Hemodynamic Consequences of Lumbar Sympathectomy with Aortofemoral Reconstruction

By

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The indications and results of lumbar sympathectomy (S) have remained controversial and it's hemodynamic consequences poorly understood. Hemodynamic improvement following arterial reconstruction alone has been well documented by electromagnetic flowmetry and doppler systolic pressures in ischemic limbs. [1-2] A few studies have concentrated on evaluating the immediate alterations in arterial flow and doppler systolic pressure in ischemic limbs with non-reconstructible disease requiring sympathectomy. However, the consequences of adding lumbar sympathectomy to aorto iliac bypass grafting procedures has not been satisfactorily investigated. The purpose of the present study was to prospectively determine the immediate and long term added hemodynamic changes due to lumbar sympathectomy in patients undergoing aortobifemoral bypass for arterial occlusive disease.

Material and Methods:

Ninety-three patients with aortoiliofemoral occlusive disease underwent aortobifemoral bypass during the 22 month period of the study. Twenty-six patients were excluded for violation of protocol or technical problems with sympathectomy. Sixty-seven patients were randomized according to the last digit of their hospital number to receive bilateral lumbar sympathetctomy in addition to aortofemoral bypass (AFB). Twenty-nine patients with odd last digits underwent S whereas 38 with an even last digit did not. A total of 81 limbs underwent bypass and no sympathectomy (NS) because five patients orginally designed to undergo bilateral S had unilateral section of the nerve due to technical reasons. The remaining 53 limbs were randomized to the S group.

In addition to routine history and physical, noninvasive laboratory assessment and ateriographic results were available for analysis. Serial noninvasive doppler studies were performed with the Parks 806 doppler. Segmental limb systolic pressures and arterial waveforms were performed preoperatively, and at one week, two months, and six month intervals following operation. The chief parameter for grading

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arterial insufficiency and comparison in the followup period was the ankle/brachial systolic blood pressure (ABI, normal 1.0). The presence or absence of superficial femoral artery occlusive disease (SFOD) was noted on arteriography. Bilateral lumbar sympathetic sectioning of the L2-4 ganglia was performed at operation. AFB was performed using a knitted dacron prosthesis in the standard fashion.

The followup ranged from one to twenty-four months, with an average of 11+2.53 months. Statistical analysis was performed on IBM 370 computer using the statistical analysis system. Statistical differences between groups was assessed by paired and unpaired Students test.

Results

There was no statistically significant difference in age, sex, risk factors, smoking history, associated diseases, and indication for operation between the S and NS groups. SFOD was somewhat more prevalent in the S group (79%) as compared to the NS group (59%) ($P < .05$).

No statistically significant difference was noted at last followup in graft patency, the need for subsequent distal bypass or amputation rate between the S and NS groups.

Mean ABI was calculated in limbs with and without SFOD in both the S and NS groups and expressed as mean±standard error of the mean (SEM). Significant improvement indicating successful revascularization was noted in all groups following operation (Table 1). Mean change in ABI following operation and during followup at two, six and twelve months between limbs with S and NS showed no significant

Ankle Indices Following Aortofemoral Bypass

	NS(N=65)		S(N=47)	
	SFOD	NSFOD	SFOD	NSFOD
Preoperative	0.499±.42	0.724±.48	0.429±.47	0.507±.43
Postoperative	0.656±.45	0.937±.45	0.662±.46	0.925±.38
Latest Followup	0.588±.42	0.883±.47	0.603±.52	0.735±.45

NS No Sympathectomy
S Sympathectomy
SFOD Superficial Femoral Artery Occlusive Disease
NSFOD No Superficial Femoral Artery Occlusive Disease
Values all mean ± standard error

Table 1: Ankle indices prior to and following aortofemoral bypass showing significant improvement in all groups.

differences at all time intervals, although a somewhat greater increase was noted in the S group (Fig. 1). Analysis of the S group showed a greater improvement in patients with patent superficial femoral arteries, although the p values again were not statistically significant (Fig. 2).

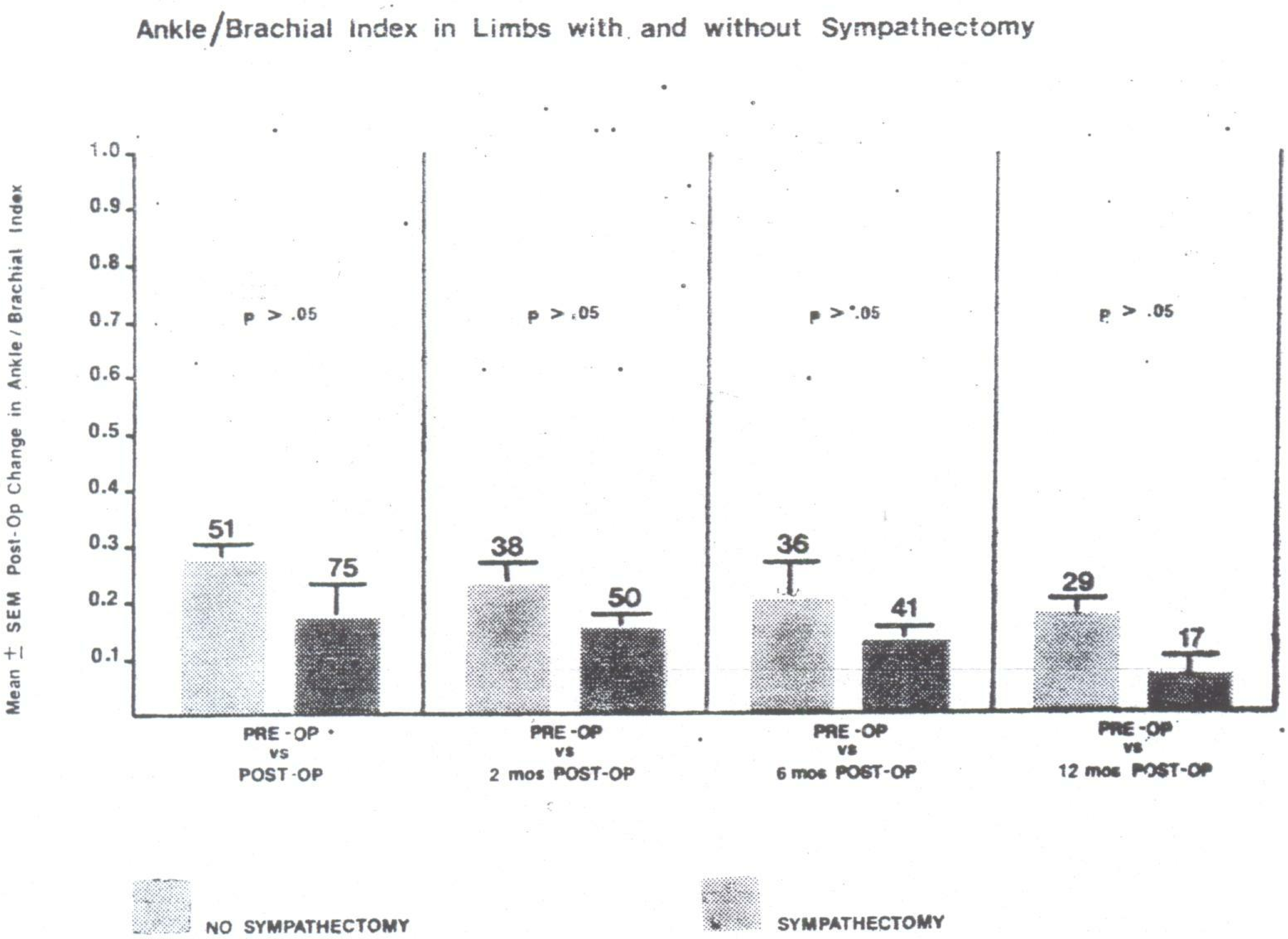

Fig. 1: Ankle/brachial index in limbs with and without sympathectomy. Mean change in the ankle index was greater at all time periods in the sympathectomy group but the difference is not statistically significant.

The difference between the S and NS groups was somewhat more obvious in limbs with no downstream occlusive disease (Fig. 3). ABIs were consistently greater in the S group at all time intervals although statisticall significance was only reached at the two month followup period.

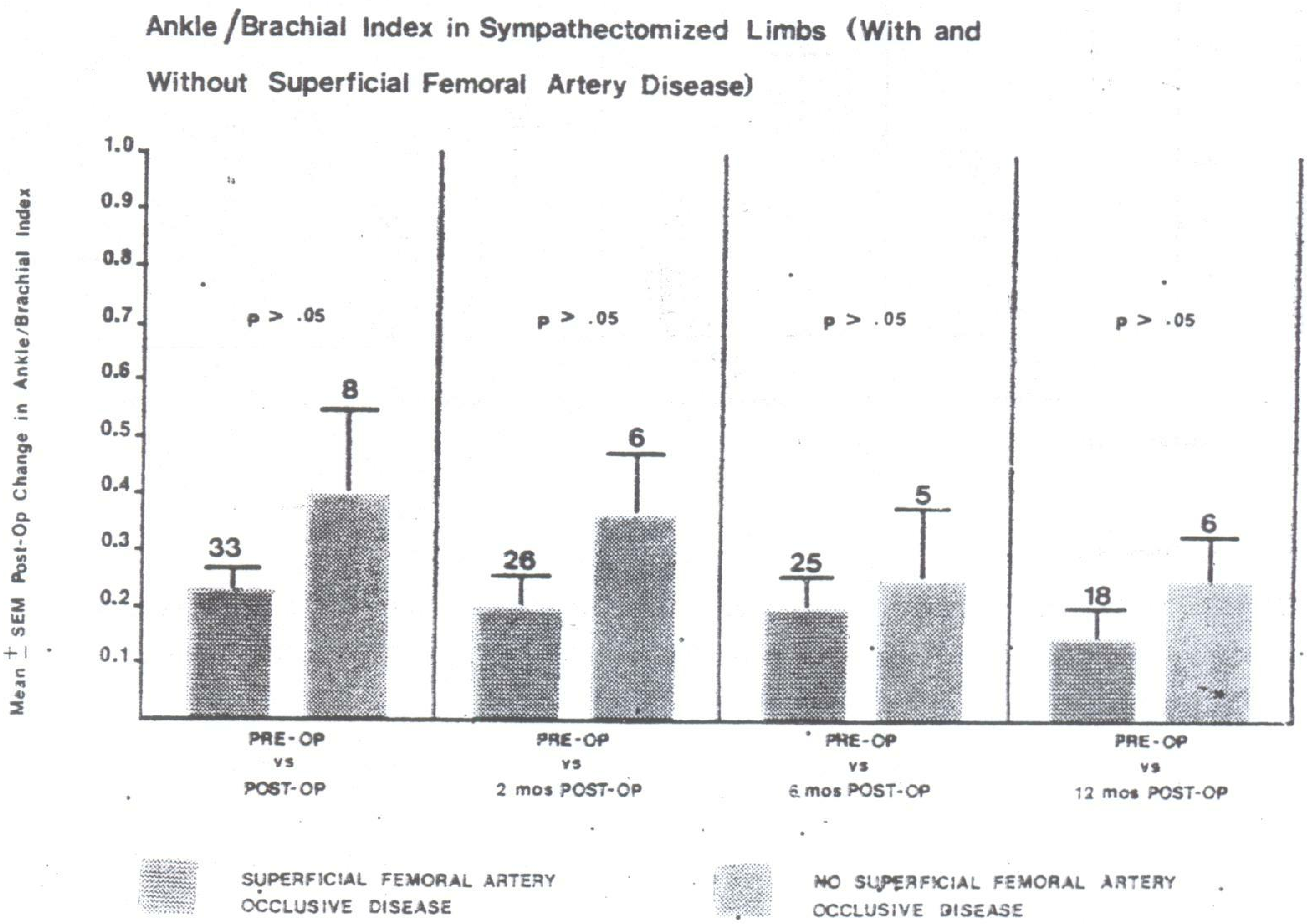

Fig. 2: Ankle/brachial index in sympathectomized limbs with and without superficial femoral artery disease. Improvement in the postoperative ABI is more marked in limbs with no distal occlusive disease although differences are not statistica'ly significant.

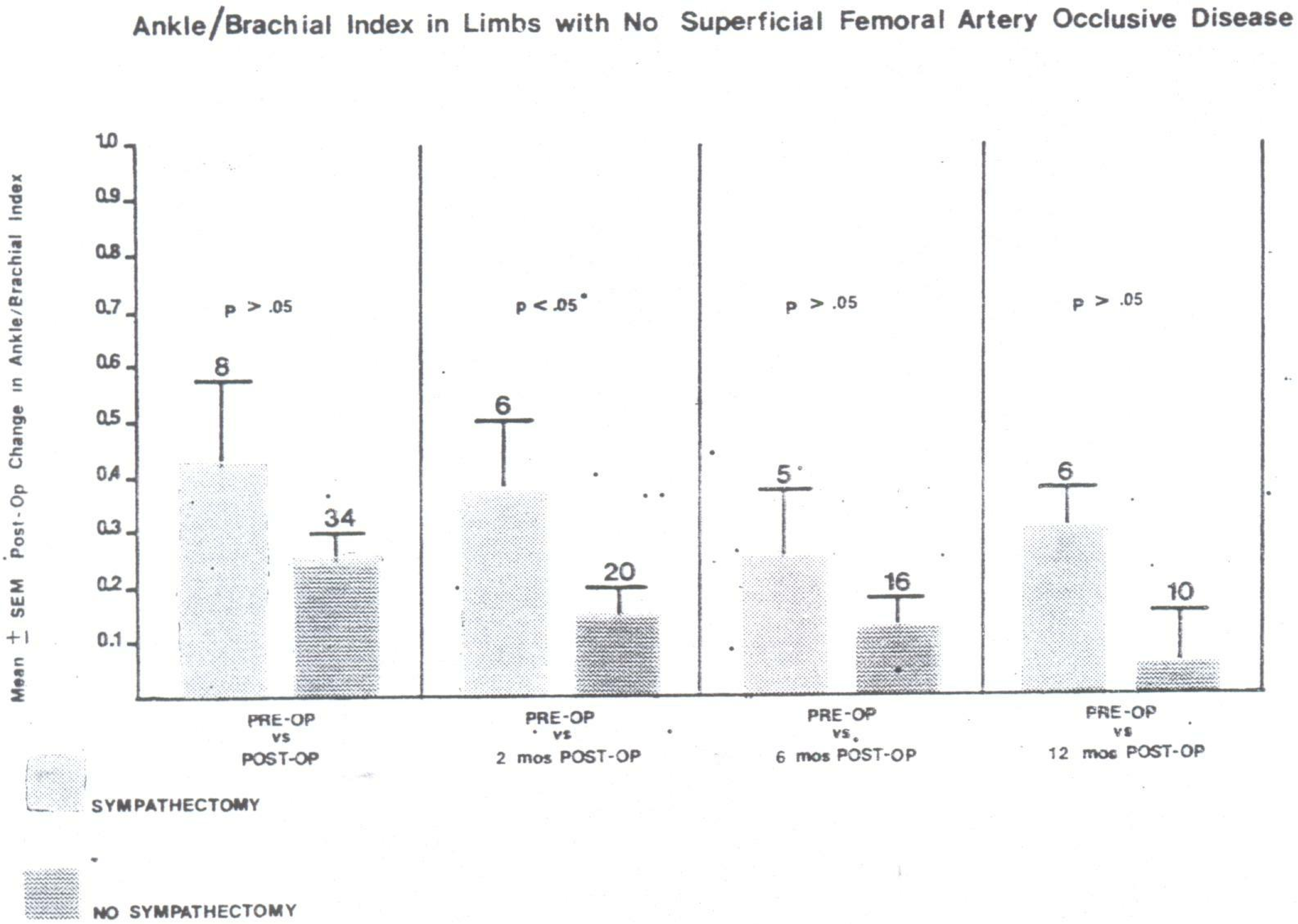

Fig. 3: Ankle/brachial index in limbs with no superficial femoral artery occlusive disease demonstrating a greater improvement in the S group although statistical significance is only reached at the two month followup period.

Discussion

Considerable controversy exists in the literature regarding the place of lumbar sympathectomy (S) in the treatment of lower extremity arterial disease. Refinements in reconstructive surgery have relegated S to a secondary procedure, often performed in end stage nonreconstructible arterial disease. However, concomitant S with aortoiliac reconstruction has often been performed on an empiric basis, without objective hemodynamic data to support this practice. Previous studies have concentrated on demonstrating increased arterial flow immediately following sympathecttomy[1-4]. Lee et al have reported an increase in arterial flow in 88% of patients within twenty minutes after sympathectomy[3]. Strain gauge plethysmography was used by Myers and Irvine to study 41 limbs before and 10-14 days following S[5]. No increase in resting flow, peak flow or distal arterial pressure in the calf muscle was described. Flows were noted to be higher, before and after S in limbs which were clinically improved. Strandness and Bell studied 29 patients prior to and after S with mercury strain gauge plethysmography[6]. Only 13% of claudicating limbs improved and no correlation existed between clinical improvement and alteration in digital blood flow. No change in calf muscle blood flow following S has been reported in resting and post exercise limbs in humans by Smith et al[7]. Terry and colleagues studied the adjunctive role of S in 20 limbs during aortoiliac reconstruction with electromagnetic flowmetry[2]. The physiologic component of vasoconstriction was abolished and all limbs demonstrated an increase in arterial flow after S. No long term results were available. Cronenwett and Lindenauer investigated the effects of S on canine hindlimbs made ischemic by proximal arterial ligation[8]. They showed that the predominant effect of S is a redistribution of increased blood flow to non-nutritive arteriovenous shunts, with no improvement in total capillary flow.

The findings of this study corroborate the results reported in the only other prospective, randomized study of S with aortoiliac reconstruction. Barnes and coauthors also measured ABIs before and after AFB a d noted no significant differences between the S and NS groups[9]. In a parallel study they investigated foot circulation by calculating foot arterial resistance index as measured by strain gauge plethysmography[10]. This index was significantly lower in the immediate postoperative period in the S group, suggesting that S might be beneficial in lowering foot vascular resistance. Increased ABIs were demonstrated due to direct arterial reconstruction in both the S and NS groups in the present study. The increase was more marked in the S group at all time intervals up to 12 months, particularly in limbs with no distal occlusive disease. However, the differences failed to achieve statistical significance for the most part.

Clinical experience suggests that S alone is of value in properly selected patients with end stage arterial disease and nonhealing ischemic ulcerations. The present study fails to demonstrate convincing evidence of its efficacy when used as an adjunct to aortofemoral bypass, with a mean followup period extending to one year.

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