

that assure the return of venous blood from the lower limb to the heart.

In early 1949, that is, about 2 years after I began to see him in the clinic, Jobst returned for his usual monthly examination. He did not have his Sooley boot on but instead was wearing a light-weight, knitted, knee-length hosiery. His stasis ulcer was markedly improved.

In answer to my astonished inquiry, he explained that he had fabricated the stocking on the principle of "gradient pressure." Because he understood that the problem of his venous circulation was the lack of functional valves, he conceived that the blood in his leg will require a constricting pressure that was greater near the ankle than it is near any given level above; this would provide an upward driving force. Thus he constructed a pattern or template by measuring at several levels about 1½ inches apart the circumference of his leg from the ankle to the knee and then reduced the measures of circumference as he proceeded from the ankle to the knee, thus creating a propelling force upward. He had some problem before he found a light-weight knitted material for making the stocking. The first phase of the fabrication of the stocking consisted of a flat piece of fabric with a width that varied according to the principle mentioned above and which then was simply sewn together as a seam in the back of the leg. He had to try several degrees of compression before he settled on the measurements that he found both comfortable and effective.

For the use of those who wished to be fitted with the new support, he stamped out a yard-long paper tape measure with side-tails for estimating the circumference of the limb at various levels. (The tape was in use for many years.) The approach, of course, may have been unsophisticated but the result was unmistakably excellent, and only a fool would have overlooked its practical value.

I myself was impressed and encouraged Jobst's plan to make the invention available for medical use. At this point I began gradually to become Jobst's consultant in ethical promotion. He first wanted to advertise his product in the daily newspapers and commercial publications. I pointed out that the nature of the device in itself would make this type of popularization impractical and even risky. The efficient performance of the device depended on individual fitting, and this requirement made buying it over the counter virtually impossible. The long range success of the product, I said, would depend on being accepted by physicians who could provide individual fitting. But first the effectiveness of this new tool had to be proven. I gave Jobst the list of names of surgeons in the near Midwest (from the roster of the Central Surgical Association) with advice that he visit as many of these as he could and leave with them samples, requesting at the same time the favor of a written testimony if they found it as claimed. In the possession of a sufficient number of endorsements he then could apply to the Committee on Physical Appliances of the American Medical Association (AMA) (long since discontinued) and request approval. With this approval he could advertise the stocking in ethical medical journals and

in particular in the *Journal of the American Medical Association*.

Jobst accepted this way to proceed. During the first few months, while he was popularizing his device, he showed persistence and energy seldom seen. He must have visited dozens of doctor's offices and eventually collected the endorsements needed for the approval of the AMA committee.

One more episode in this historical retrospective that is perhaps worth recording was an offer in 1953 or 54 by Jobst to me to become a partner in his firm (by then highly successful). I politely refused, and he did not seem to be offended, but afterwards our relationship perceptively cooled. Of course, our doctor-patient association had ceased earlier because his ulcer had healed. Jobst later became sick with kidney disease and died of it in 1957.

It would be a very sensible question to ask why I have not made public earlier this connection with a modest but highly beneficial invention that was also a spectacularly successful commercial venture. Perhaps the main reason was that I always considered my relation with Jobst a personal rather than medical or scientific or commercial one, and I have never liked making personal matters public. But I must also confess that I, almost subconsciously, underrated the medical significance of the entire episode. In the mid 1950s when Jobst's enterprise became a worldwide success, I was involved in a great adventure: surgery of the arteries. It was a common conceit among those who participated in the early history of modern vascular surgery to look at superficial venous disease as a problem worthy of little attention. In retrospect, this was a mistake.

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Thoracoscopic sympathectomy for Buerger's disease of the upper extremities

To the Editors:

With the development of arterial reconstruction techniques, the optimal surgical therapy for chronic arterial occlusive disease has shifted from sympathectomy to direct revascularization. However, sympathectomy is still widely used in the treatment of Buerger's disease because arterial reconstruction is frequently not feasible because of the peripheral localization of the lesions.¹

New endoscopic instruments and imaging equipment have recently made thoracoscopic surgery feasible. Thoracoscopy provides a wide view of the pleural cavity and mediastinum and has been shown to be useful for resection of lung bullae,² for the dissection of mediastinal cysts, and for thoracic sympathectomy in patients with hyperhidrosis.³⁻⁵ However, little information is available about the utility of thoracic sympathectomy for patients

Table I. Demographics of patients

Case	Age (yrs.)	Sex	History of smoking	Symptom
1	29	M	+	Rest pain
2	35	M	+	Dry gangrene
3	35	M	+	Rest pain
4	42	M	+	Ulcer
5	33	F	+	Ulcer
6	48	M	+	Dry gangrene
7	38	M	+	Ulcer
8	60	M	+	Dry gangrene
9	48	M	+	Rest pain
10	42	M	+	Ulcer
11	28	M	+	Ulcer
12	37	M	+	Ulcer
13	29	M	+	Ulcer

M, Male; F, female.

The patients in cases 1 to 7 underwent open sympathectomy, whereas the patients in cases 8 to 13 underwent endoscopic sympathectomy.

Table II. Intraoperative and postoperative parameters

Case	Operation time (min)	Duration of drainage	Postoperative hospitalization	Additional treatment	Complication +
1	110	2 days	11 days	(-)	(+)
2	155	2 days	14 days	Amputation	(-)
3	90	2 days	12 days	(-)	(+)
4	90	3 days	14 days	(-)	(+)
5	80	2 days	10 days	(-)	(+)
6	85	3 days	11 days	(-)	(-)
7	68	5 days	13 days	(-)	(-)
8	102	1 day	9 days	Amputation	(-)
9	75	1 day	6 days	(-)	(-)
10	100	1 day	8 days	(-)	(-)
11	70	3 days	7 days	Skin graft	(-)
12	90	1 day	7 days	(-)	(-)
13	95	2 days	7 days	(-)	(-)

*Indicates difficulty elevating the upper extremity as a result of pain at the operative site.

The patients in cases 1 to 7 underwent open sympathectomy, whereas the patients in cases 8 to 13 underwent endoscopic sympathectomy.

with Buerger's disease. The purpose of this study was to compare retrospectively the efficacy of endoscopic thoracic sympathectomy with that of open thoracic sympathectomy.

In the period from January 1987 to December 1994, 13 consecutive patients (12 men and 1 woman) underwent thoracic sympathectomy (Table I). The first seven patients underwent open thoracic sympathectomy (group 1). The remaining six underwent thoracoscopic sympathectomy (group 2). In group 1, the average patient age was 37.1 ± 2.4 years (range 29 to 48 years). In group 2, the average patient age was 40.7 ± 5.0 years (range 28 to 60 years). There were no significant differences between the two groups.

All of the patients had a history of smoking. Indications for surgery included gangrene or ulcer (76.9%), rest pain (92.0%), and coldness or paresthesia (84.6%). Pulsations of the radial artery were palpable in the 11 of 13 patients. Preoperative angiography demonstrated occlusion of the radial and digital arteries in the two patients

who did not have palpable pulses (patients 8 and 10). In the 11 other patients, the digital artery was occluded or narrowed.

After the operations, all patients demonstrated satisfactory clinical responses to sympathectomy as manifested by a warm, dry hand and upper extremity. There were no perioperative deaths.

The estimated blood loss was low in both groups (group 1, 91.7 ± 24.8 ml; group 2, 30.0 ± 3.7 ml). The difference between the groups was statistically significant. No blood transfusions were required. There were no significant differences in operative time between the two groups (Table II). All of the patients resumed a normal diet on the first postoperative day. The duration of chest tube drainage was 2.7 ± 0.4 days in group 1 and 1.5 ± 0.3 days in group 2 ($p < 0.05$). The postoperative hospitalization was significantly shorter in group 2 (7.3 ± 0.4 days) compared with group 1 (12.1 ± 0.6 days) ($p < 0.05$).

Additional treatment was required for nonhealing

ulcers or gangrene, including amputation at the distal interphalangeal joint ($n = 2$), or skin grafting ($n = 1$). There were no complications in group 2. In Group 1, one patient had atelectasis, and four (57.1%) had difficulty elevating the upper extremity as a result of pain at the operative site.

Buerger's disease is characterized by peripheral arterial occlusions in the extremities of young smokers. True Buerger's lesions in locations other than the extremities are rare. Although the incidence of the disease is low in Europe and the United States, it is still one of the most important problems in vascular surgery in Asia because of its high rate of occurrence in chronic peripheral arterial occlusive disease.¹

To our knowledge, this is the first report comparing the efficacy of thoracoscopic and open thoracic sympathectomy for Buerger's disease of the upper extremities. Thoracoscopic sympathectomy was successful in all of these cases, and our patients were satisfied with the early postoperative outcome, although three patients needed an additional treatment such as amputation or skin grafting.

On the basis of our experiences, the advantages of thoracoscopic sympathectomy include lower operative losses, shorter duration of chest tube drainage, less pain, shorter hospitalization, superior cosmetic results, and a better outcome. Thoracoscopic sympathectomy should be the treatment of choice for patients with Buerger's disease of the upper extremities.

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