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Pulmonary Thromboembolism Diagnosis via 6MWT in an Ambulatory TBI Patient

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Introduction

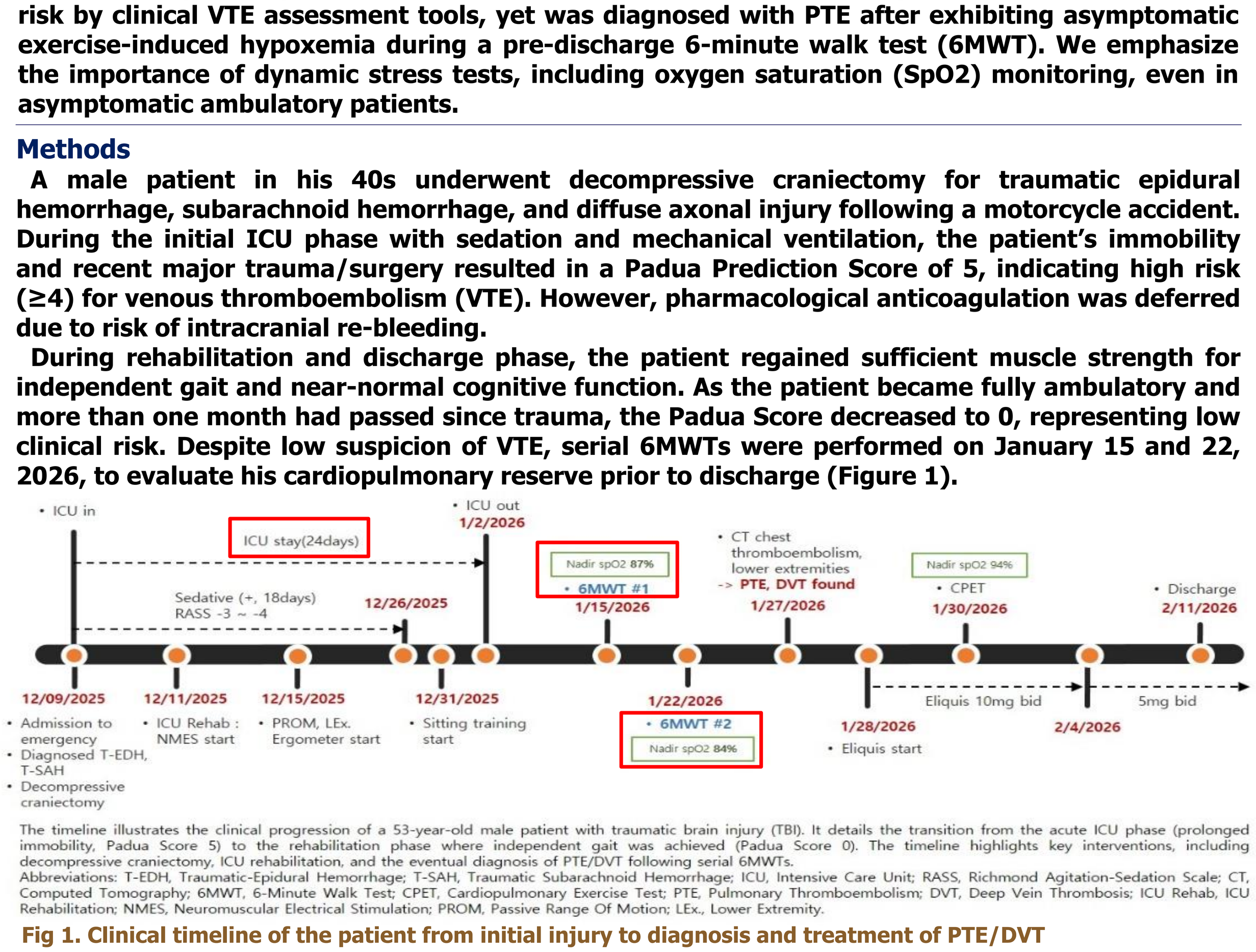
Early mobilization and gait training are essential for preventing complications in patients with traumatic brain injury (TBI). However, the risk of deep vein thrombosis (DVT) and pulmonary thromboembolism (PTE) persists depending on the severity of the acute phase and the duration of immobility.

This case reports a patient who showed excellent functional recovery and was classified as low risk by clinical VTE assessment tools, yet was diagnosed with PTE after exhibiting asymptomatic exercise-induced hypoxemia during a pre-discharge 6-minute walk test (6MWT). We emphasize the importance of dynamic stress tests, including oxygen saturation (SpO2) monitoring, even in asymptomatic ambulatory patients.

Methods

A male patient in his 40s underwent decompressive craniectomy for traumatic epidural hemorrhage, subarachnoid hemorrhage, and diffuse axonal injury following a motorcycle accident. During the initial ICU phase with sedation and mechanical ventilation, the patient's immobility and recent major trauma/surgery resulted in a Padua Prediction Score of 5, indicating high risk (≥4) for venous thromboembolism (VTE). However, pharmacological anticoagulation was deferred due to risk of intracranial re-bleeding.

During rehabilitation and discharge phase, the patient regained sufficient muscle strength for independent gait and near-normal cognitive function. As the patient became fully ambulatory and more than one month had passed since trauma, the Padua Score decreased to 0, representing low clinical risk. Despite low suspicion of VTE, serial 6MWTs were performed on January 15 and 22, 2026, to evaluate his cardiopulmonary reserve prior to discharge (Figure 1).



The timeline illustrates the clinical progression of a 53-year-old male patient with traumatic brain injury (TBI). It details the transition from the acute ICU phase (prolonged immobility, Padua Score 5) to the rehabilitation phase where independent gait was achieved (Padua Score 0). The timeline highlights key interventions, including decompressive craniectomy, ICU rehabilitation, and the eventual diagnosis of PTE/DVT following serial 6MWTs.
Abbreviations: T-EDH, Traumatic-Epidural Hemorrhage; T-SAH, Traumatic Subarachnoid Hemorrhage; ICU, Intensive Care Unit; RASS, Richmond Agitation-Sedation Scale; CT, Computed Tomography; 6MWT, 6-Minute Walk Test; CPET, Cardiopulmonary Exercise Test; PTE, Pulmonary Thromboembolism; DVT, Deep Vein Thrombosis; ICU Rehab, ICU Rehabilitation; NMES, Neuromuscular Electrical Stimulation; PROM, Passive Range Of Motion; LEx., Lower Extremity.

Fig 1. Clinical timeline of the patient from initial injury to diagnosis and treatment of PTE/DVT

Results

The patient remained entirely asymptomatic, denying dyspnea or chest discomfort during daily activities and ambulation. However, the first 6MWT showed a nadir SpO2 of 87% (459m, 61.8% of predicted). A follow-up test one week later reproduced exercise-induced hypoxemia, with SpO2 dropping to 84% during a 508 m walk. Notably, the patient reported no subjective symptoms even when SpO2 plummeted to 84%.

Chest CT angiography revealed acute PTE in the left lower lobe and lingular segment with multiple DVTs in the left popliteal vein (Figure 2). Anticoagulation with apixaban was immediately initiated, and the patient was safely discharged.

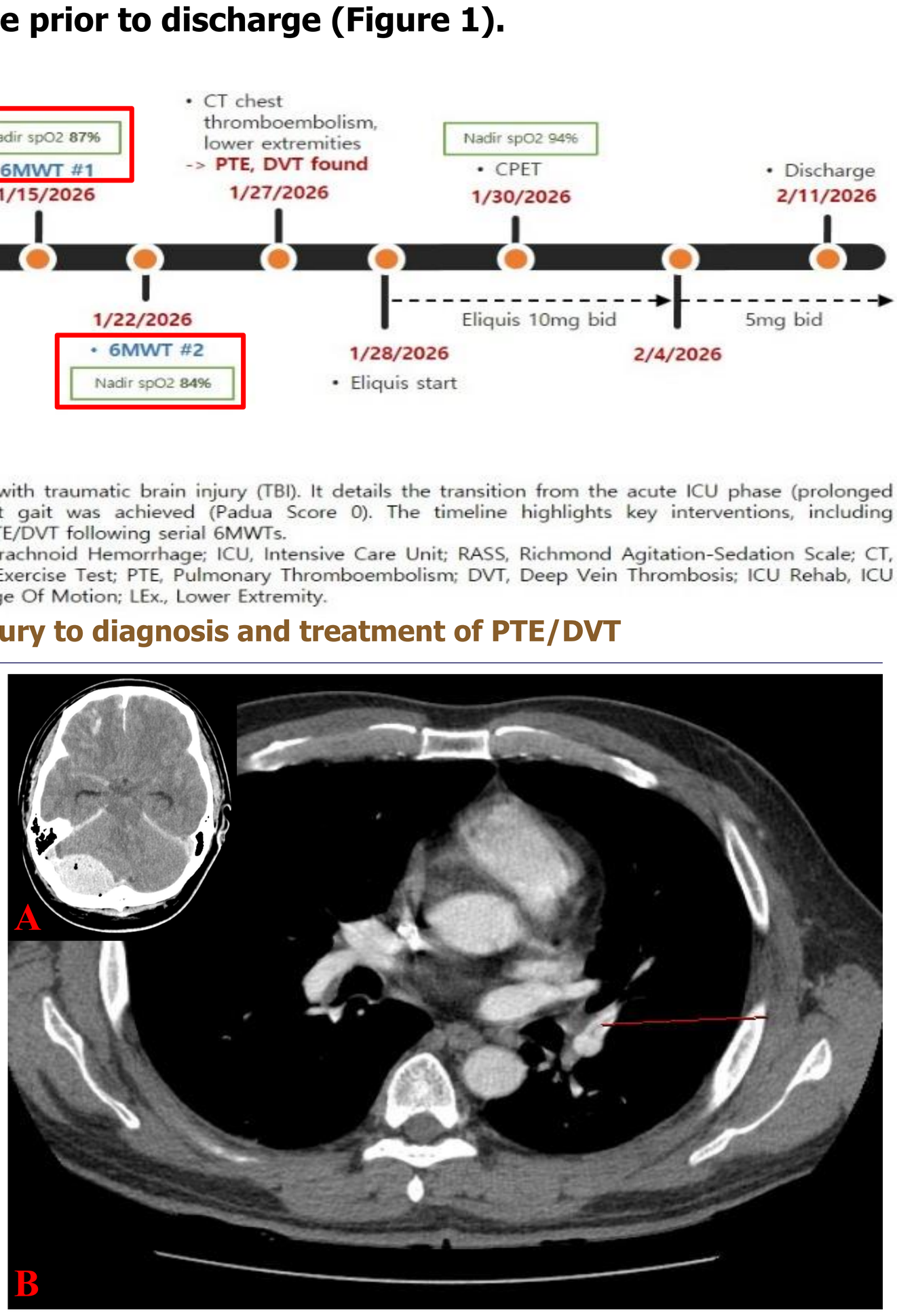


Fig 2. (A) Brain CT(NCE) at the time of injury showing TBI (B) Chest CT angiography revealing pulmonary thromboembolism (indicated by the red line)

Conclusion

This case demonstrates that patients with a history of prolonged immobility remain at risk for PTE, even if they achieve functional independence and are categorized as low risk by static screening tools like the Padua or Wells scores. Traditional scoring systems often lack diagnostic sensitivity in asymptomatic or recovering patients.

Therefore, implementing dynamic stress tests such as the 6MWT to objectively monitor cardiopulmonary function is critical for the early detection of life-threatening complications, regardless of the patient's apparent functional level.