UPPER THORACIC SYMPATHECTOMY

An Essay

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GENERAL SURGERY

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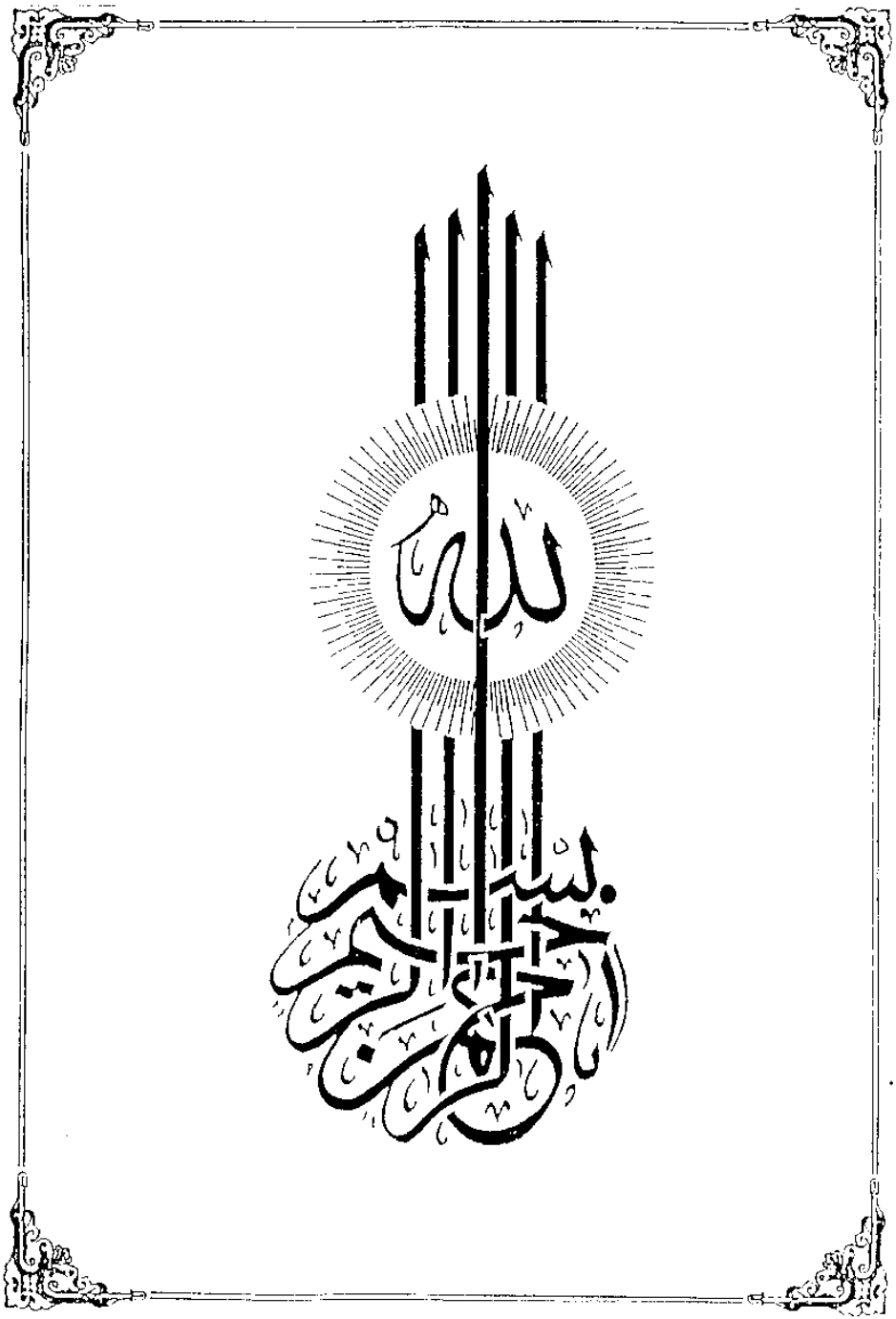
TO MY WIFE

AND

MY TWO DAUGHTERS



A C K N O W L E D G M E N T

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INTRODUCTION

I N T R O D U C T I O N

Most surgeons agree that operations performed on the sympathetic nervous system do not involve a diseased or injured structure. Therefore it has been concluded that each procedure is relatively safe and simple and results in fewer complications than most surgical procedures. Excluding technical misadventures, however, studies do not support this casual concept. Often the complication is not recognized as being directly related to the procedure, and sometimes the patient's postoperative complaint is accepted as an inevitable sequelae.

Technical complications plus those that are unexpecte and difficult to understand result in much confusion, controversy, and disagreement among surgeons regarding not only indications for sympathectomy but also the results.

Although new approaches to vascular disorders have proved worthwhile, sympathectomy may offer much to patients who have been screened properly.

The sequelae of the several types of sympathectomy may be more clearly understood if the history of each procedure is reviewed.

(Owens J.C. 1973)

Since sympathectomy was introduced as a treatment for neurological and vascular disorders at the end of the 19th century it has had a turbulent colorful history.

Between 1896 and 1921 the fluctuations of the popularity of sympathectomy began in 1896 when Jennesco advocated periarterial sympathectomy as a means of therapy for epilepsy, glaucoma, and migarine. Three years later, Jaboulay utilized it to treat ulceration of the feet.

Leriche, who was a student of Jaboulay, reintroduced periarterial sympathectomy and for two decades advocated its use in vascular disease and in painful conditions of the extrimities.

Leriche erroneously believed that the sympathetic fibres reached the periphery of the extrimity along the course of the arterial adventitial network.

Kramer and Todd in 1914, correctly described the pathway of the sympathetic fibres to the extrimity via the peripheral nerves. These studies were later confirmed by Woollard and Norrish and periarterial sympathectomy was generally replaced by ganglionectomy.

From 1921 to 1940. interestingly, Jennesco, who first advocated the use of the periarterial symathectomy, was one of the first to recommend a stellate ganglionectomy for Raynaud's disease in 1921 - during the same year, Bruing suggested its use because it had a more lasting peripheral vascular effect than periarterial sympathectomy. However the procedure did not achieve expected results in certain patients and the vasomotor tone almost invariably returned.

Kuntz, in 1927, was the first to explain the reason for the unpredicable results following a stellate ganglionectomy and its short-lived effect on vascular tone. He described direct connections between the second and third thoracic (dorsal) ganglia to the first intercostal nerve which bypassed the stellate ganglion and reached the extrimity via the peripheral nerves.

Following this report surgeons extended the stellate ganglionectomy procedure to include the second thoracic ganglion, namely a cervicothoracic or cervico dorsal sympathectomy. Again vascular tone returned, though not soon as after stellate ganglionectomy. Clinicians recognized that an adequate sympathectomy could be accomplished by an upper thoracic symathectomy in which the upper thoracic ganglia are sectioned up to the lower portion of the stellate ganglion just below the entrance of preganglionic fibres of the first thoracic ganglion.

However an adequate symathectomy was not obtained until the stellate ganglion was removed.

1940 - 1950. There was a hiatus of approximately 10 years before surgery on the sympathetic nervous system again became a common operative procedure, not only for peripheral vascular diseases but for hypertension and a seemingly endless number of disorders including angina, burns, frostbite, megacolon, pancreatitis, hyperidrosis, Causalgia and numerous other maladies.

During symathectomy's third return to popularity, surgeons again began to express widely divergent opinions about the precise value of the procedure.

Again the primary objections to symathectomy were that certain patients failed to acnieve expected results and that the beneficial effects were short lived.

From 1950 to the present time in spite of the inadequacies of the operation, the procedures continued to be performed and a trend developed not only to extend the number of ganglia removed but also to utilize several operative approaches. The list of complications increased to include some of the most unexpected and interesting postoperative problems in the field of surgery.

With the advent of ganglion blockers and reconstructive vascular surgery, symathectomy particularly as a treatment for occlusinve arterial disease, was reappraised.

(Owens J.C. 1973)

Selection of patients:

Proper selection of patients who can benifit from a sympathectomy would be easier if an accurate prediction of the results could be made preoperatively by means of some test. However no test is infalliable and since there ar no fixed rules for selecting patients for operation, this goal cannot be consistently maintained.

Generally patients who nave a favourable response to preoperative testing will do well after sympathectomy.

(Owens J.C. 1973)

SURGICAL ANATOMY

MORPHOLOGY OF THE SYMPATHETIC SYSTEM

Embrylogy of the Sympathectic System:

The ganglion cells of sympathetic system are derived from the neural crest through the median of the primitive spinal ganglia. Certain of the cells in the ventral parts of these ganglia migrate twards the sides of the aorta, where they subsequently form the ganglia of the sympathetic trunk.

Others migrate still further and eventually form the subsidiary sympathetic ganglia such as the Coeliac and renal. The original migration is limited to the thoracic and upper lumbar regions.

Thereafter the chain grows headwards and tailwards until the whole trunk is laid down.

The view has also been advanced that the sympathetic ganglion cells are, at least in part derived from cells which migrate from the ventral lamina along the ventral nerve roost.

The Sympathetic Nervous System:

The sympathetic nervous system which is the larger division of autonomic, includes the two ganglionated sympathetic trunks, their branches, plexuses and subsidiary ganglia. It has a much wider distribution than the parasympathetic system, for it innervate all sweat galnds of skin, the arrector muscles of the hairs, the muscular wall of many blood vessels, the heart, lungs and other viscera.

Efferent Sympathetic Pathways:

The preganglionic fibres are the axons of nerve cells in the lateral column of the grey matter of all the thoracic and the upper two or three lumbar segments of the spinal cord where they form intermediomedial and intermediolateral cell groups.

These fibres are myelenated and have diameter of 1.5 to 4.0 Mr.

They emerge from the spinal cord through the ventral roots of the corresponding spinal nerves and pass into the spinal nerve trunks and the commencement of their ventral rami, which they leave in the white rami communicants, to join either the corresponding ganglia on

the sympathetic trunks or their interganglionic parts. Since this outflow is confined to the thoracolumbar region, typical white rami communicants are also restricted to the fourteen spinal nerves.

The Sympathetic Ganglia:

Include collections of cells of the sympathetic trunks, nerve ganglia in the autonomic plexuses and the intermediate ganglia; in addition some ganglion cells are dispersed through the plexuses.

Originally the ganglia on the sympathetic trunks correpsond numerically to the ganglia on the dorsal roots of the spinal nerves; but fusion of adjoining ganglia has occured and in man are rarely more than twenty-two or twenty-three and there may be fewer discrete ganglia.

The nerve cells in the ganglia are multipolar and vary from 15 to 55 Mm in diameter.

The axons of the ganglion cells are usually fine, non myelinated fibres and constitute the postganglionic fibres. They are distributed to the excitor organ in a variety of ways.