

# INTRAMUSCULAR OXYTOCICS AND CORD TRACTION IN THIRD STAGE OF LABOUR

BY

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The current management of the third stage of labour is at last making increasing use of oxytocics in the late second stage and of techniques of cord traction for the delivery of the placenta. The importance of determining the most effective method for the conduct of the third stage by each unit of the maternity services will remain so long as maternal deaths from haemorrhage continue to figure prominently in the Reports on Confidential Enquiries into Maternal Deaths. The slow puerperal recovery of many more patients who, while not in danger of their lives, have blood losses that are larger than necessary, is an important aspect of this subject that does not appear in statistical tables or hospital reports.

### Oxytocics in the Late Second Stage

Since Chassar Moir extracted and named *ergometrine* in 1932, this drug has slowly become accepted in many parts of the world as an essential addition to the management of normal and abnormal labour. The intravenous route at the time of crowning or the birth of the anterior shoulder has given the lowest incidence of haemorrhage, possibly accompanied by an increased rate of manual removal of the placenta. Martin and Dumoulin (1953) reduced the primary post-partum haemorrhage rate (568 ml. or more in the first 24 hours) from 13.1% to 1.2% at the cost of a rise in manual removal rate of from 1.1% to 3%. Feeney (1963), at the South-Western Obstetrical and Gynaecological Society's meeting at Portsmouth in 1961, reported on the returns from 115 questionnaires sent to university departments, consultants, general-practitioner obstetricians, and labour-ward sisters: 55% advised routine ergometrine in the second stage, and another 26% used the drug at this stage only in "high risk" cases. *Methyl ergometrine* is used similarly in the late second stage (Brougher, 1945, 1947; Tritsch and Schneider, 1945) both in America and in Europe, although for some reason this drug has never been greatly used in the United Kingdom.

Despite frequent employment in the United States of America, *oxytocin* has not yet become popular in this country as a third-stage oxytocic. The reasons for the British preference for ergometrine are presumably the occasional cases of so-called "pituirin" shock which were reported in the days when the biologically prepared "pituirin" and "pitocin" were the only pituitary oxytocics available.

Synthetic oxytocin ("syntocinon") was introduced in 1956 by Sandoz Products Ltd. following the laboratory synthesis by Du Vigneaud and others in 1954 (Du Vigneaud *et al.*, 1957) and its commercial production by Boissonas *et al.* (1955). This preparation has become almost universally used, by intravenous infusion, for the induction of labour and to stimulate the inert uterus in the first and second stages of labour, yet it has not become accepted as the routine oxytocic to be given during delivery of the baby as a third stage prophylactic.

In physiological dosage oxytocin produces clonic contractions in the uterus near term, while ergometrine produces a tonic tracing with superimposed fast irregular

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rhythm (Smyth, 1961). It would appear, therefore, that oxytocin contractions more closely resemble the physiological uterine action of the uterus at this time.

Theobald (1960) suggested his preference of 2 units of oxytocin as soon as the head was crowned. Embrey (1961), using the puerperal uterus, showed the following time relations to the onset of contraction after various oxytocic injections:

Drug	Route	Time
Ergometrine	Intravenous	41 sec.
"	Intramuscular	7 min.
" + hyaluronidase	"	4 " 47 sec.
Oxytocin	"	2 " 32 "
Ergometrine + oxytocin	"	2 " 37 "

These results suggest that clinical trials of the above combinations in the late second stage would be of interest.

Kimball (1954, 1959) improved his post-partum haemorrhage rate from 6.4% and reported the following results, using 0.5 mg. ergometrine with 1,500 units of hyaluronidase, intramuscularly:

Year	Method of Placental Delivery	Cases	P.P.H. Rate
1954	Fundal pressure	1,748	1.3%
1959	Brandt-Andrews	1,264	0.9%

Reports on the clinical use of intramuscular ergometrine 0.5 mg. with oxytocin 5 units (syntometrine) in the late second stage were given at the 1961 meeting of the South-Western Obstetrical and Gynaecological Society. Bonham (1963) quoted favourable results, although Dumoulin (1963) was less optimistic. McGrath and Browne (1962) reported a short district series comparing intramuscular syntometrine with no oxytocic prior to placental delivery; using fundal pressure to deliver the placenta there was no appreciable difference. Clarke and Douglas (1962), starting from a control post-partum haemorrhage rate in Jamaica of 9.5%, compared groups with sterile water or ergometrine plus oxytocin prior to placental delivery, ergometrine prior to the placenta with oxytocin after its delivery, and oxytocin before the placenta with ergometrine after its delivery. The best results were obtained in the fourth group, using oxytocin in the late second stage and ergometrine after the birth of the placenta.

### Cord Traction in the Third Stage

Following the original recommendations of Aristotle (1786), cord traction fell into disuse until the papers of Brandt (1933) and Andrews (1940), who described a technique of lifting the uterus abdominally while holding the cord. When the uterus rose the placenta would lie free in the cervix or upper vagina, and they then expelled it by suprapubic pressure, directed below the fundus of the elevated uterus. Picton (1951) advocated a test for freedom of the placenta by the fundal elevation, cord-tension technique; when descent was confirmed delivery was completed by traction on the cord. He advocated the use of intravenous ergometrine at the end of the second stage. Kimbell (1958), using intramuscular ergometrine with hyaluronidase, then described a similar technique without the preliminary test, advising inhalation of amyl nitrate should the method not succeed in delivering the placenta. Our technique at University College Hospital,

described by Spencer (1962), is a further evolution of the method, in that so long as an oxytocic has been given and has resulted in a firm uterine contraction, traction is allowed even if the placenta has not yet descended from the uterus.

At the South-Western Obstetrical and Gynaecological Society meeting Feeny (1963) stated that 55% of his correspondents were in favour of cord traction. Bell (1963) and Jeffcoate (1963) were among those who favoured cord traction, preferring first to confirm descent by vaginal examination. No cases of inversion or other ill-effects were reported at this meeting.

A preliminary report of our findings using intravenous ergometrine with fundal pressure or cord traction has suggested the superiority of the latter (Bonham, 1963), and these results are also considered in the discussion.

### Material and Method

Following the findings of the 1958 Perinatal Mortality Survey (Butler and Bonham, 1963), that 70% of deliveries are supervised by midwives, we felt that the use of cord traction combined with intramuscular ergometrine should be examined more fully.\* As the preparations of ergometrine modified by combination with hyaluronidase or oxytocin promised speedier action, the trial was arranged to include these alternative drugs. High-risk cases comprising multiple pregnancies, previous post-partum haemorrhage or manual removal, forceps and breech deliveries, patients of parity of four or more, or deliveries following syntocinon infusions were managed separately, by intravenous ergometrine and cord traction. The results in these cases are also discussed. With these exceptions the trial was applied to all vaginal deliveries during 18 months commencing April, 1961, comprising 1,183 deliveries.

The intramuscular ergometrine patients were selected by random two-weeks groups for placental delivery by cord traction or maternal effort and fundal pressure. Within each method of delivery group, selection of drug was made by random numbers for ergometrine 0.5 mg., ergometrine 0.5 mg. with hyaluronidase 1,500 units, and ergometrine 0.5 mg. with synthetic oxytocin 5 units. A blind ampoule trial was not possible, as the hyaluronidase preparation necessitated the mixing of two ampoules. The drug was given by deep intramuscular injection at the crowning of the head. Subsequent oxytocic injections, either for haemorrhage or our routine intramuscular repeat dose prior to warding the patient, were of plain intramuscular ergometrine 0.5 mg.

*Controlled cord traction* was used as described by Spencer (1962). Immediately after separation of the infant the firm contraction of the uterus in response to the oxytocic was confirmed. One hand was used to grasp the lower segment between thumb and index finger and exert upward pressure on the corpus. At the same time the cord was secured by a pair of artery forceps in the other hand near the introitus. Steady tension on the cord was countered by upward pressure on the corpus and the placenta usually delivered easily within five minutes of the birth of the child. In the rare event of delayed descent of the placenta repeated attempts were made at intervals. In the rare event (1-2%) of the cord breaking, vaginal examination was made to ascertain the level of the placenta. In cases with placental descent delivery was completed by

\*The Report on the Work of the Central Midwives Board for the Year ended March 31, 1963, states that syntometrine (ergometrine with synthetic oxytocin) "was safe for use by midwives provided they had been thoroughly instructed in its use and methods of administration."

fundal pressure or lifting out from the vagina. If the placenta was undescended, manual removal was done as soon as possible after 30 minutes. In the alternative group the mother was given an opportunity to deliver the placenta by bearing down; if this failed, fundal pressure by the classical pistoning technique was used at intervals for half an hour, after which time the house-surgeon was called to deliver the placenta by cord traction or, if unsuccessful, by manual removal.

Haemorrhage was estimated by adding to the measured quantity a figure for loss on linen and swabs used during the perineal repair. The minimum loss was recorded as 90 ml.; above this figure the record was made in 20-ml. steps from 100 ml. Although such measurement is only approximate the findings over several years have shown consistent results. It should be noted that much of the bleeding was from the frequent episiotomy; routine repair by students increased bleeding from this source owing to the time taken.

### Results

The case distribution between the six different methods of delivery is given in Table I, which shows adequate randomization with approximately 200 patients in each cell. The criteria used for comparison are: primary post-partum

TABLE I.—Case Distribution and Post-partum Haemorrhage (P.P.H.)

Intra-muscular Oxytocic	Cord Traction			Fundal/Maternal			Both Methods		
	Cases	P.P.H.		Cases	P.P.H.		Cases	P.P.H.	
		No.	%		No.	%		No.	%
Ergometrine	217	5	2.3	199	8	4.0	416	13	3.1
hyaluronidase	177	1	0.6	199	5	2.5	376	6	1.6
Ergometrine + oxytocin	199	1	0.5	192	4	2.1	391	5	1.3
All oxytocics	593	7	1.2	590	17	2.9	1,183	24	2.0

haemorrhage rate (568 ml. or more); mean blood loss; incidence of minimal blood loss (up to 90 ml.); length of third stage; prolonged third stage (30 minutes or over); and manual-removal rate.

The primary post-partum haemorrhage rate was 2%. Irrespective of drug, cord traction at 1.2% is significantly better than fundal pressure at 2.9% ( $0.05 > P > 0.01$ ). Comparisons between individual drugs in each column fail to reach the conventional level of significance ( $P > 0.05$ ), but ergometrine with hyaluronidase and ergometrine with oxytocin, with similar results, both show a tendency to lower rates than plain ergometrine in each method column.

The differences in mean blood loss will be minimized by both the minimum score of 90 ml. and the high proportion of blood loss from episiotomy, and significant differences are not found (Table II). The standard deviation on the overall mean loss of 168 ml. is 123 ml. To overcome these difficulties the incidence of minimal blood loss (up to 90 ml.) is also shown.

TABLE II.—Mean Blood Loss (Minimum=90 ml.) and Incidence of Minimum Blood Loss (Up to 90 ml.)

Intra-muscular Oxytocic	Cord Traction			Fundal/Maternal			Both Methods		
	Mean Blood Loss (ml.)	Loss Up to 90 ml.		Mean Blood Loss (ml.)	Loss Up to 90 ml.		Mean Blood Loss (ml.)	Loss Up to 90 ml.	
		No.	%		No.	%		No.	%
Ergometrine	178	80	37	178	61	31	178	141	34
hyaluronidase	163	57	32	177	52	26	170	109	29
Ergometrine + oxytocin	153	78	39	155	63	33	154	141	36
All oxytocics	165	215	36	170	176	30	168	391	33

Thirty-three per cent. of all patients had a blood loss of 90 ml. or less. Cord traction irrespective of drug had significantly more patients in the group with low blood loss than had fundal pressure ( $P < 0.05$ ). The analysis by oxytocics shows best results with ergometrine plus oxytocin and plain ergometrine, though these do not differ from ergometrine plus hyaluronidase at the conventional level of significance.

#### Length of Third Stage and Manual Removal

Table III shows the results appertaining to length of the third stage and manual removal. The third stage was judged to be prolonged at 30 minutes, and such prolonged cases are excluded from the mean-length column as

TABLE III.—Mean Length of Third Stage (Less than 30 Minutes), Prolonged Third Stage (30 Minutes and Over), and Incidence of Manual Removal

Intramuscular Oxytocic	Cord Traction				Fundal Maternal				Both Methods						
	Mean Length (min.)	Prolonged Third Stage		Manual Removal		Mean Length (min.)	Prolonged Third Stage		Manual Removal		Mean Length (min.)	Prolonged Third Stage		Manual Removal	
		No.	%	No.	%		No.	%	No.	%		No.	%	No.	%
Ergometrine .. .. .	5.4	1	0.5	1	0.5	7.1	6	3.1	4	2.1	6.2	7	1.7	5	1.2
Ergometrine + hyaluronidase .. .. .	6.1	2	1.1	0	0	7.0	6	3.1	1	0.5	6.6	8	2.1	1	0.3
Ergometrine + oxytocin .. .. .	5.7	6	3.0	4	2.0	6.8	4	2.1	1	0.5	6.3	10	2.6	5	1.3
All oxytocics .. .. .	5.7	9	1.5	5	0.8	7.0	16	2.7	6	1.0	6.4	25	2.1	11	0.9

extraneous factors alter the time before manual removal is completed. Because the placenta was always delivered as soon as possible, significant differences would not be expected, but it is noteworthy that the overall mean length was 6.4 minutes, which compares well with Spencer's (1962) figure of 6.3 minutes for cord traction after intravenous ergometrine in 1,000 cases. Despite the 16 retained placentae with conventional delivery and nine with cord traction, these rates could occur by chance once in eight and the difference is not therefore significant. When cord traction was used at 30 minutes the true retained-placenta rate, and therefore the manual removal rate, fell to approximately 1% in each method of delivery group.

Table IV shows comparable results in a sample of 516 patients where random selection of placental delivery followed intravenous ergometrine (Bonham, 1963). A larger series is shortly to be published. In each case the post-partum haemorrhage rate, mean blood loss, and the percentage of patients with a loss of up to 90 ml. is less in the cord-traction group than in the fundal-pressure group. Both groups are better than the intramuscular series. In each case the retained-placenta (at 30 minutes) rate is higher than with intramuscular ergometrines. The 6.8% of retained placentae at 30 minutes in the fundal-pressure group fell to 4.4% needing manual removal after a change to cord traction at 30 minutes. This 4.4% was significantly higher than the primary cord-traction cases with 1.5% retained placentae ( $0.01 < P < 0.05$ ). It therefore appears that the ergometrines rank in post-partum

TABLE IV.—Intravenous Ergometrine with Cord Traction or Fundal Pressure

	Cord Traction (267 Cases)		Fundal Pressure (249 Cases)		Both Methods (516 Cases)	
	No.	%	No.	%	No.	%
Post-partum haemorrhage	1	0.37	3	1.2	4	0.8
Prolonged third stage (30 min.)	4	1.5	17	6.8	21	4.1
Manual removal	4	1.5	11	4.4	15	2.9
Blood loss up to 90 ml. only	126	47.0	115	46.0	241	46.5
Mean blood loss (minimum 90 ml.)	125 ml.		150 ml.		137 ml.	

haemorrhage and blood loss in the order of speed of action. The percentage of manual removals ranks to a large extent in the opposite way, as might be expected from Martin and Dumoulin's (1953) figures of a reverse relationship, but ergometrine with hyaluronidase shows a trend to a lower retained-placenta rate than would relate to its speed of action.

#### Abnormal Cases

The results in all other vaginal deliveries during the 18 months' trial of intramuscular ergometrines where intravenous ergometrine and cord traction were used for special reasons are shown in Table V. The post-partum haemorrhage rate in this group was 2.3% with manual removals at 7.5%, mainly because of the practice of manual removal for

expediency in major operative deliveries and the high rate in the patients with previous third-stage complications. This high-risk group had a haemorrhage rate of only 3%, but 12.1% needed manual removals. Sixty high-parity patients were managed without haemorrhage or retained placenta.

Adding the two series to give the total vaginal-delivery rates over 18 months we have a post-partum haemorrhage rate of 2.1% and manual removal of 3.5%. These figures compare well with our departmental figures during recent years (Table VI).

Cord traction was introduced as a routine method in 1959.

During the entire series there were no side-effects related to the use of the oxytocic drugs or method of delivery of the placenta. Since cord traction was introduced there have been no cases of uterine inversion or maternal deaths

TABLE V.—All Vaginal Deliveries April, 1961–September, 1962

Method of Delivery of Special Indication	Total Cases	Post-partum Haemorrhage		Manual Removal	
		No.	%	No.	%
Previous third-stage complications	66	2	3.0	8	12.1
Forceps or breech deliveries	337	7	2.1	40	11.9
Multiple pregnancies	39	1	2.6	4	10.2
Parity 4 or over	60	0	0	0	0
Oxytocin infusions	73	1	1.4	1	1.4
Miscellaneous: anaemia, hypofibrinogenemia, etc.	138	3	2.2	4	2.9
Injection given too late, etc.	57	4	7.0	1	1.8
Total special exclusions	770	18	2.3	58	7.5
Intramuscular series	1,183	24	2.0	11	0.9
Grand total	1,953	42	2.1	69	3.5

TABLE VI.—University College Hospital. Primary Vaginal Post-partum Haemorrhage (P.P.H.) and Manual Removals (M.R.P.)

Year	P.P.H. (%)	M.R.P. (%)	Cases
1957	5.9	2.6	1,370
1958	5.7	2.5	1,311
1959	3.7	2.4	1,313
1960	2.2	3.8	1,358
Present series 1961–2	2.1	3.5	1,953

from shock or haemorrhage. Three patients (0.25%) were transfused in the intramuscular series and seven (0.9%) in the abnormal group, a total of 10 in 18 months, or 0.5% of all vaginal deliveries.

### Discussion

I am unable to trace any case of uterine inversion following cord traction in the oxytocic-managed third stage; so long as the uterus is firmly contracted it is hard to see how the corpus could invert. An important adjunct to the management of the third stage is elevation of the corpus, as opposed to pressing it down into the pelvis, which will congest the veins. Brandt (1933) explains that Dickinson's (1899) description of this technique led him to develop his method of placental delivery. Experience shows that elevation of the empty corpus lessens post-placental haemorrhage during perineal repair.

With the knowledge that the placenta *separates* early in close relation to the birth contraction (Warnekros, 1925; Brandt, 1933; Macpherson and Wilson, 1956) and even, according to the latter authors, *descends* before signs are present, we are surely justified in speeding up our third-stage management. Jeffcoate (1963) states that mismanagement now means getting the placenta out too late. Irrespective of the precise method adopted, our intramuscular ergometrine results show that the placenta can be safely delivered in six to seven minutes by any midwife or doctor with a post-partum haemorrhage rate of from 1 to 3%. The manual removal rate (at 30 minutes) need only be 1% if cord traction is used.

Possible objections to second-stage oxytocics are only the undiagnosed multiple pregnancy and occasional transient hypotension. Undiagnosed multiple pregnancies are undesirable for other reasons; adequate maturity assessment before 16 weeks and abdominal palpation at 24-30 weeks minimize this problem. Kurtz, Keating, and Loftus (1955) in a study of twins found no deleterious effect on the second infant from accidental early oxytocics. The possible occasional hypertensive danger, perhaps merely due to sudden autotransfusion from the uterine vascular bed in a sensitive patient, was noted by Baillie (1963) and the *British Medical Journal* (1963). We have now introduced pre- and post-oxytocic blood-pressure readings and will be analysing them shortly.

Although the figures do not reach conventional levels of significance, mainly because of the low rates involved, the faster-acting modified ergometrine preparations with hyaluronidase and with oxytocin appear to improve all results other than placental retention. It appears that syntometrine (ergometrine plus oxytocin), given intramuscularly, is closest to intravenous ergometrine in all aspects. Ergometrine with hyaluronidase intramuscularly also appears to give results closer to intravenous than plain intramuscular ergometrine but may have a somewhat lower placental-retention rate. With no side-effects in our cases from either modified preparation, the results suggest that they are preferable to plain intramuscular ergometrine. Of the modified drugs syntometrine in a single ampoule is clearly preferable to the hyaluronidase preparations, which are more expensive and necessitate mixing two ampoules, one dry and one wet. For a general practitioner desiring to use only one drug of this type syntometrine may well prove to be the best when adequate trials have been made of its intravenous use. In an abortion the combination should be ideal.

### Summary

An 18-months trial, in normal cases, of intramuscular plain ergometrine, ergometrine with hyaluronidase, and

ergometrine with oxytocin (syntometrine) is reported using, at random, cord traction or conventional methods to deliver the placenta.

Irrespective of drug type, cord traction was superior to fundal pressure or maternal effort.

Syntometrine and ergometrine with hyaluronidase appeared superior to plain ergometrine. The former drug was closest in activity to intravenous ergometrine.

Where intravenous injection is impracticable, in normal cases, the use of an intramuscular preparation of modified ergometrine and cord traction gives best results, with a post-partum haemorrhage rate of 0.55% and a manual-removal rate of not more than 2%.

ADDENDUM.—Since the preparation of this paper over 250 patients have been given syntometrine in full dose (1 ampoule) intravenously, as part of a double blind trial, in all vaginal deliveries, including those under anaesthesia. The results have been entirely satisfactory and no difficulties have been encountered.

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