<table>
<thead>
<tr>
<th><strong>Title</strong></th>
<th>Diagnosing deep vein thrombosis in the lower extremity: correlation of clinical and duplex scan findings.</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Author(s)</strong></td>
<td>Lee, YM; Ting, AC; Cheng, SW</td>
</tr>
<tr>
<td><strong>Citation</strong></td>
<td>Hong Kong Medical Journal = Xianggang Yi Xue Za Zhi / Hong Kong Academy Of Medicine, 2002, v. 8 n. 1, p. 9-11</td>
</tr>
<tr>
<td><strong>Issued Date</strong></td>
<td>2002</td>
</tr>
<tr>
<td><strong>URL</strong></td>
<td><a href="http://hdl.handle.net/10722/45411">http://hdl.handle.net/10722/45411</a></td>
</tr>
<tr>
<td><strong>Rights</strong></td>
<td>This work is licensed under a Creative Commons Attribution-NonCommercial-NoDerivatives 4.0 International License.</td>
</tr>
</tbody>
</table>
Diagnosing deep vein thrombosis in the lower extremity: correlation of clinical and duplex scan findings

Objective. To identify factors that predict a positive duplex scan examination result in patients with suspected deep vein thrombosis of the lower extremity.

Design. Retrospective study.

Setting. Vascular laboratory in a university teaching hospital, Hong Kong.

Subjects and methods. The results of 345 lower extremity duplex venous scans performed between August 1994 and November 1998 were reviewed. All patients were in-patients referred from different specialties due to clinical suspicion of lower extremity deep vein thrombosis. Positive duplex scans were correlated with patients’ demographic data (sex, age), medical history (history of malignancy, deep vein thrombosis, and pulmonary embolism) and clinical features (leg swelling, venous insufficiency, calf pain, and leg ulcer). Univariate analysis was performed using the Chi squared test.

Results. A total of 345 scans were performed for 313 patients. The mean age was 55 years (range, 19-92 years). Sixty-three patients (49 male, 14 female) had a positive scan, giving a yield of 18.3%. Four factors had a significant association with a positive scan: male sex (P=0.0102), history of malignancy (P=0.0040), history of deep vein thrombosis (P=0.0001), and history of pulmonary embolism (P=0.0265).

Conclusions. Common presenting clinical features do not predict the result of ultrasonographic investigation for deep vein thrombosis. The chance of having a positive scan is significantly higher in male patients and those with a history of malignancy, deep vein thrombosis, or pulmonary embolism.

Introduction

Deep vein thrombosis (DVT) is a significant cause of morbidity and is sometimes fatal. The lack of specific symptoms and pathognomonic signs poses a diagnostic challenge to both surgeons and physicians. Preventive measures and early diagnosis through appropriate investigation are essential in reducing the risk of fatal pulmonary embolism (PE). Duplex venous scanning, due to its high sensitivity and specificity, especially for proximal deep veins, has replaced venography as the gold standard diagnostic method for DVT.
Recent years have seen the proliferation of non-invasive
diagnostic procedures in the surgical field. Although the
introduction of these techniques may reduce procedure-
related morbidity, excessive referrals can lead to a waste of
resources, and appropriate guidelines are therefore necessary
to prevent overuse of these investigations. The expanding
demand for ultrasonographic studies of patients with a
provisional clinical diagnosis of DVT is of concern in the
vascular laboratory. This study reviewed risk factors and
indications for all patients undergoing a duplex scan for the
diagnosis of DVT and aimed to identify factors associated
with a positive scan.

Methods

Between August 1994 and November 1998, all lower
extremity duplex ultrasonographic studies performed at
the Vascular Laboratory of the Department of Surgery at
Queen Mary Hospital were reviewed. Patients were referred
from different specialties for venous duplex scanning
because of clinical suspicion of DVT. All scans were
performed by a registered vascular technologist. The
examination was conducted using a colour-flow
ultrasonographic scanner (Acuson 128 XP 10 Scanner,
Acuson Inc. Mountain View, California) with a 7-MHz
transducer. The ultrasonographic criteria for the diagnosis
of acute DVT included visualisation of light echogenic intra-
luminal thrombus, lack of phasic venous flow, lack of
flow augmentation, and loss of normal vein compressibility
on light probe pressure. The ultra-sonographic features
of chronic DVT included the appearance of a bright,
echoic, intraluminal thrombus, a recanalised vein lumen
with securely attached thrombus, and the presence of
multiple venous collaterals.

Clinical information including demographic data, clinical
features, and medical history were recorded. Duplex scan
findings regarding the presence or absence of DVT, acute
or chronic DVT, and the extent of thrombosis were reported.
Nine factors were studied for their association with a positive
scan result: sex, age, leg swelling, venous insufficiency,
leg ulcer, calf pain, history of malignancy, history of DVT,
and history of PE. Univariate analysis was performed using
the Chi squared test. The P value of <0.05 was considered
statistically significant.

Results

A total of 345 lower limb duplex scans were performed for
313 patients. Sixty-three patients (49 men, 14 women) were
found to have a DVT. Venous thrombosis occurred in the
left limb in 21 patients, in the right limb in 42 patients, and
bilaterally in eight patients. The thrombus extended
proximally from the popliteal vein to the external or common
iliac veins in 30 patients.

Leg swelling was the most common presenting sign. Of
202 patients who presented with leg swelling alone, 27
patients had ultrasonographic evidence of DVT. Among
the 21 patients with a history of DVT who had a positive
scan, five had acute thrombosis and 16 had chronic thrombus.
Ten patients with a history of malignancy had a DVT. The
primary tumour was in the bladder (3), rectum (3), sigmoid
colon (1), stomach (1), liver (1), and one patient had a
leiomyosarcoma. Six patients suffered from PE. Five of these
patients had a duplex scan of the lower limbs performed at
the time of diagnosis, and three were found to have a DVT.
One patient with a history of PE was referred for a duplex
scan because of leg swelling. The result in this case was
negative.

Univariate analysis was performed using the Chi squared
test. Four factors were found to be significantly associated
with a positive scan: male sex (P=0.0102), history of
malignancy (P=0.0040), history of DVT (P=0.0001), and
history of PE (P=0.0265) [Table].

Discussion

The difficulty of making an accurate clinical diagnosis
of DVT due to the lack of specific signs and symptoms is
well known. The potential for thrombus propagation and
PE necessitates early diagnosis and prompt treatment. With
the introduction of duplex venous scanning, which is both
accurate and non-invasive, there has been increasing demand
for investigation of suspected DVT. The positive yield of
these scans reported varies between 2% to 31%, depending
on the population studied and the clinical setting.3,4 In this
study, all examinations were performed in the same
laboratory by the same vascular technologist. This study
aimed to identify clinical parameters associated with a

Table. Patient data and predictive factors for deep vein thrombosis

<table>
<thead>
<tr>
<th>Clinical feature</th>
<th>Total No. of patients</th>
<th>No. of patients with DVT* (%)</th>
<th>No. of patients without DVT (%)</th>
<th>P value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Male sex</td>
<td>211</td>
<td>49 (23.2)</td>
<td>162 (76.8)</td>
<td>0.0102†</td>
</tr>
<tr>
<td>Female sex</td>
<td>134</td>
<td>14 (10.4)</td>
<td>120 (89.6)</td>
<td>-</td>
</tr>
<tr>
<td>Leg swelling</td>
<td>266</td>
<td>51 (19.2)</td>
<td>215 (80.8)</td>
<td>0.2760</td>
</tr>
<tr>
<td>Venous insufficiency</td>
<td>36</td>
<td>0 (0)</td>
<td>36 (100)</td>
<td>0.6878</td>
</tr>
<tr>
<td>Leg ulcer</td>
<td>29</td>
<td>4 (13.8)</td>
<td>25 (86.2)</td>
<td>0.9275</td>
</tr>
<tr>
<td>Calf pain</td>
<td>25</td>
<td>7 (28.0)</td>
<td>18 (72.0)</td>
<td>0.4049</td>
</tr>
<tr>
<td>History of malignancy</td>
<td>20</td>
<td>10 (50.0)</td>
<td>10 (50.0)</td>
<td>0.0040†</td>
</tr>
<tr>
<td>History of DVT</td>
<td>27</td>
<td>21 (77.8)</td>
<td>6 (22.2)</td>
<td>0.0001†</td>
</tr>
<tr>
<td>History of pulmonary embolism</td>
<td>6</td>
<td>3 (50.0)</td>
<td>3 (50.0)</td>
<td>0.0265†</td>
</tr>
</tbody>
</table>

*DVT = deep vein thrombosis
†Statistically significant
positive duplex scan for lower limb DVT. Both the parameters studied and the yield of positive results were comparable to other studies conducted in the West.5-7

Leg swelling alone was the most common indication for duplex venous scan; however, the majority of these patients did not satisfy the ultrasonographic criteria for the diagnosis of DVT. It is not surprising that a non-specific symptom such as leg swelling is not predictive of DVT. If it is quantified by objective measurement, leg swelling has been shown to be useful in diagnosis in some studies. Criado and Burnham6 for example, found a discrepancy of less than 2 cm in the calf circumference of the involved and the normal limb predicted the absence of DVT in 93% of in-patients. A similar result was obtained by Nypaver et al,7 who reported that a discrepancy of less than 3 cm in calf circumference was associated with a negative scan in in-patients, with a specificity of up to 90%.

The association between a history of DVT and a positive result on duplex scan may be explained in two ways. Chronic thrombus rather than an acute episode of DVT may be the cause of leg swelling. In this study, 16 of 21 patients had duplex scan features of chronic DVT. In addition, patients with a previous DVT may have predisposing factors for developing recurrent DVT. A history of malignancy was also found to be associated with a positive scan. The relationship between occult malignancy and DVT has been widely investigated; the reported incidence of a subsequent diagnosis of malignancy in patients with unexplained DVT varies between 2% to 25%. There is no evidence to suggest that DVT is associated with a specific type of tumour. In this study, seven (70%) of 10 patients with malignancy had a primary malignancy of the pelvic organs. A simple postulation is that there is extrinsic compression of the pelvic veins, either by the tumour or due to pelvic lymphadenopathy. The role of malignancy screening for this group of patients is unclear, but a simple clinical evaluation, including medical history, physical examination, routine laboratory tests, and chest X-rays, is justified.

In this study, three (60%) of five patients with acute PE had positive duplex scans showing DVT in the lower limbs. Fowl et al7 reported that for patients with PE confirmed by pulmonary angiogram or ventilation perfusion scan, the incidence of acute DVT detected by duplex scan was approximately 43%. However, if the diagnosis of PE was made on clinical grounds only, the incidence of DVT detected dropped to approximately 10%. With the recent development of spiral computed tomography, the diagnosis of PE can be made by non-invasive testing. It is appropriate, therefore, to confirm the diagnosis of PE before subjecting patients to duplex scans.

Conclusion

Common clinical features are poor indicators of the presence of DVT. Thus, it is difficult to establish appropriate inclusion criteria for evaluation of suspected DVT using duplex scanning studies. The results of this study suggest that the combination of female sex and the sole presentation of leg swelling make the diagnosis of DVT very unlikely. Before the implementation of either inclusion or exclusion guidelines for referral can be considered, further prospective studies are required.

References