

**Effect of Stellate Ganglion Block on the
Incidence of Cardiac Arrhythmia and
Myocardial Ischemia after Cardiac Surgery:
A Randomized Controlled Trial**

Thesis

*Submitted for Partial Fulfillment of Master Degree in
Anesthesia*

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List of Abbreviations

Abb.	Full term
<i>AP</i>	<i>Anteroposterior</i>
<i>ATP</i>	<i>Adenosine Triphosphate</i>
<i>AVD</i>	<i>Aortic valve disease</i>
<i>CABG</i>	<i>Coronary Artery Bypass Grafting</i>
<i>CKD</i>	<i>Chronic kidney disease</i>
<i>CLD</i>	<i>Chronic liver disease</i>
<i>CNS</i>	<i>Central Nervous System</i>
<i>CPB</i>	<i>Cardiopulmonary Bypass</i>
<i>CRPSs</i>	<i>Complex Regional Pain Syndromes</i>
<i>DM</i>	<i>Diabetes mellitus</i>
<i>DR</i>	<i>Valve replacement</i>
<i>ECG</i>	<i>Electrocardiogram</i>
<i>HCV</i>	<i>Hepatitis C virus</i>
<i>HTN</i>	<i>Hypertension</i>
<i>IHD</i>	<i>Ischemic heart disease</i>
<i>IQR</i>	<i>Inter-Quartile Range</i>
<i>LAST</i>	<i>Local Anaesthetic Systemic Toxicity</i>
<i>MVD</i>	<i>Mitral valve disease</i>
<i>PABA</i>	<i>Para-Aminobenzoic Acid</i>
<i>RDS</i>	<i>Reflex Sympathetic Dystrophy</i>
<i>SD</i>	<i>Standard Deviations</i>
<i>SPSS</i>	<i>Statistical Package for Social Science</i>
<i>TEE</i>	<i>Transesophageal Echocardiogram</i>
<i>Vd</i>	<i>Volume of Distribution</i>

INTRODUCTION

The stellate ganglion is an important part of the sympathetic network formed by the inferior cervical and first thoracic ganglia. It receives input from the paravertebral sympathetic chain and provides sympathetic efferents to the upper extremities, head, neck, and heart. The cervical sympathetic chain is composed of the superior, middle, and inferior cervical ganglia (*Kwon et al., 2018*).

Large number of patients undergo coronary artery bypass grafting (CABG) each year worldwide. In the recent years, there have been major advances in techniques used in CABG surgery in order to assure better success rates and reduce complication that may occur, with an aim to reduce the rates of post-operative morbidity and length of hospital stay. Despite such advances, patients that present for CABG surgery nowadays are relatively older and frailer with multiple cardiopulmonary and other comorbidities as compared to patients operated on in the last century. Hence, the risk of occurrence of post-operative morbidity and mortality still exists and is even expected to increase due to severity of coronary disease and increasing general complexity of cases (*Bojar, 2011*).

The most important common post-operative complications of coronary artery bypass graft surgery are Cardiac tamponade (1.5%), CABG graft ischaemia (4-5%), Arrhythmia, Hypertension, and Vasoplegia.

Many studies showed that blocking the stellate ganglion result in significant decrease in the incidence of occurrence of intra-operative as well as post-operative cardiac arrhythmias, hypertension, and cardiac ischemia. Also, the major findings of these studies was that the dose of the inotrops and vasodilators needed during the operation and post-operatively was significantly lower in the patient group that received stellate ganglion block (*Bojar, 2011*).

AIM OF THE WORK

The aim of this study is to observe and record the incidence of occurrence of postoperative hypertension, cardiac arrhythmias, and ischemia in patients group that had been received a SGB, and in the other control group of cardiac surgery patients without block.

Chapter 1

ANATOMY

The stellate ganglion is an important part of the sympathetic network formed by fusion of the inferior cervical and first thoracic ganglia. It receives input from the paravertebral sympathetic chain and provides sympathetic efferents to the upper extremities, head, neck, and heart (*Kwon et al., 2018*).

The cervical sympathetic chain is composed of fusion of the superior, middle, and inferior cervical ganglia. In approximately 85% of the population, the inferior cervical ganglion fuses with the first thoracic ganglion, forming the cervicothoracic ganglion also known as the stellate ganglion (*Kwon et al., 2018*).

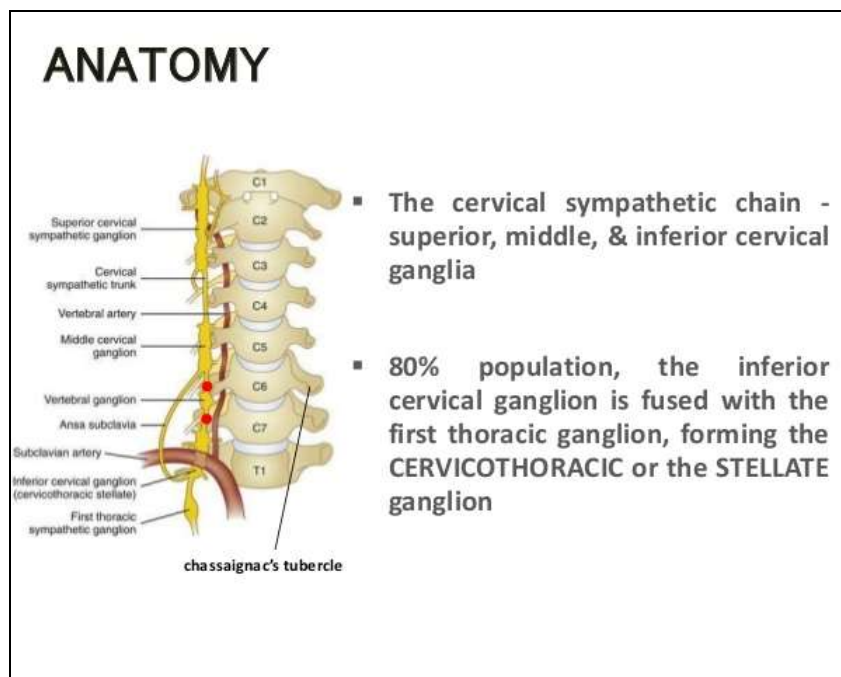


Figure (1): Cervical sympathetic chain, superior, middle, and inferior cervical ganglia (*Kolli and Mounir-Soliman, 2017*).

Understanding the anatomy of the stellate ganglion is critical for an successful effective block and to avoid serious and even life-threatening complications. The stellate ganglion lies antero-lateral to the 7th cervical vertebral body. Structures lying anterior to the ganglion include skin, subcutaneous tissue, platysma, investing cervical fascia, sternocleidomastoid muscle, and the carotid sheath (containing the internal jugular vein laterally, carotid artery medially, and vagus nerve posteriorly) (*Kwon et al., 2018*).

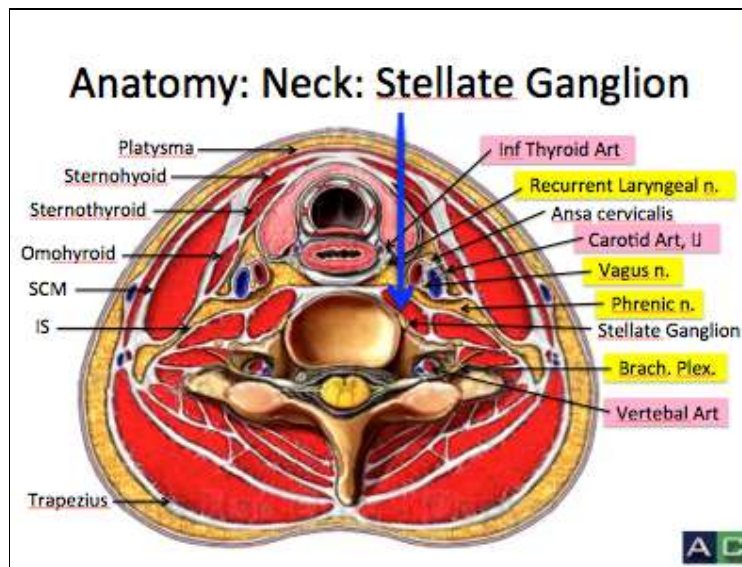


Figure (2): Cross section at the level of stellate ganglion
(Yap and Gray, 2017).

The lung apex lies anterior and inferior to the stellate ganglion. Medial structures include the 7th cervical vertebral body, esophagus, trachea, thoracic duct, recurrent laryngeal nerve, and thyroid gland. Postero-lateral structures include the anterior scalene muscle, phrenic nerve, brachial plexus and its branches, vertebral artery, and longus colli muscles. The pre-vertebral fascia should be entered before these postero-lateral structures become accessible.

The inferior (serpentine) thyroid artery lies anterior to the vertebral artery at the seventh cervical level (Yakota *et al.*, 2018).

More commonly, however, is its location as it traverses the carotid artery posterior at the 6th cervical vertebra, going medially into the thyroid gland. An important landmark located

superior to the stellate ganglion is the anterior tubercle of the the 6th cervical vertebral body, Chassaignac tubercle (carotid tubercle). This is a commonly used landmark because it could be easily palpated. Injection at this location allows for tracking of the local anesthetic down the prevertebral fascia to the stellate ganglion below (*Yakota et al., 2018*).

Indications

Indications for stellate ganglion blocks commonly fall into 1 of 2 categories, as follows:

- Pain syndromes: These conditions include complex regional pain syndromes (CRPSs) type I (reflex sympathetic dystrophy [RDS]) and type II (causalgia), hyperhidrosis, refractory angina, phantom limb pain, herpes zoster, and pain of the head and neck.
- Arterial vascular insufficiency: These conditions include Raynaud syndrome, scleroderma, obliterative vascular diseases, vasospasm, trauma, and emboli. No benefit is seen in patients with venous insufficiency (*Gofeld et al., 2018*).

Contraindications

- Patient refusal.
- Infection at planned injection site.
- Preexisting neurologic defects.
- Local anaesthetic allergy.