Recent Modalities in Anterior Surgical approaches in Management of Dorsal and Lumbar Spine Disorders

Essay

Submitted for Partial Fulfillment of the Master Degree
In General Surgery

By

Abdelmaksod Mohammed Mousa
M.B., B.CH

Under Supervision of

Prof. Dr. Ahmed Abdelaziz Abou-Zaid

Professor of General Surgery
Faculty of Medicine -Ain Shams University

Dr. Ayman Abdel-Raouf El-Shazly

Assist. Professor of Neurosurgery
Faculty of Medicine -Ain Shams University

Dr. Salah Moawad Hasanin Raslan

Lecturer of General Surgery
Faculty of Medicine -Ain Shams University

Faculty of Medicine
Ain Shams University
2011

بسم الله الرحمن الرحيم

اقْرَأْ بِاسْمِ رَبِّكَ الَّذِي خَلَقَ خَلَقَ الإِنسَانَ مِنْ عَلَقٍ اقْرَأْ وَرَبُّكَ الأَكْرَمُ * الَّذِي عَلَّمَ بِالْقَلَمِ عَلَّمَ الإِنسَانَ مَا لَمْ يَعْلَمْ *

صدق الله العظيم

Acknowledgment

First of all I would like to thank ALLAH for supporting me allover my life and stands beside me in all my difficulties.

Secondly, I can't express my deep thanks and gratitude to my Professor Dr. Ahmed abdelasis abou-Zaid Professor of General Surgery Ain Shams University for his valuable supervision and continuous guidance and encouragement to continue this work to whom I owe deep thanks.

My deep sincere thanks and appreciations goes to Dr. Ayman El-Shazly Assistant Professor of Neurosurgery Ain Shams University for his great help and assistance, intensive effort to whom I remain inspired by his grateful thoughts.

I highly appreciate the indispensable advice, the keen interest and valuable assistance of Dr. Salah Raslan lecturer of General Surgery Ain Shams University to whom no words can be enough to his hard effort during the whole study.

I cannot also forget to thank all the members of the Neurosurgery Department Ain Shams University for their great help and valuable cooperation.

Dedication

I dedicate this work to the Soul of my Mother who was the gift of Allah for me, my kind Father and to all the members of my family for their continuous support and help ...

Abdelmaksod M. Mousa
2011

CONTENTS

List of Abbreviations

- *AIDS-Acquired Immuno-Deficiency Syndrome.*
- *AIS-Adolescent Idiopathic Scoliosis.*
- *ALIF-Anterior Lumbar Interbody Fusion.*
- *AMD-Arthroscopic Microdiscectomy.*
- *BERG-Balloon-Assisted Endoscopic Retroperitoneal Gasless.*
- *BMP-Bone Morphogenic Protein.*
- *CCD-Charged Coupling Device.*
- *CES-Cauda Equina Syndrome.*
- *CNS-Central Nervous System.*
- *CVSL-Central Vertical Sacral Line.*
- *CT-Computed Tomography.*
- *FDA-Food and Drugs Administration.*
- *FEV-Forced Expiratory Volume.*
- *FVC-Forced Vital Capacity.*
- *MED-Microendoscopic Discectomy.*
- *MLND-Mediastinal Lymph Node Dissection.*
- *MOTA-Mini-Open Thoracoscopically Assisted.*
- *MRI-Magnetic resonance imaging.*
- *NSAIDs-Non-Steroidal Anti-Inflammatory Drugs.*
- *REAM-Retroperitoneal Endoscopically Assisted Minilaparotomy.*
- *RGB-Red, Green, Blue.*
- *RVA-Rib-Vertebral Angle.*
- *SSEP-Somato-Sensory Evoked Potential.*
- *SRS-Scoliosis Research Society.*
- *TB-Tuberculosis.*
- *VATS-Video-Assisted Thoracoscopic Surgery.*
- *VATS-ASFI-Anterior Spinal Fusion and Instrumentation.*
- *VATS-RF-Video-Assisted Thoracoscopic Surgery-Release & Fusion.*

Recent Modalities in Anterior Surgical approaches in Management of Dorsal and Lumbar Spine Disorders

Essay

Submitted for Partial Fulfillment of the Master Degree
In General Surgery

By

Abdelmaksod Mohammed Mousa
M.B., B.CH

Under Supervision of

Prof. Dr. Ahmed Abdelaziz Abou-Zaid

Professor of General Surgery
Faculty of Medicine -Ain Shams University

Dr. Ayman Abdel-Raouf El-Shazly

Assist. Professor of Neurosurgery
Faculty of Medicine -Ain Shams University

Dr. Salah Moawad Hasanin Raslan

Lecturer of General Surgery
Faculty of Medicine -Ain Shams University

Faculty of Medicine
Ain Shams University
2011

Chapter 8

SUMMARY AND CONCLUSION

Minimally invasive techniques are becoming more wide spread in the surgical subspecialties. Standard open surgical procedures are being modified to become less invasive, with the hope of decreased recovery time, lessened morbidity, and ultimately cost saving. Improvements in technology have allowed the surgeon to peer into body cavities and create potential spaces as the retroperitoneal and the neuroforaminal space without the need for traditional extensive surgical approach. Improved fiberoptics, light sources, and the advent of the 3 dimensional camera have resulted in improvements in visualization of the structures surrounding the spine.

The principal purpose of these minimally invasive endoscopic techniques is to approach the spine through portals rather than larger skin incisions. At the target site, the same operative procedure is performed using an endoscopic approach as is performed using an open approach, the difference being a smaller, less invasive access. Benefits include decreased soft tissue disturbance leading to lesser postoperative scarring, pain, and reduced ultimate healing time.

These new modalities have been used in patients with the following indications: Thoracic and lumbar disc herniations, fractures, spondylodiscitis/spondylitis, palliative treatment of monolocular malignant tumors, enucleation or marginal excision of benign tumors or tumor-like lesions, anterior biopsies of lesions providing no indication of their malignant or benign nature.

Video-assisted thoracoscopic surgery (VATS) and mini-open thoracoscopically assisted thoracotomy (MOTA) are two minimally

invasive approaches to the thoracic spine. Both reduce surgical trauma, improve cosmesis and provide effective exposure for release and fusion resulted in corrections that compare favorably with open thoracotomy.

These techniques have distinct advantages compared to to open thoracotomy. Small incisions are made in the intercostal spaces, without retracting any ribs. This approach can reduce postoperative pain, shorten the length of hospitalization, improve cosmetic appearances, and allow early resumption of activity. Minimally invasive surgery has revolutionized almost all areas of surgery. The use of endoscopes permits surgical maneuvers to be performed through small incisions that facilitate a patient's recovery.

Video-assisted thoracoscopic surgery can be used for a variety of spinal indications. The nerve roots and the spinal cord can be decompressed, bone grafts can be placed for interbody fusion and vertebral body reconstruction, and internal fixation devices can be applied to stabilize the spine. Thoracoscopy can be used to perform thoracic sympathectomies, to resect thoracic disk herniations, to biopsy thoracic vertebral body lesions, to release complex spinal curvatures for reduction of scoliosis, to perform vertebrectomies, to resect tumors, to debride infections, and to treat spinal fractures. The thoracic spine is exposed easily by temporarily deflating one lung using a double-lumen endotracheal tube. The collapsed lung creates a large empty working space in the pleural space in which to access the thoracic and lumbar spine.

The continued growth and development of thoracoscopic spinal surgery depend on four major issues:

(1) Educating and credentialing of surgeons.

(2)Collecting prospective data, analyzing outcomes , and performing rigorously controlled scientific studies.

(3) Developing and implementing new technology.

(4) Expanding clinical and surgical applications.

Besides the well-known complications of conventional open procedures, the following potential intraoperative complications may be faced: Inadequate exposure due to wrong positioning and/or localization, Direct or indirect injury to lung, thoracic duct, azygos/hemiazygos vein, segmental vessels, aorta or heart, intercostal vessels, intercostal nerves, and sympathetic chain/splanchnic nerves, Spinal cord injury or ischemia, Dural tears. Control of vascular injuries is most demanding through a limited transthoracic approach. The surgeon should always be prepared to enlarge the surgical field to a conventional thoracotomy if such complications cannot be managed adequately.

The concept of a minimally invasive approach to the thoracic and lumbar disorders for diagnostic or therapeutic purposes has been known since the last century and the experience with VATS has had benefits in other fields of medicine. In spine surgery it has only been used for a few years, so it is too early for an evaluation of the results.All publications on treatment series are small and none of them has had enough follow-up time to evaluate long-term results. Short- and medium-term results are very promising and we must consider that, in future, spinal cord decompression produced by a fracture may become a routine procedure with the VATS technique, the patient being discharged from hospital after just a few hours with a minimum of surgical intervention. Also anterior vertebral correction of deformities can be carried out without having to decided whether to perform a thoracotomy and a posterior fusion.

The actual results obtained with the thoracoscopic technique for spine surgery prove that this minimally invasive procedure has satisfied the expectations of a few years ago.

Experience obtained from other areas of surgery in which endoscopic surgical techniques are used, enhanced by the technical improvements of instruments and equipment, allows us to turn this procedure into a real tool to be considered as a routine method in the treatment of spine disorders where the anterior approach is indicated. It is important to highlight the development of vertebral implants that can be applied by the thoracoscopic technique, which complete the cycle of the objective in spine surgery, "decompress, align, and stabilize." Mastery of this technique has turned into a reality the direct advantages to the patient by reducing the healing period and complications. Also surgical time and in-hospital stay have been reduced, with a direct impact on treatment costs.

As with any new procedure, the VATS technique for spine surgery underwent a period of observation until it was proved that it was indeed an effective and useful resource for the treatment of spine disorders. While mastering the surgical technique, the surgeon must recognize the importance of working with a multidisciplinary team. Even though gaining access to the thoracic cavity with the thoracoscope does not represent greater technical difficulties, the close proximity of the different organs in the surgical field are still a potential risk for complications.

Careful planning of any surgical procedure is the key to obtaining a good final result, so it is very important to remember that the selection of patients to be treated with the VATS technique must be very careful. Every step should be analyzed and consideration given to the indications, limits, and contraindications for the technique.

Finally, it is very important to mention that the thoracoscopic technique is a procedure that requires a period of education and practice to be mastered. Candidates for learning this technique must be spine surgeons

already experienced in open approaches to the thorax and abdomen.While it may be true that we have greatly improved the learning curve, we must not forget that it never ends.

Laparoscopic surgical approaches have dramatically altered the field of general surgery. The advantages of transperitoneal laparoscopic surgery for the patient include smaller incisions with lessening postoperative pain, lack of postoperative ileus, and early hospital discharge. For the surgeon, there is improved visualization of the surgical anatomy and greater participation for the entire operating team, who can watch the monitor during the surgical procedure. Laparoscopic platform technology is merging with robotics and image guidance systems, which will likely lead to improved surgical accuracy and lower patient morbidity.

Anterior lumbar interbody fusion by REAM (Retroperitoneal Endoscopically Assisted Minilaparotomy) can be performed without additional hazard to the patient and appears to be a reasonable alternative to existing less invasive procedures.

Transabdominal and retroperitoneal approaches for anterior lumbar interbody fusions are widely accepted, effective tools for the management of painful degenerative disk disease unresponsive to nonoperative measures. Recent advances in interbody fusion cage technology as well as recent FDA approval of bone morphogenic protein (BMP) have generated a great deal of interest in their application by laparoscopic and minimal access techniques. There are several potential advantages to a spinal fusion system that can be inserted using a laparoscopic. This approach avoids posterior incisions with associated trauma to the paraspinal musculature. Epidural scarring, traction on nerve roots, and dural lacerations are avoided with the anterior approach. However, a team approach is essential to the

success of this technology. The general and spinal surgeon must work together from the time of preoperative consultation, at surgery, and into early postoperative care to realize the full benefits of these surgical procedures and avoid the pitfalls of this surgical approach. Appropriate patient selection is vital to success. Assessment of vascular anatomy on preoperative MRI scans and identification of anomalies or vascular disease is essential to avoid vascular injury. Monopolar cautery is avoided during surgery, and blunt dissection is used to avoid injury to the superior hypogastric plexus.

The laparoscopic transperitoneal approach to the lumbar spine and the BERG method has been successfully applied in multiple centers. Each method has several clear benefits. There appears to be a faster recovery over open techniques, and some studies have demonstrated less blood loss. Nonetheless, it remains a very technically challenging procedure. There is a steep learning curve that must be maintained with surgical frequency.

At the end, anterior spinal endoscopy, like any novel modality, carries with it additional risks and the surgeon must always be prepared to conversion to open procedure. The learning curve for spinal endoscopy is steep and the procedure should not be attempted alone by a non trained surgeon. Nevertheless, with training and experience, the spine surgeon can achieve better outcomes, reduced morbidity, and better cosmesis with spinal endoscopy, and the operating times are comparable to open procedures. As technology evolves and more experience is obtained, anterior spinal neuroendoscopy will likely achieve further roles as a mainstay in spine surgery.

❋ ❋ ❋ ❋ ❋ ❋ ❋

Recent Modalities in Anterior Surgical approaches in Management of Dorsal and Lumbar Spine Disorders

Essay

Submitted for Partial Fulfillment of the Master Degree
In General Surgery

By

Abdelmaksod Mohammed Mousa
M.B., B.CH

Under Supervision of

Prof. Dr. Ahmed Abdelaziz Abou-Zaid

Professor of General Surgery
Faculty of Medicine -Ain Shams University

Dr. Ayman Abdel-Raouf El-Shazly

Assist. Professor of Neurosurgery
Faculty of Medicine -Ain Shams University

Dr. Salah Moawad Hasanin Raslan

Lecturer of General Surgery
Faculty of Medicine -Ain Shams University

Faculty of Medicine
Ain Shams University
2011

INTRODUCTION

Minimally invasive techniques are becoming more wide spread in the surgical subspecialties. Standard open surgical procedures are being modified to become less invasive, with the hope of decreased recovery time, lessened morbidity, and ultimately cost saving. Improvements in technology have allowed the surgeon to peer into body cavities and create potential spaces as the retroperitoneal and the neuroforaminal space without the need for traditional extensive surgical approach. Improved fiberoptics, light sources, and the advent of the 3 dimensional camera have resulted in improvements in visualization of the structures surrounding the spine.[1]

The benefits of minimal access surgery were first recognized with the wide spread adoption of laparoscopic cholecystectomy. Since then, increasingly complex intra-abdominal procedures have been carried out using laparoscopic techniques. However, only recently has spinal surgery been included in the area of minimal access surgery.[2]

In 1910, professor Hans Christian Jacobeus first used an endoscope to view the thoracic cavity for lysis of tuberculosis pleural adhesions as an alternative to open thoracotomy. Recently, endoscopic procedures in various applications have dramatically increased in most surgical disciplines. The trend toward the use of minimally invasive procedures with endoscopic visualization of the thoracic cavity in thoracic spinal surgery has evolved similarly. The thoracoscopic approach can be used to allow the spine surgeon to gain adequate exposure of these anatomically challenging spinal lesions, which require specialized surgical techniques.[3]