# Surgical Treatment of Nonspecific Spinal Infections

***Essay***

*Submitted for partial fulfillment of the master degree of* ***in Orthopedic Surgery***

***By***

**Mahmoud Ibrahim Morshed Ibrahim**
**(M. B., B.Ch)**
**Ain-Shams University**

## Supervised by

**Prof. Dr. Mohamed Ahmed Maziad**
*Professor of Orthopedic Surgery*
*Faculty of Medicine*
*Ain-Shams University*

**Dr. Ahmed Mohamed Morsi**
*Lecturer of Orthopedic Surgery*
*Faculty of Medicine*
*Ain-Shams University*

**Faculty of Medicine**
**Ain Shams University**
**2013**

قَالُوا سُبْحَانَكَ لاَ عِلْمَ لَنَا إِلاَّ مَا
عَلَّمْتَنَا إِنَّكَ أَنتَ الْعَلِيمُ الْحَكِيمُ

صدق الله العظيم

سورة البقرة آية (٣٢)

# Acknowledgement

*First of all, all gratitude is due to* ***God*** *almighty for blessing this work, until it has reached its end, as a part of his generous help, throughout my life.*

*I would like to express my appreciation to* ***Prof. Dr. Mohamed Ahmed Maziad*** *professor of orthopedic surgery, faculty of medicine, Ain Shams university, for his kind and gentle guidance.*

*I would like to express my appreciation to* ***Dr. Ahmed Mohamed Morsi*** *lecturer of orthopedic surgery, faculty of medicine, Ain Shams university, for his close scrutiny, ideas and valuable discussions throughout the process of writing the essay.*

*Last but not least, I dedicate this work to my family, whom without their sincere emotional support, pushing me forward this work would not have ever been completed.*

***Mahmoud Ibrahim Morshed Ibrahim***

# Contents

# List of Abbreviations

| | | |
|---|---|---|
| Abx | : | Antibiotics |
| ALL | : | Anterior longitudinal ligaments |
| ARM | : | Arteria radicularis magna |
| ASA | : | Anterior spinal artery |
| BMA | : | Bone Marrow Aspirate |
| BMPs | : | Bone Morphogenic Proteins |
| CBC | : | Complete blood count; |
| CrCl | : | Creatinine clearance |
| CRP | : | C-reactive protein |
| CT | : | Computed tomography |
| Cx | : | Cultures |
| DRG | : | Dorsal root ganglia |
| DVT | : | Deep Venous Thrombosis |
| ESR | : | Erythrocyte sedimentation rate |
| F-18 FDG PET | : | Positron emission tomography with fluorine-18 fluorodeoxyglucose |
| FDG | : | Fluoro-2- deoxy-D- glucose |
| FSU | : | Fixed spinal unit |
| GRC | : | Gray rami communicants |
| HIV | : | Human immunodeficiency virus |
| IAR | : | Instantaneous axis of rotation |
| MRI | : | Magnetic resonance imaging |
| MSU | : | Multilevel spinal |
| NZ | : | Neutral zone |
| PCA | : | Morphine patient-controlled analgesia |
| PET SCAN | : | Positron emission tomography |
| PLL | : | Posterior longitudinal ligaments |
| PPD | : | Purified protein derivative |
| PRS | : | Penicillinase-resistant synthetic |
| PVA | : | Paravertebral abscess |
| SEA | : | Spinal epidural abscess |

# List of Abbreviations (Cont.)

| | | |
|---|---|---|
| SI | : | Spinal infections |
| SPECT | : | Single photon emission computed tomography |
| SUV | : | Standard uptake value |
| SVN | : | The sinuvertebral nerves |
| TB | : | Tuberculosis |
| TED hose | : | Thrombo-embolic deterrant hose |
| TMP-SMX | : | Trimethoprim-sulfamethoxazole. |

# List of Tables

# List of Figures

# List of Figures (Cont.)

# List of Figures (Cont.)

# Introduction

Spinal infections (SI) is a broad entity encompass a spectrum of distinct disease entities such as septic discitis, vertebral osteomyelitis, and epidural abscess, and are caused by a wide variety of organisms. Vertebral osteomyelitis represents approximately 2-7% of all cases of osteomyelitis[(1)].

Spinal infections is classified to specific and nonspecific (pyogenic), specific SI caused by TB, brucella, Syphilis and other infections - which is not our concern in this essay- while the nonspecific SI caused by many bacterial pathogens. Staphylococcus aureus remains the most common bacterial agent of pyogenic infections. In addition to TB, the HIV pandemic has caused a rise in cases due to nontuberculous mycobacteria and fungi [(2)].

In recent years, a rise in the incidence of pyogenic and nonpyogenic SI has been reported as a consequence of an increasing number of individuals with predisposing factors such as advanced age, diabetes mellitus, chronic renal or liver disease, intravenous drug use, HIV infection, long-term steroid use, malignancy, chemotherapy, severe trauma[(3)].

Diagnosis of Spinal infections is based on clinical, laboratory investigations and imaging. Suspected infections considered-in absence of microbiological or histopathological confirmation-when suggestive clinical features, appropriate MRI changes and elevated inflammatory markers were found and a positive clinical response to antimicrobial therapy was obtained[(4)].

The principles of conservative treatment are to establish an accurate microbiological diagnosis, treat with appropriate antibiotics, immobilize the spine, and closely monitor for spinal instability and neurological deterioration[(5)].

Some patients present late with failure of conservative treatment due to bacterial resistance to antibiotics, neurological complications or unfavourable general condition for chemotherapy and on them we turn to surgical management[6].

The purpose of surgical treatment is to obtain multiple intraoperative cultures of bone and soft tissue, perform a thorough debridement of infected tissue and decompression of neural structures, and reconstruct the unstable spinal column with bone graft with or without concomitant instrumentation[7].

# Aim of the Essay

This study aims to stress on:

1. The importance of  early diagnosis of spinal infections,
2. Early surgical intervention when indicated,
3. The recent trends in surgical management ,
4. The overall role of surgery, and
5. The appropriate duration of  antimicrobial treatment .

# Anatomy of The Vertebral Column

## General Characteristics:

The vertebral column usually consists of 33 vertebrae: 7 cervical, 12 thoracic, and 5 lumbar followed by the sacrum (5 fused sacral vertebrae) and the coccyx (4 frequently fused coccygeal vertebrae).

The cervical spine consists of the first 7 vertebrae in the spinal column. Typically these vertebrae are small and possess a foramen on the transverse process for the vertebral artery. The thoracic spine consists of the next 12 vertebrae and is stabilized by the attached rib cage and intercostal musculature. The lumbar spine consists of a mobile segment of 5 vertebrae, located between the relatively immobile segments of the thoracic and sacral segments. The lumbar vertebrae are particularly large and heavy in comparison with the cervical and thoracic vertebrae. The bodies are wider and have shorter and heavier pedicles, and the transverse processes project somewhat more laterally and ventrally than the other spinal segments. The laminae are shorter vertically than the bodies and are bridged by strong ligaments. The spinal processes are broader and stronger than those in the thoracic and cervical spine.

The primary curvatures are located in the thoracic and sacral regions and the secondary curvatures are located in the cervical and lumbar regions.

### *Consist of*

1- ***Bones:*** (body, vertebral arch, vertebral arch, vertebral processes, costal facets, foramina).
2- ***Soft tissues***: (disk, ligaments, muscles, blood supply).
3- ***Neural elements***: (Spinal cord and Associated Structures) .

## Bones

### *Typical vertebra: (Fig.1)*

Consists of a body and a vertebral arch with several processes for muscular and articular attachments.

### Body:

Is a short cylinder, and is separated and also bound together by the intervertebral disks.

Has costal facets on its side, which architecture with the heads of the corresponding and subjacent ribs.

### The vertebral arch:

Consists of a pair of pedicles laterally and a pair of laminae posteriorly.

Gives rise to seven processes: four articular, two transverse, and one spinous.

### Vertebral processes:

#### *The spinous process*

Projects posteriorly from the vertebral arch.

#### *The transverse processes*

Project on each side from the junctions of the pedicles and lamina articulate with the tubercles of ribs 1 to 10 in the thoracic region.

#### Articular processes (facets)

These are two superior and two inferior projections from the junction of the pedicles and laminae.