

## Isolated oligohydramnios at term: Is induction indicated?

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### Practice recommendations

- Isolated term oligohydramnios, as defined by an amniotic fluid index (AFI) of less than 5 cm, has not been shown to be associated with poor maternal or fetal outcomes. Management may be individualized based on factors such as parity, cervical ripeness, and patient preference (SOR: **B**).
- Maternal hydration with oral water has been shown to increase AFI in a few hours, likely due to improved uteroplacental perfusion. This is a reasonable alternative to immediate labor induction in women with isolated term oligohydramnios (SOR: **B**).
- An isolated finding of a so-called “borderline” AFI (5–8 cm) is not an indication for labor induction (SOR: **B**).

**F**amily physicians providing maternity care often face a scenario in which an otherwise low-risk, term patient is incidentally noted to have a low amniotic fluid index (AFI). Common reasons for obtaining an AFI in a woman with a

low-risk pregnancy include evaluation of decreased fetal movement, spontaneous variable decelerations during monitoring to evaluate for labor, or an ultrasound evaluation for fundal height measurements discordant with gestational age. How should “isolated” oligohydramnios—an AFI <5 cm—be interpreted, and should immediate induction be recommended for such patients?

Oligohydramnios occurs in about 1% to 5% of pregnancies at term.<sup>1,2</sup> Because adverse outcomes occur in high-risk pregnancies complicated by low amniotic fluid volume, oligohydramnios commonly prompts labor induction.<sup>1,3,4</sup> At one university center, oligohydramnios is now the leading indication for labor induction.<sup>5</sup> Many centers may even induce labor when the AFI is between 5 cm and 8 cm, the so-called borderline AFI.<sup>3</sup>

Labor induction increases the use of cesarean delivery, particularly for the primiparous woman with an unripe cervix.<sup>6</sup> Recent studies questioning the safety of labor induction in women who have had a cesarean may increase the number of elective repeat cesarean procedures when delivery is believed indicated for oligohydramnios.<sup>7</sup> (See **Underlying causes of oligohydramnios.**)

### ■ OLIGOHYDRAMNIOS IS DIFFICULT TO ASSESS

True oligohydramnios can be difficult to confirm due to the questionable accuracy of amniotic fluid measurement by ultrasound. There is controversy,

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### Underlying causes of oligohydramnios

By the second trimester, amniotic fluid is being produced primarily through fetal urine production and is primarily resorbed through fetal swallowing. Significant amounts of amniotic fluid are also produced and resorbed by the fetal lung and directly resorbed from the amniotic cavity by the placenta.<sup>8,9</sup> Amniotic fluid volume is affected by the status of maternal hydration and maternal plasma osmolality.<sup>10-13</sup>

*Acute* oligohydramnios may occur from ruptured membranes, usually diagnosed by clinical signs and vaginal fluid with altered pH and a ferning pattern on microscopic exam.

*Chronic* oligohydramnios arises from prerenal, renal, and postrenal causes. The latter 2 groups reflect fetal kidney and urogenital abnormalities, which directly decrease fetal amniotic fluid production. Uteroplacental insufficiency is the most common cause of prerenal oligohydramnios, and the decreased amniotic fluid is a direct result of decreased fetal renal perfusion.<sup>14</sup> Uteroplacental insufficiency may result in intrauterine growth restriction as the fetus shunts blood away from the growing torso and limbs and to vital organs such as the brain. Preeclampsia and postdate pregnancies both involve pathologic changes in the placenta that may result in uteroplacental insufficiency and oligohydramnios.

for example, about whether (and how) to include pockets of amniotic fluid containing umbilical cord.<sup>15</sup> The AFI was introduced in 1987<sup>2</sup> to replace the 2 cm “pocket technique” of fluid assessment, and studies continue to question to what extent the AFI reflects actual amniotic fluid volume.

AFI measurements may vary with the amount of pressure applied to the abdomen and with fetal position or movement.<sup>16</sup>

Serial measurements taken by the same ultra-

sound operator have been shown to differ from the true volume by 1 cm, or 10.8%; serial measurements taken by multiple operators have differed by as much as 2 cm, or 15.4%.<sup>17,18</sup>

O'Reilly-Green compared the diagnosis of oligohydramnios in 449 post-term patients with actual amniotic fluid volume measured at rupture of membranes.<sup>19</sup> They found a positive predictive value of 50% for oligohydramnios at an AFI of 5 cm as the lower limit of normal. A study of 144 third trimester patients using the dye-dilution technique found that, to achieve 95% confidence for ruling out oligohydramnios, a cutoff AFI of 30 cm would need to be used, a value consistent with polyhydramnios.<sup>20</sup>

### ■ WHAT IS THE ASSOCIATION BETWEEN OLIGOHYDRAMNIOS AND POOR FETAL OUTCOMES?

A number of studies over the past 15 years have shown an association between oligohydramnios and poor fetal outcomes. These were predominantly retrospective studies, which failed to control for the presence of factors known to be associated with oligohydramnios such as intrauterine growth restriction (IUGR) and urogenital malformations.

No studies have directly addressed whether labor induction improves outcomes. A meta-analysis of 18 studies examining outcomes of pregnancies with AFI <5 cm found an increased risk of cesarean delivery for fetal distress and low Apgar scores at 5 minutes. Most of these studies, however, had high-risk patients including IUGR (level of evidence [LOE]: 2).<sup>21</sup>

A recent study of high-risk patients failed to detect a difference in the incidence of nonreactive nonstress tests, meconium-stained amniotic fluid cesarean delivery for fetal distress, low Apgar scores, or infants with a cord pH of <7.10 when oligohydramnios (AFI <5.0 cm) was present (LOE: 1).<sup>22</sup> The patients with oligohydramnios were all induced, while many of the other high-risk patients were expectantly managed. The study therefore provides no guidance on the safety of expectant

TABLE 1

Isolated oligohydramnios and perinatal outcomes						
Study	Design	Study number, n vs controls	Patient-oriented outcomes		Comment	LOE
	Population		Significant findings	Non-significant findings		
<b>Garmel</b> <sup>19</sup>	Prospective cohort  17–37 week with subnormal EFW (>10%)	N=187  65 AFI <8 cm vs 122 AFI >8 cm	Increased preterm birth (OR=3.23; 95% CI, 1.4–7.3) in oligohydramnios group	IUGR, asphyxia, death, NICU admit	Delivery recommended at 37 weeks	2
<b>Conway</b> <sup>18</sup>	Prospective cohort  Term, isolated oligohydramnios undergoing induction	N=366  183 AFI <5 cm vs 183 AFI >5 cm	Increased CS rate (OR=2.7 95% CI, 1.3–5.4) in oligohydramnios group	CS for fetal distress; all neonatal outcomes	Treatment group induced, controls spontaneous	2
<b>Roberts</b> <sup>21</sup>	Prospective cohort  3rd trimester, isolated oligohydramnios	N=206  103 AFI 3%ile (N=103) vs matched control	Increased IUGR (OR=5.2; 95% CI, 1.6–22), induction (OR=34.4, 95% CI, 4–1425.5), NICU admit (OR=9.8; 95% CI, 1.3–432)	Fetal distress requiring CS	Used >5%ile to exclude IUGR. Included some high-risk pts (diabetes or hypertension)	2
<b>Rainford</b> <sup>22</sup>	Retrospective cohort  37–41 week, low-risk. AFI within 4 days of delivery	N=232  AFI <5 (n=44) vs >5 (n=188)	Induction rate for AFI <5 = 98% vs 51% AFI >5 <i>P</i> <.001; increased meconium staining in controls without oligohydramnios	NICU admissions, 5-minute Apgar scores		2
<b>Zhang</b> <sup>23</sup>	Retrospective nested cohort  Term or near-term, low-risk	N=6657  AFI <5 (n=86) vs >5 (n=6571)	Malpresentation (RR=3.5, 95% CI 1.8–6.60)	Fetal growth, CS, low Apgar, overall neonatal morbidity	Benefit of routine ultrasound was the primary study outcome study endpoint	2

AFI, amniotic fluid index; CI, confidence interval; CS, cesarean section; EFW, estimated fetal weight; IUGR, intrauterine growth restriction; LOE, level of evidence; NICU, neonatal intensive care unit; OR, odds ratio; RR, relative risk.

management for patients with oligohydramnios. To eliminate the potential effect of induction versus expectant management the same authors performed a case-control study of 79 high-risk women

with AFI <5 cm matched to 79 women with the same high-risk pregnancy complication who had an AFI >5 cm at the time of induction (LOE: 2).<sup>23</sup> They failed to detect any significant differences in

Hydration with oral water or IV hypotonic solutions has been shown to increase amniotic fluid volume

neonatal outcomes between the groups.

Studies of the “borderline” AFI (between 5 cm and 8 cm) may also demonstrate an association with adverse neonatal outcomes if researchers include fetuses with IUGR or malformations. In one retrospective case review of 214 women with AFI of 5 cm to 10 cm, the only statistically significant finding was an association with IUGR.<sup>3</sup> The authors recommended antepartum surveillance twice a week for mothers with borderline AFI, but they did not comment on induction (LOE: 2). Correspondence regarding this study argued that this recommendation was not supported by the evidence and would lead to unnecessary antenatal testing.<sup>24</sup>

### Studies of isolated oligohydramnios

Investigators have conducted studies (Table 1) excluding fetuses with intrauterine growth restriction or anomalies to try to determine if isolated oligohydramnios is associated with poorer outcomes.<sup>25–30</sup>

Rainford’s study of outcomes in exclusively term, low-risk patients failed to show significant outcome differences in Apgar scores, NICU admissions, or rates of cesarean delivery for non-reassuring fetal heart rate monitoring (LOE: 2).<sup>29</sup> This study was limited due to its retrospective design. The authors comment that the relatively good outcomes in the oligohydramnios group may be due to the widespread practice of inducing such patients.

In a case-control study by Conway, 183 low-risk, term parturients with oligohydramnios were matched to 183 women of similar gestational age and parity who presented in spontaneous labor. The patients with isolated oligohydramnios were induced and showed an increased cesarean delivery rate. The increased rate of cesarean delivery was not due to nonreassuring fetal surveillance and was attributed to the induction process (LOE: 2).<sup>25</sup>

An analysis of woman diagnosed with isolated oligohydramnios (AFI <5) at any gestational age in the multicenter prospective RADIUS trial demonstrated similar perinatal outcomes and fetal growth compared with pregnancies with a normal amniotic fluid (LOE: 2).<sup>30</sup>

The only randomized clinical trial of labor induction vs expectant management for term isolated oligohydramnios showed similar outcomes in each group. But this study was small (n=61) and has only been published as an abstract.<sup>31</sup>

### Effect of maternal hydration

Maternal hydration status and plasma osmolality have an affect on amniotic fluid volume (Table 2). Maternal hydration with oral water or intravenous hypotonic solutions has been shown to increase amniotic fluid volume.<sup>8,11–13</sup> Oral hydration with hypotonic fluid has been demonstrated to increase fetal urine production in one observational study.<sup>32</sup> Another observational study demonstrated increased amniotic fluid volume and uteroplacental perfusion without alteration of fetal urine production suggesting the possibility that transmembranous fluid shifts from the placenta to the amniotic cavity may be involved.<sup>12</sup>

Two small, randomized controlled trials (RCTs) demonstrated an increase in amniotic fluid volume in women with oligohydramnios after oral hydration.<sup>11,13</sup> Doi demonstrated significant increases in AFI in women with oligohydramnios beyond 35 weeks when given oral hydration with free water (increase of 3.8 cm ± 1.9; *P* < .001) or hypotonic intravenous solution (increase of 2.8 cm ± 1.9; *P* < .001) (LOE: 3).<sup>11</sup> Interestingly, this study did not demonstrate an increase in amniotic fluid volume with intravenous hydration with isotonic fluid.

Kirkpatrick demonstrated a 30% increase in amniotic fluid compared with controls in women of unspecified gestational age with oligohydramnios given 2 liters of oral water 2 to 5 hours before repeat amniotic fluid index (LOE: 3).<sup>13</sup>

A randomized trial in women with normal amniotic fluid demonstrated a 16% increase in

TABLE 2

## Effect of hydration on amniotic fluid index

Study	Design	Population	Intervention	Outcome	Comment	LOE
Kilpatrick <sup>32</sup>	RCT	N=40, AFI 2.1–6.0; population of patients referred for antenatal testing	Treatment group drank 2 L water and repeat AFI same or next day	Increase of $1.5 \pm 1.4$ cm ( $P < .01$ ) in treatment group	Gestational ages of subjects not stated	3
Kilpatrick <sup>37</sup>	RCT	N=40, AFI 7–24 cm, gestational 28 weeks	Treatment group instructed to drink 2 L and restricted group 0.1 L water. AFI repeated in 4–6 h	Increase of $3.0 \pm 2.4$ cm ( $P < .0001$ ) in treatment group; decrease of $1.5 \pm 2.7$ cm in controls ( $P < .02$ )	Subjects had normal AFI at entry	3
Flack <sup>36</sup>	Prospective cohort	N=20, 10 w/ AFI <5 cm, 10 controls AFI >7, 3rd trimester	2 L oral water over 2 h for treatment and control groups, repeat AFI at 2 h	Increase in 3.2 cm in AFI (95% CI, 1.1–5.3) in oligohydramnios group but not in normal AFI group	Improved uterine perfusion shown by increased uterine artery velocity only in oligohydramnios group	3
Doi <sup>35</sup>	RCT	N=84, AFI <5, at least 35 wks; randomized three maternal hydration methods (2 L oral water, hypotonic saline IV, or isotonic saline IV)	Hydration with 2 L fluid and AFI repeated in 1 h compared with controls	Significant increases in AFI in oral water and hypotonic IV groups by 3.8 cm and 2.8 cm ( $P < .001$ ) respectively	IV isotonic solutions did not increase amniotic fluid volume in study population	3

RCT, randomized controlled trial; AFI, amniotic fluid index; CI, confidence interval.

amniotic fluid index 4 to 6 hours after hydration with 2 liters of oral water, compared with an 8% decrease after fluid restriction during the same period.<sup>8</sup>

A recent study of daily oral hydration in women with amniotic fluid volume <10% percentile showed increased amniotic fluid volume at 1 week,

suggesting long-term benefit, although the study lacked an appropriate control group (LOE: 3).<sup>33</sup>

There are no studies of clinical outcomes such as fetal heart rate decelerations during labor, or neonatal outcomes. A Cochrane systematic review concluded that maternal hydration appears to increase amniotic fluid and may be

**Umbilical artery Doppler flow studies have been used to decrease the need for induction in high-risk pregnancies**

beneficial in management of oligohydramnios; however, it recommended controlled trials to assess clinical outcome benefits (LOE: 3).<sup>34</sup>

## ■ MANAGEMENT RECOMMENDATIONS

The AFI has low specificity and positive predictive value for oligohydramnios, and there is scant evidence that isolated term oligohydramnios causes adverse fetal outcomes. We recommend that an AFI under 5 cm should prompt additional antenatal testing rather than immediate induction in low-risk term pregnancies (SOR: B).

Though we acknowledge the lack of high-quality studies with patient-oriented outcomes to support observation and maternal hydration, we have developed a management strategy that does not require immediate induction of labor in women with uncomplicated term pregnancies.

The following recommendations apply to women having oligohydramnios as defined by amniotic fluid volume of less than 5 cm and gestational age between 37 and 41 weeks.

### Initial assessment

1. Assess for premature rupture of membranes with a thorough history and a sterile speculum exam
2. Reassess dating as oligohydramnios in post-dates pregnancy (>41 weeks) is an indication for induction (SOR: C)<sup>35</sup>
3. Perform a nonstress test to assess fetal well-being
4. Assess for IUGR with an ultrasound for estimated fetal weight and for the ratio of head circumference (HC) to abdominal circumference (AC). A comparison with prior ultrasounds can aid in assessing interval growth. An estimated fetal weight below the 10%, an elevated HC/AC ratio, or poor interval growth would suggest IUGR

5. Arrange for an ultrasound anatomic survey for fetal anomalies, if not done previously
6. Determine if preeclampsia, chronic hypertension, diabetes, or other maternal conditions associated with uteroplacental insufficiency are present.

### Action steps

With any positive findings in the initial evaluation, proceed to labor induction, as the patient does not have isolated, term oligohydramnios (SOR: C). If the initial assessment is unremarkable and the AFI is less than 5, consider hydration with oral water and repeating the AFI 2 to 6 hours later (SOR: B).

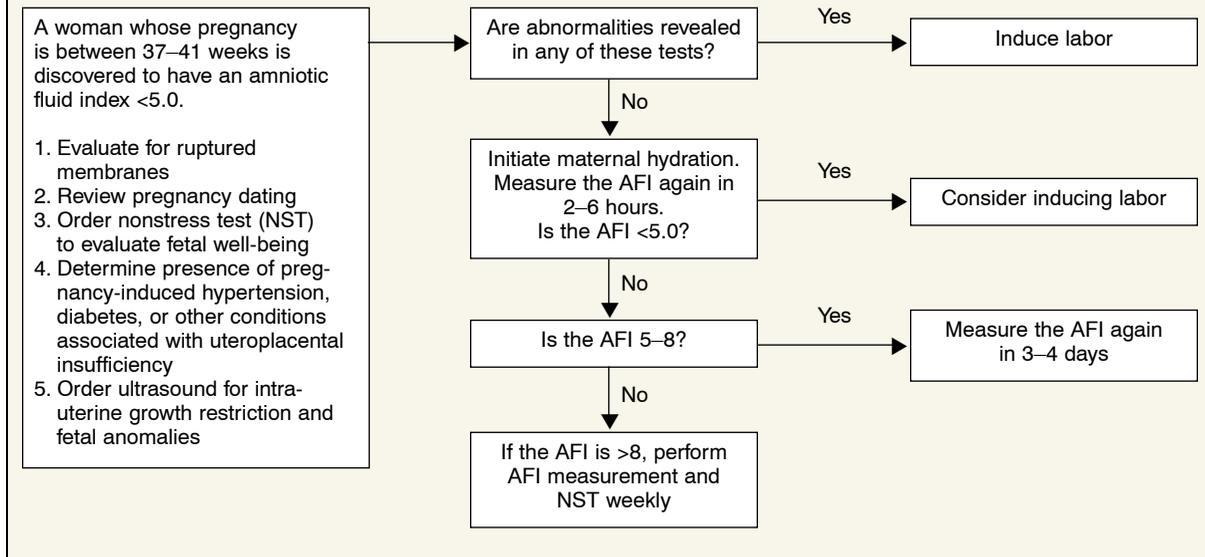
Persistent oligohydramnios at term, particularly with a ripe cervix, may lead you to consider labor induction. Continued expectant management of isolated term oligohydramnios with twice weekly fetal surveillance may also be a reasonable option due to the paucity of evidence that oligohydramnios is associated with an adverse outcome in this scenario (SOR: C). Normal results with umbilical artery Doppler flow studies have been used to decrease the need for induction in high-risk pregnancies with oligohydramnios, and this technique may eventually have a role in isolated term oligohydramnios.<sup>36</sup>

It is essential that patients receive counseling and give informed consent regarding the risks and benefits of observation or induction for isolated term oligohydramnios. The ease of induction based on parity and cervical ripeness should be considered.

A primiparous woman with an unfavorable cervix who strongly desires a spontaneous, vaginal birth could be told that, although there *may* be a small risk for her baby, no study has demonstrated any increased long-term morbidity or mortality associated with low fluid in her situation and that labor induction may double her chance of cesarean delivery.<sup>37,38</sup> In such a situation, an acceptable approach for mother and clinician may be rehydration followed by a repeat AFI and close follow-up with testing for fetal well-being according to the algorithm (**Figure**). In a practical sense,

## FIGURE

## Assessment of the pregnant woman with oligohydramnios at term



rehydration with 2 liters of oral water for oligohydramnios may be done whether or not immediate induction is chosen, as this is a safe measure that has been shown to significantly increase AFI. Alternatively, the preferred approach for a multiparous woman with a ripe cervix by Bishop score may be labor induction.

As adverse fetal outcomes have not been demonstrated in women with isolated term oligohydramnios, there is no rationale for routinely inducing labor based on an isolated finding of a so called “borderline” amniotic fluid index in the 5-to-8 range. In this situation it is appropriate to perform the initial assessment described above and may be reasonable to repeat the amniotic fluid index in 3 to 4 days to determine if true oligohydramnios has developed.

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