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The Correlation between Pulmonary Embolism and Heart Disease

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Abstract

Background: Heart diseases increase the risk of arterial embolism; whether they increase the risk of pulmonary embolism.

Methods: I take two studies; the first study was taken from Denmark using patients diagnosed with pulmonary embolism between 1980 and 2007. which contains records of acute care hospital discharges since January 1, 1977. And the second study was taken from Veneto region in Italian, they involved patients with the first inpatient hospital discharge diagnosis of pulmonary embolism recorded from January 1, 2000 to December 31, 2006.

Results: according to the first study, there was 109,752 cases, of whom 45282 patients had pulmonary embolism alone, 4680 had pulmonary embolism and deep venous thrombosis, and 59790 had deep venous thrombosis alone. However, for the second study, there was 13,053 patients discharged from hospitals in the Veneto region with a diagnosis of PE, they excluded 1817 patients younger than 60 years, Of the remaining 11,236 patients, 9079 had PE diagnosis alone.

Conclusion: both studies are proving that heart diseases increase the risk of pulmonary embolism.

Introduction

Embolism is a solid, liquid, or gaseous mass that is detached intravascular, and carried by the blood to a site distant from its point of origin. Inevitably, emboli lodge in vessels too small to allow further movement, leading to partial or complete occlusion of the vascular⁽¹⁾. So, most usual forms of emboli (90%) are thromboemboli i.e. arising from thrombi or their parts detached from the wall of the vessels⁽²⁾. As well as rare forms of emboli include fat droplets, atherosclerotic debris (cholesterol emboli), bubbles of air or nitrogen, tumor fragments, bits of bone marrow or foreign bodies such as bullets⁽¹⁾.

Hence, the term pulmonary embolism indicate to passage of a blood clot from a systemic vein within the right side of the heart to the pulmonary circulation, where it lodges in one or more branches of the pulmonary artery⁽³⁾. Also, it has an incidence of 20 to 50 per 100000 hospitalized patients, as well as it still causes about 200000 deaths per year in the united states. Indeed, venous emboli originate from deep leg vein thrombi above the level of the knee, is the cause of more than 95% of cases⁽¹⁾. The consequences of this common problem are quite variable, ranging from none to sudden death, according to the size of the embolus and the underlying medical condition of the patient. In addition to, pulmonary embolism is associated with the development of a thrombus elsewhere in the circulation⁽³⁾.

On the other hand, cardiovascular disease is the leading cause of morbidity and mortality in industrialized countries, accounting for almost 40% of all postnatal deaths in the united states⁽¹⁾. It also has a wide range of diseases can affect it, such as heart failure, congenital heart disease, ischemic heart disease, arrhythmias, hypertensive heart disease, valvular heart disease, pericardial disease, cardiac tumors, cardiomyopathies and myocarditis⁽⁴⁾.

In the case of this study is to evaluate whether common cardiovascular diseases which increase the risk of left sided arterial embolism (such as heart failure, myocardial infarction, atrial fibrillation or flutter, and valvular heart disease) are also associated with increased risk of incident pulmonary embolism without apparent peripheral venous thrombosis⁽⁵⁾.

Aim of the report: this report illustrates the association between the cardiovascular disease and pulmonary embolism.

Methods

I take two studies; the first study was taken from Denmark during the years 1980 to 2007, they used a case control study that was nested in the entire population of Denmark (population, 5.4 million). They had got data from the Danish national patient registry, which contains records of all acute care hospital discharges since January 1, 1977, outpatient specialist clinics and emergency room visits January 1, 1995, and from the Danish civil registration system. The civil registration number, a personal identifier assigned to all Danes at birth and residents at immigration, was used to link records across registries⁽⁵⁾.

And the second study was taken from the Italian Veneto region, they carried out a cross-sectional survey using the electronic medical databases. The Regione Veneto Hospital Discharge Database (RVHDD) electronically stores all summaries of discharges from veneto region's public and private hospitals, completed using a Formatted Hospital Discharge Form (FHDF). They involved patients with the first inpatient hospital discharge diagnosis of pulmonary embolism recorded from January 1, 2000 to December 31, 2006 in any of the six FHDF diagnostic fields. At first, they created a dataset involving all 3 million FHDFs collected among 2000 to 2006. PE cases were defined as patients with at least one hospitalization in which PE was recorded in the same or in any previous FHDFs in any diagnostic field with no DVT code⁽⁶⁾.

Results

In the first study, there was 109,752 cases and 541,561 population controls. Among the patients, 45,282 had a diagnosis of pulmonary embolism only, 4,680 had a diagnosis of pulmonary embolism and deep venous thrombosis, and 59,790 had a diagnosis of deep venous thrombosis only, (Table 1)⁽⁵⁾.

While in the second study, there was 13,053 patients discharged from hospitals in the Veneto region with a diagnosis of PE during the study period, they excluded 1817 patients younger than 60 years at the time of hospital admission. Of the remaining

11,236 patients, 9079 (81%) had PE diagnosis alone (cases), and 2157 had PE/DVT diagnosis (controls), (Table 2)⁽⁶⁾.

Discussion

In the first study, among 109,752 cases there was 45,282 had a diagnosis of pulmonary embolism only, 4,680 had a diagnosis of pulmonary embolism and deep venous thrombosis, and 59,790 had a diagnosis of deep venous thrombosis only. there were more women than men, and more than 70 years of age was between 40% and 50% at increase the risk of pulmonary embolism only. Isolated pulmonary embolism has been strongly associated with myocardial infarction and heart failure. However, associated with valvular heart disease much less strongly, (Table 1) ⁽⁵⁾.

That was similarly to the second study, which has 11,236 patients, 9079 patients had the diagnosis of isolated pulmonary embolism, and 2157 had the diagnosis of PE/DVT. The prevalence of unprovoked PE among patients with PE and PE/DVT was 62.6% (5680/9079) and 64.3% (1387/2157), respectively. The prevalence of hypertension in PE/DVT patients was significantly higher, while in chronic obstructive pulmonary disease and diabetes the reverse was true. Mortality in hospital was remarkably higher in patients with isolated PE than in patients with PE/DVT. The total prevalence of having at least one diagnosis of heart disease was 34.8% (3905/11236): the prevalence was 35.7% (3239/9079) for isolated PE patients and 30.9% (666/2157) for PE/DVT patients, (Table 2)⁽⁶⁾.

Table 1. Characteristics of Cases Diagnosed With the 3 Venous Thromboembolism Outcomes (Pulmonary Embolism Alone, Pulmonary Embolism with Preceding Deep Vein Thrombosis, or Deep Vein Thrombosis Alone) and Their Matched Controls

Variable	Cases (n = 109752)			Controls (n = 541561), n (%)	
	Pulmonary Embolism (n = 45282)	Pulmonary Embolism and Deep Venous Thrombosis (n = 4680)	Deep Venous Thrombosis (n = 59790)		
Age, y				136	633
55	7959 (18)	1391 (30)	18011 (30)	(25)	
56–70	12634 (28)	1487 (32)	17669 (30)	157	377
71	24689 (54)	1802 (38)	24110 (40)	(29)	
71				247	551
				(46)	
Sex Female				286	223
Male	24638 (54)	2180 (47)	31169 (52)	(53)	
Male	20644 (46)	2500 (53)	28621 (48)	255	338
				(47)	
Previous cancer*	8330 (18)	646 (14)	9328 (16)	32276	(6.0)
Hospitalization or hospital clinic visit for surgery†	13817 (31)	1044 (22)	13820 (23)	13578	(2.5)
Hospitalization or hospital clinic visit for trauma or fracture†	3584 (7.9)	247 (5.3)	3654 (6.1)	3058	(0.6)
Pregnancy†	226 (0.5)	25 (0.5)	608 (1.0)	710	(0.1)
Obesity	1763 (3.9)	195 (4.2)	2551 (4.3)	5966	(1.1)
Psychiatric diseases	1924 (4.3)	177 (3.8)	3376 (5.7)	9966	(1.8)
Myocardial infarction					
3 mo before VTE‡	2538 (5.6)	113 (2.4)	648 (1.1)	633	(0.1)
3 mo before VTE§	3598 (8.0)	211 (4.5)	2483 (4.2)	18367	(3.4)
Heart failure					
3 mo before VTE	3299 (7.3)	198 (4.2)	1318 (2.2)	853	(0.2)
3 mo before VTE	3559 (7.9)	167 (3.6)	2282 (3.8)	12519	(2.3)
Atrial fibrillation/flutter					
3 mo before VTE	2122 (4.7)	199 (4.3)	1257 (2.1)	709	(0.1)
3 mo before VTE	2367 (5.2)	114 (2.4)	1991 (3.3)	13620	(2.5)
Valvular heart disease					
3 mo before VTE	365 (0.8)	17 (0.4)	145 (0.2)	166	(0.0)
3 mo before VTE	534 (1.2)	21 (0.5)	329 (0.6)	2873	(0.5)

VTE indicates venous thromboembolism.

*Preexisting cancer or a cancer diagnosis within 3 months after VTE/index date.

†Three months before admission/index date.

‡Within 3 months before VTE but not more than 3 months before VTE.

§More than 3 months before VTE

Table 2
Main characteristics of the study patients with pulmonary embolism (PE) with and without deep venous thrombosis (DVT).

Characteristic	Isolated PE (N=9079)	PE/DVT (N=2157)	P-value
Age (years)			
Mean (SD)	77.7 (8.5)	77.0 (8.0)	b0.01
60–69	1985 (21.9)	512 (23.8)	
70–79	3623 (39.9)	892 (41.3)	
≥80	471 (38.2)	753 (34.9)	
Men	3590 (39.5)	834 (38.7)	0.45
Modality of presentation			
Unprovoked	5680 (62.6)	1387 (64.3)	0.13
Secondary	399 (37.4) ^a	770 (35.7) ^b	
Baseline features			
Hypertension	1236 (13.6)	335 (15.5)	0.02
COPD	837 (9.2)	129 (6.0)	b0.01
Diabetes mellitus	132 (1.4)	15 (0.7)	b0.01
Rank in the discharge form			
Main diagnosis	6001 (66.1)	1727 (80.1)	0.01
Ancillary diagnosis	3078 (33.9)	430 (19.9)	
In-hospital death	765 (30.5)	276 (12.8)	b0.01
Prevalence of heart diseases			
At least one	3239 (35.7)	666 (30.9)	b0.01
Hypertensive cardiopathy	1038 (11.4)	279 (12.9)	0.05
Atrial fibrillation or flutter	96 (10.9)	187 (8.6)	b0.01
Coronary heart disease	69 (10.7)	173 (8.0)	b0.01
All-cause heart failure	67 (8.5)	94 (4.3)	b0.01
Valvular heart diseases	14 (2.4)	44 (2.0)	0.37
All-cause cardiomyopathies	157 (1.7)	16 (0.7)	b0.01
Endocarditis	22 (0.2)	4 (0.2)	0.62

Numbers in parentheses indicate percentages unless otherwise indicated. COPD=chronic obstructive pulmonary diseases.

A Malignancy in 1848, surgery in 973, trauma or fracture in 578.

B Malignancy in 486, surgery in 207, trauma or fracture in 77.

Conclusion

Both studies are proving that cardiovascular diseases increase the sooner term for pulmonary embolism, there is an association between isolated PE and a number of heart diseases, which in older patients several heart diseases may directly account for the development of PE.

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