When Can the Patient With Deep Venous Thrombosis Begin to Ambulate?

Deep venous thrombosis (DVT) is a common problem among hospitalized patients,[1] even those who receive prophylaxis.[2] Patients undergoing total hip replacement have a 54% risk of developing DVT following the procedure if no methods of prophylaxis are used.[2] Use of low-molecular-weight heparin prophylaxis reduces this incidence to 16%. Despite prophylaxis, 31% of patients undergoing total knee replacement develop DVT, and 27% of patients operated on for hip fracture develop DVT.[2] Thromboembolic complications have been reported in 30% to 60% of patients following stroke.[3] Deep venous thrombosis places the patient at risk for pulmonary embolism (PE), recurrent thrombosis, and postphlebitic syndrome.[1,4] Up to 50% of patients with DVT involving the proximal deep veins of the lower extremity develop PE. Because the mortality rate for this condition is as high as 8% even with intervention, PE poses the greatest concern to the physical therapist and physician caring for the patient during initial management of the DVT, particularly in the hospital setting.[3]

Current medical management of patients with DVT includes the use of acute anticoagulation with heparin or low-molecular-weight heparin (LMWH) followed by long-term intervention with warfarin.[5] The use of full-dose heparin has been shown to reduce the incidence of PE among patients with proximal DVT.[4] Low-molecular-weight heparin demonstrated at least equal efficacy to heparin in multiple trials.[6]

In the past, patients with active DVT were placed on bed rest for periods up to 7 to 10 days due to the fear of PE among patients who remain active.[7] The logical, if simplistic, argument was that vigorous movement of the involved limb would cause the proximal clot to "break off and travel to the lungs." More recent practice has included earlier ambulation, but there has been reluctance to begin ambulation immediately after diagnosis and initial management of DVT. In practice, there appears to be no standard protocol for activity progression.

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Evidence from the medical literature is reviewed to inform the decision about the timing of ambulation for patients with deep venous thrombosis.

We sought evidence from the medical literature to inform the decision about the timing of ambulation for patients with DVT. We used PubMed to search for relevant primary studies on the issue of ambulation and DVT. Our search strategy consisted of using the National Library of Medicine's Medical Subject Headings (MeSH) terms "venous thrombosis" or "thrombophlebitis" combined with the MeSH terms "early ambulation," "walking," or "exercise." We limited the results of this search to clinical trials reported in English. This search yielded 17 references, of which 2 references were judged to be primary clinical trials after a review of the abstracts. We also searched using the MeSH term "bed rest" combined with the MeSH terms "venous thrombosis" or "thrombophlebitis." We also limited this search to clinical trials reported in English. This strategy yielded 3 additional primary clinical trials that we believed would be relevant to the question of ambulation in the setting of DVT. We also searched the bibliographies of previous articles on the topic of ambulation and DVT for other potentially useful studies. Reference to an article by Partsch et al from 1997 seemed pertinent, but on closer inspection, this cohort of patients appeared to be included in a larger cohort published later by the same investigators.[8] We noted the recent "Evidence in Practice" article by Charles Ciccone that reviewed a number of abstracts pertaining to our question as part of a demonstration of search strategies.[9] Each of these references was identified by our original search strategy.

Literature regarding the timing of ambulation for patients with DVT is limited. We identified only 5 clinical trials that focused on ambulation and DVT. Three of the trials were randomized controlled studies, one was a prospective cohort study, and one was a retrospective case control study. Each of these trials will be considered critically in this update.

The largest randomized controlled trial on the issue was reported by Aschwanden et al in 2001.[10] In this trial, DVT was diagnosed in 316 patients. One hundred eighty-seven patients were excluded from the study for various reasons (16 declined participation in a clinical trial, mobilization was not possible for 69 patients, 24 had symptomatic PE, 15 were unable to give informed consent, 13 were using oral anticoagulation medications, 11 were receiving heparin therapy for more than 24 hours, 16 had contraindications for the use of LMWH or oral anticoagulation medications, 11 had a history of DVT of greater than 3 weeks' duration, leg compression therapy not possible for 4 patients, 2 were pregnant, 1 had thrombosis vena cava, and 5 were unable to participate for other reasons). Dalteparin, a LMWH, was administered to the remaining 129 patients with DVT. Patients were randomly assigned to either a group that received strict immobilization for 4 days or to a group that ambulated for more than 4 hours a day. A study nurse supervised and encouraged ambulation around the ward. The patients were screened for PE using

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ventilation-perfusion scanning at entry into the study and again at 4 days after the beginning of the study. They were also interviewed at 3 months regarding the recurrence of DVT, clinical signs of PE, new concomitant diseases, and the occurrence of major complications.

Risk factors for recurrent DVT in the study by Aschwanden et al[10] were more prominent among the group that performed early ambulation and included greater numbers of patients with malignancy, prolonged immobilization prior to the study, estrogen use, and recent surgery. Patients assigned to the group that performed early ambulation also received compression dressings applied up to the proximal thigh, while their immobilized counterparts received no compression dressings.

Six (10%) of the 60 immobilized patients in the study by Aschwanden et al[10] developed new PEs, as detected by ventilation-perfusion scanning at 4 days, and 10 (14.4%) of the 69 ambulating patients were found to have new PEs. This difference was not statistically significant, as the 95% confidence interval (CI) for the absolute risk increase with early ambulation included zero (95% CI=−0.5%–13.8%). Twelve of the 16 new PEs occurred among patients who had been found to have evidence of PE on their baseline ventilation-perfusion scans. This finding would suggest caution for patients known to have already had a PE. However, the authors followed patients clinically for 3 months after their initial diagnosis and found no statistically significant difference in mortality, recurrent PE, or recurrent DVT. The authors suggested that early ambulation is safe for the majority of patients with DVT.

The strengths of the study by Aschwanden et al[10] included prospective planning, random assignment to groups that ambulated or received bed rest, and a controlled environment to ensure strict bed rest or supervised ambulation. However, this trial also had limitations. The use of compression stockings in the ambulation group presented a confounding variable for answering the question of whether early ambulation is safe. It is impossible to draw a definitive conclusion regarding bed rest versus early ambulation due to this difference in intervention. Lastly, the authors chose a short observation period (4 days) between the ventilation-perfusion scans. This may be an inadequate amount of time for a difference to emerge between groups.

Schellong et al[11] reported similar findings in a study published in 1999. In this trial, 309 patients with symptomatic proximal DVT, confirmed by ultrasound, were considered for inclusion. One hundred eighty-three patients were excluded from randomization for a variety of reasons (38 had overt PE, 7 had free-floating thrombus, 24 had symptoms of greater than 3 weeks' duration, 14 had contraindications to the use of anticoagulation medications, 11 had renal insufficiency, 26 were pregnant or lactating, 5 were younger than 18 years of age, 3 declined to give consent, and 55 were unable to ambulate because of other underlying conditions). The remaining 126 patients were randomly assigned to either a group that received 8 days of enforced bed rest and anticoagulation medications or to a group that performed ambulation beginning on the second day after the initiation of the use of anticoagulation medications. Patients were treated with enoxaparin followed by oral anticoagulation medications. Schellong et al did not report details regarding distance, frequency, and supervision of ambulation. The group of patients who began early ambulation were "allowed and encouraged to walk around."[11(p127)] All patients also received compression bandages or stockings. Patients underwent baseline lung scans and then repeated lung scans 8 to 10 days after being assigned to groups.

The 2 groups in the study by Schellong et al[11] appeared to be comparable, although there were a greater number of patients who had recently had surgery in the early ambulation group. New PEs were detected in 17% of the patients assigned to the group that received bed rest and in 22% of the patients assigned to the early ambulation group. The absolute risk increase calculated from the data is 5% with early ambulation, but the 95% CIs range from an absolute risk reduction of 9% to an absolute risk increase of 14%. Therefore, the difference in new PEs between the 2 groups was not statistically significant because the CI includes zero. The authors concluded that prescription of bed rest to patients with DVT did not reduce the incidence of PE enough to have a major impact on clinical outcome.

Partsch and Blattler[12] also published results of a randomized controlled trial of 45 patients with proximal DVT. Initially, 148 patients with documented proximal DVT were identified for enrollment in this study. However, approximately two thirds of these patients were excluded for the following reasons: compression or heparin therapy had already started; there was an indication for thrombolysis or thrombectomy; they had massive symptomatic PE or severe concomitant diseases; ankle-brachial Doppler scan index was <0.8; they were pregnant or breast-feeding; or there were contraindications for compression or use of anticoagulation medications, or both. The remaining 45 patients were randomly assigned to 1 of 3 study groups of 15 patients each: group A received inelastic compression bandages and walking exercise, group B received elastic compression stockings and walking exercises, and group C was put on bed rest with no form of compression. The main objective of this

study was to evaluate the benefits of compression therapy and ambulation in comparison with bed rest in the acute stage of proximal DVT. Patients assigned to the walking exercise groups (group A and B) walked an average of 1,793 m and 2,058 m, respectively, on the first day of the study, as measured by a pedometer. Patients assigned to group C walked only 66 m. The primary endpoints were the reduction of pain, reduction of leg circumference, and improvement in clinical scores related to symptoms of pain and edema. Ventilation-perfusion scans and duplex ultrasound scans were performed on days 0 and 9 to identify new PEs and changes in thrombus extension.

No differences were found in relation to the frequency of new PEs in the study by Partsch and Blattler.[12] Thrombus progression was observed in 31% of the patients in group A, 11% of the patients in group B, and 40% of the patients in group C. Leg circumference and pain were both improved in the walking exercise groups compared with the group that received bed rest. Overall, this study supports the authors' hypothesis that it is safe to mobilize patients with DVT when managed with LMWH and lower-extremity compression dressings. Like the study by Aschwanden et al,[10] this randomized controlled study provides evidence to support the early use of ambulation.

A large prospective cohort study reported by Partsch[13] in 2001 included 1,289 consecutive patients admitted with symptomatic DVT. The majority of the patients included in the study were referred to the author's outpatient department because of self-reported leg symptoms. Patients with pulmonary symptoms, symptoms that indicated vascular danger to their limbs, and patients who had been immobile for the previous 2 days were excluded. The remaining patients were treated with anticoagulation medications (primarily with LMWH initially and with oral anticoagulation medications after approximately 10 days of LMWH), compression bandages, and immediate ambulation. Patients underwent baseline ventilation-perfusion scans that were repeated at 10 days. Patients were instructed to ambulate as much as possible. Ambulation distance was measured with a pedometer and ranged from 2,000 to 12,000 m per day. Patients who were elderly or disabled began ambulation with the assistance of physical therapists.

Evidence of new PEs in the study by Partsch[13] appeared in 7.4% of patients with iliofemoral (proximal) DVT and 3.4% of patients with calf vein (distal) DVT. The incidence of fatal PE during intervention in this study was very low (0.2%).

Partsch[13] argued that walking exercise and compression bandages are safe for patients with DVT. Although this study had a large sample size, it was a prospective cohort study, not a controlled trial, and therefore should be considered as providing a lower level of evidence for early ambulation than might be found in a comparably sized randomized controlled trial. The relatively low number of new PEs (lower than the incidence in the study by Aschwanden et al[10]) is reassuring to begin walking exercise. Partsch also argued that early ambulation may be protective by reducing venous stasis, which is one of the well-known risks for recurrent or progressive DVT.

Kiser and Stefans, in 1997, conducted a retrospective case-control study and concluded that "at least 48 to 72 hours of bed rest would be prudent before return to mobilization."[14(p944)] They identified 190 patients discharged from a rehabilitation facility with a diagnosis of DVT or PE. Sixty-three patients were excluded from the study because they were transferred to another facility upon discovery of venous thromboembolism, PE was diagnosed at the time of the DVT, or DVT had been diagnosed and intervention initiated prior to admission of the patient to the rehabilitation facility. The charts of the remaining 127 patients were included in the study. Of these patients, 121 had a diagnosis of DVT and did not develop clinically apparent PE during the remainder of their hospital stay. Only 6 patients developed evidence of PE during follow-up after detection of DVT. The authors compared this group of 6 patients with the 121 patients without PE (controls). The control group included a greater diversity of underlying illnesses than the patients with PE and included a much higher proportion of patients with stroke. Management of patients differed between the 2 groups independent of initiation of ambulation. Seventy-seven control patients (63.6%) received anticoagulation therapy, whereas only 2 (33.3%) of the patients with PE received anticoagulation therapy. One half of the patients with PE had inferior vena cava (IVC) filters placed, whereas 33 controls (27.2%) received IVC filters. IVC filters are devices inserted into the inferior vena cava percutaneously by an invasive radiologist or surgically during an operation. The device is designed to prevent pulmonary embolism by trapping emboli from the lower extremities before they reach the lungs.

The investigators[14] then calculated the time from diagnosis of DVT to the initiation of exercise or ambulation, based on the time of diagnosis and the time of an order to begin exercise. Patients diagnosed with PE began ambulation a mean of 48 hours after a diagnosis of DVT, whereas those who had apparently not sustained a PE began ambulation a mean of 123 hours after diagnosis of DVT. From the data, the authors concluded that "there is an increased risk of pulmonary embolism in patients who are aggressively mobilized less than 48 to 72 hours after diagnosis of a DVT."[14(p944)]

We do not believe, for a number of reasons, that the study by Kiser and Stefans[14] adds to the understanding of safety of ambulation or aggressive exercise after the diagnosis of DVT. It was a case-control study in which the comparison groups were not well-matched and received different therapy independent of the intervention of interest. The number of cases (n=6) was too small to support conclusions. There was not sufficient evidence to exclude PE in the control group because patients underwent testing for PE only if the diagnosis was clinically suspected. The authors also commented that they were unable to determine the degree of mobility of the patients prior to the order for aggressive ambulation; therefore, they cannot really comment on the appropriate time to begin ambulation. This study raises the challenging question of when to begin aggressive ambulation or exercise, not simply routine ambulation, in patients diagnosed with DVT. However, we do not believe the study provided valid data to answer the question.

Discussion

This review focuses on the issue of ambulation among patients with DVT. Initial management of patients should include the use of anticoagulation with either LMWH or unfractionated heparin. The major trials reviewed for this article included the use of compression dressings or graduated compression stockings among patients with DVT, but the role of this modality in the management of acute DVT is beyond the scope of this brief review. Clinicians should realize, however, that authors of the studies reviewed who advocated early ambulation also used compression stockings.

The physical therapist and physician caring for a patient with DVT must consider the following issues before deciding when a patient can safely begin ambulation:

1. Is the patient receiving adequate medical treatment for DVT (ie, LMWH or unfractionated heparin)?

2. Will ambulation place the patient at increased risk of acute PE?

3. Should a PE occur during the course of intervention, will the patient be able to tolerate this insult?

4. Will continued bed rest place the patient at increased risk of progressive DVT and at increased risk for the other complications of bed rest?

5. Does the patient have evidence of PE before beginning ambulation?

The data on early ambulation of patients with DVT is limited, but the best evidence suggests that the incidence of new PE is not increased in patients with uncomplicated DVT who are mobilized early. The study reported by Aschwanden et al,[10] however, suggests that there may be an increased risk of acute PE among patients with DVT and known PE when ambulation begins early. These patients require careful consideration before beginning ambulation.

The data reported by Partsch and Blattler[12] suggest that early ambulation leads to more rapid resolution of pain and swelling associated with DVT. Therefore, among patients who have not been diagnosed with PE in the setting of DVT and who do not have cardiopulmonary impairment, early ambulation is preferred. Early ambulation would be particularly important for the patient with ongoing risk factors for DVT, especially patients with hypercoagulable states. The majority of the evidence reviewed in this article suggests that these patients may safely begin ambulation once appropriate anticoagulation medication has been instituted. Practically speaking, this would mean that the patient may begin walking within the first 24 hours after he or she has begun medical treatment for DVT.

There have been a number of published studies utilizing LMWH in management of DVT.[15,16] These trials demonstrated safety of home management of DVT and probably argue for the safety of early ambulation, although this aspect of intervention was not specified in the studies. Therefore, this evidence is indirect at best in answering the question of time to begin ambulation.

We were also interested in clinical data to guide the timing of more vigorous exercise for patients with DVT and in clinical data regarding other procedures a physical therapist might offer to patients with DVT. Unfortunately, we were unable to identify studies to address these questions. This important question for management of patients with DVT warrants further study in randomized trials or in large cohort studies.

Until more definitive evidence becomes available, the appropriate time to begin ambulation for the individual patient should be determined through the clinical judgment of the treating physician and physical therapist. Current evidence suggests that patients with DVT who are receiving appropriate anticoagulant therapy could be considered for early ambulation provided they have adequate cardiopulmonary reserve and no evidence of PE. The use of compression garments is reasonable given that they were used in the successful trials. There is inadequate evidence to advise patients regarding the initiation of vigorous or aggressive exercise or rehabilitation in the setting of recently diagnosed DVT. In this situation, the clinical judgment of the treating physician and physical therapist is even more critical.

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