

# Complications of pacemaker replacement: a case report of female patient with the upper extremity deep vein thrombosis

## Powikłania wymiany stymulatora serca – opis przypadku pacjentki z zakrzepicą żył głębokich kończyny górnej

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### Abstract

Deep venous thrombosis of the upper extremity (UEDVT) after pacemaker implantation (PM) is often an underestimated problem, but should be considered as a potential complication, because the number of implanting PM is increasing every year. This case report presents a history of a 57-years old woman with a pacemaker implanted in 1996 due to the 3<sup>rd</sup>-degree atrioventricular block. The patient was admitted to the hospital for the replacement of the stimulating system. The procedure was complicated by hemorrhage from the pocket of the device and in the postoperative period – the left upper extremity deep vein thrombosis.

Key words: deep venous thrombosis of the upper extremity, pacemaker implantation, leads extraction, complications, compression-ultrasonography

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### Introduction

Upper extremity deep vein thrombosis (UEDVT) is defined as thrombosis of either subclavian, axillary and/or brachial vein [1]. The etiology can be subdivided into primary, in which the cause would be either idiopathic or due to anatomical variation such as in the thoracic-outlet syndrome; and secondary, i.e., due to central venous catheters and cardiac pacemaker implantation [2]. The thrombus is most frequently located in the left subclavian vein in its proximal portion, due to the route used for transvenous lead placement [3]. The presence of multiple leads poses

a higher risk of venous thrombosis than a singular lead [4]. In the last few decades, the incidence of UEDVT has steadily increased, just in 2018, it accounted for 2–3% of cases with DVT [5] while in 2021 for 6% [6].

### Case report

A 57-years old woman with a pacemaker (PM) implanted in 1996 due to 3<sup>rd</sup>-degree atrioventricular block, was admitted to the hospital for replacement of the stimulating system. About the patient's medical history, she had myocarditis in childhood and nowadays is suffering from paroxysmal

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supraventricular tachycardia which is treated with sotalol. On admission, the patient was hemodynamic stable and had no major complaints. In electrocardiogram there was effective atrial and ventricular stimulation with a ventricular response rate of 75/min. Laboratory tests revealed an increased serum concentration of N-terminal pro-brain natriuretic peptide (226 pg/mL), while other parameters were within their respective reference ranges. A transthoracic echocardiography demonstrated a normal left ventricle size with a good global contraction and ejection fraction of around 60%, a normal left ventricle diastolic function, and small mitral and tricuspid regurgitation.

The replacement of PM was complicated by the hemorrhage from the PM-pocket. Due to the use of a large-diameter mechanical electrode release system, significant local bleeding was observed both during electrode release and after the removal of the system. The patient lost 1000 mL of blood and the presence of fluid in the pericardium was observed (without the impending cardiac tamponade). The patient received intensive fluid therapy, 1 unit of erythrocyte concentrate, and noradrenaline *via* continuous *i.v.* infusion. In the following days, the patient remained stable and the control echocardiographies revealed no expansion of fluid in the pericardium. Prior to the procedure, she was neither taking anticoagulation nor antiplatelet medication.

On the second day after the procedure, the woman started to complain about pain, cyanosis and edema of her upper left limb. On closer examination, there was no palpable pulse detected on the left upper limb, but the warmth was preserved. The performed doppler ultrasonography revealed thrombosis of the left internal jugular, subclavian and axillary vein, as well occlusion of the left radial artery and a residual thrombus in the proximal part of the right internal jugular vein.

Anticoagulation treatment was initiated with rivaroxaban yielding clinical improvement. Taking the occlusion of the left radial artery into consideration, compression therapy of the left arm was not recommended, instead, the patient's left upper limb was solely kept elevated. According to the vascular-surgical consultation that case posed no indication for invasive treatment of thrombosis and suggested continuation of the conservative management.

## Discussion

The pathogenesis of venous obstruction is related to the presence of a foreign body, i.e., the pacemaker leads in the blood vessel which injures endothelium causing disturbance in laminar blood flow and therefore activates factors involved in the Virchow's triad and subsequent thrombosis and/or fibrosis [3]. The risk factors of UEDVT consist of age over 40 years old, prior episodes of venous

thromboembolism, cancer, family history of venous thromboembolism, New York Heart Association III or IV heart failure, arrhythmia, venous anomalies, tobacco smoking and use of oral contraception or hormone replacement therapy [7]. The most frequent cause is the catheterization of the central vein for constant drug administration, parenteral nutrition or inserting leads for PM [8].

The UEDVT develops from several days to years after implantation of the device [8]. In the described case, several factors probably contributed to the development of thrombosis in a relatively short time after pacemaker implantation (after 2 days). Our patient is 57 years old, had no previous anticoagulation treatment, and has a negative family history of hemostatic disorders.

The clinical presentation of the UEDVT typically includes pain, heaviness, edema, cyanosis, and perhaps visible collateral veins of the upper limb or it can be asymptomatic.

Compression-/color duplex sonography (CUS) is the key method of confirming vein thrombosis and the measurement of plasma D-dimer levels is performed to exclude it. For hospitalized patients it is necessary to perform CUS due to the low specificity and predictive value of positive D-dimer test results [7].

Regarding the treatment, one can either follow the conservative path and initiate anticoagulation with low molecular weight heparin (unfractionated heparin in chronic kidney disease) for 5 days and then maintenance therapy with either vitamin K antagonist or dabigatran as well as directly without bridging rivaroxaban or apixaban for at least 3 months and according to indication perhaps longer. In cases of intense symptoms and time since onset is shorter than 10 days, invasive methods are indicated such as catheter-directed thrombolysis or percutaneous/surgical thrombectomy [9].

According to the literature, 6% of UEDVT cases are complicated by pulmonary embolism, 5% will develop post-thrombotic syndrome, and 9% report recurrence (18% of cases are coexistent with tumors) [9].

## Conclusions

Taking into consideration the progressively increasing number of pacemaker implantations and PM-related incidence of UEDVT, it is of high importance to remember this potential complication with its signs and symptoms in the postoperative period. Especially because of its simplicity to diagnose and therefore immediate initiation of treatment, the awareness of the patient of possible symptoms is very crucial and may accelerate the process.

## Conflict of interest

The authors declare no conflict of interest.

## Streszczenie

Zakrzepica żył głębokich kończyny górnej po implantacji stymulatora serca jest często bagatelizowanym problemem, chociaż powinna być brana pod uwagę jako potencjalne powikłanie zabiegu w związku z rosnącą liczbą implantowanych stymulatorów serca każdego roku. W niniejszym tekście opisano przypadek 57-letniej pacjentki po wszczepieniu stymulatora serca z powodu bloku przedsionkowo-komorowego 3. stopnia w 1996 roku, która została przyjęta do szpitala w celu wymiany urządzenia. Zabieg był powikłany krwawieniem z żyły stymulatora oraz masywną zakrzepicą żył głębokich kończyny górnej lewej w okresie pozabiegowym.

Słowa kluczowe: głęboka zakrzepica kończyny górnej, implantacja stymulatora, usunięcie elektrod, komplikacje, uciskowa ultrasonografia

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## References

1. Mustafa J, Asher I, Sthoeger Z, et al. Upper extremity deep vein thrombosis: symptoms, diagnosis, and treatment. *Isr Med Assoc J.* 2018; 20(1): 53–57, indexed in Pubmed: [29658209](#).
2. Yuen HL, Tran H, Chunilal S. Upper extremity deep vein thrombosis: current knowledge and future directions. *Semin Thromb Hemost.* 2021; 47(6): 677–691, doi: [10.1055/s-0041-1725116](#), indexed in Pubmed: [33971684](#).
3. Lelakowski J, Domagała TB, Cieśla-Dul M, et al. Association between selected risk factors and the incidence of venous obstruction after pacemaker implantation: demographic and clinical factors. *Kardiol Pol.* 2011; 69(10): 1033–1040, indexed in Pubmed: [22006604](#).
4. Safi M, Akbarzadeh MA, Azinfar A, et al. Upper extremity deep venous thrombosis and stenosis after implantation of pacemakers and defibrillators; A prospective study. *Rom J Intern Med.* 2017; 55(3): 139–144, doi: [10.1515/rjim-2017-0018](#), indexed in Pubmed: [28432849](#).
5. Mahmoud O, Vikatmaa P, Räsänen J, et al. Catheter-directed thrombolysis versus pharmacomechanical thrombectomy for upper extremity deep venous thrombosis: a cost-effectiveness analysis. *Ann Vasc Surg.* 2018; 51: 246–253, doi: [10.1016/j.avsg.2018.01.104](#), indexed in Pubmed: [29522873](#).
6. Khan O, Marmaro A, Cohen DA. A review of upper extremity deep vein thrombosis. *Postgrad Med.* 2021; 133(1): 3–10, doi: [10.1080/00325481.2021.1892390](#), indexed in Pubmed: [33618595](#).
7. Jaeschke R, Gajewski P, O'Byrne P. *McMaster Textbook of Internal Medicine 2019/2020. Venous Thromboembolism.* Medycyna Praktyczna, Warszawa 2019: 419–430.
8. Łebek-Szatańska A, Przychodzeń S, Dąbrowski M. Subclavian vein thrombosis after pacemaker implantation - case report. *Acta Angiol.* 2013; 19(2): 93–98.
9. Herold G. *Innere Medizin 2023. Tiefe Venenthrombose Der Oberen Extremität.* Herold, Köln 2022: 832.