International Journal of Science and Research (IJSR)
ISSN: 2319-7064
ResearchGate Impact Factor (2018): 0.28 | SJIF (2018): 7.426

Contribution of Thoracic Angioscanner in the Diagnosis of Pulmonary Embolism: About 90 Cases at the Aristide Le Dantec Hospital of Dakar

H. Deme[1,*], M. Diouf[1], L. G. Akpo[1], N. Badji[1], F.G. Niang[2], A. D. Diop[2], Y. Kasse[1], A. Mbaye[1], I. Faye[1], P. A. Diop[1], M. C. Fall[1], M. N. Mbengue[1], O. Sano[2], F. K. Aw[3], S. Ba[2], E H. Niang[1]

[1]Medical Imaging Department of Aristide Le DANTEC Hospital
[2]Medical Imaging Department of the FANN National University Hospital Center
[3]Cardiology department of the Aristide Le Dantec Hospital

Abstract: ***Objective: to assess the contribution of angioscanner in suspected pulmonary embolism and compare the results with clinical scores. Patients and methods: this was a retrospective, cross-sectional study over 12 months (October 1, 2016 to September 30, 2017) in the imaging department of Aristide Le Dantec Hospital, including 90 patients. The average age was 48 years (extreme: 17 years and 86 years). The clinical probability of PE was intermediate in 52.2% of patients and low in 45.5% according to the revised Geneva score; intermediate in 26.6% of patients and low in 73.3% according to the Wells score. The examinations were performed with a Siemens 64 bar scanner with a Medrad Stellant automatic injector. Results: an endoluminal defect was found in 36 patients (40%), truncular topography in 11%, segmentary in 50% and lobar in 39%. PAH was noted in 58% of these patients with reversal of the VD/VG ratio in 27.7%. Pulmonary infarction was noted in 50% of patients with PE with pleural effusion in 36.1%. Alternative diagnoses found in 60% of patients were dominated by pulmonary emphysema with 35.18% of cases. For a low clinical probability according to the revised Geneva and Wells, angioscanner was positive in 24.39% and 37.87% respectively, compared to 53.19% and 45.23% for an intermediate score. Conclusion: angioscanning made it possible to diagnose PE in 40% of patients and to assess the prognosis by studying the cardiac impact.***

Keywords: pulmonary embolism, clinical scores, angioscanner.

1. Introduction

Pulmonary embolism (PE) is caused by the sudden or partial obstruction of the trunk or one of the branches of the pulmonary artery by a circulating foreign body, most often fibrino-cruoric [1]. It is the third leading cause of cardiovascular death after myocardial infarction and stroke. Untreated, its mortality rate is 30%, increasing from 2 to 8% under anticoagulant treatment [2]. Lack of treatment leads to recurrence and significant mortality, which can reach 40% of cases [3].

Its annual incidence is estimated at 0.8 per 1000 inhabitants [1] with a prevalence of 12 to 15% in autopsy series of hospitalized patients [2,4].

Diagnosis must be made promptly, to initiate anticoagulant therapy and any clinical suspicion of pulmonary embolism requires certainty of diagnosis.

This diagnosis is based on morphological examinations, in particular thoracic angioscanner which, apart from the positive diagnosis, makes it possible to assess the cardiac impact. Its implementation must be considered as part of a diagnostic strategy that includes clinical and biological criteria.

The objectives of our study were:

- To assess pulmonary embolism with angioscanner (positive diagnosis and severity diagnosis),
- To compare the angioscanner results with clinical data (revised Geneva and Wells clinical probability scores).

2. Patients and Methods

We carried out a retrospective, cross-sectional study covering a period of one year from 1 October 2016 to 30 September 2017.

The study was conducted in the imaging department of Aristide Le Dantec Hospital, including any patient with clinical and/or biological suspicion of pulmonary embolism and in whom a thoracic angioscanner was performed. Patients with normal thoracic angioscanner and patients with poor technical quality of the angioscanner were not included.

Ninety (90) patients were selected to perform this work. This was 41 men and 49 women, or a sex ratio of 0.8.

The average age of patients is 48 years with extremes of 17 and 86 years. The standard deviation was 17.

The clinical signs of calls found in our patients are shown in Table I.

Table I: Distribution of patients by clinical call signs

Clinicalcall signs	Number de patients (%)
Dyspnea	48%
Chest pain	60%
Tachycardia	44%
Hémoptysis	8%

Paraclinical examinations performed before angioscanning were electrocardiogram in 38.88%, cardiac ultrasound in 28.88%, chest radiography in 80% and D-dimer assay in 3.33%.

Our patients were divided into three groups (Table II) according to the revised Geneva and Wells clinical probability scores [5].

Table II: Distribution of patients by clinical score

Probability of PE		Enrolment	Percentage
Revised Geneva	Low	41	45,5
	Intermediate	47	52,2
	High	2	2,2
Wells	Low	66	73,3
	Intermediate	24	26,6
	High	0	0

The scan examinations were carried out with a SIEMENS SOMATOM 64 bar scanner and a MEDRAD double-body automatic injector.

After verification of the absence of contraindications to PDC injection and hemodynamic stability. The patient was undressed and placed in supine position on the stand, head first. A peripheral venous line of 18 to 20G in size was placedat the fold of the elbow, usually to the right. In exceptional cases, an approach by central venous catheterization was possible.

After making a topogram, we made an acquisition without and then with injection of PDC.

The image analysis was done on a syngovia console for post-processing the images.

We looked for the presence of a thrombus in the pulmonary artery and its branches, specifying its location (truncular, lobar or segmental), cardiovascular abnormalities such as dilation of the trunk of the pulmonary artery (if greater than 29 mm or if the ratio between the trunk of the pulmonary artery (TAP) and the size of the ascending aorta (Ao) was greater than 1) ; the appearance of the interventricular septum (normal : convex to the right or straight ventricle and abnormal or dysmorphic if it was "S" shaped or convex to the left ventricle); the ratio VD/VG, on an axial section, was the transverse diameter at mid-height of the right ventricle (VD) to the transverse diameter at mid-height of the left ventricle (VG). This ratio was normal if less than 0.9 and abnormal if more than 0.9.

We also looked for pleuroparenchymal abnormalities with a type of pleural effusion or focal point of pulmonary infarction.

In the absence of a direct sign in favour of pulmonary embolism, we looked for alternative diagnoses.

Our data were entered and analyzed using Microsoft Excel 2016 and SPSS 22 software. The chi^2 and Student tests allowed us to look for correlations with a threshold value below 5%.

3. Results

Endoluminal hypodensity was found in 36 patients (40%) confirming the diagnosis of pulmonary embolism. The thrombus was truncated in 4 patients (11%), lobar in 14 patients (39%) and segmented in 18 patients (50%). (Figure 1A).

The trunk of the pulmonary artery was dilated in 18 patients (50%) with PE (Figure 1B).

The size ratio between the pulmonary artery and segment 1 of the ascending aorta was greater than 1 in 13 patients (36.1%).
The VD/VG ratio was greater than 0.9 in 10 patients (27.77%) with PE (Figure 1C) with a truncated seat embolus in 4 cases (40%) and lobar in 5 cases (50%). In 9 out of 10 cases (90%), this inversion was associated with dilation of the trunk of the pulmonary artery.

A pulmonary infarction outbreak (Figure 2) was found in 18 patients with PE (50%), with segmented topography in 83.33% of cases.

Among patients with PE, thirteen (36.11%) had pleural effusion that was unilateral in 7 (53.84%). The embolus was of segmented topography for all these patients.

Alternative diagnoses accounted for 60% of suspected PE (Figure 3).

The comparison between clinical scores and the positivity rate of thoracic angioscanner in our study is shown in Table III.

Table III: Positivity rate of angioscanner as a function of clinical probability score

Probability of PE		Enrolment	Percentage %
Revised Geneva	Low	10/41	24,39
	Intermédiate	25/47	53,19
	High	1/2	50
Wells	Low	25/66	37,87
	Intermédiate	11/24	45,23
	High	0	0

4. Discussion

In our series, 40% of patients had a pulmonary embolism with a truncular topography thrombus in 11%, lobar in 39% and segmental in 50%. These results are above those obtained by Fadhlaoui et al [6], who found a positive rate of 15% in 200 patients examined. Mamlouk MD had found in a multicenter study in 2010 on 2003 scanners performed that 90% were negative [7].

These rates are lower than ours because they included patients with normal scans in their study. One of the consequences of pulmonary embolism was dilation of the pulmonary artery trunk, found in 50% of patients. This expansion beyond 29 mm indicates a pressure greater than 20mmHg. This is an important endpoint for pulmonary arterial hypertension with a PPV of 83% and a NPV of 28% [8]. A trunk of the pulmonary artery larger than 29 mm is grafted with a significant excess mortality of 17.3% at six months (compared to 8.2% if the trunk is normal) and 21% at one year (compared to 10.9% if the trunk is normal) [9].

In our series, 13 patients (36.1%) with confirmed PE had an inverted TAP/Ao ratio. The size ratio between the trunk of the pulmonary artery and segment 1 of the aorta is a direct indicator of the presence of pulmonary hypertension. In chronic pulmonary arterial hypertension, this dilation is accompanied by muscularization of the right ventricular wall with a wall greater than 6 mm and recruitment of systemic bronchial circulation [9].

Right ventricular dilation was found in 11 patients (30.5%) with confirmed PE.

Signs of right ventricular dysfunction indicate ventricular myocardial compensation and its inability to control the downstream overpressure of the intraarterial thrombus obstacle to ejection.

The VD /VG ratio reflects the degree of right ventricular suffering in front of a proximal pulmonary occlusion table. It was higher than 0.9 in 10 cases (27.77%). The increase in this ratio increases the patient's mortality in the following days or weeks [10].In their study on the prognostic retrospective evaluation of mortality of 3 pulmonary embolism scan criteria, N. Dublanchet et al found that if the VD/VG ratio was greater than 0.9, 1-month mortality was 7.9% (compared to 1.6% if VD/VG normal) and 17.7% at 1 year (compared to 6.2% if VD/VG normal) [9].

A focus of pulmonary infarction was found in 18 patients with PE (50%), segmented topography in 83.33% of cases and proximal in 16.66%.

However, the presence or severity of parenchymal abnormalities is not related to the severity of pulmonary embolism [11]. Coche et al [12] had shown that infarction was present in 50% of patients with pulmonary embolism and 58% of patients with acute pulmonary embolism.

In our series, 53.84% of patients with PE had unilateral pleural effusion. This is in agreement with the studies conducted by Bynom and Wilson [13] and Porcel et al [14] which had shown that pleural effusion was mostly unilateral. The pathogenesis of pleural effusion remains difficult to determine, but it is generally associated with a pulmonary infarction.

The positivity rate of angioscanner in our study was significant in patients with intermediate clinical probability with 53.19% according to the revised Geneva score and 45.23% according to the Wells score compared to the study by Ceriani et al [15] which found a positivity of 26% for the revised Geneva score and 23% for the Wells score. This is largely related to the inclusion criteria of our study because all patients with normal angioscanners were excluded.

However, a D-Dimer assay may be of interest in reducing the unnecessary demand for angioscanning and the number of normal angioscanners.

5. Conclusion

Pulmonary embolism is a medical emergency. Its clinical diagnosis remains difficult given the lack of specificity of the symptomatology. Thoracic angioscanner makes it possible to confirm the diagnosis of pulmonary embolism, to study the prognosis of the disease by evaluating the cardiovascular and parenchymal repercussions, thus constituting the reference imaging examination in the face of a suspected pulmonary embolism. However, a good clinical evaluation based on scores and a D-dimer assay would significantly reduce the normal scanning rate.

6. Conflicts of interest

No conflicts of interest were proclaimed.

7. Contribution of authors

All the authors brought their contribution.

References

[1] **Oger E&EPI-GETBO study group.** Incidence of venous thromboembolism: a community-based study in western France.Thrombosis and Haemostasis. 2000;83(5):657-660.
[2] **Le Gall C, Parent F, Simonneau G**. Maladie thromboembolique veineuse. In « La pneumologie fondée sur les preuves ». Editions Margaux Orange, 2013 : 291-315.
[3] **Barritt DW, Lond MD, M.R.C.P, Jordan SC, Brist MB**. Anticoagulant drugs in the treatment of pulmonary embolism: a controled trial. The Lancet. 1960; 275(7138):1309–1312.
[4] **Stein PD, Henry JW.** Prevalence of acute pulmonary embolism among patients in a general hospital and at autopsy. Chest. 1995;108(4):978-981
[5] **Junot A.** les scores diagnostiques pour l'embolie pulmonaire et les scores d'exclusion de l'embolie pulmonaire. Rev Med Suisse. 2015 (11) :1204-9
[6] **Fadhlaoui, F., Tlili, N., Souei, M., &Graies, K. T**. (2008). TM-WS-5 Apport du scanner multidetecteur dans le diagnostic de l'embolie pulmonaire: techniques de l'angioscanner thoracique. Journal de radiologie. 2008 ; 89(10) :1565-1566.
[7] **Mamlouk MD, vanSonnenberg E, Gosalia R, Drachman D, Gridley D, Zamora JG et al**. Pulmonary embolism at CT angiography: implications for appropriateness, cost, and radiation exposure in 2003 patients. Radiology. 2010;256(2):625-632
[8] **Sanchez O, Revel MP, Couchon S et Meyer G.** Imagerie de l'hypertension artérielle pulmonaire. Revue des maladies respiratoires. 2007 **;** 24(2), 155-169.
[9] **Dublanchet N, Cassagnes L, Vincent N, Raconnat J, Tatulli T , Ponsoda A et al.** Mortalité d'une embolie pulmonaire : évaluation rétrospective de la valeur pronostique de trois critères scanographiques. Revue de Médecine interne. 2012; 33: S76-S77
[10] **Sista AK, Kuo WT, Schiebler M, Madoff DC.** Stratification, imaging, and management of acute massive and submassive pulmonary embolism. Radiology. 2017;284(1):5-24.
[11] **Karabulut N, Kiroğlu Y.** Relationship of parenchymal and pleural abnormalities with acute pulmonary embolism: CT findings in patients with and without embolism. Diagnostic and Interventional Radiology. 2008; 14(4):189.
[12] **Coche EE, Muller NL, Kim KI, Wiggs BR, Mayo JR.** Acute pulmonary embolism: ancillary findings at spiral CT. Radiology 1998; 207(3):753–758.
[13] **Bynum LJ, Wilson JE 3rd.**Characteristics of pleural effusions associated with pulmonary embolism. Archives of Internal Medicine. 1976;136(2):159-162.
[14] **Porcel JM, Madronero AB, Pardina M, Vives M, Esquerda A, Light RW.** Analysis of pleural effusions in acute pulmonary embolism: radiological and pleural fluid data from 230 patients. Respirology. 2007; 12(2):234-239.
[15] **Ceriani E, Combescure C, Le Gal G, et al.** Clinical prediction rules for pulmonary embolism: a systematic review and meta-analysis. Journal of Thrombosis and Haemostasis. 2010; 8(5): 957-970.

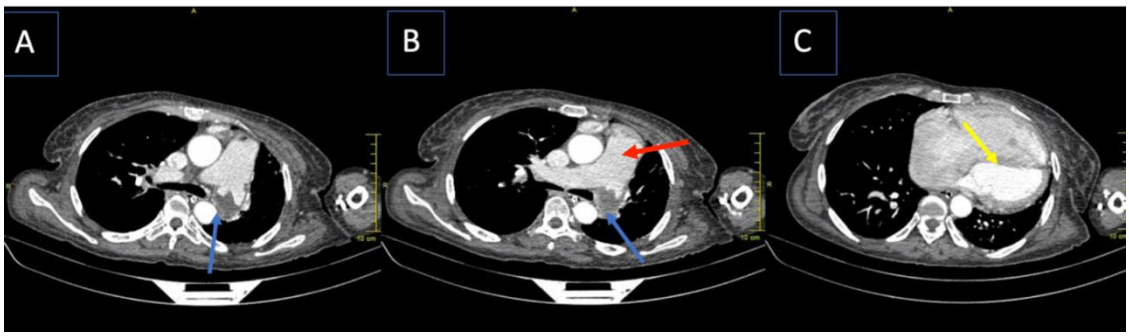

Figure 1 A, B and C: Axial sections of CT with contrast injection showing occlusive thrombus of the left branch of the pulmonary artery (A, B) (blue arrow), dilation of the TAP (red arrow) and significant right atrioventricular dilation (C) with a dysmorphic septum, curved towards the left ventricle (yellow arrow) in a 52-year-old patient received for suspected intermediate probability PE according to the Wells score and the revised Geneva score.

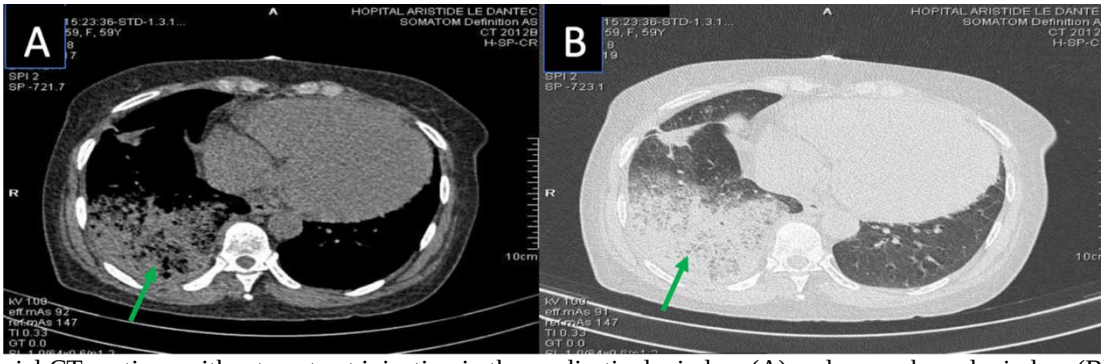

Figure 2: Axial CT sections without contrast injection in the mediastinal window (A) and parenchymal window (B) showing a pulmonary condensation site at the right pulmonary base (green arrow), heterogeneous with aerial formations, without air bronchogram in relation to a pulmonary infarct site.

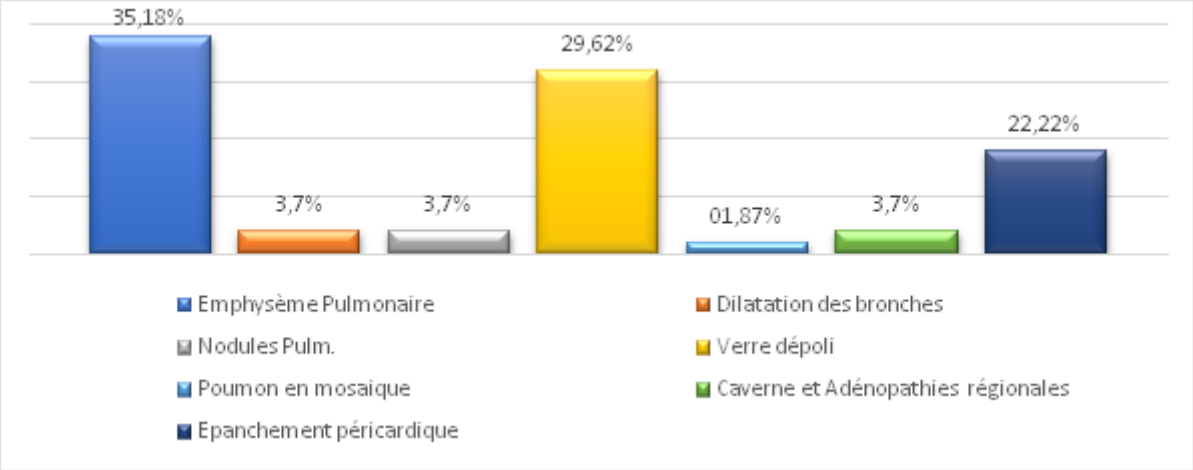

Figure 3: Alternative diagnoses found with thoracic angioscanner