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A continuing use for Kielland's forceps?

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Summary. A retrospective study over a 5-year period compared neonatal outcomes after birth by Kielland's forceps with those after caesarean section in the second stage of labour. The 253 babies born by these two modes of delivery showed no difference in Apgar score, the need for active resuscitation, incidence of jaundice or abnormal neurological behaviour. The neonatal outcome was no worse in the small number of patients where Kielland's forceps delivery was attempted but failed. This study offers support for the continuing role of Kielland's forceps in modern obstetrical practice.

It has been suggested that Kielland's forceps should be discarded because of the potential risk to the baby (O'Driscoll & Stronge 1975; Chez *et al.* 1980; O'Driscoll *et al.* 1981). Evidence that rotational forceps delivery is associated with increased perinatal loss was originally presented in the 1958 British Perinatal Mortality Survey (Butler & Bonham 1963) and more recently Chiswick & James (1979) have shown that neonatal morbidity is higher after Kielland's forceps delivery than after normal vaginal delivery.

If Kielland's forceps are to be abandoned, an improvement in neonatal outcome must be demonstrated by the use of alternative methods of delivery. Healey *et al.* (1982) were unable to show any difference in neonatal outcome when rotation with Kielland's forceps was compared with other methods of rotation and delivery. Many obstetricians would now perform caesarean section rather than apply Kielland's forceps to expedite delivery, but it remains to be demonstrated that this practice offers a distinct advantage to the baby (Owen-Drife 1983). Cardozo *et al.* (1983*a*) attempted to clarify this issue by comparing neonatal outcome after delivery by emergency caesarean section (for any indication and with some patients not in labour) with that after delivery with Kielland's forceps. The limitations of this study have already been pointed out (Morrow *et al.* 1983) and indeed Cardozo *et al.* (1983*b*) subsequently agreed that it is difficult to avoid bias when choosing groups for comparison. We have studied the outcome in babies born by Kielland's forceps compared with those born by caesarean section in the second stage of labour, because we believe this to be a more relevant comparison.

Patients and methods

The study was carried out retrospectively over a 5-year period between 1 January 1977 and 31 December 1981. During this time there were 16 376 livebirths in the Royal Maternity Hospital, Belfast and 253 patients were delivered by Kielland's forceps or by caesarean section in the second stage of labour.

Each patient was booked for hospital delivery and attended the antenatal clinic under the care of one of five consultant teams. Progress in spontaneous labour was assessed every 4 h or more frequently if necessary; when contractions were inadequate or if the rate of cervical dilatation was <1 cm/h labour was augmented with an intravenous infusion of oxytocin. The

standard method for induction of labour was by artificial rupture of membranes and immediate oxytocin infusion. Epidural analgesia was available at all times; alternatively patients received pethidine or papaveretum if required. A neonatal paediatrician was present at each delivery and admission to the special care baby unit was at his discretion; in many cases for a period of observation only.

The patients were divided into three groups. The first group comprised 132 women delivered by Kielland's forceps ('successful Kielland's'). The second group included 101 patients who were delivered in the second stage of labour by caesarean section without previous attempt at instrumental delivery. The third group included 20 patients who were delivered by caesarean section in the second stage of labour following attempted delivery by Kielland's forceps ('failed Kielland's').

Statistical analysis used the computerized statistics package for the social sciences. Significance between groups was assessed using the χ^2 test, and differences were regarded as statistically significant at $P<0.05$.

Results

The groups did not differ significantly in maternal age, weight or parity (Table 1). The mean height in the failed Kielland's group was significantly lower than the mean heights in the other two groups which were similar to each other. There were no significant differences in the induction or epidural rates between the successful Kielland's group and the caesarean section group (Table 2), although the epidural rate was significantly less in the failed Kielland's group. There was no difference in the mean length of the first stage of labour, but the duration of the second stage was significantly longer in both the caesarean section and the failed Kielland's group.

Table 1. Maternal characteristics of the three groups

Characteristic	Kielland's forceps (n=132)	Caesarean section (n=101)	Failed Kielland's (n=20)
Mean age (years)	25·4	26·1	25·6
Mean height (cm)	158·1	157·6	154·0*
Mean weight (kg)	62·9	65·5	63·1
Primipara	96 (73%)	79(78%)	11 (55%)

*The height in the failed Kielland's group is significantly less than in the other two groups. ($P<0.05$).

Two of the caesarean sections were performed under epidural analgesia and the remainder under general anaesthesia. All of the caesarean sections following failed attempts at delivery by Kielland's forceps were performed under general anaesthesia. Of those patients delivered by Kielland's forceps, 60 were delivered under epidural, 36 under general anaesthesia, 29 with pudendal block and seven following local infiltration of the perineum with lignocaine.

In 73% of both the successful Kielland's and failed Kielland's forceps deliveries the fetal head was in the occipitotransverse position before delivery, while of the caesarean section group, 50% were in the occipitoposterior position just before delivery. In most of the successful Kielland's group the fetal head was at or below the ischial spines and in all but 1% of the caesarean section group the head was at or above the spines. By contrast 30% of the failed Kielland's were attempted when the fetal head was above the spines (Table 3).

A consultant performed 13% of the deliveries, with 77% being carried out by a registrar and 10% by a senior house officer, the ratio being similar in each group.

The mean weight of the infants in the successful Kielland's group was significantly less than in the other two groups (Table 4). There was no significant difference in the proportion requiring active resuscitation (i.e. intermittent positive pressure ventilation using a face mask or more intensive resuscitation), the Apgar scores, admission rate to the special care baby unit, the presence of jaundice (bilirubin >170 μmol/l) or abnormal neurological behaviour (lethargy, jitteriness or fits).

The only two fatalities in the series occurred among these born by Kielland's forceps. One of them had multiple congenital abnormalities and died shortly after delivery. The other death followed a technically easy delivery for failure to progress in the second stage of labour, and although the fetal heart was satisfactory before delivery the infant was in poor condition at birth (Apgar scores 3 and 3 at 1 and 5 min), and required continued ventilation thereafter. Computerized axial tomography at the age of 24 days showed widespread cerebral infarction, and the infant died age 105 days. Post-mortem consent was not given.

Table 2. Details of labour in the three groups

Labour	Kielland's forceps (n=132)	Caesarean section (n=101)	Failed Kielland's (n=20)
Induced	62 (47%)	42 (42%)	11 (55%)
Epidural	65 (49%)	54 (54%)	1 (5%)*
Mean duration of 1st stage (h)	8·9	9·9	9·7
Mean duration of 2nd stage (min)	59†	102†	72†

*The epidural rate was significantly less in the failed Kielland's group ($P<0·05$).
†Duration of the 2nd stage of labour differed significantly between the three groups ($P<0·05$).

Table 3. Position and station of the fetal head in relation to the ischial spines in the second stage of labour

	Kielland's forceps (n=132)	Caesarean section (n=101)	Failed Kielland's (n=20)
Position of head			
Occipitotransverse	97 (73%)	45 (45%)*	14 (74%)
Occipitoposterior	30 (23%)	51 (50%)	5 (26%)
Occipitoanterior (right and left)	5 (4%)	5 (5%)	0
Not recorded	0	0	1
Station of head			
Above	4 (3%)	54 (53%)†	6 (30%)†
At spines	71 (54%)	46 (46%)	10 (50%)
Below	56 (43%)	1 (1%)	4 (20%)
Not recorded	1	0	0

*There were significantly more occipitoposterior positions and fewer occipitotransverse positions in the caesarean section group than in the other groups ($P<0·05$).
†The level of the fetal head is significantly higher in the caesarean section group and in the failed Kielland's group ($P<0·05$).

All infants admitted to the special care baby unit were followed up as out-patients and only two in the whole series were abnormal at review. Both had a history of birth hypoxia with prolonged cerebral signs as newborn babies. One was born by caesarean section, at which difficulty was experienced in disimpacting the head from the pelvis, and was nursed in the special care baby unit for several weeks before discharge. The second infant was born by Kielland's forceps following an acute episode of marked fetal bradycardia associated with severe intrapartum haemorrhage at the onset of the second stage of labour; during the first stage a provisional diagnosis of a small placental abruption had been made, after which labour progressed satisfactorily.

Discussion

With the steady decline in perinatal mortality, obstetric audit has focused attention on neonatal morbidity, with particular emphasis on management of labour, fetal monitoring and traumatic delivery. Kielland's forceps have received much adverse criticism, largely as a result of the reputation they gained by virtue of their original intended use for delivery when the fetal head was arrested in the transverse or posterior position high in the pelvis (Parry-Jones 1952). Today with increasingly liberal use of caesarean section high Kielland's forceps delivery has been abandoned but their use, even under more favourable conditions, has been questioned (O'Driscoll & Stronge 1975; Chez *et al.* 1980; O'Driscoll *et al.* 1981).

Table 4. Neonatal outcome

Infant characteristic	Kielland's forceps (n=132)	Caesarean section (n=101)	Failed Kielland's (n=20)
Mean weight (g)	3484*	3699	3639
Active resuscitation	37 (28%)	33 (33%)	6 (30%)
Apgar score			
⩽5 at 1 min	26 (20%)	31 (31%)	6 (30%)
⩽5 at 5 min	6 (5%)	5 (5%)	1 (5%)
Admitted to special			
care unit	38 (29%)	27 (27%)	5 (25%)
for >48 h	20 (15%)	11 (11%)	2 (10%)
Jaundice (biluribin			
>170 μmol/l)	14 (11%)	8 (8%)	1 (5%)
Abnormal neurological			
behaviour	13 (10%)	7 (7%)	2 (10%)
Abnormal at follow-up	1	1	0
Mortality	2	0	0

*The mean weight of those infants born by Kielland's forceps was significantly less than that of the other two groups (P<0·05).

We have compared Kielland's forceps delivery and caesarean section in the second stage of labour and found little difference in neonatal outcome. There was no significant difference in the Apgar scores or in the number requiring active resuscitation. The admission rate to the special care baby unit was much higher for infants born by both methods than for the hospital in general (7%), although many infants were admitted for a short period of observation only. Jaundice and abnormal neurological behaviour occurred with similar frequency in infants born by forceps and in those born by the abdominal route. This suggests that caesarean section in the second stage of labour, when the fetal head may be impacted in the pelvis, offers no less a risk of neonatal morbidity than instrumental delivery. Indeed, of the two infants who had residual cerebral signs at follow-up, one had been born by caesarean section in which difficulty in extracting the fetal head was experienced. The other infant was born by Kielland's forceps as an emergency for acute severe fetal distress as the result of placental abruption late in the first stage of labour. Although delivery was expedited without much difficulty, the baby may have been already compromised; a situation which might have been avoided if the mother had been delivered at the time of diagnosis of placental abruption rather than allowing labour to progress.

There were only two fatalities in the series of 253 patients, one of which was unavoidable (congenital absence of the diaphragm), the second of which followed a technically simple Kielland's forceps delivery for poor maternal effort with no evidence of fetal distress. The baby was in poor condition at birth and subsequent computerized axial tomography showed gross cerebral infarction. It is unfortunate that consent for post-mortem examination was not given, as it would have been important to exclude congenital cerebral malformation. The point that such abnormalities often present as acute fetal distress or as unexplained birth hypoxia has been made before, and in such circumstances the outcome is often incorrectly attributed to the obstetrical management (Illingworth 1979).

We have considered failed attempts at Kielland's forceps delivery separately, and although they comprise only 20 deliveries there are several significant features: maternal height was less, infants were larger, the fetal head was higher in the pelvis in the second stage of labour and there were fewer epidurals, compared with 'successful Kielland's' deliveries. All of these factors may reduce the chance of successful forceps delivery but it is reassuring to note that neonatal outcome was no different in this group.

The proportion of patients in our study receiving epidural analgesia in labour (47%) was much higher than for the hospital population (10%). This is in keeping with previous studies suggesting an association between epidural analgesia and malposition (Husemeyer 1983;

Hoult *et al.* 1977; Studd *et al.* 1980), probably as a result of relaxation of the pelvic floor musculature.

The duration of the second stage of labour was longer in the women delivered by caesarean section; this may be attributed partly to delay in waiting for general anaesthesia and partly to initial conservative management having made the diagnosis of second stage with the head still high in the pelvis. The mean duration of the second stage in the successful Kielland's group was shorter (59 min), which suggests that interference in some cases may have been premature, particularly in those with an epidural, since in the absence of fetal distress it has been shown that pushing may be delayed for up to 2 h with no increase in neonatal morbidity (Maresh *et al.* 1983).

Attention has already been drawn to the need for an experienced operator if neonatal trauma is to be avoided during Kielland's forceps deliveries (Paintin 1982). Only 13% of the forceps deliveries in our series were performed by consultants, although an experienced registrar or senior registrar was present at each delivery. Since less than 1% of the women in our unit are delivered using Kielland's forceps it is clear that obstetricians in training receive little experience in their use. Unfortunately this may lead, as Danforth & Ellis (1963) have suggested, to the use of these forceps becoming a 'vanishing art'.

We would endorse totally the guidelines suggested by Paintin (1982), that Kielland's forceps delivery should only be attempted by an experienced operator, when the fetal head is deeply engaged in the pelvis, in the absence of cephalopelvic disproportion and with early resort to caesarean section if application of the blades or rotation fails. As our data demonstrates little difference in neonatal outcome between Kielland's forceps deliveries and caesarean section, we conclude that Kielland's forceps retain an essential place in modern obstetric practice.

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