13,19] According to the different studies, this rate was 35% for IPF, 19% for unclassified fibrosis and 8.7% for sarcoidosis, including surgical biopsies of 938 patients evaluated with MDT between 2005 and 2015. This study identified a specific subgroup in 80% (n = 755) of patients and showed that the MDT approach contributed 70% to the outcome.[10] In the present study, the rate of diagnosis by surgical biopsy was 82%, and this rate increased to 96% in MDT meetings. Similar to several previous studies, it was found in our study that IPF ranked first with 38%, followed by sarcoidosis (22%) and fibrosis that could not be classified as third (18%). The diagnosis of sarcoidosis does not require any surgical biopsy.[20] In this study, the vast majority of patients (180/191) were diagnosed without surgical biopsy, and the biopsy needed only a small proportion (11/191) due to atypical radiological and clinical features. We believe this is an acceptable rate.

In our study, the rate of "unclassified fibrosis" was 18%. In 10–19% of cases, a specific subgroup could not be identified even after surgical biopsy.[1,9,19,21] The main reasons for this are changes in clinical, radiological, and pathological findings, non-diagnostic biopsy samples, and radiological and histological findings with previous treatments.[1] The MDT approach is especially important in determining the exact diagnosis and treatment of such patients.[18] In a study by Biglia *et al*., 56 non-classified fibrosis patients were reported before MDT involvement and 15 after MDT involvement, and this difference was significantly different ($P < 0.0001$).[9] In our series, nine patients with "non-classifiable fibrosis" pathology were reevaluated by MDT; four patients were considered IPF, two HSP and one RB-ILD.

Studies with MDT involvement report that there is a 20–64% revision in definitive diagnosis[6,9,10,18] revision is required less frequently in IPF patients than in the non-IPF subgroups.[6,13,22] The radiological criteria of IPF defined by ATS/ERS/JRS/ALAT in 2018 provided diagnostic convenience to clinicians.[14] For example, the usual interstitial pneumonia (UIP) pattern is most likely a histological and radiological lesion of IPF. The UIP pattern is defined as honeycomb observation on HRCT or subpleural fibrosis, which significantly disrupts the architectural structure.[23] Walsh *et al*. compared the subgroup diseases evaluated by MDT members from seven different countries. The study included 70 patients in whom IPF having the highest level of agreement among MDTs.[8]

However, diagnosis of some IPF patients can be difficult for clinicians, primarily because of the various radiological views of IPF, different interpretations of radiological findings (especially honeycomb), and the UIP pattern is not IPF-specific.[24,25] The UIP pattern may exist in some chronic HSPs (8%), it may be difficult to differentiate pathologically from IPF.[26] Another diagnostic challenge is to see different interstitial patterns in different parts of the same lung.[27] A UIP pattern in different lobes was detected in biopsies of patients with NSIP, which is among the most commonly fibrotic ILDs mixed with IPF.[28] In our cohort, the majority of IPF patients (81%) were diagnosed with MDT without surgical biopsy. When 19 patients diagnosed with pathological UIP after surgical biopsy were re-evaluated with MDT, the diagnosis of IPF was rejected in one-fifth, one patient was considered HSP, two patients were considered NSIP and one RB-ILD.

The rate of HSP reported after surgical biopsy is low. In the Flaherty *et al*. and Biglia *et al*. series, HSP was detected in four patients each and the diagnosis of two patients was changed to IPF with MDT[6,9] Theegarten *et al*. reported that the pathological examinations of patients later diagnosed with HSP by MDT were consistent with NSIP, UIP and OP.[13] Our study found an HSP-compliant histology in only two patients. The diagnosis was changed to sarcoidosis after MDT meeting in one of these patients. HSP was diagnosed by MDT in 35 patients without the need for a surgical biopsy. These findings show the importance of detailed evaluation of environmental and occupational exposure, BAL and typical radiological findings for the diagnosis of HSP.

The current guideline defines HRCT patterns for IPF diagnosis in four groups as "UIP," "probable," "indeterminate for UIP" and "alternative."[14] Among the IPF patients, 30–40% may not have characteristic HRCT findings.[27] Sverzellati *et al*. reported an alternative pattern of HRCT in 34 (62%) of 55 patients with IPF proven by surgical biopsy.[24] Yagihashi *et al*. investigated the consistency of the histological findings with the radiological pattern among the 241 patients with UIP

proven by surgical biopsy. Their multi-center study established pathological consistency in 99 (97.1%) of 102 UIP patients on HRCT, and demonstrated pathologically UIP and probable UIP patterns in 71 (94.7%) of 75 patients inconsistent with UIP on HRCT. The authors reported that the most common radiological characteristics of these inconsistent 71 patients were mosaic perfusion/air trapping (51, 71.8%), diffuse ground-glass (16, 22.5%), and greater involvement of the upper and middle zones (28, 39.4%).[29] In our series, the final diagnosis was accepted as IPF in three of 28 patients with an "alternative" pattern, in all four patients with an "indeterminate" pattern and eight of the 14 patients with a "probable" pattern in HRCT.

Our study found significant honeycomb and reticular interseptal thickening in IPF patients compared to non-IPF patients ($P < 0.005$, $P < 0.009$, respectively). Interestingly, traction bronchiectasis, an important finding for "probable" IPF, was more common in the IPF group (84% vs. 58%); however, the difference was only significant at the border ($P < 0.054$). This may be due to insufficient sample size. Our study showed a lower discrepancy between radiological pattern and pathological diagnosis than other studies. One reason for this may be the use of former guidelines as a reference in other studies, and the other one may be due to the careful selection of patients to be biopsied by MDT in this study.

The most important limitation of this study is its single-center retrospective design and the limited number of patients. On the other hand, this study showed 3 years of MDT experience in our center. The most common diagnosis was IPF, sarcoidosis, and unclassified fibrosis in patients undergoing surgical biopsy. IPF and unclassified fibrosis were subgroups that witnessed the most frequent diagnostic change after MDT meetings. These findings show that IPF can occur with different radiological features and the diagnosis of IPF cannot be excluded in patients with "indeterminate" and "alternative" patterns. Additionally, the other limitation of our study is that biopsy was mostly taken from one lobe in IPF patients while more than one lobe in non-IPF patients. The reason may be due to concern of possible postoperative complications. Finally cümle başından silelim lütfen.

Conclusion

Open lung biopsylung biopsy may produce nonspecific signs of fibrosis, and it may be difficult to identify a specific subgroup in the interstitial lung diseases without adopting the MDT approach.

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Conflicts of interest

There are no conflicts of interest.

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