during ultrasound compression testing. No papers were found that directly answered the clinical question. The clinical bottom line is that currently there is no evidence to suggest that compressing vessels in order to identify a DVT could cause an embolic event. Therefore we can consider ultrasound assessment a safe reliable investigation for the diagnosis of DVT with no evidence of causing harm.

Three part question?

In [patients with a DVT presentation in the emergency department] can [the ultrasound transducer compression test] [precipitate a thromboembolic event?]

Clinical scenario

A 47-year-old woman presents to the emergency department with left calf pain which came on suddenly, making walking difficult. Typical DVT risk factors are present and the examination is consistent with this. Being proficient with the portable ultrasound unit you decide to perform a "rule-in" compression test of the vasculature in the left leg. However, a colleague challenges this decision, questioning whether the test itself could cause an embolus when compressing the thrombus. You therefore wonder if there is any evidence for this adverse effect, in which case you would prefer to start anticoagulation without this information and defend your diagnosis on clinical grounds.

Search strategy?

Medline In-process and other non-indexed citations and Ovid Medline 1950–May Week 1 2007 using the Ovid interface, and EBM Reviews—Cochrane Central Register of Controlled Trials 2nd Quarter 2007, and EBM Reviews—Cochrane Database of Systematic Reviews 1st Quarter 2007, using the Ovid interface: [(deep vein thrombosis.mp.) OR (DVT.mp.) OR (thromboembolism.mp.) OR (thrombo-embolism.mp.)] AND [(compression tes\$.mp.)] AND [(contraindica\$.mp.) OR (detrimen\$.mp.) OR (deleterious.mp.) OR (precipitate) OR (thromboembolism.mp.) OR (thrombo-embolism.mp.)].

Search outcome

Altogether 0 papers were found in Medline, 0 papers were found in the Cochrane Central Register of Controlled Trials 2nd Quarter 2007 and 0 papers were found in the Cochrane Database of Systematic Reviews 1st Quarter 2007. Additionally a PubMed search [compression test, DVT, embolism, risk] yielded 0 relevant papers.

Comment(s)

The lack of evidence in this area is not surprising as a controlled clinical trial would be unlikely to gain ethical approval. However this presents the clinician with the all-too-familiar situation of wondering whether or not they should use this particular investigation. Published work advocates a focussed ultrasound technique as the 'Gold Standard' in identifying DVT. It is becoming an increasingly popular technique in the Emergency and Acute Medical Departments. However, clinicians should give due consideration to the fact that compression sonography for possible DVT has not been evaluated against any risk of causing clinically significant emboli. This information is desirable for accepted good clinical practice.

► CLINICAL BOTTOM LINE

Currently there is no evidence to suggest that compressing vessels in order to identify a DVT could cause an embolic event. Therefore we can consider ultrasound assessment a safe reliable

investigation for the diagnosis of DVT with no evidence of causing harm.

Prophylaxis of venous thromboembolism in patients with lower limb plaster cast immobilisation

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A short cut review was carried out to establish whether patients with lower limb plaster cast immobilisation require venous thromboembolism (VTE) prophylaxis. Nineteen papers were found, of which four were relevant. The clinical bottom line is that for patients requiring lower limb plaster cast immobilisation for injury (fractures and soft tissue), there is evidence supporting the use of low molecular weight heparin (LMWH) as thromboprophylaxis for venous thromboembolism.

Three part question

In [patients with leg injuries requiring lower limb plaster cast immobilisation] is [low molecular weight heparin] necessary to [prevent venous thromboembolism?]

Clinical scenario

A 48-year-old man attends the emergency department with pain and swelling in his right calf after a game of squash. Clinical examination supported by ultrasound identifies a partial rupture of the Achilles tendon. You decide to treat him with an equinus plaster cast and arrange follow up. You wonder whether you should prescribe LMWH for venous thromboembolism prophylaxis for the duration of immobilisation in the cast.

Search strategy

Medline 1950 to week 4 August 2006 using the Dialog Datastar interface: ((casts) OR (casts-surgical#.de.) OR (plaster ADJ cast)) AND ((leg) OR (leg#.w.de.) OR (lower ADJ limb) OR (lower-extremity#.de.)) AND ((low ADJ molecular ADJ weight ADJ heparin) OR (heparin-low-molecular-weight#.de.) OR (lmw ADJ heparin) OR (lmwh) OR (thromboprophylaxis)) AND ((deep ADJ vein ADJ thrombosis) OR (venous-thrombosis#.de.) OR (venous ADJ thromboembolism) OR (thromboembolism#.w.de.) OR (pulmonary ADJ embolism) OR (pulmonary-embolism#.de.)) LIMITED to human AND English.

EMBASE using the Dialog Datastar interface 1950 to week 4 August 2006: ((cast) OR (plaster ADJ cast) OR (plaster-cast#.de.)) AND ((leg) OR (leg#.w.de.) OR (lower ADJ limb) OR (lower ADJ extremity)) AND ((low ADJ molecular ADJ weight ADJ heparin) OR (low-molecular-weight-heparin#.de.) OR (lmw ADJ heparin) OR (lmwh) OR (thromboprophylaxis)) AND ((deep ADJ vein ADJ thrombosis) OR (deep-vein-thrombosis#.de.) OR (venous ADJ thromboembolism) OR (venous-thromboembolism#.de.) OR (pulmonary ADJ embolism) OR (lung-embolism#.de.)) LIMITED to human AND English

Table 3

Author, date, country	Patient group	Study type (level of evidence)	Outcomes	Key results	Study weaknesses
Kock <i>et al</i> , 1995, Germany	239 patients with leg injuries requiring conservative treatment in plaster cast or cylinder cast as outpatients. 176 received 32 mg s.c. mono-embolex until cast removal. 163 received no treatment	Prospective, randomised, single centre, open, control trial	DVT found at cast removal by clinical examination, leg measurement, ultrasound and duplex scanning, with phlebography to confirm positive findings	There were no DVTs in the prophylaxis group (0%), whereas 7/163 (4.3%) in the no treatment group had DVT. This reached significance ($p < 0.006$)	No placebo. No assessor blinding. Method of randomisation not specified
Lassen <i>et al</i> , 2002, Denmark	371 patients with leg fracture or Achilles tendon rupture requiring at least 5 weeks of immobilisation in plaster cast or brace. 217 received reviparin s.c. 1750 units daily and 223 received placebo	Prospective, randomised, double-blind, placebo-controlled multicentre (6 hospitals) trial	DVT found by ascending venography within 1 week of cast removal. Ventilation-perfusion scanning performed in those showing clinical signs of pulmonary embolus	DVT diagnosed in 17 (9%) in the reviparin group; 35 (19%) in the placebo group: the difference was significant ($p < 0.05$). 2 patients developed confirmed PE, both in the placebo group	Some patients received surgical intervention; results for these patients not distinguishable from those receiving conservative treatment. No detail of placebo content
Jorgensen <i>et al</i> , 2002, Denmark	205 patients with planned plaster cast on lower extremity for 3 weeks. 99 received 3500 IU tinzaparin s.c. daily; 106 received no treatment	Prospective, randomised, assessor-blinded, multicentre (3 centres) controlled trial	DVT on ascending venography on day of cast removal	DVT found in 10/99 (10%) of the treatment group and 18/106 (17%) in the control group. These results were not significant ($p = 0.15$)	Not statistically significant result; possibly attributable to either high drop out rate (95 of original 300) or low dose of LMWH. No placebo control
Kujath <i>et al</i> , 1993, Germany	253 outpatients with lower limb injury treated conservatively in lower limb plaster cast. 126 allocated to receive 36 mg s.c. fraxiparin daily, 127 received no treatment	Prospective, randomised, open single centre, controlled trial	DVT at cast removal by USS. Positive or doubtful findings confirmed by venography	The group with no prophylaxis had 21 DVTs (16.5%) compared to 6 in the prophylaxis group (4.8%). The difference was significant ($p < 0.01$).	No placebo. No assessor blinding. Adverse effects of treatment not reported

DVT, deep vein thrombosis; LMWH, low molecular weight heparin; PE, pulmonary embolism; s.c., subcutaneous; USS, ultrasound scan.

Cochrane Issue 3, 2006. ('cast' and 'venous thrombosis' OR 'venous thromboembolism' OR 'deep vein thrombosis' OR 'pulmonary embolism')

Search outcome

A total of 17 papers were found, of which four were relevant (table 3).

Comments

Patients receiving subcutaneous injections on a daily basis need either to be trained to self-inject, to return to a health professional each day, or else remain an inpatient. The vast majority of patients in these studies were outpatients and coped well with self-injecting. Further research is needed to assess the cost-effectiveness of the increased resources needed to offer this treatment. No two studies used the same LMWH; the appropriate dose of any particular LMWH treatment has yet to be determined. There appears to be no significant increased

risk of bleeding complications or other adverse reactions from LMWH for venous thromboembolism prophylaxis.

► CLINICAL BOTTOM LINE

In patients requiring lower limb plaster cast immobilisation for injury (fractures and soft tissue), there is evidence supporting the use of LMWH as thromboprophylaxis for venous thromboembolism.

Kock HJ, Schmit-Neuerburg KP, Hanke J, *et al*. Thromboprophylaxis with low-molecular-weight heparin in outpatients with plaster-cast immobilisation of the leg. *Lancet* 1995;**346**:459–61.

Lassen MR, Borris LC, Nakov RL. Use of the low-molecular-weight heparin reviparin to prevent deep-vein thrombosis after leg injury requiring immobilisation. *N Engl J Med* 2002;**347**:726–30.

Jorgensen PS, Warming T, Hansen K, *et al*. Low molecular weight heparin (Innohep) as thromboprophylaxis in outpatients with a plaster cast: a venographic controlled study. *Thromb res* 2002;**105**:477–80.

Kujath P, Spannagel U, Habscheid W. Incidence and prophylaxis of deep venous thrombosis in outpatients with injury of the lower limb. *Haemostasis* 1993;**23**(Suppl 1):20–6.