

the practice officially some centres that have wanted to reuse and save money with which to treat other patients have been stopped from doing so by their hospital administration because of fears of litigation. This embargo might also gain support from bacteriological purists. Were it to become nationwide, however, it would result in extra expenditure of almost £1m a year solely to eliminate the reuse of disposable dialysers on the scale practised in 1976. This money could fund 150 patient-years' home dialysis at the costs quoted in our introduction.

Financial constraint has made it necessary for many physicians to decide to reuse "disposable" dialysers. Ethical responsibility for this decision must remain with the clinician. Nevertheless, the results of our survey should show that there is no need to fear any inquiry by the courts.

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# Postpartum haemorrhage after induced and spontaneous labour

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## Summary and conclusions

**The labour records of 1000 consecutive deliveries were studied to compare the incidence of postpartum haemorrhage after induced labour with that after spontaneous labour. The discovery of an increased incidence of postpartum haemorrhage in the induced group prompted further analysis of the incidence of haemorrhage among 3674 normal deliveries. This analysis confirmed that the incidence of postpartum haemorrhage was increased after induction of labour; among primiparous patients the increased incidence after induced labours was nearly twice that after spontaneous labours, even when only normal deliveries were considered.**

**These findings indicate that postpartum haemorrhage is another complication of induction that needs to be taken into account when induction is being considered.**

## Introduction

A review of the maternity statistics of St Mary's Hospital, Portsmouth, showed an increasing incidence of postpartum haemorrhage. In 1967-9 there were 14 617 deliveries, with a surgical induction of labour rate of 39.1% and a postpartum haemorrhage rate of 5.1%. During 1970-2 there were 15 243 deliveries, a 36.5% induction rate, and a haemorrhage rate of 5.6%. In 1973-5, however, with 14 222 deliveries and an induction rate of 42.1%, the incidence of postpartum haemorrhage had increased to 8.6%.

We therefore examined the causes of the increased incidence of haemorrhage. There had been no change in the management of the third stage of labour during 1973-5, but there had been a change in the management of the first stage of labour: from 1973 intravenous oxytocin infusions have been started synchronously with surgical induction of labour, and the concept of "active management" has been accepted.

## Patients and methods

The study was undertaken in two parts. Initially the labour records of 1000 consecutive deliveries from January 1974 to April 1975, all under the care of one consultant, were studied. The duration of labour and whether it was spontaneous or induced; parity; recorded blood loss for the delivery; the occurrence of postpartum haemorrhage; abnormal deliveries (forceps, Ventouse, breech, twins); and caesarean sections were recorded. (The blood loss at caesarean section was not included in the mean blood loss survey.)

In the second survey the delivery statistics for 1974, which were already stored in the computer, were analysed. Of the 4839 deliveries, 3674 were normal. Altogether 1897 of these labours were spontaneous and 1777 were induced. As in the original survey, we could not differentiate between spontaneous labour, non-accelerated labour, and accelerated labour.

**Induction**—In this hospital labour is induced by forewater amniotomy and simultaneous oxytocin titration intravenous infusion. The infusion is started at 1 mU/min and doubled every quarter of an hour to 8 or 16 mU/min, where it is maintained if good contractions are being produced and progressive cervical dilatation is being achieved.

Syntometrine (ergometrine 0.5 mg and oxytocin 5 units) one ampoule intramuscularly is routinely given with the delivery of the anterior shoulder of the baby. The third stage of labour is managed by continuous cord traction after the uterus has retracted. The oxytocin intravenous infusion is continued for at least 30 minutes after the third stage has been completed.

## Results and comment

Table I shows the results of the initial survey. There was a small but not statistically significant difference in the incidence of postpartum haemorrhage between the two groups. To obtain a more homogeneous

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group of patients for study, all primiparous patients were analysed separately (table II). There was a higher incidence of haemorrhage among primiparous patients whose labours were induced than among those whose labours were spontaneous, although this difference was again not significant.

The most likely explanation for the higher incidence of haemorrhage would be that most of these patients had been induced for some obstetric abnormality; because of this the forceps and abnormal delivery rate might be expected to be higher in this group, but not necessarily the incidence of haemorrhage unless the haemorrhages were specifically associated with the abnormal deliveries. The last column of table II shows, however, that the increased incidence of postpartum haemorrhage in primiparous patients whose labours were induced was not due to an increase in the number of abnormal deliveries; indeed, there were 24% more abnormal deliveries among women who had a haemorrhage after spontaneous labour.

Since multiparity is known to be a predisposing factor in postpartum haemorrhage, the incidence of haemorrhage was analysed separately in each parity group; again, all caesarean sections were excluded. We found that 37.5% of all haemorrhages occurred in primiparas whose labours were induced, and 23.6% in primiparas with spontaneous labours. The remaining 38.9% of haemorrhages were almost evenly divided between para 2 and para 3 patients of both groups.

TABLE I—Overall analysis of 1000 consecutive deliveries 1974-5

Labour	No of cases*	Mean duration of labour	Mean blood loss (ml)	No (%) of postpartum haemorrhages	No of forceps deliveries	No of lower-segment caesarean sections
Induced ..	464	7 h 15 min	235	39 (8.4)	58	25
Spontaneous	516	7 h 03 min	203	33 (6.4)	53	26

\*Excluding 20 elective caesarean sections.

TABLE II—Analysis of primiparous patients only

Labour	No of cases	No (%) of postpartum haemorrhages	No (%) of forceps deliveries	No (%) of abnormal deliveries in haemorrhage group
Induced ..	218	27 (12.4)	50 (23)	11 (40.7)
Spontaneous ..	224	17 (7.6)	42 (18.8)	11 (64.7)

TABLE III—Incidence of postpartum haemorrhage according to age in normal deliveries

Age (years)	Spontaneous labour		Induced labour		P
	No of normal deliveries	No (%) of postpartum haemorrhages	No of normal deliveries	No (%) of postpartum haemorrhages	
15-19	283	10 (3.5)	180	15 (8.3)	<0.05
20-24	620	19 (3.1)	598	38 (6.4)	<0.01
25-29	666	24 (3.6)	639	25 (3.9)	
30-34	222	10 (4.5)	257	11 (4.3)	
35-39	84	1 (1.2)	85	8 (9.4)	<0.05
40-44	18	1 (5.6)	15	1 (6.6)	
Others	4	0	3	0	
Total	1897	65 (3.4)	1777	98 (5.5)	<0.05

TABLE IV—Incidence of postpartum haemorrhage in relation to parity among normal deliveries

Parity	Spontaneous labour		Induced labour		P
	No of normal deliveries	No (%) of postpartum haemorrhages	No of normal deliveries	No (%) of postpartum haemorrhages	
1	721	27 (3.7)	737	47 (6.4)	<0.05
2	715	28 (3.9)	638	31 (4.8)	
3	270	7 (2.6)	260	15 (5.8)	<0.05
4	119	1 (0.8)	93	0 (0)	
5	52	0 (0)	29	2 (6.9)	
6	14	2 (14.3)	15	1 (6.7)	
7	6	0 (0)	5	2 (40.0)	
Total	1897	65 (3.4)	1777	98 (5.5)	<0.05

Only two (2.7%) of the 73 women of high parity ( $\geq 4$ ) had postpartum haemorrhages. Both of these had normal deliveries and blood losses of 500 ml.

Tables III and IV present the results of a computer analysis of all the normal deliveries (3647) in 1974. Though the difference between the group with induced labours and those with spontaneous labours was clear, there was no great difference between primiparous patients and those of para 2 and 3 in this series.

Discussion

Induction of labour is increasingly practised in most maternity units in Britain. The induction rate at St Mary's Hospital, Portsmouth, is about 40%.

Turnbull and Anderson<sup>1</sup> claimed that induction of labour by forewater amniotomy and oxytocin titration did not increase the incidence of fetal distress, birth asphyxia, perinatal morbidity, or postpartum haemorrhage; nor did it reduce the caesarean section rate. The incidence of haemorrhage was 6.3% in their 1960 series of 1008 cases and 5.4% in their 1964 series of 1284 cases. Francis and Turnbull<sup>2</sup> in a series of 130 induced labours using the Cardiff pump, described an incidence of postpartum haemorrhage of 2.3%. Pawson and Simmons,<sup>3</sup> using forewater amniotomy and simultaneous oxytocin titration, showed an incidence of 8.3% in 290 cases compared with an overall incidence of 3.4% for the same period. They made no comment on this striking difference.

D'Esopo<sup>4</sup> compared 1000 women whose labours were induced with 1000 well-matched controls. The incidence of postpartum haemorrhage was 2.6% and 1.2% respectively, and D'Esopo commented: "the praiseworthy effect of induction, namely the short labour, may be its single disadvantage, because of the increased incidence of cervical and vaginal tears." He thought these were due to, or associated with, precipitate delivery, which is also often followed by a period of uterine atony.

Our findings add one more important caveat when considering induction of labour, especially in primigravidas. Postpartum haemorrhage should be added to the list of complications of induction of labour, and possibly even of acceleration of labour.

The increased incidence of postpartum haemorrhage after induced labour is not due entirely to the fact that induced cases are more likely to be complicated. Normal oxytocic regimens make the uterus work much harder than usual for a shorter time, so that when the fetus is expelled the uterus may become atonic and "exhausted" and the cervix may be damaged. In spite of the use of oxytocics in the third stage of labour, the uterus that has been exposed to quite high doses of oxytocic all day will therefore probably respond poorly to an intramuscular or intravenous bolus of the same or similar oxytocic.

We believe that the third stage of labour is a much neglected stage in the process of labour—there have been no published reports devoted solely to the third stage over the past 10 years—and it deserves much greater attention. It is probably the most dangerous and mismanaged part of any labour, normal or abnormal.

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