An audit of venous duplex ultrasonography in patients with lower limb cellulitis

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Abstract

Aims To audit the use and value of venous duplex ultrasound in patients hospitalised for cellulitis at Christchurch Hospital, New Zealand.

Methods The case notes of all patients with the discharge diagnosis of lower limb cellulitis admitted between January 2002 and December 2004 were reviewed for evidence of having undergone lower limb duplex ultrasonography. The presence of deep vein thrombosis (DVT) at this time was recorded and those who had thrombosis were reviewed in more depth to assess the presence of known risk factors.

Results 240 of the 1515 patients with lower limb cellulitis underwent ultrasonography of the lower limb. Of these, 15 demonstrated deep venous thrombosis; in only 3 of these 15 were the two conditions thought to have occurred concurrently. Two of the three patients with concurrent DVT and cellulitis had active malignancy, and the third had injected battery acid into the affected leg.

Conclusions Concurrent DVT and cellulitis is rare and this study suggests that investigation with ultrasonography in the absence of risk factors for DVT has a low yield.

Cellulitis and deep vein thrombosis (DVT) have multiple common clinical features. In patients with clear-cut cellulitis there can still be concern that there is concurrent deep venous thrombosis due to this overlap in clinical features, especially if the clinical course is thought to be atypical.

There are very few studies reporting the rate of investigation for DVT in patients with cellulitis by ultrasound examination, or the yield from this investigation. In studies looking at assessment of DVT, the rates of DVT have been between 10–40% in those fulfilling the Wells criteria, but it is likely that the rates of DVT in patients with cellulitis may be substantially lower than this.

The aim of this audit was to review the use of duplex ultrasonography in the population of patients admitted to hospital with lower limb cellulitis.

Method

Study population—All patients discharged from Christchurch Hospital (Christchurch, New Zealand) with a coding diagnosis of lower limb cellulitis (ICD code L03.11 ) between January 2002 and December 2004, were identified from the hospital database. The electronic records for that admission, which includes all radiological investigations, were reviewed. All those undergoing ultrasonography of the lower limb for any reason were identified and results recorded in a data sheet.

Definitions—A diagnosis of lower limb cellulitis was accepted if the patient had been reviewed by a physician who recorded a diagnosis of cellulitis and treated the patient with antibiotics. Deep venous thrombosis was diagnosed by non-compressibility of the femoral and popliteal veins by ultrasonography.
Clinical notes review—The clinical records of those that had DVT were reviewed to determine whether the DVT was previously unrecognized, and ensure the cellulitis and DVT were present in the same leg. The records were searched for known clinical risk factors for DVT which included malignancy, prolonged travel, recent surgery or immobilization, paralysis and previous DVT and results recorded on a data sheet. Cases that were coded as cellulitis but not recorded as such in the clinical notes were excluded.

Results

A total of 1515 patients were identified by their coding as being admitted with cellulitis. 240 of these patients had undergone duplex ultrasonography and 15 scans reported as showing evidence of DVT. In five cases the physician responsible for the case did not confirm the diagnosis of cellulitis although this was recorded as a possible diagnosis on admission. In another five patients the DVT had been diagnosed before the onset of cellulitis and these were excluded. In two patients the DVT was present in the contralateral leg only. In only 3 of the 240 patients scanned was a new DVT diagnosed in the cellulitic leg.

The pre-test probability of DVT was not able to be calculated systematically in review of the case-notes and rationale for ultrasonography in the subset that underwent scanning could not always be identified from the notes.

Figure 1. Flow chart of results of ultrasonography of lower limb of patients with cellulitis
The first patient with a newly diagnosed DVT was a 71-year-old man with melanoma of the same leg. He had undergone removal and skin grafting as well as radiotherapy.

The second patient was a 66-year-old man with a recent diagnosis of Dukes C colonic adenocarcinoma that had been treated surgically.

The third patient was a 53-year-old man who was an injecting drug user and had injected battery acid into the foot of the affected leg.

**Discussion**

The rate of co-incident cellulitis and DVT was extremely low in this study, and those in whom a DVT was newly diagnosed had clear risk factors for DVT. There is likely to be a small group of patients whose DVT may not be diagnosed if a single duplex ultrasound assessing only the femoral veins is done.

Ultrasonographic assessment of DVT at Christchurch Hospital involves femoral and popliteal vein insonation and a phasicity assessment of the ipsilateral common femoral vein. Repeat ultrasonography is unlikely to meaningfully alter the diagnostic yield. This prevalence of 0.66% is similar to previous studies into the rate of hospitalized patients.

Stein et al found a prevalence of 0.78% in general medical inpatients and Schuurman et al found a higher rate of 3.17%.\(^4,5\) This result is higher than some studies, such as Klatsky et al who found a prevalence of 0.10% in Kaiser Permanente Hospitals in California.\(^6\) The very low rate in this study has been attributed to the fact that only patients with a primary discharge diagnosis of DVT were included. Our findings suggest that despite clinical findings that are clinically suspicious of DVT the prevalence rate is similar to general hospital inpatients.

These results raise the question as to the usefulness of ultrasound scans to assess DVT in the presence of cellulitis unless there are unequivocal risk factors present and suggests that the clinicians perceive the risk of DVT as much higher than reality as judged by the number of negative scans recorded.

It is possible that the perceived risk of DVT is influenced by the current approach to the assessment of DVT risk by the use of Wells score. This tool includes a combination of clinical characteristics and risk factors and a D-dimer measurement, and was in use at Christchurch Hospital during the study period.\(^7,8,9\) These criteria have been well validated in populations of patients presenting with symptoms and signs consistent with DVT as the primary diagnosis in which the rate of DVT was over 10%.\(^1,4\) However, the value of the Wells score is much less certain if there is a primary diagnosis of infection of the lower limb which can produce many of the same features of DVT and inevitably causes a rise in D-dimer as this is an acute phase protein.

This study has inherent limitations because of its retrospective nature and because we could not determine the reasons why the scan was performed as these were not systematically recorded in the hospital records. It is possible some scans were performed to exclude other complications such as abscess formation or to assess risk factors for recurrent cellulitis such as venous incompetence although DVT assessment was included in the report from radiology.
While some cases of DVT may have been missed because of coding errors, the number is likely to be small and not unduly influence the overall results.

Within these limitations, the study suggests that the risk of co-incidental DVT with lower limb cellulitis is likely to be overestimated and leads to low-yield ultrasound scanning. A prospective study is needed to address this further and should include the calculated pre-test probability of DVT in those undergoing ultrasonography. If these findings are confirmed then new criteria may need to be developed to minimize the number of unnecessary scans performed.

Competing interests: None

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References:
Therefore, it is prudent to perform a duplex examination for deep vein thrombosis and in selective cases, a follow-up examination in patients with suspected or proven ascending superficial phlebitis. Evaluation of the lower extremity venous system for deep vein thrombosis has revealed thrombosis of the great saphenous vein in approximately 1% of limbs. Thus, examination of the saphenofemoral junction should be part of the examination of the lower extremity venous system when deep vein thrombosis is suspected. Patients admitted with lower limb cellulitis prospectively underwent a likelihood assessment for DVT using the Wells criteria followed by investigation with D-dimer and ultrasonography of ipsilateral femoral veins as appropriate. Diagnoses of contralateral DVT or pulmonary embolism during admission were recorded. 200 patients assessed for DVT. 20% of subjects were high risk by Wells criteria. D-dimer was elevated in 74% and 79% underwent insonation of the affected leg. Maze MJ, Dawes T, Pithie A, Chambers ST: An audit of venous duplex ultrasonography in patients with lower limb cellulitis. N Z Med J. 2011, 124 (1329): 53-6. PubMed Google Scholar. Results: On our three volunteers the intended segments of the deep venous system of the lower limb were visualized clearly between 45 and 350 seconds by CEUS. This should be pathbreaking, especially in patients with e.g. high Body Mass Index, local edema, diffuse inflammation etc. undergoing sonographic assessment for suspected deep vein thrombosis not definable by complete compression venous ultrasound or duplex ultrasound. @article{Spiss2011ContrastEU, title={Contrast Enhanced Ultrasound of the lower limb deep venous system: a technical feasibility study.}, author={V. Spiss and A. Loizides and M. Plaikner and S. Ostermann and S. Peer and H. Gruber}, journal={Medical ultrasonography}, year={2011}, volume={13}, pages={267-271} }. 