VACUUM EXTRACTION OF PREMATURE INFANTS*

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The vacuum extractor is now an established instrument in the practice of obstetrics. It frequently happens that, knowingly or unknowingly, a vacuum extractor is applied to a premature infant during the first or second stage of labour. Snoek[1] and Rosa[2] accept its use on premature infants, by stating that the extractor achieves only 1/20 of the increase in intracranial pressure of that of an optimal forceps application. Snoek[3] claims that in his hands the vacuum extractor has completely replaced the forceps for the elective delivery of the premature infant's head. Chalmers and Fothergill[5] are cautious in their report, as they had 1 neonatal death due to cerebral haemorrhage in 9 premature infants. De Villiers and Bornman[4] express a conservative attitude on this matter. Buss[5] claims that prematurity is a definite contraindication to vacuum extraction. Greenhill[6] goes even further and states that an experienced obstetrician who knows how to perform forceps operations does not need a vacuum extractor.

MATERIAL

In an effort to decide whether the use of the extractor on premature infants was safe, it was decided to analyse all vacuum extractions performed on infants whose birthweights were 5½ lb or less at the Peninsula Maternity Hospital (Cape Town) during the period January 1964—September 1968. This hospital averages about 4,000 deliveries per year.

Altogether 60 premature infants were delivered by vacuum extraction in this period. The extractions were virtually all performed by registrars in training. The vacuum pressures never exceeded 0·8 kg./sq.cm. and the operations never exceeded 40 minutes in duration from application to delivery.

The 234 extractions performed on full-term infants in the year 1967 at the same institution were also analysed. The incidence of vacuum extraction during the same period has averaged 5 - 6%, as compared with 7 - 8% for forceps deliveries.

Results were then analysed according to gravidity, indication for vacuum extraction, dilatation of the cervix, station of the vertex and the result of extraction on mother and foetus.

RESULTS

Gravidity (Table I)

The hospital admits only primigravidae with normal pregnancies and patients with obstetrical complications among the non-White population, mainly of Cape Town. Multigravidae are, however, slightly more frequently treated than primigravidae. It is surprising that most of the premature infants delivered by the vacuum extractor were from primigravid mothers. For this fact no obvious reason could be found, except that the so-called 'small for dates' infants may frequently be encountered in primigravid patients.[7]

TABLE I. ANALYSIS OF CASES ACCORDING TO GRAVIDITY

Gravidity	*1967 mature*	*1964–1968 premature*
Primigravidae	107	52
Multigravidae	127	8
Total	234	60

Indication for Vacuum Extraction (Table II)

The commonest indication for the use of the vacuum extractor in this series was foetal distress, and accounted for 30% of all extractions on both mature and premature infants. Other authors[4,5,8] reporting from the continent of Africa all have a similarly high incidence of foetal distress in their indication for delivery by ventouse. In the reports from other continents,[9-16] however, foetal distress is not the commonest indication.

TABLE II. INDICATION FOR VACUUM EXTRACTION*

	Primigravidae		*Multigravidae*	
Indication	*1967 mature*	*1964–1968 prem.*	*1967 mature*	*1964–1968 prem.*
Foetal distress	36	16	32	2
Obstetric indication				
Prolonged 1st stage	44	9	17	1
Prolonged 2nd stage	17	6	10	1
POP	13	0	16	0
Transverse arrest	8	4	7	0
Antepartum haemorrhage	4	7	10	0
Maternal indication				
Pre-eclamptic toxaemia	9	18	18	2
Eclampsia	5	2	0	0
Cardiac disease	4	0	6	0
Previous caesarean	0	0	7	6
Maternal distress	13	1	11	0

*The totals in this table are in excess of the actual numbers because in many cases there was more than one indication applicable.
POP = persistent occipitoposterior.

The second commonest indication in the present series was prolonged first stage of labour without cephalopelvic disproportion, accounting for 25% of all extractions. If to this figure of first-stage vacuum extractions are added the other frequent indications for first-stage use of the ventouse, like deterioration of pre-eclamptic toxaemia and increasing antepartum haemorrhage, the reason for the unit's formidably high extraction rate before full dilatation of the cervix, becomes plain. This high incidence of first-stage ventouse usage is especially applicable to the premature deliveries, where it is 75%!

Toxaemia is probably the commonest complication encountered in the community served by this hospital. It is unit policy to induce labour at not later than 38 weeks' gestation and this explains why so many of the vacuum extraction deliveries on premature infants were for pre-eclamptic toxaemia.

Malrotation of the vertex, a common indication for vacuum extraction in other reports,[9-16] has not featured so frequently in this series, especially not in the prema-

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tures. The reason may lie in the excellent bearing-down efforts in the second stage made by most non-White patients.

Dilatation of the Cervix (Table III)

The high percentage of vacuum extractions before full dilatation of the cervix has been stressed above. At full dilatation of the cervix forceps delivery is still preferred.

TABLE III. STAGE OF DILATATION

Dilatation of cervix	*1967 mature*	*1964–1968 premature*
Before full dilatation	152 (65%)	45 (75%)
Primigravidae	78	38
Multigravidae	74	7
Full dilatation	82 (35%)	15 (25%)
Primigravidae	44	14
Multigravidae	27	1

Station of Vertex (Table IV)

The station of the vertex in relation to the ischial spines in the premature infants did not differ much from that of the 1967 controls. This is ascribed to the fact that the majority of extractions were done before full dilatation of the cervix and therefore frequently with the presenting vertex still at the level of or above the spines.

TABLE IV. STATION OF VERTEX

	High		*Mid*		*Low*	
Gravidity	*1967 mature*	*1964–68 premature*	*1967 mature*	*1964–68 premature*	*1967 mature*	*1964–68 premature*
Primigravidae	43	12	60	28	38	12
Multigravidae	17	3	52	3	24	2
Total	60	15	112	31	62	14
Percentage	24	25	48	52	28	23

Result of the Vacuum Extractions (Table V)

(a) *Failed vacuum extraction.* The failed vacuum extraction rate of 5% in premature infants appears to compare favourably with other reported series; but the results are not impressive if inspected more closely. All the failed extractions in premature infants were ultimately delivered by forceps, because full dilatation of the cervix had been achieved by the extractor. However, the trauma resulting to the infant was considerable (perinatal mortality and morbidity). All the failed vacuum extractions occurred when a hurried application and delivery was attempted in a case of foetal distress. One infant died on the first day after such a delivery. All infants born after a failed extraction had scalp lesions, and the majority had Apgar ratings below 5/10 and relatively severe jaundice—two of the latter needed exchange transfusions.

TABLE V. RESULTS OF VACUUM EXTRACTIONS

	1967 mature	*1964–1968 premature*
Failed vacuum extractions	19 (8·1%)	3 (5%)
Maternal morbidity		
Cervical tear	4 (1·8%)	4 (6·7%)
Postpartum haemorrhage.. ..	11 (4·8%)	6 (10%)
Puerperal sepsis	27 (11·1%)	20 (31·7%)
Perinatal mortality (excluding IUD)	8 (3·3%)	3 (5·0%)
Perinatal morbidity		
(*a*) Scalp lesions	75 (32·0%)	12 (20·0%)
Abrasion + ulceration ..	35 (15%)	8 (13·3%)
Scalp sepsis	18 (7·8%)	3 (5·0%)
Cephalhaematoma	22 (9·4%)	1 (1·7%)
(*b*) Neurological complications ..	53 (22·7%)	24 (40·0%)
Apgar below 5/10	42 (17·9%)	14 (23·3%)
Cerebral irritation	4 (1·8%)	8 (13·3%)
Cerebral haemorrhage ..	3 (1·3%)	1 (1·7%)
Nerve palsies	4 (1·8%)	1 (1·7%)
Miscellaneous		
Jaundice (not Rh or ABO) ..	28 (11·9%)	9 (15·0%)

(b) *Maternal morbidity.* There was a much higher incidence of maternal morbidity in the patients delivered of premature infants by vacuum extraction. This may be ascribed to the fact that 75% of all these extractions performed on premature infants occurred in the first stage of labour. At this stage application is more difficult and takes longer to achieve. Furthermore, in 77% of these premature infants this instrumental assistance was initiated when the vertex was at or above the level of the ischial spines.

When the cup of the vacuum extractor is applied to a small head it is invariably displaced upwards to a higher level in the pelvis. This increases the difficulty and the time taken to complete the delivery. These factors all play a part in the unusually high maternal sepsis rate of 31·7% in mothers of premature infants delivered by extraction, and in the high incidence of postpartum haemorrhage (10%) and cervical lacerations (6·7%), as compared with the 1967 series of mature infants.

(c) *Perinatal mortality.* The perinatal mortality rate of 5·0% compares very favourably with those reported in the literature,[1-6,8-12] where the rate is usually in the vicinity of 4%. Although 3 neonatal deaths have occurred in these premature infants, only one could be directly attributable to the ventouse delivery. The other 2 infants died of the respiratory distress syndrome and prematurity respectively.

(d) *Perinatal morbidity.* The surprisingly low incidence in the premature infant of abrasions, ulcerations and sepsis can only be explained on the basis that once application of the cup is achieved in the prematures, the actual delivery time is shorter because the extraction itself is very easy. This may also explain the low incidence of cephalhaematoma of 1·7% in the prematures as compared with 9·4% in the 1967 series. The majority of the scalp lesions occurred in cases where the vacuum failed and delivery was completed with forceps. As mentioned before, these infants suffered the most severe scalp lesions due entirely to the extractor.

On first glance the incidence of neurological complications in the premature infants is alarmingly high. A more careful scrutiny, however, gives a better perspective. The large number of Apgar ratings below 5/10 may be partly ascribed to the frequency of foetal distress as an indication for vacuum extraction delivery, and also to the fact that the premature infant as such tends to have a low Apgar score at birth and shortly thereafter.

The very high incidence of cerebral irritation (irrita-

bility, twitchings, vomiting, photophobia or neck rigidity) of 13·3% among our premature infants is alarming. This high incidence of cerebral irritation indicates cerebral trauma. The trauma was, however, not related to the number of pulls necessary to achieve delivery, as described by Lasbrey *et al.*,[8] because the premature infants were nearly all delivered by 3 - 4 pulls, without undue force.

The soft skull with its lack of subcutaneous fat allows the vacuum pressure to be transmitted to the skull bones with a resulting increased degree of moulding in these premature infants, causing cerebral trauma. A pond fracture of the skull can be elevated by a vacuum extractor.

A too rapid delivery of the head, causing a sudden decompression, may possibly be another contributing factor. Episiotomies were performed in nearly all cases, except in the mothers of premature infants, and this may also be a factor.

The low incidence of proved cerebral haemorrhage is surprising, as the same factors should apply. The answer may be that very few of the premature infants had lumbar punctures performed on them, and the diagnosis depended on clinical findings. Theoretically a higher incidence of cerebral haemorrhage is expected for the reasons quoted above.

No long-term studies have as yet been done specifically on premature infants who have had vacuum extractions, to evaluate their subsequent mental growth.

The large number of jaundiced babies (15%) among the premature infants cannot be ascribed to the prematurity alone. Rhesus and ABO incompatibility were excluded. This 15% is higher than the estimated 10% of severe neonatal jaundice in normal premature infants in this unit.

The impression gained is that haemorrhage into subcutaneous tissues underlying the 'chignon' must be common, although obvious abrasions or contusions are not present. With subsequent absorption of the blood, jaundice results. Two premature infants needed an exchange transfusion for jaundice attributed to the vacuum delivery. Even among the 1967 series our incidence of jaundice (11·9%) is much higher than the usually reported 4%.[3-6,8-13]

DISCUSSION

Because the commonest indications for the ventouse in this series seem to differ from those reported, the results obtained on the premature infants had to be compared with a series of vacuum extractions on full-term infants performed at the same institution during the same period. It is also apparent that a comparison with other reports, especially from Europe, is not valid; we seem to apply the extractor less often at full dilatation, and our patients generally possess a less adequate pelvis.

This analysis indicates without doubt that a vacuum extraction delivery is more harmful to the premature than to the infant of greater birthweight. What is of even more surprising significance is that the maternal morbidity is also much greater in the premature series. The reason for the higher maternal morbidity rate can be ascribed to the fact that most applications of the cup were instituted before full dilatation with the vertex frequently stationed at or above the level of the ischial spines. During these prolonged and difficult attempts at application, the vertex was invariably dislodged to a higher level in the pelvis, with resultant poorer application of the cervix to the vertex, and increased likelihood of maternal cervix and vagina being sucked into the cup during application.

From this analysis it would appear that when foetal distress is encountered in a premature infant during the first stage of labour, resort to another method of delivery could lead to better results than attempting a difficult and hurried vacuum extraction which might easily fail. The severest complications due to the extractor in the premature infants were encountered in just such cases. The one neonatal death which could be attributed to the ventouse, and the two premature infants with severe neonatal jaundice needing exchange transfusion, were in this category.

It is admitted that an analysis of this kind on premature infants is extremely difficult, as prematurity itself could have been the cause for some complication listed against the ventouse.

A vacuum extractor should be used with caution when an infant of low birthweight is anticipated. This instrument seems to be contraindicated in the presence of foetal distress in premature infants before full dilatation of the cervix and with the vertex above or only level with the ischial spines.

SUMMARY

An analysis has been made of 60 extraction deliveries performed on premature infants at Peninsula Maternity Hospital between January 1964 and September 1968. In order to obtain a valid comparison, the results were matched against extractions performed on infants of mature birthweight at the same institution during 1967.

The conclusion reached after this analysis is that prematurity is a relative contraindication to vacuum extractions, especially in the presence of foetal distress in the first stage of labour.

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