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# The relation between causes and onset time of polyhydramnios

**T. Fukami, M. Goto, S. Matsuoka, S. Nishijima-Sorano, A. Tohyama, H. Yamamoto, S. Nakamura, R. Matsuoka, H. Tsujioka, F. Eguchi**

*Department of Obstetrics and Gynecology, ASO Iizuka Hospital, Iizuka, Fukuoka (Japan)*

**Summary**

The aim of this analysis was to investigate the onset time and significance of maximum volume of polyhydraminios and whether the latter was associated with causes. This was a retrospective cohort study between 2012 and 2014. A total number of 68 singleton pregnancies were analyzed. Gestational age at onset of polyhydramnios was 30.0 ± 2.8 (25–36) weeks in maternal factor, 30.0 ± 3.5 (25–37) weeks in fetal factor, and 32.3 ± 2.0 (27–37) weeks in idiopathic factor. Median of maximum amniotic fluid index (AFI) was significantly late onset in idiopathic factor. Diabetes, gestational or pre-existing, was present in all of women (ten cases) in maternal factor. Higher AFI was found to be associated with an increased frequency of prenatally detected congenital anomalies. Abnormal fetal karyotype noted in 18/45 (40%) cases of polyhydramnios. Polyhydramnios diagnosed on ultrasound requires further maternal and fetal diagnostic tests.

*Key words:* Polyhydraminios; Maternal and fetal diagnosis.

## Introduction

Polyhydramnios is defined as excessive accumulation of amniotic fluid. The diagnosis is now commonly made sonographically. Ultrasound evaluation of the amount of amniotic fluid can be either a subjective assessment or a semiquantitative estimation commonly using the maximal vertical pocket (MVP) [1] or amniotic fluid index (AFI) [2]. When defining the upper limit of normal amniotic fluid indices, a constant value of AFI ≥ 25 cm can be used across all gestational ages, or gestational-age specific thresholds can be utilized [3, 4]. This clinical condition is associated with a high risk of poor pregnancy outcomes [5-7]. Under physiological conditions, there is a dynamic equilibrium between the production and resorption of amniotic fluid. Fluid levels are influenced by fetal urination and fetal lung liquid production. Amniotic fluid is reabsorbed by fetal swallowing and intramembranous and intravascular absorption. The relative attribution of each of these mechanisms varies over the course of the pregnancy. A disturbed equilibrium can be the result of compromised swallowing function or increased urination and can lead to polyhydramnios [8-11]. A fetus close to term will produce between 500–1,200 ml of urine and swallow between 210–760 ml of amniotic fluid per day. Even small changes in this equilibrium can result in significant changes in amniotic fluid volumes [9-11]. Amniotic fluid balance is a consequence of complex interactions between fetal and maternal systems. The integration of fluid inflow and outflow generally determines the ultimate volume of amniotic fluid. Fetal urination, lung fluid production, swallowing, and membranous absorption contribute to overall fluid balance. Approximately 50% of cases are idiopathic with no known etiology [3]. The aim of this analysis was to investigate the onset time and significance of maximum volume of polyhydraminios and whether the latter was associated with causes.

## Materials and Methods

This was a retrospective cohort study of patients treated in the present institution between 2012 and 2014 that was approved by the Institutional Review Board. A total number of 68 singleton pregnancies were reviewed which were under routine surveillance of antenatal care unit beginning from early gestation. Polyhydramnios was defined as AFI greater than 25 cm, using four-quadrant technique [2]. Cases with fetal anomalies that had been detected in utero or by physical examination at birth, accompanying placental anomalies, positive evidence of in-utero infections (syphilis, toxoplasma, cytomegalovirus), history of maternal diabetes, gestational diabetes, Rh iso-immunization, and multiple gestations were included in fetal or maternal causes. These factors were excluded in order to define the idiopathic polyhydramnios. Finally, 68 consecutive polyhydramnios cases were selected as the study group. Statistical analysis was performed with ANOVA, the chi-square test and Student's *t*-test using SPSS version 17 and $p < 0.05$ was considered statistically significant.

## Results

A total number of 68 singleton pregnancies were analyzed. Gestational age at onset of polyhydramnios was 30.0 ± 2.8 (25–36) weeks in maternal factor, 30.0 ± 3.5 (25–37) weeks in fetal factor, and 32.3 ± 2.0 (27–37) weeks in idiopathic factor (Table 1). Median of maximum AFI was significantly late onset in idiopathic factor (Table 1). Diabetes, gestational or pre-existing, was present in all of women (ten

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Table 1. — *Polyhydramnios: characteristics of causes.*

| | Median of diagnosis (range weeks) | AFI (cm) at diagnosis | Median of maximum AFI | Maximum AFI (cm) |
|---|---|---|---|---|
| Maternal factor | 30/0 (25-36) | 26.7 | 31/2 | 27.3 |
| Fetal factor | 30/0 (25-37) | 28.6 | 33/0 | 32.5 |
| Idiopathic factor | 32/2 (27-37) | 27.3 | 33/5* | 28.5 |

*$p < 0.05$.

Table 2. — *Distribution of polyhydramnios causes.*

| | |
|---|---|
| Maternal factor | 10 (15%) |
| GDM/DM | (n = 10) |
| Fetal factor | 45 (66%) |
| Chromosomal abnormality | (n = 18) |
| - Trisomy 18 | (n = 14) |
| - Trisomy 21 | (n = 2) |
| - Others | (n = 2) |
| Bowel obstruction | (n = 11) |
| Swallowing dysfunction/obstruction | (n = 5) |
| Others | (n = 11) |
| Idiopathic factor | 13 (19%) |
| Total | 68 (100%) |

cases) in maternal factor (Table 2). A non-statistically significant correlation was noted between maximal AFI and factors. However, higher AFI was found to be associated with an increased frequency of prenatally detected congenital anomalies (Table 1). Fetal factor, the majority of which were determined prenatally, were available in 45 patients (66%). There was a correlation between the degree of abnormal AFI and the frequency of fetal aneuploidy, with abnormal fetal karyotype noted in 18/45 (40%) cases of polyhydramnios - 14 cases of trisomy 18 and two cases of trisomy 21. The most common structural anomalies detected sonographically were gastrointestinal system without chromosomal abnormalities (Table 2).

## Discussion

Polyhydramnios is one of the common disorders among pregnancies and the fetal factors are in majority of the causes. Higher AFI was found to be associated with an increased frequency of prenatally detected congenital anomalies. Comprehensive investigation of the mother and the fetus is mandatory since several maternal disorders and fetal abnormalities should be excluded in order to define idiopathic cases. For this purpose, laboratory tests to identify causes of polyhydramnios should include: 75 g oral glucose tolerance test to exclude gestational diabetes or overt diabetes mellitus, maternal diagnostic testing for infection (TORCH serology), if there is a suspicion of fetal anemia or fetal hydrops, tests to exclude immunological causes (blood type incompatible pregnancy, maternal blood group, Rhesus factor, screening for antibodies) and hematological disorders (possibly Kleihauer-Betke test to exclude feto-maternal hemorrhage) are indicated. The literature lists certain drugs, e.g. lithium, which is associated with a higher incidence of polyhydramnios. Lithium is a psychotropic drug prescribed prenatally, e.g. to treat bipolar disorders [12]. The fetus should be examined carefully during fetal organ screening. The anomalies most commonly missed at screening are tracheoesophageal fistula, cardiac septal defects, and cleft palate [14]. In a large study, the prevalence of aneuploidy in fetal anomalies was found to be 10% [13]. A diagnosis of polyhydramnios - especially early weeks of pregnancy (≥ 26 weeks) and with AFI ≥ 30 cm - warrants careful sonographic evaluation of the fetus. The present authors have focused on the evaluation of the gastrointestinal and central nervous systems. Amniocentesis should be considered in cases with clear evidence of abnormalities and elevated aneuploidy risk. Clinicians should be aware of chromosomal abnormalities, especially for early onset polyhydramnios cases. AFI assessments commencing from the 20$^{th}$ week of gestation is recommended. Careful examination of the neonates either for syndromical abnormalities or late onset findings is another crucial issue. As the cause could also be fetal metabolic syndrome, children born after pregnancy complicated by polyhydramnios should be followed up by a pediatrician [14, 15].

Because the present facility (Comprehensive Prenatal Center) is a tertiary referral center that focuses on pregnancies with fetal anomalies, the present population likely included a higher proportion of such pregnancies in comparison to other institutions. Finally, the present study was limited by a lack of complete neonatal data, including rates of postnatal diagnosis of structural abnormalities and other relevant conditions such as neuromuscular disease.

## Conclusion

Polyhydramnios diagnosed on ultrasound requires further maternal and fetal diagnostic tests. Maternal gestational diabetes should be excluded and maternal TORCH screening is recommended. Detailed morphological testing should be planned for the fetus. Delivery in a perinatal center is recommended.

## References

[1] Moore T.R.: "Clinical assessment of amniotic fluid". *Clin. Obstet. Gynecol.*, 1997, *40*, 303.
[2] Phelan J.P., Smith C.V., Broussard P., Small M.: "Amniotic fluid volume assessment with the four-quadrant technique at 36–42 weeks' gestation". *J. Reprod. Med.*, 1987, *32*, 540.
[3] Magann E.F., Chauhan S.P., Doherty D.A., Lutgendorf M.A., Magann M.I., Morrison J.C.: "A review of idiopathic hydramnios and pregnancy outcomes". *Obstet. Gynecol. Surv.*, 2007, *62*, 795.
[4] Moise K.J. Jr.: "Polyhydramnios". *Clin. Obstet. Gynecol.*, 1997, *40*, 266.

[5] Golan A., Wolman I., Sagi J. Yovel I., David M.P.: "Persistence of polyhydramnios during pregnancy – its significance and correlation with maternal and fetal complications". *Gynecol. Obstet. Invest.*, 1994, *37*, 18.
[6] Many A., Hill L.M., Lazebnik N. Martin J.G.: "The association between polyhydramnios and preterm delivery". *Obstet. Gynecol.*, 1995, *86*, 389.
[7] Smith C.V., Plambeck R.D., Rayburn W.F., Albaugh K.J.: "Relation of mild idiopathic polyhydramnios to perinatal outcome". *Obstet. Gynecol.*, 1992, *79*, 387.
[8] Brace R.A.: "Physiology of amniotic fluid volume regulation". *Clin. Obstet. Gynecol.*, 1997, *40*, 280.
[9] Harding R., Bocking A.D., Sigger J.N., Wickham P.J.: "Composition and volume of fluid swallowed by fetal sheep". *Q. J. Exp. Physiol.*, 1984, *69*, 487.
[10] Pritchard J.A.: "Deglutition by normal and anencephalic fetuses". *Obstet. Gynecol.*, 1965, *25*, 289.
[11] Pritchard J.A.: "Fetal swallowing and amniotic fluid volume". *Obstet. Gynecol.*, 1966, *28*, 606.
[12] Oyebode F., Rastogi A., Berrisford G., Coccia F.: "Psychotropics in pregnancy: safety and other considerations". *Pharmacol. Ther.*, 2012, *135*, 71.
[13] Dashe J.S., McIntire D.D., Ramus R.M., Santos-Ramos R., Twickler D.M.: "Hydramnios: anomaly prevalence and sonographic detection". *Obstet. Gynecol.*, 2002, *100*, 134.
[14] Touboul C., Boileau P., Picone O., Foix-l'Hélias L., Frydman R., Senat M.: "Outcome of children born out of pregnancies complicated by unexplained polyhydramnios". *BJOG*, 2007, *114*, 489.
[15] Touboul C., Picone O., Levaillant J.M. et al.: "Clinical application of fetal urine production rate in unexplained polyhydramnios". *Ultrasound Obstet. Gynecol.*, 2009, *34*, 521.

Corresponding Author:
T. FUKAMI, M.D., Ph.D.
Department of Obstetrics and Gynecology
ASO Iizuka Hospital
3-83 Yoshio-machi, Iizuka
Fukuoka 820-8505 (Japan)
e-mail: fukami1975@msn.com