

## **PRELIMINARY COMMUNICATION**

### ***Direction of spiral of the umbilical cord***

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Recent interest in the spiral form of arteries, eg the internal carotids,<sup>1</sup> has led to consideration of the direction of spiral of the umbilical vessels which is related to the direction of spiral of the umbilical cord. For the purposes of description here the sense of spiral will be that seen looking from the foetus to the placenta and travelling in that direction.

A study of some well-known textbooks of anatomy, physiology and obstetrics has proved unhelpful. In several of the textbooks of anatomy and physiology there is no description at all of the umbilical cord and its vessels, but where a description is given<sup>2, 3</sup> the spiral form is mentioned but without reference to the direction of the spiral. The diagrams and artists drawings in the books<sup>2, 3, 4, 5</sup> however show a clock-wise spiral while the photographs of foetus and placenta show an anti-clockwise spiral.

These differences are repeated in sundry textbooks of obstetrics<sup>6, 7, 8</sup> where illustrations of the cord are largely copies from the textbooks of anatomy with acknowledgements. In two textbooks of obstetrics<sup>6, 7</sup> the direction of the spiral is, however, reported and described. In one<sup>6</sup> it states ". . . the arteries usually encircling the vein from left to right." And in the other<sup>7</sup> "A cord frequently presents a twisted appearance, the coiling usually being from left to right." Neither defines the sense of spiral.

#### **Method**

In view of these discrepancies it was decided to undertake a study to determine the direction of spiral and the incidence of variations, if any. A search of the literature of the last ten years revealed no similar study. One hundred placentae from consecutive deliveries in October and November 1970 at the Royal Air Force Hospital, Ely were examined. There were two sets of twins but as these were both binovular and had separate placentae they were counted as individuals. Of the 100 cords 42 were from male infants and 58 from females.

#### **Results**

The majority (81 per cent) including all the twins, showed an anti-clockwise spiral as defined above. Of the remainder, 10 per cent showed a clockwise spiral and in 9 per cent the spiral changed direction one or more times. The distribution is shown in the table and it will be noted that there is no correlation with sex. No anomalies in the number of veins or arteries were found in the series although according to Benirschke and Bourne<sup>9</sup> the expected incidence is about seven per 1,000.

#### **Discussion**

These studies are being continued because of their value in relation to the application to blood flow of the science of fluid logic, where a spiral corresponds, by analogy, to a resistance employed in electrical circuits. It is also felt that in view of the spiral form of the cranial arteries<sup>1</sup> there may be a relationship between the direction of spiral of the umbilical arteries and left or right cerebral dominance. It is interesting to note that the incidence of left-handedness in the population at large is variously given as anything up to 10 per cent,<sup>10, 11, 12, 13</sup> and that it is also said to be related to the asymmetrical tonic neck reflex which in turn may be related to the

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dominant cerebral hemisphere<sup>14, 15</sup>. In addition Christiaens *et al*<sup>16</sup> (quoted by Hécaeu and de Ajuriaquerra<sup>17</sup>) found that in a sample of 1,180 subjects, 6.8 per cent of the men showed complete left-handedness and 11.2 per cent left-sided (ie, right cerebral) dominance. In the women the figures were 6.2 and 9.3 per cent respectively.

Clearly the further investigation of the possibility that handedness may be related to the direction of umbilical cord spiral will require long-term prospective studies on a large scale.

### Summary

A study was undertaken to determine the direction of spiral of the umbilical vessels and the variations in such spirals. The sense of spiral was defined and it was found that in 81 per cent of cases the spiral was in an anti-clockwise direction in the terms defined. In 10 per cent of cases the spiral was clockwise and in 9 per cent the direction changed. Suggestions are made as to the possible relationship of this finding to other factors, for example cerebral dominance.

TABLE I

Spiral	No.	Male		Female	
		No.	Per cent	No.	Per cent
Anti-clockwise ..	81	34	42	47	58
Clockwise .. ..	10	5	50	5	50
Changing .. ..	9	3	33	6	66
TOTALS .. ..	100	42		58	

### REFERENCES

1. Malcolm, J. E. (1959). *Blood Pressure Sounds and their Meaning*. Part 2. P. 40. London. Heinemann.
2. Johnston, T. B., and Willis, J. (1954). *Gray's Anatomy*. 31st ed. London. Longman's Green & Co.
3. Hamilton, W. J. (1956). *Textbook of Human Anatomy*. London. Macmillan.
4. Bell, G. H., Davidson, J. N., and Scarborough, L. H. (1968). *Textbook of Physiology and Biochemistry*. 7th ed. P. 1168. Edinburgh. E. & S. Livingstone.
5. Jamieson, R. A., and Kay, A. W. (1965). *Textbook of Surgical Physiology*. 2nd ed. P. 198. Edinburgh. E. & S. Livingstone.
6. Percival, R. (1963). *Manual of Obstetrics*. 13th ed. P. 61. Edinburgh. E. & S. Livingstone.
7. Easton, N. J., and Hellman, L. M. (1961). *Williams' Obstetrics*. 12th ed. P. 169. New York. Appleton-Century-Crofts.
8. Claye, Sir A. (1963). *British Obstetric and Gynaecological Practice*. 2nd ed. Obstetric volume. London. Heinemann.
9. Benirschke, K., and Bourne, G. L. (1960). *American Journal of Obstetrics and Gynaecology*, **79**, 251-4.
10. Ausubel, D. P. (1958). *Theory and Problems of Child Development*. New York. Grune & Stratton.
11. Bakwin, H. (1950). *Journal of Paediatrics*, **36**, 385.
12. Brain, R. (1961). *Speech Disorders*. London. Butterworth.
13. Morley, M. E. (1957). *The Development and Disorders of Speech in Childhood*. London. E. & S. Livingstone.
14. Gessell, A., and Ames, L. B. (1943). *Yale Journal of Biological Medicine*, **15**, 565.
15. Illingworth, R. S. (1970). *The Development of the Infant and Young Child*. 4th ed. P. 125. London. E. & S. Livingstone.
16. Christiaens, L., Bize, P. R., and Maurin, P. (1962). *Les Gauchers au Travail. VII Journées Naturelle de Médecine du Travail*. Paris. Massin et Cie.
17. Hécaeu, H., and de Ajuriaquerra, J. (1964). *Left-handedness, Mental Superiority and Cerebral Dominance*. New York. Grune & Stratton.