# ROLE OF ANTEPARTUM AMNIOINFUSION IN SEVERE OLIGOAMNIOS

*Aruna Ratikrinda[1], Saroja Adapa[2]*

*[1]Associate Professor, Department of Obstetrics and Gynaecology, Government Maternity Hospital, Osmania Medical College, Hyderabad, Telangana.*
*[2]Assistant Professor, Department of Obstetrics and Gynaecology, Government Maternity Hospital, Osmania Medical College, Hyderabad, Telangana.*

**ABSTRACT**

**BACKGROUND**
The purpose of this study was to evaluate the effectiveness of antepartum transabdominal amnioinfusion in cases of severe oligoamnios and to prolong the pregnancy to improve the foetal prognosis.

**MATERIALS AND METHODS**
The study comprised of a prospective analysis of 100 pregnant women with oligoamnios in which study and control group consists of 50 patients in each group. Transabdominal amnioinfusion is performed in the study group.

**RESULTS**
In study group, improvement in the biophysical score, APGAR score, and perinatal outcome are noted. Intrapartum complications reduced. The incidence of operative intervention is decreased.

**CONCLUSION**
Antepartum transabdominal amnioinfusion is of great help to a patient with severe oligoamnios as it reduces the neonatal morbidity and mortality.

**KEYWORDS**
Transabdominal Amnioinfusion, Oligoamnios, AFI, IUGR.

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## BACKGROUND

Amniotic fluid[1] is essential during pregnancy to allow normal fetal growth organ development and functions. Oligoamnios complicate 4% of pregnancies and associated with an increased incidence of perinatal morbidity and mortality due to its antepartum and intrapartum complications. Amniotic fluid index forms one of the important factors taken into consideration in manning's biophysical profile and in modified biophysical profile.

Gerbruch and Hansman[2] in 1983 described a technique of amino infusion to overcome these difficulties to prevent the occurance if foetal lung hypoplasia in pregnancies complicated by oligohydramnios.

### The Amniotic Fluid in Normal Pregnancy

The source of amniotic fluid is both fetal and placenta. Plentill (1966) demonstrated the dynamics of amniotic fluid circulation using sodium and deuterium oxide. It was shown that about 34% of water is exchanged per hour in the amniotic fluid. Sodium and potassium are more independent of water suggesting that the various constituents, transfer at there own rates in amniotic fluids. At full term, the exchange from maternal to the amniotic fluid is very small and negligible, while the transfer rates from the fetus to the mother are high being maximum from the fetus to the amniotic fluid. The volume is 50ml at 12 weeks of pregnancy, 400ml at 20 weeks and nearly 1000ml between 28 and 30 weeks and is 100 to 600ml at 42 weeks. At 36 weeks AF is virtually colorless while floccules may sometimes appear.

### Composition

The amniotic fluid is a heterogeneous solution suspension consists of 98 to 99% water, 1 to 2% solids about one-half of solids are organic of which 50% is protein.

### Electrolytes

During the first half of the pregnancy, sodium and chloride concentrations are similar to foetal than maternal sera. Later the fluid becomes progressively hypotonic with decreased sodium and chloride concentration and a corresponding fall in foetal osmatic pressure. These changes are associated with a gradual rise in urea, uric acid, and creatinine level reflecting the contribution of maturing foetal renal function to the amniotic fluid. Iron and sulfur are also present without any changes throughout pregnancy. In the later part of pregnancy, AF is alkaline with the ph at term is 7.04 to 7.11.

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*Corresponding Author:*
*Dr. Saroja Adapa,*
*H. No. 6-3-1216/4, Flat No. 102,*
*Priyanka Apartment, Mathodist Colony,*
*Begumpet- 16, Hyderabad, Telangana.*
*E-mail: dr.adapasaroja@gmail.com*
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(Bonsness 1961). Other constituents are glucose, proteins and protein derivatives, enzymes, hormones, lipids, and prostaglandins.

**Functions of Amniotic Fluid**

I. During pregnancy
   1. It acts as a shock absorber protecting the foetus from possible external injury.
   2. Maintain even temperature.
   3. Allows free movement of the foetus and prevents adhesion formation between foetal parts and amniotic sac.
   4. Amniocentesis can be used as a diagnostic tool for various disorders.
   5. The bacteriostatic function of amniotic fluid prevents ascending infection.

II. During labor
   1. The bag of membranes promotes cervical dilatation.
   2. Serves as a biological medium in which prostaglandins are stored for a longer period.
   3. Prevents cord compression.
   4. Prevents ascending infection by its aseptic and bactericidal action.

**Oligoamnios**

A clinical condition characterized by an abnormally low volume of amniotic fluid. Amniotic fluid index[3] of 5 or less than 5 is considered as severe oligoamnios.

**Aetiology**

**1. Depending on the Gestational Age at which it Appears**

A. Early onset oligoamnios- usually associated with chromosomal abnormalities and has a bad prognosis.

B. Late-onset oligoamnios- associated with placental insufficiency of various causes.

**2. Depending on Causative Factors**

**A. Foetal**

1. Chromosomal abnormalities –
   - Triploidy
   - Trisomy 18
   - Turners syndrome

2. Congenital anomalies
   a. Cardiac diseases – Fallot's tetralogy, septal defects.
   b. CNS- Holoprosencephaly, meningocele, encephalocele, microcephaly
   c. Genitourinary – renal agenesis, renal dysplasia, polycystic
      - Kidney
      - Urethral Obstruction
      - Bladder exstrophy
      - Meckel Gruber syndrome
      - Ureteropelvic junction obstruction
      - Prune belly syndrome
   d. Cloacal dysgenesis
   e. Cystic hygroma
   f. A diaphragmatic hernia
   g. Gastroschisis
   h. Hypothyroidism
   i. Skeletal – sirenomelia, sacral agencies, absent radius, facial clefting.
   j. TRAP –(Twin reverse arterial perfusion) sequelae
   k. Twin – twin transfusion
   l. VACTERL – Vertebral, anal, cardiac, trachea-oesophageal, renal, limb association.

**B. Placental Causes**

1. Abruption of placenta
2. Twin-twin transfusion – Artery to vein shunt causes oligoamnios in donor and polyhydramnios in recipient twin.
3. Chorioangiomas
4. Multiple infarcts.

**C. Maternal Causes**

1. Vascular – preeclampsia
   Chronic Hypertension
   Diabetes mellitus
2. Haematological – Sickle cell disease
3. Uteroplacental Insufficiency.

**D. Drugs**

1. Prostaglandin synthase inhibitor-
   Indomethacin used for polyhydramnios
   By impairing lung liquid production or enhancing absorption
   Decrease foetal urine production
   Increases fluid movement across foetal membranes
2. Angiotensin-converting enzyme inhibitors

**E. Idiopathic**

**Complications of Oligoamnios**

Antepartum -Lung hypoplasia, amniotic bands, positions deformities, cord accents, IUFD.

Intrapartum -Abnormal labour, cord compression, foetal distress, stillbirths.

**3. Intra Uterine Growth Retardation**

IUGR was designed to indicate fetuses with birth weight below the 10$^{th}$ percentile for their gestational age. It should be applied to fetuses affected by pathologic restriction in their ability to grow.

It affects 3-10% of all pregnancies. Most of the cases of IUGR are associated with oligoamnios.

Cause- due to decreased urinary output caused by redistribution of the blood flow with preferential shunting to brain and decrease in renal perfusion.

**4. Foetal Demise**

**5. Post term Pregnancy**

**6. Ruptured Membranes**

**Objective of the Study**

To evaluate the role of transabdominal amnioinfusion in reducing the complications resulting from oligoamnios.

**MATERIALS AND METHODS**

A randomized controlled study was conducted in Government Maternity Hospital, Sultan Bazaar, Hyderabad, over a period of two years from January 2015 to December 2016. Women with Oligoamnios (AF<5) were evaluated for participation in the study. 50 women with Oligoamnios were selected for amnioinfusion after taking informed consent.[4] 50 women with Oligoamnios were taken as control after taking informed consent.

**Inclusion Criteria**

Oligoamnios with AFI≤5, single foetus, more than 28 weeks' gestation, afebrile, normal foetal heart rate pattern.

**Exclusion Criteria**

Multiple pregnancy, febrile woman, chorioamnionitis.
A detailed history and clinical examination are done, and all preliminary investigations performed.

**Procedure**

Before starting amnioinfusion patients were explained about the procedure and informed consent is taken. The complications like preterm delivery prom then chorioamnionitis abruption and IUFD is explained to the patient.

**Technique[5]**

The patient is placed in dorsal position, the abdomen is cleaned with surgical spirit and draped. With the ultrasound guidance echo-free area around the foetus is identified avoiding the placental site, under aseptic precautions and ultrasound guidance, the pocket is entered with an 18G intracatheter and the stylet is removed when the needle tip is in. Then the intracath is connected to normal saline drip which is at room temperature or at 37-degree Celsius. The normal saline is infused at a rate of 30 to 40 drops per minute until AFI becomes 10, approximately 100 to 600ml then intracath is removed and the sterile piaster is applied over the site.

A biophysical profile is performed after the infusion and the foetal safety is demonstrated to the patient. The patient is advised bed rest for next 24 hours.

**Delivery was conducted in the following way-**

1. As soon as the head was born a thorough, suction of oropharynx and nasopharynx.
2. Colour, the quantity of liquor was noted.
3. 1-minute Apgar scoring was done.
4. Baby's cord clamped sex of the baby shown to the mother and baby was taken to the baby room.
5. The weight of the baby and gestational age noted and any sign of IUGR noted.
6. Placenta examined for any signs of infarction and separation, calcification, size, and weight of the placenta was noted.
7. 5 minutes and 10 minutes Apgar scoring was done.
8. Evidence of respiratory distress noted such as increased respiratory rate, intercostal retraction, and grunting.
9. If RD present baby was admitted to the nursery.

**RESULTS**

In the study group out of 50 patients, prime gravida is 20 (40%) and multigravida is 30(60%). All the patients were aged between 22 to 25 years. 32 patients (64%) with hypertensive disorders, 10 cases (20%) associated with IUGR, 8 cases (16%) were normotensives. 14 cases (28%) belonged to 28-32 weeks' gestation, 30 cases (60%) belonged to 33-36 weeks' gestation and 6 cases (12%) were 37-38 weeks. Amount of normal saline infused varied from 100ml to 500ml. AFI before the procedure was 1.1 to 2 in 3 cases (6%), 2.1 to 3 in 7 cases (14%), 3.1 to 4 in 6 cases (12%) and 4.1 to 5 in 31 cases (62%).

| Amount of NS | Gest-age (wks.) | AFI Before AI | AFI After AI | No. of Cases |
|---|---|---|---|---|
| 100-200 | 37-38 | 5 | 10 | 2 |
| | 33-36 | 5 | 10.1 | 9 |
| 200-250 | 37-38 | 4.5 | 10 | 4 |
| | 33-36 | 4.2 | 10 | 12 |
| 250-300 | 33-36 | 4.5 | 11.5 | 5 |
| 300-350 | 28-32 | 2.4 | 10 | 2 |
| | 33-36 | 4.8 | 10.8 | 2 |
| | 33-36 | 3.5 | 10 | 2 |
| 350-400 | 28-32 | 2.5 | 10.5 | 7 |
| 400-450 | 28-32 | 3.2 | 12.3 | 2 |
| | 28-32 | 3.6 | 12.8 | 2 |
| 450-500 | 28-32 | 1.8 | 10 | 1 |

***Table 1. Amount of Normal Saline Infused***

| Diagnosis | No. of Cases | Pre-Infusion | Post Infusion |
|---|---|---|---|
| Hypertensive Disorders | 28 | 6 | 8-10 |
| IUGR | 10 | 4 | 8 |
| Normotensive | 18 | 8 | 10 |

***Table 2. Effect of Amnioinfusion on Biophysical Score***

Biophysical score improved in all cases after Amnioinfusion.

| | 1″ | 5″ |
|---|---|---|
| | <7 >7 | <7 >7 |
| Hypertensive Disorders | 4 30 | Nil 34 |
| Normotensive | 0 8 | Nil 8 |
| IUGR | 4 2 | 2 4 |

***Table 3. Apgar Score***

In 80% of cases, I minute Apgar score was more than 7, in 12% of the cases Apgar score was improved to more than 7 after 5 minutes. In 92% of cases, the Apgar score was more than 7 at 5 minutes in the amnioinfusion group.

In the control group, 27 patients were primes, 23 were multigravida. Patients with hypertensive disorders were 37, IUGR 7 patients and 6 were normotensives. All the patients belong to the gestational age of 33 to 36 weeks.

**Comparison of Data**

| | |
|---|---|
| Amnio-infusion | 100% |
| Control | 30-37% |
| ***Table 4. Sono Visibility*** | |

Amino infusion increases acoustic window by which foetus anatomy can be visualized properly. So in the study group sonovisibility 100% when compared with control (30-37%). p<0.01.

| **Group** | **No. of Days Pregnancy** | | | |
|---|---|---|---|---|
| | <1 wk. | 1-2 wks. | 2-4 wks. | >4 wks. |
| Amnio Infusion | 8(16%) | 29(58%) | 11(22%) | 2(4%) |
| Control Group | All cases delivered within one week | | | |
| ***Table 5. No. of Days of Pregnancy Prolonged*** | | | | |

In 58% of cases, pregnancy prolonged up to 2 weeks with an average of 12.75 days. In 22% of cases, up to 2-4 weeks, pregnancy was prolonged with a mean of 21.25 days. In 4% of cases, pregnancy was prolonged for 4 weeks. In the study group, 84% of pregnancies were prolonged for more than one week due to the protective effect of amnioinfusion by improving the biophysical score. No case was prolonged for more than one week in the control group. (p<0.01)

| | **Amnioinfusion** | **Control** |
|---|---|---|
| Hypertensive Disorders | 8-10 | 8 |
| IUGR | 8 | 4 |
| Normotensive | 10 | 6 |
| ***Table 6. Biophysical Profile*** | | |

Biophysical score improved in the study group after amnioinfusion when compared with a control group without amnioinfusion.

| | **Outlet Forceps (%)** | **SPVD (%)** | **L S C S (%)** |
|---|---|---|---|
| Amnioinfusion | 6 | 54 | 40 |
| Control | 14 | 18 | 68 |
| ***Table 7. Mode of Delivery*** | | | |

Operative intervention in the study group was 46% and in the control group 82%. (p<0.05) which is very significant, thus amnioinfusion decreases operative interventions.

| | **Amnioinfusion** | **Control** |
|---|---|---|
| No. of live births | 46(92%) | 33(66%) |
| IUD | 2(4%) | 4(8%) |
| Stillbirths | 0 | 7(14%) |
| Neonatal deaths | 2(4%) | 6(12%) p<0.01) |
| ***Table 8. No. of Live Births*** | | |

A number of live births in the study group are more in comparison with the control group.

| **Group** | **Clear** | **Meconium stained** |
|---|---|---|
| Amnioinfusion | 33(66%) | 17(34%) |
| Control | 11(22%) | 39(78%) (p<0.01) |
| ***Table 9. Colour of Liquor*** | | |

A number of cases with clear liquor more in amnioinfusion group.

| | **Amnioinfusion** | **Control** |
|---|---|---|
| Admitted | 18 | 24 |
| Not Admitted | 30 | 15 |
| ***Table 10. Nursery Admissions*** | | |

| | **Amnioinfusion** | **Control** |
|---|---|---|
| RD | 5 | 19 |
| Observation | 13 | 5 (p<0.01) |
| ***Table 11. Indication for Admission*** | | |

No. of cases admitted in control group 19 was significant compared to study group 5.

**DISCUSSION**

Oligoamnios complicates 4% of pregnancies. Early oligoamnios is associated with chromosomal anomalies and organ defects and has a poor prognosis. Late-onset oligoamnios is mainly because of placental insufficiency due to various causes.

Oligoamnios causes pulmonary "hypoplasia", amniotic bands, amputation of limbs, deformity, IUFD and during labour cord compression leading to foetal distress, increased operative intervention and poor Apgar scores.

To overcome the problems of oligoamnios artificial replacement of amniotic fluid has been attempted by Stringer[6] et al 1980, commentary[7] in 1992.

Harrison[8] et al 1982 reported that lung hypoplasia was prevented where amniotic fluid was replaced before 20 weeks in cases with bladder outlet obstruction in animal models.

Fisk[9] et al have shown amnioinfusion to prevent the occurrence of fetal lung hyperplasia in oligoamnios.

Gembruch and Hansman 1988 used amnioinfusion to improve ultrasound guidance visualization of congenital anomalies in IUGR cases.

Oligoamnios is also statistically associated with high incidence of early termination of pregnancy, low birth weight, prematurity, foetal distress and delivery by cesarean section and low Apgar scores. Therefore, antepartum

amnioinfusion would be ideal to prevent the antepartum and intrapartum ill effects of oligoamnios.

**In the Present Study, the Following Result was Obtained**

1. A total of 50 cases in the study group and 50 cases in the control group were enrolled in the study. The results were subjected to Chi-square test to test the statistical significance.
2. Hypertensive disorders accounted for 76% of the cases in the study group.
3. A number of cases with hypertensive disorders were comparable in both the groups.
4. In 58% of cases, pregnancy was prolonged to 2 weeks with an average of 12.75 days.
5. In 22% of cases, pregnancy was prolonged by 2 to 4 weeks with a mean 21.25 days.
6. In 4% of cases, pregnancy was prolonged for more than 4 weeks.
7. In the control group, no pregnancy was prolonged for more than 1 week.
8. Amnioinfusion improved the sonovisibility by 100%.
9. Amnioinfusion improved the biophysical score in the study group.
10. On an average 275ml of normal saline was infused into the study group ranging(100-600ml).
11. The rate of operative intervention in the infusion group was 46% as compared to 82% in the control group with good statistical significance.
12. The operative intervention for fetal distress was done in 19 cases in the control group as compared to 2 cases in infusion group.
13. The 1" and 5" Apgar score was -
    1" Apgar score was more than 7 in 80% of the infusion group as compared to 28% in the control group which is a significant improvement. (<0.01).
    5" Apgar score was more than 7in 92% of infusion group as compared to 46% in the control group. Statistically very significant ($p<0.01$).
14. A number of live births were 92% in the infusion group as compared to 66% in the control group. Statistically very significant ($p<0.01$).
15. In babies who had nursery admission, 2 has RD in infusion group as compared to 19 who had RD in control group($p<0.01$).

**CONCLUSION**

Antepartum Amnioinfusion is effective in-

1. Improving the biophysical scores.
2. By prolonging the pregnancy, it has improved the perinatal outcome.
3. Reducing the intrapartum complications.
4. Decreasing the incidence of operative intervention[10] and also for foetal distress with statistical significance.
5. Amnioinfusion improved the 1" and 5" Apgar scores when compared with the control group.
6. Increases sonovisibility by which unnecessary continuation of pregnancy with anomalies can be curtailed.

In summary antepartum transabdominal amnioinfusion is safe, easy and inexpensive technique to prolong the pregnancy and improves the obstetric outcome in oligoamnios with no apparent risk of maternal and neonatal morbidity and mortality.

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