

Association Between Lactate Levels in Vaginal Fluid and Time of Spontaneous Onset of Labor in Suspected Cases of Prelabor Rupture of Membranes

Jaiswar Shyam Pyari · Natu S. M. ·
Gupta Amrit · Chaurasia Shweta

Received: 27 May 2012 / Accepted: 28 October 2012 / Published online: 22 February 2013
© Federation of Obstetric & Gynecological Societies of India 2013

Abstract

Purpose To assess correlation between lactate levels in vaginal fluid and onset of labor in suspected PROM.

Method A prospective observational study conducted at the Dept. of Obstetrics and Gynecology and Pathology from 2008 to 2009. 118 women with complaints of leaking per vaginam underwent a sterile speculum examination and vaginal fluid was taken to estimate lactate level. Then, women were followed till the spontaneous onset of labor. The association was presented as Odds ratio with 95 %CI.

Results The median time of onset of spontaneous labor and examination was 12 h in patients with lactate levels >5.0 mmol/L and 76 h in patients with lactate levels <5.0 mmol/L. Among 62 women with lactate levels >5.0 mmol/L, 67.7 % of women ($n = 42$) had spontaneous onset of labor within 24 h and 83.87 % women of ($n = 52$) within 48 h.

Conclusion A lactate level >5.0 mmol/L is significantly associated with the spontaneous onset of labor within 24 and 48 h in suspected cases of PROM.

Keywords Lactate levels · Labor · Prelabor rupture of membranes

Introduction

Premature rupture of membranes is defined as the rupture of membranes before the onset of labor [1], which is one of the most common complications of pregnancy. It occurs in approximately 10 % of all pregnancies and is implicated in more than one-third of preterm deliveries.

A very important question in clinical practice with regard to women with PROM is the time of onset of spontaneous labor. Latency, which is defined as the time of PROM to delivery, is highly variable. It depends on various factors like gestational age at the time of rupture of membranes, degree of oligohydramnios, and myometrial thickness. Latency is important in terms of referral of patients to the higher institutions for appropriate management of high-risk infants.

Lactate levels in amniotic fluid are reported to be four–six times higher than fetal and maternal blood. The source of lactate in amniotic fluid is the fetus, mainly through urine and lung excretion. Quenby et al. [2] suggested the myometrium as another possible lactate producer. The lactate concentration in vaginal fluid was found to be 0.8–15.6 mmol/L [3]. Varied lactate concentrations in vaginal fluid could describe different myometrial activities. In this study, we aim to assess whether lactate concentration in vaginal fluid is associated with onset of spontaneous labor.

Jaiswar S. P. (✉), Professor · Gupta A.,
Assistant Professor · Chaurasia S., Resident
Department of Obstetrics and Gynaecology, C S M Medical
University, Lucknow 226003, Uttar Pradesh, India
e-mail: spjaiswar@yahoo.com

Natu S. M., Professor
Department of Pathology, C S M Medical University,
Lucknow, Uttar Pradesh, India

Material and Method

This prospective observational study was conducted in the department of obstetrics and gynecology, Queen Mary’s Hospital, CSM Medical University, in collaboration with the department of Pathology, CSM Medical University, Lucknow, in the year 2008–2009.

The study population consisted of 118 pregnant women with singleton pregnancy of >34 weeks of gestation, with a suspicion of premature rupture of membranes. These 118 women were divided into two groups, Group 1—Nonvisible (*n* = 67) and Group 2—Visible (*n* = 51), according to visibility of amniotic fluid.

Women with PROM who were already in labor, having meconium-stained liquor or features of chorio-amnionitis, and women with labor induction or delivery by cesarean section before the end of the latent phase were excluded from the study.

All the women in the study had undergone a sterile speculum examination and vaginal fluid was collected with the help of a micro-autopipette of 50 µL capacity; the lactate level was analyzed within 2–3 and h if not possible, the sample was stored at –20 °C and the lactate level was determined within 24–48 h. For biochemical analysis of lactate level, a commercially available Spinreact Kit was used. The analysis of the sample was done by the kinetic method using a semi-auto analyzer.

These patients were closely followed up for spontaneous onset of active phase of labor, which was defined as regular painful uterine contractions (>3 contraction of >20–25 s within 10 min) with cervical dilatation of >4 cm.

Results

The demographic profile of study population shows that both groups are almost similar in age, parity, and gestational age (Table 1). The cut-off value of >5.0 mmol/L of the lactate levels was found to be most appropriate with specificity of 87 % and sensitivity of 83.65 % (Fig. 1).

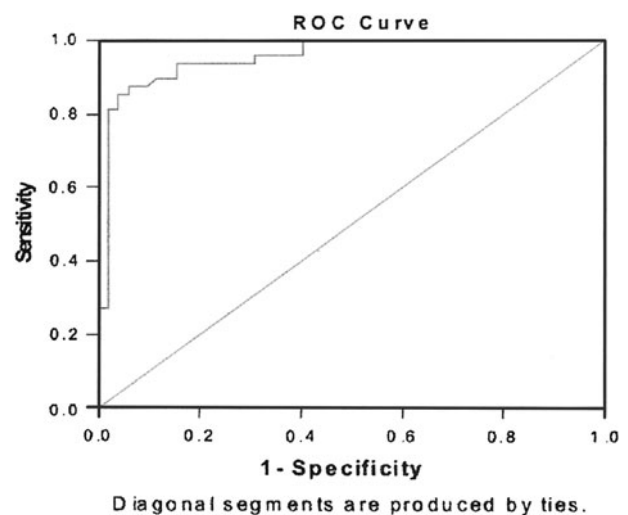
Regarding distribution of various lactate levels in the study population, it is seen that no patient in the Visible group had lactate levels less than 5.0 mmol/L, whereas 83.6 % of women (56/67) of the Nonvisible Amniotic Fluid group had lactate levels less than 5.0 mmol/L (Table 2).

Median time of onset of spontaneous labor among women with lactate level <5.0 mmol/L was 76 h and among women with >5.0 mmol/L was 12 h.

With lactate levels >5.0 mmol/L, 83.87 % of women (51/62) had onset of spontaneous labor within 48 h. Within the group of women with lactate levels <5.0 mmol/L, only 19.6 % (11/56) had spontaneous onset within 48 h. High

Table 1 Demographic analysis of women in different groups (*n* = 118)

S. no.	Parameters	Visible group (<i>n</i> = 51)	Nonvisible group (<i>n</i> = 67)
1.	Median age	25 years	23 years
2.	Parity		
	P0 + 0	23 (45 %)	31 (46.26 %)
	P1 + 0	14 (27.5 %)	18 (26.87 %)
	P2 + 0	14 (27.5 %)	18 (26.87 %)
3.	Gestational age		
	34–36 week	16 (31.375 %)	31 (46.27 %)
	36–38 week	17 (33.33 %)	16 (23.88 %)
	38–40 week	18 (35.29 %)	20 (29.85 %)



CUT OFF	True positive	False positive
4.5	.93	.24
5	.89	.13

Fig. 1 Receiver operator characteristic (ROC) curve constructed testing arbitrarily chosen lactate cut-off values for diagnosis of suspected PROM

lactate concentration and visibility of amniotic fluid are strongly associated with onset of spontaneous labor within 24 and 48 h. The odds ratio of being in labor within 24 h is almost 18 times higher among women with lactate concentrations >5.0 mmol/L than women with lower lactate levels. We also used the onset of labor within 48 h as the dependant variable. The results were similar (Table 3).

40.67 % (48/118) of all the women went into labor within 24 h. Among those with high lactate levels, 67.7 % (42/62) of women went into labor within 24 h compared with 10.71 % (6/56) of women with lower lactate levels. By using lactate levels >5.0 mmol/L as the cut-off, 87.5 % of women (42/48) would be correctly classified as to whether they were going to be in labor within 24 h (Tables 3, 4).

Table 2 Lactate level distribution among study population ($n = 118$)

S. no.	Lactate levels (mmol/l)	Visible group ($n = 51$)	Nonvisible group ($n = 67$)
1. ($n = 56$)	<5.0	0	56 (83.6 %)
2. ($n = 62$)	>5.0	51 (100 %)	11 (16.4 %)

Table 3 Median time of spontaneous onset of labor within 24 h and 48 h according to lactate level and visibility of amniotic fluid

S. no.	Explanatory ($n = 118$)	Onset within 24 h	Odds ratio (95 % CI)	Onset within 48 h	Odds ratio (95 % CI)
1. According to lactate level	Lactate level				
	<5.0 mmol/L ($n = 56$)	6 (10.71 %)	17.5 (6.43–47.59)	11 (19.61 %)	47.43 (15.91–139.66)
	>5.0 mmol/L ($n = 62$)	42 (67.7 %)		52 (83.87 %)	
2. According to visibility of amniotic fluid	Amniotic fluid				
	Nonvisible ($n = 67$)	16 (23.88 %)	5.368 (2.45–11.932)	21 (31.34 %)	10.22 (4.21–24.79)
	Visible ($n = 51$)	32 (62.74 %)		42 (82.35 %)	

Table 4 Lactate levels > 5.0 mmol/L Vs AF visibility for detection of spontaneous onset of labor within 24 and 48 h

S. no.	Time of onset of labor	Lactate level >5.0 mmol/L ($n = 62$)	AF visible ($n = 51$)
1.	Within 24 h ($n = 48$)	42 of 48 (87.50 %)	32 of 48 (66.7 %)
	40.67 %		
2.	Within 48 h ($n = 63$)	55 of 63 (88.71 %)	42 of 63 (67.74 %)
	53.38 %		

Discussion

It is a well-known fact that the time of onset of spontaneous labor after the rupture of membranes is very important in terms of management decisions as well as proper counseling of patients with suspected PROM regarding interventions which may be necessary for them. Wiberg-Itzel E et al. [4] in 2006 described for the first time the association between lactate concentration in vaginal fluid and time to spontaneous onset of labor in women with suspected PROM. They also studied the association of gestational age at the time of PROM, maternal age, parity, and visibility of amniotic fluid with the time of spontaneous onset of labor.

In the present study, we also observed for an association between gestational age, parity, visibility of amniotic fluid, along with concentrations of lactate in vaginal fluid and the spontaneous onset of labor. In our study, 48 women

(40.67 %) had spontaneous onset of labor within 24 h of examination and 63 patients (53.3 %), that is around half of the patients, had onset of spontaneous labor within 48 h. The median time of onset of spontaneous labor in patients who had lactate levels of less than 5.0 mmol/L was 76 h and in patients who had lactate levels of >5.0 mmol/L was 12 h. Results were almost similar to the study by Wiberg-Itzel E et al. In their study, 53.3 % of patients had spontaneous onset of labor within 24 h and 71.5 % patients had spontaneous onset of labor within 48 h. In their study, they found that the median time between examination and onset of labor among women who had lactate levels more than 4.5 mmol/L was 8.4 h, while the corresponding value for those women who had lactate concentrations less than 4.5 mmol/L was 54 h.

When visibility of amniotic fluid was taken into account, it was observed that 32 patients (62.74 %) out of 51 patients with visible amniotic fluid had spontaneous onset of labor within 24 h and 82.35 % (42/51) patients within 48 h, while only 16 patients (23.88 %) out of 67 patients without visible amniotic fluid had onset of labor within 24 h and 21 patients (31.34 %) within 48 h. Wiberg-Itzel E et al. in their study found that among 108 patients with visible amniotic fluid, 83 patients (76.89 %) had spontaneous onset of labor within 24 h and 97 patients (89.81 %) within 48 h. Compared with women without visible amniotic fluid, women with visible amniotic fluid were 5.368 times as likely to have spontaneous onset of labor within 24 h and 10.2 times as likely within 48 h.

If the patient is not having visible amniotic fluid on per speculum examination and is having a lactate concentration

of less than 5.0 mmol/L, there is only a 10.7 % chance that she will have spontaneous onset of labor within 24 h, and in 14.28 % cases, within 48 h. But, if the patient is having a lactate concentration of more than 5.0 mmol/L, there is a 67.27 % chance that she will have spontaneous onset of labor within 24 h, and in 85.71 % cases, within 48 h.

Conclusion

We have found that the lactate determination of vaginal fluid is a valid method for the prediction of onset of labor within 24 and 48 h. A high lactate concentration is more strongly associated with spontaneous onset of labor than visible amniotic fluid. A negative lactate test (lactate level <5.0 mmol/L) gives strong support that women are not having PROM and will not go into labor within 48 h. The women could be sent back home and can wait for the spontaneous onset of labor. The lactate test can be made a

simpler and more attractive tool in bedside obstetrics by using electrochemical strips that need only 5 μ l of amniotic fluid, with the result available after 60 s.

References

1. American College of Obstetrics and Gynecology, Premature rupture of membranes. Washington' DC: American College of Obstetrics and Gynecology; 1998 (ACOG Practical bulletin No. 1).
2. Quenby S, Pierce SJ, Brigham S. Dysfunctional labour and myometrial lactic acidosis. *Obstet Gynecol.* 2004;103(4):2–718.
3. Wiberg-Itjel E, Petterson H, Cnattingius S, et al. Lactate determination in vaginal fluid: a new method in the diagnosis of prelabour rupture of membranes. *BJOG.* 2005;112:754–8.
4. Wiberg-Itjel E, Petterson H, Cnattingius S, et al. Association between lactate in vaginal fluid and time to spontaneous onset of labour for women with suspected prelabour rupture of membranes. *BJOG.* 2006;113:1426–30.