NEW ERA OF SYMPATHECTOMY

Essay
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CONTENTS

Acknowledgment

Contents

List of figures

List of tables

١.introduction ١-٢

٢.Historical review ٣-٥

٣.anatomy of sympathetic chain ٦-٢٩

٤.physiology of the sympathetic chain ٣٠-٤٢

٥.indications for sympathectomy ٤٣-٥١

٦.techniques to sympathectomy ٥٢-١٢٦

٧.surgical results and complications of sympathectomy ١٢٧-١٤٤

Summary ١٤٥-١٤٦

Refrences ١٤٧-١٦١

Arabic summary

List of figures

figure	illustrating	page
١	General arrangement of the somatic&autonomic part of the the nrvous system	٨
٢	Anatomic organization	١٢
٣	Cranial portion of the sympathetic trunk	١٣
٤	Cervical sympthetic ganglion	١٤
٥	Detailed relations of the sympathetic cervical trunk &ganglia	١٧
٦	A-P relations of the thoracic sympathetic trunk &ganglia	١٨-١٩
٧	Sympathetic trunk plexuses(thoracic&abdominal) anterior view	٢١
٨	Sympathetic plexuses side view	٢٢
٩	Lumber sympathetic chain	٢٥
١٠	Intercommunicating branches around thoracic aorta &its branches	٢٧
١١	Sympathetic chainin pelvis	٢٨
١٢	Section of autonomic ganglia stained with H&E.	٢٩
١٣	General organization of autonomic nervous system	٣١
١٤	Nerve connections between spinal cord,sympathetic chain,spinal nerves,peripheral sympathetic chain	٣٢
١٥	Mechanism of denervation hypersensetivity	٤٠
١٦	Clinical picture of palmar hyperhydrosis	٤٣
١٧	Mechanism of reflex sympathetic dystrophy	٤٥
١٨	Position during open cervical sympathectomy	٥٢
١٩	Cutting of clavicular head of sternocliomastoid muscle	٥٣

٢٠	Anatomy of cervical chain ٧its relations	٥٤
٢١	Techniques of dissection&clipping of the sympathetic chain	٥٥
٢٢	Position of transaxillary approach	٥٦
٢٣	Incision along the line of the second intercostal space	٥٦
٢٤	Sympathetic chain beneath the parietal pleura	٥٧
٢٥	Supine position in lumber sympathectomy	٥٨
٢٦	Sympathetic chain mobilization with nerve hook	٦٠
٢٧	Endoscopic video camera	٦٦
٢٨	Fibre optic bundle with integrated irrigation mechanism	٦٧
٢٩	Soft tissue dissection tools	٧٠
٣٠	Operating room setup	٧١
٣١	Position during thoracoscopy	٧٣
٣٢	٣ Portals used in endoscopic thoracic sympathectomy	٧٥
٣٣	Position of the sympthetic thoracic chain	٧٦
٣٤	Grasping &mobilisation of the sympathetic chain by endoscopic forceps	٧٧
٣٥	Tansection of the sympathetic chain	٧٨
٣٦	Final apperance of sympathetic chain after meticulous hemostasis was achieved	٧٩
٣٧	Lateral decubitus position in endoscopic extraperitoneal approach	٨٥
٣٨	Stellate ganglion block percutanoeus	٩٠
٣٩	Image guided stellate ganglion block	٩٤

٤٠	Posterior approach to upper thoracic sympathetic block	٩٦
٤١	Intrapleural infusion for thoracic sympathetic block	٩٩
٤٢	Midthoracic sympatheic block	١٠٠
٤٣	Radiofrequency percutanoeus thoracic sympathetic block	١٠٤
٤٤	Radiofrequency lesion of a thoracic nerve root	١٠٥
٤٥،٤٦	c.t guided Radiofrequency sympathetic block	١٠٩
٤٧	Splanchnic nerves	١١٠
٤٨	Surfac landmark for celiac plexus block &cross-section of celiac plexus block	١١٣
٤٩	C.t radiographs of celiac plexus block	١١٧
٥٠	Lateral approach for lumber sympathetic block	١٢٠
٥١	Paramedian approach to the sympathetic block	١٢٢
٥٢	Correct linear spread of contrast,fluorscopic view in lumber chemical sympathetic neurolysis	١٢٥
٥٣	x-ray needle placement	١٢٦

List of tables

figure	demonstrating	page
١	Showes segmmental sympathetic supplies	١١
٢	Autonomic effect on various organs of the body	٣٨
٣	Case reports of major complications during thoracic endoscopic sympathectomy	١٣٨

Introduction

Introduction

The sympathetic division of the autonomic nervous system is the portion that equips the body to respond maximally during crisis conditions. Such reflexes, which prepare the individual for "fight or flight," include papillary dilation, deepened respiration, increased heart rate, and cutaneous vasoconstriction ***(Willd-ris and Rengachary, ١٩٩٦).***

Surgeons first employed sympathectomy during, the last decade of the ١٩th Century. At that time, Jonnesco performed cervical ganglionectomies for the treatment of epilepsy, exophthalmic goiter and (somewhat later), angina pectoris. During these same years, Jaboulay and later LeRiche carried out sympathectomies for the relief of trophic ulcers in the lower extremity. Further interest in the operation was stimulated by the work of Royleand Hunter, who believed that sympathectomy would relieve spasticity. Although their theory was proved erroneous, observations of the patients who undergone sympathectomy led to increased use for the operation for vasoactive disease. Subsequently, this procedure was used to treat a wide variety of conditions, including angina pectoris, hypertension, and vascular disease of large and small vessels. Currently, many of these conditions are no longer indication for sympathectomy, probably because new methods of treatment have been developed as in the case of angina pectoris and hypertension ***(Bunker et al., ٢٠٠٢).***

Although the early enthusiasm for sympathectomy has waned, as in cases of spastisty, epilepsy, transient cerebral ischemia, migraine, hypertension, angina pectoris, and glaucoma. Nevertheless, sympathectomy remains as a uniquely effective treatment for a number of distressing

disorders as in cases of causalgia, essential hyperhidrosis, vascular occlusive states, Raynuad's disease and visceral pain (pancreatic carcinoma, chronic pancreatitis), and shoulder-hand syndrome ***(willd-ris and Rengachary, ١٩٩٦).***

At present. the use of sympathectomy is limited to a handful of conditions, but remains an important surgical technique because it is uniquely effective in hyperhidrosis, major causalgia, and some forms of minor causalgia, shoulder hand syndrome and certain pain of visceral origin. sympathectomy is also used for the treatment of ischemic ulceration, Raynaud's phenomenon, rest pain, and other sequelae of vascular insufficiency ***(Rapee and Spence, ٢٠٠٤).***

A variety of surgical techniques have been described for sympathetic denervation. These include: (١) preganglionic cervicodorsal sympathectomy, either through: supraclavicular, transaxillary anterior transpleural (Thoracotomy) and several posterior thoracic approaches. (٢) operative method for lumbar svmpathectomy. (٣) Endoscopic method. (٤) percutaneous rediofrequency sympathectomy. (٥) chemical method ***(Saeed et al., ٢٠٠٦).***

Historical Review

Historical Review

Galen's many contributions to the field of anatomy include the earliest history of the sympathetic nervous system. A text published in ١٥٢٨ describes a nerve trunk along the rib heads that communicates with the spinal cord. He also noted three enlargements along this nerve trunk and described a ganglion at the entrance of the nerve into the abdomen. Although Galen erroneously thought this nerve was a branch of the vagus nerve, he initiated a concept that sympathy or consent existed between different parts of the body.Later anatomists described the vagus nerve and sympathetic trunk as a single functional entity until ***Estienne (***١٥٤٥***)*** correctly identified them as individual anatomical structures**.** ***Window (***١٧٣٢***)*** was the first to term the paravertebral chain "the great sympathetic nerve." Later, ***Whytt (***١٧٦٥***)*** wrote that all sympathy or consent must be referred to the central nervous system (CNS) initially, because it occurred between body parts without interconnecting nerves ***(Bonica,* ١٩٥٣*).***

The ١٩th century brought meticulous and extensive dissections by men like ***Bichat, Ehrenberg, Red, Meissner, and Auerbach***. Numerous publications during this period helped to essentially complete the anatomical understanding of the sympathetic nervous system. ***Lengley*** and ***Dickinson (***١٨٨٩***)*** proposed the name autonomic nervous system and differentiated the functional effects of the thoracolumbar and craniosacral outflows, subsequently naming the latter system parasympathetic ***(Bonica,* ١٩٦٨*).***

The beginning of the ٢٠th century brought extensive research examining the role of sympathetic nerves and the transmission of visceral

pain. ***Jonnesco*** first demonstrated that visceral pain in humans was transmitted by the sympathetic nervous system when he resected the stellate ganglion and successfully relieved a patient of angina pectoris ***(White and Sweet et al., ١٩٥٥).***

Whereas ***Koller*** first demonstrated the local anesthetic properties of cocaine in ١٨٨٤, ***Sellheim*** first used a Paravertebral approach in ١٩٠٥ to inject somatic Spinal nerves of surgical anesthesia. Techniques were later refined to allow blocks of parts of the sympathetic nervous system. ***Kappis*** and others in ١٩٢٣ began to use Paravertebral sympathetic blocks as a therapeutic measure for severe pain and certain visceral pain ***(Bonica, ١٩٦٨).***

During the ١٩٢٠s, ***Leriche*** studied the function of the stellate ganglion and subsequently reported superb pain relief from causalgia and reflex sympathetic dystrophy with stellate ganglion blocks in the upper extremities and lumbar sympathetic blocks in the lower extremities. A large group of patients injured in World War II, with causalgia and reflex sympathetic dystrophy were successfully managed with sympathetic nerve blocks ***(Rauck, ٢٠٠٠).***

Stallate ganglionectomy for the treatment of epilepsy was performed over sympathectomy by periarterial stripping, as reported by ***Jaboulay*** ١٨٩٩ and ***Leriche*** in ١٩١٣ become popular for the treatment of vasospastic disorders of the extremities. Although ***Leriche*** reported lower extremities hyperemia following this form of sympathectomy ***(Bay and Dohn, ١٩٩٦).***

Tivilkinson described posterior percutaneous radiofrequency ablation of the thoracic ganglia which was subsequently performed by ***C'huang*** and colleague stereotacticaly in ١٩٨٨. The tarnsthoracic approach to the upper sympathetic chain using video assisted endoscopic techniques is a well

tolerated and effective method to disrupt the sympathetic supply to the upper extremities, and likely to replace other more invasive open posterior or anterior surgical procedures ***(Wilkinson, ١٩٩٦).***

The debate over the extent of tissue that must be removed for adequate sympathectomy has been at least as active as that over the appropriate approach for the operation in the past, treatment failures have been attributed to hypersensivity for epinephrine following denervation that might be an incomplete denervation or the development of collateral pathways, as a result multiple versions of upper extremity sympathectomy have been proposed ***(Rothenthal and Dickman et.;١٩٩٩)***

Recent clinical and Laboratory findings indicate that $T^{٢}$ ganglionectomy is likely sufficient to treat palmer hyperhydrosis. If the hyperhydrosis includes the axilla, the $T^{٣}$ and possibly $T^{٤}$ and $T^{٥}$ ganglia should be removed as well. To treat minor causalgia or hyperhydrosis affecting the upper extremity, removal $T^{٢}$ and $T^{٣}$ ganglia along with the adjacent sympathetic nerve fibers. Removal of stellate ganglion rarely improves outcome, and it leads to Homer's syndrome in most cases. For Other disorders that respond to disruption of the sympathetic outflow respondat least partially to removal or ablation of the sympathetic chain and the $T^{٢}$ to $T^{٤}$ ganglia ***(Bay and Dohn, ١٩٩٦).***

Since World War II, refinements have continued in nerve block techniques used in the sympathetic nervous system. Needle design has improved, new local anesthetics have been developed, and a rebirth of interest in regional anesthetic techniques has helped to popularize the clinical use of sympathetic nerve blocks ***(Rauck, ٢٠٠٠).***