DIAGNOSTIC IMAGING OF THE SPINE

Essay

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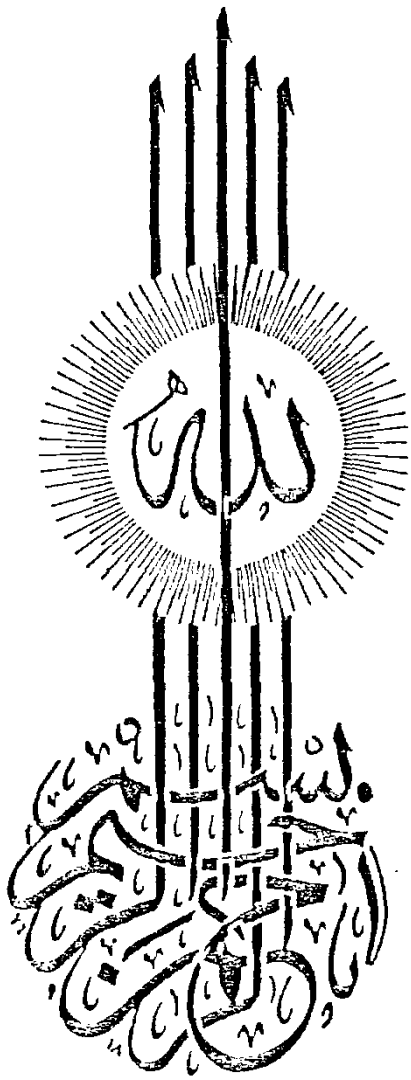

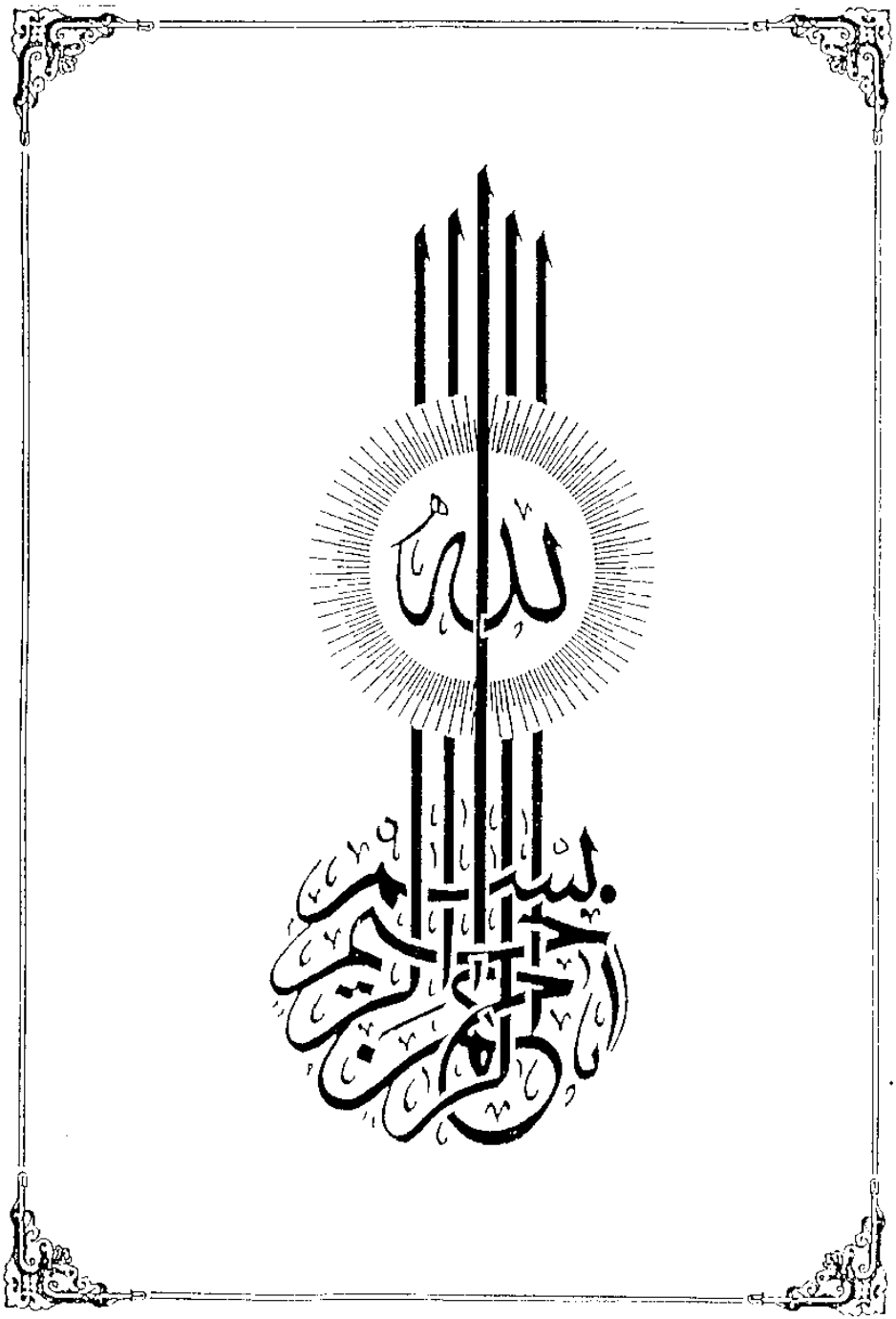

My Work is Dedicated to
The Soul of My Late Father
and to My Mother

Sources of Drive and Inspiration

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INTRODUCTION

INTRODUCTION

On December 28th, 1895, Wilhelr Conrad Roentgen presented his paper on "A new kind of rays". Since that time the ability to visualize spinal anatomy and pathology in a direct, non destructive fashion has been steadily increasing with subsequent advances in x ray production, detection and recording leading to reduction of the imaging time and patient radiation exposure markedly (Hesselink, 1988).

Effective evaluation of the spine demands not only on the capacity to visualize the complex bony structure of the vertebral column but also the ability to assess the spinal cord, exiting nerve roots, and the thecal sac that are surrounded and protected by the bony canal. Imaging of the spine had changed markedly since 1977. At that time, radiographs (plain films) sometimes coupled with motion (tomography) or contrast (myelography) and radionuclide studies were the radiologist's modalities of choice. In the last 14 years the cross sectional images of ultrasonography, computed tomography (CT), magnetic resonance imaging (MRI) and single photon emission computed tomography (SPECT) has been introduced. Each of these modalities however relies heavily upon digital

processing, and the growing trend toward the use of these digital systems emphasizes the importance of computing in medical imaging today (Bates, D., 1991).

The digital data derived from these cross sectional techniques allow more accurate three dimensional localization of the pathologic process and may provide additional information to characterize a lesion or form a differential diagnosis. Consequently, abnormalities can be detected with a higher degree of sensitivity and specificity than with the more indirect imaging modalities.

Nowadays there is a rapid shift toward CT and MR imaging as the primary diagnostic tools beyond the clinical history and physical examination. This imaging trend has been stimulated by the physicians desire to minimize the need for invasive procedures and potential risks, to improve the spatial and contrast resolution, to produce images with greater morphologic detail of the patient anatomy and pathology, and to reduce the number of imaging studies to those examinations, that yield the greatest possible sensitivity and specificity for the clinical situations.

Although MR imaging is capable of detecting small morphologic abnormalities and the indication for the alternative imaging modalities are declining and becoming more specialized, it continues to be a challenge to improve the specificity of the examination. This may be possible in the near future through the use of perfusion imaging with the use of new intravascular contrast agents, dynamic studies of C.S.F motion, and possibly MR spectroscopy. Close correlation between the imaging findings, clinical presentation, pathological condition and the results of long term follow up will define the role of each imaging technique in patient management more clearly (Ruggieri, P., 1991).

RADIOGRAPHY (PLAIN X RAY)

REVIEW OF LITERATURE

Radiography (plain x ray)

Plain radiographs offer an expensive evaluation of bony structures. They are widely available, rapidly obtained, and reveal fine bony detail because of their high spatial resolution. Radiographs represent the initial screening examination for the detection of fractures and bony malalignment. Angular deformities of the spine such as kyphosis and scoliosis may be assessed readily with conventional radiography. Conventional radiography also is a useful screening tool for the detection of congenital spinal defects such as incomplete closure of the spinal canal. The major limitation of plain radiographs is the poor visualization of soft tissues because of the markedly limited contrast resolution of this techniques (Bates, D., 1991).

Radiographic anatomy of adult vertebral column:

Cervical spine:

A routine examination of the cervical spine should comprise five projections; a full lateral, left and right oblique views, an anteroposterior projection for the mid and lower cervical regions and one taken through the mouth to show the upper 2 or 3 cervical vertebral.