

COMPARISON BETWEEN CONTINUOUS THORACIC EPIDURAL BLOCK AND CONTINUOUS THORACIC PARAVERTEBRAL BLOCK FOR THORACOTOMY PAIN RELIEF

Thesis

**Sumbitted for partial fulfillment of the MD Degree in
Anesthesia**

By

Nadeen Mohamed Mamdouh Habib
(M.B.B.Ch., M.S.c. Anesthesia)

Under Supervision of

Professor Doctor. Mahmoud Sherif Mostafa

Professor of Anesthesia and Intensive Care
Faculty of Medicine
Ain Shams University

Professor Doctor. Ahmed Ibrahim Ibrahim

Professor of Anesthesia and Intensive Care
Faculty of Medicine
Ain Shams University

Doctor. Ahmed Anwer Elnoor

Assistant Professor of Cardiothoracic Surgery
Faculty of Medicine
Ain Shams University

Faculty of Medicine
Ain Shams University

۲۰۰۸

مقارنة بين الحقن المستمر خارج الأم الجافية
بالفقرات الصدرية
والحقن المستمر بجانب الفقرات الصدرية
لتسكين ألم الشق الصدري

رسالة

توطئة للحصول على درجة الدكتوراه

فى التخدير مقدمة من

نادين محمد ممدوح حبيب

بكالوريوس الطب والجراحة - ماجستير التخدير

تحت إشراف

أستاذ دكتور / محمود شريف مصطفى

أستاذ التخدير والرعاية المركزة

كلية الطب - جامعة عين شمس

أستاذ دكتور / أحمد إبراهيم إبراهيم

أستاذ التخدير والرعاية المركزة

كلية الطب - جامعة عين شمس

دكتور / أحمد أنور النوري

أستاذ مساعد جراحة القلب والصدر

كلية الطب - جامعة عين شمس

كلية الطب - جامعة عين شمس

٢٠٠٨

ACKNOWLEDGMENT

*First thanks are all due to **God** the most merciful for blessing this work until it has reached its end.*

*I would like to express my deepest gratitude to professor **Doctor Mahmoud Sherif Mostafa** Professor of Anesthesia and Intensive Care Faculty of Medicine Ain Shams University. I feel highly honored by having the chance to work under his supervision.*

*I am very grateful to Professor **Doctor. Ahmed Ibrahim Ibrahim** Professor of Anesthesia and Intensive Care, Faculty of Medicine- Ain Shams University, for his close supervision, his fruitful advices, his patience and for the great effort he has done throughout the whole work.*

*I am also grateful to **Doctor. Ahmed Anwer Elnoor**y Assistant Professor of Cardiothoracic Surgery Faculty of Medicine Ain Shams University for his kindness and his generous help in each step of this work. I had the privilege to benefit from his knowledge.*

Nadeen Mohamed Mamdouh Habib

CONTENTS

<i>Title</i>	<i>PAGES</i>
Introduction	١- ٣
Aim of the work	٤
Review of literature:	٥- ٥٦
A- Postthoracotomy pain and its physiologic impact	٥
B- Acute pain management for thoracic surgical patients:	١٦
I- Systemic analgesic treatment:	١٦
a- Systemic opioids	١٦
b- Systemic non-opioid analgesic	١٨
II- Regional analgesic techniques	١٩
A- Intercostal nerve blocks and catheters	١٩
B- Thoracic epidural analgesia	٢٣
C- Thoracic paravertebral nerve block	٣٥
Patients and methods	٥٧- ٦٦
Results	٦٧- ٩٤
Discussion	٩٥- ١١٤
Conclusion	١١٥
Summary	١١٦- ١٢١
References	١٢٢- ١٣٩
Arabic Summary	

LIST OF TABLES

<i>Table No.</i>	<i>Title</i>	<i>Page</i>
۱	<i>Drugs and dosages for intravenous patient-controlled analgesia</i>	۱۷
۲	<i>Demographic data.</i>	۶۷
۳	<i>ASA classification and type of operation in both groups.</i>	۶۸
۴	<i>The operative data in both groups.</i>	۶۸
۵	<i>Changes in the Mean Arterial Pressure values in group I.</i>	۷۰
۶	<i>Changes in the Mean Arterial Pressure in group II.</i>	۷۱
۷	<i>Comparison between the Mean Arterial Pressure in both groups.</i>	۷۲
۸	<i>changes in heart rate in group I.</i>	۷۴
۹	<i>changes in heart rate in group II.</i>	۷۵
۱۰	<i>Comparison between heart rate in both groups.</i>	۷۶
۱۱	<i>The extent of the sensory block during postoperative period in both groups.</i>	۷۷
۱۲	<i>Comparison between both groups as regards VAS.</i>	۷۸

١٣	<i>Comparison between both groups as regards postoperative morphine consumption.</i>	٧٩
١٤	<i>Changes in the plasma cortisol level in group I.</i>	٨٠
١٥	<i>Changes in the plasma cortisol level in group II</i>	٨٠
١٦	<i>Comparison between both groups as regards the the plasma cortisol level.</i>	٨١
١٧	<i>Changes in the plasma glucose level in group I.</i>	٨٢
١٨	<i>Changes in the plasma glucose level in group II.</i>	٨٣
١٩	<i>Comparison between both groups as regards the the plasma glucose level</i>	٨٤
٢٠	<i>Changes in the PaO_٢/FiO_٢ in group I.</i>	٨٤
٢١	<i>Changes in the PaO_٢/FiO_٢ in group II.</i>	٨٥
٢٢	<i>Comparison between both groups as regards PaO_٢/FiO_٢.</i>	٨٥
٢٣	<i>Comparison between both groups as regards PaCO_٢</i>	٨٦

۲۴	<i>Changes in the respiratory functions in group I.</i>	۸۷
۲۵	<i>Changes in the respiratory functions in group II.</i>	۸۷
۲۶	<i>Comparison between both groups as regards the preoperative respiratory functions.</i>	۸۸
۲۷	<i>Comparison between both groups as regards the postoperative respiratory functions.</i>	۸۸
۲۸	<i>Changes in the PEFr in group I.</i>	۹۰
۲۹	<i>Changes in the PEFr in group II.</i>	۹۱
۳۰	<i>Comparison between both groups as regards the PEFr</i>	۹۱
۳۱	<i>Comparison between both groups as regards intraoperative fentanyl consumption</i>	۹۲
۳۲	<i>Comparison between both groups as regards the total volume of ropivacaine infused over ۲۴hr.</i>	۹۳
۳۳	<i>Comparison between both groups as regards complications.</i>	۹۴

LIST OF FIGURES

<i>Fig. No.</i>	<i>Title</i>	<i>Page</i>
١	<i>The physiologic neuroendocrine response to surgery.</i>	٦
٢	<i>Neural pathways for sympathetic activation in response to surgery.</i>	١٠
٣	<i>Anatomy of the epidural space</i>	٢٤
٤	<i>Lumbar and thoracic epidural technique.</i>	٢٦
٥	<i>Position of the needle for thoracic epidural technique.</i>	٢٧
٦	<i>anatomy of paravertebral space</i>	٣٦
٧	<i>Patients position during thoracic paravertebral block.</i>	٣٩
٨	<i>Schematic thoracic spinal nerve.</i>	٤٠
٩	<i>Optimal needle position during thoracic paravertebral block.</i>	٤١
١٠	<i>Radiographic appearances after contrast medium infusion through a correctly placed paravertebral catheter.</i>	٤٢

၁၁	<i>Optimal position of a paravertebral catheter</i>	၄၄
၁၂	<i>Chemical structure of Ropivacaine</i>	၈၂

١٣	<i>Mean Arterial Blood Pressure values at different times in both groups</i>	٧٣
١٤	<i>Extent of sensory block in both groups.</i>	٧٧
١٥	<i>The postoperative distribution of the VAS in both groups.</i>	٧٨
١٦	<i>The postoperative morphine consumption in both groups.</i>	٧٩
١٧	<i>The changes in the plasma cortisol level in both groups.</i>	٨٢
١٨	<i>The changes in the plasma glucose level in both groups.</i>	٨٣
١٩	<i>The changes in PaO_٢/FIO_٢ in both groups</i>	٨٦
٢٠	<i>The changes in the FVC in both groups</i>	٨٩
٢١	<i>The changes in the FEV_١/FVC in both groups</i>	٨٩
٢٢	<i>The changes in the FEF_{٢٥-٧٥} in both groups.</i>	٩٠
٢٣	<i>The changes in the PEF_R in both groups.</i>	٩٢

LIST OF ABBREVIATION

Introduction

Thoracotomy can be one of the most painful types of incision that patients can experience. Several different thoracotomy incisions are used in current practice. Thoracotomy for lung resection usually involves a posterolateral skin incision at the 4th intercostal space, a variable degree of muscle cutting and either excision or division of a rib. Forceful retraction of the wound is needed to achieve reasonable access and this frequently causes pressure on the intercostal nerves and may cause acute intercostal neuritis. Other sites damaged by retraction are the anterior and posterior intercostal articulations. Up to three chest drains may be inserted after thoracotomy. The prolonged lateral decubitus position with upper arm supported on a gully may be associated with postoperative generalized muscular pain. Furthermore, patients may well be extremely anxious after major thoracic surgery, exacerbating the perception of postoperative pain induced by all the previously mentioned factors (***Richard and Fang, ۲۰۰۵***).

Adequate pain relief is an obvious humanitarian issue. The consequences of poor analgesia as shallow breathing and impaired coughing are a major cause of atelectasis and retention of secretions, both of which can lead to hypoxemia, hypercapnia and

respiratory failure, especially in patients with pre-existing lung disease. Also acute pain causes increased sympathetic tone accompanied by increased myocardial oxygen demand, increased afterload, myocardial dysfunction and arrhythmias. Poor analgesia may also result in a delay in patients' mobilization with increased incidence of deep venous thrombosis and pulmonary embolism, longer ICU admissions, and overall hospital stay (**Richard and Fang, ۲۰۰۵**).

Thoracic epidural analgesia is often regarded to be the gold standard for post-thoracotomy pain relief (**Slinger, ۲۰۰۴**). However, there are several drawbacks. There is a failure rate of up to ۱۵% even in experienced hands. Placement of a thoracic epidural catheter may be technically difficult because of caudal angulations of the spinous processes and spinal cord damage is theoretically more likely than the lumbar placement. The unilateral nature of a thoracotomy means that bilateral analgesia should be unnecessary. Furthermore, the consequential bilateral sympathetic blockade frequently causes hypotension. Motor blockade of intercostal muscles may reduce the effectiveness of coughing. The technique is contraindicated in the presence of local or systemic sepsis (**Richard and Fang, ۲۰۰۵**).