

## INCIDENCE AND PREVENTION OF DEEP VEIN THROMBOSIS IN RESTRAINED PSYCHIATRIC PATIENTS

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### SUMMARY

**Background:** Although physical restraint is still used in psychiatric inpatient settings, it sometimes causes serious side effects, including deep vein thrombosis (DVT) and resulting pulmonary embolism. The aim of this study was to review the literature investigating the incidence of the DVT in restrained psychiatric patients, to identify the risk factors of this condition and the effectiveness of routine prophylaxis.

**Subjects and methods:** Studies investigating associations between deep vein thrombosis and restrained psychiatric patients were searched in the Pubmed database. More than 700 articles were sorted independently by two of the authors using predefined criteria. Only research articles, reviews and meta-analyses were selected for this review.

**Results:** 5 articles published between 2010 and 2016 were selected. Although antipsychotics and restraint are known to be thrombogenic, in all retrospective studies, with anticoagulant prophylaxis for those restrained for more than 12 or 24 h, incidence of DVT in restrained psychiatric patients was almost not existent. Controversially, in a comparative study by Ishida, although deep sedation and physical comorbidities were associated with the occurrence of DVT, not using of anticoagulants was not associated with any increased incidence of DVT. DVT may be overlooked because psychiatric patients are often unaware of leg symptoms because of their psychiatric disease and induced sedation. Furthermore most DVT, in particular distal DVT are asymptomatic. When screened and assessed with more appropriate methods such as plasma D Dimer and ultrasound scanning the incidence of DVT reaches 11.6%.

**Conclusion:** The incidence of DVT in restrained psychiatric patients was not low in spite of prophylaxis. These findings emphasize the importance of regular screening of and thorough assessments of DVT, especially in restrained psychiatric patients.

**Key words:** deep vein thrombosis – physically restrained – psychiatric patient

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### INTRODUCTION

The practice of physical restraint puts patients at risk. Not only it is associated with physical injury but it may also be perceived as punitive and aversive (Petti et al. 2001), with potential traumatic sequels (Mohr et al. 2003).

The French National Authority for Health (HAS) is an independent public scientific authority with an overall mission of contributing to the regulation of the healthcare system by improving health quality and efficiency. According to HAS recommendations edited in 2017 (HAS 2017), the prevention of thromboembolic diseases should be considered for each patient put under mechanical restraint depending on the benefit-risk balance, including the prescription of anticoagulant therapy.

Deep vein thrombosis (DVT) is a partial or complete obstruction of a leg vein by a thrombus. The most critical complication of DVT is pulmonary thromboembolism. The thrombogenic role of second generation antipsychotic drugs has been repeatedly reported (Hagg & Spigst 2002, Liperoti et al. 2005, Liperoti & Gambassi 2010). Antipsychotics facilitate platelet aggregation and increase anticardiolipin antibodies. In addition, drug-induced sedation promotes venous stasis. Other throm-

boembolic risk factors include history of venous thromboembolism (VTE), major familial thrombophilia, cancer, chemotherapy, heart failure or respiratory failure, hormonal therapy, oral contraception, accidents cerebrovascular disorders with neurological deficit, postpartum, age, obesity, prolonged bed rest, severe renal insufficiency. HAS recommends that special attention be paid to patients at highest risk somatically or psychologically, including: extremely agitated patients; patients intoxicated by alcohol or psychostimulant substances; patients with a history of heart or respiratory disease, morbid obesity, neurological and/or metabolic disorders; elderly patients; pregnant or postpartum women and patients who have been abused in the past.

The aim of this review is to seek what is known about the incidence of deep vein thrombosis in restrained psychiatric patients and whether preventive measures can be suggested.

### SUBJECTS AND METHODS

Medline, Cochrane Library and Psycinfo databases were searched for the terms: "thrombosis", "thromboembolic risk", "thrombophilia", "thromboembolism" combined with each of the following terms: "restrai-

ned", "psychiatric patients", "schizophrenia", up to December 2017. More than 700 articles were sorted independently by two of the authors using those predefined criteria. Only research articles, reviews and meta-analyses were sorted out for this review. Excluded were theoretical articles, editorials and opinion articles. Eligibility assessment of titles and abstracts was performed independently by two of the authors and disagreements between reviewers were resolved by consensus with a third author. Pertinent data was further extracted by two of the authors.

## RESULTS

5 articles with retrospective designs met the inclusion criteria. Extracted data was sorted according to our research questions.

679 inpatients suffering from psychosis were followed in a descriptive and retrospective study carried out in Belgium between 2002 and 2009. 68.8% were male and 31.2% females. Out of 170 secluded patients, 138 underwent 296 physical restrain episodes. 65 (38.2%) out of 170 secluded patients benefited from anticoagulants as a preventive measure. DVT prevention with anticoagulants was more frequent when patients were restrained and in seclusion lasting more than one day. Because no thromboembolic event was observed throughout the study the authors suggested that the preventive measures were effective. This statement must be taken with caution since it relies on a retrospective analysis of electronic records (De Hert et al. 2010).

In Sakuragaoka Memorial Hospital in Tokyo, Japan routine prophylaxis for DVT has been employed for physically restrained patients since 2008. All restrained patients wear graduated compression stockings. Unless contraindicated, patients restrained for more than 12 hours, receive subcutaneous UFH 5000 IU b.i.d. Plasma D-dimer level is measured when restraint was removed. At levels of 0.50 ug/dL or higher Doppler ultrasound scanning is performed to look for the presence of DVT at their lower limbs. 181 patient were included in a study conducted between December 2008 and September 2010. DVT was detected in 21 (11.6%) in despite of prophylaxis. None of the DVTs that were found with a dopler ultrasound scanning in this study was symptomatic. Incidence of DVT was associated with longer duration of restraint, excessive sedation, recent hospitalization for physical comorbidities and paradoxically low antipsychotic dosage (Ishida et al. 2014a).

UFH was not used from December 2010 to September 2012 to compare the incidence of DVT with and without the use of UFH in restrained psychiatric patients. 93 heparin (+) patients were matched to 117 heparin (-) patients. Surprisingly, the use of UFH was not associated with any reduction in the incidence of DVT. Deep sedation and psychical comorbidities were associated with DVT (Ishida et al. 2014b).

The incidence of DVT in catatonic patients was found to be much higher than in restrained patients. Using the same protocol with plasma D-dimer level measured and Doppler ultrasound scanning performed at levels of 0.50 ug/dL or higher the presence of DVT at their lower limbs was as high as 25.3% (20/79). None of the DVTs was symptomatic. Proximal DVT was detected in 2 patients. The incidence of DVT was not associated with not using UFH, but because of the retrospective observations design, this may be attributable to uncontrolled factors. Patients with more risk of DVT are more likely to be prescribed UFH than others. (Ishida et al. 2016).

In a retrospective study carried out in Germany in 2012 and 2013, 12734 patients were hospitalized. The number of restraining episodes was 1035 and involved 469 patients. 75 episodes lasted more than 24h and in that cases patients were give, Exoparin 40 mg subcutaneously as a DVT profilaxis. None of the prolonged restrain episodes nor the shorter ones were associated with sings or symptoms of DVT

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Controversially, in a comparative study by Ishida, although deep sedation and physical comorbidities were associated with the occurrence of DVT, not using of anticoagulants was not associated with any increased incidence of DVT. When evaluated relying only on clinical and symptoms, the incidence of DVT is likely to be underestimated. DVT may be overlooked because psychiatric patients are often unaware of leg symptoms because of their psychiatric disease and induced sedation. Furthermore most DVT, in particular distal DVT are asymptomatic. Most DVTs originate in calves, and 80% og distal DVTs are known to resolve spontaneously (Mohr et al. 2003). However the remaining 20% cvan extent to proximal veins, such as popliteal vein or higher. Once DVT reach the popliteal vein pulmonary embolism occurs in 50%of the patients. When screened and assessed with more appropriate methods such as plasma D Dimer and ultrasound scanning the incidence of DVT reaches 11.6%.

## DISCUSSION

Although antipsychotics and restrain are known to be thrombogenic, in all retrospective studies, with anticoagulant profilaxis for those restrained for more than 12 or 24 h, incidence of DVT in restrained psychiatric patients was almost not existent. Interestingly the incidence is higher in other categories of patients that might appear similar such as unrestrained catatonic patients, or intensive care restrained inpatients

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## CONCLUSION

Although often asymptomatic, in view of the high incidence of DVT in psychiatric restrained patients, it seems appropriate to put preventive and scanning measures in place.

Excessive sedation, physical comorbidities, longer restrains are aggravation that must be taken into consideration. The prophylactic effectiveness of anticoagulants is still a subject of controversy. Ishida's detection protocol looking for plasma levels of D dimers, followed by ultrasound scanning for those with plasma levels  $>0.5 \mu\text{g/dl}$  appear to be a promising suggestion worth deepening. Given the paucity of data on this clinical relevant issue, further research is needed to devise more efficient scanning protocols for the prevention and detections of DVT.

### Contribution of individual authors:

All four authors participated to the literature search and medical writing. Dr Tecco came up with the idea of this manuscript. Dr Therasse wrote the first draft. The final draft was written by or under Dr Tecco's close supervision. Finally, the manuscript was approved by all co-authors

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