West of England Medical Journal

Formerly Bristol Medico-Chirurgical Journal

WEMJ Volume 115 No.3 Article 2 September 2016

The e-journal of the
Bristol Medico-Chirurgical Society

Observations on the third stage of labour

Peter M. Dunn, MA, MD, FRCP, FRCOG, FRCPCH
Emeritus professor of perinatal medicine and child health, University of Bristol, UK
e-mail: P.M.Dunn@bristol.ac.uk

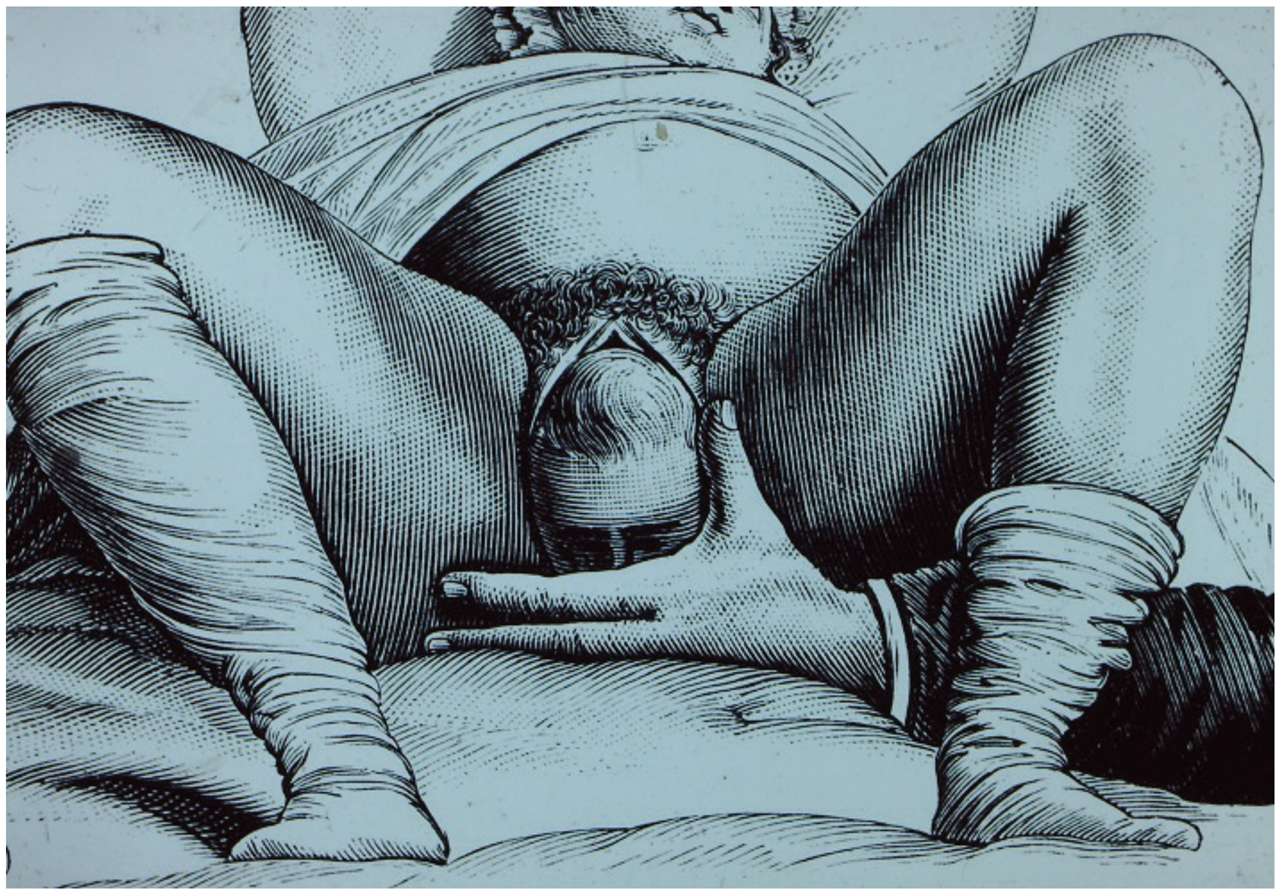

Fig 2
Dorsal recumbent position for delivery of the baby and placenta, first introduced in the 17th century

In September 1984 I was asked to speak on the management of the third stage of labour and fetal adaptation to extra-uterine life at the 9th European Congress of Perinatal Medicine in Dublin[1]. My talk was based on research undertaken in Bristol between 1963 and 1966. During the following decade I gave similar talks on the management of the third stage of labour at a number of perinatal conferences at home and abroad, the last being to a RCOG meeting in 1995[2]. As little has changed in the management of the third stage of labour in the years since, it seems worthwhile to report again the observations originally made some 50 years ago.

The modern western management of the third stage of labour consists of a series of interlocking interventions which are applied so routinely that many obstetricians regard them as 'normal'. This routine management had its roots in France only 300 years ago when Francois Mauriceau[3] advocated cord traction for the delivery of the placenta (Fig 1).
Another intervention also credited to Mauriceau was the use of the dorsal recumbent position for delivery of the baby and placenta (Fig 2). Indeed in England this was dubbed the French position.

Once the baby was delivered with the mother lying on her back, the cord is usually divided straight away with scissors between double clamps (Fig 3). The clamp near the umbilicus is required to prevent haemorrhage from the infant while that on the placental side of the cut serves to prevent placental blood from soiling the bed clothes.

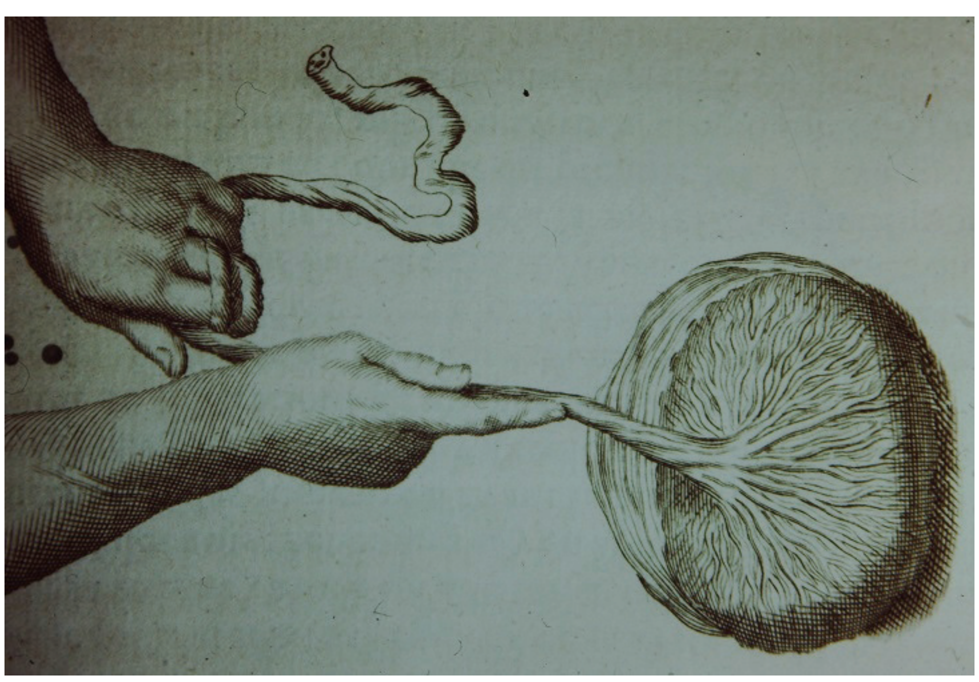

Fig 1
Traction on the umbilical cord to aid delivery of the placenta, first introduced in the 17th century

Fig 3
Umbilical cord clamped immediately at delivery

West of England Medical Journal

Formerly Bristol Medico-Chirurgical Journal

The e-journal of the
Bristol Medico-Chirurgical Society

WEMJ Volume 115 No.3 Article 2 September 2016
Observations on the third stage of labour

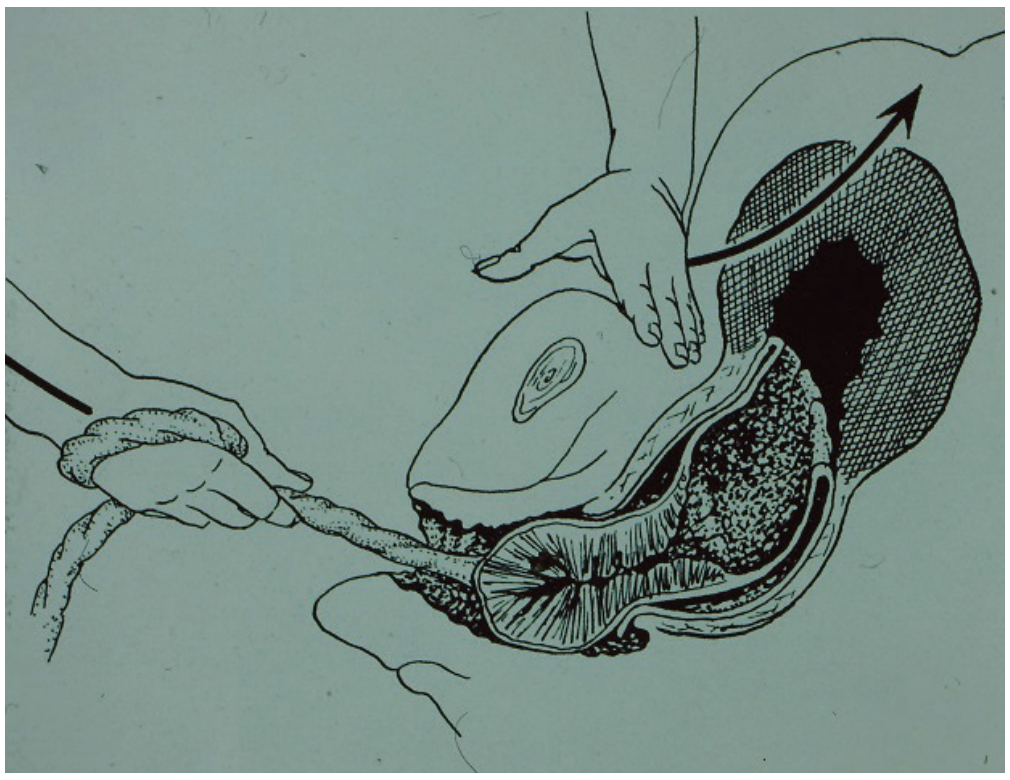

Fig 4
Modern management of the third stage of labour (see text)

Figure 6a (above)

Figure 6b (right)

Fig 6 (a and b)
Amer-Indian woman in Brazil delivering (a) baby and (b) placenta in the upright position without cord clamping

Early division of the umbilical cord (Fig 4) frees the infant for transfer to the resuscitation area should this be necessary. The third stage is then actively managed. An oxytocic agent such as syntometrine is given as the anterior shoulder of the baby delivers and, once the uterus is contracting, steady traction is exerted on the umbilical cord while the free hand of the birth attendant holds the uterus out of the pelvis (Fig 4).
The aim of this management is to reduce the risk of post-partum haemorrhage and retained placenta. Yet the fact remains that significant post-partum haemorrhage (>500ml) still occurs in 2-8% of hospital deliveries and manual removal of the placenta is necessary in at least 1-2% of all cases. Perhaps this may be because cord traction creates a vacuum behind the placenta encouraging maternal blood loss. (With cord traction there is also the risk of uterine prolapse.) Meanwhile the use of oxytocic agents, if not at once successful, will enhance uterine and cervical contraction and placental retention.

In order to learn about the natural third stage of labour, I studied the history and anthropology of childbirth (Fig 5) and also parturition in a variety of mammals[4-8]. I also studied childbirth in the rural areas of developing countries not yet penetrated by western obstetrics. Almost invariably the story was the same. The woman delivered her baby in an upright position, either standing, kneeling, crouching or sitting and remained in this upright position throughout the third stage [9-10]. The mother might strain but the umbilical cord was never pulled. As the uterus contracted and retracted, the placenta was partly pushed and partly fell with the aid of gravity down alongside the baby, usually within minutes of birth (Fig 6a, b). Meanwhile, the cord remained unclamped with the placenta alongside the baby until all pulsation had ceased, usually within a few minutes of birth. Only then was the cord divided using a blunt rather than a sharp instrument. Often the cord was not ligated and umbilical haemorrhage from the baby was not found to be a problem. Nor were there usually any major problems with the delivery of the placenta or with post-partum haemorrhage.

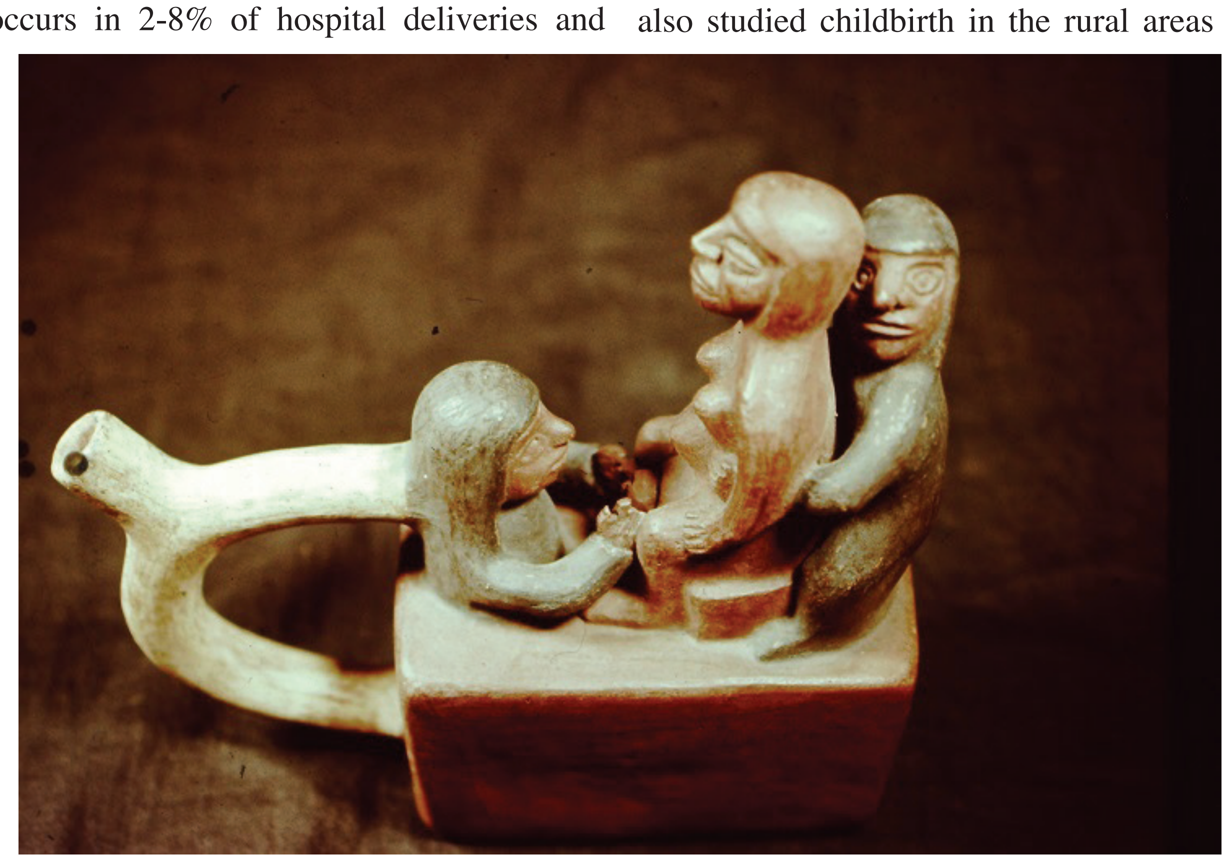

Fig 5
Ancient Peruvian pottery of a woman giving birth in the upright position

In 1968 Botha[11] described his experience working for ten years with the Bantu in rural South Africa. Attending some 26,000 deliveries, he stated that a retained placenta was seldom seen and blood transfusion for

West of England Medical Journal
Formerly Bristol Medico-Chirurgical Journal
The e-journal of the
Bristol Medico-Chirurgical Society
WEMJ Volume 115 No.3 Article 2 September 2016

post-partum haemorrhage was hardly ever necessary. Botha then went to work in a Cape Town hospital that also catered for a Bantu population. There he studied the influence of clamping or not clamping the placental end of the cord prior to its division. He showed that when it was not clamped and blood was left to drain freely from the placenta the mean duration of the third stage was reduced from 10.5 to 3.5 minutes (P<0.001) and post-partum blood loss was less than half as great as when the placental end of the cord had been clamped (P<0.001).

Between 1960 and 1966 I studied the influence that management of the umbilical cord had on the infant and on adaptation to extra-uterine life as well as on the delivery of the placenta[11-19]. Many clinical, haematological and biochemical parameters were measured and in every one of them the impact of cord clamping could be shown to be dramatic and significant. For example, the effect of immediate cord clamping (< 5 seconds, usually < 2 seconds) versus clamping delayed for at least three minutes on the term infant's haematocrit during the first 48 hours after birth is shown in Fig 7. Such changes should not surprise us for in my studies the mean volume of blood transferred from placenta to baby during this three minute period was 136ml which is equivalent to 49% of the normal circulating volume of a term infant.

As a result the infant may become plethoric and hypervolaemic (Fig 8a). However, as I was able to show, if the cord remains unclamped following delivery of the placenta, this excess blood may flow back along the umbilical vein to the placenta [14, 20]. Note that there are no valves on the umbilical vein.

Fig 8 Neonatal facies at the age of 30 minutes of two infants following (a) delayed and (b) immediate clamping of the umbilical cord. Both infants had identical cord blood haematocrits. 200ml of blood was later drained from the placenta of infant on the right

My studies showed that the normal distribution of blood between fetus and placenta was altered during the second stage of labour with a net transfer of approximately 66ml of blood from baby to placenta, a feto-placental transfusion[11]. This was presumably due to selective compression of the soft-walled outer umbilical vein (as compared with the inner umbilical arteries) between the vaginal wall and the baby's abdomen (Fig 3).

If then the cord is clamped immediately following delivery, this blood volume (now on average a total of 166ml) will be trapped within the placenta. The baby unsurprisingly shows the signs of hypovolaemia with intense peripheral vaso-constriction and a low blood pressure (Fig 8b). The placenta, on the other hand, is bulky, stiff and engorged with blood. Histological studies revealed intense capillary distension and congestion with blood (Fig 9a) while the vessels on the fetal surface of the placenta demonstrate tension within both blue arteries and pink veins (Fig 10).

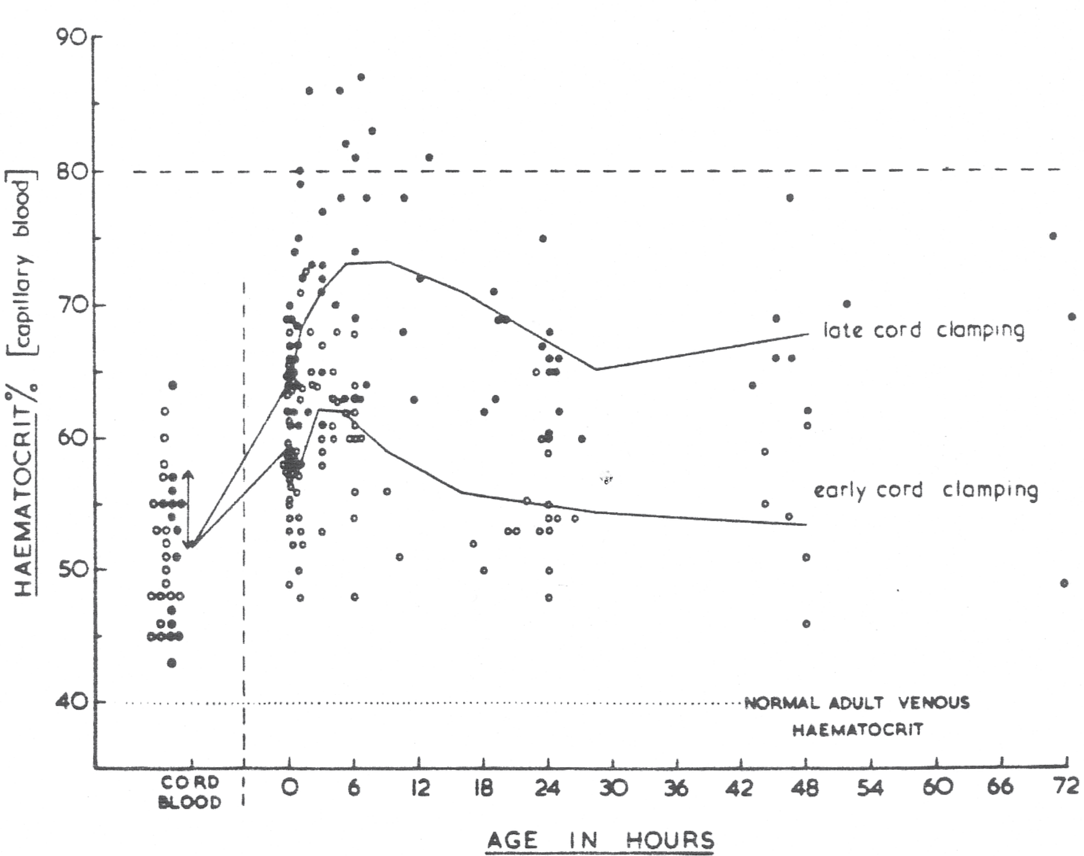

Fig 7
The umbilical cord and heel capillary blood haematocrit values of thirty-two infants delivered normally at term, according to whether the umbilical cord was clamped at the instant of birth (<2 s) or after a delay of at least 3 min. (Dunn, 1985[1,15])
o = early clamping; □ = late clamping

Fig.9a

Fig.9b

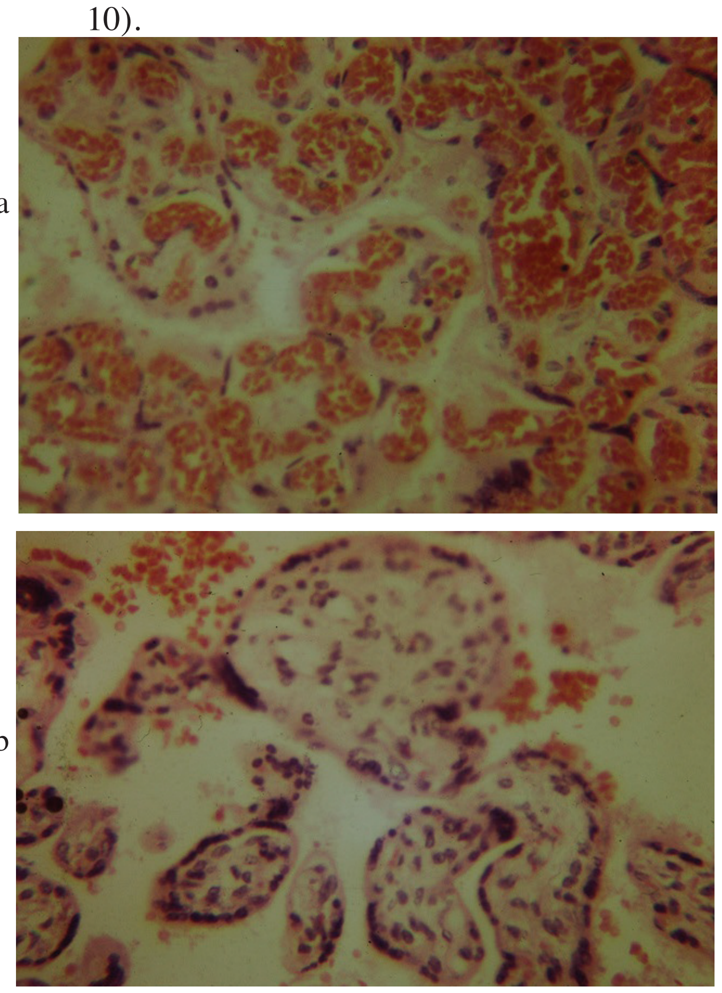

Fig 9
Placental vasculature (x 200) following
(a) immediate and (b) delayed clamping of the umbilical cord. Note capillary engorgement with blood in (a).

West of England Medical Journal

Formerly Bristol Medico-Chirurgical Journal

WEMJ Volume 115 No.3 Article 2 September 2016

Observations on the third stage of labour

The e-journal of the Bristol Medico-Chirurgical Society

Fig 10
Fetal surface of a placenta following immediate clamping of the cord at delivery. The blood pressure within the placental vasculature was 28 mmHg.

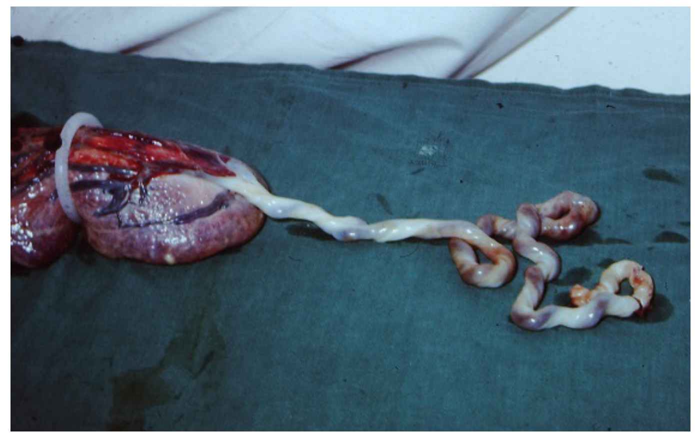

Fig 12
Placenta with peripheral cord insertion and early cord clamping being drawn through a pessary ring.

Blood pressure within the placenta vasculature following immediate cord clamping in my studies demonstrated a mean residual pressure of 28mmHg. Thus the placenta was not only bulky, its volume being increased by perhaps 33% (compared with the blood evacuated state), but is also tense in the way any erectile vascular structure may be made rigid by blood under pressure.

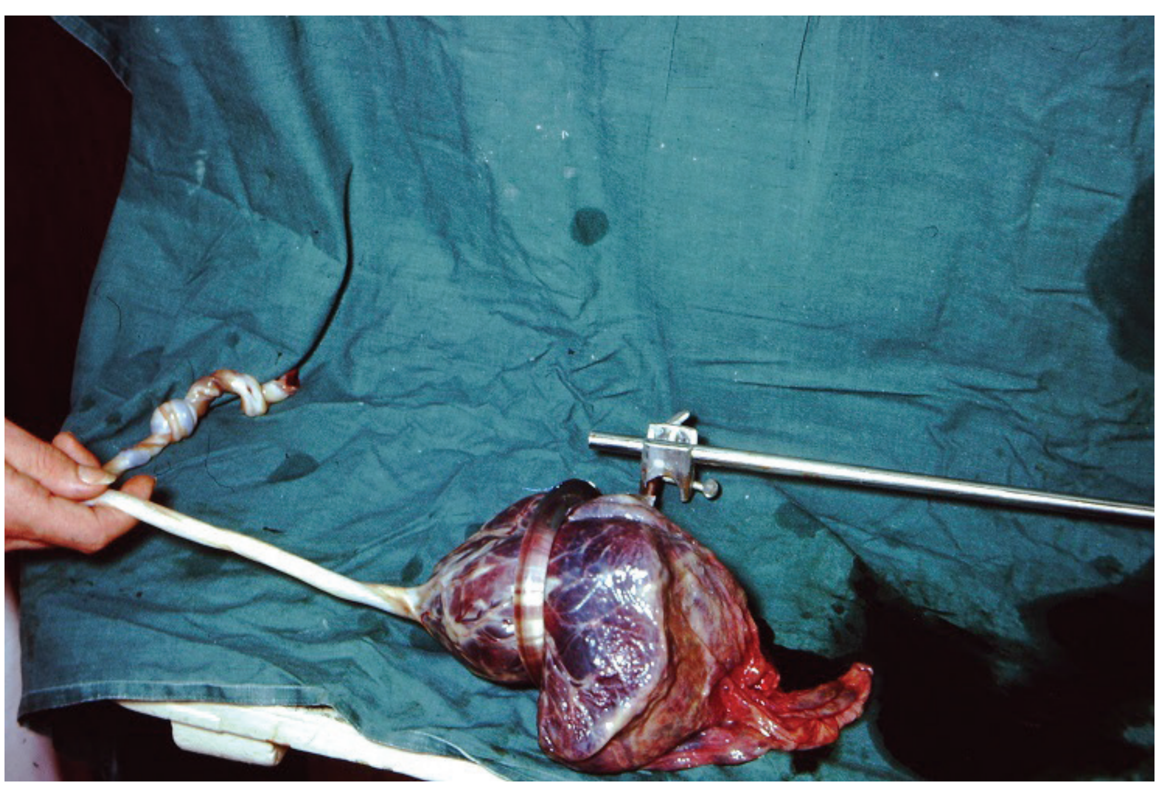

Fig 11
Placenta with central cord insertion and early cord clamping being drawn through a pessary ring (see text).

My next step was to study in more detail the mechanical problems presented by the passage of the placenta through the retracting cervix following delivery of the baby. I did this by measuring the smallest hoop (I used pessary rings of known diameter to serve as an artificial cervix) through which the placenta might be passed, first engorged with blood following early cord clamping and secondly after draining out all the blood from the placenta. At this point I noticed another factor which may not have been previously described. This is that if traction is exerted on a cord inserted centrally into the placenta, the latter everts like an inside out umbrella and presents a much thicker diameter for passage through the pessary ring (or cervix) (Fig 11). It should be noted that the same does not occur if the cord is inserted into the margin of the placenta or alternatively if traction is exerted directly by an inserted finger on the lower edge of the placenta (Fig 12). These simple mechanical facts should be obvious but like the importance of gravity in childbirth, may have escaped attention in the past.

Let me demonstrate one of the studies made in 1964. Following early cord clamping the placenta in this case weighed 1lb 9oz or 725g and would just pass through the ring on the left seen in Fig 13 which had a diameter of 79mm. After draining out 85ml of blood, the placenta passed through the smaller ring in the centre using central cord traction; this ring had a diameter of 62mm. When, however, traction was exerted on the edge of the placenta, it would pass through an even smaller ring of 48mm. This represented a 40% reduction on the original figure of 79mm.

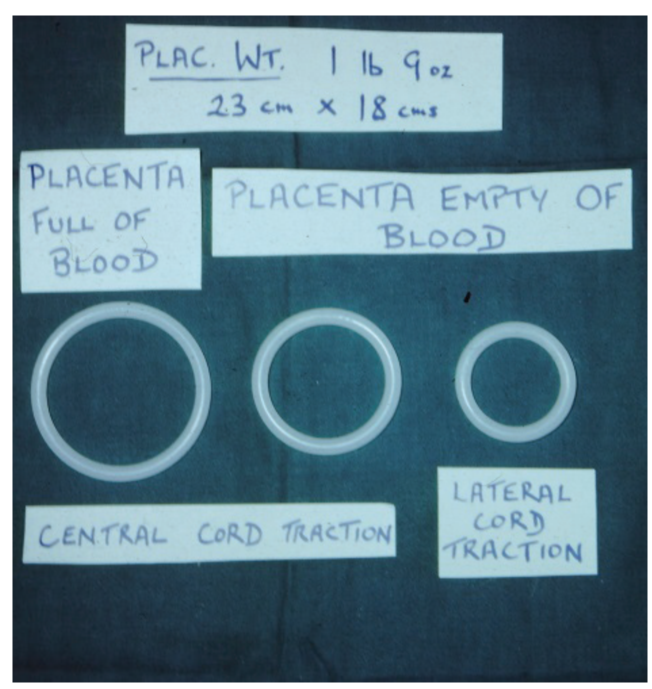

Fig 13
Case described in text

Expressed another way, the surface area enclosed within the larger ring on the left is 1.7 times greater than that of the middle ring and no less than 2.8 times greater than that of the smaller ring on the right. There is no longer need to look further for justification of the practice of our forebears in neither clamping the umbilical cord nor exerting traction on it.

West of England Medical Journal

Formerly Bristol Medico-Chirurgical Journal

WEMJ Volume 115 No.3 Article 2 September 2016

Observations on the third stage of labour

The e-journal of the Bristol Medico-Chirurgical Society

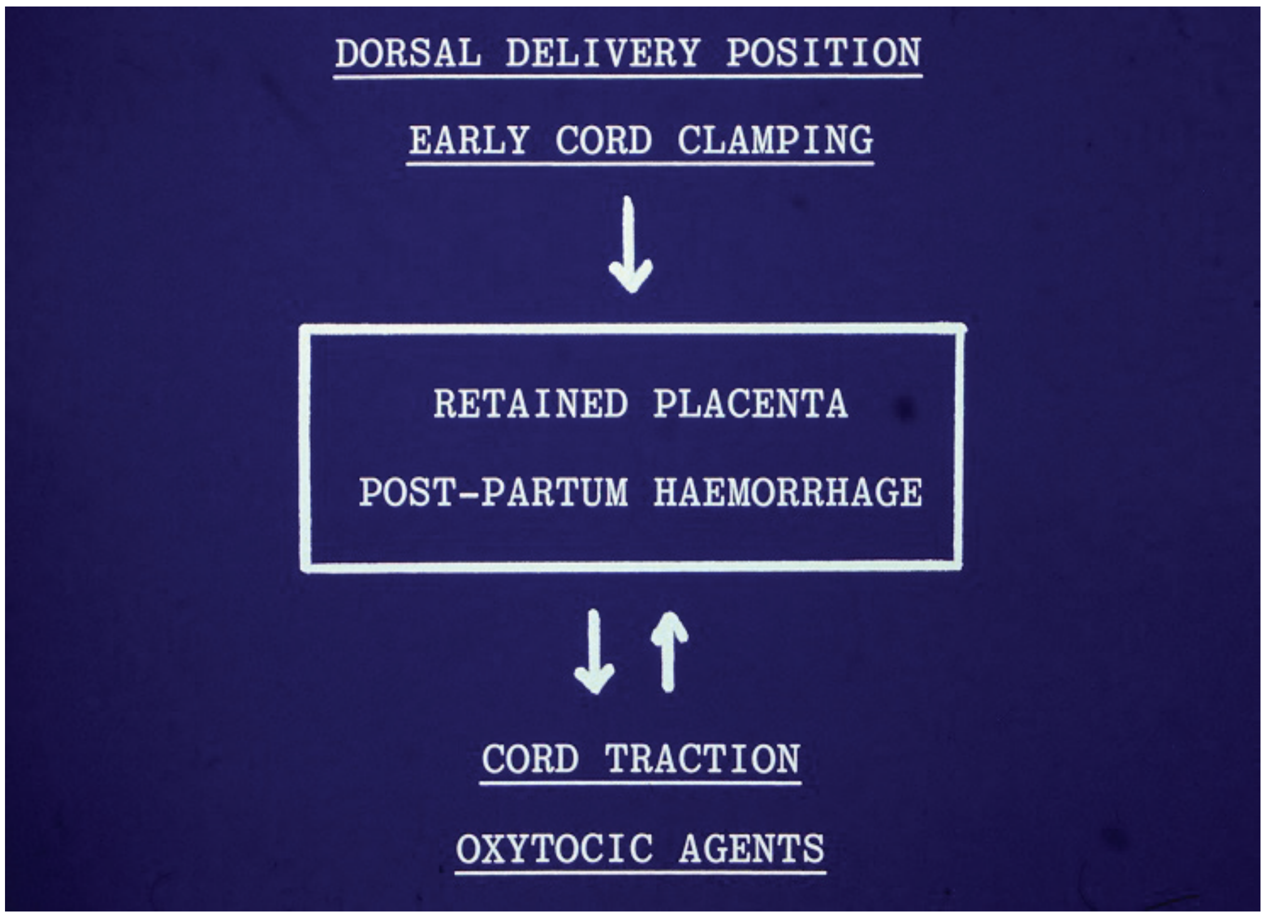

Fig 14
Problems surrounding the modern management of the third stage of labour.

CONCLUSION

In summary, there is a need to rethink and hopefully discontinue the various interventions that contribute to the current problems of the third stage. The dorsal recumbent position and early cord clamping create a problem, and cord traction and the use of oxytocic agents, while seeking to solve it, often make matters worse (Fig 14). Instead it is recommended that delivery of the baby and placenta should take place with the mother in an upright position. Following delivery, clamping and division of the umbilical cord should preferably be delayed until after the placenta has delivered and laid alongside the baby, and all pulsation in the cord has ceased. If for any reason there is a need to clamp and divide the cord before the placenta is delivered then this should preferably be delayed for at least 30 seconds and the placental end of the cord should be allowed to drain freely. With this management there would hopefully be little or no need for either oxytocic agents and cord traction or for the occurrence of the complications of post-partum haemorrhage or retained placenta. For an event taking place at least 300 million times every year throughout the world, surely these observations on the third stage of labour deserve serious consideration.

REFERENCES

1. Dunn, P.M. (1985): Management of childbirth in normal women: the third stage and fetal adaptation. In: Perinatal Medicine. IXth European Congress on Perinatal Medicine, Dublin, September, 1984. Lancaster: MTP, pp 47 - 54.
2. Dunn, P.M. Management of the third stage of labour and fetal adaptation to extrauterine life. RCOG Course on the Modern Management of Labour. Birmingham, March 13th-14th, 1995. In: P.M. Dunn Publications, Vol. VI (1994-5), University of Bristol Medical Library, Bristol.
3. Mauriceau, F. (1668): Les Maladies des Femmes Grosses. (Paris)
4. Engelmann, G.L. (1882). Labour among Primitive Peoples (St. Louis: Chambers).
5. Ploss, H.H., Bartels, M. and Bartels, P. (1935). Women: An Historical Gynecological and Anthropological Compendium (ed. Dingwall, E.G.), Vols 1-3. (London: Heinnemann).
6. Atwood, R.J. (1976): Parturitional posture and related birth behaviour. Acta Obstet. Gynecol. Scand. Suppl. 57, p 6.
7. Pacionik, C. and Pacionik, M. Birth and rooming-in: lessons learned from the forest Indians in Brazil. Birth, 1983: 10, 115-119.
8. Galba, A. (1980): The traditional birth attendant in Brazil. In: Philpott, R.H. (ed) Maternity Services in the Developing World: What the Community Needs, pp 239 - 310. (London: Royal College of Obstetricians and Gynaecologists.)
9. Dunn, P.M. (1989): Maternal posture during labor and delivery: historical and anthropological aspects. In: Advances in Gynecology and Obstetrics, Vol. 4, Maternal Physiology and Pathology. Proc. 12th World Congr. Obstet. Gynec., Rio de Janeiro, Oct, 1988. Ed. by Belfort, P., Pinotti, J.A. and Eskes, T.K.A.B. Parthenon Publ. Carnforth, Lancs, 23, 173-7.
10. Dunn, P.M. and Caldeyro-Barcia, R. (2015): Appropriate maternal posture during delivery: a commentary. West Engl. Med. J., 114, 1-9 (March).
11. Botha, M.C. (1968): The management of the umbilical cord in labour. South African J. Obstet. Gynaecol., 6: 30 - 33.
12. Dunn, P.M. (1968): Early versus late clamping of the cord. In: Gellis S.S. (ed): Year Book of Pediatrics, 1967-68. Chicago: Year Book Series: 16 - 17.
13. Dunn, P.M. (1973). Caesarean section and the prevention of respiratory distress syndrome of the newborn. In: Bossart, H. et al (eds). Perinatal Medicine, 3rd Europ. Congr. Perinatal Medicine, Laussanne, 1972, pp.138-45. (Bern: HaNS Hubor).
14. Dunn, P.M. (1986): Reservations about the methods of assessing at birth the predictive value of intrapartum monitoring, including premature interruption of the feto-placental circulation. In: Rolfe. P. (Ed.): Fetal physiological measurements. (Report of the 2nd International Conference. Oxford, 204 April, 1984). London: Butterworths, pp 130 - 137.
15. Dunn, P.M. (1988). The third stage and fetal adaptation. In: #Advances in Perinatal Medicine. Ed. by E.V. Cosmi, G.C. di Renzo and D.F. Hawkins. Harwood Academic Publ., London, pp.71-82.
16. Dunn. P.M. (1989): Perinatal factors influencing adaptation to extraunterine life. In: Befort, P., Pinotti, J.A., Eskes, T.K.A.B. (Eds). Advances in Gynecology and Obstetrics, Vol 5, Pregnancy and labour. Proc. 12th World Congr. Obstet. Gynec., Rio de Janeiro, Oct. 1988. Carnforth: Parthenon Publishing. 15, pp 119-23.
17. Dunn, P.M. (1992): Banking umbilical cord blood. Lancet, 140, 309.
18. Dunn, P.M. (2009): Managing the umbilical cord. Infant, 5, 73.
19. Dunn, P.M. (2014): Charles White (1728-1813) of Manchester and fetal adaptation at birth. West Engl. Med. J., 113, 1-6 (Sept).
20. Gunther, M. (1957): The transfer of blood between baby and placenta in the first minutes after birth. Lancet, 1, 1277 - 80.