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DVT in acute stroke

The use of graduated compression stockings

Background

Graduated compression stockings (GCS) are routinely prescribed for deep vein thrombosis (DVT) prophylaxis in acute stroke patients. In the light of recent data from the CLOTS trial 1, this practice needs to be reviewed.

Objective

This article presents an evidence based review of the literature regarding the use of GCS for DVT prevention in acute stroke patients.

Discussion

Data on the use of GCS for DVT prevention in acute stroke is limited. The CLOTS trial 1 provides strong evidence that the routine use of GCS in acute stroke patients does not significantly reduce the risk of DVT and that GCS increase the risk of skin problems in this population. Graduated compression stockings may also increase the risk of critical limb ischaemia and are contraindicated in patients with known peripheral vascular disease, or an ankle brachial pressure index <0.8. Graduated compression stockings may help reduce dependant oedema in stroke patients with reduced mobility, although there have been no studies looking at this question in stroke patients. Graduated compression stockings should not be routinely prescribed for acute stroke patients. The decision to use GCS in acute stroke patients should be individualised.

Keywords: venous thrombosis; stockings, compression; stroke



routinely prescribed for acute stroke patients as it is believed that they help prevent deep vein thrombosis (DVT). This is recommended by stroke management guidelines, including the Australian National Stroke Foundation guidelines.² However, in the light of recent data, these recommendations need to be reviewed.

Search strategy

A literature search was performed using MEDLINE (via an EBSCOhost® search platform). The topics searched were 'deep vein thrombosis', 'graduated compression stockings' and 'stroke'. These topics were matched by MEDLINE to the medical subject headings (MeSH) terms 'venous thrombosis'; 'stockings, compression' and 'stroke' and exploded to include related terms. Non-English articles were excluded; randomised controlled trials, systematic reviews and consensus clinical guidelines were included. While a large number of papers (138) resulted from a combined search of 'graduated compression stockings' and 'deep vein thrombosis', only five papers were found that matched all three search terms and met the above criteria. These five papers were obtained and reviewed by the author. They included two randomised controlled trials,^{3,4} one Cochrane systematic review and two consensus guidelines.

Results

The results of the above literature search are presented in *Table 1*.

Randomised controlled trials

Two randomised controlled trials were identified. The first, Muir et al,³ was published in 2003. This trial included patients who were not independently ambulant within 24 hours of acute stroke and unable to maintain straight leg raise against gravity for 5 seconds. Comatose patients, those with life threatening intercurrent illness, critical limb ischaemia and severe dermatological

Case study

Mr JW, 74 years of age and with a past history of hypertension, presented with right arm weakness and slurred speech as a result of left middle cerebral artery ischaemic stroke. He was referred to a hospital emergency department and admitted to the stroke unit. While he was in hospital, he was fitted with graduated compression stockings (also called thromboembolic deterrent stockings or 'TED' stockings) for deep vein thrombosis prophylaxis.

Venous thromboembolism frequently complicates acute stroke. A prospective study using magnetic resonance direct thrombus imaging in 102 acute ischaemic stroke patients reported a 40% incidence of venous thromboembolism at 21 days.¹ Graduated compression stockings are

Table 1. Results of a literature search on the use of graduated compression stockings for DVT prevention in acute stroke

| Article | Type of evidence or recommendation | Patient numbers | Outcome measures | Intervention | Results/comments |
|---|--|---|---|--|---|
| Muir et al, 2003 ³ | Randomised controlled trial | 97: 65 in GCS group; 32 in non-GCS group | DVT detected by ultrasound | Application of two brands of full length stockings (28 with one brand; 37 with another brand) | Nonsignificant reduction in DVT in GCS group with an odds ratio of 0.43 (95% CI: 0.14–1.36) |
| CLOTS trial 1, 2009 ⁴ | Randomised controlled trial | 2518: 1256 in GCS group; 1262 in non-GCS group | Symptomatic or asymptomatic DVT in popliteal or femoral veins within 30 days detected by ultrasound | Application of thigh length GCS after randomisation until mobile/discharge/patient refusal/skin problems | Nonsignificant 0.5% reduction in DVT in GCS group Significant increase (5% vs. 1%) in skin complications in GCS group |
| Cochrane Database of Systematic Reviews, 2004 ⁵ | Systematic review | Two small studies were included (a total of 123 patients) | Not applicable | Not applicable | Given the paucity of data, authors recommend against routine GCS in acute stroke |
| <i>Prevention of venous thromboembolism: best practice guidelines for Australia and New Zealand, 2007⁶</i> | Consensus guideline (Australia & New Zealand Working Party on the Management and Prevention of Venous thromboembolism) | Not applicable | Not applicable | Not applicable | Low dose subcutaneous heparin or low molecular weight heparins recommended for DVT prevention in acute stroke patients but not GCS |
| Albers, et al, 2008 ⁷ | Consensus guideline (American College of Chest Physicians) | Not applicable | Not applicable | Not applicable | GCS or intermittent pneumatic compression devices recommended for DVT prevention in acute stroke patients with contraindications to anticoagulation |

conditions were excluded. Sixty-five patients were randomised to stockings (28 with one brand of stockings; 37 with another brand of stockings). Thirty-two patients were randomised to standard care. An initial ultrasound, looking for evidence of DVT, was performed before the application of stockings, and a second ultrasound was performed at 7 +/- 2 days. The author found a nonsignificant reduction in DVT with GCS with an odds ratio of 0.43 (95% confidence intervals: 0.14–1.36). This study suffered from important limitations including a small sample size, the fact that two different types of GCS were used, and the high dropout rate (at the second ultrasound

examination, 20 patients dropped out in the GCS group, and six dropped out in the control group).³

The largest collection of data came from the CLOTS trial 1, published in 2009.⁴ This multicentre RCT examined the use of thigh length GCS to prevent DVT in acute stroke. There were 2518 patients within 1 week of an acute stroke randomised to routine stroke unit care with thigh length GCS (n=1256) or routine care stroke unit without thigh length GCS (n=1262). The primary outcome was symptomatic or asymptomatic DVT in popliteal or femoral veins within 30 days of randomisation. This occurred in 126 (10%) patients in the GCS group, and 133 (10.5%)

patients in the control group. This represented a nonsignificant risk reduction of 0.5% in the primary outcome. However, there was a significant increase in skin ulcers, breaks, blisters and necrosis in the GCS group (5% vs. 1%). The CLOTS trial 1 group concluded that GCS should not be routinely used in acute stroke patients.⁴

CLOTS trial 1 used thigh length GCS. CLOTS trial 2 was designed to examine whether thigh length GCS provided greater benefits in DVT prevention compared to knee length GCS. However, recruitment in CLOTS trial 2 has now been terminated due to results of CLOTS trial 1.⁴ While it could be argued that knee length GCS

are easier to apply and more cost effective, knee length GCS would expose acute stroke patients to the same skin complications as thigh length GCS.

Cochrane review

The Cochrane review on this topic was conducted in 2004⁵ after the Muir et al³ RCT was published. This review looked at physical methods for preventing DVT in stroke and included two studies: the Muir et al³ study of 97 patients and another study of 26 patients looking at the use of an intermittent pneumatic compression device instead of GCS. The compression device was found not to be associated with a significant reduction in DVT. Overall, given insufficient evidence, the authors concluded that GCS should not be routinely used in acute stroke patients.⁵

Consensus guidelines

The *Prevention of venous thromboembolism: best practice guidelines for Australia and New Zealand*⁶ was published in 2007. These guidelines classify acute stroke patients as high risk medical patients and recommended chemical prophylaxis with low dose subcutaneous heparin or low molecular weight heparins but not GCS.⁶

The *American College of Chest Physicians Antithrombotic and thrombolytic therapy for ischemic stroke: evidence-based clinical practice guidelines*⁷ was published in 2008. These guidelines also recommend prophylactic low dose subcutaneous heparin or low molecular weight heparins for acute stroke patients with reduced mobility. The use of intermittent pneumatic compression devices or elastic compression stockings for DVT prevention was recommended only for those patients with contraindications to anticoagulation.⁷

Discussion

Before the publication of CLOTS trial 1,⁴ data specifically addressing the use of GCS in DVT prevention in acute stroke was limited. CLOTS trial 1 provides strong evidence that the routine use of GCS in acute stroke patients does not significantly reduce the risk of DVT. On the contrary, it does significantly increase the risk of adverse outcomes, mainly skin problems and potentially critical limb ischaemia. Stroke patients are more at risk of skin complications of GCS due to their immobility and sensory changes.

The risk of critical limb ischaemia may be minimised by using a Doppler probe to calculate the ankle brachial pressure index (ABI);⁸ for patients with known peripheral vascular disease, or an ankle brachial pressure index <0.8, GCS are contraindicated.⁸ Graduated compression stockings also have the potential disadvantages of cost, and the time and training required for nursing staff to size, and apply them correctly. It might be argued that in those who have problems with dependent oedema due to immobility, and no contraindications to GCS, GCS could be used to assist with resorption of dependent oedema. However, there have been no studies looking at this question in stroke patients.

Graduated compression stockings should be prescribed in a responsible, evidence based fashion. For DVT prevention, GCS are not routinely recommended for acute stroke patients. Data from the CLOTS trial 1 provide an opportunity to review the guidelines on DVT prevention in acute stroke.

Case study continued

Mr JW reported skin tightness while the stockings were worn. He did not develop any acute skin problems from the GCS. He was transferred to the rehabilitation unit after acute stroke, where GCS were used to manage peripheral oedema in his legs.

Summary of important points

- GCS are not routinely recommended for DVT prevention in the setting of acute stroke.
- GCS increase the risk of skin problems in acute stroke patients.
- GCS may increase the risk of critical limb ischaemia and are contraindicated in patients with known peripheral vascular disease, or an ankle brachial pressure index <0.8.
- GCS may help reduce dependant oedema in stroke patients with reduced mobility, although there have been no studies looking at this question in stroke patients.
- CLOTS trial 1 data provide an opportunity to review current guidelines on the use of GCS for DVT prevention in the setting of acute stroke.

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Conflict of interest: none declared.

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