obtained from patients during the first day of rash; it was also present in the blood obtained from one patient two days before rash. 2. Inoculation of these materials in susceptible persons produced typical rubella following an incubation period ranging from 9 to 16 days. 3. Experimental rubella was contagious; it produced the typical disease in susceptible persons following natural exposure. 4. The agent could be preserved in the dry ice chest at −70 C for at least nine months. 5. The same agent that caused typical rubella with rash was also capable of causing rubella without rash.

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CONTINUOUS PROCAINE BLOCK OF PARAVERTEBRAL SYMPATHETIC GANGLIONS

OBSERVATIONS ON ONE HUNDRED PATIENTS

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The functional relationship between the sympathetic nervous system and many disease syndromes has been clearly established. In many instances the exact nature of this association is not definitely known; that is, imbalance or disturbed activity of the sympathetic system is not an etiological factor. Yet, interruption or cessation of this activity results in remission, amelioration, or cure of the disease syndrome. The vast accumulation of experimental and clinical evidence relating to the beneficial effects of sympathetic interruption in peripheral vascular diseases, hypertension, post-traumatic painful syndromes, disorders of abdominal viscera, and hyperhidrosis has led investigators to search for nonoperative methods of sympathetic denervation.[1] This is of particular importance, since many of these conditions respond favorably to temporary interruption of nervous impulses. At present there are three principal methods of achieving sympathetic interruption: surgical ganglionectomy, chemical block of the paravertebral ganglions by direct infiltration, and pharmacologic interruption with adrenolytic or ganglion blocking agents. It is the purpose of this report to present the results obtained in 100 patients in whom continuous procaine block of the paravertebral ganglions was carried out. It has been thought advisable to preface the discussion of technique and results by a brief review of the physiological basis of sympathetic interruption and a survey of those clinical entities in which procedures accomplishing this have been successful.

PHYSIOLOGICAL BASIS FOR INTERRUPTION OF SYMPATHETIC ACTIVITY

The sympathetic nervous system is an integral component of the homeostatic mechanism of the human organism. It fulfills this role through a variety of mechanisms and pathways, but primarily, as a major factor in regulating body heat, it is responsible for the continuing variations in the capacity of the peripheral vascular bed. The functional capacity of the vascular bed is also responsive to a variety of other stimuli: infection, exercise, stress, operation, and trauma; and, again, this is mediated through sympathetic pathways, either by way of reflex arcs or as a result of central cerebral stimulation.

This vasomotor regulatory function of the sympathetic nervous system constitutes its principal function in the healthy patient. Nerve pathways extend through the arterial trunk down to the smallest arterioles and, in addition, extend to the entire venous system, so that both afferent and efferent vascular distributing trunks are controlled and balanced.[2] Vasomotor activity is constant, and responsiveness is delicately adjusted to minor changes in external environment. Both vasoconstriction and vasodilatation are sympathetic functions, although it is probable that the latter applies particularly to arterioles of skeletal muscle.[3] As a result, the normal, uninterrupted flow of sympathetic impulses provides for proper temperature control and adequate variation of blood flow to satisfy local demands, whether these be the normal physiological demands of basal function or the altered demands resulting from local trauma or infection. This latter mechanism has been termed hemometakinesia by Ochsner and his associates.[4]

Sympathetic vasoconstrictive activity may be classified as normal, hyperactive, or disturbed, and in each group certain indications for interruption of this activity may exist. It may be desirable to interrupt normal activity to an extremity in order to provide for a locally increased volume flow of blood. However, since the vasoconstrictive mechanism is so delicately attuned to local stimuli, this situation rarely exists. The principal indication in our experience for the interruption of normal sympathetic activity is as a preliminary measure in preparation for surgery on major peripheral arteries. It may be debated whether the smaller arteries and arterioles in the extremities of patients with arteriosclerotic obliterative disease are normally innervated. We prefer to consider these cases as examples of hyperactivity.

The commonest indication for sympathetic interruption is hyperactivity resulting from local stimuli. Clini-

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From the Departments of Anesthesiology (Drs. Betcher and Bean) and of Surgery (Dr. Casten), Hospital for Joint Diseases, and St. Clare's Hospital (Dr. Casten).

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4. De Bakey, M. E.; Burch, G.; Ray, T., and Ochsner, A.: The "Borrowing-Lending" Hemodynamic Phenomena (Hemometakinesia) and Its Therapeutic Application in Peripheral Vascular Disturbances, Ann. Surg. **126**: 850, 1947.

cally, one encounters excessive vasoconstriction in the various acute obliterative diseases of arteries and veins, with or without infection, and in the chronic obliterative arterial diseases.[5] Local pathological disturbances (anoxia, infection, trauma) set up a constant bombardment of sympathetic centers and result in a massive outflow of vasoconstrictive impulses. Depending upon the extent, duration, and nature of the local disease, either permanent or temporary interruption is indicated. Altered or disturbed vasomotor activity, which is manifested locally by varying degrees of temperature changes, is defined as the irregular transmission of constrictive and of dilatatory impulses to the vascular tree of an extremity, with these impulses often existing simultaneously in the same extremity. This phenomenon has been observed most frequently by us in conjunction with pain phenomena and will be discussed with the reflex dystrophies. We have, however, observed this interesting phenomenon as the only manifestation of disturbed sympathetic activity (namely, as a postherpetic state), and, since pain and disturbances of function have been absent, we have classified this as a disturbance of vasomotor activity.

The second principal function of the sympathetic system that deserves clinical consideration is the transmission of pain impulses. The transmission of such sensory impulses from the abdominal or thoracic viscera by way of sympathetic pathways has been thoroughly established, but the exact delineation of such pathways in the extremities, in man, has not been as satisfactory. Kuntz and Farnsworth,[6] Threadgill,[7] and Langworthy [8] have produced confirmatory evidence, but the burden of proof rests on the response of patients suffering from posttraumatic painful syndromes. Neither the hypothesis advanced by Doupe, Cullen, and Chance [9] nor that of Livingston [10] explains satisfactorily the prompt relief of pain following sympathetic interruption in these patients. It is our opinion that afferent pain impulses, as well as proprioceptive afferent stimuli arising in smooth muscles, are transmitted over sympathetic pathways as axon reflexes and through higher centers. This, we believe, is verified by ample clinical evidence.[11]

The third function of the sympathetic system deserving brief mention is the sudomotor activity.[12] Clinically, this is reflected in the specific response of hyperhidrosis to sympathetic denervation and to the utilization of sweating patterns to delineate the extent of denervation when carried out for other conditions.[13] (A summary of the functions of the sympathetic nervous system is presented in table 1.)

CLINICAL INDICATIONS FOR INTERRUPTION OF SYMPATHETIC ACTIVITY

The principal indications for temporary or permanent interruption of sympathetic activity have been presented in a previous report by one of us.[1] Essentially, our present purpose is to outline the principles governing the selection of the method of interruption. In our experience the use of sympatholytic or ganglion blocking drugs has been of little or no value, and we shall confine the discussion to the choice between surgical ganglionectomy and paravertebral procaine block of selected ganglions, either intermittent or continuous. Since we are concerned, in this report, with the continuous paravertebral method, no reference will be made to interruption of splanchnic or visceral pathways.

Complete and lasting sympathetic denervation is best accomplished by surgical ganglionectomy of desired segments of the paravertebral chain. In the lumbar chain the results are excellent, and, in selected cases, upper dorsal ganglionectomy is also extremely successful. In the upper dorsal chain, however, anatomic variation of outflow level, crossed fibers, accessory ganglions, and regeneration phenomenon continue to reduce the percentage of complete and lasting favorable results.[14] Nevertheless, for those conditions that are progressive or sustained because of persistence of the local stimulus, surgical ganglionectomy is definitely indicated. The principle, therefore, underlying the utilization of surgical denervation is: persistence of local causes (traumatic, metabolic, anoxic, pathological), with sustained and continued accentuation of sympathetic outflow. In this group we include all chronic arterial obliterative diseases, reflex sympathetic dystrophy (type 1), hyperhidrosis, and visceral pain syndromes.[15]

Temporary interruption of sympathetic activity is indicated in those patients in whom it is possible to remove or subdue the exciting local cause before irreparable damage to tissues has ensued and before the hyperactivity or disturbed activity of the sympathetic system has become irreversible. In this category are included the acute obstructions to arterial continuity due to laceration of a vessel, followed by suture; to embolus removed by embolectomy; and to contusion, spasm, or infection. Obviously, should these factors result in permanent obliteration of arterial flow, surgical sympathetic interruption may become necessary if collateral circulation is inadequate. It is true, moreover, that sympathetic ganglionectomy is a very intense stimulation for the development of collateral circulation.[16] Also in this category are the patients with acute thrombophlebitis, the phlegmasia alba dolens, or, in many instances, the acute, superficial thrombophlebitis occurring in varicose veins.[17] In reflex sympathetic dystrophy (type 2),[18] surgical denervation is rarely necessary, while, in type 3, therapy is purely prophylactic and is therefore temporary. (Clinical indications for interruption of sympathetic activity are outlined in table 2.)

CONTINUOUS PARAVERTEBRAL PROCAINE BLOCK

Extension of the field of usefulness of temporary interruption of sympathetic activity has emphasized the inadequacies of the two methods in general use prior to

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5a. Allen, E. V., Barker, N. W., and Hines, E. A.: Peripheral Vascular Diseases, Philadelphia, W. B. Saunders Company, 1946.

6. Kuntz, A., and Farnsworth, D. I.: Distribution of Afferent Fibers via the Sympathetic Trunks and Gray Communicating Rami to Brachial and Lumbosacral Plexuses, J. Comp. Neurol. **53**: 389, 1931.

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8. Langworthy, O. R.: General Principles of Autonomic Innervation, Arch. Neurol. & Psychiat. **50**: 590 (Nov.) 1943.

9. Doupe, J.; Cullen, C. H., and Chance, G. Q.: Posttraumatic Pain and Causalgic Syndrome, J. Neurol., Neurosurg. & Psychiat. **7**: 33, 1944.

10. Livingston, W. K.: Pain Mechanisms: A Physiologic Interpretation of Causalgia and Its Related States, New York, the Macmillan Company, 1943.

14. Kirgis, H. D., and Kuntz, A.: Inconstant Sympathetic Neural Pathways: Their Relation to Sympathetic Denervation of the Upper Extremity, Arch. Surg. **44**: 95, 1942.

15. Casten, D. F., and Betcher, A. M.: To be published.

1949: (1) repeated procaine infiltration of selected paravertebral ganglions and (2) chemical ganglionic blocking agents. The first method presents several disadvantages: the short duration of interruption, the necessity for repeated needle punctures, and the presence of a period of beginning sympathetic activity followed by a period of

TABLE 3.—*Effect of Sympathetic Nerve Block on Patients with Peripheral Vascular Disease*

Disease	No. of Cases	Duration of Block, Days	Result of Therapy: Excellent*	Good†	Poor‡
Thrombophlebitis, acute	4	6 to 14	4	0	0
Thrombosis, popliteal	1	5	1	0	0
Peripheral arterial disease	4	3 to 8	0	4	0
Thromboangiitis obliterans	3	5 to 7	0	2	1
Embolism (arterial)					
Popliteal	2	4	0	2	0
Brachial	1	9	0	0	1
Frostbite	1	11	0	1	0
Total	16	..	5	9	2

* Effective block: complete subsidence of symptoms.
† Effective block: temporary relief; further therapy necessary.
‡ Effective block: no effect on symptoms or progress of disease.

normal or increased activity, unless blocks are performed as often as every three or four hours. Furthermore, the full effect of sympathetic denervation of an extremity may not become apparent unless this is maintained continuously for a period of several days. This is particularly true in patients with reflex sympathetic dystrophy in whom pain is associated with disturbed function.[15] In many persons with peripheral arterial obliterative disease, relief of vascular spasm and opening up of new collaterals constitute a synchronous and progressive process.[19] A single procaine block of short duration may therefore be extremely misleading as a guide for further therapy and, as such, has been discontinued in many clinics.[20]

In our experience the use of chemical blocking agents has not been successful in providing complete sympathetic blockade. Dose schedules necessary for full local interruption result in numerous distressing side-effects of a systemic nature. Further, results are unselective and inconstant, and rarely, even with large doses, is complete interruption of sympathetic activity obtained; nor can the duration of effect be effectively predicted.[21] Finally, these agents are valueless in the treatment of the reflex sympathetic dystrophies.[1]

In 1949 Thomason and Moretz [22] reported on the establishment of continuous blockade of the paravertebral sympathetic ganglions. They inserted a Tuohy catheter in the region of the selected sympathetic ganglions and injected procaine solution through the catheter at varying time intervals. Prior to this report, continuous sympathetic blockade had been attempted by Hingson and co-workers,[23] who utilized the spinal intradural approach; by Smith and Rees,[24] who advocated continuous and prolonged spinal anesthesia; by Ruben and Kamsler,[25] who inserted a catheter through the sacral hiatus; and by Curbelo,[26] who used a catheter technique in a peridural approach. These methods have, in common, the dangers associated with spinal anesthesia, principally infection and neurological sequelae. The paravertebral approach as we now use it has neither of these dangers and is simple, selective, accurate, and persistent. Blockade may be prolonged for days or weeks, the patient may be ambulatory, and injections are easily accomplished by a nurse.

TECHNIQUE OF CONTINUOUS PARAVERTEBRAL SYMPATHETIC NERVE BLOCK

The technique of establishment of continuous paravertebral procaine block of selected sympathetic ganglions requires the following basic equipment: 25 gage needle, 80-mm. 22 gage needle, 25-mm. 18 gage needle, 16 gage Tuohy needle with Huber directional point, 3½ French Tuohy catheter and ureteral adapter, 10 cc. syringe, 2 cc. syringe, test tube, towels, gauze, towel clips, sponge forceps, and skin antiseptic solution, as well as 1% procaine, all of which are properly sterilized.

The patient is placed in the prone position with a pillow under the chest or abdomen, depending on the site of the injection. This will accentuate the bony landmarks and is most comfortable for those patients having an extremity in a plaster-of-paris boot. After suitable preparation and draping of the skin, the 22 gage needle is placed at the level of the desired sympathetic ganglion and 3 cc. of 1% procaine injected as a test dose. After five minutes the efficacy of the block is determined, and, if satisfactory, the Huber point needle is introduced alongside the first needle and its point brought down to the same plane. The catheter is then threaded through the Tuohy needle, which is simultaneously withdrawn, followed by the guide needle. The catheter is now fixed to the skin with adhesive tape. The ureteral adapter is attached to the free end of the catheter and placed in a sterile test tube, which is also conveniently fixed to the skin of the patient.

Our approach to specific ganglions has been made at the level of T_3 for interruption of the sympathetic chain

TABLE 4.—*Effect of Sympathetic Nerve Block on Patients with Reflex Sympathetic Dystrophy, Type I*

Dystrophy	No. of Cases	Duration of Block, Days	Result of Therapy: Excellent*	Good†	Poor‡
Post-traumatic					
Left upper extremity	4	3 to 5	0	3	1
Right upper extremity	3	9 to 10	0	3	0
Postherpetic, lower extremity	2	7 to 10	0	2	0
Total	9	.....	0	8	1

* Persistence of relief of pain, hyperesthesia, and sweating after block discontinued.
† Adequate and sustained relief of symptoms for duration of block.
‡ No apparent relief; effective block.

to the upper extremity and at L_2 for denervation of the lower extremity. Previous technical studies with opaque radiographic material have shown that the anesthetic agent diffuses at least one vertebral segment above and one below the catheter tip with the patient in the horizontal position. Thus, optimal results may be obtained with the catheter in the positions described. Seven cubic centimeters of 1% procaine solution is instilled through the

20a. White, J. C.: Progress in Surgery of the Autonomic Nervous System, 1940-1942, Surgery **15**: 491, 1944.

22. Thomason, J. R., and Moretz, W. H.: Continuous Lumbar Paravertebral Sympathetic Block Maintained by Fractional Instillation of Procaine, Surg., Gynec. & Obst. **89**: 447, 1949.

catheter immediately and followed by 10 cc. of 1% procaine solution at four hour intervals. Ambulation is encouraged wherever possible. As prophylaxis against possible infection around the catheter, procaine penicillin is given daily by the intramuscular route. Obviously, an aseptic technique must be maintained for the instillation of the procaine, as it would be for injection of any type. There is only one specific contraindication to this method of therapy, and that is the presence of generalized infection in the tissues at the site of proposed injection. We no longer consider the use of anticoagulant therapy as a bar to the use of paravertebral injection.

TABLE 5.—*Effect of Sympathetic Nerve Block on Patients with Reflex Sympathetic Dystrophy, Type 2*

Dystrophy	No. of Cases	Duration of Block, Days	Result of Therapy: Excellent*	Good†	Poor‡
Lower extremity, no known injury	6	2 to 14	5	1	0
Lower extremity, following fracture, old	5	4 to 12	5	0	0
Post-traumatic pain, swelling, limitation of motion, upper extremity (no fracture)	3	3 to 9	2	0	1
Intractable pain, postoperative status, old	5	5 to 7	0	4	1
Shoulder-hand syndrome	2	4 to 10	0	2	0
Phantom limb and stump pain	5	7 to 22	0	4	1
Total	26	.....	12	11	3

* Effective block: complete and persistent relief of symptoms and return of function.
† Effective block: relief of symptoms; little or no effect on function or incomplete symptomatic relief.
‡ Effective block: no symptomatic relief or functional improvement.

GENERAL RESULTS OF NERVE BLOCK

The results obtained from continuous paravertebral sympathetic nerve block in this series of 100 patients are presented in tables 3, 4, 5, and 6. (A summary of these results is given in table 7.) This study was undertaken to provide information relative to certain distinct but interrelated problems, and the results were evaluated accordingly. The problems may be stated as follows: 1. Does continuous paravertebral procaine block provide continuous, uninterrupted, adequate, and specific interruption of sympathetic impulses? 2. Has this method sufficient merit to warrant advocacy of its routine use in preference to simple or repeated procaine blocks? 3. Is there sufficient justification for the use of continuous sympathetic block as a prophylactic and therapeutic method in patients with reflex sympathetic dystrophy (types 1, 2, and 3) and in patients in whom at the time of injury or surgery the development of such a syndrome may be anticipated?

Results in each patient were carefully observed and analyzed on the basis of objective and subjective criteria. Objectively, the usual criteria employed to determine the extent and adequacy of sympathetic interruption were utilized: elevation of peripheral skin temperature, abolition of sweating, increase of minute volume flow of blood as determined by plethysmography, development of Horner's syndrome (in upper dorsal ganglion blocks), the abolition of reflex vasomotor phenomena, and subsiding edema. Subjectively, relief of ischemic pain, increase of walking tolerance, disappearance or amelioration of causalgic pain, and increased functional capacity are the best criteria of satisfactory sympathetic interruption. In addition, careful and repeated observations were made at various intervals to determine the duration of blockade with each procaine injection and to check the continuing efficacy of the repeated injections. Since it was considered particularly desirable to avoid periods of escape or rebound of sympathetic activity once the optimum period of action of a single injection was determined, spot checks, using the above objective test, were performed at frequent but irregular intervals. Results of these observations were again correlated with subjective impressions. Finally, in the group of patients with reflex sympathetic dystrophy, the results obtained in type 2 patients after institution of continuous block were compared with findings prior to block, and in type 3 cases the results were controlled with a comparable group of patients who received no therapy directed at interruption of sympathetic activity.

The results of the continuous paravertebral procaine blocks were gratifying. By careful observation it was soon noted that almost invariably the duration of effect following the injection of 10 cc. of 1% procaine was from three to four hours. From the third to the fourth hour in some patients a slight return of sympathetic activity was observed. This was usually manifested by minor fluctuations of local skin temperature, by sweating in response to local heat, and by return of slight to variable pain. In over 80% of the patients, however, at the end of the four hour period no detectable evidence of sympathetic activity was present. On this basis, a routine was established of injecting procaine every four hours. Catheters were left in place from 2 to 26 days. Complete abolition of sympathetic activity was maintained throughout this entire period, and this was the most consistent and impressive observation. Many patients insisted on retaining the catheters after removal was advised, since relief of symptoms was so effectively maintained. Only two local complications occurred: One was pain at the site of catheter insertion and the other a slight skin irritation and infection in two patients at this site. Neither complication was troublesome, and both subsided immediately after withdrawal of the catheter.

TABLE 6.—*Effect of Sympathetic (Prophylactic) Nerve Block on Patients with Reflex Sympathetic Dystrophy, Type 3*

Dystrophy	No. of Cases	Duration of Block, Days	Result of Therapy*: Excellent†	Good‡	Poor§
Ankle fusion	10	3 to 18	9	0	1
Knee fusion	3	6 to 21	2	1	0
Hip fusion	2	4 to 23	0	2	0
Wrist fusion	2	10	2	0	0
Fractures, simple					
Closed reduction	4	6 to 16	4	0	0
Open reduction	6	7 to 8	6	0	0
Fractures, compound	5	3 to 7	2	3	0
Saucerization for osteomyelitis	3	11 to 20	1	2	0
Midthigh amputation	2	4 to 14	0	2	0
Tendon transplant or repair	5	5 to 15	4	1	0
Nerve repair or transposition	3	5 to 10	2	1	0
Skin grafting with pedicle	4	17 to 26	2	2	0
Total	49	.....	34	14	1

* This group compared with comparable group of 50 control cases; results are relative, not absolute.
† Complete pain relief; no edema; increased circulation; early ambulation or motion; accelerated healing.
‡ No analgesics necessary; minimal edema; some evidence of increased circulation and earlier functional return.
§ No apparent relief.

RESULTS IN SPECIFIC CLINICAL CONDITIONS

Having established the efficacy of the continuous method, it remained to be seen whether this procedure was more beneficial than repeated blocks and whether, in certain categories, it might replace surgical sympathectomy. The essential workability of the continuous block was established in patients listed in table 3. This group provided the most suitable patients on whom the various methods for determining extent, duration, and completeness of sympathetic interruption could be used. Obviously, clinical improvement was not obtained in every case, since, in some, even surgical denervation was not beneficial. Despite this, we did obtain satisfactory evidence in these patients that continuous paravertebral block was actually and thoroughly efficacious in providing complete and continuous interruption of sympathetic activity to a selected area.

The second large group of patients in whom sympathetic interruption has proved of benefit is the group with reflex sympathetic dystrophy. Under this classification are grouped such entities previously described as true causalgia, minor causalgia, post-traumatic vasomotor disorders, Sudeck's atrophy, post-traumatic osteoporosis, traumatic angiospasm, chronic traumatic edema, and reflex nervous dystrophy. In another publication [18] we have classified these entities into three principal groups according to causation, severity and nature of pain, extent of accompanying vasomotor disturbance, and restriction of function. In following this classification, we observed that in type 1 patients, in whom pain was severe, lancinating, almost continuous, and unrelated to function and in whom the etiological factor of nerve injury was constantly present, the results of continuous block approximated those of surgical sympathectomy only for as long as the blockade was maintained. In this series, when symptoms recurred, a repeat continuous block was instituted; and if symptoms again recurred, surgical sympathectomy became necessary. In patients classified as type 2 (pain less severe, causation less specific and not necessarily involving nerve trauma, and functional disability marked), the results were equally satisfactory while the block was continued and, in general, more persistent after discontinuing the injections. It was possible, during the course of the block, to encourage active motion and to increase the functional range of passive motion. In the lower extremity, walking was tolerated well, whereas, before the block, patients walked only with difficulty because of aggravation of pain. In this group, also, the most encouraging subjective improvement was noted, and many patients insisted on replacement of the catheter following withdrawal. The most striking beneficial result of the continuous block in this group was the ease with which functional exercise could be instituted and the impetus that this gave to the rehabilitation of these patients. Type 3 represents perhaps a more debatable indication, but to us it was one of the most important developments of this study. We have been impressed by variations in response by patients to operations of almost comparable magnitude, particularly in cases involving the extremities. In some, convalescence was slow and return to normal functional activity was retarded by excessive pain on motion or even while at rest. The combination of excessive postoperative pain, delayed functional return, and vasomotor instability has constituted an entity that we believe merits intensive therapy.[18] In these patients (table 6) the so-called prophylactic continuous block was instituted.

While this study was being conducted, a roughly comparable group of patients was observed in whom no direct therapy directed toward abolishing sympathetic activity was instituted. The results obtained by continuous sympathetic block were exceedingly satisfactory and, in general, when compared to this control group, were as follows: marked decrease in postoperative pain, much earlier functional rehabilitation, and absence of signs of sympathetic vasomotor hyperactivity. In this group a most careful attempt was made to provide continuous and unrelenting interruption, and in every case all test methods indicated that this was achieved. Admittedly, interpretation of results in this group is difficult because of difficulty in securing adequate controls and because of the subjective nature of the findings. Nevertheless, to us this constituted the most satisfactory group of cases and the one in which was established the definite superiority of the method of continuous paravertebral procaine block, as herein presented.

SUMMARY AND CONCLUSIONS

The physiological and clinical basis for interruption of sympathetic activity to designated areas is presented, and an evaluation of the principal methods for achieving selective denervation, permanent or transient, is made. The technique of a method of continuous paravertebral procaine ganglionic block is given in detail, and the results of the use of this method in 100 patients are critically analyzed. It is concluded that this method is preferable to the use of chemical adrenolytic or ganglion blocking agents and to the simple or intermittent type of procaine block. In many cases the continuous block method may replace surgical sympathectomy. However, criteria are presented for selection of patients for permanent or temporary interruption.

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Carcinoma of Rectosigmoid.—Anterior resection with re-establishment of continuity of the bowel by means of end to end anastomosis would seem to be indicated in cases of carcinoma of the lower part of the sigmoid and, less often, in cases of carcinoma of the upper part of the rectum, when at least 2 cm. of normal sigmoid or normal rectum distal to the lower border of the tumor can be removed. . . . Relatively few lesions in the upper part of the rectum can be satisfactorily resected by this method. For the most part, the operation under consideration is intended for lesions at or near the pelvic peritoneal reflection. . . . If a lesion is said by a proctologist to be 10 cm. from the anal margin, in most instances there is good reason to hope that anterior resection, with re-establishment of continuity of the bowel can be carried out. It is well, however, to mention here that carcinoma at or immediately proximal to the peritoneal reflection, if a patient is short and obese, may not lend itself to anterior resection followed by anastomosis, whereas a similar lesion in approximately the same segment of bowel, if a patient is slender, may be adequately removed by anterior resection. Many factors, then, make such a type of resection possible or impossible.—C. F. Dixon, M.D., Carcinoma of the Rectosigmoid and Upper Part of the Rectum: Indications for Anterior Resection and Anastomosis, *American Surgeon*, October, 1952.