Are pulmonary embolism and deep-vein thrombosis always one disease?

Langevelde, K. van

REFERENCES

1. Naess IA, Christiansen SC, Romundstad P, Cannegieter SC, Rosendaal FR, Hammerstrom J. Incidence and mortality of venous thrombosis: a population-based study. *J Thromb Haemost*. 2007;5(4):692-699.
2. Goldhaber SZ. Acute pulmonary embolism: risk stratification. *Pathophysiol Haemost Thromb*. 2006;35(1-2):153-156.
3. Lensing AW, Prandoni P, Prins MH, Büller HR. Deep-vein thrombosis. *Lancet*. 1999;353(9151):479-485.
4. Virchow R. Phlogose und Thrombose im Gefäßsystem: Gesammelte Abhandlungen zur Wissenschaftlichen Medizin. *Frankfurt Staatsdruckerei*. 1856
5. Rafi, S. Associations between cardiovascular risk factors, hyper- and hypocoagulability. Thesis AMC-UvA 2011.
6. Lurie F, Kistner RL, Eklof B, Kessler D. Mechanism of venous valve closure and role of the valve in circulation: a new concept. *J Vasc Surg*. 2003;38(5):955-961.
7. Karino T, Motomiya M. Flow through a venous valve and its implication for thrombus formation. *Thromb Res*. 1984;36(3):245-257.
8. Hamer JD, Malone PC, Silver IA. The PO2 in venous valve pockets: its possible bearing on thrombogenesis. *Br J Surg*. 1981;68(3):166-170.
9. Bovill EG, van der Vliet A. Venous valvular stasis-associated hypoxia and thrombosis: what is the link? *Annu Rev Physiol*. 2011;73527-545.
10. Yamaki T, Nozaki M, Sakurai H, Takeuchi M, Soejima K, Kono T. Presence of lower limb deep vein thrombosis and prognosis in patients with symptomatic pulmonary embolism: preliminary report. *Eur J Vasc Endovasc Surg*. 2009;37(2):225-231.
11. Jimenez D, Aujesky D, Diaz G, Monreal M, Otero R, Marti D, Marin E, Aracil E, Sueiro A, Yusen RD. Prognostic significance of deep vein thrombosis in patients presenting with acute symptomatic pulmonary embolism. *Am J Respir Crit Care Med*. 2010;181(9):983-991.
12. White RH, McGahan JP, Daschbach MM, Hartling RP. Diagnosis of deep-vein thrombosis using duplex ultrasound. *Ann Intern Med*. 1989;111(4):297-304.
13. Kelly J, Hunt BJ, Moody A. Magnetic resonance direct thrombus imaging: a novel technique for imaging venous thromboemboli. *Thromb Haemost*. 2003;89(5):773-782.
14. Manten B, Westendorp RG, Koster T, Reitsma PH, Rosendaal FR. Risk factor profiles in patients with different clinical manifestations of venous thromboembolism: a focus on the factor V Leiden mutation. *Thromb Haemost*. 1996;76(4):510-513.
15. Baglin TP, Brown K, Williamson D, Baker P, Luddington R. Relative risk of pulmonary embolism and deep vein thrombosis in association with the factor V Leiden mutation in a United Kingdom population. *Thromb Haemost*. 1997;77(6):1219.
16. Martinelli I, Cattaneo M, Panzeri D, Mannucci PM. Low prevalence of factor V:Q506 in 41 patients with isolated pulmonary embolism. *Thromb Haemost*. 1997;77(3):440-443.
17. van Stralen KJ, Doggen CJM, Bezemer ID, Pomp ER, Lisman T, Rosendaal FR. Mechanisms of the factor V Leiden paradox. *Arterioscler Thromb Vasc Biol*. 2008;28(10):1872-1877.
18. van Hylckama Vlieg A, Helmerhorst FM, Vandenbroucke JP, Doggen CJM, Rosendaal FR. The venous thrombotic risk of oral contraceptives, effects of oestrogen dose and progestogen type: results of the MEGA case-control study. *BMJ*. 2009;339b2921.

19. Rosendaal FR, van Hylckama Vlieg A, Doggen CJ. Venous thrombosis in the elderly. *J Thromb Haemost*. 2007;5 Suppl 1310-317.
20. Olsen H, Lanne T. Reduced venous compliance in lower limbs of aging humans and its importance for capacitance function. *Am J Physiol*. 1998;275(3 Pt 2):H878-H886.
21. Saphir O, Lev M. The venous valve in the aged. *Am Heart J*. 1952;44(6):843-850.
22. Chopard RP, Miranda Neto MH, Biazotto W, Molinari SL. Age-related changes in the human renal veins and their valves. *Ital J Anat Embryol*. 1994;99(2):91-101.
23. Desmarais S, de Moerloose P, Reber G, Minazio P, Perrier A, Bounameaux H. Resistance to activated protein C in an unselected population of patients with pulmonary embolism. *Lancet*. 1996;347(9012):1374-1375.
24. Arsov T, Miladinova D, Spiroski M. Factor V Leiden is associated with higher risk of deep venous thrombosis of large blood vessels. *Croat Med J*. 2006;47(3):433-439.
25. Ordonez AJ, Carreira JM, Alvarez CR, Rodriguez JM, Alvarez MV, Coto E. Comparison of the risk of pulmonary embolism and deep vein thrombosis in the presence of factor V Leiden or prothrombin G20210A. *Thromb Haemost*. 2000;83(2):352-354.
26. Boyanovsky B, Russeva M, Ganev V, Penev M, Baleva M. Prevalence of factor V Leiden and prothrombin 20210 A variant in Bulgarian patients with pulmonary thromboembolism and deep venous thrombosis. *Blood Coagul Fibrinolysis*. 2001;12(8):639-642.
27. Margaglione M, Brancaccio V, De Lucia D, Martinelli I, Ciampa A, Grandone E, Di Minno G. Inherited thrombophilic risk factors and venous thromboembolism: distinct role in peripheral deep venous thrombosis and pulmonary embolism. *Chest*. 2000;118(5):1405-1411.
28. de Moerloose P, Reber G, Perrier A, Perneger T, Bounameaux H. Prevalence of factor V Leiden and prothrombin G20210A mutations in unselected patients with venous thromboembolism. *Br J Haematol*. 2000;110(1):125-129.
29. Emmerich J, Rosendaal FR, Cattaneo M, Margaglione M, De Stefano V, Cumming T, Arruda V, Hillarp A, Reny JL. Combined effect of factor V Leiden and prothrombin 20210A on the risk of venous thromboembolism--pooled analysis of 8 case-control studies including 2310 cases and 3204 controls. Study Group for Pooled-Analysis in Venous Thromboembolism. *Thromb Haemost*. 2001;86(3):809-816.
30. Austin H, Key NS, Benson JM, Lally C, Dowling NF, Whitsett C, Hooper WC. Sickle cell trait and the risk of venous thromboembolism among blacks. *Blood*. 2007;110(3):908-912.
31. Rosendaal FR. Venous thrombosis: the role of genes, environment, and behavior. *Hematology Am Soc Hematol Educ Program*. 20051-12.
32. Kniffin WD, Jr., Baron JA, Barrett J, Birkmeyer JD, Anderson FA, Jr. The epidemiology of diagnosed pulmonary embolism and deep venous thrombosis in the elderly. *Arch Intern Med*. 1994;154(8):861-866.
33. Anderson FA, Jr., Wheeler HB, Goldberg RJ, Hosmer DW, Patwardhan NA, Jovanovic B, Forcier A, Dalen JE. A population-based perspective of the hospital incidence and case-fatality rates of deep vein thrombosis and pulmonary embolism. The Worcester DVT Study. *Arch Intern Med*. 1991;151(5):933-938.
34. Oger E. Incidence of venous thromboembolism: a community-based study in Western France. EPI-GETBP Study Group. Groupe d'Etude de la Thrombose de Bretagne Occidentale. *Thromb Haemost*. 2000;83(5):657-660.
35. Silverstein MD, Heit JA, Mohr DN, Petterson TM, O'Fallon WM, Melton LJ, III. Trends in the incidence of deep vein thrombosis and pulmonary embolism: a 25-year population-based study. *Arch Intern Med*. 1998;158(6):585-593.

36. Holst AG, Jensen G, Prescott E. Risk factors for venous thromboembolism: results from the Copenhagen City Heart Study. *Circulation*. 2010;121(17):1896-1903.
37. Severinsen MT, Johnsen SP, Tjonneland A, Overvad K, Dethlefsen C, Kristensen SR. Body height and sex-related differences in incidence of venous thromboembolism: A Danish follow-up study. *Eur J Intern Med*. 2010;21(4):268-272.
38. White RH, Keenan CR. Effects of race and ethnicity on the incidence of venous thromboembolism. *Thromb Res*. 2009;123 Suppl 4S11-S17.
39. Klatsky AL, Armstrong MA, Poggi J. Risk of pulmonary embolism and/or deep venous thrombosis in Asian-Americans. *Am J Cardiol*. 2000;85(11):1334-1337.
40. White RH, Zhou H, Romano PS. Incidence of idiopathic deep venous thrombosis and secondary thromboembolism among ethnic groups in California. *Ann Intern Med*. 1998;128(9):737-740.
41. Lutsey PL, Cushman M, Heckbert SR, Tang W, Folsom AR. Longer legs are associated with greater risk of incident venous thromboembolism independent of total body height. The Longitudinal Study of Thromboembolism Etiology (LITE). *Thromb Haemost*. 2011;106(1):113-120.
42. Braekkan SK, Borch KH, Mathiesen EB, Njolstad I, Wilsgaard T, Hansen JB. Body height and risk of venous thromboembolism: The Tromso Study. *Am J Epidemiol*. 2010;171(10):1109-1115.
43. Stein PD, Beemath A, Olson RE. Obesity as a risk factor in venous thromboembolism. *Am J Med*. 2005;118(9):978-980.
44. Pomp ER, le Cessie S, Rosendaal FR, Doggen CJM. Risk of venous thrombosis: obesity and its joint effect with oral contraceptive use and prothrombotic mutations. *Br J Haematol*. 2007;139(2):289-296.
45. Beam DM, Courtney DM, Kabrhel C, Moore CL, Richman PB, Kline JA. Risk of thromboembolism varies, depending on category of immobility in outpatients. *Ann Emerg Med*. 2009;54(2):147-152.
46. Cannegieter SC, Doggen CJM, van Houwelingen HC, Rosendaal FR. Travel-related venous thrombosis: results from a large population-based case control study (MEGA study). *PLoS Med*. 2006;3(8):e307.
47. Sweetland S, Green J, Liu B, Berrington de Gonzalez A, Canonico M, Reeves G, Beral V. Duration and magnitude of the postoperative risk of venous thromboembolism in middle aged women: prospective cohort study. *BMJ*. 2009;339b4583.
48. van Stralen KJ, Rosendaal FR, Doggen CJM. Minor injuries as a risk factor for venous thrombosis. *Arch Intern Med*. 2008;168(1):21-26.
49. Venous thromboembolic disease and combined oral contraceptives: results of international multicentre case-control study. World Health Organization Collaborative Study of Cardiovascular Disease and Steroid Hormone Contraception. *Lancet*. 1995;346(8990):1575-1582.
50. McColl MD, Ramsay JE, Tait RC, Walker ID, McCall F, Conkie JA, Carty MJ, Greer IA. Risk factors for pregnancy associated venous thromboembolism. *Thromb Haemost*. 1997;78(4):1183-1188.
51. Pomp ER, Lenselink AM, Rosendaal FR, Doggen CJM. Pregnancy, the postpartum period and prothrombotic defects: risk of venous thrombosis in the MEGA study. *J Thromb Haemost*. 2008;6(4):632-637.
52. Heit JA, Kobbervig CE, James AH, Petterson TM, Bailey KR, Melton LJ, III. Trends in the incidence of venous thromboembolism during pregnancy or postpartum: a 30-year population-based study. *Ann Intern Med*. 2005;143(10):697-706.
53. Glynn RJ, Rosner B. Comparison of risk factors for the competing risks of coronary heart disease, stroke, and venous thromboembolism. *Am J Epidemiol*. 2005;162(10):975-982.

54. Tsai AW, Cushman M, Rosamond WD, Heckbert SR, Polak JF, Folsom AR. Cardiovascular risk factors and venous thromboembolism incidence: the longitudinal investigation of thromboembolism etiology. *Arch Intern Med*. 2002;162(10):1182-1189.
55. Sidney S, Petitti DB, Soff GA, Cundiff DL, Tolan KK, Quesenberry CP, Jr. Venous thromboembolic disease in users of low-estrogen combined estrogen-progestin oral contraceptives. *Contraception*. 2004;70(1):3-10.
56. van Stralen KJ, le Cessie S, Rosendaal FR, Doggen CJM. Regular sports activities decrease the risk of venous thrombosis. *J Thromb Haemost*. 2007;5(11):2186-2192.
57. Ageno W, Becattini C, Brighton T, Selby R, Kamphuisen PW. Cardiovascular risk factors and venous thromboembolism: a meta-analysis. *Circulation*. 2008;117(1):93-102.
58. Pomp ER, Rosendaal FR, Doggen CJM. Smoking increases the risk of venous thrombosis and acts synergistically with oral contraceptive use. *Am J Hematol*. 2008;83(2):97-102.
59. Pomp ER, Rosendaal FR, Doggen CJM. Alcohol consumption is associated with a decreased risk of venous thrombosis. *Thromb Haemost*. 2008;99(1):59-63.
60. Blom JW, Doggen CJM, Osanto S, Rosendaal FR. Malignancies, prothrombotic mutations, and the risk of venous thrombosis. *JAMA*. 2005;293(6):715-722.
61. Tillie-Leblond I, Marquette CH, Perez T, Scherpereel A, Zanetti C, Tonnel AB, Remy-Jardin M. Pulmonary embolism in patients with unexplained exacerbation of chronic obstructive pulmonary disease: prevalence and risk factors. *Ann Intern Med*. 2006;144(6):390-396.
62. Stein PD, Beemath A, Meyers FA, Olson RE. Pulmonary embolism and deep venous thrombosis in hospitalized adults with chronic obstructive pulmonary disease. *J Cardiovasc Med (Hagerstown)*. 2007;8(4):253-257.
63. Baum G, Fisher F. The relationship of fatal pulmonary insufficiency with cor pulmonale, rightsided mural thrombi and pulmonary emboli: a preliminary report. *Am J Med Sci*. 1960;240609-612.
64. Schneider C, Bothner U, Jick SS, Meier CR. Chronic obstructive pulmonary disease and the risk of cardiovascular diseases. *Eur J Epidemiol*. 2010;25(4):253-260.
65. Stein PD, Beemath A, Meyers FA, Skaf E, Olson RE. Deep venous thrombosis and pulmonary embolism in hospitalized patients with sickle cell disease. *Am J Med*. 2006;119(10):897-11.
66. Grainge MJ, West J, Card TR. Venous thromboembolism during active disease and remission in inflammatory bowel disease: a cohort study. *Lancet*. 2010;375(9715):657-663.
67. Nguyen GC, Sam J. Rising prevalence of venous thromboembolism and its impact on mortality among hospitalized inflammatory bowel disease patients. *Am J Gastroenterol*. 2008;103(9):2272-2280.
68. Miehsler W, Reinisch W, Valic E, Osterode W, Tillinger W, Feichtenschlager T, Grisar J, Machold K, Scholz S, Vogelsang H, Novacek G. Is inflammatory bowel disease an independent and disease specific risk factor for thromboembolism? *Gut*. 2004;53(4):542-548.
69. Bernstein CN, Blanchard JF, Houston DS, Wajda A. The incidence of deep venous thrombosis and pulmonary embolism among patients with inflammatory bowel disease: a population-based cohort study. *Thromb Haemost*. 2001;85(3):430-434.
70. van Zaane B, Squizzato A, Huijgen R, van Zanten AP, Fliers E, Cannegieter SC, Büller HR, Gerdes VE, Brandjes DP. Increasing levels of free thyroxine as a risk factor for a first venous thrombosis: a case-control study. *Blood*. 2010;115(22):4344-4349.
71. Jick H, Slone D, Westerholm B, Inman WH, Vessey MP, Shapiro S, Lewis GP, Worcester J. Venous thromboembolic disease and ABO blood type. A cooperative study. *Lancet*. 1969;1(7594):539-542.

72. Morelli VM, de Visser MC, Vos HL, Bertina RM, Rosendaal FR. ABO blood group genotypes and the risk of venous thrombosis: effect of factor V Leiden. *J Thromb Haemost*. 2005;3(1):183-185.
73. Koster T, Blann AD, Briet E, Vandenbroucke JP, Rosendaal FR. Role of clotting factor VIII in effect of von Willebrand factor on occurrence of deep-vein thrombosis. *Lancet*. 1995;345(8943):152-155.
74. Wautrecht JC, Galle C, Motte S, Dereume JP, Dramaix M. The role of ABO blood groups in the incidence of deep vein thrombosis. *Thromb Haemost*. 1998;79(3):688-689.
75. Mercier B, Oger E, le Gal G, Mottier D, Ferec C. Phenotypic but not allelic ABO blood group association with risk of venous thrombosis. *Thromb Haemost*. 2005;93(2):388-389.
76. Schleef M, Strobel E, Dick A, Frank J, Schramm W, Spannagl M. Relationship between ABO and Secretor genotype with plasma levels of factor VIII and von Willebrand factor in thrombosis patients and control individuals. *Br J Haematol*. 2005;128(1):100-107.
77. Wiggins KL, Smith NL, Glazer NL, Rosendaal FR, Heckbert SR, Psaty BM, Rice KM, Lumley T. ABO genotype and risk of thrombotic events and hemorrhagic stroke. *J Thromb Haemost*. 2009;7(2):263-269.
78. Talbot S, Wakley EJ, Langman MJ. A19 A29 B, and O blood-groups, Lewis blood-groups, and serum triglyceride and cholesterol concentrations in patients with venous thromboembolic disease. *Lancet*. 1972;1(7761):1152-1154.
79. Gonzalez Ordonez AJ, Medina Rodriguez JM, Martin L, Alvarez V, Coto E. The O blood group protects against venous thromboembolism in individuals with the factor V Leiden but not the prothrombin (factor II G20210A) mutation. *Blood Coagul Fibrinolysis*. 1999;10(5):303-307.
80. Tirado I, Mateo J, Soria JM, Oliver A, Martinez-Sanchez E, Vallve C, Borrell M, Urrutia T, Fontcuberta J. The ABO blood group genotype and factor VIII levels as independent risk factors for venous thromboembolism. *Thromb Haemost*. 2005;93(3):468-474.
81. Ohira T, Cushman M, Tsai MY, Zhang Y, Heckbert SR, Zakai NA, Rosamond WD, Folsom AR. ABO blood group, other risk factors and incidence of venous thromboembolism: the Longitudinal Investigation of Thromboembolism Etiology (LITE). *J Thromb Haemost*. 2007;5(7):1455-1461.
82. Larsen TB, Johnsen SP, Gislum M, Moller CA, Larsen H, Sorensen HT. ABO blood groups and risk of venous thromboembolism during pregnancy and the puerperium. A population-based, nested case-control study. *J Thromb Haemost*. 2005;3(2):300-304.
83. Poort SR, Rosendaal FR, Reitsma PH, Bertina RM. A common genetic variation in the 3'-untranslated region of the prothrombin gene is associated with elevated plasma prothrombin levels and an increase in venous thrombosis. *Blood*. 1996;88(10):3698-3703.
84. Okumus G, Kiyan E, Arseven O, Tabak L, Diz-Kucukkaya R, Unlucerci Y, Abaci N, Unaltuna NE, Issever H. Hereditary thrombophilic risk factors and venous thromboembolism in Istanbul, Turkey: the role in different clinical manifestations of venous thromboembolism. *Clin Appl Thromb Hemost*. 2008;14(2):168-173.
85. Weischer M, Juul K, Zacho J, Jensen GB, Steffensen R, Schroeder TV, Tybjaerg-Hansen A, Nordestgaard BG. Prothrombin and risk of venous thromboembolism, ischemic heart disease and ischemic cerebrovascular disease in the general population. *Atherosclerosis*. 2010;208(2):480-483.
86. Jun ZJ, Ping T, Lei Y, Li L, Ming SY, Jing W. Prevalence of factor V Leiden and prothrombin G20210A mutations in Chinese patients with deep venous thrombosis and pulmonary embolism. *Clin Lab Haematol*. 2006;28(2):111-116.
87. Castoldi E, Rosing J. APC resistance: biological basis and acquired influences. *J Thromb Haemost*. 2010;8(3):445-453.

88. Lijfering WM, Christiansen SC, Naess IA, Hammerstrøm J, van Hylckama Vlieg A, Rosendaal FR, Cannegieter SC. The risk of venous thrombosis related to increase in body mass index is mediated by factor VIII induced APC-resistance. [abstract]. *Blood*. 2009;114:3985. Abstract 453.
89. Parker AC, Mundada LV, Schmaier AH, Fay WP. Factor V Leiden inhibits fibrinolysis in vivo. *Circulation*. 2004;110(23):3594-3598.
90. Bajzar L, Kalafatis M, Simioni P, Tracy PB. An antifibrinolytic mechanism describing the prothrombotic effect associated with factor VLeiden. *J Biol Chem*. 1996;271(38):22949-22952.
91. Moser KM, Fedullo PF, LitteJohn JK, Crawford R. Frequent asymptomatic pulmonary embolism in patients with deep venous thrombosis. *JAMA*. 1994;271(3):223-225.
92. Murin S, Romano PS, White RH. Comparison of outcomes after hospitalization for deep venous thrombosis or pulmonary embolism. *Thromb Haemost*. 2002;88(3):407-414.
93. Baglin T, Douketis J, Tosetto A, Marcucci M, Cushman M, Kyrle P, Palareti G, Poli D, Tait RC, Iorio A. Does the clinical presentation and extent of venous thrombosis predict likelihood and type of recurrence? A patient-level meta-analysis. *J Thromb Haemost*. 2010;8(11):2436-2442.
94. Rosendaal FR, Koster T, Vandenbroucke JP, Reitsma PH. High risk of thrombosis in patients homozygous for factor V Leiden (activated protein C resistance). *Blood*. 1995;85(6):1504-1508.
95. Kanne JP, Lalani TA. Role of computed tomography and magnetic resonance imaging for deep venous thrombosis and pulmonary embolism. *Circulation*. 2004;109(12 Suppl 1):I15-I21.
96. Remy-Jardin M, Pistolesi M, Goodman LR, Gefter WB, Gottschalk A, Mayo JR, Sostman HD. Management of suspected acute pulmonary embolism in the era of CT angiography: a statement from the Fleischner Society. *Radiology*. 2007;245(2):315-329.
97. Stein PD, Fowler SE, Goodman LR, Gottschalk A, Hales CA, Hull RD, Leeper KV, Jr., Popovich J, Jr., Quinn DA, Sos TA, Sostman HD, Tapson VF, Wakefield TW, Weg JG, Woodard PK. Multidetector computed tomography for acute pulmonary embolism. *N Engl J Med*. 2006;354(22):2317-2327.
98. Dogan H, Kroft LJ, Bax JJ, Schuijf JD, van der Geest RJ, Doornbos J, de Roos A. MDCT assessment of right ventricular systolic function. *AJR Am J Roentgenol*. 2006;186(6 Suppl 2):S366-S370.
99. van der Meer RW, Pattynama PM, van Strijen MJ, van den Berg-Huijsmans AA, Hartmann IJ, Putter H, de Roos A, Huisman MV. Right ventricular dysfunction and pulmonary obstruction index at helical CT: prediction of clinical outcome during 3-month follow-up in patients with acute pulmonary embolism. *Radiology*. 2005;235(3):798-803.
100. Collomb D, Paramelle PJ, Calaque O, Bosson JL, Vanzetto G, Barnoud D, Pison C, Coulomb M, Ferretti G. Severity assessment of acute pulmonary embolism: evaluation using helical CT. *Eur Radiol*. 2003;13(7):1508-1514.
101. Reid JH, Murchison JT. Acute right ventricular dilatation: a new helical CT sign of massive pulmonary embolism. *Clin Radiol*. 1998;53(9):694-698.
102. Schoepf UJ, Kucher N, Kipfmueller F, Quiroz R, Costello P, Goldhaber SZ. Right ventricular enlargement on chest computed tomography: a predictor of early death in acute pulmonary embolism. *Circulation*. 2004;110(20):3276-3280.
103. Delhaye D, Remy-Jardin M, Salem R, Teisseire A, Khalil C, Delannoy-Deken V, Duhamel A, Remy J. Coronary imaging quality in routine ECG-gated multidetector CT examinations of the entire thorax: preliminary experience with a 64-slice CT system in 133 patients. *Eur Radiol*. 2007;17(4):902-910.
104. Halpern EJ. Triple-rule-out CT angiography for evaluation of acute chest pain and possible acute coronary syndrome. *Radiology*. 2009;252(2):332-345.

105. Mortele KJ, Oliva MR, Ondategui S, Ros PR, Silverman SG. Universal use of nonionic iodinated contrast medium for CT: evaluation of safety in a large urban teaching hospital. *AJR Am J Roentgenol*. 2005;184(1):31-34.
106. Nijkeuter M, Ginsberg JS, Huisman MV. Diagnosis of deep vein thrombosis and pulmonary embolism in pregnancy: a systematic review. *J Thromb Haemost*. 2006;4(3):496-500.
107. van Beek EJ, Brouwers EM, Song B, Bongaerts AH, Oudkerk M. Lung scintigraphy and helical computed tomography for the diagnosis of pulmonary embolism: a meta-analysis. *Clin Appl Thromb Hemost*. 2001;7(2):87-92.
108. Zophel K, Bacher-Stier C, Pinkert J, Kropp J. Ventilation/perfusion lung scintigraphy: what is still needed? A review considering technetium-99m-labeled macro-aggregates of albumin. *Ann Nucl Med*. 2009;23(1):1-16.
109. Bajc M, Neilly JB, Miniati M, Schuemichen C, Meignan M, Jonson B. EANM guidelines for ventilation/perfusion scintigraphy : Part 1. Pulmonary imaging with ventilation/perfusion single photon emission tomography. *Eur J Nucl Med Mol Imaging*. 2009;36(8):1356-1370.
110. Reinartz P, Wildberger JE, Schaefer W, Nowak B, Mahnken AH, Buell U. Tomographic imaging in the diagnosis of pulmonary embolism: a comparison between V/Q lung scintigraphy in SPECT technique and multislice spiral CT. *J Nucl Med*. 2004;45(9):1501-1508.
111. Badr A, Joyce JM, Durick J. Rim of FDG uptake around a pulmonary infarct on PET/CT in a patient with unsuspected pulmonary embolism. *Clin Nucl Med*. 2009;34(5):285-286.
112. Kamel EM, McKee TA, Calcagni ML, Schmidt S, Markl S, Castaldo S, Delaloye AB. Occult lung infarction may induce false interpretation of 18F-FDG PET in primary staging of pulmonary malignancies. *Eur J Nucl Med Mol Imaging*. 2005;32(6):641-646.
113. Wittram C, Scott JA. 18F-FDG PET of pulmonary embolism. *AJR Am J Roentgenol*. 2007;189(1):171-176.
114. Ley S, Kauczor HU. MR imaging/magnetic resonance angiography of the pulmonary arteries and pulmonary thromboembolic disease. *Magn Reson Imaging Clin N Am*. 2008;16(2):263-73, ix.
115. Ohno Y, Higashino T, Takenaka D, Sugimoto K, Yoshikawa T, Kawai H, Fujii M, Hatabu H, Sugimura K. MR angiography with sensitivity encoding (SENSE) for suspected pulmonary embolism: comparison with MDCT and ventilation-perfusion scintigraphy. *AJR Am J Roentgenol*. 2004;183(1):91-98.
116. Meaney JF, Weg JG, Chenevert TL, Stafford-Johnson D, Hamilton BH, Prince MR. Diagnosis of pulmonary embolism with magnetic resonance angiography. *N Engl J Med*. 1997;336(20):1422-1427.
117. Oudkerk M, van Beek EJ, Wielopolski P, van Ooijen PM, Brouwers-Kuyper EM, Bongaerts AH, Berghout A. Comparison of contrast-enhanced magnetic resonance angiography and conventional pulmonary angiography for the diagnosis of pulmonary embolism: a prospective study. *Lancet*. 2002;359(9318):1643-1647.
118. Stein PD, Gottschalk A, Sostman HD, Chenevert TL, Fowler SE, Goodman LR, Hales CA, Hull RD, Kanal E, Leeper KV, Jr., Nadich DP, Sak DJ, Tapson VF, Wakefield TW, Weg JG, Woodard PK. Methods of Prospective Investigation of Pulmonary Embolism Diagnosis III (PIOPED III). *Semin Nucl Med*. 2008;38(6):462-470.
119. Ersoy H, Goldhaber SZ, Cai T, Luu T, Rosebrook J, Mulkern R, Rybicki F. Time-resolved MR angiography: a primary screening examination of patients with suspected pulmonary embolism and contraindications to administration of iodinated contrast material. *AJR Am J Roentgenol*. 2007;188(5):1246-1254.

120. Kluge A, Luboldt W, Bachmann G. Acute pulmonary embolism to the subsegmental level: diagnostic accuracy of three MRI techniques compared with 16-MDCT. *AJR Am J Roentgenol*. 2006;187(1):W7-14.
121. Clemens S, Leeper KV, Jr. Newer modalities for detection of pulmonary emboli. *Am J Med*. 2007;120(10 Suppl 2):S2-12.
122. Kluge A, Gerriets T, Lange U, Bachman G. MRI for short-term follow-up of acute pulmonary embolism. Assessment of thrombus appearance and pulmonary perfusion: a feasibility study. *Eur Radiol*. 2005;15(9):1969-1977.
123. Kluge A, Gerriets T, Stolz E, Dill T, Mueller KD, Mueller C, Bachmann G. Pulmonary perfusion in acute pulmonary embolism: agreement of MRI and SPECT for lobar, segmental and subsegmental perfusion defects. *Acta Radiol*. 2006;47(9):933-940.
124. Kluge A, Mueller C, Strunk J, Lange U, Bachmann G. Experience in 207 combined MRI examinations for acute pulmonary embolism and deep vein thrombosis. *AJR Am J Roentgenol*. 2006;186(6):1686-1696.
125. Westerbeek RE, van Rooden CJ, Tan M, van Gils AP, Kok S, de Bats MJ, de Roos A, Huisman MV. Magnetic resonance direct thrombus imaging of the evolution of acute deep vein thrombosis of the leg. *J Thromb Haemost*. 2008;6(7):1087-1092.
126. Fraser DG, Moody AR, Morgan PS, Martel AL, Davidson I. Diagnosis of lower-limb deep venous thrombosis: a prospective blinded study of magnetic resonance direct thrombus imaging. *Ann Intern Med*. 2002;136(2):89-98.
127. Moody AR, Liddicoat A, Krarup K. Magnetic resonance pulmonary angiography and direct imaging of embolus for the detection of pulmonary emboli. *Invest Radiol*. 1997;32(8):431-440.
128. Caravan P. Protein-targeted gadolinium-based magnetic resonance imaging (MRI) contrast agents: design and mechanism of action. *Acc Chem Res*. 2009;42(7):851-862.
129. Botnar RM, Perez AS, Witte S, Wiethoff AJ, Laredo J, Hamilton J, Quist W, Parsons EC, Jr., Vaidya A, Kolodziej A, Barrett JA, Graham PB, Weisskoff RM, Manning WJ, Johnstone MT. In vivo molecular imaging of acute and subacute thrombosis using a fibrin-binding magnetic resonance imaging contrast agent. *Circulation*. 2004;109(16):2023-2029.
130. Sirol M, Fuster V, Badimon JJ, Fallon JT, Moreno PR, Toussaint JF, Fayad ZA. Chronic thrombus detection with in vivo magnetic resonance imaging and a fibrin-targeted contrast agent. *Circulation*. 2005;112(11):1594-1600.
131. Katoh M, Haage P, Wiethoff AJ, Gunther RW, Bucker A, Tacke J, Spuentrup E. Molecular Magnetic Resonance Imaging of Deep Vein Thrombosis Using a Fibrin-Targeted Contrast Agent: A Feasibility Study. *Invest Radiol*. 2009
132. Miserus RJ, Herias MV, Prinzen L, Lobbes MB, Van Suylen RJ, Dirksen A, Hackeng TM, Heemskerk JW, van Engelshoven JM, Daemen MJ, van Zandvoort MA, Heeneman S, Kooi ME. Molecular MRI of early thrombus formation using a bimodal alpha2-antiplasmin-based contrast agent. *JACC Cardiovasc Imaging*. 2009;2(8):987-996.
133. Spuentrup E, Botnar RM, Wiethoff AJ, Ibrahim T, Kelle S, Katoh M, Ozgun M, Nagel E, Vymazal J, Graham PB, Gunther RW, Maintz D. MR imaging of thrombi using EP-2104R, a fibrin-specific contrast agent: initial results in patients. *Eur Radiol*. 2008;18(9):1995-2005.
134. Baldt MM, Zontsich T, Stumpflen A, Fleischmann D, Schneider B, Minar E, Mostbeck GH. Deep venous thrombosis of the lower extremity: efficacy of spiral CT venography compared with conventional venography in diagnosis. *Radiology*. 1996;200(2):423-428.
135. Thomas SM, Goodacre SW, Sampson FC, van Beek EJ. Diagnostic value of CT for deep vein thrombosis: results of a systematic review and meta-analysis. *Clin Radiol*. 2008;63(3):299-304.

136. Goodman LR, Sostman HD, Stein PD, Woodard PK. CT venography: a necessary adjunct to CT pulmonary angiography or a waste of time, money, and radiation? *Radiology*. 2009;250(2):327-330.
137. Nyman UR, Jacobsson B. Routine CT venography after CT for pulmonary embolism: evidence-based radiology or hemorrhage from anticoagulation of false-positive deep venous thrombosis? *Radiology*. 2006;241(3):945-946.
138. Goodman LR, Stein PD, Matta F, Sostman HD, Wakefield TW, Woodard PK, Hull R, Yankelevitz DF, Beemath A. CT venography and compression sonography are diagnostically equivalent: data from PIOPED II. *AJR Am J Roentgenol*. 2007;189(5):1071-1076.
139. Rademaker J, Griesshaber V, Hidajat N, Oestmann JW, Felix R. Combined CT pulmonary angiography and venography for diagnosis of pulmonary embolism and deep vein thrombosis: radiation dose. *J Thorac Imaging*. 2001;16(4):297-299.
140. Hunsaker AR, Zou KH, Poh AC, Trotman-Dickenson B, Jacobson FL, Gill RR, Goldhaber SZ. Routine pelvic and lower extremity CT venography in patients undergoing pulmonary CT angiography. *AJR Am J Roentgenol*. 2008;190(2):322-326.
141. Righini M, le Gal G, Aujesky D, Roy PM, Sanchez O, Verschuren F, Rutschmann O, Nonent M, Cornuz J, Thys F, le Manach CP, Revel MP, Poletti PA, Meyer G, Mottier D, Perneger T, Bounameaux H, Perrier A. Diagnosis of pulmonary embolism by multidetector CT alone or combined with venous ultrasonography of the leg: a randomised non-inferiority trial. *Lancet*. 2008;371(9621):1343-1352.
142. Mos IC, Klok FA, Kroft LJ, de Roos A, Dekkers OM, Huisman MV. Safety of ruling out acute pulmonary embolism by normal computed tomography pulmonary angiography in patients with an indication for computed tomography: systematic review and meta-analysis. *J Thromb Haemost*. 2009;7(9):1491-1498.
143. Kalva SP, Jagannathan JP, Hahn PF, Wicky ST. Venous thromboembolism: indirect CT venography during CT pulmonary angiography--should the pelvis be imaged? *Radiology*. 2008;246(2):605-611.
144. Sampson FC, Goodacre SW, Thomas SM, van Beek EJ. The accuracy of MRI in diagnosis of suspected deep vein thrombosis: systematic review and meta-analysis. *Eur Radiol*. 2007;17(1):175-181.
145. Erdman WA, Jayson HT, Redman HC, Miller GL, Parkey RW, Peshock RW. Deep venous thrombosis of extremities: role of MR imaging in the diagnosis. *Radiology*. 1990;174(2):425-431.
146. Spritzer CE, Norconk JJ, Jr., Sostman HD, Coleman RE. Detection of deep venous thrombosis by magnetic resonance imaging. *Chest*. 1993;104(1):54-60.
147. Evans AJ, Sostman HD, Knelson MH, Spritzer CE, Newman GE, Paine SS, Beam CA. 1992 ARRS Executive Council Award. Detection of deep venous thrombosis: prospective comparison of MR imaging with contrast venography. *AJR Am J Roentgenol*. 1993;161(1):131-139.
148. Dupas B, el Kouri D, Curtet C, Peltier P, de Faucal P, Planchon B, Lejeune JJ. Angiomagnetic resonance imaging of iliofemorocaval venous thrombosis. *Lancet*. 1995;346(8966):17-19.
149. Polak JF, Fox LA. MR assessment of the extremity veins. *Semin Ultrasound CT MR*. 1999;20(1):36-46.
150. Orbell JH, Smith A, Burnand KG, Waltham M. Imaging of deep vein thrombosis. *Br J Surg*. 2008;95(2):137-146.
151. Catalano C, Pavone P, Laghi A, Scipioni A, Fanelli F, Assael FG, Grossi A, Venosi S, Passariello R. Role of MR venography in the evaluation of deep venous thrombosis. *Acta Radiol*. 1997;38(5):907-912.
152. Murphy TP, Cronan JJ. Evolution of deep venous thrombosis: a prospective evaluation with US. *Radiology*. 1990;177(2):543-548.
153. Piovella F, Crippa L, Barone M, Vigano DS, Serafini S, Galli L, Beltrametti C, D'Angelo A. Normalization rates of compression ultrasonography in patients with a first episode of deep vein

thrombosis of the lower limbs: association with recurrence and new thrombosis. *Haematologica*. 2002;87(5):515-522.

154. Heijboer H, Jongbloets LM, Buller HR, Lensing AW, ten Cate JW. Clinical utility of real-time compression ultrasonography for diagnostic management of patients with recurrent venous thrombosis. *Acta Radiol*. 1992;33(4):297-300.
155. Fraser DG, Moody AR, Davidson IR, Martel AL, Morgan PS. Deep venous thrombosis: diagnosis by using venous enhanced subtracted peak arterial MR venography versus conventional venography. *Radiology*. 2003;226(3):812-820.
156. Pedrosa I, Morrin M, Oleaga L, Baptista J, Rofsky NM. Is true FISP imaging reliable in the evaluation of venous thrombosis? *AJR Am J Roentgenol*. 2005;185(6):1632-1640.
157. Cantwell CP, Cradock A, Bruzzi J, Fitzpatrick P, Eustace S, Murray JG. MR venography with true fast imaging with steady-state precession for suspected lower-limb deep vein thrombosis. *J Vasc Interv Radiol*. 2006;17(11 Pt 1):1763-1769.
158. Edelman RR, Koktzoglou I. Unenhanced flow-independent MR venography by using signal targeting alternative radiofrequency and flow-independent relaxation enhancement. *Radiology*. 2009;250(1):236-245.
159. Li W, Salanitri J, Tutton S, Dunkle EE, Schneider JR, Caprini JA, Pierchala LN, Jacobs PM, Edelman RR. Lower extremity deep venous thrombosis: evaluation with ferumoxytol-enhanced MR imaging and dual-contrast mechanism--preliminary experience. *Radiology*. 2007;242(3):873-881.
160. Goyen M. Gadofosveset-enhanced magnetic resonance angiography. *Vasc Health Risk Manag*. 2008;4(1):1-9.
161. Pedrosa I, Ngo L, Wei J, Schuster M, Mahallati H, Smith M, Rofsky NM. Dynamic half-Fourier single-shot turbo spin echo for assessment of deep venous thrombosis: initial observations. *Magn Reson Imaging*. 2009;27(5):617-624.
162. Ono A, Murase K, Taniguchi T, Shibutani O, Takata S, Kobashi Y, Miyazaki M. Deep vein thrombosis using noncontrast-enhanced MR venography with electrocardiographically gated three-dimensional half-Fourier FSE: preliminary experience. *Magn Reson Med*. 2009;61(4):907-917.
163. Carpenter JP, Holland GA, Baum RA, Owen RS, Carpenter JT, Cope C. Magnetic resonance venography for the detection of deep venous thrombosis: comparison with contrast venography and duplex Doppler ultrasonography. *J Vasc Surg*. 1993;18(5):734-741.
164. Laissy JP, Cinqualbre A, Loshkajian A, Henry-Feugeas MC, Crestani B, Riquelme C, Schouman-Claeys E. Assessment of deep venous thrombosis in the lower limbs and pelvis: MR venography versus duplex Doppler sonography. *AJR Am J Roentgenol*. 1996;167(4):971-975.
165. Evans AJ, Sostman HD, Witty LA, Paulson EK, Spritzer CE, Hertzberg BS, Carroll BA, Tapson VF, Saltzman HA, DeLong DM. Detection of deep venous thrombosis: prospective comparison of MR imaging and sonography. *J Magn Reson Imaging*. 1996;6(1):44-51.
166. Nordström M, Lindblad B, Bergqvist D, Kjellström T. A prospective study of the incidence of deep-vein thrombosis within a defined urban population. *J Intern Med*. 1992;232(2):155-160.
167. Reitsma PH, Rosendaal FR. Past and future of genetic research in thrombosis. *J Thromb Haemost*. 2007;5 Suppl 1:264-269.
168. Bertina RM, Koeleman BP, Koster T, Rosendaal FR, Dirven RJ, de Ronde H, van der Velden PA, Reitsma PH. Mutation in blood coagulation factor V associated with resistance to activated protein C. *Nature*. 1994;369(6475):64-67.
169. Brooks EG, Trotman W, Wadsworth MP, Taatjes DJ, Evans MF, Ittleman FP, Callas PW, Esmon CT, Bovill EG. Valves of the deep venous system: an overlooked risk factor. *Blood*. 2009;114(6):1276-1279.

170. Criqui MH, Jamosmos M, Fronek A, Denenberg JO, Langer RD, Bergan J, Golomb BA. Chronic venous disease in an ethnically diverse population: the San Diego Population Study. *Am J Epidemiol*. 2003;158(5):448-456.
171. Kahn SR. How I manage the post thrombotic syndrome. *Blood*. 2009;114(21):4624-4631.
172. Bergan JJ, Schmid-Schonbein GW, Smith PD, Nicolaides AN, Boisseau MR, Eklof B. Chronic venous disease. *N Engl J Med*. 2006;355(5):488-498.
173. Raju S. Venous insufficiency of the lower limb and stasis ulceration. Changing concepts and management. *Ann Surg*. 1983;197(6):688-697.
174. Boisseau MR. Venous valves in the legs: hemodynamic and biological problems and relationship to physiopathology. *J Mal Vasc*. 1997;22(2):122-127.
175. Labropoulos N, Tiongson J, Pryor L, Tassiopoulos AK, Kang SS, Ashraf MM, Baker WH. Definition of venous reflux in lower-extremity veins. *J Vasc Surg*. 2003;38(4):793-798.
176. Adame IM, van der Geest RJ, Bluemke DA, Lima JA, Reiber JH, Lelieveldt BP. Automatic vessel wall contour detection and quantification of wall thickness in in-vivo MR images of the human aorta. *J Magn Reson Imaging*. 2006;24(3):595-602.
177. El Aidi H, Mani V, Weinshelbaum KB, Aguiar SH, Taniguchi H, Postley JE, Samber DD, Cohen EI, Stern J, van der Geest RJ, Reiber JH, Woodward M, Fuster V, Gidding SS, Fayad ZA. Cross-sectional, prospective study of MRI reproducibility in the assessment of plaque burden of the carotid arteries and aorta. *Nat Clin Pract Cardiovasc Med*. 2009;6(3):219-228.
178. Bland JM, Altman DG. Statistical methods for assessing agreement between two methods of clinical measurement. *Lancet*. 1986;1(8476):307-310.
179. Bland JM, Altman DG. Applying the right statistics: analyses of measurement studies. *Ultrasound Obstet Gynecol*. 2003;22(1):85-93.
180. Corcos L, de Anna D, Dini M, Macchi C, Ferrari PA, Dini S. Proximal long saphenous vein valves in primary venous insufficiency. *J Mal Vasc*. 2000;25(1):27-36.
181. Schina MJ, Jr., Neumyer MM, Healy DA, Atnip RG, Thiele BL. Influence of age on venous physiologic parameters. *J Vasc Surg*. 1993;18(5):749-752.
182. Chiesa R, Marone EM, Limoni C, Volonte M, Schaefer E, Petrini O. Effect of chronic venous insufficiency on activities of daily living and quality of life: correlation of demographic factors with duplex ultrasonography findings. *Angiology*. 2007;58(4):440-449.
183. Labropoulos N, Tassiopoulos AK, Kang SS, Mansour MA, Littooy FN, Baker WH. Prevalence of deep venous reflux in patients with primary superficial vein incompetence. *J Vasc Surg*. 2000;32(4):663-668.
184. Labropoulos N, Gasparis AP, Pefanis D, Leon LR, Jr., Tassiopoulos AK. Secondary chronic venous disease progresses faster than primary. *J Vasc Surg*. 2009;49(3):704-710.
185. Labropoulos N, Giannoukas AD, Delis K, Mansour MA, Kang SS, Nicolaides AN, Lumley J, Baker WH. Where does venous reflux start? *J Vasc Surg*. 1997;26(5):736-742.
186. Lurie F, Pevec WC. Ultrasound Estimates of Venous Valve Function in Screening For Insufficiency and Following Patients With Chronic Venous Disease. *Int J Angiol*. 2000;9(4):246-249.
187. Bounameaux H. Factor V Leiden paradox: risk of deep-vein thrombosis but not of pulmonary embolism. *Lancet*. 2000;356(9225):182-183.
188. Schneider C, Bothner U, Jick SS, Meier CR. Chronic obstructive pulmonary disease and the risk of cardiovascular diseases. *Eur J Epidemiol*. 2010;25(4):253-260.
189. Moody AR. Magnetic resonance direct thrombus imaging. *J Thromb Haemost*. 2003;1(7):1403-1409.

190. van Langevelde K, Tan M, Sramek A, Huisman MV, de Roos A. Magnetic resonance imaging and computed tomography developments in imaging of venous thromboembolism. *J Magn Reson Imaging*. 2010;32(6):1302-1312.
191. Coon WW, Coller FA. Clinicopathologic correlation in thromboembolism. *Surg Gynecol Obstet*. 1959;109:259-269.
192. Lindblad B, Sternby NH, Bergqvist D. Incidence of venous thromboembolism verified by necropsy over 30 years. *BMJ*. 1991;302(6778):709-711.
193. Velmahos GC, Spaniolas K, Tabbara M, Abujudeh HH, de Moya M, Gervasini A, Alam HB. Pulmonary embolism and deep venous thrombosis in trauma: are they related? *Arch Surg*. 2009;144(10):928-932.
194. Cairoli E, Codina C, Cura L, Pino A, Alonso J. Atrial thrombus entrapped in a patent foramen oval. Report of one case. *Rev Med Chil*. 2008;136(6):753-756.
195. Myers PO, Fassa AA, Panos A, Licker M, Bounameaux H, Zender HO, Kalangos A. Life-threatening pulmonary embolism associated with a thrombus straddling a patent foramen ovale: report of a case. *J Card Surg*. 2008;23(4):376-378.
196. Sorensen HT, Horvath-Puho E, Lash TL, Christiansen CF, Pesavento R, Pedersen L, Baron JA, Prandoni P. Heart disease may be a risk factor for pulmonary embolism without peripheral deep venous thrombosis. *Circulation*. 2011;124(13):1435-1441.
197. Pesavento R, Piovella C, Prandoni P. Heart disease in patients with pulmonary embolism. *Curr Opin Pulm Med*. 2010;16(5):415-418.
198. Prandoni P, Pesavento R, Sorensen HT, Gennaro N, Dalla VF, Minotto I, Perina F, Pengo V, Pagnan A. Prevalence of heart diseases in patients with pulmonary embolism with and without peripheral venous thrombosis: findings from a cross-sectional survey. *Eur J Intern Med*. 2009;20(5):470-473.
199. Knudson MM, Gomez D, Haas B, Cohen MJ, Nathens AB. Three thousand seven hundred thirty-eight posttraumatic pulmonary emboli: a new look at an old disease. *Ann Surg*. 2011;254(4):625-632.
200. van der Poll T, Boer JD, Levi M. The effect of inflammation on coagulation and vice versa. *Curr Opin Infect Dis*. 2011;24(3):273-278.
201. Browse NL, Thomas ML. Source of non-lethal pulmonary emboli. *Lancet*. 1974;1(7851):258-259.
202. Gibbs NM. Venous thrombosis of the lower limbs with particular reference to bed-rest. *Br J Surg*. 1957;45(191):209-236.
203. Kruit WH, de Boer AC, Sing AK, van Roon F. The significance of venography in the management of patients with clinically suspected pulmonary embolism. *J Intern Med*. 1991;230(4):333-339.
204. Moser KM, LeMoine JR. Is embolic risk conditioned by location of deep venous thrombosis? *Ann Intern Med*. 1981;94(4 pt 1):439-444.
205. Monreal M, Ruiz J, Olazabal A, Arias A, Roca J. Deep venous thrombosis and the risk of pulmonary embolism. A systematic study. *Chest*. 1992;102(3):677-681.
206. Goldhaber SZ, Visani L, de Rosa M. Acute pulmonary embolism: clinical outcomes in the International Cooperative Pulmonary Embolism Registry (ICOPER). *Lancet*. 1999;353(9162):1386-1389.
207. Qanadli SD, el Hajjam M, Vieillard-Baron A, Joseph T, Mesurolle B, Oliva VL, Barre O, Bruckert F, Dubourg O, Lacombe P. New CT index to quantify arterial obstruction in pulmonary embolism: comparison with angiographic index and echocardiography. *AJR Am J Roentgenol*. 2001;176(6):1415-1420.
208. Wu AS, Pezzullo JA, Cronan JJ, Hou DD, Mayo-Smith WW. CT pulmonary angiography: quantification of pulmonary embolus as a predictor of patient outcome--initial experience. *Radiology*. 2004;230(3):831-835.

209. Ghaye B, Willems V, Nchimi A, Kouokam L, Noukoua C, de Maertelaer V, Gevenois PA, Dondelinger RF. Relationship between the extent of deep venous thrombosis and the extent of acute pulmonary embolism as assessed by CT angiography. *Br J Radiol*. 2009;82(975):198-203.
210. Girard P, Musset D, Parent F, Maitre S, Phlippoteau C, Simonneau G. High prevalence of detectable deep venous thrombosis in patients with acute pulmonary embolism. *Chest*. 1999;116(4):903-908.
211. Suh JM, Cronan JJ, Healey TT. Dots are not clots: the over-diagnosis and over-treatment of PE. *Emerg Radiol*. 2010
212. Cha SI, Shin KM, Lee JW, Lee J, Lee SY, Kim CH, Park JY, Jung TH. Clinical characteristics of patients with peripheral pulmonary embolism. *Respiration*. 2010;80(6):500-508.
213. Agnelli G, Becattini C. Acute pulmonary embolism. *N Engl J Med*. 2010;363(3):266-274.
214. Chae EJ, Seo JB, Jang YM, Krauss B, Lee CW, Lee HJ, Song KS. Dual-Energy CT for Assessment of the Severity of Acute Pulmonary Embolism: Pulmonary Perfusion Defect Score Compared With CT Angiographic Obstruction Score and Right Ventricular/Left Ventricular Diameter Ratio. *AJR Am J Roentgenol*. 2010;194(3):604-610.
215. Ghaye B, Ghuysen A, Willems V, Lambermont B, Gerard P, D'Orio V, Gevenois PA, Dondelinger RF. Severe pulmonary embolism:pulmonary artery clot load scores and cardiovascular parameters as predictors of mortality. *Radiology*. 2006;239(3):884-891.
216. Ouriel K, Greenberg RK, Green RM, Massullo JM, Goines DR. A volumetric index for the quantification of deep venous thrombosis. *J Vasc Surg*. 1999;30(6):1060-1066.
217. Hull RD, Hirsh J, Carter CJ, Jay RM, Dodd PE, Ockelford PA, Coates G, Gill GJ, Turpie AG, Doyle DJ, Büller HR, Raskob GE. Pulmonary angiography, ventilation lung scanning, and venography for clinically suspected pulmonary embolism with abnormal perfusion lung scan. *Ann Intern Med*. 1983;98(6):891-899.
218. Bezemer ID, Doggen CJ, Vos HL, Rosendaal FR. No association between the common MTHFR 677C->T polymorphism and venous thrombosis: results from the MEGA study. *Arch Intern Med*. 2007;167(5):497-501.
219. Borst-Krafek B, Fink AM, Lipp C, Umek H, Kohn H, Steiner A. Proximal extent of pelvic vein thrombosis and its association with pulmonary embolism. *J Vasc Surg*. 2003;37(3):518-522.
220. Havig O. Deep vein thrombosis and pulmonary embolism. An autopsy study with multiple regression analysis of possible risk factors. *Acta Chir Scand Suppl*. 1977;4781-120.
221. Horii Y, Yoshimura N, Hori Y, Takaki S, Takano T, Inagawa S, Aoyama H. Correlation between the site of pulmonary embolism and the extent of deep vein thrombosis: evaluation by computed tomography pulmonary angiography and computed tomography venography. *Jpn J Radiol*. 2011;29(3):171-176.
222. Gottlieb RH, Widjaja J, Mehra S, Robinette WB. Clinically important pulmonary emboli: does calf vein US alter outcomes? *Radiology*. 1999;211(1):25-29.
223. Kitchens CS. How I treat superficial venous thrombosis. *Blood*. 2011;117(1):39-44.
224. Decousus H, Quere I, Presles E, Becker F, Barrellier MT, Chanut M, Gillet JL, Guenneguez H, Leandri C, Mismetti P, Pichot O, Leizorovicz A. Superficial Venous Thrombosis and Venous Thromboembolism: A Large, Prospective Epidemiologic Study. *Ann Intern Med*. 2010;152(4):218-224.
225. van Langevelde K, Lijfering WM, Rosendaal FR, Cannegieter SC. Increased risk of venous thrombosis in persons with clinically diagnosed superficial vein thrombosis: results from the MEGA study. *Blood*. 2011;118(15):4239-4241.

226. Lopez-Beret P, Pinto JM, Romero A, Orgaz A, Fontcuberta J, Oblas M. Systematic study of occult pulmonary thromboembolism in patients with deep venous thrombosis. *J Vasc Surg*. 2001;33(3):515-521.
227. Huisman MV, Büller HR, ten Cate JW, van Royen EA, Vreeken J, Kersten MJ, Bakx B. Unexpected high prevalence of silent pulmonary embolism in patients with deep venous thrombosis. *Chest*. 1989;95(3):498-502.
228. Decousus H, Prandoni P, Mismetti P, Bauersachs RM, Boda Z, Brenner B, Laporte S, Matyas L, Middeldorp S, Sokurenko G, Leizorovicz A. Fondaparinux for the treatment of superficial-vein thrombosis in the legs. *N Engl J Med*. 2010;363(13):1222-1232.
229. Decousus H, Bertoletti L, Frappe P, Becker F, Jaouhari AE, Mismetti P, Moulin N, Presles E, Quere I, Leizorovicz A. Recent findings in the epidemiology, diagnosis and treatment of superficial-vein thrombosis. *Thromb Res*. 2011;127 Suppl 3S81-S85.
230. Heit JA, Silverstein MD, Mohr DN, Petterson TM, O'Fallon WM, Melton LJ, III. Risk factors for deep vein thrombosis and pulmonary embolism: a population-based case-control study. *Arch Intern Med*. 2000;160(6):809-815.
231. Schonauer V, Kyrle PA, Weltermann A, Minar E, Bialonczyk C, Hirschl M, Quehenberger P, Schneider B, Partsch H, Eichinger S. Superficial thrombophlebitis and risk for recurrent venous thromboembolism. *J Vasc Surg*. 2003;37(4):834-838.
232. Hafner C, Cranley J, Krause R, Strasser E. A method of managing superficial thrombophlebitis. *Surgery*. 1964;55201-206.
233. Wichers IM, di Nisio M, Büller HR, Middeldorp S. Treatment of superficial vein thrombosis to prevent deep vein thrombosis and pulmonary embolism: a systematic review. *Haematologica*. 2005;90(5):672-677.
234. de Moerloose P, Wutschert R, Heinzmann M, Perneger T, Reber G, Bounameaux H. Superficial vein thrombosis of lower limbs: influence of factor V Leiden, factor II G20210A and overweight. *Thromb Haemost*. 1998;80(2):239-241.
235. Bergqvist D, Jaroszewski H. Deep vein thrombosis in patients with superficial thrombophlebitis of the leg. *Br Med J (Clin Res Ed)*. 1986;292(6521):658-659.
236. Leon L, Giannoukas AD, Dodd D, Chan P, Labropoulos N. Clinical significance of superficial vein thrombosis. *Eur J Vasc Endovasc Surg*. 2005;29(1):10-17.
237. Martinelli I, Cattaneo M, Taioli E, de Stefano V, Chiusolo P, Mannucci PM. Genetic risk factors for superficial vein thrombosis. *Thromb Haemost*. 1999;82(4):1215-1217.
238. Milio G, Siragusa S, Mina C, Amato C, Corrado E, Grimaudo S, Novo S. Superficial venous thrombosis: prevalence of common genetic risk factors and their role on spreading to deep veins. *Thromb Res*. 2008;123(2):194-199.
239. Stein PD, Terrin ML, Hales CA, Palevsky HI, Saltzman HA, Thompson BT, Weg JG. Clinical, laboratory, roentgenographic, and electrocardiographic findings in patients with acute pulmonary embolism and no pre-existing cardiac or pulmonary disease. *Chest*. 1991;100(3):598-603.
240. van Strijen MJ, Bloem JL, de Monye W, Kieft GJ, Pattynama PM, Berg-Huijsmans A, Huisman MV. Helical computed tomography and alternative diagnosis in patients with excluded pulmonary embolism. *J Thromb Haemost*. 2005;3(11):2449-2456.
241. van Rossum AB, Pattynama PM, Mallens WM, Hermans J, Heijerman HG. Can helical CT replace scintigraphy in the diagnostic process in suspected pulmonary embolism? A retrolective-prolective cohort study focusing on total diagnostic yield. *Eur Radiol*. 1998;8(1):90-96.
242. Wiener RS, Schwartz LM, Woloshin S. Time trends in pulmonary embolism in the United States: evidence of overdiagnosis. *Arch Intern Med*. 2011;171(9):831-837.

243. Bossuyt PMM. De schaduwkant van betere diagnostiek. *Ned Tijdschr Geneeskd*. 2011;155:A3858.
244. Costantino MM, Randall G, Gosselin M, Brandt M, Spinning K, Vegas CD. CT angiography in the evaluation of acute pulmonary embolus. *AJR Am J Roentgenol*. 2008;191(2):471-474.
245. Hall WB, Truitt SG, Scheunemann LP, Shah SA, Rivera MP, Parker LA, Carson SS. The prevalence of clinically relevant incidental findings on chest computed tomographic angiograms ordered to diagnose pulmonary embolism. *Arch Intern Med*. 2009;169(21):1961-1965.
246. Mamlouk MD, van Sonnenberg E, Gosalia R, Drachman D, Gridley D, Zamora JG, Casola G, Ornstein S. Pulmonary embolism at CT angiography: implications for appropriateness, cost, and radiation exposure in 2003 patients. *Radiology*. 2010;256(2):625-632.
247. Groth M, Henes FO, Mayer U, Regier M, Adam G, Begemann PG. Age-related incidence of pulmonary embolism and additional pathologic findings detected by computed tomography pulmonary angiography. *Eur J Radiol*. 2011
248. Soye JA, Loughrey CB, Hanley PD. Computed tomography pulmonary angiography: a sample of experience at a District General Hospital. *Ulster Med J*. 2008;77(3):175-180.
249. Bauer RW, Kerl JM, Weber E, Weisser P, Korkusuz H, Lehnert T, Jacobi V, Vogl TJ. Lung perfusion analysis with dual energy CT in patients with suspected pulmonary embolism-Influence of window settings on the diagnosis of underlying pathologies of perfusion defects. *Eur J Radiol*. 2010
250. Sueyoshi E, Tsutsui S, Hayashida T, Ashizawa K, Sakamoto I, Uetani M. Quantification of lung perfusion blood volume (lung PBV) by dual-energy CT in patients with and without pulmonary embolism: Preliminary results. *Eur J Radiol*. 2010;80(3):505-509.
251. Klok FA, Kruisman E, Spaan J, Nijkeuter M, Righini M, Aujesky D, Roy PM, Perrier A, le Gal G, Huisman MV. Comparison of the revised Geneva score with the Wells rule for assessing clinical probability of pulmonary embolism. *J Thromb Haemost*. 2008;6(1):40-44.
252. van Belle A, Buller HR, Huisman MV, Huisman PM, Kaasjager K, Kamphuisen PW, Kramer MH, Kruip MJ, Kwakkel-van Erp JM, Leebeek FW, Nijkeuter M, Prins MH, Sohne M, Tick LW. Effectiveness of managing suspected pulmonary embolism using an algorithm combining clinical probability, D-dimer testing, and computed tomography. *JAMA*. 2006;295(2):172-179.
253. Smith-Bindman R, Lipson J, Marcus R, Kim KP, Mahesh M, Gould R, Berrington de Gonzalez A, Miglioretti DL. Radiation dose associated with common computed tomography examinations and the associated lifetime attributable risk of cancer. *Arch Intern Med*. 2009;169(22):2078-2086.
254. Singh J, Daftary A. Iodinated contrast media and their adverse reactions. *J Nucl Med Technol*. 2008;36(2):69-74.
255. Bush WH, Swanson DP. Acute reactions to intravascular contrast media: types, risk factors, recognition, and specific treatment. *AJR Am J Roentgenol*. 1991;157(6):1153-1161.
256. Stein PD, Beemath A, Quinn DA, Olson RE, Goodman LR, Gottschalk A, Hales CA, Hull RD, Leeper KV, Jr., Sostman HD, Weg JG, Woodard PK. Usefulness of multidetector spiral computed tomography according to age and gender for diagnosis of acute pulmonary embolism. *Am J Cardiol*. 2007;99(9):1303-1305.
257. Robert-Ebadi H, le Gal G, Carrier M, Couturaud F, Perrier A, Bounameaux H, Righini M. Differences in clinical presentation of pulmonary embolism in women and men. *J Thromb Haemost*. 2010;8(4):693-698.
258. Kyrle PA, Minar E, Bialonczyk C, Hirschl M, Weltermann A, Eichinger S. The risk of recurrent venous thromboembolism in men and women. *N Engl J Med*. 2004;350(25):2558-2563.
259. Heit JA. Risk factors for venous thromboembolism. *Clin Chest Med*. 2003;24(1):1-12.

260. Righini M, le Gal G, Perrier A, Bounameaux H. The challenge of diagnosing pulmonary embolism in elderly patients: influence of age on commonly used diagnostic tests and strategies. *J Am Geriatr Soc*. 2005;53(6):1039-1045.
261. Kokturk N, Oguzulgen IK, Demir N, Demirel K, Ekim N. Differences in clinical presentation of pulmonary embolism in older vs younger patients. *Circ J*. 2005;69(8):981-986.
262. Green RM, Meyer TJ, Dunn M, Glassroth J. Pulmonary embolism in younger adults. *Chest*. 1992;101(6):1507-1511.
263. Arima M, Kanoh T, Takagi A, Tanimoto K, Oigawa T, Matsuda S. Clinical features of acute pulmonary thromboembolism in younger patients. *Circ J*. 2003;67(4):330-333.
264. Cereser L, Bagatto D, Girometti R, Como G, Zuiani C, Bazzocchi M. Chest multidetector computed tomography (MDCT) in patients with suspected acute pulmonary embolism: diagnostic yield and proportion of other clinically relevant findings. *Radiol Med*. 2011;116(2):219-229.
265. Arnason T, Wells PS, Forster AJ. Appropriateness of diagnostic strategies for evaluating suspected venous thromboembolism. *Thromb Haemost*. 2007;97(2):195-201.
266. Soo Hoo GW, Wu CC, Vazirani S, Li Z, Barack BM. Does a Clinical Decision Rule Using D-Dimer Level Improve the Yield of Pulmonary CT Angiography? *AJR Am J Roentgenol*. 2011;196(5):1059-1064.
267. Ten Cate-Hoek AJ, Prins MH. Management studies using a combination of D-dimer test result and clinical probability to rule out venous thromboembolism: a systematic review. *J Thromb Haemost*. 2005;3(11):2465-2470.
268. Zondag W, Klok FA, Nijkeuter M, Kruip M, Douma RA, Kramer MH, Huisman MV. Comparison of risk profile and clinical outcome of patients after acute pulmonary embolism in university and non-university hospitals. *J Thromb Haemost*. 2010;8(2):407-409.
269. Trotman WE, Taatjes DJ, Callas PW, Bovill EG. The endothelial microenvironment in the venous valvular sinus: thromboresistance trends and inter-individual variation. *Histochem Cell Biol*. 2011;135(2):141-152.