Dr Alfred Hart (1888–1954) of Toronto and exsanguination transfusion of the newborn

Peter M Dunn

Dr Alfred Purvis Hart, MB, MC was born on a farm at Wilfred in Canada. He received his early education at Uxbridge and graduated in medicine at the University of Toronto in 1911. After postgraduate studies in London, England, and service in France during the Great War, he returned to Toronto to join the paediatric staff of the Hospital for Sick Children in 1921. There he remained for 30 years until his retirement in 1951. In the meantime, he and his wife, Katherine Crichton, had two sons. He was an elder of Erskine United Church and his chief hobby was raising sheep, shorthorn cattle, and Yorkshire hogs on his 500 acre Netherburn Farm.

Dr Hart cofounded a paediatric cardiac clinic in 1923, but his claim to fame rests on a report in 1924 of the first use of exchange transfusion in order to remove ‘some unknown circulating toxin’ and prevent kernicterus in a case of familial icterus gravis. The following extract is from his paper:

'It was my fortune to be called by Dr Murray, of Parkdale, to see the case which is the subject of this paper a few hours after the baby was born on December 18, 1924. The baby was a perfectly healthy looking, fine specimen of male child weighing between eight and nine pounds. The family history, however, was so remarkable that one was prepared for trouble. As the father informed me, they had had six boys born previously all apparently as healthy and strong at birth as this baby. They all, however, had developed jaundice within the first twenty-four hours, and the condition had become progressively worse until death occurred in from three to four days. They had only one child living, a girl who was the second child born to the family. She had become jaundiced as the others and although it was felt that she was going the same road as they had gone, she had managed to live although deeply jaundiced until one year old and weighing at this age what she had weighed at birth. After a year the jaundice gradually disappeared and she grew very rapidly so that she is now at twelve years a very big girl for her age but suffering with chorea. There was no specific history. There had been no miscarriages. The baby was a well-developed male child, two hours old, and so far as one could find, perfectly healthy and at this time with no sign of jaundice. On the second day, the father stated that he could see jaundice beginning to appear on the tip of the nose but as it was evening and only artificial light could be used, I could not see it myself. On the next day, however, the baby being then forty-eight hours old, he was distinctly jaundiced. The liver was not enlarged and as the jaundice was no more intense than ordinary icterus neonatorum I found it difficult to be certain that it was a more serious condition. During this time the baby was taking the breast vigorously every four hours and taking large quantities of water between nursings as instructed on the first day. The stool was still meconium. On the third day, the jaundice had become much more intense so that the skin was a deep orange colour. The pupils were equal, the sclerotics had a distinctly yellow tinge and the baby tended to be drowsy... The abdomen was flaccid and the liver just palpable at the costal margin. The spleen was not enlarged and the umbilicus was perfectly clean... Van Der Bergh's indirect test was strongly positive... The stools which were losing the nature of meconium looked as though they contained bile and the Gmelin's test for bile was strongly positive. The urine also contained bile. The blood culture was sterile and the temperature had not been above normal since birth.

It was quite certain that we were dealing with a case of familial icterus gravis... in this...
case there was no sign of sepsis or infection of any kind. The mother had no sisters but her brothers had normal children. The father’s brothers and sisters also had normal children. There was no evidence of syphilis. It would look as if...the condition was due to some unknown toxin circulating in the blood and possibly absorbed from the gastro-intestinal tract.

(As) I felt that if something drastic was not done at once, the child was certainly going to die as the six other previous male babies had done, it was decided to do an exsanguination transfusion after the technique brought out and perfected by the late Dr Bruce Robertson, in the hope of removing a sufficient amount of toxin to prevent the progress of the disease. The baby was in Group II Jansky. Dr J L MacDonald, of the Hospital for Sick Children, exsanguinated three hundred cc. of blood from the anterior fontanelle at the same time transusing 335 cc. of blood into the internal saphenous vein at the left ankle. The transfusion of blood was commenced after 20 cc. of blood had been removed and the transfusion and exsanguination went on synchronously until the required quantity had been used, and we ended by giving the baby 35 cc. more than had been removed. In addition, 60 cc. of 5 per cent glucose solution were given. The donor was a healthy male not belonging to the family. By the following morning the jaundice was much less intense. It continued to fade so that by the fourth day it had entirely disappeared and the baby seemed much better...He has had no return to the jaundice since and is gaining and developing at five and a half months as any normal baby - weight seventeen pounds. He is still on the breast so that it would hardly seem as if the mother’s milk were a factor.

Blood transfusion using citrated blood became established during the Great War. One of its leading proponents, Dr Bruce Robertson, served with the Canadian army in France. After the war he returned to Toronto and set up a blood transfusion service in the Hospital for Sick Children. It was then that he introduced exsanguination transfusion in order to remove organisms and toxins from the circulation. In a single year (October 1922 and September 1923) there were no less than 122 exsanguination transfusions undertaken on infants and children in the hospital, usually for septicaemia, gastroenteritis, or severe burns (Cross, 1924). This, then, was the setting for Dr Hart’s use of the procedure in 1924. Sadly, his report was overlooked and 21 years passed before Wallerstein of New York City reported in 1946 three further cases of exchange transfusion in the treatment of the newly discovered Rh haemolytic disease.

These early exchange transfusions made use of the longitudinal sinus and a peripheral vein. Although Sidbury had reported the use of the umbilical vein for simple blood transfusion of the newborn in 1923, this route was only widely introduced into practice after the suggestion of Diamond in 1947.

The influence of the exchange transfusion extended far beyond its therapeutic benefit. It provided the main impetus for appointing paediatric staff to maternity hospitals (at least in the UK) and hence for beginning to establish sound neonatal care.

Dr Hart died in 1954 at the age of 66. He was buried at Wilfred.

1 Hart AP. Familial icterus gravis of the newborn and its treatment. Can Med Assoc 1925; 15: 1008
2 Cross GK. Report on blood transfusion work seen in the Hospital for Sick Children, Toronto, Canada. British Journal of Children’s Disease 1924; 31: 173
3 Wallerstein H. Treatment of severe erythroblastosis by simultaneous removal and replacement of the blood of the newborn infant. Science 1946; 103: 583
4 Sidbury JB. Transfusion through the umbilical vein in haemorrhage of the newborn. Am J Dis Child 1923; 25: 290