CURRENT STATUS OF FETAL SURGERY

AN ESSAY

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OF MASTER DEGREE IN
GENERAL SURGERY (M.Sc.)

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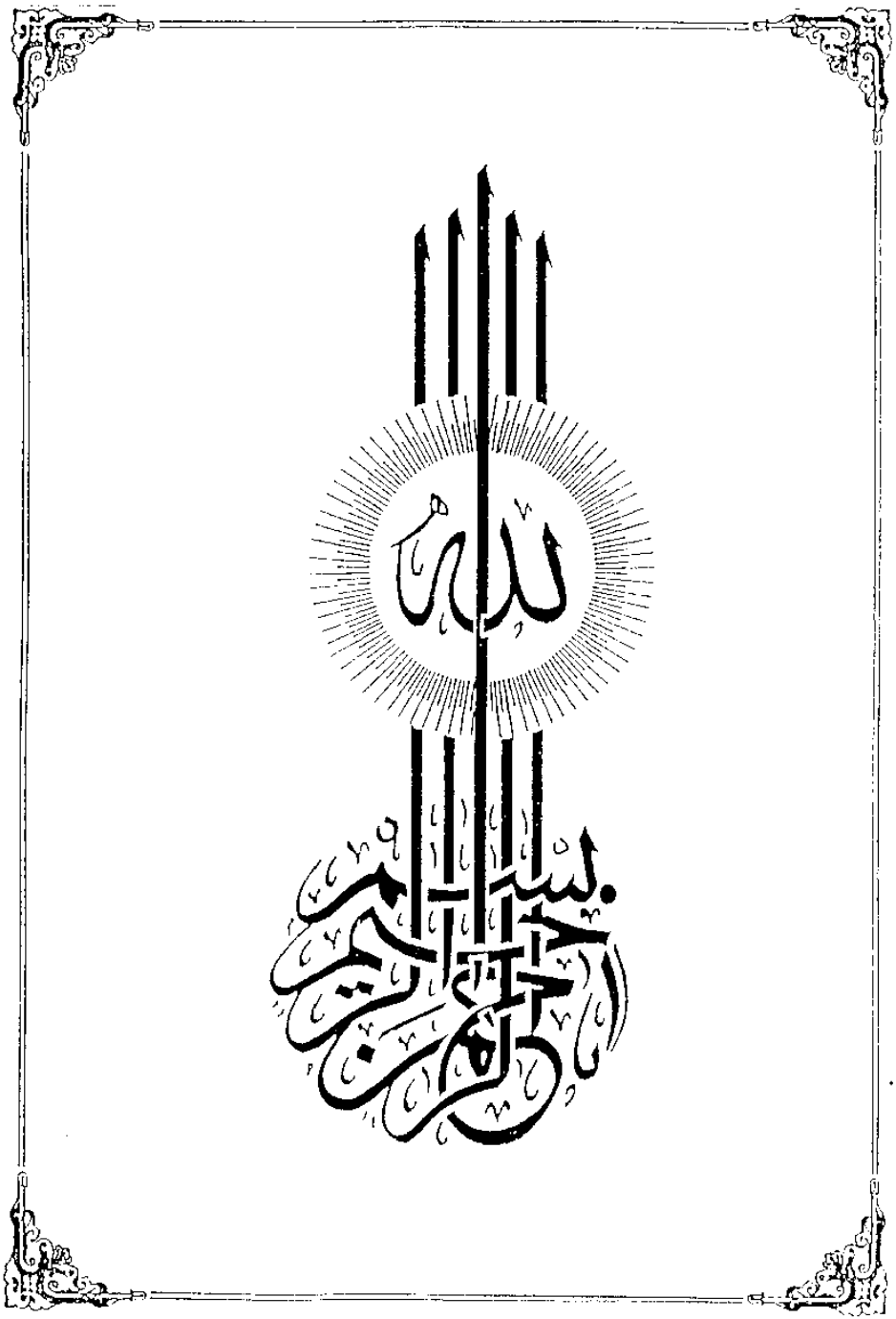

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INTRODUCTION

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INTRODUCTION

During the last 2 decades we have witnessed the revolutionary development of several techniques for prenatal diagnosis of fetal abnormalities, and ultimately, the development of fetal surgery.

Ultrasonography as a non invasive technique, has advanced rapidly in the last decade, and appeared safe to the fetus and the mother. It delineates normal and abnormal fetal anatomy, it evaluates the fetus as a whole, since malformations often occur as a part of a syndrome. Real-time sonographic evaluation may yield important information on fetal movement and fetal vital functions, serial sonographic evaluation is useful in defining the natural history and progression of fetal disease, finally fetal fluids (urine, ascitis, blood, CSF , and pleural fluid) can be aspirated under sonographic guidance for both diagnosis and therapy (Harrison et al., 1984).

Amniocentesis made possible the pre natal diagnosis of inherited metabolic and chromosomal abnormalities (Golbus et al., 1979), assessement of severity of fetal haemolytic reactions, and of fetal pulmonary maturity by estimating the amniotic fluid lecithin-sphingomyelin ratio (Depp, 1980). It is ususlly performed before 18 weeks of gestation and involves a very low risk of fe-

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tal injury or loss.

The fetoscope is best performed between 15-21 weeks gestation, it permitted visualization of a living fetus and sampling of fetal blood, and tissue biopsies, it prooved usefal also in intrauterine fetal therapy,e.g., direct intra vascular fetal transfusion (Rodeck et al., 1981). A new technique, chorionic villous biopsy now makes it possible to diagnose in the first trimester all the defects previously detected by amnio centesis in the second trimester.

The advance in these pre-natal diagnostic tools had led to the concept of grouping fetal malformations according to the line of therpay:-

a) *Fetal conditions requiring pre-natal medical treatment*:-

- Erythroblastosis fetalis, needs intra-peritoneal or intravenous red blood cell transfusion.
- Heart failure, hydrops, cardiac arrythmia need trnasplacental digitalis, propranolol, procainamide.
- Pulmonary immaturity surfactant difficiency needs trans placental cortico-steroids.
- In the future, it is possible that difficiences in cellular function will be corrected by providing appropriate stem cell graft.

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B. Fetal conditions that may require surgical treatment, are further divided according to timing of management:

1. deffects detected in-utero but best corrected after term delivery.

- oesophageal, dudenal & jugeno-ileal atresia.
- Meconium ileus, small intact omphalocele
- Unilateral multicystic and hydronephrotic kidneys
- Small sacro-coccygeal teratoma
- Small intact meningocele, meningo myelocele.

2. Defects that may lead to elective cesarean delivery rather than trial at vaginal deliverx, because of dystocia, or the patient may benifit from immediate surgical repair in a sterile environment (Harrison et al., 1984).

- Severe hydrocephalus, ruptured omphalocele
- Malformations requiring preterm delivery in the presence of obstructed labour or fetal distress.

3. Defects that may lead to induced preterm delivery, e.g.:

- Obstructive hydronephrosis and hdyrocephalus
- Gastroschisis or ruptured omphalocele.
- These conditions may compromize the functions of a specific organ system and continue to deteriorate until the lesion is

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corrected.

4. Defects usually managed by elective abortion, e.g.:

- anencephally, severe abnormalities associated with chromosomal abnormalities e.g. trisomy 13, severe untreatable,inherited metabolic disease, lethal bone dysplasia, and bilateral renal agenesis. The presence of above malformations will justify termination of pregnancy, and influence the line of management of concomitant correctable malformations.

5. Malformations that may require correction in-utero. these interfere with organ system development, and if alleviated would allow normal development.

At present only 3 of such malformations are recognized:

* Urinary tract obstruction
* Congenital hydrocephalus (aqueductal stenosis)
* Diaphragmatic hernia

A few others will be come candidates to fetal surgery when their patho-physiology is well under-stood (Harrison et al., 1981).

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In this essay, we will put light on those 3 malformations with concentration on urinary tract obstruction, as the pre-natal intervention for such an anomally is now established, and its natural history and pathophysiology are well under-stood.

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HISTORY

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HISTORY

Considering the fetus as an independent patient is not a new concept, adminstration of medical therapies to the mother to benifit the fetus has been widely practiced for many years (Depp et al., 1980).

The idea, and practice of direct fetal intervention are also not new, in1966, exteriorization of the human fetal lower limb through laparotomy, and hysterotomy incisions was reported with cannulation of fetal vesseles for exchange blood transfusion as a treatment of erythroblastosis fetalis (Harrison et al., 1980).

Lily, however, first reported percutaneous intra peritoneal intrauterine fetal blood transfusion as early as 1963 (Lily, 1963). Recent refinement of Lily's technique included U/S guided direct placement of transfusion needle into umbilical vessels. Contemplation of prenatal intervention has came about in large port as an extention to the urinary and other fetal systems of these accepted therapeutic techniques..

In the seventies, extensive experimental studies were done on fetal monkeys & lambs to outline the natural history and pa-

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thophysiology of congenital hydronephrosis and CDH, and to assess the efficacy of inutero intervention in averting the harmeful sequlae of these anomalies, and also to assess thefeasibility of in utro intervention. With this experimental work fetal and maternal risks encountered, could be obviated with marked improvement in anethetic, tocolytic and surgical procedures.

The procedure of percutaneous placement of diversion catheter shunt from the bladder or kidney to the amniotic fluid was successfully developed by Golbus & coworkers and first reported at 1982 (Golbus et al., 1982).

The miniature shunt diverting cerbrospinal fluidfrom lateral ventricles to the amniotic fluid was designed by John B. Newkirk, a bio-engineer experienced in the design and production of implantable shunting devices and the first ventriculo-amniotic shunting procedure was done in April, 1981 (Clewell et al., 1982).

In the period 1982 to 1985, 73 placements of catheter shunts for fetal obstructive uropathy, and 44 drainage procedures for obstructive hydrocephalus were done (Manning et al., 1986).

Open human fetal srugery is limited to 5 fetuses with congenital hydronephrosis, all the surgical procedures were per-

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