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Research Article

New Delivery Chair for Vaginal Delivery

Vedran Stefanovic, Veli-Matti Ulander, Mervi Väisänen-Tommiska, Sanna Suomalainen-König, Eija Kortelainen, Christina Salmén, Minna Tikkanen and Jorma Paavonen*

Department of Obstetrics and Gynaecology, Helsinki University Hospital, Finland

ABSTRACT

Objectives: Compared to different upright positions, delivery in recumbent position in bed may increase the likelihood of operative delivery and other delivery complications, and also decrease levels of maternal self-control. A new delivery chair has been developed to facilitate a variety of upright positions during labour. A randomised controlled trial was conducted to evaluate the impact of the delivery chair use on selected obstetrical and neonatal outcomes, compared to traditional recumbent position.

Methods: A total of 1477 women with uncomplicated singleton pregnancy ≥ 34 gestational weeks with fetus in vertex presentation were enrolled to the study: 776 in the delivery chair group, and 701 in the control group.

Results: An intention-to-treat analysis showed no differences between the groups in any of the outcomes used. Of the women in the delivery chair group, 251 used the chair throughout the second stage. An as-treated analysis was performed between these 251 women and their counterparts in the control group. Women using the delivery chair had a shorter second stage of delivery, fewer episiotomies, and less need for vacuum extraction, with no difference in blood loss or neonatal outcome. However, women using the delivery chair had more third-degree tears (11 cases, or 4.4%, *vs.* 9 cases, or 1.8%).

Conclusion: The novel delivery chair can be safely used for vaginal delivery. More attention should be given to perineal support to prevent perineal tears. There is a need for multicentre trials of the delivery chair using standardised measurements of outcomes, including maternal pain, maternal self-control, and overall satisfaction.

Keywords: Delivery chair; Vaginal birth; Episiotomy

INTRODUCTION

Compared to different upright positions, delivery in recumbent position in bed may increase the likelihood of operative delivery and other delivery complications and also decrease levels of maternal self-control [1-4]. A novel birthing chair has been developed in Finland (Figure 1). Use of this chair enables a more upright position during delivery. Preliminary experiences of the use of this birthing chair have been encouraging. Therefore, we decided to perform a randomized controlled trial of the use of the delivery chair. We compared key outcomes between women who used the birthing chair and those who delivered in recumbent position in a conventional delivery bed.

MATERIALS AND METHODS

The inclusion criteria of the trial were: Uncomplicated singleton pregnancies ≥ 34 gestational weeks with fetus in vertex presentation and planned vaginal delivery.

The following key outcomes were determined: duration of the first and second stage of labour, the incidence caesarean section, vacuum extraction episiotomy and perineal tears the amount of bleeding, and the short-term condition of the new-born.

Information about the study was distributed to all antenatal clinics in the area. Randomization was performed after admission to delivery department for eligible participants after obtaining written informed consent into either the delivery chair group (study group) or the conventional vaginal birth group (control group). Randomisation was performed by drawing a closed envelope that contained the study group allocation.

Midwives were trained in the use of the birthing chair, both before and during the study. The use of the data collection forms were tested prior to the study.

In accordance with Good Clinical Practice guidelines mothers were informed about the right to withdraw from the study at any

Correspondence to: Jorma Paavonen, Department of Obstetrics and Gynaecology, Helsinki University Hospital, Finland, Tel: 358400497900; E-mail: jorma.paavonen@helsinki.fi

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time, without this having any effect on the standard management of the delivery. Interim analyses were performed during the trial in order to rule out any harm in which case the trial would have been discontinued.

All data was collected by two experienced research nurses (EK, CS) from the Obstetric electronic hospital data base. Mothers were asked to fill up a form before discharge or to return the form by mail in a prepaid envelope. The data was analysed by SPSS, and $p<0.05$ was considered statistically significant.

RESULTS

The flow chart of the study is presented in Figure 2. A total of 1477 mothers were enrolled of whom 776 into the delivery chair group and 701 into the control group. An intention-to-treat analysis showed that the groups were comparable (Table 1). The delivery chair group did not differ from the control group in relation to any of the outcomes considered.

Next we decided to perform an additional as-treated analysis. We excluded mothers who gave up the use of the delivery chair, and those who delivered by caesarean section or vacuum extraction. There were 582 mothers left in the delivery chair group and 513 in the control group.

Of the 582 mothers in the delivery chair group, 251 (43.1%) used the delivery chair throughout the second stage of labour until the infant was born. Thus, 331 mothers (56.9%) did not use the delivery chair for various reasons including signs of fetal distress on cardiotocography, fetal malposition, mothers' exhaustion, or reluctance to move to the delivery chair during the second stage of labour.

By as-treated analysis we compared these 251 mothers from the delivery chair group with the 513 controls. The groups were comparable with respect to age, body mass index and obesity, gestational age and obstetric history (Table 2).

An episiotomy was performed in 30 cases (12.0%) in the delivery chair group, and 106 cases (20.7%) in the control group ($p<0.05$). Of the mothers in the delivery chair group, 183 (72.9%) had a second stage lasting less than 20 minutes compared to 310 (60.4 %), ($p<0.01$) in the control group. We observed 11 third-degree perineal tears (4.4%) in the delivery chair group, and 9 (1.8%) in the control group ($p<0.05$). No fourth-degree lacerations occurred in either group. The amount of bleeding exceeded 1000 ml in 18 mothers (7.2%) in the delivery chair group, and in 34 mothers (6.6%) in the control group. Three mothers in the delivery chair group (1.2%) and 7 mothers in the control group (1.4%) had total blood loss exceeding 2000 ml. These differences are not significant.

The groups did not differ with respect to the short-term outcome of new-borns. Apgar scores (1 min/5 min) in the delivery chair group were 8.7/9.0, and 8.6/8.9 in the control group. The mean

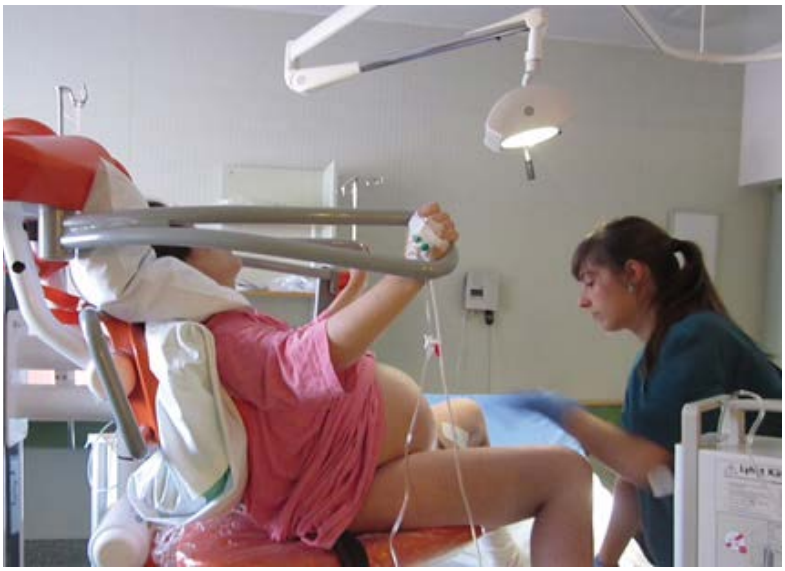

Figure 1: Delivery chair. Note the position of mother and midwife.

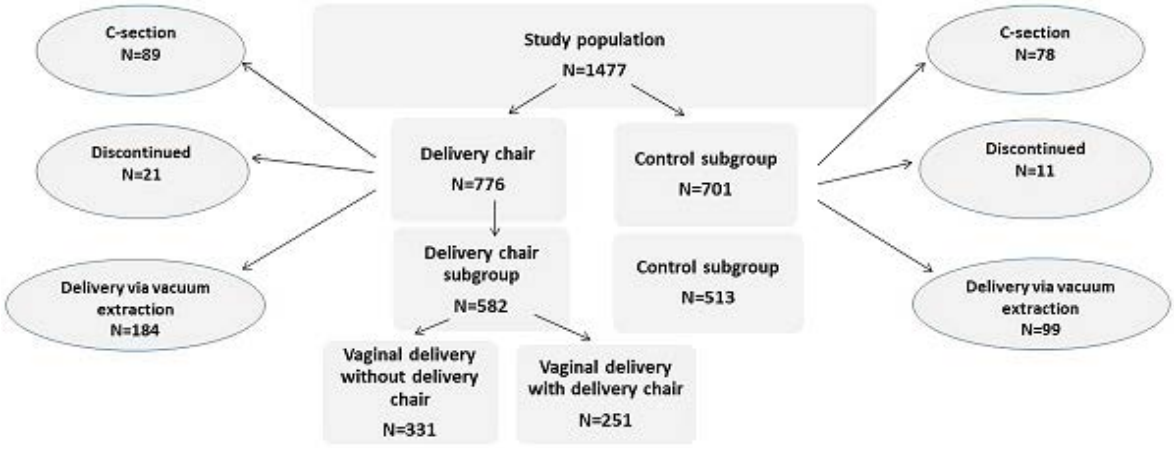

Figure 2: Flowchart.

Table 1: Comparison of the delivery chair group and the control group; an intention-to-treat analysis.

Categories	Delivery chair group N=776	Control group N=701
Maternal age, mean (range)	30.0 (16-45) yrs.	30.0 (18-44) yrs.
BMI, mean (range)	24.6 (16.1-49.0)	24.2 (17.2-51.3)
BMI>30 (%)	102 (13.1 %)	75 (10.7 %)
Gestational age at delivery (days)	282 (240-298)	282 (245-297)
Primipara (%)	425 (54.8 %)	405 (57.8 %)
Birth weight, mean (range)	3588 (2140-5135) g	3610 (2335-5190) g
Episiotomy	194 (25 %)	194 (27.7 %)
Blood loss>1000 ml (%)	91 (11.7 %)	82 (11.7 %)
3rd degree tear	20 (2.6 %)	14 (2.0 %)
Induction of labour	247 (31.8 %)	248 (35.4 %)
Caesarean section	89 (11.5 %)	78 (11.1 %)
Vacuum extraction (%)	84 (10.8 %)	99 (14.1 %)
Duration of second stage labour<20 min	377 (48.6 %)	333 (47.5 %)

Note: BMI = Body mass index

Table 2: Comparison of the delivery chair group and the control group: as treated-analysis.

Categories	Delivery chair group N=251	Control group N=513
Maternal age, mean (range)	29.8 (16-42) yrs.	30.1 (18-44) yrs.
BMI, mean (range)	23.9 (17.9-42.5)	24.2 (17.3-51.3)
BMI>30 (%)	24 (9.6 %)	54 (10.5 %)
Gestational age at delivery (days)	282 (240-298)	281 (245-296)
Primipara (%)	111 (44.2 %)	258 (50.3 %)
Birth weight, mean (range)	3574 (2520-4864) g	3592 (2365-5190) g
Episiotomy	30 (12.0 %)	106 (20.7 %)
Blood loss>1000 ml (%)	18 (7.2 %)	34 (6.6 %)
3rd degree tear	11 (4.4 %)	9 (1.8 %)
Duration of second stage labour<20 min	183 (72.9 %)	310 (60.4 %)

Note: BMI = Body mass index

umbilical arterial pH of the new-borns was 7.28 in the delivery chair group and 7.25 in the control group.

Ventouse deliveries were analysed separately. In the whole delivery chair group (N=776), the rate of vacuum extraction was 10.8%, compared to 14.1% in the control group. Due to lack of experience of vacuum extraction in the delivery chair, this procedure was always performed conventionally on the bed. In order to assess the effect of the use of delivery chair on the risk of vacuum extraction, all vacuum extraction cases were analysed. There were 18 deliveries (6.7%, n=269) for which the second stage of labour began with the delivery chair and ended in delivery by vacuum extraction. Of the mothers in the delivery chair group who did not use the birthing chair to the end of the delivery, 66 (16.7%) ended up in delivery by vacuum extraction. The corresponding number in the control group was 99 (16.2%, n=612). Thus, those who used the delivery chair during the second stage of labour had lower risk of operative vaginal delivery by vacuum extraction ($p<0.001$).

DISCUSSION

We compared vaginal delivery in the novel delivery chair to vaginal delivery in the standard recumbent position in bed. In the "intention-to-treat" analysis, no differences between the groups were noted with regard to the selected outcomes. This suggests that the delivery chair had no harmful effect on the course of delivery.

In addition to this analysis, we performed so called "as-treated" analysis in which we compared selected obstetrical and neonatal outcomes between women who used the delivery chair consistently to the end of the second stage of labour to the controls who ultimately delivered vaginally. We observed that these two groups differed regarding the number of episiotomies performed (fewer in the delivery chair group), the overall duration of the second stage (shorter in the delivery chair group), and 3rd-degree perineal tears (more in the delivery chair group). No difference in blood loss was observed.

The increased risk for perineal tears in the delivery chair group may have been due to midwives' insufficient experience of using the delivery chair, together with inconsistent perineal support and protection. We could not identify any other factors explaining the observed difference. Therefore, it is likely and also technically plausible that the delivery position in the delivery chair increases the risk of perineal tears [4,5]. However, we want to emphasize that the numbers were small. It may well be that with gaining experience of the midwives handling labour in delivery chair, the risk of perineal tear might be lowered [6]. Of importance, we did

not observe fourth-degree perineal tears known to increase the risk for anal incontinence and bowel dysfunction. Those who used the delivery chair had a lower risk of ultimately undergoing delivery by vacuum extraction than those in the control group. This suggests that the delivery chair may reduce the likelihood of operative delivery.

The strengths of our study were the randomised design and large sample size. One weakness was that although information of the trial was distributed beforehand to all antenatal clinics, the training of the midwives was not systematic. Thus, the midwives' reactions to the delivery chair varied more than we expected. Some of the midwives were enthusiastic and had a positive attitude, whereas others were surprisingly critical and hesitated to use the chair. This undoubtedly may have caused a selection bias.

One problem was that in the beginning of the study we only had one delivery chair in use. Also, the model of the chair we had in use was large, heavy and somewhat difficult to move. The new, smaller-size version of the delivery chair had not yet been released while the study was in progress.

We point out that it is important in general to offer alternatives to mothers giving birth. Mothers are often open-minded to innovations. The delivery chair may make it easier to relax during labour and may improve pushing. If the chair shortens the duration of the second stage of labour and reduces the need for operative deliveries, it will increase the rates of vaginal delivery. A positive birthing experience has a major effect on the subsequent pregnancy and delivery. The delivery chair offers several different position and movement options for both the first and second stages of labour, including upright positions.

No similar studies have been reported so far. According to the Cochrane review, an upright position shortens the duration of the second stage and reduces the likelihood of operative delivery and episiotomies, but increases tears and bleeding [4]. Our results are largely in line with the Cochrane review. Ultimately, the delivery chair may also increase positive birthing experiences. Currently, we are in the process of analysing in more detail the mothers' subjective experiences of the birthing chair use.

CONCLUSION

We conclude that the use of the delivery chair is safe. No severe adverse effects were reported during the study. More third-degree tears occurred in the birthing-chair group. This potential harm can be addressed by better education and better perineal support during the second stage of labour. We feel it is ergonomically easy to support the perineum in the birthing chair although proper training is required.

ETHICS APPROVAL

The ethics committee of the Helsinki University Hospital approved the study protocol.

CONFLICT OF INTEREST

The authors have declared no conflict of interest.

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