

## CASE REPORT

# Massive Pulmonary Embolism After Leg Massage: A Case Report

Stevan Kristian Lionardi,<sup>1,2</sup> Ignatius Ivan,<sup>2,3</sup> Tommy Alexander<sup>3,4</sup>

Medical Doctor, Sultan Syarif Mohamad Alkadrie General Regional Hospital,<sup>1</sup> Pontianak, West Kalimantan – Indonesia

School of Medicine and Health Science, Atma Jaya Catholic University of Indonesia,<sup>2</sup> Jakarta – Indonesia

Kalabahi General Regional Hospital,<sup>3</sup> Alor, East Nusa Tenggara – Indonesia

Department of Cardiology, Sultan Syarif Mohamad Alkadrie General Regional Hospital,<sup>4</sup> Pontianak – Indonesia

## Introduction

Venous thromboembolism (VTE) incidents encompass occurrences of both deep vein thrombosis (DVT) and pulmonary embolisms (PE). This occurrence is frequently observed, with an annual incidence rate of 122/100,000 individuals.<sup>1</sup> These two entities share a common pathological pathway, but they are believed to appear in different ways.

In Indonesia, traditional massage is a commonly acknowledged practice applied to individuals experiencing muscle pain or injuries, involving soft tissue manipulation to alleviate pain, induce muscle relaxation, or serve therapeutic purposes as an alternative medical intervention prior to seeking hospital care. Nevertheless, there is limited understanding regarding its effectiveness and safety. Here, we present a case involving a massive PE in a female patient occurring two hours following a traditional lower leg massage, a scenario that has rarely been documented in scientific literature.

## Case Report

A 33-year-old Asian woman, devoid of significant prior medical conditions, was admitted to the emergency department (ED) complaining of a shortness of breath. This symptom appeared two hours after she had her left leg massaged, due to acute pain that had persisted for the past five months. Concurrently, she experienced chest discomfort radiating to her back. The massage

was administered by a well-known traditional service, renowned for its efficacy in alleviating muscle-related injuries or pain within the community. The session, using oil and lotion, lasted for approximately one hour. Prior to this event, the patient had led a sedentary lifestyle and was obese, employed in a desk job, with no history of smoking, alcohol consumption, or prior surgical interventions.

Upon admission, she was agitated, with a respiratory rate of 36 breaths per minute, hypotensive with 90/70 mmHg, hypoxic with 85% oxygen saturation, tachycardia at 105 beats per minute, and a normal temperature. Notably, her left calf was swollen, erythematous, and tender when compared to the right calf. An electrocardiogram (ECG) revealed a characteristic  $S_1Q_3T_3$  pattern, shown in Figure 1, indicative of PE, along with t-wave inversion in the precordial lead, suggestive of right ventricular (RV) hypertrophy or strain. Chest X-ray examination showed a Westermark sign, as shown in Figure 2. Laboratory results indicated a D-dimer level of 1,046 ng/mL and a troponin-I level of 2.25 ng/mL. Additionally, a duplex ultrasound of the left lower extremity's venous system confirmed the presence of acute DVT in the left popliteal and posterior tibial veins.

Transthoracic echocardiography (TTE) was conducted, revealing McConnell's sign, characterized by RV free wall akinesis with sparing of the apex, indicative of thromboembolism. Additionally, an elevated right-sided pressure was evidenced by the RV being larger than the left ventricle (LV), as well as a prominent high-velocity tricuspid regurgitation (TR) jet, shown in Figures 3 and 4.

In the ED, subsequent to identifying a patient with a high-risk PE (indicated by a Bova score of 6) and unstable hemodynamics according to the ESC 2019 guideline, and following the assessment of the absence of contraindications

## Keywords

Pulmonary Embolism; Venous Thrombosis; Massage.

### Mailind Address: Stevan Kristian Lionardi

Atma Jaya Catholic University of Indonesia School of Medicine and Health Science. Jl. Pluit Raya No.2, RW.8, Penjaringan, Kec. Penjaringan, Jkt Utara, Daerah Khusus Ibukota Jakarta, 14440. Postal code: 12930. South Jakarta – Indonesia.

E-mail: stevanlionardi15@gmail.com

Editor responsible for the review: Glaucia Maria Moraes de Oliveira

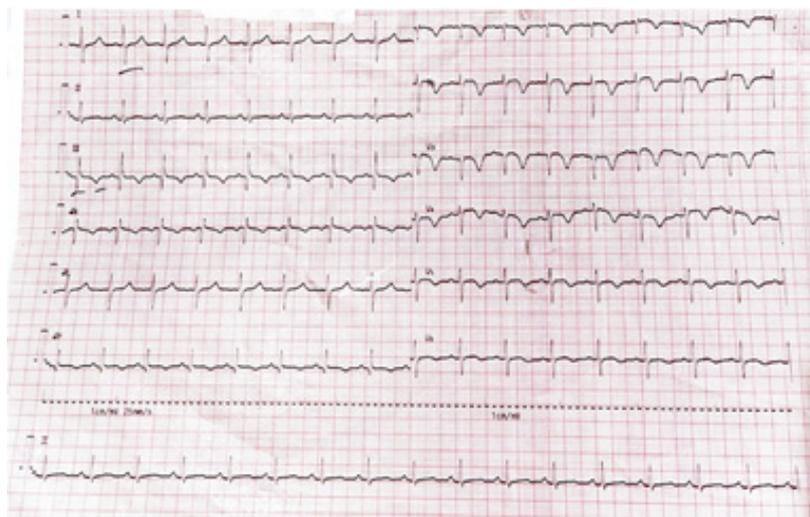


Figure 1 - ECG at the time of admission, with an S1Q3T3 pattern

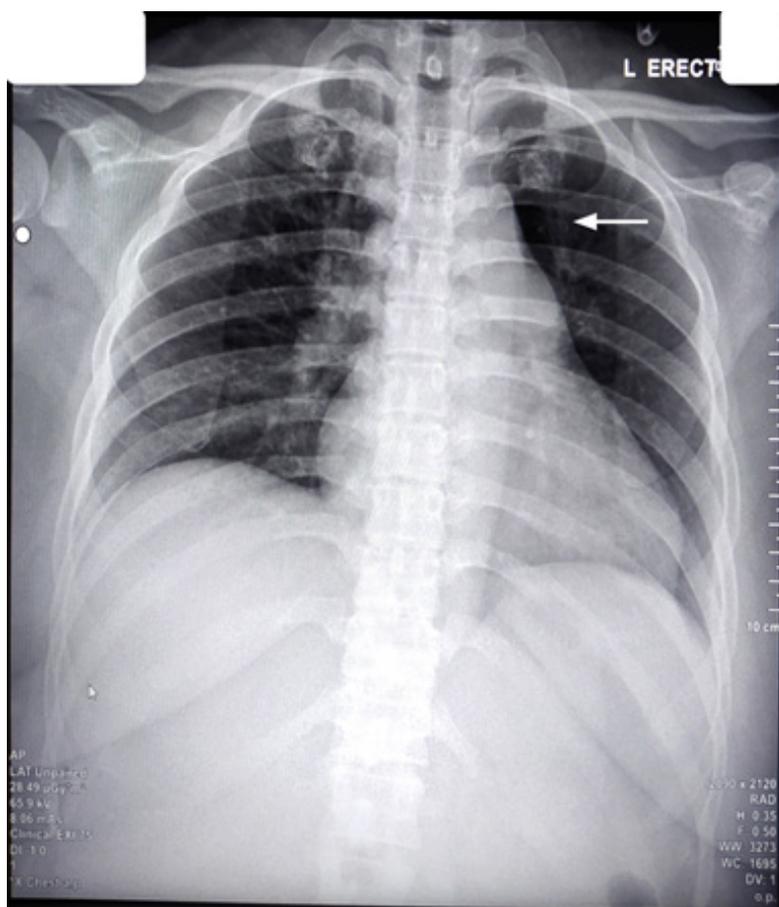


Figure 2 - Chest X-ray demonstrating the Westermark sign (white arrow)

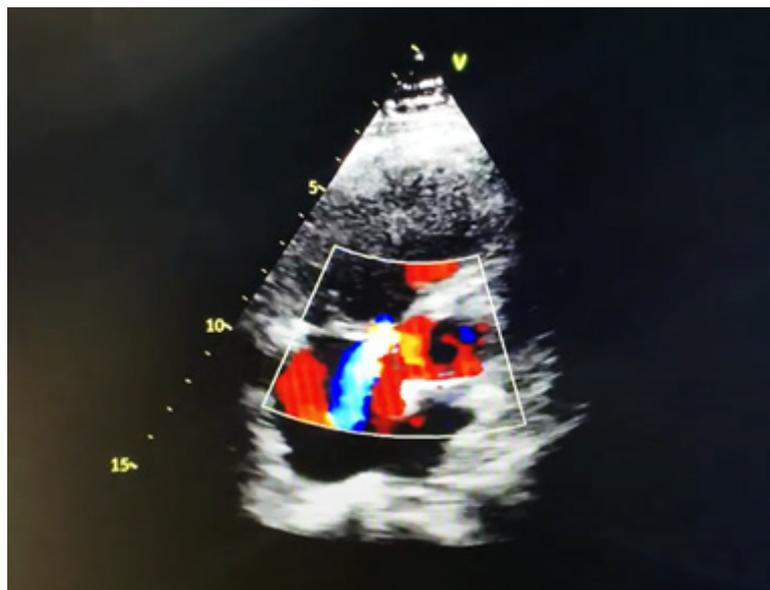


Figure 3 - TTE with a RV dilatation with TR.

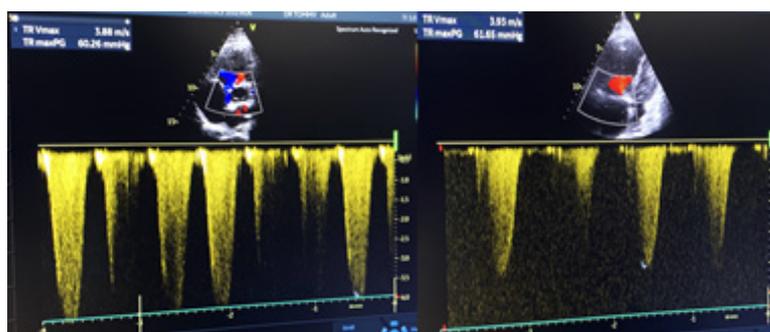


Figure 4 – Comparison of TR velocity before and after treatment.

to fibrinolytics, an accelerated regimen of fibrinolytic therapy employing 1,500,000 IU of streptokinase was administered intravenously on the initial day of treatment. Moreover, considering an intermediate bleeding risk score (Kuijer bleeding risk score of 1.3), a subcutaneous administration of fondaparinux at a dosage of 2.5 mg was begun and continued for the subsequent five days. After a two-week hospitalization period, the patient was discharged and was given rivaroxaban 10 mg and antihypertensive medications due to a comorbidity of hypertension. A follow-up echocardiogram conducted after four-months revealed no significant structural changes; however, the patient reported no ongoing

complaints of shortness of breath and improvement in her leg pain.

### Discussion

Multiple cases have reported massage-related PEs. In this case, the patient received a traditional massage two hours before experiencing symptoms. The rapid onset of dyspnea, coupled with prior leg pain, suggests a possible PE resulting from mechanical dislodgement of a blood clot during the massage. Prior reports have documented diverse timeframes between massage and symptom onset, ranging from three weeks<sup>2</sup> to five days<sup>3</sup> to thirty minutes<sup>4</sup> to ten minutes.<sup>5</sup>

VTE associated with massage therapy is rarely reported in the literature. Notable cases include a 53-year-old woman with stage I endometrial adenocarcinoma, who developed PE after a calf massage.<sup>2</sup> Another case involved a 72-year-old woman, with pre-existing DVT, who experienced PE following a vigorous leg massage.<sup>6</sup> Additionally, a 59-year-old man had a left renal embolism dislodged from an aortofemoral bypass graft during a massage session, which included external pressure applied by a person walking on his back.<sup>7</sup> It is important to note that adverse events from massage therapy are generally considered rare.

Interestingly, one prior study highlighted the potential benefits of brief self-administered calf massages lasting only 2 minutes, with 30 massages over a two-day period, in preventing DVT following total knee arthroplasty.<sup>8</sup> This self-care procedure was notably briefer when compared to massages administered by conventional masseuses. Besides established DVT risk factors, such as obesity and prolonged sitting, forceful leg massages have been linked to PE.<sup>3</sup> This association may be attributed to mechanical shear stress on venous walls, leading to endothelial cell damage, platelet aggregation, and thrombin-mediated fibrin clot formation.<sup>9</sup>

Most patients receiving leg massages undergo the procedure without clinical evaluations to detect DVT. This observation stems from multiple case reports documenting adverse events, specifically the occurrence of DVT following a leg massage.<sup>2,6,7</sup> This could also be ascribed to the widespread involvement in traditional massage practices without adequate oversight from local governmental authorities. Consequently, a substantial number of individuals lacking adequate training partake in traditional massage, and numerous massage establishments operate with no respect for governmental regulations. As is the case with any medical modality, a traditional massage holds the potential for adverse effects, underscoring the necessity for additional research on this subject.<sup>10</sup>

VTE arises from factors in Virchow's triad: venous stasis, venous wall damage, and coagulation initiation. In this case, venous wall injury due to intense non-penetrating massage may increase the risk of VTE. Patients with a strong likelihood of VTE, with unstable hemodynamics, require resuscitation, anticoagulation, and diagnostic imaging. If stability remains elusive,

bedside TTE and Doppler ultrasound of leg veins should be performed. This strategy supports the immediate consideration of potentially life-saving measures, including the use of thrombolytic agents.<sup>5</sup>

The approach to managing high-risk PE with hemodynamic instability involved the implementation of thrombolysis therapy, adhering to the guidelines outlined in the ESC 2019 protocol. Following successful reperfusion, a transition to oral anticoagulation was considered. The recommended anticoagulation for high-risk PE was unfractionated heparin (UFH). However, after assessing the bleeding risk and determining it to be of intermediate level based on the Kujier bleeding score, we opted to administer fondaparinux to the patient. This decision was influenced by the lower risk associated with fondaparinux in inducing major bleeding. Furthermore, the use of fondaparinux is advantageous, as it is associated with a reduced incidence of heparin-induced thrombocytopenia, and it obviates the need for routine monitoring of anti-Xa levels.<sup>11</sup>

This case highlights the use of bedside TTE for assessing the RV in massive PE. While not the primary tool for diagnosing PE, TTE can be valuable for diagnoses in unstable patients. Moreover, this procedure also plays a crucial role in risk stratification and prognosis. Echocardiographic signs of PE include reduced RV function, RV enlargement, TR, paradoxical motion of the interventricular septum, pulmonary artery enlargement, elevated pulmonary pressures, empty left heart, and, rarely, right heart thrombus.<sup>12</sup>

Our case report has one key limitation, as previous case reports have already documented instances of PEs occurring after leg massages. Despite the existence of these prior reports, our objective is to contribute additional evidence to the discussion on the risk of PE in patients with DVT. By doing so, we seek to emphasize the significance of risk stratifying patients with pre-existing DVT before undergoing leg massages, aiming to prevent the occurrence of PE.

## Conclusion

In conclusion, the practice of vigorous and prolonged lower limb massage, even when performed by professionals, carries the unsettling potential to dislodge pre-existing thrombi, emboli, or blood clots in individuals who may already be susceptible to DVT in their leg veins. This elevates the risk of PE and the consequent possibility of sudden and severe outcomes, including

fatality. Hence, it is imperative for healthcare providers to strongly discourage patients with this medical condition from pursuing massage therapy on the affected limb, in the interest of their safety and well-being.

### Author Contributions

Conception and design of the research, analysis and interpretation of the data and critical revision of the manuscript for intellectual content: Lionardi SK, Ivan I, Alexander T; acquisition of data: Lionardi SK, Alexander T; writing of the manuscript: Lionardi SK, Ivan I.

### Potential Conflict of Interest

No potential conflict of interest relevant to this article was reported.

### References

1. Silverstein MD, Heit JA, Mohr DN, Petterson TM, O'Fallon WM, Melton LJ 3rd. Trends in the Incidence of Deep Vein Thrombosis and Pulmonary Embolism: A 25-Year Population-Based Study. *Arch Intern Med.* 1998;158(6):585-93. doi: 10.1001/archinte.158.6.585.
2. Jabr FI. Massive Pulmonary Emboli after Legs Massage. *Am J Phys Med Rehabil.* 2007;86(8):691. doi: 10.1097/PHM.0b013e31811e2a7a.
3. Crump C, Paluska SA. Venous Thromboembolism Following Vigorous Deep Tissue Massage. *Phys Sportsmed.* 2010;38(4):136-9. doi: 10.3810/psm.2010.12.1836.
4. Behera C, Devassy S, Mridha AR, Chauhan M, Gupta SK. Leg Massage by Mother Resulting in Fatal Pulmonary Thromboembolism. *Med Leg J.* 2018;86(3):146-50. doi: 10.1177/0025817217706645.
5. Sutham K, Na-Nan S, Paiboonsithiwong S, Chaksuwat P, Tongsong T. Leg Massage During Pregnancy with Unrecognized Deep Vein Thrombosis Could be Life Threatening: a Case Report. *BMC Pregnancy Childbirth.* 2020;20(1):237. doi: 10.1186/s12884-020-02924-w.
6. Warren SE. Pulmonary Embolus Originating Below Knee. *Lancet.* 1978;2(8083):272-3. doi: 10.1016/s0140-6736(78)91793-2.
7. Mikhail A, Reidy JF, Taylor PR, Scoble JE. Renal Artery Embolization after Back Massage in a Patient with Aortic Occlusion. *Nephrol Dial Transplant.* 1997;12(4):797-8. doi: 10.1093/ndt/12.4.797.
8. Oka T, Wada O, Nitta S, Maruno H, Mizuno K. Effect of Self-Calf Massage on the Prevention of Deep Vein Thrombosis after Total Knee Arthroplasty: a Randomized Clinical Trial. *Phys Ther Res.* 2020;23(1):66-71. doi: 10.1298/ptr.E10014.
9. Rosenberg RD, Aird WC. Vascular-Bed--Specific Hemostasis and Hypercoagulable States. *N Engl J Med.* 1999;340(20):1555-64. doi: 10.1056/NEJM199905203402007.
10. Sutham K, Na-Nan S, Paiboonsithiwong S, Chaksuwat P, Tongsong T. Leg Massage During Pregnancy with Unrecognized Deep Vein Thrombosis Could be Life Threatening: a Case Report. *BMC Pregnancy Childbirth.* 2020;20(1):237. doi: 10.1186/s12884-020-02924-w.
11. Konstantinides SV, Meyer G, Becattini C, Bueno H, Geersing GJ, Harjola VP, et al. 2019 ESC Guidelines for the Diagnosis and Management of Acute Pulmonary Embolism Developed in Collaboration with the European Respiratory Society (ERS). *Eur Heart J.* 2020;41(4):543-603. doi: 10.1093/eurheartj/ehz405.
12. Lim DC, Jayanthi HK, Money-Kyrle A, Ramrakha P. Massaging the Outcome: an Unusual Presentation of Pulmonary Embolism. *BMJ Case Rep.* 2009;2009:bcr01.2009.1505. doi: 10.1136/bcr.01.2009.1505.

### Sources of Funding

There were no external funding sources for this study.

### Study Association

This study is not associated with any thesis or dissertation work.

### Ethics Approval and Consent to Participate

This study was approved by the Ethics Committee of the Sultan Syarif Mohamad Alkadrie General Regional Hospital under the protocol number 800/1060.a/UPT RSUD-PTK/2023. All the procedures in this study were in accordance with the 1975 Helsinki Declaration, updated in 2013. Informed consent was obtained from all participants included in the study.

