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Case report

Thrombosis associated with physical restraints

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Objective: Physical restraint is controversial, but still frequently used in psychiatric units. We describe two cases of thromboembolic phenomena, one with a fatal outcome, in association with physical restraint.
Method: The world literature on physical restraint and thrombosis was reviewed by undertaking a search of electronic databases.
Results: To our knowledge, we are the first to report thrombosis associated with physical restraint.
Conclusion: Immobilization and trauma to the legs while restraining a patient are adequate explanations for the occurrence of thrombosis. Special attention should be paid to thrombosis when employing restraints in psychiatric wards. Further systematic research into physical restraints in psychiatry is clearly needed.

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Key words: pulmonary embolism; thromboembolism; thrombophlebitis; venous thrombosis; physical restraint; sudden death

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Introduction

Physical restraint is controversial, but still used frequently in psychiatric wards in order to prevent injury and reduce agitation (1–3). Restraints may be defined as any device which restricts voluntary movement. In our ward restraints refer to the use of cloth bracelets to restrict the movements of a patient's limbs. The bracelets are attached by means of a belt to the bed frame so that the patient is maintained in a supine position under the constant monitoring of psychiatric personnel.

The controversy surrounding the use of physical restraint encompasses a continuum. On one hand some consider restraint to be an archaic, perhaps even a barbaric remnant of custodial psychiatry which has no place in modern psychiatry. Others suggest that restraints continue to serve as an important treatment function also in progressive, highly staffed units (3). Restraint and seclusion are claimed to be efficacious in preventing injury and reducing agitation, and that it is nearly impossible to operate a programme for severely symptomatic individuals without some form of seclusion or physical restraint (1).

In this paper two case reports of venous thromboembolism in excited states in an acute psychiatric ward are presented. Moreover, the worldwide literature on thrombosis associated with restraints is reviewed.

Case reports

Case 1

A 29-year-old man was admitted to our emergency psychiatric ward in June 1996 because of exacerbated chronic paranoid schizophrenia (DSM-IV). He had been discharged from the same ward 11 days earlier, and during that stay he had also been restrained for 11 days. He had elevated blood pressure (about 180/90 mm Hg in repeated measurements), and was overweight (120 kg/195 cm; body mass index (BMI) = 31.6 kg/m^2). Routine physical and laboratory examination proved satisfactory.

He was restrained after arrival due to physical agitation. He accepted peroral medication, and perphenazine 16 mg × 2 and levomepromazine up to 100 mg × 4 was administered. Three days later he complained of chest pain, had a body temperature of 38.0°C, and the general condition of his health had dropped. Clinical examination, chest X-ray and Doppler echocardiography of his heart were satis-

factory. A laboratory examination showed slightly elevated measures of infectious parameters (Table 1).

Two days later he again complained of chest pains. That night his pulse rate was measured at 120, infectious parameters were clearly elevated, a chest X-ray showed probable pneumonia, and treatment with phenoxymethylpenicillin was initiated.

The day after, 4 days after his first remarks about chest pains, a unilateral swelling of the right leg was observed. A deep venous thrombosis and a pulmonary embolism on the right side were diagnosed by contrast venography and perfusion ventilation scintigraphy, and standard treatment was initiated in the medical ward. No haematological predisposing factors were identified (4).

Case 2

A 59-year-old man was admitted to our emergency psychiatric ward in November 1998 because of severe physical agitation. He had a history of long and frequent psychiatric hospitalization, and his diagnosis was in accordance with a bipolar I disorder, most recent episode manic (DSM-IV). The patient was restrained after arrival. He was supposed to be suffering from an exacerbation of his affective disorder, and medicated with oral haloperidol 15 mg and clonazepam 2 mg.

The patient was restrained for 38 hours, during which time he was very sleepy. He himself wanted to remain restrained because he was afraid of hurting the staff. On day 2 laboratory tests showed elevated values of some parameters, temperature (37.9°C), and pulse rate (90 per minute regular), but low blood pressure (90/60 mm Hg). ECG was not available. Toxicological examination showed the presence of a subtherapeutic level of 0.1 mEq/L of lithium. No other drugs were monitored (Table 2).

He was released from his restraints on day 3. He was asleep 3.5 hours later, and after having been wakened he went to the toilet unassisted, presumably for the first time in 40 hours. Less than 10 minutes afterwards he suddenly collapsed. Resuscitation was attempted, but failed. Only 1.5 hours earlier a blood test showed approximately the same results as on the day before.

The subsequent autopsy showed a massive pulmonary embolism, small thromboses in the femoral veins, and a myocardial infarction of a few days' duration. He was not overweight (58 kg/173 cm; BMI = 19.4 kg/m^2). Pathology was not shown in the liver or brain.

Table 1. Laboratory tests of case 1. At day 6 some parameters were measured twice

	Day 3	Day 6	Day 7	Reference interval
Haemoglobin	12.6	—	12.0*	12.5–16.5 g/dL
Haematocrit	0.40	—	0.35*	0.38–0.48
C-Reactive protein	20*	104*–151*	136*	<10 mg/L
Leucocyte count	13.0*	13.9*–12.3*	12.0*	3.0–11.0 × 10^9/L
Sedimentation rate	20*	36*	83*	2–10 mm
Sodium	134*	—	136	136–146 mmol/L
ASAT	46	58*–48	49	<50 U/L
ALAT	50	108*	83*	<50 U/L
LD	497*	498*	539*	150–450 U/L
GGT	64	—	270*	<80 U/L
ALP	238	—	362*	80–275 U/L

Platelet count, potassium, creatinine, creatine kinase, FT4 and TSH were within reference intervals.
* = Pathological values; — = not measured at this time.

Literature search

We conducted searches in Medline (1966–99), Psyclit (1974–99), Embase (1980–99) and Social Sciences Citation Index (1987–99) by cross-referencing pulmonary embolism, thromboembolism, thrombophlebitis and venous thrombosis against physical restraint. No papers on thrombosis in physical restraints were identified.

Discussion

The two cases described were admitted during 1996–98 when there had been 2150 admissions to the ward. In total 200 patients were restrained 391 times during these 3 years. No physical harm other than that described was noted during these years.

It is surprising that we are the first to demonstrate an association between thrombosis and restraints. This may be due to a low incidence, that the association may have been considered obvious, that the diagnosis has not been recognized or underreported. Restraint may be a rather uneasy topic among psychiatrists (5).

The physiological mechanisms involved in restraints are complex. Hence, causality is hard to establish. Case 2 may have suffered from a silent myocardial infarction, which may have rendered

Table 2. Laboratory tests of case 2

	Day 2	Day 3 (1.5 h before death)	Reference interval
Haematocrit	0.49*	—	0.38–0.48
C-Reactive protein	97*	140*	<10 mg/L
Leucocyte count	21.3*	19.3*	3.0–11.0 × 10^9/L
Vitamin B_{12}	651*	—	140–600 pmol/L
ALAT	52*	38	<50 U/L
LD	—	694*	150–450 U/L
Carbohydrate deficient transferrin	—	32*	<21 IE/L

Haemoglobin, platelet count, sedimentation rate, sodium, potassium, chloride, creatinine, ASAT, CK, ALP, GGT, FT4 and TSH were within reference intervals.
* = Pathological values; — = not measured at this time.

him especially susceptible to thrombosis in restraints. Generally, resumption of activity after prolonged periods of immobility is a time of increased risk of a thrombosis (6). Immobilization and trauma to legs while restraining the patient are adequate explanations for the occurrence of thrombosis in restraints (7). Retrospectively considered, the two cases described had been restrained for too long a period, and case 2 was not optimally treated.

When psychosocial techniques and medication are insufficient to prevent injury to the patient or staff, the therapeutic options are restraint, seclusion and ECT. We consider restraints to be most appropriate in order to communicate with and care for the patient. Whether this assumption is correct remains uncertain. Some guidelines for the use of restraints have been proposed describing indications, contraindications, duration, evaluation and side-effects (1–3). However, the use of restraint is today still too often based on local traditions rather than on scientific knowledge (8). The literature on the subject comes mainly from the United States, and these publications tend not to draw clear distinctions between seclusion and physical restraints (8). In somatic wards and nursing homes the efficacy of restraints has, in recent years, been increasingly questioned and their use reduced (9–11). Special attention should be paid to thrombosis when employing restraints (12–13). Regarding the frequent use of physical restraint in psychiatric departments, further systematic research and debate are clearly needed.

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Invited comment

The paper by Hem et al. is interesting for more than one reason. It says clearly that physical restraints are still used in the daily psychiatric practice at the beginning of the 21st century in a highly developed country. There are not enough papers on similar topics in psychiatry. The fact is that emergency psychiatry often deals with violence and potential danger. Physical restraint might sometimes be necessary, but it does not improve the image of psychiatry in the community. In this respect, this paper is even more courageous, because it describes a side-effect of the use of physical restraints in psychiatric patients.

Here, I would like to share my experience in this field, being responsible for the only psychiatric emergency unit in a catchment area of about 5 million inhabitants for the past two decades in Morocco. The mean number of agitated patients received daily in the Casablanca University Psychiatric Center emergency unit is about 20, most of them young, threatening their family members or others in the community, and often the psychiatric team in the emergency unit as well. If we add to this the lack of human and financial resources (especially nurses and medications), which usually hamper the activity of psychiatrists in developing countries, this gives us a good experience on how to deal with agitated patients.

One of the main criticisms which could be directed to the paper is the length of physical restraint. When we are obliged to use it in Casablanca, it very seldom lasts for more than a few hours. By then, and if the pharmacological treatment does not help to settle down the agitation, we try to find an explanation: is it an akathisia? is it a confusional state due to an organic disease (which often happens in developing countries)? is it a delirium due to dehydration secondary to the agitation? There are of course severe relapses of schizophrenia or recurrences in manic patients which continue to be agitated for weeks, and sometimes for months. We prefer then to use seclusion rooms (we have five for 104 beds) for a certain period of time, and trial of reinserting the agitated patient among those in locked wards. In half of the patients this helps to reduce the agitation, and the other half are again sent to the seclusion room with very close monitoring for a few more

days. Seclusion rooms are far from being satisfactory from the humanitarian point of view, but at least the patients can move in a small space avoiding possible side effects such as thrombosis due to the prolonged physical restraint.

For patient no. 1, a man who was overweight, perhaps with hypertension, was physically restrained for days (11, than 4 days) and because of the prolonged supine position developed an infection, then a deep venous thrombosis and a pulmonary embolism. Was this patient dangerous enough to himself and to others to be restrained this way for such a long time? There is nothing in the paper which explains this clinical crucial point clearly. Would it not have been better to put him in a seclusion room under close monitoring of the treating staff?

For patient no. 2, it is even more questionable. A man who was almost 60, being restrained during 3 days (even though he asked for it) died because of a massive pulmonary embolism immediately after he walked out of the bed where he was restrained. This description is very similar to reports by surgeons in the 1950s about sudden deaths due to massive pulmonary embolism after surgery (especially on lower limbs or pelvis), and after a prolonged stay in bed. This is why surgeons have a basic principle: the operated patient or the woman who just delivered should be out of bed as soon as he/she can, preferably a few hours after the intervention or the delivery, in order to avoid such complication. Such a principle should be kept in mind by psychiatrists, especially if their patients are old or overweight.

There is no perfect solution in case of a dangerous agitated patient, and sometimes physical restraint during a few hours or seclusion during a few days could help stabilize the patient without exposing him or her to too many side-effects of psychotropic medications. However, association of two mood stabilizers in bipolar patients (and sometimes ECT) could represent a good alternative in very acute cases, or high doses of atypical neuroleptics with few cardiovascular side-effects for schizophrenic patients, such as clozapine (with haematological monitoring) could represent exceptional solutions for exceptional patients.

I have visited many European departments of psychiatry and have always asked about the management of agitated and violent patients. Seclusion rooms were very often presented as first alternative. In the United States, however, I have seen more devices for restraining this type of patient in the emergency units and the locked wards I have visited. In Casablanca, we prefer the first solution. A comparative study between these two techniques may be of interest, knowing all the methodological difficulties such a study would encounter.

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