British Journal of Obstetrics and Gynaecology
February 1998, Vol. 105, pp. 186–188

Immediate and delayed pushing in the second stage of labour for nulliparous women with epidural analgesia: a randomised controlled trial

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Objective To test the hypothesis that a policy of delaying active pushing in nulliparous women with epidural analgesia in labour reduces operative vaginal deliveries.

Design A randomised controlled trial.

Setting The delivery suite at Leeds General Infirmary.

Sample One hundred and thirty-five nulliparous women with an effective epidural in labour.

Methods The women were randomised to early pushing (commencement of pushing within one hour of the diagnosis of full dilatation) or delayed pushing (delaying pushing for a maximum of three hours from the time of diagnosis of full dilatation, unless the vertex was visible at the introitus sooner).

Main outcome measure Rate of instrumental vaginal delivery.

Results There was a nonsignificantly increased rate of instrumental vaginal delivery with early pushing (odds ratio 1·31, 95% CI 0·62–2·78). No adverse effects were noted.

Conclusion Although delayed pushing was associated with fewer instrumental vaginal deliveries, the size of the effect may have occurred by chance and the evidence does not, at present, justify a general recommendation towards either early or delayed pushing.

INTRODUCTION

Epidural analgesia in labour is associated with increased instrumental delivery rates[1], and delaying active pushing has been suggested to minimise this. Although trials show that delaying pushing reduces rotational forceps delivery[2], many midwives and doctors remain unconvinced, as the results of implementing a policy of delayed pushing have either shown no improvement in spontaneous vaginal delivery rates[3,4] or even an increase in forceps delivery[5]. Since the confidence intervals of the overview encompass clinically important effect sizes, it is worth continuing randomised trials. We therefore performed one, to test further the hypothesis that a policy of delaying pushing reduces operative deliveries. Since any benefit might be outweighed by adverse effects on the fetus, we measured cord pH in a subset of participants.

METHODS

Local research ethics committee approval was obtained, and the trial was conducted from November 1993 to October 1996. Nulliparous women in spontaneous or induced labour, with a singleton fetus between 37 and 42 weeks of gestation, and with an effective epidural, were eligible. Women with a non vertex presentation, or any complication which might influence second stage management, such as raised blood pressure, heart disease, or a dural tap were excluded. Eligible women were invited to participate, given an information sheet, and written consent was obtained. Participants were randomly allocated to early or delayed pushing, using numbered opaque sealed envelopes containing computer generated random allocations in a ratio of 1:1 in balanced blocks of ten. They were randomised either in the first stage or within one hour of the start of the second stage, and the time of randomisation was noted.

If the woman was allocated to early pushing, it was intended that pushing would commence within one hour of full dilatation, whether the vertex was visible or not. Women allocated to delayed pushing were encouraged to rest without pushing for a maximum of three hours from the time of full dilatation, unless the vertex was visible at the introitus earlier. In both groups progress was reviewed by medical staff after 30 minutes of active pushing. Use of oxytocin was unrestricted, and continuous fetal heart rate monitoring was performed in all

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Table 2. Time intervals (minutes). Values are given as median (interquartile range [IQR]) and *n*.

	Early		Delayed		
	Median (IQR)	*n*	Median (IQR)	*n*	*P*
Randomisation to full dilatation	150 (75–290)	63	148 (46–256)	60	0·503
Full dilatation to pushing *	52 (15–64)	62	168 (87–180)	60	< 0·002
Pushing to delivery*	73 (48–115)	62	52 (31–90)	60	0·026
Randomisation to pushing*	185 (105–326)	62	270 (199–416)	60	0·003
Randomisation to delivery	278 (190–456)	67	367 (272–486)	68	0·031
Full dilatation to delivery	119 (89–155)	63	214 (149–252)	60	< 0·002

*One woman in the early pushing arm had a lower segment caesarean section in the second stage of labour before active pushing was commenced.

Table 1. Characteristics of the women. There were no significant differences between the two groups.

	Early	Delayed
n	67	68
Age (years)	27·8	26·1
Gestation (days)	281·3	281·0
Oxytocin first stage	34	40
Birthweight (g)	3491	3432

cases, with scalp pH estimation always available. It was intended to measure umbilical cord venous pH on all women after the first 44 women had been enrolled (i.e. on 91 women). Outcome details were retrieved from the obstetric records after delivery. The sample size of 135 had 80% power to detect a halving in the rate of instrumental vaginal delivery in nulliparous women with an epidural, from 44% to 22% ($\alpha = 0{\cdot}05$).

Statistics

The significance of differences in mean birthweight, gestational age and blood loss were tested using Students *t* test. The significance of differences in the duration of each phase of labour was tested using the Mann-Whitney *U* test. Rates of adverse outcomes in both groups are given as odds ratios (OR) and 95% confidence intervals (95% CI), and the present results were combined with previous trials using the Mantel-Haenszel formula. All analyses were by intention-to-treat unless otherwise stated.

RESULTS

During the three year recruitment period approximately 13,000 women were delivered at Leeds General Infirmary. Approximately 5000 were in their first pregnancy at term and 2500 would have had an epidural anaesthetic and been eligible; 135 women participated: 67 were allocated to early pushing and 68 to delayed pushing. Outcome details were obtained in the women. There were no significant differences bewteen the groups in age, gestational age, use of oxytocin in the first stage of labour or birthweight (Table 1). There were four protocol violations: one woman was multiparous (allocated to delayed pushing), one woman was randomised more than 1 hour after full dilatation (allocated to delayed pushing), and two had gestational ages of < 37 weeks (one allocated to early, one to delayed pushing). These were all included in the analysis by intention to treat. There were also 13 women (five allocated to early pushing, eight allocated to delayed pushing) who underwent caesarean delivery in the first stage of labour or within 1 hour of the onset of the second stage. These are excluded where appropriate from the time interval comparisons, but included in the main intention to treat analysis.

The randomisation to full dilatation interval was similar in both groups. The second stage of labour was shorter in the early pushing group, but there was a shorter passive phase and a longer active phase. Overall, the randomisation to delivery interval was shorter in the early pushing group (Table 2).

The main outcomes are shown in Table 3. All ventouse deliveries were occipito-anterior before application, apart from two where rotation was required, both in the early pushing group. Therefore a total of eight rotational deliveries occurred in the early pushing group, compared with three in the delayed pushing group. Umbilical cord pH at delivery was measured in 41/91 women in whom this was intended. Three of the 23 women in the early group and four of the 18 women in the delayed group had an umbilical venous pH of < 7·25.

When the five previously published trials were combined in a meta-analysis[2], and the effect of early *versus* delayed pushing on nonspontaneous vaginal delivery considered, the typical odds ratio was 1·14 (95% CI 0·72–1·81). When this study was included the typical odds ratio became 1·15 (95% CI 0·83–1·6).

Table 3. Outcomes. Values are given as *n* unless otherwise indicated. CS = caesarean section; SCBU = special care baby unit.

	Early ($n = 67$)	Delayed ($n = 68$)	OR (95% CI)
Oxytocin in second stage	40	43	0·86 (0·41–1·83)
Mode of delivery			
Instrumental vaginal delivery			
Nonrotational forceps	15	16	0·94 (0·39–2·25)
Rotational forceps	6	3	2·13 (0·45–11·33)
Ventouse	8	6	1·40 (0·41–4·90)
TOTAL	29	25	1·31 (0·62–2·78)
Lower segment CS			
First stage	4	8	0·48 (0·11–1·87)
Second stage	2	1	2·06 (0·14–59·0)
TOTAL	35	34	1·09 (0·53–2·27)
Other outcomes			
Second degree tear	13	8	1·81 (0·64–5·21)
Episiotomy	42	40	1·18 (0·56–2·49)
Blood loss at delivery ≥ 500 mL	11	12	0·92 (0·34–2·46)
Blood loss at delivery (mL): mean	327*	334*	
Manual removal of placenta	2	5	0·39 (0·05–2·38)
Apgar < 7 at 5 min	0	0	
SCBU	3	5	0·59 (0·11–3·0)
Intubated	1	0	
Neonatal fits	0	0	
Perinatal death	0	0	

*$P > 0·5$

DISCUSSION

These results confirm previous trials which show that early pushing increases the odds of rotational forceps delivery, but does not significantly increase instrumental delivery overall. The addition of the present results to previous trials has not shifted the odds ratios significantly but has narrowed the confidence intervals slightly.

Recruitment proved to be both slow and difficult. Nevertheless, the low recruitment does not affect the internal validity of the trial, and there was good compliance with the allocations to the trial. Early pushing shortened the second stage, but did not reduce the duration of pushing. The difference in duration of the second stage was not only due to late diagnosis of full dilatation in the early pushing group. The labour ward staff could have consciously or subconsciously delayed the crucial vaginal examination to diagnose the second stage if allocation had been to early pushing. However, this did not seem to have occurred as the randomisation to full dilatation intervals were similar in both groups. The randomisation to delivery interval, which could not be biased, was measured and this was shorter in the early pushing group.

Despite the lengthening of the second stage with delayed pushing there were no significant differences in fetal outcome, although less than half of the women scheduled to have the umbilical cord pH measured had this performed. Although there was no obvious deleterious effect as a result of delayed pushing, there did not appear to be any beneficial effect. No significant difference in overall instrumental delivery rate was noted, and so the primary hypothesis was refuted.

During the three years of the study the rate of ventouse delivery in the hospital increased from 1·3% to 3·9%, the rate of nonrotational forceps fell from 6·8% to 3·5% and of rotational forceps from 3·5% to 1·6%. With the ventouse being increasingly used instead of forceps it could be argued that the issue of delayed pushing becomes less relevant. However in this trial the ventouse was used mainly for occipito-anterior positions, and in only two women did it appear to be used in place of rotational forceps.

In summary, a policy of delaying pushing for women with epidural analgesia reduces the rate of rotational forceps delivery at the expense of an extra hour in labour. Although this is not translated into a significant reduction in instrumental vaginal delivery overall, the trend is towards lower instrumental delivery with delayed pushing. No clear adverse fetal effect of delaying pushing has been observed. The evidence does not at present justify a policy of either early or delayed pushing, but women who are particularly keen to avoid rotational instrumental delivery will increase their chance of achieving this by delaying pushing.

Acknowledgement

The authors would like to thank all members of midwifery and medical staff for their co-operation with this project

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Received 2 May 1997
Returned for revision 2 July 1997
Revised version received 20 August 1997
Accepted 8 October 1997