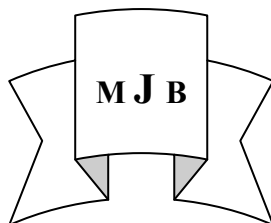


## Oligohydromnios, Sonographic Evaluation and its Clinical Implication

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### Abstract

**Introduction :** Amniotic fluid volume is an important parameter in the assessment of fetal-wellbeing. Oligohydromnios occurs in many high risk conditions and is associated with poor perinatal outcome. Many caregivers practice planned delivery by induction of labor or caesarean section after diagnosis of decreased amniotic fluid at term by an ultrasound. Decreased amniotic fluid volume is correlated with increased peripartum morbidity and mortality. Many ultrasonic methods are used to evaluate the amniotic fluid adequacy but which of these are the best, the current study will evaluate the different methods available and are commonly used in clinical practice.

**Objective:** 1.To compare the use of the amniotic fluid index with the single deepest vertical pocket measurement as a screening tool for decreased amniotic fluid volume .

2.Show the relation of that screening tool for evaluating oligohydromnios to common obstetric intervention used to terminate the pregnancy.

3.Study the effects of that method of assessing oligohydromnios , obstetric intervention on the neonatal outcome.

**Materials and methods:** 300 pregnant women attending Babylon maternity teaching hospital ( both out-patient and in- patient )from 2002 -2006, they were visiting the ultrasound department of that hospital after 34 weeks of their pregnancy for antepartum assessment of fetal well-being, a diagnosis of oligohydromnios was made by the ultrasonographer using 2 methods for evaluation, the deep amniotic fluid pocket <2cm x 1cm or amniotic fluid index=or< 5cm, then following the patients till labor was induced, or the women had cesarean section for fetal distress, neonatal outcome was followed also.

### Results:

1.When the amniotic fluid index was used ,significantly more cases of oligohydromnios were diagnosed and more women had induction of labor ,60 % versus 15% in those with the diagnosis of oligohydromnios made by deep amniotic fluid pocket,P- value was 0.001.

2.Women with oligohydromnios diagnosed with AFI <5cm were more likely to undergo cesarean section delivery for fetal intolerance of labour(25% versus 10,% in those with deep pocket ),p-value was 0.014.

3.There was no difference between the 2 groups for neonatal outcome, including : admission to a neonatal intensive care unit, birth weight, the presence of meconium, an Apgar score of less than 7 at five minutes.

**Conclusion:** The present study shows that single deepest vertical measurement in the assessment of amniotic fluid volume during fetal surveillance seems a better choice since the use of the amniotic fluid index increases the rate of diagnosis of oligohydromnios without improvement in peripartum outcome.

### الخلاصة

دراسة تمت فيها متابعة ٣٠٠ حامل زرن مستشفى الولادة والاطفال في ؛ وحدة السونار لغرض فحص السونار كجزء من متابعة الحوامل هذه المستشفى. وجد قلة في السائل الامنيوسي كتشخيص اولي باستعمال احدى الطريقتين الاولى قياس مؤشر السائل الامنيوسي والثانية طريقة اعماق جيب للسائل الامنيوسي داخل كيس الحمل وبعد متابعة الحوامل لحين الولادة اما بتحفيز الولادة بعقار البيتوسين او باجراء عملية قيصرية كاجراء مستعجل لمنع اجهاد الطفل خلال الولادة. وجد ان الحوامل مع قلة السائل الامنيوسي

باستعمال طريقة مؤشر السائل الامنيوسي كانوا اكثر عرضة للتدخل سواء يتحريض الولادة بالبيتوسين او باجراء العملية القيصرية وما يتبع ذلك من مضاعفات. لم يلاحظ اية فروقات في حالة الولادات باستعمال كلا الطريقتين لقياس السائل الامنيوسي . تبين من هذه الدراسة ان استعمال اعرق جيب للسائل الامنيوسي هو افضل من مؤشر قياس السائل الامنيوسي في متابعة قلة السائل الامنيوسي من حيث قلة التداخلات خلال الولادة وقلة اجراء العمليات القيصرية.

### **Introduction**

**A**mniotic fluid provides a supportive and protective environment for fetal development during pregnancy. the fluid is in dynamic state throughout pregnancy and is essential to fetal well-being. During the first trimester, the amniotic fluid composition is similar to that of fetal plasma. There is bi-directional diffusion between the fetus and the amniotic fluid across the fetal skin that is not keratinized yet, and the surface of the amnion, placenta, and umbilical cord being freely permeable to water and solutes [1]. Keratinization of fetal skin begins at 19-20 weeks of gestation, after that the production of amniotic fluid is predominately accomplished by the fetal urine and lung fluid production, fetal breathing movement contribute to efflux of the lung secretion into the amniotic fluid. Other contribution consist of oral, nasal, and tracheal secretion[1-3]. Removal of the amniotic fluid is predominantly accomplished by fetal swallowing.

Amniotic fluid volume is dependant on gestational age, maintained within a fixed range, and appears to be highly regulated ( although the precise regulation mechanism remains elusive ).The volume peaks between the 36 and 38 weeks of gestation[2,7].

Amniotic fluid volume is maintained by delicate balance between Inflow (fetal urine and to lesser extent, lung secretion) and outflow (swallowing and intramembraneous absorption ) of fluid in the amniotic cavity [3,5,8,9].

Several studies demonstrate that the amount of fluid removed by fetal

swallowing Is significantly smaller than that produced by fetal urination[2,5,6].Despite these considerably unequal parameters ,amniotic fluid volume remains in relative equilibrium [3].

Oligohydromnios complicates 0.5% to 8% of pregnancies and the prognosis for pregnancies complicated by oligohydromnios is gestational age dependant.Oligohydromnios can be diagnosed subjectively by the ultrasound. As is well known, ultrasound is non invasive procedure, which makes it ideal for application on a very large scale,not infrequently. For repeat amniotic fluid volume determination in those cases where there is the suspect of amniotic fluid abnormalities. The visual criteria for oligohydromnios include evidence of fetal crowding and an obvious lack of fluid. Using the single largest pocket of amniotic fluid, oligohydromnios has been variously defined as single pocket with a depth of less than or equal to 0.5cm [15], less than 1cm and 2cm [16], and less than or equal to 3cm [17].

The single deepest pocket when it is normal ,it is found to be associated with perinatal mortality of 2-4/1000, it inceases 13- fold when amniotic fluid volume is reduced (maximum vertical pocket between >1cm and <2cm ) and 47- fold when severe oligohydromnios ( maximum vertical pocket<1cm ) is present.

The amniotic fluid index is a measure of fluid volume, calculating the index allows one to follow changes in the amniotic fluid volume.The uterine content are divided into four sections, the largest depth of amniotic fluid is

measured in each quadrant. The four measurements are then totaled and compared with the values in a standard graph. The sum of these quadrants is the amniotic fluid index (AFI). An amniotic fluid index AFI of less than 5 cm indicate oligohydromnios, An amniotic fluid index between 5-10 cm indicates a decreased fluid volume or borderline, amniotic fluid index between 10-15 cm is normal, amniotic fluid index I between 15-20 cm indicates increased fluid volume, and amniotic fluid index more than 25 cm means polyhydromnios

Moore defined oligohydromnios as a amniotic fluid index below the 5<sup>th</sup> percentile [19]. This corresponds to amniotic fluid index of less than 5 cm near term. A wider interobserver variation in the amniotic fluid index has been observed when oligohydromnios is present. Therefore, averaging three amniotic fluid index measurement is recommended when a low value is obtained [19].

A large meta-analysis has shown an association between reduced amniotic fluid index and low apgar scores, and they found that oligohydromnios was associated with increased perinatal outcome. [13]

If there is a pocket which meets the 2 cm criterion in both the vertical and horizontal planes, a biophysical profile BPS of 2 cm is assigned even in the presence of oligohydromnios by amniotic fluid index. The amniotic fluid index can be falsely reassuring where there are narrow vertical pockets. Conversely, when wide shallow pockets are present, subjective assessment of fluid volume may prove more useful. [11,12]

Subjective assessment, although quite accurate when done by an experienced observer, has limitation because it can not provide quantitative information

about trends in fluid volume, particularly if a different monitors the patient in subsequent exams. [15]

Oligohydromnios in the second trimester is usually the result of preterm rupture of the membranes, uteroplacental insufficiency, and urinary tract malformation and twin to twin transfusion. Oligohydromnios with intact membranes warrants comprehensive evaluation to detect possible fetal and placental abnormalities frequent at all ages but hand contractures were common only in the second trimester, flat hands were almost exclusively in the fetuses in the third trimester [10].

Pulmonary hypoplasia and skeletal deformities are common complications of prolonged oligohydromnios. Severe oligohydromnios from 16 weeks onwards appear to preclude further pulmonary development. In contrast, oligohydromnios after the second trimester is unlikely to result in pulmonary hypoplasia because the crucial canalicular phase of lung development (occurring between 16-25) has largely been completed beyond this stage. Patients presenting in the second, in contrast to the third, trimester have a higher prevalence of structural malformation (50.7% versus 22.1%) and a lower survival rate (10.25 versus 85.3%). [8,9,13]

In a study by Chritianson C et al, on limb deformities in case of oligohydromnios, they concluded that contractures in fetuses with oligohydromnios were more frequent with earlier onset and longer duration of oligohydromnios. They added that the type of contracture varied with the gestational age, club foot the most frequent at all ages but hand contractures were common only in the second trimester, flat hands were exclusively in the fetuses in the third trimester [10].

### **Materials and Methods**

This was a prospective study , including 300 pregnant females attending ultrasound department of Babylon maternity and children teaching hospital for antenatal assessment of fetal wellbeing , and perinatal outcome following the delivery of these 300 pregnant females, All pregnant women recruited for this study was more than 34 weeks.

All had no medical or other related disorders. 1-

All had single pregnancy with no congenital abnormality. 2-

Pregnant women with ruptured membrane, fetal abnormality and multiple pregnancies were excluded. 3- Assessment of amniotic fluid volume by ultrasound was made by the same ultrasonographer with good obstetric ultrasound experience , a diagnosis of oligohydromnios was diagnosed with the criteria mentioned above for amniotic fluid index and single deep pocket , subjective evaluation of amniotic fluid volume.

The 300 pregnant females were divided into 2 groups, 150 pregnant females were Followed after adiagnosis of oligohydromnios Byamniotic fluid index, other 150 pregnant females oligohydromnios was diagnosed by deep amniotic pocket measurment using the criteria mentioned above for both methods of amniotic fluid volume measurement. After the evaluation of the maternal condition, cervical softening or ripeness of the uterine cervix (bishop score) was assessed, ascore of 6 or more predicts the likelihood of successful induction. Oxytocin infusion may be started with amniotomy or may be used only if progress after amniotomy is inadequate. Variable dose of oxytocin was titrated according to the sensitivity of the myometrium , once

labour is established, the rate of infusion is reduced .

Fetal wellbeing was assessed by fetal monitoring with cardiotocograph, those females with low risk factor( when no other risk factor was present apart from Oligohydromnios was the only finding on ultrasound ) was assessed by frequent checking with the sonicaid.

Cesarean section was carried either by an emergency procedure when it is indicated for fetal or maternal reasons. All cesarean operation was done Under general anesthesia using alower segment horizontal incision on the lower uterine segment, prophylactic antibiotic was admintered introperatively, the uterine incision and abdominal layers was closed in the routine method, Care of the mother was similar to that after any abdominal surgery. The rate of induction of labour for all 300 females was evaluated, rate of cesarean

Section in both groups with low amniotic fluid volume weather measured by amniotic fluid index, or single deep amniotic fluid pocket, neonatal outcome regarding birth weight, admission to baby care unit, presence of meconium durind labour, low apgar score less than 7 after 5 minutes.

Statistical analysis was made by student t-test and to find the difference between the subgroups we use the two tailed test- depending on the p value, we consider any value more than 0.05 not significant.

### **Results**

The results of our study shows that ;

1- In cases of oligohydromnios , the rate of induction of labour when the amniotic fluid index was used as a parameter for assessment of amniotic fluid volume was significantly higher than with single deep pocket, It was 60% versus 15%, which equal to 90

patients in those lowamniotic fluid index compared to 23 in oligohydromnios group with single deep amniotic pocket, p-value was 0.001.

2-Women with oligohydromnios diagnosed with amniotic fluid index had higher cesarean section rate, as compared to oligohydromnios diagnosed with single deep amniotic pocket. It was 25% in the 1<sup>st</sup> group while it was 10% in the 2<sup>nd</sup> group, p-value was 0.014.

3- there was no difference in the neonatal outcome regarding mean birth weight

, admission to baby care unit, presence of meconium during labour, apgar score at 5 minutes after delivery. P-value was >0.05

This review demonstrated that pregnant women of total 300 females, there was more women induced for labour in oligohydromnios cases diagnosed by amniotic fluid index, 90 women was induced compared to 23 women on single deep amniotic fluid pocket. Found on ultrasound examination.

The study showed that the rate of cesarean section are higher in amniotic fluid index group while it was less in the second group, 25% in oligohydromnios cases with low amniotic fluid index which equal to 38 women and it was only 10 % in those with single deep pocket measurement which equal to 15 women only. Yet the rate of admission to neonatal intensive care unit nearly similar in both groups. The other measured perinatal outcomes that were no different with the presence of meconium and low an apgar score of less than 7 at 5 minutes.

### **Discussion**

The assessment of fetal wellbeing in the third trimester of pregnancy depends on many variables including

fetal size, amniotic fluid volume, the non stress test, and the biophysical profile. [15]

The evaluation of amniotic fluid volume is of fundamental importance in pregnancy especially in late presentation (after 34 weeks).

Chamberlain et al. have demonstrated that perinatal morbidity and mortality increases dramatically with progressive severity of oligohydromnios. Oligohydromnios, in a pregnancy without a fetal renal abnormality or genitourinary obstruction, is thought to represent chronic in utero stress. [15,16]

Leveno et al, have demonstrated that umbilical cord compression caused by oligohydromnios is the most common cause of intrapartum fetal distress in these patients. [27]

Ultrasound is a reliable technique for estimation of amniotic fluid volume. Two Different methods of estimating the amniotic fluid are common in practice, so it is very important to establish which method is optimal for estimation of amniotic fluid volume along with the other component of the biophysical profile to identify the fetus at risk for an adverse outcome. [18]

In this study the high number of women identified with oligohydromnios (300) Women, 150 women for each method, however, monitoring with the amniotic fluid index resulted in a much increased number of women undergoing cesarean delivery for fetal intolerance of labor in these with low amniotic fluid index compared with oligohydromnios cases diagnosed with the single deepest pocket group.

Chauhan has reported that the knowledge of the amniotic fluid estimation by the health care provider in labor and delivery results in a greater number of cesarean deliveries

for fetal intolerance in labor than if the estimation is unknown.[16]

Identification of oligohydromnios By amniotic fluid index may be related to fetal position, there is a significant relationship between the laterality score and the amniotic fluid index calculation but not the single deep pocket. Therefore, single deep pocket may be amore consistent parameter for the estimation of amniotic fluid volume.

Recently, Ultrasonic evaluation of amniotic fluid volume byamniotic fluid index appeared with increasing frequency in many literature but it does not evaluate the true changes in amniotic fluid volume over time due to fetal positioning, experience of the examiner, subjective criteria may vary from individual to individual, interobserver communication and statistical comparisons more difficult.[15] Miyamura,etal.

Demonstrating in a trial of comparing the 2 methods for evaluation of amniotic fluid during pregnancy and intrapartum monitoring of fetal heart rate,in a group of pregnant women including 69 women ,that single deep pocket was associated with highest accuracy in predicting fetal distress, but the rate of cesarean section among patients with single deep pocket was higher than that in amniotic fluid index. He concluded that a single deepest pocket measurement f is the most useful criterion for

'oligohydromnios" in prediction of fetal distress .[28]

Higher numbers of pregnancies classified as having oligohydromnios by the amniotic fluid index compared with single deepest pocket have previously been reported in postterm pregnancies. Alfirevic and colleagues observed that, although a greater number of the women were labelled as having low fluid, the perinatal outcomes,the diagnosis of low fluid may increase interventions and cause rather than prevent morbidity. The difference between the amniotic fluid index and single deepest pocket in labeling a pregnancy as oligohydromnios was demonstrated in an investigation in which 72% of the women with an amniotic fluid indexof 5 or less still had a single deepest pocket of more than 2 cm. [25]

The single deepest pocket may be the better test for the clinical evaluation of amniotic fluid volume, because it seems to have poor sensitivity but good specificity whereas the amniotic fluid index seems to have both poor sensitivity and poor specificity. This investigation( Trial) implies that the single deepest pocket should remain as the methodology to estimate amniotic fluid volume along with the other component of biophysical profile and that amniotic fluid index should not be used further in the evaluation. [20]

These are shown in table (1)

**Table 1**

| Parameter studied    | 1 <sup>st</sup> group=150<br>Single DAP | 2 <sup>nd</sup> group=150<br>Low AFI | P-value |
|----------------------|-----------------------------------------|--------------------------------------|---------|
| Induction of labour  | 15%                                     | 60%                                  | 0.001   |
| Cesarean section     | 10%                                     | 25%                                  | 0.014   |
| Mean birth weight    | 2.9 00-3100g                            | 3.200                                | 0.05    |
| NCU admission        | 15                                      | 18                                   | > 0.05  |
| Presence of meconium | 32                                      | 40                                   | > 0.05  |
| Apgar score          | 7                                       | 17                                   | > 0.05  |

**Conclusion**

The single deepest vertical pocket measurement in the assessment of amniotic fluid volume during fetal surveillance seems a better choice since the use of the amniotic fluid index increases the rate of diagnosis of oligohydromnios and the rate of induction of labor, obstetrical intervention and the rate of cesarean section without improvement in peripartum outcome.

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