A rare case of neonatal hypothyroidism

Eyton-Chong CK[1], Gregory JW[2], Teoh YP[1], Davies G[1], Weerasinghe K[1]

1 – Department of Paediatrics, Wrexham Maelor Hospital, Betsi Cadwaladr University Health Board, Wales, UK
2 – Division of Population Experimental Medicine, School of Medicine, Cardiff University, Cardiff, UK

Background

Hypothyroidism in infants is usually detected by the newborn screening tool used in most developed countries. A capillary blood sample is collected on filter paper and analysed for either thyroid stimulating hormone (TSH) or free thyroxine (T4). Early diagnosis and treatment can prevent complications of congenital hypothyroidism prior to them developing signs and symptoms and can prevent the severe complications such as intellectual disability.

In the UK, congenital hypothyroidism screening is carried out on day 5 of life and blood samples analysed for TSH levels greater than or equal to 8mU/L with a duplicate test in those babies hitting this level.[1] Due to immaturity of the thyroid gland in very preterm babies, those born less than 32 weeks require a repeat test at day 28 of life.

We present a case of hypothyroidism that was not detected by the initial newborn screen.

Case Study

Baby A, a boy was delivered at 33 weeks gestation (birth weight 1.545kg, 9th centile) by emergency caesarean section following maternal preeclampsia. He did not require any resuscitation at birth. He is the second baby of non-consanguineous Asian parents with no family history to note. Both parents are healthy and there was no history of maternal medication use.

Baby A experienced mild respiratory distress syndrome, requiring CPAP, and suspected sepsis, treated with 5 days of IV antibiotics. He developed a heart murmur, confirmed by echocardiography to be a ventricular septal defect and atrial septal defect. After initial intravenous fluids he was established on expressed breast milk by nasogastric tube. As he was failing to thrive, Baby A's feed was switched to high-calorie formula and there was a brief period where his weight seemed to be improving. Around this time he also developed symptoms of gastroesophageal reflux disease and was commenced on Ranitidine and Gaviscon.

However his vomiting and weight gain failed to improve. Furthermore he required continued nasogastric feeding, out of keeping for his prematurity. We carried out extensive investigations to look for a cause which included a metabolic screen. Surprisingly, in-spite of a normal newborn screen, his TSH was extremely high at 340mU/L with free-T4 at 4.0pmol/L.

An urgent radioisotope scan revealed a bulky thyroid normally sited within the neck. Levothyroxine was commenced at 25micrograms and adjusted as shown in the table below.

Age (weeks)	9	10	11	12	13	14	20	33	35
TSH (mU/L)	340	44.47	2.36	0.57	2.63	2.73	1.43	2.61	5.33
T4 (pmol/L)	4.0	13.7	25.0	27.4	21.3	14.8	18.5	15.3	13
Levothyroxine (mcg)	25	25	25	25	15	15	15	15	15

References

1. Public Health England. *A laboratory guide to newborn screening in the UK for congenital hypothyroidism*. Available from: http://cpd.screening.nhs.uk/newbornbloodspot [Accessed 23/08/2016].
2. Up to date. *Iodine deficiency disorders*. Available from: http://www.uptodate.com/contents/iodine-deficiency-disorders [Accessed 23/08/2016].
3. Connelly KJ et al. Congenital hypothyroidism caused by excess prenatal maternal iodine ingestion. *J Pediatr*. 2012;161(4): 760-762.
4. Yaman AK et al. Maternal and neonatal urinary iodine status and its effect on neonatal TSH levels in mildly iodine-deficient area. *J Clin Res Pediatr Endocrinol*. 200=13;5(2):90-94.

Progress

We also looked for rarer causes of hypothyroidism including iodine exposure. Initial urinary iodine/creatinine ratio was high at 2361 nmol/mmol (normal 50-360nmol/mmol). We considered analysing maternal breast milk for iodine but maternal urinary iodine are was normal at 130nmol/mmol. Repeat results are shown in the table below. At 35 weeks old his urinary iodine level appears to have fallen, and his plasma iodine level was the upper limit of normal at 0.62 umol/L (0.32-0.63). The fall in urinary iodine could be an due to a higher degree of measured creatinine in his urine (3.2mmol/L which is still within normal values).

Age (weeks)	9	13	16	35
Iodine/Creatinine (nnol/mol)	2361	1450	2058	847

We looked for sources of iodine exposure. During neonatal life, Baby A received various types of prescribed milk which included hydrolysed formulas as well as high-energy formulas. The iodine content of these milks varied from 10-16mcg/100ml. Taking into account his feed volumes he is still not exceeding the recommended iodine intake for a neonate of 90micrograms a day.[2] On our unit we do not use any iodine-based skin preparations. We also checked items that had prolonged skin contact such as the ultrasound gel that was used for echocardiography and abdominal ultrasound.

Baby A developed two posterior rib fractures as an inpatient. He had investigations done for metabolic bone disease which was normal and a skeletal survey did not reveal any further fractures. A genetics opinion was requested due to his multiple medical problems, his microarray is normal and no genetic syndromes have been identified. We have also done an MRI of his head which is normal.

Baby A had significant problems with vomiting and failure to establish bottle feeds led to problems with weight gain. Medical treatment for gastroesophageal reflux disease was optimised with domperidone. He was eventually discharged home at 10 weeks post term on NG feeds.

Since discharge, his development is slow but he is making some progress. At 4 months corrected gestational age, our dietician has recommenced early weaning, this has lead some some improvement in his weight gain. Baby A will continue to be followed up in our paediatric clinic

Discussion

There have been case reports of babies developing hypothyroidism from placental transfer of iodine from maternal diet. Connelly et al report of three babies who developed iodine-induced hypothyroidism.[3] Iodine is essential for thyroxine production. The Wolff-Chaikoff effect usually prevents excessive iodine exposure from causing hyperthyroidism by temporarily shutting down thyroxine production.[3] However in neonates, the immaturity of the thyroid gland does not prevent the acute Wolff-Chaikoff effect, resulting in hypothyroidism.[3] Yet in a different study by Yaman et al,[4] measured urinary iodine levels that were similar or higher than our case did not result in hypothyroidism. As the other investigations are normal, we assume that the excess iodine, be it from ingestion or environmental exposure, has contributed to his hypothyroidism, however, we cannot be certain about it being the absolute cause.

Conclusion

This case highlights the importance of further investigations into hypothyroidism when initial screening results are normal, especially to exclude exposure to excess iodine. However, at present, we are still uncertain to the exact cause of this baby's hypothyroidism.

Topic: Perinatal Endocrinology

55ESPE 568--P1
Perinatal Endocrinology
Chin Kien
DOI: 10.3252/pso.eu.55ESPE.2016
Poster presented at: ESPE 2016 PARIS 10-12 SEPTEMBER