Graduated elastic compression stockings on a stroke unit: a feasibility study

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Abstract

Background: thrombo-embolic complications are important causes of morbidity and mortality after acute stroke. Anticoagulant prophylaxis is contraindicated in intracerebral haemorrhage and not recommended in acute ischaemic stroke because of increased risk of cerebral haemorrhage. Graduated elastic compression stockings are a simple alternative but are not widely used in stroke patients, perhaps because of perceived contraindications and problems with tolerability.

Objectives: to establish the feasibility and tolerability of graduated compression stockings on a stroke unit.

Design: we assessed 112 consecutive stroke patients for contraindications to and tolerability of graduated compression stockings.

Measurements: we used clinical indices and ankle–brachial Doppler pressure measures to assess suitability. We prospectively assessed tolerability of the stockings.

Results: Ninety-four (84%) of the 112 patients had no contraindications to the use of the stockings. The most common contraindication was an ankle–brachial index of <0.8. Other contraindications were marked dependent leg oedema (1/18) and severe venous ulceration. Eighty-nine (95%) of the 94 patients tolerated the stockings and wore them until discharge. Skin irritation was the most common reason for intolerance.

Conclusions: contraindications to the use of graduated compression stockings can be defined using clinical criteria and a Doppler machine to calculate an ankle–brachial pressure index. If this is done, tolerability is excellent. This approach may be a useful alternative in preventing venous thrombo-embolism in stroke patients.

Keywords: deep vein thrombosis, Doppler ankle–brachial pressure index, graduated elastic compression stockings, stroke

Introduction

Deep vein thrombosis and pulmonary embolus are major cause of morbidity and mortality in stroke patients. The incidence of deep vein thrombosis within the first 2 weeks of acute stroke was 53% in one study [1] and that of pulmonary embolus 7–9% [1, 2]. In other situations where there is increased risk of deep vein thrombosis (particularly postoperatively), both graduated compression stockings (GECS) and anticoagulant prophylaxis are effective [3, 4]. In neurosurgical patients, anticoagulant prophylaxis has not gained widespread acceptance because of the fear of intracranial bleeding [5].

The International Stroke Trial [6] found that early use of heparin—even at low doses—increased the risk of haemorrhage and that aspirin, while beneficial (in terms of mortality and secondary prevention), is not an adequate prophylaxis for deep vein thrombosis and pulmonary embolus.

GECS are a simple way of reducing venous stasis. In surgical patients, they are well tolerated and widely used, but in general these patients are younger than those admitted to stroke units. The use of GECS might be problematic in older people because of contraindications (especially incipient ischaemia, resulting from peripheral vascular disease) and problems of tolerability.
In this study we assess the feasibility and tolerability of GECS on a stroke unit using predefined contraindications, mainly designed to exclude those with peripheral vascular insufficiency.

Methods

We examined 112 consecutive admissions to a stroke unit. In each case we confirmed the diagnosis of stroke and determined suitability for GECS. We applied thigh-length GECS (Kendall TED, Kendall UK Ltd) to both legs soon after admission (mean 48 h) unless there were any contraindications (Table 1).

Routine clinical examination may be particularly insensitive in the presence of stroke [7]. One objective way to define peripheral vascular disease is based on the ankle–arm systolic blood pressure index (ABPI), calculated by dividing the ankle systolic pressure by the brachial systolic pressure [8]. This is widely used to help decide if patients with venous ulceration will be able to tolerate compression bandaging.

We screened all our stroke patients for peripheral vascular disease. We asked about intermittent claudication, symptoms suggestive of ischaemic heart disease, transient ischaemic attacks, \( \beta \)-blocker medication, diabetes mellitus and smoking. We palpated the femoral, popliteal, posterior tibial and dorsalis pedis pulses. We used a Huntleigh Mini Doppler (D900) with 8 MHz vascular probe (VP8) to calculate the ABPI. We made measurements with the patient lying flat and blood pressure taken from the ankle and brachial region. For the leg we placed the sphygmomanometer cuff above the ankle. We used the highest reading in each foot to calculate the pressure index. We used an ABPI of <0.8 as an absolute contraindication to GECS [8].

We defined other clinical contraindications based on our experience of GECS in other patient groups. To assess tolerability, we reviewed patients daily, and the nurses checked for skin breakdown or colour change in the legs.

Results

We assessed 112 consecutive patients, 48 men and 64 women (average age 79, range 41–94 years). There were 100 cases of cerebral infarction and 12 of haemorrhagic stroke. Ninety-four (84%) had no contraindications to GECS. Of the 18 (16%) who were unsuitable, the most common contraindication (in 13) was an ABPI of <0.8. Only one gave a history of peripheral vascular disease but in all 13 the dorsalis pedis pulses were palpable. In 15 subjects (16%), the dorsalis pedis pulses were impalpable but the ABPI was >0.8 and stockings were applied. The other contraindications were: venous ulceration with broken skin (three cases), severe leg oedema (one case) and leg veins being used for venous access (one case).

Tolerability of GECS was excellent, with 89 (95%) of the patients having no problems and continuing to wear the stockings during admission (average length of stay 17 days). Eighty-one patients were on the ward for more than 10 days and 16 for more than 30 days: all tolerated the GECS for these periods. Any problems with tolerability became apparent within 2–3 days of use. Of those unable to tolerate the stockings, three developed skin irritation (itching, soreness or paraesthesiae), one developed pain at the ankle joints and in one the stockings were problematic because of incontinence. Seven patients with mild strokes who were more mobile needed encouragement to continue wearing the stockings.

We diagnosed one deep vein thrombosis. Another patient developed symptoms of a pulmonary embolus confirmed by ventilation-perfusion scan. Neither wore GECS because of peripheral vascular disease. There were nine deaths on the stroke unit during the study (post mortem examinations of two did not reveal pulmonary embolus).

Discussion

In the early stages of acute stroke, anticoagulant prophylaxis is contraindicated—despite a high incidence of thrombo-embolic complications [6]. GECS may provide a simple but effective measure for these patients.

We have shown that on a stroke unit GECS are well tolerated, as long as patients are screened for contraindications. The most common of these was an ABPI of <0.8, indicative of peripheral vascular disease. An interesting finding is that, although the dorsalis pedis pulses were impalpable in 15 of the 112 patients, these subjects had ABPIs of >0.8 and wore GECS with no subsequent problems. The sensitivity of pulse palpation and claudication history in predicting peripheral vascular disease is poor, with both false-negatives and false-positives when compared with an assessment of ABPI [7]. Usually, pulse palpation underestimates the prevalence of peripheral vascular disease [9]. Doppler indices may also underestimate the true prevalence of peripheral vascular disease, particularly in patients with diabetes, because of medial calcification, which

<table>
<thead>
<tr>
<th>Table 1. Contraindications to graduated elastic compression stockings</th>
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<tr>
<td>Peripheral vascular disease (Doppler pressure index &lt;0.8)</td>
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<tr>
<td>Gross oedema of the legs (beyond the knees)</td>
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<tr>
<td>Venous ulceration causing broken skin</td>
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<td>Cellulitis</td>
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<td>Deformity of legs, making application of stockings difficult</td>
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Graduated elastic compression stockings for stroke patients

falsely elevate pressures [9]. All patients with palpable dorsalis pedis pulses in our series were able to tolerate GECS.

The main benefit of the Doppler machine was to ensure that patients with adequate ABPI but impalpable foot pulses received GECS. In stroke patients, palpation of foot pulses may be even less accurate because of circulatory changes. Skin irritation and discomfort affected tolerability in a few patients (5%). Assessing tolerability in stroke patients can be difficult because of sensory changes and communication difficulties. Pressure-induced necrosis can occur from inappropriate use of the stockings or lack of regular checks. Such problems can be overcome by daily inspection of the legs, and this was an important feature of our study. Initial concerns that GECS would interfere with physiotherapy were unfounded.

The average length of stay on the stroke unit was 17 days and the average length time wearing GECS was 14 days; we do not have data on the longer-term tolerability of the stockings. Problems with the GECS were apparent quickly (within 2 days) in those patients unable to tolerate them. Those who were on the stroke unit for more than 30 days had no additional problems with the GECS.

This study does not have the statistical power to assess the efficacy of GECS in the prevention of thrombo-embolic complications after acute stroke, but this is very likely given the efficacy demonstrated in neurosurgical patients and stroke patients on a rehabilitation unit [10]. An alternative method would be to use an intermittent pneumatic compression device. These have been used in surgical patients and are efficacious [11]. However, data directly comparing different methods of venous compression are few.

We have demonstrated that GECS can be worn by most stroke patients. They are well tolerated if patients are screened for contraindications before use and there is daily surveillance of the underlying skin. A portable Doppler machine to assess the vascular supply to the legs is a useful screening tool, which can be used in addition to clinical features to define those for whom GECS are contraindicated.

Key points

- Graduated compression stockings can be used safely for thrombo-embolic prophylaxis following stroke.
- The main contraindication to the use of graduated elastic compression stockings is peripheral vascular insufficiency.
- A portable Doppler machine can be used for screening.
- Skin surveillance should be carried out daily.

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References


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