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CASE REPORT

Contribution of Surgical Pulmonary Biopsy in the Diffuse Infiltrative Pulmonary Disease

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Abstract

Introduction: Surgical lung biopsy is an invasive procedure of last resort in the etiologic diagnosis of acute and chronic diffuse infiltrative lung diseases.

Materials and Methods: We report the experience of the pulmonology department in collaboration with the thoracic surgery department of University Hospital Hassan II of Fez on the indications and the contribution of surgical lung biopsy (SLB) in the etiologic diagnosis of diffuse infiltrative pulmonary disease.

Results: Thirty-three biopsies were performed in 13 men and 20 women. The average age of our patients was 49.96 years. 8 patients' biopsies were made by videothoracoscopy and 25 per mini thoracotomy. Histology is back for a usual interstitial pneumonia (UIP) in 11 patients, non-specific interstitial pneumonia (NSIP) in 6 patients, sarcoidosis in 2 patients, and hypersensitivity pneumonitis in 2 others, cryptogenic organized pneumonia (COP) in 2 patients, tuberculosis in 2 cases and desquamative interstitial pneumonia (DIP) in 2 patients. It was a lymphoid interstitial pneumonia (LIP) in a patient and a lung adenocarcinoma in another. In 4 patients, the biopsy was inconclusive. One patient developed respiratory failure in post-surgical suites and died.

Conclusion: Surgical lung biopsy is a part of the diagnostic arsenal of diffuse infiltrative disease because it allows for a diagnosis, provide a therapeutic and assess prognosis.

Keywords: Surgical Lung Biopsy; Diffuse Infiltrative Pulmonary Disease; Interstitial Lung Disease; Videothoracoscopy; Mini-Thoracotomy

Introduction

The diagnostic approach of diffuse infiltrative pulmonary disease or interstitial lung disease (ILD) is very different depending on whether it is sub-acute and chronic diffuse pulmonary disease (more than 3 months of evolution) or acute diffuse pneumonitis. For chronic diffuse infiltrating pneumonitis, the etiological diagnosis in computed tomography is based on a rigorous approach including the identification of the predominant lesion and its lesional topography, other pulmonary lesions and extra-pulmonary thoracic lesions. The set of thoracic lesions makes it possible to describe patterns or groups of lesions that are often characteristic of a small number of diseases. The confrontation of imagery and epidemiological, anamnestic, clinical, biological, functional and cytological data generally leads to the diagnosis. Otherwise, the surgical lung biopsy (SLB) is necessary. SLB is an invasive technique for diagnostic purposes. Its indication must answer essentially a question: apart from the satisfaction for the doctor to obtain a precise nosological diagnosis, does it bring a real benefit to the patient? It must also weigh this profit against the risks incurred. This article aims to discern our experience with the contribution of surgical lung biopsy in the etiological diagnosis of ILDs. It also exposes the different surgical techniques and their complications.

Materials and methods

This is a retrospective study from January 2009 to December 2015 covering all cases of surgical lung biopsies performed as part of the etiological assessment of ILDs. We report the experience of the department of pneumology in close collaboration with the department of thoracic surgery of the university hospital center Hassan II of Fez on the indications and the contribution of the pulmonary biopsy in the etiological diagnosis of the ILD. Data collection was done on Excel and statistical analysis by Epi info.

Results

Three hundred and thirty-six patients were admitted to our department for ILD. Surgical biopsy was indicated in 48 patients but not performed in 15 patients (patient refusal, ischemic heart disease, respiratory distress requiring urgent treatment). For 33 patients (9.8% of cases), this biopsy was performed because the etiological assessment remained negative. There are 13 men and 20 women. The average age of our patients is 49.96 years. In the antecedents, there was active smoking in 7 patients, a notion of avian contact in 3 patients and exposure to silica in a patient. Two patients were already treated for tuberculosis; one was followed for scleroderma and one for lupus. Clinically, sixteen patients complained of chronic cough, and eighteen reported chronic dyspnea (stage 2 according to the Sadul classification in 5 patients, stage 3 in 9 patients and stage 4 in 4 patients). In 3 patients there was an alteration of the general condition. In chest CT, micro nodules and crosslinks was isolated in 22 patients and associated with mediastinal lymphadenopathies in 11 others. In 6 patients, there was pulmonary condensation and in 2 others a frosted glass appearance. Six patients were already in the stage of chronic respiratory failure before the surgical procedure (Table 1). In all our patients, SLB was only discussed after a thorough etiological review that did not allow retaining a specific etiology or nosological entity (biological, immunological, bronchial endoscopy with staged bronchial biopsies and bronchoalveolar lavage, mediastinoscopy). Also, the indication of the pulmonary biopsy was validated after discussion in multidisciplinary consultation meeting, it also allows a radiological discussion and precise to the thoracic surgeon the seat and the number of pulmonary biopsies required. In 8 patients, the biopsies were made by videothoracoscopy while in the other 25 by mini thoracotomy. Histology returned to favor UIP in 11 patients, NSIP in 6 patients, sarcoidosis in 2 patients, extrinsic allergic alveolitis in 2 others, cryptogenic organized pneumonia (COP) in 2 patients, tuberculosis in 2 cases and DIP in 2 patients.

variable	number	%
Age (mean/year)	49,96	
Gender		
Men	13	39,4
Women	20	60,6
Chronic cough	16	48,5
Dyspnea		
Stage 2	5	15,1
Stage 3	9	27,2
Stage 4	4	12,1
Chronic respiratory failure	6	18,2
Chest CT		
Micronodules+/-crosslinks	22	66,6
Mediastinal lymphadenopathy	11	33,3
Pulmonary condensation	6	18,1
Frosted glass appearence	2	6

Table 1: demographic, clinical and radiological patients' data

Variable	number	%
Biopsy approach		
VATS	8	24,2
Mini thoracotomy	25	75,8
Pathological diagnosis		
UIP	11	33,4
NSIP	6	18,2
Sarcoidosis	2	6
Extrinsic allergic alveolitis	2	6
COP	2	6
DI	2	6
Tuberculosis	2	6
LIP	1	3
Adenocarcinoma	1	3
inconclusive	4	12,4

Table 2: biopsy approach and pathologic diagnosis

It was an LIP in one patient and a lung adenocarcinoma in another. In 4 patients, the biopsy was inconclusive (Table2). In 3 patients of 11 with UIP, lung biopsy could have been avoided because they have a CT pattern but this biopsy was performed before the introduction of these CT criteria. The mean hospital stay of our patients was 6 days (2-8 days). All our patients were placed on paracetamol 3grams a day for 48 hours after the intervention with a cessation of pain. Only 5 patients (who underwent a mini thoracotomy) maintained paresthesia that had evolved well over the long term under symptomatic treatment. No patient presented another complication. The surgical lung biopsy allowed us to change the treatment or to put the patients under appropriate treatment in 18 cases (54.5%). This served to the remission of 13 patients (39.4%). Only one patient presented post-operative respiratory distress and died. Respiratory function deterioration was noted in 4 patients within 6 months after biopsy (2 patients per minithoracotomy and 2 per thoracoscopy) but it cannot be said whether this is secondary to surgery or to the evolution of their diseases. After 6 months of follow-up, no other death was noted other than that which occurred postoperatively.

Discussion

Due to the multiple causes of ILDs, accurate diagnosis remains a clinical challenge. Despite clinical, radiological, biological and bronchoscopic investigations, one third of patients with ILD still require a lung biopsy to achieve a definitive diagnosis [1-3]. The importance of distinguishing different ILDs lies in three points: to establish a prognosis, to propose adapted treatments according to the current knowledge (In 54% to 73% of the cases, the results of the SLB have changed the therapeutic treatment attitude of patients with ILD) and obtain homogeneous populations for therapeutic protocols [4]. In our series, pulmonary biopsy was made on 9.8% of our patients with ILD. In the first report of the Italian ILD registry, 20.5% of surgical biopsy was performed in a total of 1382 cases [5]. In the Vermersch series in Toulouse, in a total of 459 ILD files, SLB indication was retained in 58 patients but was only performed in 18 of them (patient refusal or disagreement of the patient reference pulmonologist) [6]. In a Tunisian series, among 262 patients hospitalized for ILD assessment, 17 had a surgical lung biopsy (6.4%) with a female predominance (12 women vs. 5 men) which joins our series (20 women and 13 men) [7]. Video-assisted thoracoscopic pulmonary biopsy or its alternative, limited thoracotomy biopsy, are the reference methods for obtaining biopsies of sufficient size to allow histological classification of ILDs [8]. Videothoracoscopy (VATS) is the most commonly used and recommended surgical technique for performing lung biopsies because of its minimally invasive nature [9,10]. The intervention under general anesthesia requires selective bronchial intubation (Carlens-type double-lumen airway probe) with pulmonary exclusion on the operated side during the surgical procedure, in order to create a "working" space in the pleural cavity. The location of the selective airway probe is usually controlled by fibroscopy before the procedure. The patient is positioned in lateral decubitus with a transverse block under the contralateral hemithorax. An additional intercostal gap is thus obtained on the operated side, which favors the manipulation of endoscopic instruments [11]. If it is necessary to convert to a thoracotomy, it may be posterolateral or axillary. In videothoracoscopy, the instruments are introduced via operating channels, called trocars. Three chest incisions of 1.5-2 cm placed in triangulation are made. Generally, these incisions are located at the level of the anterior, middle and posterior axillary lines. Using the thoracoscope and endoscopic palpation and grasping instruments, lung regions are selected for biopsy. The technique of videothoracoscopy allows a good exploration of the entire pleural cavity and the lung surface, without costal spacing, hence its character of minimally invasive technique. The biopsy, in itself, is done using mechanical tweezers that at the same time allow the parenchyma of the lung to be cut and suture the remaining "wound" of tissue, thus achieving haemostasis and aerostasis. However, in some situations it is necessary to use a thoracotomy, called minithoracotomy (because of its shorter length than a standard thoracotomy) in case of large pleural adhesions or if the lesion biopsy is not found at thoracoscopic exploration [11]. In practice, it consists of enlarging one of the trocar incisions (often the one with a posterior position) by partially opening an intercostal space. In our series, 10 patients underwent thoracoscopy but in 2 cases, a conversion to a thoracotomy was made because of pleural adhesions. In the UK study involving 2820 patients, VATS was performed in 66% of the cases. In a Italian study, 93, 8% of patients had VATS and 6, 2% limited thoracotomy [12,13]. The mini-thoracotomy surgical biopsy can also be performed immediately in case of emergency diagnostic need (patient with diffuse interstitial pneumonitis responsible for worsening respiratory failure, requiring respiratory assistance). The arguments for a mini-thoracotomy are: to avoid intubating maneuvers with a dual-lumen probe, to avoid selective pulmonary ventilation of the patient during the procedure and to reduce operative time [14]. Some surgeons prefer to opt for a mini-thoracotomy immediately in case of diffuse pulmonary involvement, even in case of programmed operation. The mini-thoracotomy is performed anterolaterally at the level of the fourth or fifth intercostal space, the anterior end of the incision being located 2-3 cm laterally of the nipple line [15]. The hemithorax is elevated at 45° to the operating Table, using a posterior longitudinal block or supports. The costal spacing should be avoided in these patients, in order to reduce post-operative pain, hence the difficulty of biopsying several pulmonary sites. Between these two techniques, it therefore seems reasonable to leave the choice to the surgeon's experience. In our series, the preference was for the mini-thoracotomy performed in the majority of our patients while in the Tunisian series, mini-thoracotomy was done in 9 cases and video-thoracoscopy in 8 cases [7].

Another aspect that is open to discussion is the number and sites of biopsies to be performed. The site of biopsy should be focused on involved lung parenchyma or areas adjacent to obviously abnormal lung. Older literature cautions against biopsy specimens from the lingula, but this caveat has not been borne out in more recent studies. Although not prospectively studied, a specimen size of at least 3x 2 x1 cm3 seems to be adequate. No fewer than two biopsy specimens from separate lobes should be obtained to address the possibility of discordant histopathologic findings (eg, explanted lungs in patients with UIP can exhibit areas of NSIP in up to 80% of cases) [16]. This is the case in our series: biopsies were performed in at least 2 different lobes and this was decided

in multidisciplinary consultation meeting before surgery. Each biopsy was at least 3 cm long, avoiding fibrous and scarred areas, and focusing on less affected areas or straddling lesions and the "healthy" parenchyma. All biopsies were sent to an ILD specialized laboratory but unfortunately did not have a mineralogy study. This multidisciplinary approach is now considered to be the gold standard for the diagnosis of ILDs : Diagnostic confidence, the proportion of correct diagnoses, and agreement on the final diagnosis progressively increase as clinicians, radiologists, and pathologists share and discuss the available clinical, radiologic, and histopathologic data and reach a best-fit consensus diagnosis; the agreement on the final diagnosis is thus significantly better than when histopathologic information is interpreted in isolation [16]. Complications are various, represented by prolonged air leak beyond 5 days, infection of the operative site, haemothorax, pneumothorax, bronchopleural fistula, deterioration of respiratory function requiring mechanical ventilation. For idiopathic ILDs, a common complication is acute exacerbation [17]. Painful sequelae are possible, of variable intensity, including latero-thoracic paresthesia and pains in relation to the scar of the thoracic drains in particular. The frequency of painful sequelae varies according to the series ranging from 5 to 25% [18,19].

According to recent studies postoperative mortality after SLB is 4.3% to 4.8%. However, some subgroups of patients: immunocompromised patients or patients with severe respiratory failure have substantially higher operative mortality. The shift from conventional thoracotomy toward video-assisted thoracoscopic surgery (VATS) favors the new technique in regards to mortality and hospital stay [16,17]. In our series, no patient has kept intense pain, only a few cases of paresthesia were noted and one case of acute exacerbation who dies few days after surgery. In the Italian study, 19 patients (11.8%) presented postoperative complications, predominantly prolonged air leakage (5.0% of all cases) and 3,1% died from acute exacerbation [13]. Also, in the Chinese study, there were 16 cases had a fever after surgery and antibiotics were administrated for eleven of them [20]. Other complication were included delayed wound healing (>10 days after surgery, 6 cases), thoracic hemorrhage (5 cases), chest tube re-indwelling because of pneumothorax (4 cases), delayed weaning of ventilator (>3 days after surgery, 4 cases), respiratory failure (3 cases), and thoracic infection (2 cases). There were two cases died within 30 days following surgery because of respiratory failure. In the Tunisian series, 3 deaths were reported (one in the immediate future: it was an acute ILD with the histopathological result diffuse alveolar damage (DAD). The other two remote pulmonary surgical biopsy (due rather to the course of the disease) [7]. In our study, surgical lung biopsy made it possible to diagnose more than 87.7% of cases. This is in line with literature data in which pulmonary biopsy retained a histological entity in several studies: 76.4% in Takamori in Japan, 92.2% in Gaensler and 100% in the Tunisian series [7,21,22].

Conclusion

Despite the various controversies it raises, SLB is a part of the diagnostic arsenal of interstitial lung disease. Although the number of surgical biopsies has decreased considerably, particularly as a result of advances in imaging, anatomopathological confirmation is sometimes essential for the initiation of long-term treatment and prognosis evaluation. However, SLB can lead to significant morbidity and mortality that's why patients should be selected carefully following discussion at a multidisciplinary team meeting in order to make optimal use of this resource.

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