A STUDY OF THE RELATIVE MERITS AND SCOPE FOR VACUUM EXTRACTION AS OPPOSED TO FORCEPS DELIVERY

A PRELIMINARY REPORT

A. H. LASBREY,* M.B., CH.B. (CAPE TOWN), D.R.C.O.G.; C. D. ORCHARD, M.B., CH.B. (RAND); and DERK CRICHTON,† M.B., CH.B. (CAPE TOWN), D.PHIL. (OXON.), F.R.C.S. (EDIN.), F.R.C.O.G., *University of Natal Obstetric Unit at the McCord Zulu Hospital, Durban*

Many attempts to compare the safety and usefulness of vacuum extraction and forceps delivery have been reported in the literature, but, as far as we can discern, conclusions hitherto are all vulnerable to criticism on the score of possible 'observer bias'. As emphasized in a leading article of the *Lancet*[1] in 1961, there is need for the present impressionistic situation to be replaced by scientific evaluation through carefully planned clinical trials, for, to date, no single controlled clinical trial has been reported on.

The interim findings in a controlled clinical trial, conducted on a random-sample basis at the McCord Zulu Hospital from April 1961 to March 1963, are presented in this paper.

CLINICAL CASE MATERIAL AND METHODS

Cases were admitted to the series only if these criteria for safe forceps delivery were met:

1. The head was found on abdominal palpation to be engaged, by the 'Durban' definition, namely that the occiput was not palpable, or was just tipped, on deep abdominal palpation.

2. The cervix was fully dilated.

If these criteria were fulfilled, and indications for expediting delivery existed, a slip of paper was drawn in the approved random-sample manner, to indicate whether obstetrical forceps or the vacuum extractor should be used. If either method failed, delivery was then attempted by the alternative method.

Excluded from the series, however, despite fulfilling the above conditions for safe forceps delivery, were those cases in which very rapid delivery was desirable—as in the case of a prolapsed cord—or those in which it was undesirable for the mother to bear down at all, as in very severe pre-eclamptic toxaemia or cardiac failure. In these cases forceps delivery was considered preferable.

The Malmström Vacuum Extractor apparatus was used. The large or medium cap was applied and a vacuum was rapidly induced over 2 - 3 minutes. At the pressure of 0·2 kg. per sq. cm., the application was checked and then the vacuum was rapidly increased to 0·6 or 0·8 kg. per sq. cm.; traction was commenced with the next contraction and the patient was encouraged to bear down.

A record was kept of the number of pulls—each coin-

*Lecturer. †Part-time professor.

ciding with a contraction—required to achieve delivery. The interval between application of the cap and delivery was noted, as were the occasions on which the cap was pulled off.

The degree of asphyxia at birth was assessed, and was classified as being 'absent', 'slight', 'moderate', or 'severe'.

The vacuum babies were examined daily for caput succedaneum and cap haematoma. Unfortunately these observations were not made with equal care in the forceps group.

RESULTS

252 cases were admitted to the series, 131 being delivered by forceps and 121 by the vacuum extractor. The distribution of parity and the indications for assisted delivery

TABLE I. PARITY AND INDICATIONS

						Forceps	Vacuum
TOTAL ..	..	..	..	..	..	131	121
PARITY							
Primipara ..	..	..	..	..		88	77
Multipara ..	..	..	..	..		43	44
INDICATIONS							
Maternal ..	..	..	..	..		16	11
Delay in 2nd stage {OA	..	..				57	62
or foetal distress {OP	..	..				58	48

are summarized in Table I. In 42% of the cases the occiput was posterior or transverse (indicated by the abbreviation 'OP' in the Table).

Anaesthesia. In all but one case the anaesthetic used, if any, was local anaesthetic—either infiltration of the perineum or a pudendal block. In 20 forceps cases and 1 vacuum case the trilene inhaler was used in addition. Table II details the anaesthetic used. The exclusion in

TABLE II. ANAESTHETIC USED

					Forceps	Vacuum
Total ..	..	..	..	..	131	121
No anaesthetic	..	..	..	..	34	56
Local anaesthetic	..	..	..	..	72	62
Trilene inhaler + local	..	..	..	20	1
Trilene inhaler	..	..	..	..	4	2
General anaesthetic ..	..	..	..	1	0

both groups of the depressant effect of general anaesthesia on the baby renders the groups comparable in regard to the degree of asphyxia present at birth and the risk to the baby.

Level of the head. The head was in the midcavity of the pelvis in 47% of forceps cases, and in 45% of vacuum cases. In the remainder the head was at the pelvic outlet.

Rotation of the head. The head was rotated manually in 31 forceps cases and 16 vacuum cases. Kielland's forceps were used to rotate the head in 45 cases. In one of these cases delivery with forceps failed (after rotation) but delivery with the vacuum extractor was easily achieved. It is often impossible to rotate a moulded head arrested deep in a contracted Bantu pelvis, without dislodging the head from the true pelvis. Hence the frequent resort to Kielland's forceps for rotation. In the great majority of vacuum cases spontaneous rotation occurred as the head came down to the perineum. Where the occiput was posterior the cap was applied eccentrically over the occiput and subsequent traction certainly increased flexion and therefore facilitated rotation. Manual or instrumental rotation was used only if vacuum extraction failed initially. Exact definition of the position of the head was not so vital, however, in vacuum extraction as in forceps delivery.

Failures. All cases admitted to the series were delivered vaginally. In 12 cases allotted to the vacuum group delivery with the vacuum extractor failed. In 8 of these the occiput was posterior. All 12 cases were successfully delivered with forceps. In the forceps group there were 3 failures, and these were delivered with the vacuum extractor.

Number of pulls required: Only 1 - 3 pulls with the vacuum extractor sufficed to effect delivery in 78% (94 out of 121) cases, and the application delivery interval was less than 15 minutes in 80% (96 out of 121) cases. Unfortunately the average application delivery interval, when forceps were used, was not available for comparison.

Prematurity, foetal distress and asphyxia. As can be seen from Table III, the incidence of prematurity was 8·4% in the forceps group and 5·4% in the vacuum group. Foetal distress as indicated by either meconium staining of the liquor amnii or alterations in the foetal heart rate

TABLE III. INCIDENCE OF PREMATURITY, FOETAL DISTRESS, AND ASPHYXIA

					Forceps	Vacuum
Total ..	..	..	..	..	131	121
WEIGHT OF BABY (LB.)						
5·8 and under	..	..	..	..	11	7
FOETAL DISTRESS						
Present	..	..	..	..	54	58
Severe	..	..	..	..	19	13
ASPHYXIA						
Moderate or severe		..	..	..	11	19
					8·5%	16%

was present in 44% of cases in the series. Severe foetal distress—where both factors were present—was diagnosed in 14·5% (19) of the forceps cases and 11% (13) of the vacuum cases. Moderate or severe asphyxia at birth occurred in 8·5% of the forceps babies and 16% of vacuum babies.

Perinatal mortality. 4 forceps babies and five vacuum babies were lost. The corrected perinatal mortality in the forceps group was 2·3% and in the vacuum group 0·8%.

The correction was made by subtracting the cases where intra-uterine death had occurred before the application of forceps (1 case) or the vacuum extractor (4 cases) (Table IV). Even the corrected figure is misleading be-

TABLE IV. PERINATAL MORTALITY

					Forceps	Vacuum
Total ..	..	..	..	..	131	121
PERINATAL LOSS						
Intra-uterine death	..	..	..	1	4
Fresh still-birth	..	..	..	..	1	1
Neonatal death	..	..	..	..	2	—
PERINATAL MORTALITY						
(Corrected)	..	..	..	..	2·3%	0·8%

cause, in fact, only one of the 4 remaining deaths could be attributed to the operative delivery. In this particular case there was severe foetal distress at the onset of the 2nd stage and the degree of disproportion was under-estimated. After 5 pulls, the cap having slipped off twice, the attempt at vacuum extraction was abandoned and forceps were applied. A 9 lb. 6 oz. stillborn baby was delivered with difficulty.

Diagnosis of cause of death (4 cases): The details of these cases were, briefly, as follows:

1. Asphyxia and cerebral haemorrhage (weight 9 lb. 6 oz., see above). No necropsy.

2. Pulmonary syndrome of the newborn (weight 4 lb. 2 oz.). Mother suffering from pneumonia. Forceps delivery after manual rotation of the head. Severe foetal distress had been diagnosed. No necropsy.

3. Haemorrhagic disease of the newborn (weight 6 lb. 4 oz.). Easy outlet forceps for acute foetal distress. Necropsy diagnosis.

4. Atelectasis (weight 5 lb.). Delivered with a single pull by vacuum extractor. The foetal heart had been very slow. Necropsy diagnosis.

Cerebral trauma. Signs of cerebral irritation, including twitchings, were noted in one forceps baby and one vacuum baby. Both mothers were primiparae; both had posterior positions and foetal distress. Both babies apparently made a complete recovery.

Facial nerve palsy. This occurred in two infants in whom delivery with Kielland's forceps had failed but subsequent vacuum extraction proved successful.

Caput succedaneum. All oedema of the scalp had disappeared by the 4th day in 79% of vacuum cases. The size of the oedematous area varied with the size of the cap and the presence of the caput succedaneum before the cap was applied.

Cap haematoma. A cap haematoma was found in 17% of cases. In many this haematoma was so small that it might easily have been overlooked. It was of the same size as the cap, was not tense, and appeared to be beneath the parietal periosteum. Until oedema of the scalp had subsided the cap haematoma was often not palpable.

Maternal morbidity. Lacerations of the birth canal occurred more frequently as a result of forceps delivery than of vacuum extraction. The incidence of puerperal pyrexia was similar in the two groups. (Table V.)

TABLE V. MATERNAL MORBIDITY

TOTAL					Forceps	Vacuum
LACERATIONS					131	121
3° perineal ..	..	..	..	..	2	0
Extensive vaginal ..	..	..	..		3	1
·Cervical	..	..	..	..	5	1
PUERPERAL PYREXIA						
(100·4°F. and over)	..	..	..		20	18

DISCUSSION

Vacuum extraction is less uncomfortable for the mother than forceps delivery, and it is less traumatic to the birth canal. The simplicity of the procedure and the lack of necessity to rotate the head contrast sharply with the difficulties of manual rotation and of the application of Kielland's forceps in the contracted Bantu pelvis. The problem of exact definition of the position of the head, where sutures and fontanelles are obscured by caput succedaneum, and the dangers of the oblique grip with forceps, do not arise. In spite of these advantages, however, the clinical worth of the vacuum extractor stands or falls on its safety or danger to the baby.

In the present series no significant difference in the foetal morbidity, as compared with forceps delivery, was demonstrated. The high incidence of cap haematoma is not regarded as a condemning factor, because of the mildness of the lesion in most cases. However, review of a further 223 vacuum extractions which were not included in the random sample series because the head was not engaged—and therefore were unsuitable for forceps delivery—revealed that the incidence of cerebral trauma was directly related to the number of pulls required to extract the baby. The total incidence of cerebral trauma* following vacuum extraction at McCord's since 1961 is 2·7% (11 out of 403 babies); 2 were stillborn, 2 died within a few days of birth, 1 had residual spasticity of a limb, 5 were apparently normal on discharge; and 1 went home a cerebral baby, the cause being intrapartum asphyxia and not excessive traction.

Among the 223 vacuum cases, in which the head was high, the incidence of cerebral trauma where 1 - 5 pulls were used was 1·2% (2 of 172) cases, whereas it rose to 11·8% (6 of 51 cases) where 6 or more pulls were required to extract the baby. This fact rendered it essential for us to evolve and introduce the following practical safeguards in the use of the vacuum extractor: 'If there is not very good progress towards delivery after the third pull, the case should be carefully reassessed for cephalo-pelvic disproportion and an alternative method of delivery seriously considered.'

This might not apply to occasional cases of inertia, but nevertheless occasional exceptions do not, in our view, weaken the strength of our general argument in favour of caution along the lines we have indicated. The dangers of ignoring the rule may be enhanced in the Bantu patient with a high incidence of contracted pelvis, i.e. with cephalo-pelvic disproportion.

*The term 'cerebral trauma' is used to include any baby dying because of intracranial trauma or showing any clinical signs, such as twitchings or spasticity, even if these were transient.

In 1961 the incidence of cerebral damage in our vacuum extractions was alarmingly high, being 4·4% (7 of 158 cases), whereas in 1962 - 63 when abiding, to a

TABLE VI. INCIDENCE OF DIAGNOSED CEREBRAL TRAUMA
IN 403 VACUUM EXTRACTIONS

						1961	1962 and 1963
						%	%
1—5 pulls	..	..	..	..	..	1·6	1·0
6 + pulls	..	..	..	..	..	13·5	5·0
Total ..	..	..	..	..	..	4·4	1·5

large extent, by this rule, the incidence was reduced to 1·5% (4 of 245 cases), again clearly demonstrating the possible consequence of pulling too often (Table VI).

Cases in which the vacuum extractor were used where the head was not engaged, or a rim of cervix remained, have not been described in further detail in this contribution. Suffice it to say that it enabled, or facilitated, vaginal delivery in many cases that would otherwise have been delivered by caesarean section. Similarly, delivery after symphysiotomy was assisted on a number of occasions with the vacuum extractor, in circumstances in which the application of forceps would have been hazardous.

CONCLUSIONS

1. The vacuum extractor, if used with the head engaged and the cervix fully dilated, provides a mode of delivery as safe for the baby as forceps, more comfortable and less traumatic to the mother, and simpler for the obstetrician.

2. Because of the incidence of cap haematoma, forceps delivery is probably preferable in cases where the occiput is anterior, the head is at the pelvic outlet, and local anaesthesia is adequate for forceps delivery.

3. Forceps delivery remains the method of choice for the mother with severe cardiac failure, impending eclampsia, or other severe illness, when it may be lifesaving to ensure that she be spared even minimal effort in the delivery of the child; because the success of vacuum extraction depends partly on the bearing-down effort of the mother.

4. Kielland's forceps were found to be more effective for rotation of occipito-posterior and occipito-transverse positions of the head, but more uncomfortable and more traumatic to the mother. Manual and forceps rotation might well be reserved for cases that do not easily descend and rotate with two or three pulls of the vacuum extractor.

5. Even when the head is high the use of the vacuum extractor may be safe, provided the head descends readily and easily through the pelvis. The danger of using more than 5 pulls is reflected in a high incidence of cerebral damage and requires emphasis.

REFERENCE

1. Leading article (1961): Lancet, 2, 189.