Postphlebitic syndrome after total knee arthroplasty

405 patients examined 2–10 years after surgery

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ABSTRACT – We assessed the prevalence and relevance of putative risk factors for significant postphlebitic syndrome (PPS) in a cohort of 405 patients who underwent single limb cemented total knee arthroplasty. All patients were studied by means of a questionnaire and clinical examination to detect the presence of lower limb venous insufficiency. We found 52 (13%) new cases of postphlebitic syndrome. Comparison of those patients with and without PPS revealed no significant differences in the median age, sex ratio, preoperative mass, primary joint pathology or relevance of primary or revision surgery. A confirmed history of pre- or post-operative deep vein thrombosis was associated with the development of disease. Most cases seemed to develop within 5 years of surgery.

Postphlebitic syndrome occurs as a result of chronic venous insufficiency of the lower limb. It is manifest clinically by a leg which has varicose veins, mild oedema, skin pigmentation, eczema or liposclerosis in the gaiter area. The relationship between the late development of disease and acute thrombosis has not been accurately defined. Chronic inflammation with end-stage recanalization of the thrombus fails to restore the valvular mechanism. Under the influence of gravity, post-ambulatory pooling of blood occurs distally and venous hypertension develops (McEnroe 1988). Such pathology may appear in the superficial, deep or both venous compartments.

While the natural history and prevalence of deep vein thrombosis (DVT) after knee replacement has been extensively studied, we have been particularly interested in the relationship between knee arthroplasty and the development of chronic venous insufficiency (Stringer et al. 1989, Khaw et al. 1993). We report the prevalence of and risk factors for postphlebitic syndrome after total knee arthroplasty.

Patients and methods

We studied 405 patients. All subjects were examined by a single assessor over an 18-month period at a mean of 70 (24–122) months after surgery. This took place as part of an ongoing review of all lower limb arthroplasty procedures in a standard outpatient setting. Previous cemented total knee arthroplasty had been performed in a single unit by 1 of 3 surgeons using a standard implant system during 1984–1993. All procedures had been performed via a paramedian approach under tourniquet control. Mobilisation was commenced after removal of drains on the second postoperative day. Subcutaneous low-dose bolus heparin thromboprophylaxis was reserved for those 9 patients with a definite history of previous acute deep vein thrombosis. Radiological investigation of the venous system was performed only after arthroplasty, in the presence of early symptoms and/or signs of venous thrombosis.

At the time of review, each patient was asked to fill in a detailed questionnaire about previous medical history prior to knee arthroplasty and after surgery. Information was sought specifically about a history of previous venous thrombosis, pulmonary embolism, major abdominal or pelvic surgery, hormonal (oestrogen containing) replacement therapy and other possible risk factors.

Symptoms of or a previous history of surgery for venous disease prior to index arthroplasty were also documented. This information was cross-checked against the preoperative history from the patients' medical records. The relevant leg was examined for evidence of swelling, varicose veins, pigmentation, an ankle flare, lipodermatosclerosis or ulceration. The clinical scoring system of Browse et al. (1980) was used (Table 1). A cumulative final score is derived for allocating a value to each of a number of specified symptoms or signs. For the purposes of our study, we defined disease as being present with a score of 4 points or more. Thus we obtained 2 patient groups, those with disease (PPS) and those without (no PPS).

Statistics

All data were assumed to be non-parametric. Differences between the two groups were analysed by the chi-squared test for nominal data or the Mann-Whitney U-test for ordinal data. A p value of less than 0.05 was regarded as significant.

Table 1. Weighted scoring system

Symptom/sign	Points
Varicose veins	1
Any one of: gaiter area swelling, tibial skin pigmentation, ankle 'flare'	2
Venous claudication	3
Lipodermatosclerosis	4
Gaiter area ulceration	5

Table 2. Demographics of patients with postphlebitic syndrome (PPS) and those without (no PPS)

	PPS	No PPS
Male/female	1/3	1/4
Median age (range)	68 (35–82)	70 (32–84)
Osteoarthrosis/rheumatoid disease as primary pathology	5/1	6/1
% of cohort where procedure was a primary arthroplasty	82	90
Median mass, kg, (1 SD)	70 (9)	64 (11)

No significant difference between the 2 groups for any category

Results

405 procedures were performed in 405 patients. Evidence of postphlebitic syndrome (final score greater than or equal to 4 points) was found in 65 limbs. Further inspection of those patients with a phlebitic limb identified 13 patients who had a history of significant venous disease prior to surgery. This gave a final new prevalence of 52 cases or 13% of the original study group.

Comparisons were then drawn between these 2 groups of patients, those with PPS and those without disease on review. No significant differences were seen in the sex ratio, median age, and percentage of the total group, where a primary procedure (as opposed to a revision arthroplasty) was performed, median body mass on review and ratio of primary underlying pathology (osteoarthrosis versus rheumatoid disease) (Table 2). No differences were seen between the two groups of patients for the presence of diabetes mellitus, concurrent hormonal (oestrogen) replacement therapy, previous major abdominal or pelvic surgery or preoperative varicose veins or previous lower limb venous surgery (Table 3). A further review of previous thrombotic events requiring intravenous heparinisation both prior to and within three months of surgery was carried out. We found that all 9 patients who required heparinisation for thrombosis in the postoperative period developed PPS.

Table 3. Prevalence of putative contributory factors to the development of PPS for each of the 2 groups of patients as a percentage

	PPS	No PPS	P-value
Diabetes mellitus	2	4	0.7
Previous surgery	4	5	0.5
Hormonal therapy	2	4	0.7
Post-op DVT/PE	1	1	0.03
History of venous thrombosis	18	1	0.01
Ulceration	3	0	0.4

Most cases of PPS occurred within the first 5 years after the index procedure (Figure).

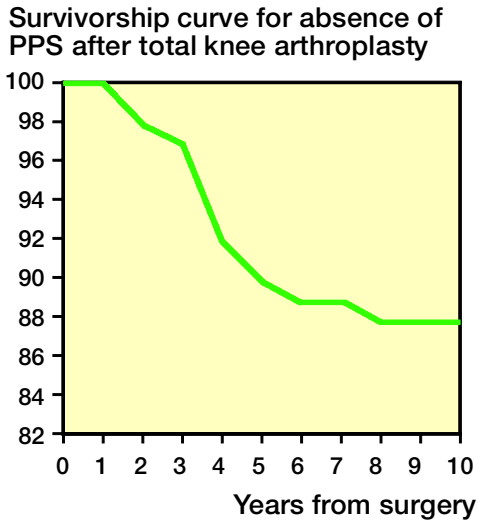

Figure. Percent PPS-free survival (Kaplan-Meier) after total knee arthroplasty. Most cases of PPS occurred within the first 5 years after the index procedure.

Discussion

Postphlebitic syndrome is the end stage of chronic venous insufficiency as a consequence of prolonged incompetence of the valvular mechanism of the peripheral venous architecture (Bauer 1950). This is presumed to originate from an acute peripheral venous thrombosis. Subsequent recanalization of the lumen fails to restore a competent anti-reflux system. This condition is characterised by chronicity and relapse and imposes a considerable financial burden on public expenditure. Absence of complete radiographic venous studies prevented the use of the CEAP system for classification (Porter and Moneta 1995). Therefore we used a validated scoring system based on a standard history and clinical examination (Browse et al. 1980).

Patients who have undergone knee arthroplasty probably run more risk of developing chronic venous disease than a non-arthroplasty group (Stringer et al. 1989). Such post-surgical patients tend to be elderly and have other diseases. Total knee arthroplasty is usually performed under tourniquet control. Mechanical manipulation of the lower limb may further impair venous competence. Clinical studies have found impairment in venous capacitance and flow in the early postarthroplasty period (McNally et al. 1997). Indeed, the degree of reduction in blood flow correlates with the venographic incidence of postoperative DVT. While routine postsurgery venographic screening has shown an incidence of about 60% of thrombosis (Stulberg et al. 1984), clinical venous thrombosis is an infrequent finding (Kim 1990, Mohr et al. 1992, Khaw et al. 1993). As less than 20% of patients who went on to develop PPS had been treated for clinically evident DVT after knee arthroplasty, it can only be surmised that either most patients sustained a subclinical DVT and/or that an alternative pathogenesis may also underlie this disease. Indeed, the development of a 'postphlebitic leg' may not depend entirely upon the extent of the initial thrombosis and may occur in the absence of thrombosis. Further, there is no direct correlation between the extent of initial thrombus and symptom severity (Browse et al. 1980).

It has been proposed that symptomatic DVT may cause chronic venous insufficiency in 30%–90% of patients within 5 years (Philbrick and Becker 1988). As there are certain recognised risk factors for the initiation of thrombus formation in the peripheral venous circulation, we investigated whether such variables would be commoner in the cohort that developed PPS (THRIFT 1992). However, none of the patient demographics, older age, greater mean body weight or female preponderance was seen in the PPS group. Nor could we find an increase in the frequency of diabetes mellitus, previous major surgery or oestrogen replacement therapy. We have confirmed that clinically-treated DVT after surgery is a significant risk factor for PPS. All patients who had received chemical therapy for a confirmed deep vein thrombosis after surgery subsequently went on to develop PPS.

Analysis of the timing of onset of PPS was limited by the cross-sectional nature of this study. We have attempted to correct for this by noting the year after surgery incidence as a percentage of the total number of patients examined for that year. We found that most cases arose in the first 5 years after surgery and there appeared to be a marked diminution in the incidence after this watershed. This is in keeping with other studies which have found that symptoms of chronic venous disease

may occur within 3 years of an acute thrombotic event (Browse and Clemenson 1974). We are currently prospectively evaluating the role of ambulatory venous haemodynamic monitoring both pre- and postoperatively to assess the risk of developing chronic venous disease after total knee arthroplasty.

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Bauer G. Division of the popliteal vein in the treatment of so-called varicose ulceration. Br Med J 1950; 2: 318.

Browse N L, Clemenson G. Sequelae of an 125-fibrinogen detected thrombus. Br Med J 1974; ii; 468-70.

Browse N L, Clemenson G, Lea T. Is the postphlebitic leg always postphlebitic? Relation between phlebographic appearances of deep-vein thrombosis and late sequelae. Br Med J 1980; 281: 1167-70.

Khaw F M, Moran C G, Pinder I M, Smith S R. The incidence of fatal pulmonary embolism after knee replacement with no prophylactic anticoagulation. J Bone Joint Surg (Br) 1993; 75: 940-1.

Kim Y-H. The incidence of deep vein thrombosis after cementless and cemented knee replacements. J Bone Joint Surg (Br) 1990; 72: 779-83.

McEnroe C S, O'Donnell T F, Mackey W C. Correlation of clinical findings with venous hemodynamics in 386 patients with chronic venous insufficiency. Am J Surg 1988; 156: 148-52.

McNally M A, Bahadur R, Cooke E A, Mollan R A B. Venous haemodynamics in both legs after total knee replacement. J Bone Joint Surg (Br) 1997; 79: 633-7.

Mohr D N, Silverstein M D, Ilstrup D M, Heit J A, Morrey B F. Venous thromboembolism associated with hip and knee arthroplasty: current prophylactic practices and outcomes. Mayo Clin Proc 1992; 67: 861-70.

Philbrick J T, Becker D M. Calf deep venous thrombosis: a wolf in sheep's clothing? Arch Intern Med 1988; 148: 2131-8.

Porter J M, Moneta G L. Reporting standards in venous disease: an update. J Vasc Surg 1995; 21: 635-45.

Stringer M D, Steadman C A, Hedges A R, Thomas E M, Morley T R, Kakkar V V. Deep vein thrombosis after elective knee surgery: an incidence study in 312 patients. J Bone Joint Surg (Br) 1989; 71: 492-7.

Stulberg B N, Insall J N, Williams G W, Ghelman B. Deep-vein thrombosis following total knee replacement: an analysis of six hundred and thirty-eight arthroplasties. J Bone Joint Surg (Am) 1984; 66: 194-201.

THRIFT. Thromboembolic Risk Factors Consensus Group. Risk of and prophylaxis for venous thromboembolism in hospital patients. Br Med J 1992; 305: 567-74.