Compression therapy post-deep vein thrombosis: How to best avoid post-thrombotic syndrome

CONTRIBUTORS

RICHARD WHITE, *Scientific Editor,* Wounds UK; *Professor of Tissue Viability, University of Worcester, Worcester*

ANNEMARIE BROWN (**AB**), *Independent Tissue Viability Consultant, East of England Strategic Health Authority, Cambridge*

MR CHRISTOPHER R LATTIMER (**CL**), *Vascular Surgeon, Ealing & Northwick Park Hospitals, Middlesex. Honorary Clinical Research Fellow, Imperial College, London*

MR GEORGE GEROULAKOS (**GG**), *Consultant Vascular Surgeon, Ealing & Northwick Park Hospitals, Middlesex; Reader in Vascular Surgery, Imperial College, London*

ALAN ELSTONE (**AE**), *Vascular Nurse Specialist, Derriford Hospital, Plymouth*

Venous thromboembolism (VTE) is the process of clot formation in the veins. While it can occur anywhere in the system, it is usually in the vessels of the leg that deep vein thrombosis (DVT) occurs (Blann and Yip 2006). It has been estimated that 25000 people in the UK die from preventable, hospital-acquired VTE every year (House of Commons Health Committee, 2005). This includes patients admitted to hospital for both medical care and surgery.

VTE is often asymptomatic; less frequently it causes pain and swelling in the leg. Part or all of the thrombus can come free and travel to the lung as a potentially fatal pulmonary embolism (PE). Symptomatic VTE carries a considerable burden of long-term morbidity due to chronic venous insufficiency. This, in turn, can cause venous leg ulceration and development of a post-thrombotic limb, which are characterised by chronic pain, swelling, and skin changes.

The inconsistent use of prophylactic measures for VTE among hospital inpatients has been widely reported. One UK survey indicated that over 70% of patients assessed to be at "medium or high risk" of developing a DVT did not receive any form of mechanical or pharmacological prophylaxis (Rashid et al, 2005).

While guidelines for VTE prophylaxis are available, in the event of DVT the forward treatment appears to be unclear, or at least variable. NICE guidelines (2010) clearly state that patients should be commenced with compression hosiery a week after DVT diagnosis, or once swelling has reduced sufficiently and there are no contraindications. The application of hosiery – as with any compression therapy – demands an up-to-date ankle–brachial pressure index (ABPI) or equivalent.

What is not clear is the level of compression required, when it may safely be applied in the community, and the factors that require the review of compression over time. In this issue of *Wounds UK*, the debate focuses on undertaking compression therapy in the post-DVT patient, and how best to avoid post-thrombotic syndrome.

Richard White

What are the clinical issues surrounding "stabilisation" of DVT prior to use of compression?

AB: The problem currently is that patients, diagnosed with DVT, are discharged back into the community with a treatment plan in place. However, the practice of early hospital discharge means that the efficacy of the DVT interventions cannot be carefully monitored and so stabilisation of a DVT cannot be definitively confirmed. This is particularly true if the patient does not need district nursing intervention. For example, whilst many patients are able to self-administer the prescribed pharmacological VTE prophylaxis, some, notably, the elderly, may not be able to do this and may be referred to the district nursing service. Furthermore, if mechanical prophylaxis is implemented (TED stockings), NICE recommends that the use of anti-embolism stockings is monitored and assistance is offered if they are not being worn correctly (NICE, 2010). Since current district nursing services lack the resources to assist with the application of prophylactic compression hosiery in the case of healed ulceration, this recommendation may be impossible to follow since it has huge resource implications for community nurses.

CL & GG: Once a thrombus has formed causing symptoms like swelling and pain it is considered fixed to the wall of the vein. Dislodgement at this stage by the direct application of a graduated elastic compression stocking is a theoretical possibility but extremely rare. However, if a free-floating thrombus is detected using duplex ultrasound, caution is advised in the use of compression. Our group was the first to study the haemodynamic effects on veins whilst a stocking was pulled up from ankle to knee (Lattimer et al, 2012). However, these forces are unlikely to have significant impact on dislodging thrombus in a clinical setting.

Our practice is to apply compression as soon as possible after a diagnosis of DVT with a class II (23–32mmHg) graduated elastic compression (GEC) stocking. Knee length stockings are usually prescribed. However, if the thigh is very swollen a thigh length stocking with a waist attachment may be more suitable. Early mobilisation is actively encouraged (Kahn et al, 2008).

There are two situations when full compression with a GEC stocking is not advised. If the patient is acutely unwell from a concomitant illness like a hip fracture, a myocardial infarct/stroke or abdominal surgery then early mobilisation is not possible. In these circumstances the leg

should be elevated in order to reduce oedema and improve the venous return. Instead, a thrombo-embolic deterrent (TED) stocking should be applied to both legs provided they fit well and are checked regularly for rucking. The toes should remain exposed. In patients with impending venous gangrene all compression is contraindicated.

AE: DVT classically manifests itself usually within in the vessels in the leg, with patients often experiencing symptoms of pain, significant swelling or oedema and erythema. In recent years guidance from NICE has come to the fore (NICE, 2010; 2012; 2013a) in an attempt to ensure that patients have countrywide access to standardised, quality services to diagnose the condition, treat appropriately and offer ongoing proactive management and advice. This has to be welcomed as a way forward to help guide clinicians with the management of individuals with DVT. However, questions and topics for further debate and discussion remain. Patients previously diagnosed with DVT were only ever offered conservative management in the form of anticoagulation and possibly compression hosiery. Interventional techniques are currently being clinically trialled to remove or treat the thrombus present, so offer advances for the future (Strijkers et al, 2011). The underlying possible cause of the DVT must be investigated to prevent reoccurrence.

To what degree should post-DVT management be tailored to the individual patient, and what are the main considerations?

AB: Every patient needs an individual assessment when deciding on post-DVT management. Some patients may be unable to manage hosiery due to lack of dexterity, obesity and may benefit from application aids or even intermittent compression devices. Patients must be offered a choice of compression hosiery and practitioners may consider using a lower class of compression if application is proving difficult. If, despite these efforts, the patient is unable to tolerate any form of compression, he/she may need to be referred back to the prescribing physician who may decide to manage post-DVT prophylaxis with pharmacological methods alone.

CL & GG: The site and extent of DVT has a major impact. Patients with an isolated calf vein thrombosis resolving after a few weeks will clearly have a different prognosis than those with an ilio-femoral DVT. The later group has a much higher risk of developing the post-thrombotic syndrome and therefore will have a greater benefit from compression.

Compliance with compression is another consideration (Raju et al, 2007). A recent study from our group suggested how compliance may be improved by allowing patients to choose their own stocking based on comfort (Lattimer et al, 2013). Patients were tested with four different compression stockings in a set-up analogous to a department store. More than 50% of patients required a prescription change based on personal preference, with 38% to a thigh stocking. There was no significant difference in the reduction of reflux between stockings of different lengths or strengths. However, their outflow performance was not tested and is the current focus of our research.

Many legs do not conform to the standardised shapes of stocking supplied by the manufacturer. Ordering custom made stockings in these patients is likely to increase compliance and reduce the problems associated with a poor fit.

If patients have a reduced ABPI then compression should be avoided as this can exacerbate peripheral vascular disease.

AE: Despite effective conservative management, one in four patients with a DVT develops post thrombotic syndrome within one year (Kahn et al, 2008) which often leads to a significantly reduced quality of life. Once safely anticoagulated, consideration can be given to symptom management and the use of graduated compression hosiery. NICE (2013a) suggests that below knee hosiery should be offered within 3 weeks at 23mmHg or greater. Persistent swelling and pain or discomfort may prevent this. Often patients with iliofemoral DVTs may have considerable thigh oedema and associated discomfort and it may be appropriate to consider thigh length hosiery in the short term. Patients with considerable oedema may require compression bandaging to reduce the oedema present and reshape the limb prior to consideration of graduated hosiery.

Another factor to consider is that hosiery will reduce the oedema and then the limb circumference will subsequently decrease and the hosiery may not be applying the desired level of compression, to reduce the venous hypertension. Re-evaluation then becomes necessary and a possible decrease in hosiery size, to maintain effective compression.

The NICE quality standard (2013a) is certainly welcomed to drive up the consistent management of patients with DVT, however, all patients are individuals, so therefore the care provided has to be individualised. Compression hosiery from experience is a field where generalist practitioners may have a limited knowledge and experience which can lead to confusion and error. We need to further understand the decision making process used by health care professionals when selecting hosiery. The development of local hosiery formularies may aid this process. Not all patients could apply or safely tolerate circular knit compression at 23mmHg or above as recommended, so important clinical decisions need to be made as to best practice for each individual.

Another important consideration is the patients' understanding of their condition and their willingness to be involved with its management and to take ownership of the situation thus enhancing concordance. Patients with pre-existing conditions (e.g. obesity, chronic lower back problems, arthritis, dexterity problems) may struggle to apply any form of elastic hosiery and patients suspected of having peripheral vascular disease, cardiac failure and cellulitis should be fully investigated

before applying compression. Any pre-existing skin conditions also need to be considered, as do allergies to the components of the compression hosiery.

The shape of the affected limb is another consideration and the degree of swelling present. The application of British standard circular knit hosiery is not always appropriate on oedematous limbs, where a flat knit garment, or one with a higher stiffness index, may be more effective in the long term.

Over time, concordance with the use of compression hosiery may become poor among patients who develop DVT. Patients who would have to purchase their compression on prescription – with each British standard garment representing one prescription cost – may be reluctant to continue to spending their money on the garments.

Which clinicians should be entrusted with patient assessment and the process of hosiery fitting in community care?

AB: Logically, the clinicians best placed to assess the patient and fit compression hosiery are registered community and practice nurses, since specialist assessment skills, for example ABPI measurement are required prior to the implementation of compression hosiery. Unfortunately, it cannot be assumed that this has been done prior to fitting in hospital, from my experience.

Some leg ulcer services have already incorporated this type of service into their service provision. The impact of this, however, must be highlighted in terms of reimbursement for nursing services. For example, the service specification for the provision of leg ulcer services will only reimburse service providers for 1-hour of follow-up and hosiery prescription session and recommend that the patient is then discharged from the service (DH 2011). In order to be fully compliant with the NICE guidance, local commissioners of leg ulcer services must acknowledge this additional aspect of leg ulcer care and negotiate additional revenue payments for service providers.

CL & GG: The acute management of DVT is entrusted to junior doctors in the emergency department. Emergency duplex scans can pick up the occasional more serious DVTs that are then referred to the vascular surgeon. Thereafter, most patients are referred to a nurse-led anticoagulation clinic and discharged after 3–6 months depending on the duration of anticoagulation. Further management is usually provided by the GP. Vascular surgeons only become involved when a specialist referral is made. On a pragmatic level since several healthcare professionals are involved there should be widespread education on the importance of compression stockings. They should be available on-site and fitted in the emergency department.

Our practice is to have a vascular clinic running concurrently with the anticoagulation clinic. Legs can be re-measured and the compression can be checked by vascular outpatient nurses. This should form part of the treatment package post-DVT. Trained practice nurses can continue with the measuring and fitting thereafter.

AE: The clinicians most likely to be involved with patient assessment and the process of fitting hosiery in the community are the GP's, practice and district nurses. Pharmacists may well be involved with the measuring and supply of the garments. It strongly depends on the knowledge, experience, and decision-making processes used to select hosiery and, thus, to ensure that patients receive the most appropriate form of hosiery for them, which will aid concordance.

Clinicians involved in delivery of this care should have knowledge and experience of a range of aids to assist with application or donning of the hosiery. Patients need to be offered choice, advice, training, and support with hosiery, and they need to know what the indications for seeking medical help are. Negative experiences will lead to nonadherence.

For how long should compression therapy be continued?

AB: In the case of patients assessed as at risk of developing a DVT, NICE (2010) recommend that they are fitted with TED stockings on admission, which should then be removed when the patient no longer has significantly reduced mobility, usually 5–7 days depending on client group. NICE define this as "patients who are bedbound, unable to walk unaided or likely to spend a substantial proportion of the day in bed or in a chair" (NICE, 2010). Unfortunately, the majority or district nurse patients fit into this category, so assessing when a patient's mobility is less reduced may pose a potential problem.

This guidance, although slightly vague, is overdue since it has been my experience, in the past as a District Nurse, that patients discharged with TED stockings are unsure of the time they need to wear these and I have experienced patients wearing their TEDS 2 years post-DVT.

It is recommended that patients with confirmed DVT are offered below-knee graduated compression stockings within 3 weeks of diagnosis. This timeframe allows for any swelling to reduce (NICE, 2010). Interestingly, however, the NICE (2013a) Quality Statement uses 1 week as a quality indicator when measuring service standards. The rationale for this is that it is estimated that 1 in 3 people who have had a DVT will develop some post-thrombotic symptoms (PTS) within 5 years, and most symptoms of PTS will occur within 2 years of the thrombosis. People who have thrombosis more than once (recurrent thrombosis) are at higher risk for PTS (Sheffield Teaching Hospital NHS Trust 2011). Furthermore, history of DVT has been highlighted as a risk factor for chronic venous insufficiency and even ulceration.

There is some contradiction here, however. The NICE (2010) guidance for management of DVT lists varicose veins with phlebitis as a risk

factor for DVT and recommends compression hosiery as a prevention strategy. The recently published NICE guidance on managing varicose veins, however, recommends alternate interventions, such as endovenous laser treatment or radiofrequency ablation over compression therapy due to lack of research evidence (NICE, 2013b).

This is not currently available in many trusts and for these patients, a compression class higher than TEDs (class 1; British standard) may be required this may be life-long, bringing with it all the problems associated with patient adherence with compression therapy.

CL & GG: All patients should wear a GEC stocking whenever they are ambulant for at least 2 years after a DVT. In a meta-analysis performed by our group, we concluded that stockings were able to reduce the incidence of post-thrombotic syndrome by about 50% (Kakkos et al, 2006). We were able to demonstrate that four patients were required to reduce one case of PTS, which makes this treatment highly cost-effective. There is ongoing research into this field (Kahn et al, 2007). Life-long compression is advised in patients with recurrent DVT.

AE: The question of how long the compression therapy should be continued for remains open to debate. Ideally, patients need ongoing assessment, and may require lifelong compression if they remain symptomatic or develop significant changes associated with chronic venous insufficiency. Patients with a history of skin changes, persistent oedema, or ulceration should be encouraged to use life-long compression.

What symptoms may dictate specialist referral?

AB: Unfortunately, the symptoms of PTS are very similar to DVT, for example, heaviness and swelling of the leg which is usually worse after sitting or standing for long periods, and is helped by walking. However, sometimes the symptoms are made worse by exercise if the obstruction to the blood flow out of the leg is very severe. PTS can also cause redness and pain of the skin around the ankle (inflammation) and swelling due to leakage of oedema (Sheffield Teaching Hospital NHS Trust, 2011). If existing symptoms change, for example, increased pain or swelling, the patient needs to be referred to a vascular department to rule out a recurrent DVT.

Equally, as is the case with all compression therapy, patients with signs/ symptoms of ischaemic disease will need specialist assessment prior to implementing compression hosiery.

CL & GG: Severe pain with massive swelling of the entire lower extremity usually suggests an acute ilio-femoral thrombosis. This can be treated by catheter directed thrombolysis or mechanical aspiration devices. There is accumulating evidence that reduction of the clot burden achieved by these procedures can reduce the incidence of post-thrombotic syndrome (Hull et al, 2005).

Worsening leg symptoms in a patient with established post-thrombotic syndrome may suggest recurrent DVT. Leg pain and swelling on exercise suggests venous claudication occasionally amenable to iliac stenting. Venous ulceration can be treated in selected cases by addressing secondary superficial venous reflux or rarely by deep venous valve repair/ replacement.

AE: Specialist referral, primarily to a vascular service, should be considered in patients who develop skin changes associated with chronic venous hypertension, such as pigmentation or eczema, persistent oedema or recurrent cellulitis, ongoing discomfort, and a diminished quality of life from PTS, and most importantly in patients who develop tissue loss or ulceration. NICE (2013b) recommends that patients with a venous leg ulcer should be referred to a vascular service if it has not healed within 2 weeks. It will be interesting to see in the coming months how these new guidelines are interpreted locally by clinical commissioning groups and are subsequently incorporated into referral guidelines and patient care pathways. WUK

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