Compared with a group of normal Europeans the Africans have a consistently smaller intravascular pool, a consistently higher ratio of extravascular to intravascular albumin, and possibly a slightly lower rate of albumin katabolism.

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FOETAL ASPHYXIA ASSOCIATED WITH UMBILICAL CORD AROUND THE NECK

BY

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Coiling of the umbilical cord around the foetal neck is a common complication of labour, said to occur about once in every five deliveries (Brews and Bender, 1955). Foetal asphyxia, deflexion attitudes, and malpresentations are sequelae of this complication recognized by most British and American textbooks of the present day, although generally this subject receives only scant attention. Shui and Eastman (1957), however, found no increased perinatal mortality attributable to this phenomenon in their recent series.

To find the cord coiled five times around the neck is relatively rare: this rarity and the severe foetal distress associated with it have prompted recording of the following case.

Case Report

A 35-year-old woman, married three years, attended University College Obstetric Hospital in her first pregnancy in 1956. She was a healthy woman with no past history of disease, found to be rhesus-positive and W.R.-negative. The expected date of delivery was calculated to be July 7, 1957. Pregnancy proceeded normally, uncomplicated by hyperten-

sion or pre-eclampsia. The foetus presented by the breech at the 28th week, but had undergone spontaneous version to a vertex presentation by the 32nd week. It remained thus and the foetal head was engaged at 36 weeks. The maternal pelvic cavity and outlet were adequate.

Labour began spontaneously at the 39th week with contractions. On her admission at 9 p.m. on June 30 the foetal head was in the upper pelvic cavity, and the foetal heart was regular at 132 beats a minute. The cervix was not taken up and was only 2 cm. dilated. Contractions were weak, but became strong and regular during the next two hours. Intramuscular pethidine, 125 mg., was given at 11 p.m. At 3.30 a.m. on July 1 the membranes ruptured spontaneously and copious amounts of thick green meconium escaped. The foetal heart remained steady and regular. Vaginal examination showed that the head was now deeply engaged, with the sagittal suture transverse; no cord was felt. The cervix was 8 cm. dilated. At 4 a.m. the foetal heart was first found irregular: there were coupling of the beats and variations in rhythm and rate, which was between 98 and 164 beats a minute. Uterine contractions were strong and regular, and the patient was given a further 125 mg. of pethidine. She was also given oxygen to breathe intermittently from a B.L.B. mask.

The cervix was fully dilated by 7.30 a.m.: the foetal heart now varied between 100 and 180 beats a minute. Preparations were made for forceps delivery, and the patient was premedicated with atropine, 1/100 gr. (0.65 mg.). General anaesthesia was induced with cyclopropane and maintained with gas, oxygen, and ether. Vaginal examination showed the foetal head at the level of the ischial spines in the left occipito-lateral position. After a right medio-lateral episiotomy, Kielland's forceps were applied by the wandering method and the foetal head was rotated and delivered. The foetal cord, devoid of pulsation, was coiled tightly five times around the neck and had to be severed before delivery of the trunk. Ergometrine, 0.5 mg., had been given intravenously with the crowning of the head, and the placenta and membranes were delivered intact by the Brandt-Andrews technique, with a total blood loss of 255 ml. The puerperium was uneventful.

The placenta weighed 740 g. and was normal. The cord was eccentrically implanted and its total length was 131 cm. (52½ in.).

The infant, a male, was limp and shocked at birth; although he gasped immediately, regular respirations were not established for 10 minutes, and the first cry was at 20 minutes. Resuscitation consisted in the clearing of the air passages, which contained thick green meconium, and the administration of gastric oxygen, and 0.25 mg. of nalorphine hydrobromide (*n*-allylnormorphine; "lethidrone") into the umbilical vein. The birth weight was 6 lb. 6 oz. (2,890 g.).

The baby was transferred to the sick-baby nursery and treated with intramuscular penicillin, 100,000 units, and streptomycin, 60 mg., twice daily for five days as well as one injection of "vikastab," 1 mg. Two hours after delivery he was found to be restless and irritable, with a shrill cry, marked opisthotonos, and exaggerated limb tone. He was sedated with intramuscular phenobarbitone, 1/8 gr. (8 mg.) four-hourly for two days. Respirations were shallow for the first 24 hours, but regular after that.

Feeding was started with expressed breast milk on the second day. By the fifth day the baby was established on the breast and transferred to the mother's ward. He was discharged with the mother, in good condition, fully breast-fed, on the 10th day, when the weight had risen to 6 lb. 14 oz. (3,120 g.). At the follow-up clinic six weeks later the baby was in satisfactory condition and weighed 7 lb. 14 oz. (3,570 g.), being totally breast-fed.

Arrangements were made for further follow-up visits, to ascertain whether any permanent cerebral damage might have resulted from the anoxia at birth.

Discussion

Napier (1882) found coiling of the cord to occur once in every seven births, and gave the average length of the cord as 20 in. (50 cm.), with extremes ranging from 2 in. (5 cm.) to 70 in. (175 cm.). Gardiner (1922) reviewed 35,712 deliveries: the incidence of coiling around some part of the foetus was 1 in every 5.5 births, and of coiling around the neck once in every 9.2 births. Shui and Eastman (1957), in a study of 1,000 consecutive deliveries, found the cord coiled once around the neck in 20.6%, twice in 2.5%, and thrice in 0.5% of cases.

According to McCaffrey (1927), Gray reported a case with nine coils around the neck and Credé one with eight coils. The fate of the infants is not recorded. Eight coils around the neck are also recorded by Beach (1916): the foetus was stillborn. Fjestad (1903) encountered seven coils around the neck, as did Greenhill (1955). Six coils were reported by Voorhees (1916): in his case there was intense congestion of the baby's head, with haemorrhages into the eyes, causing a permanent opacity in one eye. Gossett's (1927) case with five coils around the neck was in good condition at birth and survived. McCaffrey (1927) encountered four coils around the neck on three occasions in 3,041 deliveries.

Rachel (1884) and Gardiner (1922) found the average neck circumference of the foetus at term to be 17 cm. and the average distance from umbilicus to neck 18.5 cm. If the distance from the fundus uteri at term to the vulva is taken as 30 cm., then the minimum length of an umbilical cord coiled five times around the neck must be $5 \times 17 + 18.5 + 30 \text{ cm.} = 133.5 \text{ cm.}$, if the infant is to be born without rupture of the cord. This figure corresponds to the length of cord of 131 cm. found in the case reported above.

Hamilton (1947) has shown the value of slowing of the foetal heart on pressing the head manually into the pelvis as a diagnostic sign. (This may also be found in cases of placenta praevia.) Stretching and tightening of the cord, which occur during this procedure, just as they do during descent of the head in labour, no doubt narrow the calibre of the umbilical vein. The subsequent anoxia of the foetus has been demonstrated by Clemetson's (1953) cord-blood analyses of two groups of vertex deliveries—one where babies were born with the cord around the neck, and the other where this complication did not occur.

Apart from slowing of the foetal heart, the passage of meconium is a real signal of cord complications: this finding of FitzGerald and McFarlane's (1955) has been confirmed by Lister and Buchanan (1957) and also by Reiss (1958), who has shown that, in the majority of labours where meconium is passed, either post-maturity or a cord complication can be diagnosed with confidence.

Apart from the administration of oxygen to the mother, rapid delivery is the only effective treatment. Dumoulin and Martin (1957) have shown that in the case that is not post-mature which develops foetal distress it may be possible to avoid caesarean section provided that full dilatation is anticipated soon and no other complication such as hypertension exists. In these cases the application of forceps as soon as the cervix is fully dilated is clearly indicated.

Innumerable reports in the literature bear witness to the lethal results which may attend coiling of the cord around the neck. Hamilton (1947) has described the different ways in which the cord may kill, and Browne (1925) quotes early cases of strangulation in pregnancy, quite apart from asphyxia in labour.

Shui and Eastman (1957) question the tendency to attribute unexplained foetal deaths to this complication. However, their series of 1,000 deliveries is too small to produce significant data for cases in which more than one coil around the neck occurs. Nor, in their publication, is any note taken of how tight the loops around the neck were.

Finally, foetal mortality is not the only criterion by which to judge the ill effects of this complication. Butler (1953) showed that 22% of a series of 275 cases of foetal distress

experienced respiratory difficulties at or after birth, either severe enough to require resuscitation or resulting in delay in establishing regular respiration for a period of five minutes or more after birth. Delayed onset of respiration, with deficient pulmonary aeration, is often responsible for such signs of cerebral irritation in neonates as found in the case here reported, even in the absence of cerebral trauma. This has been clearly shown in the post-mortem studies of Bound *et al.* (1956), who attribute the cerebral signs to the effects of hypoxia and carbon dioxide retention on the brain and cerebral vessels.

The remote prognosis of perinatal cerebral anoxia cannot yet be stated. Cerebral palsy, mental retardation, and possibly epilepsy are the disabilities most feared for children who are anoxic at birth and survive only after hours or days of anxiety. That many of them do develop normally thereafter is undoubtedly true: but others may not, and, in the words of a recent writer (*Lancet*, 1957), "physiological parturition must be the aim and the infant must not, without very good reason, be exposed to anything that may conceivably be harmful."

Summary

A case of foetal asphyxia, associated with five coils of the umbilical cord around the neck, is presented. Forceps delivery at full dilatation resulted in the delivery of a living but severely asphyxiated infant.

The literature on coiling of the cord around the neck is briefly reviewed and the diagnostic importance of the passage of meconium is stressed. Although rapid delivery is the best hope for a live birth, caesarean section may be avoided (as in this case) if full dilatation of the cervix is expected soon and labour is not complicated by hypertension or postmaturity. The remote prognosis of cerebral anoxia at birth is not yet known.

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Potatoes as a Food is the title of a recent booklet issued by the Potato Marketing Board. It discusses the origin, structure, composition, and nutritive value of the potato, the effects of storage, varieties for cooking, the effect of cooking on nutritive value, and commercial preservation. In the early part of the sixteenth century Spanish invaders of South America found the plant which we now call the potato in regular cultivation and use there. Sir Walter Raleigh is reputed to have brought potatoes from Virginia in 1585, but it now appears unlikely that the plant was cultivated there until about 1700. The more probable explanation is that Spaniards returning from the New World about 1550 brought back with them the first specimens of potato. These later spread from Spain to the rest of Europe. The booklet can be obtained from the Potato Marketing Board, 50, Hans Crescent, London, S.W.1, price 1s. 3d.