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A randomized study of the sitting position for delivery using a newly designed obstetric chair

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Summary. A new obstetric chair has been designed to overcome some of the problems of those currently available commercially. The chair has been used to assess the effects of the sitting position in the second stage of labour on the outcome of delivery in 304 women randomly allocated to be delivered either in the chair or in the conventional dorsal position. Delivery in the chair conferred no benefits to mother or baby and resulted in greater mean blood loss and a higher rate of postpartum haemorrhage.

There is considerable evidence to suggest that in primitive societies labour and delivery were conducted in the upright or squatting positions (Englemann 1883). Until a century ago in Europe and North America, the use of a birth chair was common practice (Householder 1974). Since then, however, the recumbent position, either dorsal or left lateral, has been the usual position for delivery. In recent years, some obstetricians and lay people have advocated a return to the modified upright position for delivery, suggesting that it is more physiological and advantageous to the outcome of labour (Howard 1959; Newton & Newton 1960). Although modified delivery beds and specially designed chairs have been described and advocated (Haukeland 1981; Romney 1985; Kesby 1982), most studies of the sitting position for delivery have either involved few patients or have been poorly controlled.

In a randomized study using a birth chair Stewart *et al.* (1983) concluded that the sitting position reduced the use of episiotomies but increased the amount of blood loss at delivery. However, whether or not to perform an episiotomy may well depend more on the judgement of the midwife than on the position of the woman in labour. Also, the design of the chair appeared to cause congestion of the perineum due to herniation of tissues through the seat so that minor trauma of the excessively congested perineum may have been responsible for the increased blood loss found at delivery. Thus it is possible that these two findings reported by Stewart *et al.* (1983) were influenced by the personnel and equipment involved rather than the posture adopted for delivery.

A birth chair has been designed which provides both greater flexibility for the position of the woman during delivery, and also support for the perineum during the second stage of labour, thereby reducing tissue congestion. It seemed appropriate to perform a further randomized study with a different group of midwives, using this new obstetric chair to confirm or refute the previous findings that delivery in the sitting position reduced the use of episiotomy, but increased blood loss.

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Patients and methods

The new obstetric chair

The new chair was designed in conjunction with obstetricians from the Medical Research Council Clinical Research Centre at Northwick Park, Harrow, London, and was manufactured

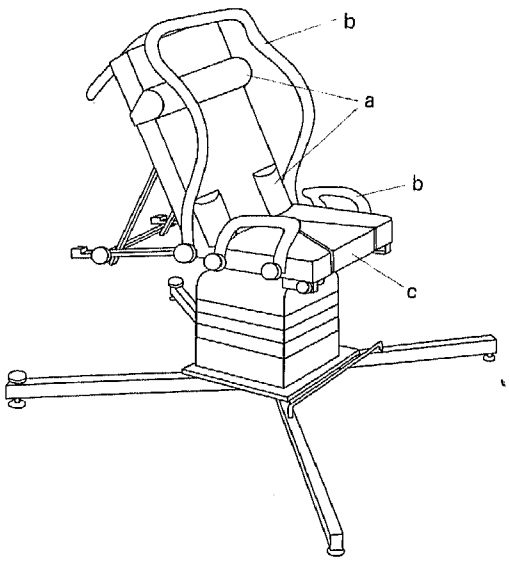

Fig. 1. Design of obstetric chair showing head-rest and side supports (a), hand grabs (b) and the removable portion of the seat (c).

to our specifications by the Rocket Instrument Company of London.

The main features of the chair are illustrated in Fig. 1. A movable head-rest, side- and hand-supports provide comfort for the labouring woman (a and b). Full movements of the chair include a 12° head-down tilt; in case of emergency, the chair can convert to a couch with the insertion of a leg extension. In normal circumstances, there is no hole in the seat of the chair so that maximum support for the perineum is provided up to the time of delivery. A hinged flap (c) can then be opened up to provide good access to the perineum to facilitate control of the delivery by the midwife.

Participants

During a 23-month period from May 1984 to March 1986 all women attending the hospital antenatal clinic during the third trimester were asked to enter the study. Women who were interested had an interview with the research midwife. They were shown the birth chair and given details of the protocol. The use of the chair was restricted to those women who agreed to randomization. The protocol was accepted by the local ethics committee.

The first stage of labour was managed by the labour ward staff in the usual manner. Patients who so desired were ambulant and the fetal heart rate was monitored as considered appropriate. In an attempt to achieve a homogeneous group of 'normal' labouring women, only those with a singleton pregnancy and cephalic presentation who were in spontaneous labour at 37–42 weeks gestation without augmentation or epidural analgesia were included in the study. The women were randomized as late as possible in the first stage in order to reduce to a minimum the number of women who did not successfully enter their intended group. The women were allocated either to delivery in the birth chair or the 'wedged' dorsal position. Allocation was made by opening sealed envelopes.

The chair was maintained in a 15–20° recline from the upright. Fetal well-being in the second stage was assessed in both groups using continuous fetal heart rate monitoring. All deliveries were supervised by a small group of experienced midwives (80% by the research midwife herself) in an attempt to obtain uniformity of technique. No fixed times were allocated for the duration of the second stage and it was allowed to proceed as long as there appeared to be progress with no evidence of maternal or fetal distress. The indications for forceps deliveries and the use of episiotomies were at the discretion of the attending medical and midwifery staff. If vaginal operative intervention was required in those patients in the chair, then they remained in the chair for their delivery.

The total sample size was determined by the 23-month recruitment period.

Data regarding the labour, delivery and condition of the infant were collected, but it was not possible to blind those collecting this information to the experimental group allocation. The 95% confidence intervals (CI) were calculated for differences between means (Armitage 1973) and for relative risks (Freeman 1987).

A subsample of 92 women included in the study were asked their opinion of their delivery position using either an interview schedule or questionnaire dependent on the availability of the research midwife. Following earlier pilot work the interview was standardized to the second day after delivery.

Results

During the 23 months of the study, 980 women were recruited. Of these, 304 fulfilled all the inclusion criteria and were randomized into the

Table 1. Characteristics of the women in the study

Characteristic	Multigravidae		Primigravidae	
	Chair (n=96)	Bed (n=91)	Chair (n=61)	Bed (n=56)
Height (cm)	160·6 (5·1)	162·5 (5·9)	162·4 (5·3)	162·3 (5·4)
Weight (kg)	72·4 (11·6)	75·6 (11·0)	73·2 (8·9)	71·9 (8·5)
Age (years)	27·8 (4·0)	27·3 (4·4)	24·5 (4·0)	24·8 (4·3)
Gestational age (weeks)	39·7 (1·3)	39·5 (1·1)	39·8 (0·9)	39·8 (1·1)
Socio-economic group				
I	2	6	2	2
II	26	15	14	17
III	42	40	30	24
IV	4	6	3	3
V	0	2	0	1
Unclassified	22	22	12	9

Results are mean (SD) values.

two groups for the delivery position. The characteristics of the women in the two groups are shown in Table 1. The differences between the numbers in the groups are accounted for by there being no 'batching' of the randomization envelopes. The study was also terminated at a particular time rather than after a specific number of patients.

The groups were similar in terms of socio-economic class, ethnic origin, mean maternal age, height, weight, gestation at delivery, and attendance at antenatal classes.

Details of the first stage of labour are given in Table 2. The two groups were also similar in the position and station of the fetal head as assessed at full dilatation. Unfortunately, these details were not fully recorded in 32 patients who gave birth in the chair and 43 patients who were delivered in the bed.

Twenty-two patients failed to comply with their intended delivery position. Nineteen of these patients were intended to give birth in the chair: 11 were delivered too quickly to be transferred; three decided that they did not wish to be transferred; two returned to bed as they found the chair uncomfortable; and three were retained in bed for obstetric reasons. Three multiparae who were allocated to be delivered in the semi-recumbent position in bed were then delivered in alternative positions: squatting, kneeling and in the lateral position. The analysis was based on group allocation, that is intention to treat rather than the actual position adopted for delivery.

Details of the second stage of labour and delivery are given in Table 3. Many patients chose to use limited bearing down during the second stage as opposed to organized pushing. There was no difference between the groups in the proportion of women choosing this type of

Table 2. Details of the first stage of labour

First stage of labour	Multigravidae		Primigravidae	
	Chair (n=96)	Bed (n=91)	Chair (n=61)	Bed (n=56)
Duration (h) mean (SD)	4·7 (2·6)	5·4 (3·1)	7·8 (3·4)	6·8 (3·0)
Ambulation				
Yes	18	19	20	13
No	78	72	40	43
Not recorded	—	—	1	—
Analgesia				
Narcotics	41	35	49	35
Inhalation	34	39	11	18
Nil	21	17	1	3

Table 3. Details of the second stage of labour and delivery

Details	Multigravidae		Primigravidae		All women	
	Chair (n=96)	Bed (n=91)	Chair (n=61)	Bed (n=56)	Chair (n=157)	Bed (n=147)
Duration of second stage (min)						
Mean (SD)	18·8 (14·0)	16·9 (11·6)	70·8 (43·3)	60·9 (46·0)	38·7 (30·0)	33·7 (30·0)
Difference between means (CI)	1·9 (−1·9 to 5·6)		9·2 (−7·1 to 25·5)		5·0 (−3·4 to 13·5)	
Duration of active pushing (min)						
Mean (SD)	16·8 (12·6)	15·9 (11·7)	58·1 (35·0)	52·0 (39·6)	33·0 (24·0)	29·6 (25·0)
Difference between means (CI)	0·9 (−4·5 to 2·6)		6·1 (−7·3 to 19·9)		3·4 (−3·7 to 10·4)	
Mode of delivery						
Spontaneous	96	91	48	48	144	139
Forceps/Ventouse	0	0	13	7	13	7
LSCS	0	0	0	1	0	1
Relative risk (CI)			1·85 (0·68 to 4·99)		1·79 (0·92 to 3·45)	

CI, 95% confidence intervals; LSCS, lower-segment caesarean section.

management of labour. The mean duration of the second stage was similar in women delivered in the bed and in the chair. All multigravidae were delivered spontaneously. One primigravida required a lower-segment caesarean section for suspected cephalopelvic disproportion with an occipito-posterior position. More primigravidae in the chair group required an operative delivery but the difference was not statistically significant.

The neonatal outcome is shown in Table 4. Only one infant (born in the birthing chair) showed signs of neonatal asphyxia with an Apgar score of 3 at 1 min and an umbilical artery pH of 7·29; the baby responded well to resuscitation. The mother had not received any narcotic analgesia.

Blood loss and perineal trauma at delivery are shown in Table 5. Blood loss was significantly increased in the chair delivery group and more women in this group had a postpartum haemorrhage. Fewer episiotomies were performed in the multigravid women in the chair delivery group but this was not apparent in the primigravid women.

From the responses to interview and questionnaire the patients' satisfaction with their allocated delivery position was judged by their experience of comfort in the second stage and preferred delivery position for the next birth. The findings are summarized in Tables 6 and 7. Patients delivered in the chair were more likely to describe their labour as 'comfortable' and none in this group described it as 'very uncomfortable'. All but one patient who had used the chair said they would request it in a

Table 4. Neonatal outcome

Factor	Multigravidae		Primigravidae		All women	
	Chair (n=96)	Bed (n=91)	Chair (n=61)	Bed (n=56)	Chair (n=157)	Bed (n=147)
Birthweight (kg)						
Mean (SD)	3·48 (0·39)	3·59 (0·44)	3·35 (0·32)	3·42 (0·36)	3·43 (0·37)	3·53 (0·42)
Difference between means (CI)	0·11 (−0·27 to 0·49)		0·07 (−0·06 to 0·20)		0·10 (0·01 to 0·19)	
Umbilical artery pH						
Mean (SD)	7·28 (0·09)	7·26 (0·08)	7·23 (0·07)	7·23 (0·07)	7·26 (0·08)	7·25 (0·08)
Difference between means (CI)	0·02 (0·0 to 0·10)				0·01 (−0·02 to 0·10)	
Number with Apgar score <7 at 1 min	6	3	5	3	11	6
Relative risk (CI)	1·95 (−2·31 to 8·84)		1·57 (−2·77 to 6·82)		1·77 (−1·53 to 4·80)	

CI, 95% confidence intervals.

Table 5. Blood loss and perineal trauma at delivery

	Multigravidae		Primigravidae		All Patients	
	Chair (n=96)	Bed (n=91)	Chair (n=61)	Bed (n=56)	Chair (n=157)	Bed (n=147)
Blood loss (ml)						
Mean (SD)	234 (211)	184 (121)	340 (229)	236 (169)	275	204
Difference between means (CI)	50 (−4 to 94)		104 (22 to 186)		71 (26 to 116)	
Postpartum haemorrhage >500 ml	11	3	16	4	27	7
Relative risk (CI)	3·8 (1·0 to 14·2)		4·6 (1·4 to 14·5)		4·1 (1·8 to 9·4)	
Perineal trauma						
None	42	38	17	9	59	47
1st degree tear	19	13	2	12	21	25
Relative risk (CI)	1·5 (0·7 to 3·1)		0·1 (0·0 to 0·6)		0·7 (0·6 to 1·0)	
2nd degree tear	29	25	12	10	41	35
Relative risk (CI)	1·1 (0·6 to 2·2)		1·1 (0·5 to 2·8)		1·1 (0·7 to 1·3)	
Episiotomy	6	15	30	25	36	40
Relative risk (CI)	0·3 (0·2 to 0·7)		1·2 (0·6 to 2·4)		0·8 (0·5 to 1·4)	

CI, 95% confidence intervals.

future delivery. No patient who was delivered in a bed said they would opt for that in the future.

Discussion

Only 282 patients in our study were delivered finally in the trial group to which they were allocated. This reflects the very strict entry criteria which were used so as to obtain a study group of 'normal' patients. We excluded many women who would have been included in other trials.

In 11 of 22 women not delivered in their allocated position, the reason was rapid progress of the second stage of labour. As duration of the second stage was one factor which was being investigated, this group of patients who failed to comply could have altered the overall results. The data were therefore analysed on the basis of 'intention to treat' with the 'failed' patients included, rather than on the actual treatment given. However, a secondary analysis based on the actual position adopted for delivery did not lead to any important modification of the differences and similarities noted in the primary analysis.

The effect of delivery in the chair on perineal trauma remains unresolved. In this study we were unable to confirm a reduction in perineal damage as was reported by Stewart *et al.* (1983). There were fewer episiotomies in the multigravid women in the chair group but this was not reflected in the primigravid women. Turner *et al.* (1986) noted a possible increase in perineal trauma, and Shannahan & Cottrell (1985) stated that in their series 'the majority of deliveries were spontaneous with median episiotomies'. Hemminki *et al.* (1986) also found no significant difference in perineal trauma rate between chair and bed deliveries. Charles White, an 18th century English obstetrician, stated that delivery in the upright position was potentially hazardous 'frequently occasioning laceration of the perineum and sphincter ani' (Atwood 1976), but apart from the study by Turner *et al.* (1986) there seems to be little support for this historical viewpoint. It may well be that this aspect of midwifery is more dependent on individual patients and midwives than on the actual position of delivery.

We have been unable to demonstrate any reduction in the duration of the second stage of

Table 6. Patients' experience of comfort in the second stage

	Delivery position	
	Chair (n=52)	Bed (n=40)
Comfortable all of the time	23	5
Comfortable part of the time	7	3
Some discomfort part of the time	17	10
Some discomfort all of the time	—	2
Uncomfortable part of the time	—	6
Uncomfortable all of the time	—	4
No response/unclassified	5	10

Table 7. Patients' preference for next delivery related to this delivery

Preferred position for future delivery	Allocated position	
	Chair (n=52)	Bed (n=40)
Chair	51	35
Bed	0	0
Alternative position, e.g. kneeling, squatting	1	1
No preference/no response	0	4

labour, or the instrumental delivery rate in women delivered in the chair; indeed our results tend to suggest the opposite. In our series, the rate of forceps delivery may have been so low because women with epidural analgesia were excluded, but Turner *et al.* (1986) found no reduction in their rate of forceps deliveries and they did have an epidural rate of 26%. Also Shannahan & Cottrell (1985) and Hemminki *et al.* (1986) apparently found no significant differences in their rates of instrumental delivery.

There was no obvious benefit to the fetus in terms of Apgar score and umbilical artery pH. A small study by Aarnoudse *et al.* (1984) using a continuous subcutaneous Po_2 electrode had failed to demonstrate any improved oxygenation of the fetus in the upright position.

Three previous studies have concluded that delivery in a birth chair increased the mean blood loss at delivery (Shannahan & Cottrell 1985) or the frequency of postpartum haemorrhage (Turner *et al.* 1986) or both (Stewart *et al.* 1983). The birth chair used in the present trial was specifically designed to provide good support to the perineum and thereby reduce excessive perineal congestion and oedema which has been reported previously (Goodlin & Frederick 1983). This congestion may exacerbate blood loss from perineal lacerations. Despite this, we found a significant increase in mean blood loss in both parity groups with a concomitant increase in postpartum haemorrhage rate. It has been suggested that the greater the blood loss the more it is underestimated (Brant 1967). If that is so, then this potential hazard of delivery in a birth chair may be even greater than our results suggest. The cause of this excessive blood loss remains uncertain. Production of prostaglandin E_2 (PGE_2) (Husslein & Sinzinger 1984) and PGF_2 (Sellers *et al.* 1982) is greatly increased in the third stage of labour and it has been suggested that these may be the hormones primarily responsible for placental separation and preventing haemorrhage from uterine atony. Further work is needed to determine whether posture has any effect on the production of these prostaglandins at the time of delivery.

Interpretation of the results of the interviews and questionnaires concerning satisfaction with delivery position must be undertaken with caution. All participants in the trial could be assumed to be interested in the concept of the birth chair for delivery. It is, therefore, possible that women delivered in the bed responded negatively due to disappointment following randomization.

The experiences of this group of women will be presented in more detail elsewhere but appear to compare with those reported previously by Hillan (1983), who found that the birth chair afforded a more comfortable delivery position, and Hemminki *et al.* (1986) who noted that the chair was the preferred choice of patients for their next delivery.

Having failed to demonstrate any significant obstetric benefits, but clearly shown a possible hazard from delivery in a birth chair, we feel that these facts need to be emphasized to women who request such a delivery.

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