This study therefore assesses recurrences 31 to 39 years after operation.

**PATIENTS AND METHODS**

Patients selected for this study underwent operation between 1960 and 1967 by one surgeon at the Wattwil City Hospital. Only those who fulfilled the following criteria were included: a saphenofemoral ligation was done in the course of comprehensive stripping of the greater saphenous vein, perioperative documentation was adequate, and the patient was younger than age 46 at the time of operation. This age limitation avoided asking patients who were, on average, more than 80 years old to appear for reexamination. There were 602 patients who fulfilled these requirements. When the study was performed, 485 of the 602 patients had died or could not be traced. The remaining 117 were contacted and invited to return for reexamination. Ultimately, 77 patients (13% of 602; 59 women, 18 men) appeared for examination, comprising 125 operated limbs. Their mean age at the time of operation was 35 years (range, 23-45 years).

According to prevailing opinion, the lowest rate of recurrent reflux after saphenous vein surgery can be expected if the saphenous vein is resected with ligation of the saphenofemoral junction flush with the surface of the common femoral vein and interruption of all proximal tributaries.\(^1\)\(^-\)\(^3\) It has been both surprising and disappointing to discover that even after correctly performed saphenofemoral ligation, recurrent reflux across the former junction can develop and may lead to recurrent superficial varicose veins.\(^4\)\(^-\)\(^9\) Research is underway elsewhere on why this occurs and how it can be prevented.\(^4\)\(^,\)\(^5\)\(^,\)\(^10\)\(^-\)\(^16\) The objective of this study is to provide a long-term perspective on the incidence of such recurrences and their clinical relevance. Previous studies have all been performed just a few years after the operation. However, from the point of view of the patient, it is the long-term result that counts.
tion, removal of the entire greater saphenous vein by strip-
ing, excision of varicose side branches, and, if necessary, dissec-
tion of perforator veins. This was the procedure advocated by lead-
ing vein surgeons at that time, as well as by us.1-3,9 Resection to the first bifurcation of the jun-
cctional side branches was not done. The fossa ovalis was
opened, and the femoral vein was inspected 1 cm above
and 1 cm below the junction. The saphenofemoral ligation
was right at the surface of the common femoral vein. The
stump of the saphenous vein distal to the ligation was left
without further treatment, and the fossa ovalis was not
closed. After operation, compression was applied as long
as the tendency to swelling lasted (usually 3 months). If
necessary, the remaining varices were sclerosed.

The study examinations were conducted in 1998
through 1999 and consisted of a review of the original
records, a new interval history, a clinical examination that
focused on the operated limb(s), and color-coded duplex
scanning with an Acuson 128/XP10 apparatus (Acuson
Corp, Mountain View, Calif) with a 7.5-MHz probe. The

Fig 1. Sonographic findings were of four types: A, no saphe-
nofemoral recurrence; B1, junctional recurrence appearing as
strand or tangle of veins originating from former site of ligation;
B2, single-lumen junctional recurrence that originates from for-
mer site of ligation; C, circumjunctional recurrence that origi-
nates from subfascial vein other than common femoral vein itself
in region of former ligation.

The appearance of new varices in the proximal portion
of the thigh defined a recurrence but not necessarily a
saphenofemoral recurrence. A tiny bulge or irregularity on
the anteromedial wall of the common femoral vein, with or
without wall thinning, on duplex sonography marked the
site of the former saphenofemoral junction ligation.
Sonographic findings were classified as A, B1, B2, or C (Fig
1). In type A, there was no sonographic sign of recurrence
in the region of the former saphenofemoral ligation. Type
B was a true saphenofemoral junction recurrence, with a
refluxing connection between epifascial varicosities and the
femoral vein at the site of the former ligature. This could
appear as a B1 tangle or strand of thin-walled veins or as a
B2 single-lumen varicosity. Type C defined a circumjunc-
tional recurrence, with reflux originating not from the for-
mer site of ligation, but nearby, from a deep external
pudendal vein, the external iliac vein, or another subfascial
vein. If the refluxing superficial–to–deep vein connection
associated with recurrent varicosities had its origin from a
subfascial vein elsewhere in the thigh, it was not consid-
ered as a saphenofemoral recurrence. Clinically relevant
saphenofemoral recurrences were those that required con-
sideration of new treatment because of complaints, compli-
cations, or a disturbing cosmetic appearance.

RESULTS

The relationship between suspicion of recurrence on
clinical examination and proven recurrence with sonogra-
phy is shown in Table I and graphically in Fig 2. The examining physician suspected a saphenofemoral recurrence in 59 limbs (47%) on the basis of the observation of new superficial varices in the groin or proximal portion of the thigh. Thirteen limbs were classified as having a severe saphenofemoral recurrence, of which 12 were confirmed by sonography. However, 10 (22%) of 46 limbs classified clinically as having mild recurrent varicosities were shown not to have junctional or circumjunctional reflux but to have instead isolated superficial system reflux or reflux originating from a more distally located communicating vein.

Although clinical examination suggested that 66 limbs were recurrence free, duplex sonography (Fig 2) showed that only 50 limbs (40%) actually maintained an impeccable long-term, type A result, with no refluxing new varix formation in the region of the former saphenofemoral ligation. Among the 75 limbs with duplex-detectable recurrence, 53 (71%) had a type B real junctional recurrence, with new varices and venous reflux between the femoral vein and the epifascial veins at the site of the former ligation. True junctional recurrences were uniformly on the anteromedial aspect of the common femoral vein. They appeared as a B1 tangle or strand of more or less fine veins in 22 limbs and as a B2 single-lumen varix in 31 limbs. The remaining 22 limbs (29%) were type C circumjunctional recurrences, with a transfascial refluxing connection between superficial recurrent varicose veins and a subfascial vein other than the common femoral vein in the neighborhood of the former ligation.

As shown in Table I, sonography revealed a true junctional recurrence or a circumjunctional recurrence in 27 limbs (41%) in which saphenofemoral recurrence had not been suspected on clinical examination. Conversely, if the examining physician suspected a saphenofemoral recurrence, sonography confirmed it in 81% of the 59 limbs. Clinical examination detected nearly 75% of both B2 and C recurrences but missed 59% of B1 recurrences. This led to a considerable number of false-positive and false-negative results with true junctional recurrences, yielding a sensitivity of 71%, a specificity of 72%, a positive predictive value of only 66%, and a negative predictive value of only 77%.

Table I. Clinical recurrence versus color-coded duplex findings

<table>
<thead>
<tr>
<th>Conclusion from clinical examination</th>
<th>A</th>
<th>B1</th>
<th>B2</th>
<th>C</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Suspected recurrence</td>
<td>59</td>
<td>11 (19)*</td>
<td>9 (15)*</td>
<td>23 (39)*</td>
<td>16 (27)*</td>
</tr>
<tr>
<td>No recurrence</td>
<td>66</td>
<td>39 (59)†</td>
<td>13 (20)†</td>
<td>8 (12)†</td>
<td>6 (9)†</td>
</tr>
<tr>
<td>Total</td>
<td>125</td>
<td>50</td>
<td>22</td>
<td>31</td>
<td>22</td>
</tr>
</tbody>
</table>

*Percentage of 59 clinically suspected recurrences. †Percentage of 66 clinical conclusions of no recurrence.

Table II. Saphenofemoral recurrence and its clinical relevance in 125 limbs

<table>
<thead>
<tr>
<th>Sonographic classification</th>
<th>No recurrence</th>
<th>Junctional recurrence</th>
<th>Circumjunctional recurrence</th>
<th>Saphenofemoral recurrence total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Limbs (%)</td>
<td>50 (40)</td>
<td>22 (18)</td>
<td>25 (20)</td>
<td>75 (60)</td>
</tr>
<tr>
<td>Clinically relevant (%)</td>
<td>—</td>
<td>2 (1.6)</td>
<td>0 (0)</td>
<td>27 (22)</td>
</tr>
</tbody>
</table>

*Sufficiently symptomatic or cosmetically disturbing to warrant additional treatment.

DISCUSSION

This uniquely late follow-up of 125 limbs with surgically treated primary varicose veins, by a team that included the original treating surgeon, shows that 60% of the limbs...
developed epifascial–to–deep vein reconnections at the site of a properly performed ligation of the saphenofemoral junction or reconnections to other deep veins in the immediate neighborhood. These junctional or circumjunctional recurrences occurred at some time in the intervening 31 to 39 years, even though the operation always included interruption of all identified junctional tributaries and stripping of the greater saphenous vein. As noted by many others, color-coded duplex ultrasonography was an absolutely necessary part of this long-term assessment, finding refluxing reconnections that were not evident on clinical examination and identifying the B2, single-lumen varix direct reconnection to the common femoral vein, at the site of the former ligation, to be particularly likely to provoke need for secondary treatments.

It is not possible to prove with sonography that saphenofemoral ligation was performed correctly. However, an incorrect ligation can be identified by demonstrating the presence of the original saphenous vein terminal valve or a patent proximal saphenous vein and its junctional branches. Neither of these signs of incomplete ligation was found in any of the study limbs, reinforcing our confidence that the original ligation had been complete and that we were indeed observing true junctional or circumjunctional reconnections.

Of the 66 cases where saphenofemoral recurrence was not clinically suspected, color-coded duplex scanning showed a B or C reconnection had been missed in the clinical examination of 27 limbs. On the other hand, in the 59 limbs not clinically suspected, color-coded duplex scanning showed a B or C reconnection had been missed in the clinical examination and identifying the B2, single-lumen varix direct reconnection to the common femoral vein, at the site of the former ligation, to be particularly likely to provoke need for secondary treatments.

In 1968 Leu17 reexamined our patients who had undergone operation 3 years previously. He examined 57 limbs clinically and found recurrences in the groin or proximal portion of the thigh in 6.5%. In 1998 with duplex sonography Jeanneret et al17 examined 176 limbs that had had we operated on 6 years earlier and found recurrent saphenofemoral reflux in 24.4%. The nearly fourfold increase in recurrences between 1968 and 1998 reflects both the passage of time and the additional accuracy of duplex scanning over clinical examination alone that cannot be completely parsed. These earlier findings and those of this long-term study suggest that recurrences continued to accrue in later years, but the data must be interpreted with caution because the three studies examined different samples from the population of 602 patients.

Although there are many reports of saphenofemoral recurrence after ill-defined and unverified saphenofemoral ligation, there are only a few studies of recurrence after well-defined, correct saphenofemoral ligation with stripping of the greater saphenous vein. Creton15 observed 19.4% saphenofemoral recurrence in 2149 limbs, Dwerryhouse et al5 reported a 6% recurrence after 5 years in 52 limbs, Glass16 noted a 25% recurrence in 141 limbs after more than 4 years, and De Maesseneer et al18 reported a 5% recurrence after both saphenofemoral and saphenopopliteal ligation, collectively yielding a range of from 5% to 25%. The comparability of these studies is, however, limited because of differences in treatment and assessment methods. The interested reader will have to look up the original articles for such details.

Certain authors explicitly described their method of correct saphenofemoral ligation and appear to have made clinical and sonographic assessments comparable to those in this study: Frings et al6 reexamined 81 cases after 4 to 5 years and found 26% “small refluxing branches of the femoral vein” and 7% “distinct recurrences” that had to undergo repeat operation. Kluess et al8 observed an 8% recurrence incidence in 78 limbs after 30 months. Chandler et al4 identified three recurrences among 48 cases after 12 months, yielding a recurrence incidence range of 6% to 26%, depending on the level of severity that might be considered. In any event, the current saphenofemoral recurrence incidence of 60% after a well-defined, correct saphenofemoral ligation compared with all of the foregoing studies again suggests that these reconnections continue to develop in later years.

CONCLUSIONS

Current opinion holds that there are fewer recurrences after correct saphenofemoral ligation than after incomplete or ill-defined ligation. Many phlebologists have even ventured that there should be no saphenofemoral recurrences after a correct ligation, but this study, with its 31- to 39-year follow-up, shows that the recurrence incidence after a well-documented and sonographically confirmed correct ligation may rise to 60% when patients are observed over the long term with color-coded duplex scanning. More than one third of the duplex scanning–detectable saphenofemoral recurrences will require additional treatment, and almost all of these will be B2 single-lumen varicosity direct reconnections to the common femoral vein at the site of the former saphenofemoral ligation.

REFERENCES