SONOGRAPHIC ANATOMY OF THE HUMAN CERVIX

THESIS

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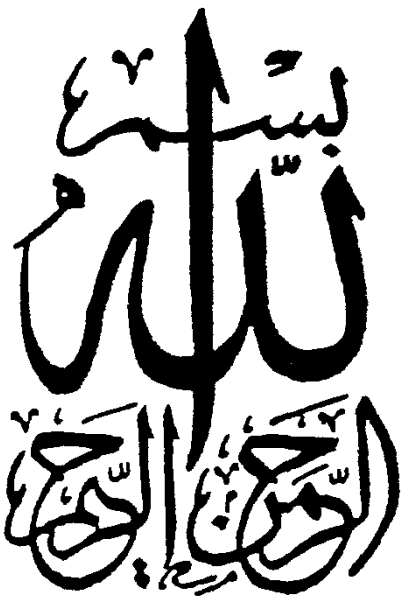

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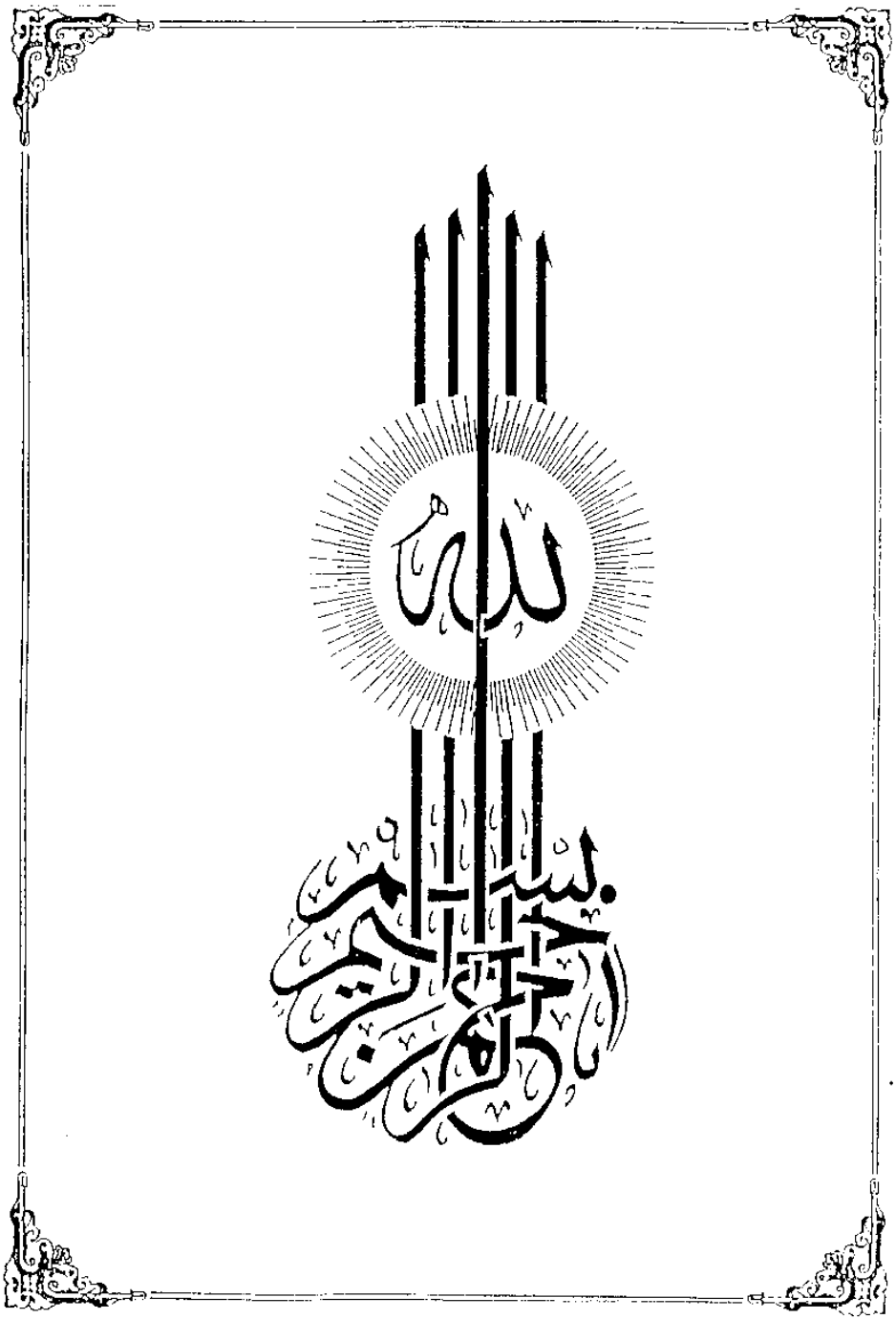

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INTRODUCTION

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SONAR an acronym for sound navigation and ranging, was first applied clinically to obstetrics and gynaecology by Ian Donald in 1958. Donald and the glasgow group stimulated the rapid development of sonogoraphic technology and interest that has resulted in a major application of this technique in our speciality.

The widespread availability of equipment, high resolution of the image, greater portability, and less expensive instrumentation have contributed to ultrasound's popularity. Moreover, the real-time images displayed are intuitively logical and thereby more likely to be interpreted. Lastly the acceptance of ultrasound as a safe and important diagnostic procedure during pregnancy by patients and health care professionals alike has added to its success.

As has been true with most technical advances, the exact role that ultrasound will play in pregnancy management is under continous review and refinement. Continuing questions of safety and cost efficacy have challenged the practice of routine obstetric ultrasound scanning. Although it is common place in some areas of the world, the use of routine pregnancy scanning is not currently accepted as a

standard practice in the United States. However, its use in high-risk pregnancy evaluation and management is widely accepted and advocated. (Burrow and Ferris, 1988).

Nonetheless, the uterus and cervix each plays an important roles during pregnancy and parturition. Because of its ability to view these regions and the changes they undergo during pregnancy, ultrasound functions as an extension of the physical examination in determining if abnormalities such as placneta previa or incompetent cervix are present. Altough fetal and maternal morbidity and mortality have decreased because of ultrasonic diagnosis of conditions affecting the lower uterine segment and cerix, their precise pathophysilogy remains to be determined.

Repeated abortion is a common clinical entity in many developing countries. Damage of the internal os is the most important traumatic cause underlying repeated abortions. The relationships of the suspected etiologic factors to cervical incompetence have been difficult to establish. Patients' past histories often include dilatation of the cervix for diagnostic curettage or abortion, cervical surgery, previous traumatic obstetric deliveries (forceps), and maternal exposure to diethylstilbestrol (as a fetus).

Approximately 2% of patients have no apparent etiology and are described as congenital (McDonald, 1980).

It is important to differentiate between a patulous internal os and an incompetent cervix. A patulous internal os is an anatomic definition denoting an abnormally dilated internal os which can be easily diagnosed by a hysterogram or ultrasound. Cervical incompetence is a term which indicates gradual progressive dilatation of the internal os during pregnancy ending in sponteneous abortion. Cervical incompetence can only be diagnosed by ultrasound by which we can monitor the process of slow dilatation of the internal os prior to actual abortion (Mahran, 1980).

Sonography plays an important role in monitoring the progress of abortion or labour, evaluating cervical incompetence, selecting patients for surgical correction, and evaluating the correction (Zemlyn 1981; Bernstine et al. 1981; Mc Gahan et al. 1981 and Sarti et al, 1979).

Evaluation of the endocervical canal by ultrasound can similarly reassure many patients and physicians by ascertaining that it appears normal.

This thesis reviews the role of ultrasound in evaluating the cervical region. It emphasizes normal anatomy and abnormal conditions such as incompetent cervix. Hopefully, future applications of ultrasound will help to solve some of the mysteries surrounding these conditions.

AIM OF WORK

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1. Identificaiton of the planes of measurements and appropriate dimension localization in hysterectomy fresh specimens.

2. Cervical tissue characterization by using the gamma correction for tissue enhancement to differentiate its anatomical boundaries.

3. Evaluation of the cervix of habitual abortion candidates and ultrasound differentiation of the competent from the incompetent cervix.

REVIEW OF LITERATURE

EMBRYOLOGY OF THE CERVIX

Mullerian ducts appear in the sixth week (8-10 mm. embryo). Each begins as a groove on lateral side of the upper part of mesonephric ridge. The lower end of the groove tends down as a solid cord of cells which acquires a lumen. At the lower end of the mesonephros, the paramesonephric duct curves medially infront of the mesonephric duct. Then it bends caudally in close contact with the duct of opposite side. The two ducts descend and reach the dorsal wall of urogenital sinus where they form an elevation called the Mullerian tubercle. The lower vertical part of the paramesonephric duct lies medial to the mesonephric duct and forms the utero-vaginal canal which forms the cervix and primitive vagina (Mahran, et al., 1973).

The cervix uteri is differentiated into two segments, namely, the portio or ectocervix and the endocervix. The exocervix derives from the invading epithelium of the urovaginal sinus or possibly the vaginal plate epithelium of the united mesonephric ducts. The endocervix is of paramesonephric origin, after fusion of the Mullerian ducts. Fusion and canalization of the Mullerian ducts are complete by the sixteenth week. The formation of the tissues which will surround them has already begun, the mesenchyme immediately adjacent to the epithelium condense into the

muscular and connective tissue coates that envelop the adult organs. The exact mechanisms responsible for the marked differences in the thickness and type of musculature developed around the various parts of the Mullerian duct are poorly understood (Crosby and Hill, 1962). Embryologically there is definable secretory activity in the endocervical glands during late embryonic life. Functionally and grossly, the cervical segment of the uterus is larger than the fundal portion during the embryonic and early developmental years (Novak and Woodruff, 1979).

THE MORPHOLOGY OF THE HUMAN CERVIX

The word cervix is derived from latin, meaning "neck or neck-like".

The human uterus has been recognized as an anatomic entity since the Third Egyptian Dynasty, about 4500 B.C. Soranus, in the first century A.D., was the earliest physician known to describe the cervix as a separate portion of the uterus (Krantz and Phillips, 1962).

* Gross Anatomy of Non-pregnant Cervix:

The cervix is the elongated lower most part of the uterus. It is connected with the upper part or corpus by a fibromuscular junction usually refered to as the internal os. It projects through the anterior wall of the vagina at the vaginal vault, as a result of which, there is an upper supra-vaginal portion and a lower vaginal portion, portio-vaginalis. The vaginal reflection is located at about the junction of the inferior and middle third of the cervix (Danforth, 1983).

In normal position the cervix is directed slightly downwards and backwards with the long axis seldom in line with the corpus. The bend usually occurs in the region of the isthmus with a variable degree of angulation. (krantz, 1973).