THE VALUE OF ULTRASONOGRAPHY IN DIAGNOSIS OF INTRAABDOMINAL SWELLINGS IN SURGICAL CASES

Thesis

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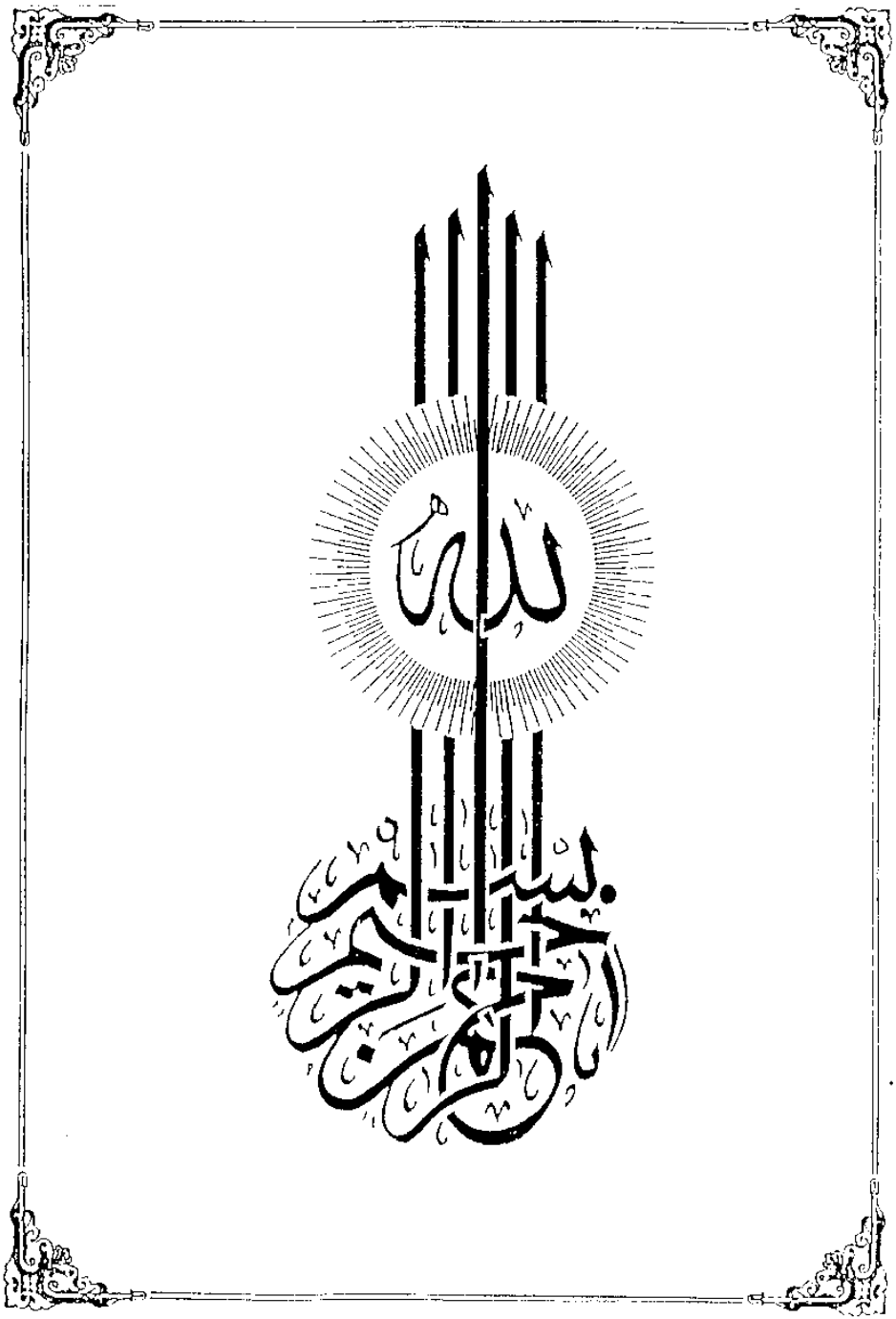

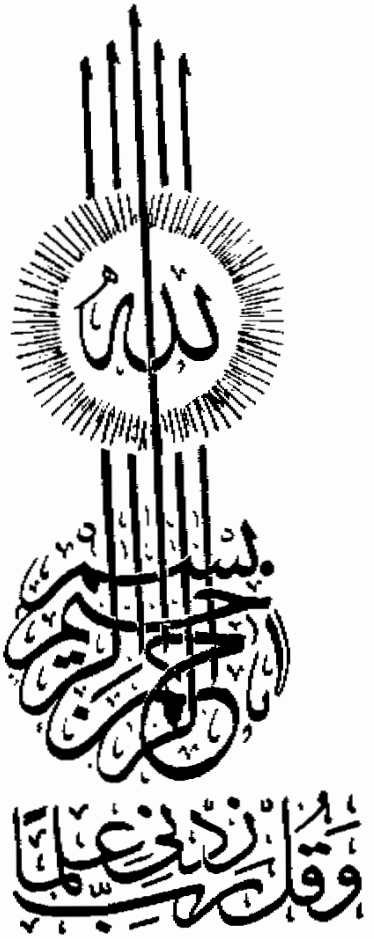

صدق الله العظيم

TO THE SOUL OF MY FATHER

CONTENTS

INTRODUCTION

Introduction:

Ultrasonography is gaining a foot as a diagnostic tool in surgeon's armamentation.

Barnett & Morley 1974 have used it in the investigation and diagnosis of practically all varieties of abdominal swellings. Ultrasonography has become established as one of the most significant, useful techniques which provides valuable informations in diagnosis of intra abdominal swellings. Ultrasounds records cross section, Anatomical relationships, the internal architecture of abdominal structures and related swellings.

Ultrasonography is non invasive, Hazardless and Painless method that requires the least preparation of the patient. Ultrasonic examination can be done in Acut conditions and emergency cases as well as in pregnant female and young childrens without harm.

No other method except ultrasonography can sharply determine wheather a swelling is solid, cystic or mixed. This is of great diagnostic aid particularly in the differentiation of some benign and malignant lesion.

Abdominal masses may sometimes be problematic in diagnosis. They have to be taken seriously because a large proportion are neoplasms and most are malignant (Boles 1967)

The early diagnosis and interpretation of the nature of abdominal masses is an important task for the surgeon. It is essential for the successful planning of the therapeutic approach.

Every available investigation should be made use of to reach rapid and correct diagnosis of the investigation available are laboratory studies, radiography by plain films, I.V.P., gastro-intestinal series, radio-isotopic procedures, lymphangiography, arteriography, needle biopsy, aspiration of cysts.

Each of the previously mentioned investigations has its Hazards, percentage error and need special preparation of the patient.

Ultrasonography is now considered as one of the most important diagnostic procedures in diagnosis of abdominal swellings because it is safe, non invasive, does not cause discomfort or morbidity to the patient, so ultrasonography is established as a useful technique which provide valuable information about abdominal swellings (Gramiak, Borg 1977).

REVIEW OF LITERATURE

Review of Literature

a- Historical Review

It was not until 1917, under the stimulus of the First World War that Langevin first achieved the generation of high frequency sonic power as a means for remote detection of submarines. Attempts were made to apply ultrasound to medical diagnosis just prior to the Second World War.

Douglas Howry (1952) is credited with being one of the truely forseeing pioneers of diagnostic ultrasound. He developed the principles of compound scanning to improve image quality. The echoes received were displayed as intensity-modulated dots on a large phosphor screen.

In 1960 a series of studies on animals were carried out to verify the anatomic-accuracy of ultrasound pictures. John Wild 1952 of the earliest pioneers, is credited with demonstrating that ultrasound could detect differences between normal tissues, benign and malignant tumours. He reported 90% accuracy in the diagnosis of benign versus malignant lesions after studying 77 patients with breast anomalies.

Ian Donald 1958 is largely responsible for the development of contact scanning concept and for pioneering the extensive application of ultrasound imaging in obstetrics and gynaecology. He started his studies in 1954 and was directed to uterine fibromyomata and ovarian tumours.

The principle of contact scanning is now almost universally used for imaging the abdomen and pelvis.

Through efforts of these early investigators and others working with them, and after them, diagnostic ultrasound has evolved into a highly useful tool of diverse clinical application.

b- Physical Principles of Ultrasound

(I) Ultrasound nature and characteristics:

Sound is a mechanical vibration of particles in a medium around an equilibrium position.

It propagates in the medium in the form of waves of alternate condensations and rarefactions, and can not travel across a vaccum.

The highest frequency sound audible to the human ear is 20.000 cycles/second or 20 kilo Hertz (KHZ), ultrasound is a sound waves above this frequency.

- Pulse-echo principle:
  when one is at the side of a canyon and shouts towards the other side, shout is a "pulse", that pulse travels through the air at the speed of sound until it hits the opposite wall of canyon where it is reflected back. Once the pulse has been reflected it becomes an "echo". The echo travels back to the person at the same speed of sound.
- The following definitions and principles are applied to ultrasound:
  - cycle: Is one complete condensation and rarefaction.
  - Wave length: Is the length between starting and ending points of a cycle.
  - Frequency: Number of cycles per unit time, it is described in terms of hertz (cycles per second).

The frequency range used in diagnostic medicine is approximately one million cycles per second with wave length of about 1.5 mm in water.

. Velocity: is the speed of sound in the medium through which sound is propagated. (Velocity = wave length x frequency), It is more in solids than liquids than gases. Thus air in lungs or gas in the bowel presents a barrier to ultrasonic examination. In a homogeneous medium the ultrasound travels in a straight line at a velocity dependent on the properties of the medium but independent of wave length.

(II) Interaction of ultrasound and tissue:

Sound energy is similar to light energy and follows many of the same physical principles as attenuation, transmission, reflection, refraction, diffraction, scattering and absorption. Attenuation: is a progressive weakening of the ultrasound beam as it travels through the tissues, it results from scattering and absorption through the medium.

Attenuation of the same sonic beam has many practical applications e.g.: in differentiating solid and cystic masses. Cystic masses have less attenuation than solid masses. Attenuation is more in bone than soft tissue.