EVALUATION OF VACUUM EXTRACTOR AND FORCEPS DELIVERIES

by

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The use of vacuum extractor in obstetrics has spread considerably throughout the world, particularly in Europe, since Malmström, in 1954, designed his instrument. There have been many favourable reports particularly from Europe. Many authors, viz. Bruniqual and Israel (1958), Chalmers and Fothergill (1960), Estrella R. (1957 and 1960), Goldberg (1958) and Rosa (1957), believe that it could replace obstetric forceps with advantage. However, American authors have emphasised the foetal risks. According to Aguero and Alvarez, "Vacuum extractor is as traumatic or perhaps more traumatic than any other extraction instrument." In view of these controversial reports, the present study was conducted at the All-India Institute of Medical Sciences Hospital. For the benefit of those, not familiar with the instrument, a short historical review is given and the instrument is described first.

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Historical Review

The concept of assisting child-birth by application of a suction cup to the presenting area of the foetal head dates back to several centuries. Yonge, in 1706, describing a difficult delivery, wrote, "I could neither fasten a crochet nor draw it out by a cupping glass fixed to the scalp with air pump." In 1849, Simpson published an article on "The suction tractor or new mechanical power as a substitute for the forceps in tedious labours." In 1855, he named it "Air Tractor." Since then there has been sporadic revival of interest in the use of a suction cup to effect delivery (McCahey 1860, Torpin 1938, Couzigon 1947, Koller 1950, Finderle 1955). The Vacuum Extractor designed by Malmström, in 1954, differs from the "suction cup" that preceded it, in that the suction cup of a Vacuum Extractor also functions as a traction cup. As a result, now a usable suction forceps is available.

The Instrument (Fig. 1)

Vacuum Extractor consists of a bell shaped steel cup, the lips of which are smooth and turned in.

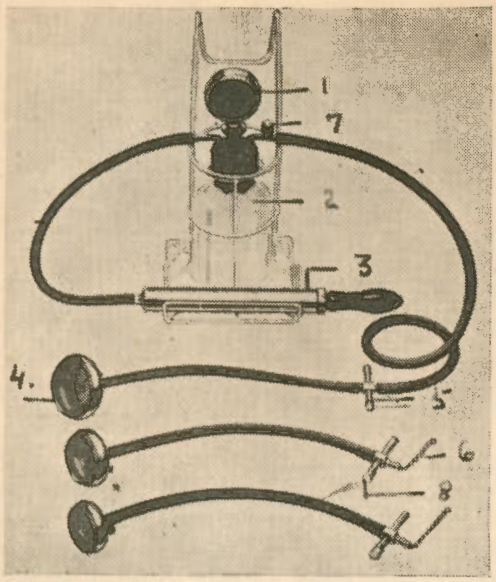

Fig. 1
Malmstrom Vacuum Extractor.
1. Vacuum gauge, 2. Vacuum bottle, 3. Vacuum pump, 4. Suction cup, 5. Traction handle, 6. Traction chain, 7. Valve to relieve the pressure, 8. Fixation pin.

The cup is attached to a rubber tube through which a traction chain is passed to form a traction tube and traction cup. Traction tube is connected to a metal handle (traction handle). To complete the instrument there is a wide-mouthed bottle fitted by means of a 3 hole rubber stopper with a vacuum gauge and two metal connectors. One connector is for rubber tube attached to traction handle and therefore in turn to the traction cup. The other connector is for a rubber tube attached to a suction pump which is an ordinary bicycle pump with a backward valve so as to create negative pressure or vacuum in the bottle. The vacuum created may be rapidly dissipated by means of a small thumb valve located in one of the metal connectors. The diameters of the metal cup vary from 30 — 60 mm. and its height is 20 mm. Vacuum gauge is calibrated in kilograms per square centimeters with the maximum upto 1.0 kilogram.

Technique of Application

The cup is introduced in the vagina as a pessary would be (Fig. 2). It is

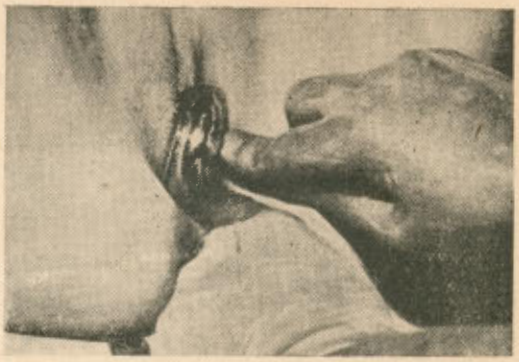

Fig. 2
Shows method of introduction of Vacuum cup in the vagina.

applied on the foetal vertex as near the posterior fontanelle as possible. When the cup is on foetal scalp the pressure is gradually raised. The idea is to create an artificial caput succedaneum which fills the cup and thus a firm hold of the vacuum extractor on the foetal head is secured. The pressure is raised initially to 0.2 kilogram and then increased by 0.2 kilogram every two minutes. Beyond 0.8 kilograms it should not be raised. In practice 0.6 kilogram was found adequate for majority of the patients in this series. If the caput is already present then the vacuum pressure can be raised more quickly. After raising the pressure careful check is made to see that the edges of vagina or cervix have not been sucked in the

cup. Traction is then made as in figures 3 and 4.

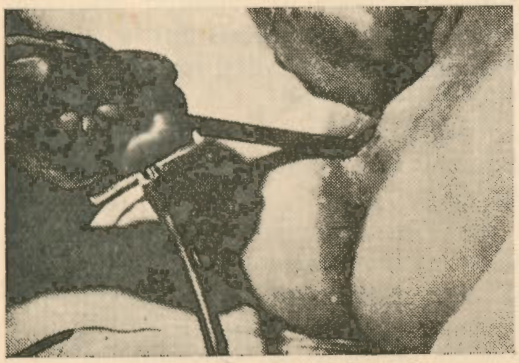

Fig. 3

Shows traction being made during the contraction, after the pressure is raised. Index finger of the left hand checks up that the cervix or vagina are not sucked in the cup.

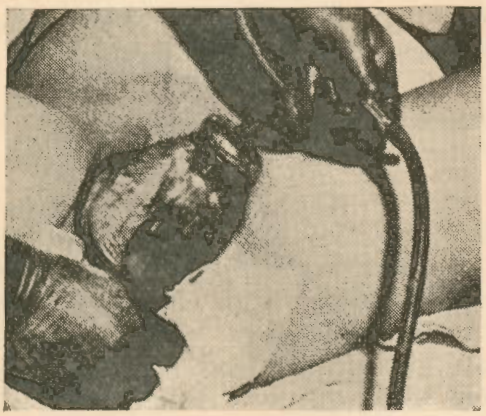

Fig. 4

Shows extraction of the head with vacuum extractor (by courtesy of AB Vacuum Extractor).

It is advisable to pull in synchronization with the pains. In the majority of the cases, rotation of the head from transverse or posterior position takes place spontaneously during traction.

The construction of the vacuum extractor makes it possible to change easily the direction of the traction force which is necessary as the foetal head passes through the pelvis. However, care is taken not to pull obliquely as the cup is likely to slip in that case.

Experiences with Vacuum Extractor

During the period from 1st April 1961 to 31st March 1963, Vacuum Extractor was successfully used in 65 patients at the All-India Institute of Medical Sciences Hospital. During this period there were 1459 deliveries. Sixty-three patients were delivered by forceps and 33 by caesarean section, giving an incidence of vacuum extraction at 4.5%, forceps 4.3%, caesarean section 2.25% (Tabel I).

TABLE I

Total deliveries	1459	
Vacuum extractions	65	4.5%
Forceps	63	4.3%
Caesarean	33	2.25%

In the preceding year, when vacuum extractor was not practised the incidence of caesarean section was 5% and that of forceps delivery was 4.5%.

Age

Patients' age in the vacuum extraction group varied from 16 years to 45 years and there was no significant difference in the forceps or caesarean group.

Parity

The parity of the patients in vacuum extraction and forceps groups is shown in Table II.

TABLE II

	Vacuum Extractions	Forceps
Primipara	38	41
Multipara	27	22

More than half the patients in both groups were primiparas.

Vacuum Pressures

Pressures varying from 0.5 to 0.8 kilograms were used for vacuum extractions. However, in the majority of the cases pressure of 0.6 kilogram was adequate.

Time of Vacuum Extractor Application

Vaccum was slowly created taking an average of 5 minutes to raise the pressure to 0.6 kgm/cc. Where caput was present pressure was raised within 1 — 2 minutes. Traction was made during the pains. Time of extraction varied from 5 minutes to 35 minutes (Table III).

TABLE III

Vaccum Extraction Time

Time in minutes	No. of cases
5-10	40
11-20	24
35	1

Station of Head

Vacuum extractor in this series was used only in cephalic presentations when conditions for a forceps delivery were fulfilled and the cervix was fully dilated.

Station of the head for vacuum extraction and forceps delivery is shown in Table IV.

In the case of mid-cavity forceps delivery the head was manually rotated to anterior positions. In the case of vacuum extraction in all the successful applications spontaneous rotation occurred during traction. All cases were delivered with occiput in anterior position, except in one case where the occiput was lying in the oblique posterior position and backward rotation occurred, baby being delivered face to pubis position.

Failed Vacuum Extractions and Failed Forceps

In four cases the vacuum extraction was not successful. In three cases there was leakage in the tubes, so deliveries were completed by forceps application. In the fourth case, the rotation from posterior position with vacuum extraction did not occur. However, soon after, spontaneous rotation occurred and baby

TABLE IV

Station of Head

	Vacuum extraction		Forceps	
Low	42		39	
Mid cavity	23	10 Transverse position 9 Posterior 4 Oblique anterior	24	9 Transverse 7 Posterior 8 Oblique anterior

was delivered without further assistance. In one other case, where manual rotation could not be successfully performed for forceps delivery, rotation with vacuum extraction occurred during traction and delivery with vacuum extraction was successful.

Indications

Indications in the vacuum extractor group were the same as those for forceps delivery. Maternal distress, foetal distress, prolonged second stage or shortening of second stage for cardiac mother, toxemia of pregnancy or where there was previous caesarean scar. However, where there was gross foetal distress, forceps were applied as it was felt that quicker delivery could be achieved.

Condition of New-born

Weights of the babies varied from 1800 to 4100 gms. Table V shows the distribution of weights in both groups.

TABLE V

Birth Weights of Babies

Weight in Grams	Vacuum extraction	Forceps
1500-2000	1	3
2001-2500	16	21
2501-3000	27	20
3001-3500	18	17
3501-4000	3	1
4001-4500	—	1
Total	65	63

Perinatal Loss

All babies were born alive except one baby in vacuum extraction group in whom the foetal heart was absent before the application of vacuum extractor. There was one neonatal death forty-eight hours after birth, in the vacuum extraction group, due to intracranial haemorrhage. The mother was a grand multipara who had a prolonged labour. There was excessive moulding and a large caput had formed. Baby weighed 3750 grams. It was felt that intracranial haemorrhage had possibly occurred during the descent of the head with excessive moulding during prolonged labour, and also this was one of the earlier cases where vacuum extraction time was rather long (35 minutes). This death may have been avoided by earlier intervention by caesarean section.

In the forceps group also there was one neonatal death due to intracranial haemorrhage. There was a gross foetal anoxia just before the application of forceps. The foetal heart had dropped to 80/min. and meconium was present. Delivery by forceps was easy; however, there was difficulty in reviving the baby. Baby died 36 hours after birth.

Birth Injuries. These are given in Table VI.

TABLE VI

	Vacuum extractions	Forceps
Cephalhaematoma	0	1
Abrasions	1	1
Neonatal death (intracranial haemorrhage)	1	1

All the babies in the vacuum extraction group had caput succedanum which disappeared within 24 hours.

Mishell and Kelly (1962) have reported incidence of cephalhaema-

toma as 8% in vacuum extraction group and 4% in forceps group. Lauridsen et al (1963) had six cases of cephalhaematoma in 69 vacuum extractions.

Minor scalp abrasions, reported by Mishell and Kelly, were 16% in vacuum extraction group, and 0% in forceps deliveries, whereas Aguero and Alvarez report an incidence of scalp ulceration as 12%.

There were no cases of alopecia, which we looked for specially in the vacuum extraction group, as reported by others. Absence of this, and low incidence of abrasions are possibly due to the fact that negative pressures were used for short periods and continuous traction was avoided. Lauridsen et al agree with this as they had two cases of alopecia in 69 vacuum extractions and in one of them the extraction time was 70 minutes! Sternbeck also believes that intermittent traction is rarely necessary for longer than 20-30 minutes and shorter periods of traction do not cause alopecia, necrosis or ulcerations. Short periods of application and use of only 0.6 kgms. of negative pressures were possible, because the vacuum extractor in this series was used only when the cervix was fully dilated. Some of these babies live in the campus and have been observed for 1-2 years and no untoward effects have been noticed.

Maternal Complications

One mother delivered by vacuum extractor had a vulval haematoma on the opposite side of episiotomy. Though vulval haematomas are known to occur even after normal vaginal delivery, whether vacuum extraction was the cause of it, cannot be ruled out.

There were no maternal deaths in the vacuum extraction series, but there was one maternal death in forceps series. Forceps were applied under pudendal block. Later, as the placenta was retained, manual removal was done. Death was not considered to be due to forceps delivery per se.

Anasthesia

Table VII shows the nature of anaesthesia used for vacuum extraction and forceps delivery.

TABLE VII

Anaesthesia	Vacuum extractions	Forceps
General	1	13
Pudendal	2	25
Local infiltration of episiotomy area	48	23
Nil	14	2

In the vacuum extraction group, fourteen of the multiparas did not require any anaesthesia. Forty-eight of them required only local infiltration of the episiotomy area. Only one patient, a second gravida whose first baby had been born by caesarean section, required a general anaesthetic. There was definitely higher incidence of pudendal blocks in the forceps series, partly because application of forceps causes more discomfort to the patients than vacuum extraction and also better relaxation is required for forceps. The incidence of general anaesthesia was much higher in the forceps group. Most of the patients who were nervous and thus were not co-operating otherwise were given

general anaesthesia, and quicker delivery by forceps in the presence of foetal distress was considered desirable.

Discussion

Evelbauer (1958) and Berggren (1958) commented that the vacuum extraction can replace forceps delivery in most cases, while others are more conservative. In the present series approximately fifty per cent of forceps were replaced by vacuum extractions. Forceps were mostly applied when immediate delivery, due to gross foetal distress, was desirable and in cases where vacuum extraction failed.

Rossel and Champod (1958) recommend the use of vacuum extraction only in cases where head is almost against the perineum, while Fauvet and Scheele (1956), Meinrenken and Schieferstein (1957), Barben (1958), Berggren (1958), and Evelbauer (1958), all find that vacuum extractor is particularly useful in cases where the head is in the mid-pelvis or even higher. The present study is more in conformity with the latter group, as more than one-third of the patients had mid-cavity extractions. Its use in higher stations except for the second twin is not recommended.

Evelbauer (1956, 1958) and Berggren (1958) have used it in breech presentation. Malmström recommends its use in cases of uterine inertia to hasten the dilatation of the cervix. However, in this series the use of vacuum extraction has been restricted to cases where presentation was cephalic and cervix was fully dilated and conditions for forceps delivery were fulfilled.

Solomons (1962) has used it for delivery of head during caesarean section. However, we have only manually delivered the head at sections.

An electric pump for vacuum extraction by Ruther and Sokal has been reported. However, only hand pump was used in this study and was found quite satisfactory. Electric pump operated with foot switch appears to have the advantage that the help of one assistant to work the hand pump is not required.

More recently, particularly in the American literature, viz. Oscar and Homero (1962), Mishell and Kelly (1962), Grossbard and Cohn (1962) have reported a high incidence of foetal trauma. This is a timely warning that vacuum extraction though easy to use should be used with caution, in selected cases, and by those who have some obstetric experience and also are familiar with the use of forceps so that the forceps may be resorted to, when required.

Summary and Conclusion

Vacuum extractor and technique of its application are described.

Evaluation of vacuum extraction deliveries and forceps deliveries, conducted over a period of two years, is made.

Maternal and foetal risks and anaesthesia required are discussed.

It is felt that Vacuum Extractor is a useful instrument in obstetric practice and may safely replace about fifty per cent of forceps deliveries. The ease in its use, and minimal maternal and foetal risks involved are likely to make the instrument increasingly

popular. Caution is issued that it be used with care and only by those who are conversant with forceps delivery.

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