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FACILITATION OF VAGINAL DELIVERY BY PELVIC OUTLET DECOMPRESSION

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Following an earlier investigation into the effects of a local reduction in atmospheric pressure over the pelvic outlet during the second and third stages of labour (Heyns *et al.*[1]) we present evidence of the value of outlet decompression in the management of the second stage of labour, based on results obtained in 41 consecutive cases so treated. (A further report on the use of outlet decompression during the third stage of labour is intended at a later date.)

Our results indicate that this safe, readily available and relatively easier method than forceps delivery, to which it will be compared, shortens the normal duration of the second stage of labour, can obviate the need for forceps delivery in 80% of cases where assisted delivery is indicated, and is to be preferred to forceps delivery in over 60% of such cases.

APPARATUS AND METHOD

As distinct from the abdominal decompression used for entirely different purposes during pregnancy and in the first stage of labour, where the whole trunk of the patient is enclosed in a pressure-reducible chamber (Heyns[2, 3]), outlet decompression during the second stage of labour depends on a purely local reduction in atmospheric pressure over the patient's perineal area to reduce forces opposing advance of the foetus. This is achieved by placing a small, suitably shaped chamber connected to a simple vacuum pump over the perineum to include the vulva, anus and surrounding skin, so that an airtight fit is obtained, and by then extracting air from the chamber by means of the pump.

Description of Apparatus

The instrument used in this series was the Heyns 'Gasyd'. It consists of a perspex cup 6 inches in diameter, to which is attached a hand-operated suction pump. The edges of the cup are shaped to make an airtight fit with the perineal skin when the patient is in the lithotomy position. The shape of the cup is critical and was obtained by taking perineal plaster-of-paris casts of patients in the lithotomy position and by using these casts as moulds to produce models from which the shape of the cup could be accurately determined. So successful is the shape of the cup that one size has proved suitable for all patients.

Two forms of pumps were used. One is a stainless cylinder and piston directly attached to the cup by a bayonet fitting. It carries a vacuum gauge. It is operated by traction strokes of the handle. The other pump is a rubber bulb connected to the cup by means of a short length of polythene tubing. Both are fitted with non-return valves so that successive strokes reduce pressure further within the chamber formed by cup and patient. Both were effective. The perspex cups were perforated by a single small hole within easy reach of the operator. The hole was kept closed by the thumb of the applying hand when decompression was required, so that instant reversion to atmospheric conditions could be obtained by lifting the thumb.

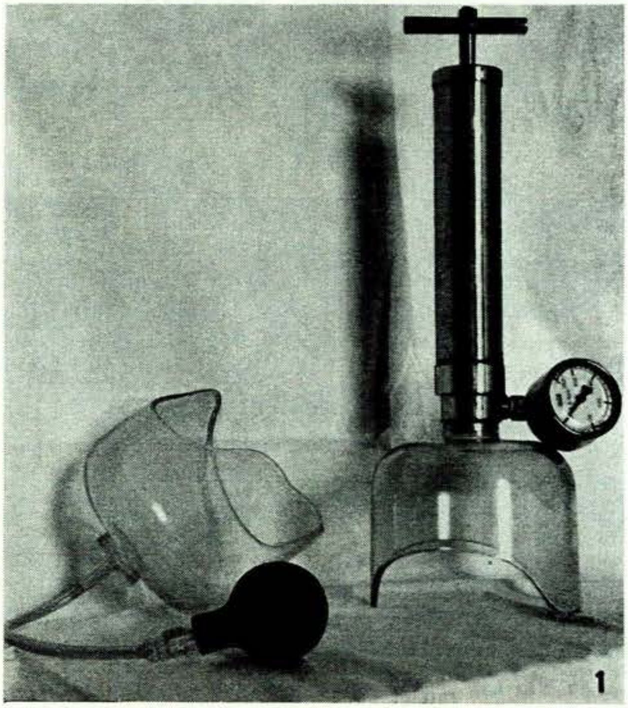
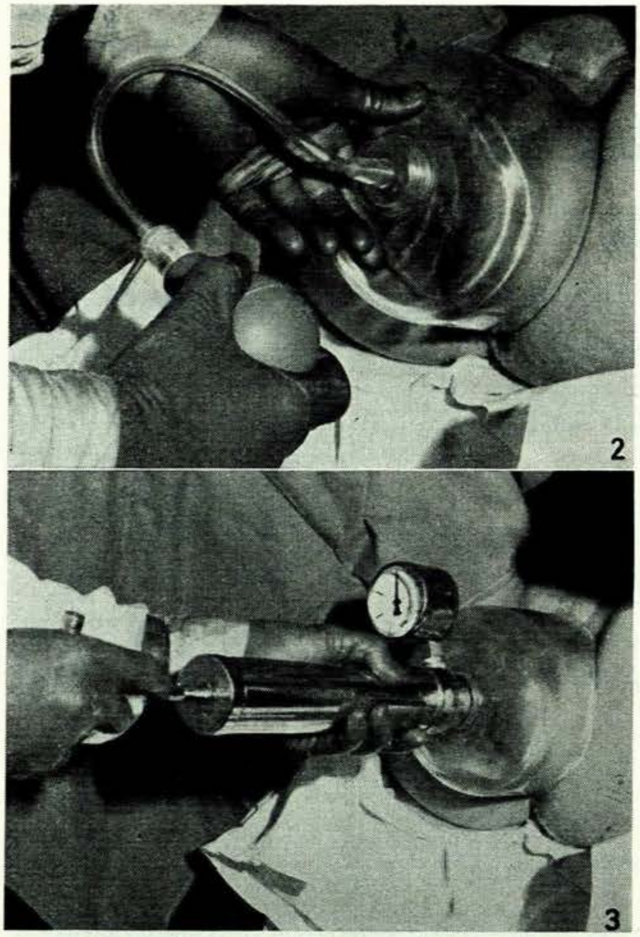


Fig. 1. Two models of 'Gasyd' were used in the investigations. In the one a rubber bulb constitutes the pump. In the other a stainless cylindrical pump, fitted with a vacuum gauge was used. Both were fitted with non-return valves.

Application

'Gasyd' is applied with the patient in the lithotomy position, or with the heels on the bed and the legs flexed at the knees and abducted, or in the lateral position. The perspex cup is applied to the perineum so that its superior border is just above the clitoris half-way up the symphysis pubis and its pointed posterior angle reaches to behind the tip of the coccyx, on which it presses. The thumb of the applying hand occludes the inlet hole in the perspex cup while the other hand actuates the pump to reduce the pressure (Figs. 2 and 3).

The pressure may be reduced by 120 mm.Hg, which is the limit of the bulb pump, or less if required. Experience has shown that each application of outlet decompression should last for about 10 seconds, with a rest of a few



Figs. 2 and 3. See text.

seconds before the next application. Reductions of pressure for from 5 to 10 seconds with pauses of about 5 seconds between each application have been found satisfactory.

Circumstances calling for Use of 'Gasyd'

Outlet decompression was applied on occasion at the commencement of the second stage, e.g. where hypotonic uterine inertia had occasioned a first stage of 29 hours and the patient was in no condition to use her secondary (bearing-down) powers of expulsion. At other times outlet decompression was first used when the second stage had been in progress for a considerable period without advance. Sometimes the presenting part was relatively high, at others it was visible at the perineum.

Outlet decompression may be applied during or between contractions, in the presence or absence of secondary powers.

In the course of this investigation circumstances were present which called for each of these applications of outlet decompression.

1. In general and in order to achieve the greatest effect, outlet decompression was applied during contractions in the presence of secondary powers. The patient then has the benefit of complete rest until the next contraction and, whereas most patients do not object to outlet decompression during contractions, many find it disturbing in their absence.

2. Where pre-eclamptic toxaemia and hypertension were present the 'Gasyd' was used during contractions but without bearing-down efforts, which were forbidden, since they would also be in cardiac disease.

3. In the absence of a contraction the chief indication for the use of outlet decompression is acute foetal distress. We believe that we saved a life by extracting a foetus in a matter of seconds with powerful outlet decompression without waiting for the next contraction to develop (see clinical results). The foetal head was also brought through the perineum on many occasions in the absence of contractions or secondary powers. This allows for excellent and gentle control while the very small negative pressures (5 - 20 mm.Hg) required are not distressing to the patient. Outlet decompression was also used between contractions to good effect in hypotonic uterine inertia, where its use seemed to stimulate the primary powers.

Special Considerations in using the 'Gasyd'

1. If the presenting part is well down on the perineum and the patient is required to bear down, it is advised that outlet decompression be withheld until she is bearing down. Descent can then be readily controlled. If outlet decompression is applied first a sudden expulsive effort by the patient, at a moment when outlet decompression is all but extracting the foetus, may cause explosive delivery with rupture of the perineum.
2. After a little practice it is possible to bring the presenting part up to complete and gentle delivery. Until familiarity is gained with the method it is probably advisable to deliver normally once this is imminent.
3. The indications for episiotomy are no different with the use of outlet decompression. The incision will bleed a little more freely and so should not be made unnecessarily early, but episiotomy should certainly not be withheld if the risk of a severe tear is thought likely.
4. In patients who have considerable adipose tissue in the perineal area it is advisable to stretch the perineal skin outwards laterally under the edges of the 'Gasyd', otherwise when decompression is applied the fatty tissue tends to bunch up inside the perspex cup obstructing the vaginal outlet.

SELECTION OF EXPERIMENTAL MATERIAL

Outlet decompression can be employed to facilitate the second stage of labour in normal cases but, for the purposes of this investigation, its use was almost exclusively reserved for cases of *delay in the second stage* or where other conditions indicated the need for assisted delivery, i.e. forceps delivery according to the criteria of the Queen Victoria Hospital in Johannesburg, where the investigation was made.

This was done because, whereas facilitation soon becomes evident to the operator when decompression is applied in a normal case, particularly where the foetal head is visible, a comparison of second stage times, with and without decompression, poses difficulties in satisfactory assessment and representation. On the other hand, where it can be shown that outlet decompression has obviated the otherwise necessary use of forceps, it becomes immediately obvious, not only that the method facilitates advance in the second stage of labour, but also that such facilitation is comparable with the use of forceps, and that it is at once more physiological in action, quicker and easier to use, requires no anaesthesia, and is less likely to introduce infection or to traumatize the mother and infant.

It will be shown that outlet decompression is more suitable in certain cases than in others, but this was only revealed during the investigation and no attempt was made to exclude any case where indications for assisted delivery were present.

In order to demonstrate the 'Gasyd' to colleagues when no case requiring forceps delivery was available, outlet decompression was used in 2 normal cases. These are included to preserve the continuity of 41 consecutive cases.

CLASSIFICATION OF CASES UNDER INVESTIGATION FOR ASSISTED DELIVERY

1. Delay of more than 30 minutes in second stage without advance 17
2. Delay of 20 - 27 minutes in second stage when patient begins to show evidence of exhaustion 8
3. Hysterical and completely uncooperative patients with 12-hour and 29-hour first stages respectively 2
4. No advance after episiotomy 1
5. Foetal distress 6
6. Pre-eclamptic toxaemia with hypertension 3
7. Poor secondary powers—'Gasyd' used early 2
8. Demonstration 2

We consider that assisted (forceps) delivery was indicated in the first 6 categories of the above classification, i.e. 37 cases. The seventh category is excluded because, although we believe that assisted delivery was indicated, outlet decompression was applied too early to provide satisfactory proof of this. The 2 demonstration cases are also excluded.

DESCRIPTION AND ANALYSIS OF CLINICAL RESULTS

Of the 41 patients treated by outlet decompression, delivery was effected in 35 (85%). In 31 of the 37 patients where forceps delivery was indicated, delivery by outlet decompression (84%) took place. In 6 patients outlet decompression failed to effect delivery and moderately difficult forceps delivery was required in 5 of these patients. The sixth patient would probably have been delivered by outlet decompression in the light of later experience, but, when no advance was discernible after 10 minutes of decompression, it was decided to employ forceps. After pudendal block had been performed and just as the forceps blades were to be applied, a great effort by the patient achieved good advance of the foetal head and normal delivery followed episiotomy.

During the course of this investigation it became evident that the results which can be expected from outlet decompression depend to a much greater extent on the degree of cephalo-pelvic disproportion present than is the case where forceps are used. The level of the presenting part is also of importance in this regard. The reasons for these effects will be discussed later. Owing to the great difficulty in determining disproportion or the degree to which such disproportion will affect the course of any particular labour, (we believe that outlet decompression itself will now provide a means of assessing disproportion in many instances), our assessment is based on clinical impressions gained at the time and upon the circumstantial evidence surrounding each case. Thus, where delay has occurred in the second stage of labour, we have related the quality of primary and secondary maternal powers, the level within the pelvis at which the delay has occurred, the clinical impressions gained from vaginal examination, and the presence of caput and moulding in the infant after delivery, in order to assess the degree of disproportion. Where vaginal examination has revealed a foetal head well down in a clinically capacious pelvis, the infant has shown no evidence of moulding or caput succedaneum and the second stage has been preceded by a long first stage indicating poor primary powers, we have not hesitated to exclude disproportion. On the other hand, where the first stage has been short, the contractions powerful and frequent, vaginal examination has indicated a tight fit, delay has occurred relatively high in the pelvis and caput and moulding have been present in the infant, we have assumed moderate disproportion.

In order to consider the effects of outlet decompression in relation to the quality of maternal powers and the extent of cephalo-pelvic disproportion in each case, the 41 cases are regrouped in Table I. Table II shows separate details for all cases.

In groups (a), (b), (c) and (d), where no evidence of disproportion was present, the success rate with outlet decompression was 100% and the average time for which outlet decompression was used was relatively short. The time for which outlet decompression was required is greater in group (b) which is to be expected when it is remembered that results were obtained without the aid of maternal expulsive effort in this category.

TABLE I. THE EFFECTS OF OUTLET DECOMPRESSION IN RELATION TO THE QUALITY OF MATERNAL POWERS AND THE EXTENT OF CEPHALO-PELVIC DISPROPORTION

	No. of cases	*Av. time before 'Gasyd' (Minutes)*	*Av. time using 'Gasyd' (Minutes)*	*Total time of 2nd stage*	*Good result*	*Failed 'Gasyd'*	*Forceps indicated*	*Forceps performed*	*Vulval oedema*
No disproportion									
(a) Demonstration ..	2	10	5	15	2	—	0	—	—
(b) P.E.T. with hypertension	3	10	10	20	3	—	3	—	—
(c) Foetal distress ..	6	13	5	18	6	—	6	—	—
(d) Poor powers no disproportion ..	13	22	7	28	13	—	11	—	1
Disproportion									
(e) Poor powers, slight disproportion ..	9	28	17	44	8	1=12%	9	—	3
(f) Fair powers, slight to moderate disproportion	7	49	12	70	3	4=57%	7	4	2
(g) Poor powers, moderate disproportion	1	45	15	75	0	1=100%	1	1	—

Overall success rate	85⅓%
Success rate where no evidence of disproportion	100%
Failed	6 cases
Delivered by forceps	5 cases
Delivered by pudendal block and episiotomy	1 case

	Indicated	*Performed*	*Averted*	*Success rate*
Forceps	37	5	31	84%

Groups (e), (f) and (g), where evidence of disproportion was present, show both a decreased success rate (65% as against 100%) and a greater average time for which outlet decompression was required in order to achieve results. The prolonged powerful outlet decompression required also led to congestion and oedema of soft tissue in some of these cases (see under *Complications*).

The average times for which outlet decompression was used, as reflected in column 3 of Table I, are relatively short for groups (f) and (g) because in the unsuccessful cases the method was discontinued as soon as good results appeared unlikely, and forceps extraction was performed. Though outlet decompression was used for only 15 minutes in group (g), therefore, 15 minutes elapsed between the use of outlet decompression and delivery of the infant by forceps extraction (see column 4). In group (f) an average time of 9 minutes elapsed between use of outlet decompression and delivery. Attention is also drawn to cases 19 and 38 (Table II).

It has been suggested by a colleague that, where outlet decompression is used with episiotomy, the latter might effect delivery without the use of outlet decompression. Apart from the fact that this statement is equally true, or false, in the case of forceps delivery, case 19 shows easy extraction of the foetus by outlet decompression after episiotomy had failed to effect delivery. In this regard it is to be remembered that outlet decompression will effect delivery even in the absence of contractions or secondary powers.

Case 38 is of considerable interest in that incipient foetal death was clearly indicated by the sudden slowing and disappearance of a well-heard foetal heart beat. As foetal distress was confirmed by a limp, asphyxiated infant with a barely perceptible heart beat, rating Apgar 1 on delivery, we state with confidence that powerful outlet decompression which extracted the foetus in the absence of a contraction in 10 seconds and within one minute of the cnset of distress, saved this infant's life. Furthermore, we know of no other method which could normally have been applied in the time available.

TABLE II. OVERALL RESULTS IN INVESTIGATION OF PELVIC OUTLET DECOMPRESSION

Number	*Parity*	*Indication for G.*	*Position of p.p.*	*1st stage (hrs.)*	*2nd stage before G. Delay (mins.)*	*2nd stage using G. (mins.)*	*Total 2nd stage (mins.)*	*Result*	*Complications*	*Observations and comment*
1	0	Fair powers, mod. disp.	Just visible	12	45	7	52	Good	—	Good advance with G. Episiotomy for impending rupture of perineum. Delivered by G without contraction.
2	4	Demonstration	Level with I.S.	1	10	5	15	Good	—	2nd of twins. Used to demonstrate method, showing advance in latter stages without primary or secondary powers.
3	0	Fair powers, disp. +	¼" below I.S.	8	45	10	60	Failed	—	Direct O.P. position. Rotation and delivery with forceps.
4	0	Poor powers	½" below I.S.	29	—	15	15	Good	—	Hysterical patient with hypertonic inertia who would not bear down at all.
5	0	Foetal distress	½" below I.S.	19	—	15	15	Good	—	Long 1st stage with evidence of foetal distress. Pea-soup liquor and irregular foetal heart. G in place of forceps.
6	0	Poor secondary powers, slt. disp.	¼" below I.S.	8	10	25	35	Good	2° tear	Poor secondary powers. Good advance with G. 2nd degree tear owing to too rapid delivery of head with G.
7	1	Poor powers, slt. disp.	½" below I.S.	24	20	10	35	Failed	—	After 10 mins. G without advance. Preparations were made for forceps just before use of which patient made great effort and delivered after episiotomy.
8	0	P.E.T., hypertension	½" below I.S.	7	5	15	20	Good	—	Used in place of forceps. Patient not bearing down.
9	0	Foetal distress	Just visible	4	15	5	20	Good	2° tear	Evidence of foetal distress in 2nd stage. G used to extract foetus rapidly, probably causing 2nd degree tear.
10	0	Fair powers, mod. disp.	Just visible	7	45	15	60	Good	Vulval oedema	Good advance with G. Episiotomy for tight perineum after which easy delivery with G.
11	0	Fair powers, mod. disp.	Just visible	5	66	7	73	Good	—	G brought head down well to perineum. Episiotomy—patient still unable to deliver—G—easy delivery.
12	0	Poor powers, disp. +	¼" below I.S.	17	35	30	78	Failed	—	After forceps delivery, marked caput and moulding indicated disproportion.
13	0	Poor powers, tired pt.	Just visible	14	20	5	25	Good	—	Head brought to crowning with 1 G-aided contraction. Delivered by G without contraction. Perineum intact.
14	0	Poor powers, slt. disp.	Just visible	14	45	10	55	Good	—	Good result with G. Caput and moulding present.
15	1	Foetal distress	On perineum	18	12	3	15	Good	—	Good advance with G. Episiotomy for tight perineum. Easy delivery with G.
16	0	Poor secondary powers, slt. disp.	½" below I.S.	9	40	14	54	Fair	Vulval oedema	High reduction in pressure used for long time. Oedema of vulva but good result.
17	1	Poor secondary powers, ? disp.	Just below I.S.	6	5	40	45	Fair	Vulval oedema 2° tear	? facilitation with G until head just visible with contractions, thereafter rapid advance and delivery.
18	0	Poor powers with disp.	Just visible	21	30	20	50	Fair	Vulval oedema	No advance without G—good with G though slow. Vulval oedema due to prolonged powerful use.
19	1	Poor powers, no advance after epis.	On perineum	12	19	4	23	Good	—	Patient unable to deliver after episiotomy. Easy delivery by G.
20	0	Poor powers	Visible	11	30	5	35	Good	—	Good advance with G. Episiotomy for tight perineum.
21	0	Foetal distress	Visible	7	22	3	25	Good	—	Episiotomy and immediate extraction with G for foetal distress.
22	0	Fair powers, disp.	¼" below I.S.	4	56	20	98	Failed	—	Delivered as a difficult mid-cavity forceps.
23	0	Poor powers, tired pt.	Visible	19	25	5	30	Good	2° tear	Rapid advance with G. Head escaped through perineum with a 2nd degree tear.
24	0	Poor powers slt. disp.	Visible	15	30	12	42	Fair	—	Patient unable to deliver after episiotomy. Good result with G.
25	0	P.E.T. hypertension	Visible	19	15	2	17	Good	—	No advance after episiotomy. Immediate delivery with G.
26	0	Fair powers, disp.	½" below I.S.	11	45	15	75	Failed	—	Required episiotomy and stiffish forceps delivery.
27	0	Foetal distress	½" below I.S.	9	—	5	5	Good	2° tear	P.V. examination made when foetal distress became evident. Found fully dilated—G—rapid delivery.
28	0	Poor secondary powers	Just visible	9	40	5	45	Good	—	G promoted good advance and delivery.
29	0	Poor powers with disp.	Just visible	12	30	10	40	Good	—	Head brought down well by G. Episiotomy for impending rupture of perineum. Episiotomy and delivery by G.
30	0	Poor powers, tired pt.	Just visible	11	20	6	26	Good	—	Good advance with G to complete delivery. Perineum intact.
31	0	Poor secondary powers	Just visible	8	35	5	40	Good	—	Good advance with G to delivery. Perineum intact.
32	0	Poor powers	Visible	9	30	5	35	Good	—	G brought head down easily and smoothly even when patient not bearing down.
33	2	Poor powers	Just below I.S.	12	—	20	20	Good	Vulval haematoma	2 previous forceps deliveries. Completely uncooperative patient with hypotonic inertia. G used from onset of 2nd stage. Good result but just before delivery sudden vulval haematoma. High long pressure.
34	0	Demonstration	Visible	12	10	5	15	Good	—	Head brought to crowning easily and at will.
35	0	Poor powers, tired pt.	Visible	13	25	5	30	Good	—	Immediate advance with G. Episiotomy for tight perineum.
36	0	Poor secondary powers, tired pt.	Visible	8	22	1	23	Good	—	Immediate advance with G to crowning and delivery. Perineum intact.
37	0	Poor powers, tired pt.	½" below I.S.	15	20	7	27	Good	—	Rapid advance with G. Perineum intact.
38	0	Foetal distress	Visible	3	27	1	28	Good	—	After 27 mins. in 2nd stage foetal heart suddenly slowed and stopped. Immediate powerful G extracted foetus in 10 secs. Infant recovered after resuscitation. Perineum intact. No doubt saved life.
39	0	Poor powers, disprop.	½" below I.S.	14	25	13	38	Fair	Vulval oedema	G applied when no further advance in 2nd stage. Good result with powerful long G but slight vulval oedema.
40	4	Fair powers, disp.	At I.S.	10	45	15	75	Failed	—	After 45 mins. delay at I.S. G used for 10 mins. Advance to ½" below I.S. Fairly difficult forceps extraction then performed.
41	0	P.E.T. hypertension	½" below I.S.	11	10	12	22	Good	—	Used in place of forceps, patient not bearing down, with good result.

Abbreviations: G = 'Gasyd'; p.p. = presenting part; I.S. = Ischial spine; mod. = moderate; slt. = slight; disp. = disproportion; P.E.T. = Pre-eclamptic toxaemia; pt = patient; epis. = episiotomy.

If for no other reason than this, we believe that outlet decompression should be instantly available to all those conducting the second stage of labour. The method can be applied within seconds and, particularly where the presenting part is visible, is so easy to use that it could safely be employed by a midwife.

Considering the cases successfully treated by outlet decompression, a clear-cut division becomes evident between those cases in which outlet decompression appears to be the method of choice and those which, though successful, do not indicate a definite advantage over forceps delivery.

Division A

Twenty patients in groups (b), (c) and (d) indicated the need for assisted delivery. All were successfully treated with outlet decompression. No patient required anaesthesia and relatively few required the episiotomy usually performed with forceps. These 20 patients with a 100% success rate comprise 64·5% of patients indicating the need for assisted delivery.

Division B

The remaining 17 patients falling into groups (e), (f) and (g), where evidence of disproportion was present, were successfully treated in 11 instances with a failure rate of 35%. These patients required more than twice the amount of outlet decompression, and second stages were prolonged. Advantages over forceps delivery remained the same, e.g. ease of application, reduced risk of sepsis, non-requirement of anaesthesia, reduced traumatic risk to mother and foetus; but in this connection see under *Complications.*

Considering the divisions A and B, it becomes important to consider the type of obstetrics practised when assessing whether outlet decompression will be the method of choice in a particular case.

In efficient hospital practice, where aseptic techniques are practised and forceps delivery in good hands is readily available, outlet decompression should probably be confined to cases where no evidence of disproportion exists, i.e. groups (b), (c) and (d) comprising 64% of the cases requiring assisted delivery.

In domiciliary practice or where conditions are primitive and the application of obstetrical forceps is difficult or impossible, outlet decompression will effect delivery in a further 20% of cases (84% in all), according to this series.

REACTIONS OF PATIENTS

As a rule patients do not object to the use of outlet decompression, particularly when used during contractions. Some complain that it is painful. Others state that they were unaware when the method was in use. One patient, on whom the 'Gasyd' was employed early in the second stage, subsequently refused to bear down unless outlet decompression was in force, which recalls an anecdote related by Dr. Arwyn Evans of Cardiff. He exhorted a woman to 'push' and received the reply, 'I'm a private patient, you *pull*'.

The use of 'Gasyd' in the absence of a contraction is more likely to cause discomfort, particularly if large reductions of pressure are employed. Most patients complain of some discomfort under these conditions, but less so than where forceps under local anaesthesia are used. No form of anaesthesia was used in this investigation, but there is no reason why local infiltration should not be used if desired. No discomfort should then be felt. Some of the patients in whom vulval oedema occurred, complained of discomfort on the day following delivery, but less so than the average patient with a sutured, second-degree tear.

COMPLICATIONS

Vulval oedema and vulval haematoma occurred in 5 patients and 1 patient (no. 33) respectively. Both conditions are associated with relatively powerful and prolonged decompression. Neither condition is serious.

It should be born in mind that this investigation concerned the use of a new instrument the operating technique of which has had to be learned by trial and error. *One of the lessons learned is that vulval oedema will occur if outlet decompression is used over prolonged periods with the emphasis on the time each continuous reduction in pressure is allowed to last.* By limiting the latter to 10 seconds for any reduction of pressure above 100 mm.Hg, with a few seconds elapsing before the next application, vulval oedema is avoided. The novitiate operator is likely to see a case of vulval oedema owing to outlet decompression before he has done many cases, but, if he is guided by our experience, this should not occur, except rarely in cases where an element of disproportion necessitates relatively prolonged application of the method with reductions in pressure above 100 mm.Hg.

The oedema is transitory and the postoperative discomfort to the patient is considerably less than a sutured perineum.

Haematoma has been satisfactorily treated by incision after the delivery was complete, with expression of the fresh blood clot.

Perineal tears can occur owing to the sudden escape of the head with misuse of outlet decompression particularly if the patient suddenly bears down during application of decompression, when the head is on the perineum. The operator should either wait until the expulsive effort is being made, so that he is then adding a controlled, additional effect to the expulsive effort, or warn the patient not to bear down without instructions. Episiotomy should be done if there is doubt whether the perineum can be preserved intact and it is intended to deliver the head completely by outlet decompression.

Increased bleeding from episiotomy incisions is the only other adverse effect with the use of outlet decompression. In practice no significant increases in blood loss have been measured, being in all probability in the nature of 10 to 50 ml.

MECHANISMS AND RATIONALE

The mechanism of outlet decompression has been described by Heyns *et al.*[1] but, for convenience, the essential principles will be restated:

1. The body is subjected to a pressure of ±16 lb./sq. inch owing to the weight of the atmosphere and is compressed until the pressure within is the same as that outside it.

During the second stage of labour secondary (bearing-down) powers can increase intra-abdominal pressure by about 2 lb./sq. inch. An expulsive pressure is thus established behind the foetal head, where the pressure is now 18 lb./sq. inch as against the opposing pressure in the pelvis of 16 lb./sq. inch. The nett pressure gradient is 2 lb./sq. inch.

A strictly comparable effect will be obtained if abdominal pressure remains atmospheric but the opposing pelvic pressure can be *reduced* by 2 lb./sq. inch. Intra-abdominal pressure of 16 lb./sq. inch will then be opposed by 14 lb./sq. inch and the nett expulsive force will again be 2 lb./sq. inch. A double advantage will be obtained if the mother bears down and opposing pressure is reduced at the same time. Intra-abdominal pressure of 18 lb./sq. inch will then be opposed by a pressure of only 14 lb./sq. inch and a nett pressure head of 4 lb./sq. inch will be available.

The technique of outlet decompression aims to achieve this result in the first instance by a reduction in atmospheric pressure over the patient's perineum.

When pressure is reduced over the perineum the immediately higher atmospheric pressure within the cavity of the pelvis forces the distensible pelvic floor downwards.

If the pelvic inlet is sealed above, as is the case where engagement of the foetal head has occurred, the volume of the closed pelvic chamber (cavity) increases as its floor descends, and the intrapelvic pressure will drop.

Thus, the resistance from atmospheric pressure in the area immediately preceding the advancing, presenting part is reduced and the expulsive powers are correspondingly enhanced.

Near the outlet, probably up to the level of the levator gap, outlet decompression can effect an added useful expulsive force in the order of 3 lb./sq. inch. Therefore, resistance to advance of the foetal head of up to 3 lb./sq. inch will be overcome by outlet decompression, which will then effect delivery. The traction force supplied by obstetrical forceps is seldom greater than 4 lb./sq. inch. When the walls of the vaginal canal below the presenting part are still in apposition, the decrease in pressure applied at the perineum must be transmitted upwards through the soft tissues of the pelvis. Only by the bulging down of the soft tissues and the consequent increase in pelvic cavity volume can the pressure above the perineum be reduced. Since these tissues, particularly the levatores, possess an inherent elastic tone, they will tend to resist movement and so dissipate the energy created by decompression to some extent. Thus, the more intervening tissue there is between outlet and presenting part, the more energy will be dissipated in overcoming elastic tone and the less will be the effective decrease in pressure higher in the pelvic cavity.

The axiom follows that the higher the presenting part the less efficiently will outlet decompression assist advance.

Where advance of the engaged foetal head is held up at any level, outlet decompression can turn the balance in favour of expulsion and will always tend to do so. However, delivery with outlet decompression will require more time than with forceps extraction, particularly where an element of disproportion is present. If delay in the second stage is purely due to poor expulsive powers and disproportion is not a factor, the drop in intrapelvic pressure required to effect advance will be low, and excellent results can be expected of outlet decompression. On the other hand, where cephalo-pelvic disproportion causes resistance to advance of the presenting part, such resistance may be greater than can be overcome by outlet decompression, particularly where the presenting part is high or of such an extent that only by prolonged and powerful outlet decompression, sufficiently great to decrease intrapelvic pressure, will delivery be accomplished.

The great decrease in intrapelvic pressure, particularly if prolonged, will cause congestion and oedema of the soft tissues as their vascular compartments, in communication with areas at higher atmospheric pressure, become engorged.

To illustrate these principles the analogy of suction applied to the nozzle of an ordinary syringe is considered. Where no disproportion exists and the plunger is free to move in the barrel of the syringe, suction applied at the nozzle will cause the plunger to move rapidly down the barrel without the pressure within the barrel falling more than slightly. The effect on the walls of the syringe will be minimal. If the plunger is jammed in the syringe the pressure within the barrel will fall to the full extent of the vacuum pump supplying the suction and the glass walls of the syringe will be fully subject to the reduction in pressure.

The higher the presenting part the more soft tissue will be subject to this effect. At the vulva, congestion is first observed, followed by oedema. The use of high pressure reduction (above 150 mm.Hg), particularly in the presence of vulval varicosity, when prolonged, may cause vulval haematoma. The intrapelvic soft tissues will slowly become oedematous and by their increased bulk may even impede delivery.

It is emphasized that these conditions are liable to occur where powerful, prolonged outlet decompression is used in the presence of cephalo-pelvic disproportion.

The mechanical effect of outlet decompression on the pelvic floor structure is a widening of the levator gap. Outlet decompression causes descent of the levator muscles and, since they are anchored everywhere but in the midline, the gap between them widens as the muscles bulge downwards. This reduces the mechanical resistance of the pelvic floor to the passage of the foetal head through the levator gap.

The results achieved by outlet decompression may be partly due to improved primary (uterine) powers observed with the use of the method. Contraction of the uterus often appeared to be initiated by application of the 'Gasyd'. As it is not considered likely that the drop in intrapelvic pressure can extend to the cavity of the uterus, reflex stimulation of the uterine musculature is suggested as a possibility.

CONCLUSIONS

The reduction of atmospheric pressure over the perineal area during the second stage of labour produces an expulsive force in every way similar to the secondary (bearing-down) powers of the patient. It is believed that the resistance of the pelvic floor is reduced by outlet decompression and that stimulation of the primary (uterine) powers also occurs.

As the powers generated by outlet decompresssion are in the order of, or greater than, those produced by maternal bearing-down efforts, progress in the second stage of labour can often be maintained or accelerated without voluntary effort on the part of the mother and in the absence of uterine contractions.

Whenever assisted delivery is required in the absence of cephalo-pelvic disproportion, whether from inadequate expulsive powers, maternal conditions such as cardiac disease or pre-eclamptic toxaemia, foetal conditions such as distress or prematurity, outlet decompression seems superior in every way to the use of forceps or ventouse extraction. Where cephalo-pelvic disproportion is suspected, clinical judgment is required as to whether outlet decompression, forceps, or the ventouse method will be used.

If the degree of disproportion is slight and the presenting part is low, results obtained with outlet decompression are good. The method is less effective the higher the presenting part and the greater the degree of disproportion.

It seems inadvisable to use the method to treat delay in the second stage of labour if the presenting part is not visible, unless the delay is attributable to a failure of the primary or secondary powers of expulsion. A short trial of outlet decompression is valuable in assessing whether disproportion is present.

Prolonged, powerful outlet decompression can cause oedema of the pelvic soft tissues and one case of vulval haematoma occurred in this series. Neither condition is serious. Both conditions are associated with cephalo-pelvic disproportion probably more properly treated by forceps delivery.

This series indicates that outlet decompression is superior to forceps or ventouse extraction in over 60% of cases requiring assisted delivery under the best hospital conditions and that the method can be used to effect delivery in over 80% of such cases where facilities for safe forceps delivery are lacking.

In cases of acute, unexpected foetal distress late in the second stage of labour, outlet decompression can be life-saving. In this series outlet decompression extracted an acutely distressed infant (long before forceps could have been applied) within seconds in the absence of primary and secondary powers. The method is safe and simple enough to be used by midwives. It requires no preparation as does a forceps tray or ventouse set and can be used without anaesthesia.

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REFERENCES

1. Heyns, O. S., Roberts, W. A. B. and Smulian, H. G. (1960): J. Int. Coll. Surg., **34**, 333.
2. Heyns, O. S. (1958): S. Afr. J. Med. Sci., **23**, 157.
3. *Idem* (1963): *Abdominal Decompression—a Monograph*. Johannesburg: Witwatersrand University Press.