Sympathectomy for Raynaud's Phenomenon

Follow-Up Study of 70 Women with Raynaud's Disease and 54 Women with Secondary Raynaud's Phenomenon

By Ray W. Gifford, Jr., M.D., Edgar A. Hines, Jr., M.D., and Winchell McK. Craig, M.D.

Follow-up information has been obtained from 70 women with Raynaud's disease and 54 women with secondary Raynaud's phenomenon who were subjected to surgical sympathetic denervation of one extremity or more. The results of sympathectomy in the upper and lower extremities are described. The effect of operation on the subsequent course, the complications and sequelae are presented and compared with the reports of others.

Gifford and Hines1 reviewed the clinical data from the records of 474 female patients who had been seen at the Mayo Clinic from 1920 through 1945 and for whom a diagnosis of Raynaud's disease had been confirmed by use of the criteria of Allen and Brown.2, 3 Three hundred ninety-seven of these patients were treated by nonsurgical methods and the results presented. Seventy-seven women were subjected to surgical sympathetic denervation of one or more extremity. In this report the results of surgical sympathectomy are evaluated in the 70 women with Raynaud's disease in whom we have adequate follow-up information and in 54 women with secondary Raynaud's phenomenon.

Raynaud's Disease

Method of Study. The diagnosis of Raynaud's disease was established either preoperatively or postoperatively in all cases by reference to the criteria of Allen and Brown.2, 3 Stated briefly, these criteria are (1) episodes of Raynaud's phenomenon excited by cold or emotion; (2) bilaterality of Raynaud's phenomenon; (3) absence of gangrene, or, if present, its limitation to minimal grades of cutaneous gangrene; (4) absence of any other primary disease that might be causal, such as occlusive arterial disease, atherosclerosis, cervical rib, or organic disease of the nervous system, and (5) symptoms for at least 2 years. Cases of secondary Raynaud's phenomenon were carefully excluded.

Follow-up data were obtained by questionnaire, by re-examination at the clinic, or both.

Age at Onset and Duration of Symptoms Prior to Sympathectomy. The ages at onset of Raynaud's disease as well as at time of sympathectomy of the 70 patients are given in table 1. Ninety-three per cent of the patients were less than 40 years old and 70 per cent were less than 30 years old when symptoms of Raynaud's disease were first noted. Seventy-three per cent were less than 40 years of age when sympathectomy was undertaken. The shortest duration of Raynaud's phenomenon at time of sympathectomy was 1 year for 3 patients, and the longest duration of symptoms before operation was 23 years for 1 patient. The mean duration of symptoms before operation was 7 years. Eighty-one per cent had had symptoms for 10 years or less. Six patients were operated on less than 2 years after onset of symptoms, but for all, follow-up data were more than adequate to satisfy the fifth criterion of Allen and Brown.

Location of Raynaud's Phenomenon. Raynaud's phenomenon occurred in the fingers of both hands of all 70 patients. Fifty-one patients noted vasomotor phenomena in the toes also, and the nose of one was similarly affected.

Precipitating Factors. Exposure to cold was the only precipitating factor for Raynaud's phenomenon cited by 46 women. The remaining 24 stated that emotional reactions as well as exposure to cold were responsible.

Phases of Color Change. Detailed descriptions of the phases of color change were available for only 22 patients. Seventeen had the typical 3-phase color changes (pallor to cyanosis to rubor), 4 had only 2 phases of color change, and 1 described pallor only.
Family History. Only 2 patients gave a family history of Raynaud’s disease.

Associated Diagnoses. Thirteen of the 70 patients were sufficiently troubled by various functional and neurotic symptoms (exclusive of migraine headache) to warrant their inclusion among the final diagnoses. Ten patients had migraine headaches, and 2 had arterial hypertension (greater than 150 mm. Hg systolic and 90 mm. Hg diastolic).

Incidence of Complications Before Operation. Only 24 (34 per cent) of the 70 women were free of the complications of Raynaud’s disease before the diagnosis was first made at the clinic. Twenty-one (30 per cent) had or gave a history of trophic changes* in the fingers. One patient had trophic changes in the toes. Ten women (14 per cent) had evidence of sclerodactylio† in the fingers when sympathectomy was performed. Thirteen (19 per cent) had both trophic changes and sclerodactylio in the fingers preoperatively and 1 had trophic changes and sclerodactylio in the fingers and toes. One woman had calcinosis in the finger tips in addi-

* By trophic changes we mean ulceration, necrosis, chronic or recurrent paronychia, scarring, and fissuring.
† For the purposes of this paper sclerodactylio will be defined as sclerodermaous changes confined to the skin of the digits. As a complication of Raynaud’s disease it remains localized in the aeral parts in contradistinction to the progressive scleroderma that is characteristic of aresclerosis and diffuse scleroderma.

tion to trophic lesions and sclerodactylio. A nonhealing and painful ulcer had led to amputation of the terminal phalanx of the left third finger of 1 patient before she was first seen at the clinic.

In summary, 51 per cent of the patients with Raynaud’s disease had or gave a history of trophic lesions of the digits and 34 per cent had sclerodactylio. These figures include the 20 per cent who had both.

That patients with the more severe lesions were chosen for sympathectomy is amply demonstrated by comparing these figures with the incidence of initial complications among the previously reported group* in the nonsurgical group. Among 307 such patients only 3 per cent had trophic changes in the digits, 7 per cent had sclerodactylio, and 2 per cent had both when the diagnosis of Raynaud’s disease was first made or suspected at the clinic. Amputation of terminal phalanges of 2 toes had been necessary for 1 woman.

The mean age at onset of Raynaud’s disease was lower for the surgical group (25 years) as compared to the nonsurgical group (33 years). Emotional reactions were factors in precipitating Raynaud’s phenomenon in a greater percentage of the surgically treated group.

Types of Sympathectomy. Eighty-nine operations to interrupt sympathetic nervous pathways were performed on the 70 women with Raynaud’s disease, and the types of procedures employed are listed in table 2. Sympathectomy was performed on 52 women for the upper extremities only, for the lower extremities only for 2 women, and for both the upper and the lower extremities for 16 women. More extensive ganglionectomy was performed on 2 women who had obtained no relief from earlier ganglionectomy. Each is included as only 1 operation in table 2. Three women underwent cervicothoracic ganglionectomy after resection of the thoracic trunk had failed to give relief. Only the final result for each patient will be included in subsequent tables. Bilateral procedures were considered and evaluated as 1 operation because in most cases the responses between paired denervated extremities did not vary appreciably.

The cervicothoracic ganglionectomy of Ad-
sympathectomy consists of the extirpation of the stellate ganglion and, usually but not always, of the second thoracic sympathetic ganglion through a posterior approach. It is a postganglionic sympathectomy. Resection of the thoracic trunk, proposed independently by Smithwick and Telford, consists of dividing the sympathetic chain between the third and fourth thoracic ganglia and dividing the rami to the second and third ganglia. The second and third thoracic nerves are divided proximal to the sensory root ganglia. No ganglia are removed and hence this is a preganglionic sympathectomy. The anterior rhizotomy performed for 1 patient was a variation of the preganglionic sympathectomy.

Duration of Follow-up after Sympathectomy. The period of postoperative follow-up for these 70 women varied from 1 to 28 years and the mean was 12 years. The mean period of follow-up after cervicothoracic sympathectomy was 11 years, and after lumbar sympathectomy 14 years.

Effect of Sympathectomy on Raynaud’s Phenomenon. Forty-three (63 per cent) of the 68 patients with Raynaud’s disease who underwent sympathectomy for the upper extremities noted definite lessening in the severity and frequency of Raynaud’s phenomenon after operation (table 3). For 9 of these patients Raynaud’s phenomenon disappeared entirely. Complications of Raynaud’s disease in the form of trophic lesions of the digits or sclerodactyly or both were present preoperatively for 45 per cent of the women who obtained complete relief from Raynaud’s phenomenon; complications were present preoperatively for almost 70 per cent of those who obtained only partial or no relief. There were no striking differences in the results produced by preganglionic and postganglionic procedures.

In striking contrast to the results of sympathectomy for the upper extremities are the results obtained by lumbar sympathectomy for the lower extremities. Complete and permanent relief from Raynaud’s phenomenon in the feet was obtained for 83 per cent of these patients.

Table 2.—Types of Sympathectomy Performed on 70 Women

<table>
<thead>
<tr>
<th>Type of operation</th>
<th>Operations</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cervicothoracic ganglioneulectomy (Adson)</td>
<td>33</td>
</tr>
<tr>
<td>unilateral</td>
<td>1</td>
</tr>
<tr>
<td>bilateral</td>
<td>33</td>
</tr>
<tr>
<td>Resection of thoracic trunk (Smithwick; Telford)</td>
<td>9</td>
</tr>
<tr>
<td>bilateral</td>
<td>9</td>
</tr>
<tr>
<td>Undetermined type (performed elsewhere)</td>
<td>6</td>
</tr>
<tr>
<td>unilateral</td>
<td>1</td>
</tr>
<tr>
<td>bilateral</td>
<td>6</td>
</tr>
<tr>
<td>Bilateral rhizotomy</td>
<td>1</td>
</tr>
<tr>
<td>(Tr. 2, 3, 4, 5)</td>
<td>1</td>
</tr>
<tr>
<td>Bilateral lumbar sympathectomy</td>
<td>18</td>
</tr>
<tr>
<td>Total</td>
<td>80*</td>
</tr>
</tbody>
</table>

* More than one operation was performed on 19 women as follows: thoracic trunk resection followed later by cervicothoracic ganglioneulectomy on 3; bilateral lumbar sympathectomy in addition to sympathectomy for upper extremities on 16. Ten operations were performed elsewhere.

Table 3.—Effect of Sympathectomy on Raynaud’s Phenomenon

<table>
<thead>
<tr>
<th>Raynaud’s phenomenon after operation</th>
<th>Patients having extremities denervated</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Upper</td>
</tr>
<tr>
<td>Disappeared</td>
<td>9</td>
</tr>
<tr>
<td>Improved</td>
<td>34</td>
</tr>
<tr>
<td>Same or worse</td>
<td>25</td>
</tr>
<tr>
<td>Total</td>
<td>68</td>
</tr>
</tbody>
</table>

Table 4.—Effect of Sympathectomy on Trophic Lesions and Sclerodactyly

<table>
<thead>
<tr>
<th>Effect on lesion</th>
<th>Trophic lesions of patients having extremities denervated</th>
<th>Sclerodactyly of patients having extremities denervated</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Upper</td>
<td>Lower</td>
</tr>
<tr>
<td>Present before operation</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Disappeared</td>
<td>13</td>
<td>1</td>
</tr>
<tr>
<td>Improved</td>
<td>8</td>
<td>0</td>
</tr>
<tr>
<td>Same or worse</td>
<td>14</td>
<td>0</td>
</tr>
<tr>
<td>Not present before operation</td>
<td></td>
<td></td>
</tr>
<tr>
<td>None after operation</td>
<td>29</td>
<td>16</td>
</tr>
<tr>
<td>Appeared after operation</td>
<td>4</td>
<td>1</td>
</tr>
<tr>
<td>Total</td>
<td>68</td>
<td>18</td>
</tr>
</tbody>
</table>

* Follow-up data insufficient for evaluation in 7 cases.
with Raynaud’s disease and only 1 patient (6 per cent) failed to obtain any relief. Only 1 patient had complications of Raynaud’s disease in the feet before operation, and she obtained an excellent result.

Effect of Sympathectomy on Trophic Lesions. Trophic lesions were present on the fingers of 35 patients with Raynaud’s disease before cervicothoracic sympathectomy. Thirty-seven per cent of these women had no further difficulty with trophic lesions after operation. Sympathectomy reduced the severity and frequency of trophic lesions of 23 per cent but failed to give permanent improvement of the trophic lesions of 40 per cent (table 4).

Trophic lesions of the fingers appeared for the first time after cervicothoracic sympathectomy in 4 (12 per cent) of 33 women with Raynaud’s disease. With regard to trophic lesions of the upper extremities, the results obtained by preganglionic procedures were not significantly different from those obtained by postganglionic procedures. Lumbar sympathectomy was followed by complete disappearance of trophic lesions of the toes in the only case of Raynaud’s disease in which they were present preoperatively. Trophic lesions of the toes developed postoperatively in 1 of 17 women who had no such lesions preoperatively.

Effect of Sympathectomy on Sclerodactyly. Twenty-four patients with Raynaud’s disease had sclerodactyly of the fingers before cervicothoracic sympathectomy was performed, but follow-up data with regard to sclerodactyly were adequate for only 21. Five (24 per cent) noted complete regression of sclerodactyly after sympathectomy, and 8 (38 per cent) noted definite improvement (table 4). Sclerodactyly was not present preoperatively on the fingers of 44 women. Postoperative follow-up data were adequate with regard to sclerodactyly for only 40 women of whom 6 (15 per cent) first noted sclerodactyly postoperatively. There was no appreciable difference between preganglionic and postganglionic procedures with regard to their effect on sclerodactyly of the upper extremities.

Sclerodactyly was not present in the toes of any patient undergoing lumbar sympathectomy either before or after operation.

Incidence of Calcinosis after Sympathectomy. Calcinosis developed postoperatively in the fingers of 5 (7 per cent) of the 68 women with Raynaud’s disease who had undergone sympathectomy for the upper extremities. All 5 had trophic lesions or sclerodactyly or both preoperatively and these complications persisted in varying degrees of severity after operation. All had undergone bilateral stellate ganglionectomy, and for 4 of the 5 women the second thoracic ganglia were extirpated also. Raynaud’s phenomenon failed to improve after operation for 4 of the 5 women who subsequently developed calcinosis.

The one woman who had calcinosis before sympathectomy was subjected to cervicothoracic sympathectomy (type unknown) elsewhere. The result was unsatisfactory in all respects, in that Raynaud’s phenomenon, trophic lesions, sclerodactyly, and calcinosis persisted with undiminished severity.

Incidence of Amputation after Sympathectomy. Two women (3 per cent) of the 68 who underwent sympathectomy for Raynaud’s disease of the upper extremities lost parts of fingers at a later time. No patient required amputation of toes after lumbar sympathectomy.

A woman, aged 27 years, had had Raynaud’s phenomenon for 2 years when she was first seen at the clinic in 1944. A sweating test showed that sympathectomy performed elsewhere for the upper extremities was incomplete. Because of recurrent ulcerations of the tips of the fingers, bilateral stellate and second thoracic ganglionectomy was performed in 1944. For 2 years after operation considerable improvement in the Raynaud’s phenomenon and in the recurrent ulcerations of the fingers occurred. Thereafter symptoms recurred and the patient finally lost the distal phalanx of the right second finger due to painful, infected ulcerations. Whether this phalanx was amputated or sloughed spontaneously is not clear from follow-up data.

A woman, aged 48 years, had had Raynaud’s disease for 23 years before bilateral stellate ganglionectomy was performed in 1942. For 5 years after operation she was free of all symptoms including trophic lesions and sele-
rodactyly that were present initially. In 1948, infected ulcers developed at the tips of the thumb and second, third, and fourth fingers of the right hand, and sclerodactyly was again evident. A sweating test indicated complete sympathetic denervation of the upper extremities. The distal 2 phalanges of the right ring finger had to be amputated.

As mentioned previously, 1 woman, aged 21 years who had had Raynaud's disease for 3 years, had required amputation of the distal phalanx of the left third finger before coming to the clinic the first time in 1944. Bilateral stellate ganglionectomy was performed at the clinic. In the ensuing 7 years she had no further trouble with trophic lesions of the fingers and Raynaud's phenomenon was much less troublesome. Sclerodactyly was not present at any time.

**Over-all Results of Sympathectomy.** Heretofore the effects of sympathectomy on Raynaud's phenomenon, trophic lesions, and sclerodactyly have been considered separately. Such evaluation does not take into consideration the fact that in a single patient sympathectomy may have dissimilar effects on Raynaud's phenomenon and the pre-existing complications of Raynaud's disease. Striking improvement in only 1 category was often responsible for a greater degree of rehabilitation than moderate improvement in 2 or 3 categories. Conversely, striking improvement in nondisabling symptoms was occasionally nullified by lack of improvement in the most disabling symptom or complication. An attempt has been made, therefore, to evaluate the total result of sympathectomy for each patient individually, taking into consideration preoperative and postoperative disability according to the following criteria:

1. An excellent result indicates absolutely no disability from Raynaud's disease. To be included in this group a patient must have obtained complete and permanent relief not only from Raynaud's phenomenon but also from any preoperative complications that may have existed.

2. A good result indicates definite and often striking reduction in disability from Raynaud's disease. Many patients included in this group

<table>
<thead>
<tr>
<th>TABLE 5.—Over-All Results of Sympathectomy</th>
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<tbody>
<tr>
<td>Over all results</td>
</tr>
<tr>
<td>------------------</td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td>Excellent</td>
</tr>
<tr>
<td>Good</td>
</tr>
<tr>
<td>Fair</td>
</tr>
<tr>
<td>Poor</td>
</tr>
<tr>
<td>Total</td>
</tr>
</tbody>
</table>

*Incomplete denervation in 4 patients indicated by sweating test.
† Two women (3 per cent) required amputation of phalanges in follow-up period.

might well have been included in the group of excellent results had minor symptoms not persisted.

3. A fair result indicates only modest improvement with continuation or recurrence of disability after operation, although less marked than preoperatively. Usually the most disabling symptom was least improved.

4. A poor result indicates that disability continued or recurred postoperatively with unabated severity. In some cases new complications of Raynaud's disease appeared, so that disability was actually greater after operation.

The results of sympathectomy for Raynaud's disease according to these criteria are given in Table 5. In the upper extremities sympathectomy yielded good or excellent results for 54 per cent of cases. In 4 women persistence of sweating in the hands indicated that denervation of the upper extremities was incomplete after sympathectomy and they failed to obtain relief. If these cases are excluded from the series, the proportion of patients obtaining good or excellent results is increased to 58 per cent. Good or excellent results were apparent immediately after sympathectomy, and improvement was maintained throughout the period of follow-up. However, of the 31 women for whom sympathectomy yielded a fair or poor result, the failure was apparent immediately after operation for only 8 (26 per cent). The remainder had relapses after showing considerable improvement for periods that varied from 2 months to 6 years after operation.

Only 1 patient from the group with good or excellent results was followed for less than 2 years postoperatively, and only 5 from this
group were followed for less than 5 years. The
mean period of postoperative follow-up for
this group was 12 years.

Good or excellent results were obtained in 65
per cent of the women without complications
of Raynaud’s disease before operation, whereas
only 49 per cent of women with complications
before operation obtained good or excellent re-
sults. Otherwise there was no correlation be-
tween preoperative data and the result obtained
by sympathectomy. Specifically, the result
obtained by sympathectomy in the upper
extremities did not seem to be influenced by
age (either at onset of the disease or at time of
operation), duration of symptoms before
operation, the incidence of emotional reactions
as precipitating factors for the vasospastic
phenomena, or the use of tobacco. Likewise,
the type of sympathectomy performed seemed
to have no influence on the final results.

Good or excellent results were obtained for
94 per cent of women who had lumbar sympat-
thectomies for Raynaud’s disease of the feet.
Eighty-three per cent got excellent (complete
and permanent) relief. Only 1 patient who had
lumbar sympathectomy had complications of
Raynaud’s disease in the feet later.

Sixteen women had sympathectomy in both
upper and lower extremities and none obtained
a better result in the upper extremities than in
the lower. In 11, the results in the lower
extremities were better than in the upper
extremities and in 5 the results in the upper
and lower extremities were the same.

Fifty-two women had undergone sympathe-
tomy for the upper extremities only. Thirty-
three of these women also had Raynaud’s dis-
ease of the lower extremities but not severe
enough to warrant lumbar sympathectomy.
After cervicothoracic sympathectomy, Ray-
naud’s disease became more marked in the
lower extremities of 7 of these 33 women, re-
mained unchanged in 1, and improved or dis-
appeared in 14. There was inadequate follow-up
information concerning Raynaud’s disease in
the lower extremities in the remaining 11.

Causes of Death in Follow-up Period. Six
women who had undergone sympathectomy for
Raynaud’s disease died during the period of
follow-up. There was no operative mortality,
and all deaths occurred at least 1 year after
sympathectomy. One patient died of pneu-
monia, 1 of pulmonary tuberculosis, and 1 died
suddenly after injection of a local anesthetic
agent. Causes of death in the remaining 3
women were unknown. Ages at time of death
varied from 30 to 52 years and averaged 39
years. All had had Raynaud’s disease for at
least 10 years prior to death. The sympathec-
tomy had given good or excellent results for all
except 1 of the patients who died.

Discussion

When results of this study are compared with
results of previous similar investigations (table
6), it should be remembered that all of our
patients were women and all had Raynaud’s
disease. All cases of secondary Raynaud’s
phenomenon were carefully separated. Previous
authors have not confined their follow-up
studies to women, although the nature of the
disease, the majority would be women, and
some have included patients with secondary
Raynaud’s phenomenon and other arteriospas-
tic diseases such as livedo reticularis and acro-
cyanosis. We have no reason to believe that the
results of sympathectomy for Raynaud’s
disease would be different in male patients, but
no large series is available for comparison.
Apparenty Raynaud’s disease is not severe in
men, since Hines and Christensen14 reported
that only 2 of 69 male patients with Raynaud’s
disease were subjected to sympathectomy. Both
obtained satisfactory results.

We are in agreement with all previous
authors that the results of sympathectomy for
Raynaud’s disease are vastly better and more
predictable in the lower extremities than in
the upper.

Like others, we have found a high incidence
of relapse in the first few years after sympathe-
tomy in the upper extremities. Blain and col-
leagues11 observed relapse as late as 13 years
after cervicothoracic sympathectomy whereas
Barcroft and Hamilton9, and Kinmouth and
Hadfield12 stated that most failures are evident
within the first year after operation. Our data
indicate that most relapses occur within the
first 2 years after operation, as shown by Felder
and colleagues,10 although in our study 1 re-
on conservative management and surgical treatment is not usually indicated.

The data presented herein do not permit us to take sides in the controversy between the proponents of preganglionic sympathectomy and the proponents of postganglionic sympathectomy. Three women in this series who failed to obtain relief from resection of the thoracic trunk (preganglionic sympathectomy) subsequently received great benefit from cervicothoracic ganglionectionomy (postganglionic). If these 3 cases are counted as failures for trunk resection and as successes for ganglionectionomy, good or excellent results were obtained after 50 per cent of the latter operations and after 67 per cent of the former. The small number of trunk resections performed does not make this difference significant. Haxton and Kinmonth and Hadfield also found that the two types of sympathectomy give similar results. Stellate ganglionectionomy alone seemed to yield good or excellent results as often as when the second thoracic ganglion was also removed. Felder and associates found that the results of sympathectomy were better when the stellate ganglion was extirpated. Recently Ray has suggested that a more complete sympathectomy for the upper extremity might be achieved by removing the sympathetic chain from the middle cervical ganglion to the third thoracic ganglion inclusive. There is no evidence as yet that this procedure gives better results than those obtained by the less extensive operations employed for this series.

The incidence of long-term good results of the surgical treatment of Raynaud’s disease presented in this paper is not much greater than the incidence of long-term good results of conservative treatment presented in the previous study. The 2 groups of patients are not strictly comparable, however, since patients with the more severe disease were more likely to be chosen for, and to accept, sympathectomy. This is ably demonstrated by the higher incidence of complications among the surgically treated group.

The early age at death of 6 patients with Raynaud’s disease in this series is disturbing and raises the question of mistaken diagnoses or

### Table 6.-Review of the Literature on Sympathectomy for Raynaud’s Disease and Allied Conditions

<table>
<thead>
<tr>
<th>Author and date</th>
<th>Follow-up (years)</th>
<th>Results in per cent of cases or extremities</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Upper extremities</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Good or excellent</td>
</tr>
<tr>
<td>Telford, 1946</td>
<td>More than 1</td>
<td>43</td>
</tr>
<tr>
<td>Haxton, 1947</td>
<td>1–14</td>
<td>35</td>
</tr>
<tr>
<td>Barcroft and Barcroft and Hamilton, 9</td>
<td>1–6</td>
<td>80</td>
</tr>
<tr>
<td>Felder and co-workers, 1949</td>
<td>1/2–20</td>
<td>64</td>
</tr>
<tr>
<td>Blain, Coller, and Carver, 1951</td>
<td>4–15</td>
<td>58</td>
</tr>
<tr>
<td>Robertson and Smithwick, 12</td>
<td>1951</td>
<td>45</td>
</tr>
<tr>
<td>Kinmonth and Hadfield, 13</td>
<td>1952</td>
<td>69</td>
</tr>
<tr>
<td>Gifford, Hines, and Craig, 1957</td>
<td>1–28</td>
<td>54</td>
</tr>
</tbody>
</table>

* Some authors included a few cases of livedo reticularis, acrocyanosis, and secondary Raynaud’s phenomenon.

Relapse developed 6 years after cervicothoracic sympathectomy. This tendency to relapse after initial improvement must be taken into consideration in evaluating the results of sympathectomy for Raynaud’s disease in the upper extremities.

Our data do not reveal any way by which the results of sympathectomy in the upper extremities can be predicted in advance, except that good or excellent results were obtained more often when complications of Raynaud’s disease were not present before operation. This was also true in the series of Kinmonth and Hadfield. Our conclusion that good or excellent results were obtained more often when complications of Raynaud’s disease were not present before operation is of little practical importance, however, since our companion study has shown that most patients with uncomplicated Raynaud’s disease get along well
untoward sequelae of cervicothoracic sympathectomy. Since the causes of death of 3 patients are not known and 64 of the 70 women were still alive at the time of last follow-up, no conclusions can be drawn as yet.

Secondary Raynaud’s Phenomenon

In addition to the 70 women with Raynaud’s disease, 54 women with Raynaud’s phenomenon secondary to other diseases were also subjected to sympathectomy of the upper or lower extremities or both prior to 1946. The diagnoses included acrosclerosis (37 patients), rheumatoid arthritis (5 patients), livedo reticularis or acrocyanosis (5 patients), chronic occlusive arterial disease (2 patients) and chronic pernio, periarthritis nodosa, scalenus anticus syndrome, indeterminate hemorrhagic diathesis, and indeterminate disease of the central nervous system (1 patient each). Sympathectomy, although giving better results in the lower than in the upper extremities, was successful much less frequently than in primary Raynaud’s disease (table 7). The majority of the good or excellent results were obtained in the patients with acrocyanosis, livedo reticularis, scalenus anticus syndrome, and chronic pernio. Sympathectomy was followed by major or minor amputations in 6 patients in this group. Nineteen (35 per cent) of the women with secondary Raynaud’s phenomenon were dead at the time of follow-up. The average age at death was 39 years.

Errors in the diagnosis of Raynaud’s disease will lead to disappointing results from sympathectomy since Raynaud’s phenomenon second-

ary to other diseases (notably acrosclerosis) usually responds poorly to sympathectomy.

Summary

Sympathectomy for Raynaud’s disease affecting the upper extremities gave good or excellent results in 37 (54 per cent) of 68 women in this series. Good or excellent results were obtained more frequently if complications of Raynaud’s disease (trophic lesions or sclerodactyia or both) were not present before operation. There was no significant difference between the results obtained by preganglionic and postganglionic sympathectomies. Two (3 per cent) of the 68 patients lost portions of fingers after sympathectomy. Of the patients who had a fair or poor long-term result, the majority initially obtained a good result and then had relapses during the first 2 years after sympathectomy.

Sympathectomy for the lower extremities gave good or excellent results for 17 (94 per cent) of 18 women with Raynaud’s disease. Sympathectomy for Raynaud’s phenomenon secondary to other diseases gave poor results in the upper extremities in 72 per cent of cases and only slightly better results in the lower extremities.

Sympathectomy should be reserved for patients with the more severe and progressive Raynaud’s disease, since the prognosis is good without sympathectomy when the disease is mild or moderately severe, and not progressing.

Summary in Interlingua

Sympathectomia in le tractamento de morbo de Raynaud afficiente le extremitates superior produceva bon o excellentes resultatos in 37 ex le 68 femenas del presente serie (54 pro cento). Bon o excellentes resultatos esseva obteinite plus frequentemente quando complicationes de morbo de Raynaud—lesiones trofiche o sclerodactyia o ambes—non esseva presente ante le operation. Nulle significative differentiation esseva notate inter le resultatos obteinite per sympathectomia preganglionic e le resultatos obtenite per sympathectomia postganglionic. Duo del 68 patientes (3 pro cento) perdiva partes de digitu post sympathectomia. Quanto al patientes in qui le resultatos a longe vista esseva solmente acceptabile o clarmente mal,
le majoritade de illés comenciava per mostrar bon resultatos sed habeva recidivas durante le prime 2 años post le sympathectomia.

Sympathectomia pro morbo de Raynaud in le extremidades inferior produceva bon o excellente resultatos in 17 ex 18 feminas (94 pro cento).

Sympathectomia pro phenomeno de Raynaud secundari a altere morbos produceva mal resultatos in 72 pro cento del casos in que le extremidades superior esseva afficite e resultatos non multo melior in le casos in que le extremidades inferior esseva afficite.

Sympathectomia debe esser reserved pro patientes con morbo de Raynaud in forma sever e progressive, proque le prognose es bon sin sympathectomia quando le morbo es leve o moderamente sever e non progredente.

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Sympathectomy for Raynaud's Phenomenon: Follow-Up Study of 70 Women with Raynaud's Disease and 54 Women with Secondary Raynaud's Phenomenon
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