ENDOSCOPIC SPINE SURGERY

Essay

submitted for partial fulfillment of master degree in orthopaedic surgery

presented by

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M B B ch

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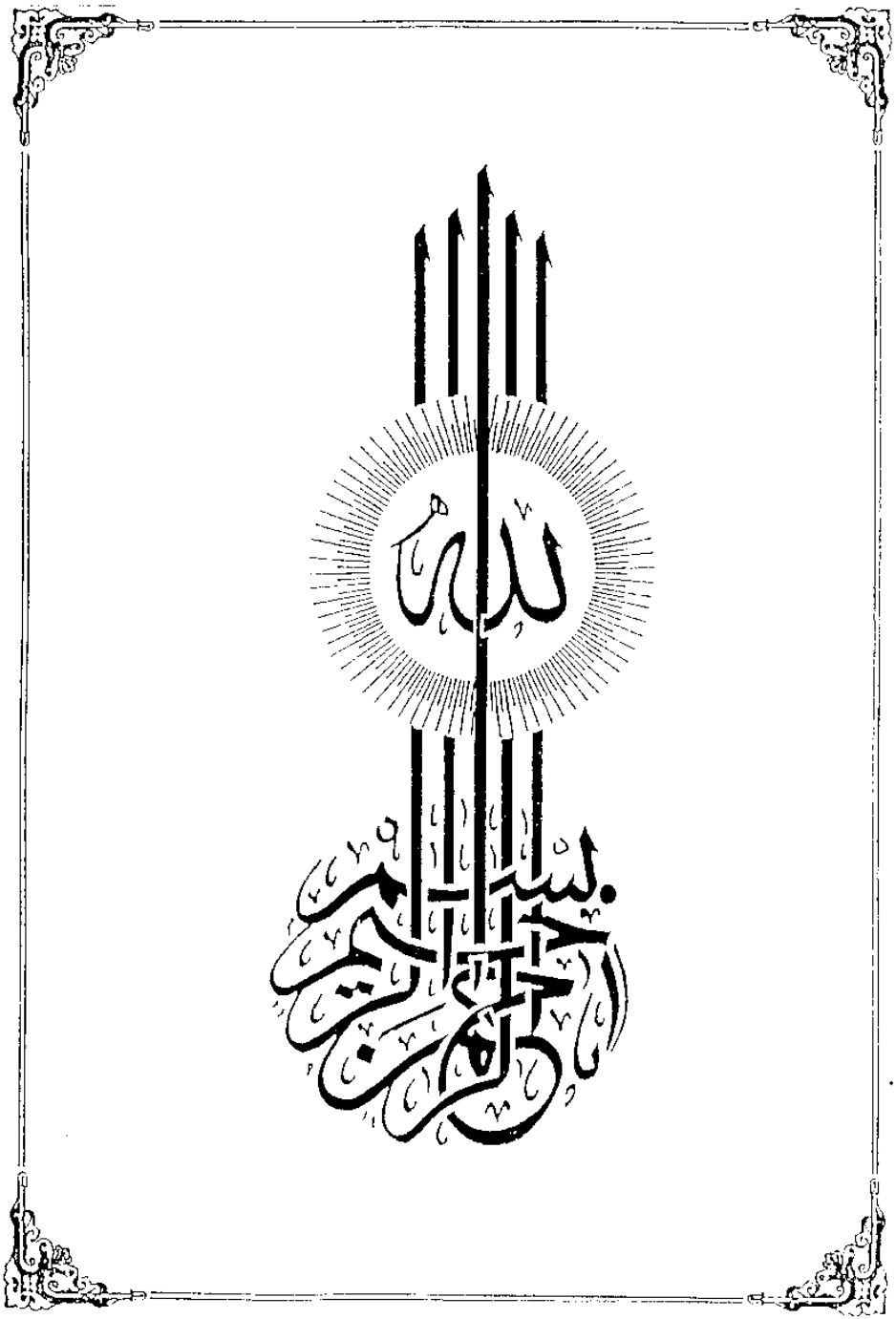
وفي أنفسكم
أفلا تبصرون

صدق الله العظيم

(الذاريات- ٢١)



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All praise to ALLAH most merciful most gracious ,nothing would have been accomplished without HIS will

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DEDECATOIN

To the greatest two persons in my life
My Parents .

INTRODUCTION

Man's curiosity to view inside of the body cavities or canals is known to date back to the time of Hippocrates (460 -375 BC) who mentioned examination of the rectum using a speculum soon adopted as a vaginal speculum as well Abu Al - Kasim in 1012 used glass mirrors to reflect light into the vaginal cavity ,thus , he was the first to use reflected light for the purpose of illuminating and observing the interior of a body cavity
(Gunning and Rosenzweig , 1991)

Endoscopic surgery began in 1805 by Bozzini who developed the first endoscope ,the *Lichtleiter* ,using candles to illuminate the orifices
(Regan and Guyer , 1997)

By the year 1879 , Nitze developed the first known cystoscope later in 1886 ,Segaglas , improved these instruments adding introductory cannulas and some mirrors to reflect the light. *Ventroscopoe* was another step made in the year 1900 by Ott ,a famous gynecologist , to visualize the abdominal cavity . Soon , the name Ventroscope was changed by Kelling to *Celioscope* .
(Hernandez et al. ,1996)

The development of Video - Assisted Thoracoscopic Surgery (**VATS**) has passed through many phases . In 1910 ,Jacobaeus used the cystoscope to visualize the thoracic cavity to aid in diagnosis and treatment of pulmonary TB . Soon he applied this technique to many pulmonary diseases such as pulmonary tumours and he developed new instruments to aid his work. Gradually he made it more valuable by using it as a definitive therapeutic tool rather than just a diagnostic one . The advanced technology with the presence of silicon chips , fiber- optics and video systems lead to the presence of today's VATS system .
(Kaiser ,1994)

Mouret and Dubois in France were the first to perform Laparoscopic cholecystectomy in 1987 shortly followed by Reddnick in the USA ,thus starting a great revolutionary change in these endoscopic techniques . This was rapidly followed by increasing waves of development of this new surgical trend .
(Moreno , 1996)

The introduction of thoracoscopic and laparoscopic techniques to the spine surgery was soon accomplished by the beginning of this decade . First , Obenchain reported his first laparoscopic lumbar discectomy in 1991 . Soon , other surgeons followed him using both VATS and laparoscopic approaches to treat many thoracic and lumbar spine problems . The introduction of cages and bone dowels , with instruments used to insert them specially designed for endoscopic spine surgery , has given the chance for anterior interbody fusion to be performed through the endoscope . More approaches, instruments and skills are being developed every day to gain the best benefit from this new era in spine surgery .
(Regan and Guyer , 1997)

This study aims to focus on the techniques and approaches of this new trend in spine surgery . Spotting lights over their current applications , advantages and benefits together with their inconveniences and complications . Available studies comparing these techniques to the conventional ones were discussed in brief as well .

ANATOMY

Related anatomy to the endoscopic spine surgery

Anatomy of the chest from inside as seen through the thoracoscope:-

Anatomy ,as seen through the endoscope ,is alive and beating with many colours and hues and always actively moving The major vessels and the heart in the proximity make the view from inside the chest spectacular

The *Lung* is the most obvious structure on entering the chest cavity It is collapsed on the working side and almost bluish with small pink areas of trapped alveolar air .The right lung has 3 lobes and the left has 2 lobes. Right pulmonary vein is often seen between the upper and the middle lobes. Knowing this , further contact is avoided

The *diaphragm* ,a very thin dome shaped muscle lying inferior to the lung ,tends to rise up in the chest at T8 -T9 level. If gently pushed down , its insertion into T11,T12 vertebral bodies can be seen .

The *heart* can be seen on the left side . It gives that enormous pulsation that tend to make most of the adjacent structures beat as well . The *Aorta* can be seen on the left side of the chest .It partially covers the right side of the spine and in cases of right side scoliosis it covers it completely .The segmental vessels taking off from the aorta can be seen under the aorta as they course over the vertebral bodies. Following the aorta upwards ,the aortic arch can be seen as it disappears over the esophagus . The *phrenic nerve* may be seen on the left side coming across the arch of the aorta then between the medial side of the aorta and the pericardium .On the right side the nerve may be more visible lying on the anterior surface of the superior vena cava. However if this nerve is seen in the field ,we are definitely in the wrong area . The *vagus nerve* on the other hand can be seen

often on the right side lying on the esophagus .It courses under the arch of the hemiazygos vein as this vein joins the vena cava and then runs downwards on the anterior surface of the esophagus .The nerve would not be seen on the left side . On the right side ,unless we are above T4 or below T 10 ,we should not expect to see the superior vena cava or the inferior vena cava .In between these levels ,segmental veins may be mistaken for vena cava .

(Blackman,1996 A)

Fig1 - Left side view at T4 level and the aortic arch
(Blackman ,1996 A)

looking up into the apex of the lung , there are some large beating structures visible through the pleura .These are the *subclavian artery and vein* .

(Blackman ,1996 A)

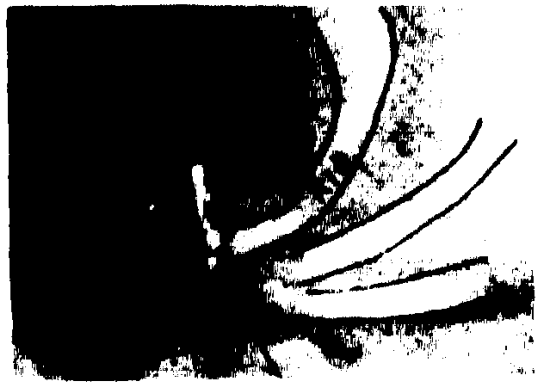

Fig 2 - View looking up into the apex of the chest (Blackman , 1996 A)

The segmental vessels are extension of intercostal artery and vein .The intercostal nerve separates from the vessels at the head of the rib and disappears through the neural foramen .From T5 downwards, the segmental vessels lie over the middle of the vertebral bodies . At T4 ,the vessels tend to slide across the vertebral body from top to bottom sometimes obscuring the disc space . It may even unite with segmental vessels at T3 and even T2 to form the conjoined vein ,*superior intercostal vein* .Both of these vessels join the arch of the azygos vein as it turns medially to empty into the superior vena cava .these vessels are easily seen and help in determining the level . the *azygos vein* on the

right side receives venous supply from the intercostal and segmental veins and it maybe mistaken for the vena cava .
(McMinn 1994)

Arteria Radicularis Magna (*artery of Adamkiewicz*)

During embryonic development ,each segment of the spinal cord receives a radicular vessel on both sides .They enter through the intervertebral foramina as the spinal arteries to penetrate the meninges and run along the nerve roots .As fetal growth proceeds ,most of these arteries disappear and those which remain anastomose with the anterior and the posterior spinal arteries .The largest of these vessels is called *Arteria Radicularis Magna (artery of Adamkiewicz)* . It is commonly at the left side at the level of T10- T11. Sometimes spinal cord is largely dependent on the radicular supply .
(*McMinn ,1994*)

If exposure is on the left side of the lower thoracic region , the surgeon should consider identifying the *artery of Adamkiewicz* via preoperative spinal angiography
(Dickman and Mican ,1995)

features of the th

The 12 *thorac* vertebral bodies l progressively from obvious under the p vessels coursing relatively narrow segmental vessels are cut ,the annul avascular structure slightly concave w showing some b intraoperative ident

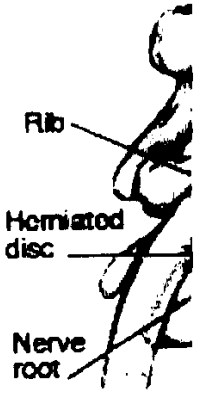

Fig 7 - Thoraci

Fig 3 - **spinal angiography for determining the level for** Arteria Radicularis Magna (*artery of Adamkiewicz*)

1- selective catheterization of the left 11th intercostal artery
2-Arteria Radicularis Magna (*artery of Adamkiewicz*)
3- anterior spinal artery
4- Normal transdural stenosis of the artery of AdamKiewicz (Weir et al. ,1992)

The sympathetic chain can be seen shining at the head of the rib level .The lesser splanchanic nerve and the greater splanchanic nerves come off about T4 and T 8 level and go over