Intermittent pneumatic compression in patients with stroke

A patient with acute stroke has just been admitted who is immobile, and cannot walk to the bathroom without help. Looking at the patient’s unmoving legs the risk of thrombosis is clear, but a low molecular weight heparin (LMWH) might lead to bleeding, and elastic compression stockings cause skin problems. So you settle on intermittent pneumatic compression devices (IPCs)—but do they actually prevent blood clots?

Decades after IPCs were first reported to prevent venous thromboembolism (VTE) in surgical patients, Martin Dennis and colleagues present the results of the randomised CLOTS 3 trial in The Lancet, showing that IPCs reduce the risk of VTE in immobilised medical inpatients who have had a stroke.

VTE is among the most significant complications associated with hospital stay. Several entities recommend strategies to prevent hospital-acquired VTE, indeed, the US Center for Medicare Services does not compensate hospitals for treating VTEs acquired in hospital or diagnosed in the month after discharge. Yet VTE prevention measures are persistently underused, and their use is substantially lower in medical inpatients than in surgical inpatients. Is it surprising that three-quarters of hospital-acquired VTEs occur in medical patients?

There are several reasons doctors fail to provide prophylaxis. One could simply forget; or hesitate to use an anticoagulant because of a fear of excessive bleeding. Medical patients often have disorders that place them at high risk of bleeding and can require invasive procedures, sometimes at short notice. Although regulatory bodies dictate use of pharmacological prophylaxis in ever-larger populations of medical inpatients, recent trials have shown a very tight balance between preventing VTE and causing bleeding. In patients who have had a stroke, anticoagulant prophylaxis causes a 0.6% absolute increase in major bleeding, whereas the degree of protection against VTE is debated. IPCs, which do not increase bleeding risk, are therefore attractive.

IPCs are often used in non-surgical patients, on the basis of indirect evidence from surgical populations. However, the benefits seen in surgical patients cannot be assumed to translate to medical patients. Elastic compression stockings were reported to cause net harm in patients who have had a stroke, despite studies showing net benefit in surgical patients. Direct evidence has been needed. To our knowledge, CLOTS 3 is the highest quality, and by far the largest, study to date of IPC use for VTE prophylaxis in non-surgical patients. It enrolled immobile (ie, unable to walk to the toilet without assistance) patients admitted with stroke. Patients were randomly assigned to either not receive IPC or to receive open-label IPCs (given the impracticality of masking this intervention), which were continued for a minimum of 30 days, until the patient regained mobility or was discharged. Background prophylaxis with additional methods was allowed, and anticoagulant prophylaxis or therapeutic anticoagulation was given to about a third of patients allocated IPCs and 3% of control patients also used elastic stockings. Thrombotic outcomes were assessed by mandatory screening ultrasound on days 7–10 and 25–30 and by objective assessment if VTE symptoms arose. Masked assessors did the ultrasounds. The investigators paid careful attention to the randomisation scheme, and patients’ characteristics were well balanced between study groups.

IPC use resulted in an absolute risk reduction of 3.6% (95% CI 1.4–5.8) of the primary outcome of all proximal deep vein thrombosis (DVT) by day 30 compared with no IPC use. Most other thrombotic outcomes were also significantly reduced with IPC use. Although the trial was not powered to show a significant reduction in either pulmonary embolism or death, the IPC group appeared to be favoured compared with the no IPC group. Skin breaks occurred more frequently in the IPC group than in the no IPC group, and a non-significant increase in falls with injury was noted in the IPC group.

The trial has several limitations. The prospective, randomised, open, blinded endpoint (PROBE) design is subject to bias, but a double-blind design for an IPC study would be impractical. Both the size of the study and the design of the IPC device were changed during trial execution; but neither change is likely to have materially affected the results. The rate of symptomatic (vs asymptomatic) DVT was unexpectedly high, which could be attributed to the method of ascertainment (clinicians were asked to indicate if DVT symptoms were present...
after completion of the scheduled screening ultrasound tests). Had more traditional methodology been used, more DVTs would have been classified as asymptomatic, and a smaller reduction in symptomatic DVT would probably have been reported. How well asymptomatic DVT predicts the risk of symptomatic VTE is debated, but asymptomatic DVT is a common trial endpoint.\(^1\)

IPCs are hard to keep on patients;\(^1\) and adherence issues were noted in the trial. Perfect adherence (IPC use for the entire intended duration) occurred in less than a third of patients. Moreover, adherence was monitored by nurses who were asked to assess IPC use three times a day; yet adherence was counted in whole days. This method probably yielded an incomplete picture of actual device use. Outside a trial, IPC adherence might be even worse, leading to less benefit. Future studies should explore methods to improve device compliance, and could use technology that continually monitors IPC use.\(^1\)

Nonetheless, CLOTS 3 has convinced us, and we will prescribe IPCs to patients who have had a stroke and are immobile in hospital. The benefit of IPCs in reducing VTE outweighs the risk of skin complications. More studies of IPCs in other medical inpatients are needed, but it could be years until similar high-quality evidence is available. Until then, CLOTS 3 provides reassurance to clinicians who choose to prescribe IPCs to immobilised medical inpatients without stroke.

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We declare that we have no conflicts of interest.

1. CLOTS (Clots in Legs Or sTockings after Stroke) trials collaboration. Effectiveness of intermittent pneumatic compression in reduction of risk of deep vein thrombosis in patients who have had a stroke (CLOTS 3): a multicentre randomised controlled trial. Lancet 2013; published online May 31. http://dx.doi.org/10.1016/S0140-6736(13)60950-8.


