The aim of this study was to determine the prevalence of deep venous thrombosis (DVT) following lower limb arthroplasty and to assess whether this adversely affected satisfaction, relief from pain, or the level of mobility as perceived by patients. Six hundred and ten consecutive recipients of primary total hip replacement (THR) or total knee replacement (TKR) underwent routine post-operative venography. The functional outcome had already been assessed at one year by using the Regional Arthroplasty Database questionnaire, the results of which were correlated to venographic records.

The combined prevalence of DVT after THR and TKR in the patients, who did not receive chemical thromboprophylaxis, was 46.4%. Thrombus was identified in 57.6% of those with a TKR and in 33.5% of patients with a THR. Proximal thrombus was found in 11.0% of TKRs and in 14.8% of THRs. One year after surgery, patients who had a DVT established by venography did not report higher levels of immobility (p = 0.07), discomfort (p = 0.12) or dissatisfaction (p = 0.23) when compared to those with patent venous systems.

This suggests that the prevalence of DVT following TKR/THR without chemical thromboprophylaxis is high and these findings are consistent with the literature. However, patients did not perceive thrombosis to compromise their overall outcome. This challenges the belief that DVT is associated with morbidity and calls for further comprehensive research in this area. The low morbidity of the lower limb associated with DVT in these patients does not support the use of chemical thromboprophylaxis.

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Deep venous thrombosis (DVT) is a common complication following total hip and knee replacement (THR and TKR). It is not necessarily symptomatic and the late effects of asymptomatic thrombosis are largely unknown. Peri-operative DVT may precipitate chronic venous insufficiency. However, this condition is difficult to evaluate clinically because both the postphlebitic limb and leg ulceration are common affictions of the elderly population and are almost certainly multifactorial. The association between DVT and chronic venous insufficiency remains a contentious issue.

Patients who have acquired DVT following arthroplasty, asymptomatic or otherwise, may be expected to have more residual limb discomfort, impaired mobility and less overall satisfaction as a consequence.

Venography was used to determine the prevalence and the anatomical distribution of DVT in a large cohort of patients who did not receive routine chemical thromboprophylaxis during lower limb arthroplasty. The patients were reviewed by postal questionnaire one year after arthroplasty in order to establish their overall level of satisfaction, pain and walking ability. The results observed on venography were identified and correlated with the questionnaire to assess outcome.

Patients and Methods

A retrospective review was performed on 610 consecutive patients who underwent either THR or TKR between April 1992 and May 1998. A total of 292 hip and 318 knee replacements were carried out during this six-year period for which peri-operative and patient-related details were recorded on a regional arthroplasty database. All patients had their primary surgery undertaken at one university teaching hospital under the care of the two senior authors (WMH and PJG). Thromboprophylaxis comprised below-knee compression stockings and early mobilisation. Routine
chemical thromboprophylaxis was not given but venography was performed on the ipsilateral (operative) side between the seventh and tenth post-operative day. Those with DVT of the proximal segment received warfarin anticoagulation for three months.

The venographic records were retrieved and the results grouped into one of these categories: femoropopliteal (proximal) segment DVT, below-knee DVT or patent deep venous systems.

One year after operation, all patients were sent a standard regional arthroplasty review questionnaire. This was a simple tick-box form that assessed symptoms relating to the patients’ perception of residual discomfort, their ability to walk and their overall satisfaction. They were asked to grade their level of pain as either ‘constant’, ‘rare’, ‘sometimes’, or ‘never’ while walking ability was graded as ‘never’, ‘rarely’, ‘sometimes’ or ‘often’. The overall outcome was rated as ‘satisfactory’, ‘unsatisfactory’ or ‘undecided’. The findings at venography were correlated with the subjective outcome measurements and then evaluated using chi-squared analysis.

Results

The venographic records relating to the operated limb were retrieved for 494 of the 610 patients (81.0%). The remainder either did not have records for various reasons including technical problems with venography, or ‘lost’ radiological reports, or they had received ultrasound imaging, which is known to be an inferior technique when evaluating below-knee thrombus.4

Of the 494 patients with available records, 63 (12.8%) were found to have thrombus formation on the femoropopliteal segment, 166 (33.6%) had below-knee DVT and 265 (53.6%) had no evidence of thrombus formation. DVT occurred in association with 57.6% of TKRs and 33.5% of THRs. Involvement of the proximal segment, usually considered to be of greater importance, was found in association with 11.0% of TKRs and 14.8% of THRs (Table I).

A high rate (85.7%) of response to the questionnaire was achieved, although not all patients had completed every component. Statistical analysis of reported symptoms and the satisfaction rating, when correlated to the venographic findings, were not found to differ significantly between the two groups. On chi-squared analysis, neither the perceived ability to walk (p = 0.07), the level of residual discomfort (p = 0.12), nor overall satisfaction (p = 0.23) varied significantly between patients who had developed post-operative DVT compared to those with venographically patent deep venous systems (Table II).

Discussion

The development of DVT following THR and TKR is multifactorial and controversy surrounds the best methods of thromboprophylaxis.5 In our patients, chemical thromboprophylaxis was not given and they were mobilised early in graduated compression stockings. The prevalence of thrombosis was 46.4%, which is consistent with other studies widely reported in the literature.4,6 The differences in DVT rates between THR and TKR are similar to those found in previous studies and were not the main focus of our investigation.

The primary objective of this study was to assess whether DVT following arthroplasty, including both symptomatic and clinically silent thromboses, was associated with a poorer outcome as perceived by patients. A correlation was not demonstrated between thrombus formation as observed on venography and symptoms of discomfort at 12 months. Similarly, no difference was detected in either patient satisfaction or mobility between the two groups.

Ascending contrast venography remains the best procedure for evaluation of thrombus. A number of patients were excluded from the investigation due to technical problems relating to the invasive nature of this test. Since venography was performed between the seventh and tenth day after operation only, no information regarding DVT after discharge from hospital was available and thus the point prevalence rather than true incidence was measured. Deep vein thrombosis may have developed after the initial venographic assessment, which is said to occur in up to 20% of patients.7

The possibility of not diagnosing these possible thrombi is a point of potential criticism but repeated, sequential venographic screening has both risk and practical limitations. It could be argued that bias occurred in the group of

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**Table I.** Distribution of DVT relative to the type of arthroplasty (THR or TKR)

<table>
<thead>
<tr>
<th></th>
<th>Proximal DVT</th>
<th>Distal DVT</th>
<th>No DVT</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of patients (%)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>THR</td>
<td>34/230</td>
<td>43/230</td>
<td>153/230</td>
</tr>
<tr>
<td>TKR</td>
<td>29/264</td>
<td>123/264</td>
<td>112/264</td>
</tr>
<tr>
<td>Total number of DVT</td>
<td>63/494</td>
<td>166/494</td>
<td>265/494</td>
</tr>
<tr>
<td></td>
<td>14.8</td>
<td>18.7</td>
<td>66.5</td>
</tr>
<tr>
<td></td>
<td>11.0</td>
<td>46.6</td>
<td>42.4</td>
</tr>
<tr>
<td></td>
<td>12.8</td>
<td>33.6</td>
<td>53.6</td>
</tr>
</tbody>
</table>

**Table II.** Perceived functional outcome at one year relative to post-operative DVT as confirmed by venography

<table>
<thead>
<tr>
<th>Patients’ reported symptoms and satisfaction rating</th>
<th>p value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Level of residual discomfort</td>
<td>0.12</td>
</tr>
<tr>
<td>Subjective mobility status</td>
<td>0.07</td>
</tr>
<tr>
<td>Satisfaction rating</td>
<td>0.23</td>
</tr>
</tbody>
</table>

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patients who were treated with warfarin for proximal venous thrombosis but we are aware of no definite evidence to suggest that therapeutic anti-coagulation alters the development of the post-phlebitic limb.8

The outcome measure used for correlation with the results of venography was the standard one-year questionnaire that is routinely mailed to all patients on the database. These were the only outcome data available for analysis. Although it is accepted that this tool is not the best available, it has been validated against the Nottingham Health Profile (a standardised assessment form used to measure patients’ musculoskeletal disability)9 and does provide outcome information regarding the categories analysed.

Despite a high prevalence of DVT in patients who do not receive routine chemical thromboprophylaxis, this did not compromise satisfaction, pain relief or mobility as rated by patients one year after THR or TKR. No chemical thromboprophylaxis was given and this has allowed the natural history of morbidity associated with DVT to be studied. Our findings challenge the belief that DVT following arthroplasty is associated with morbidity. A clinical review of patients more than five years after arthroplasty has been initiated as a result of these findings.

We wish to thank the Trent Institute for Health Services Research for its statistical analysis of the data.

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References