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LETTER TO THE EDITORS

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The effect of phototherapy on urinary calcium excretion in newborns

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Sirs,
Hypocalcaemia has been reported as a reaction to phototherapy in premature and term newborns [1, 2, 3]. It has been suggested that phototherapy reduces melatonin secretion and this may induce hypocalcemia. [4, 5]. Vitamin D has no role in the pathogenesis of phototherapy induced hypocalcemia [6, 7].

Whether this hypocalcaemia is a consequence of increased urinary calcium excretion is undetermined. The aim of this study was to evaluate UCa/UCr in icteric neonates before and during phototherapy.

Between May and October 2001, 50 breastfed icteric neonates with (n=27; group A) and without (n=23; group B) indication for phototherapy were included in our preliminary study. The survey was approved by the ethics committee of Kashan University and informed consent was given by all parents. Neonates who needed antibiotic therapy or blood exchange were excluded. Indication for phototherapy was a serum bilirubin concentration of $\geq$15 mg dL^{-1}. Continuous phototherapy was used for treatment. Spot urine samples were collected for all neonates at the beginning of the study and for group A a second spot sample was collected 24 h after start of phototherapy. Calcium and creatinine were measured and UCa/UCr ratio (mg mg^{-1}) was determined. Serum calcium was not measured. Hypercalciuria was defined by a ratio >0.85 [8]. We used Student's t-test to compare means, the nonparametric Chi-square for frequencies, and the Pearson test for correlation. A value less than 0.05 was considered significant.

As shown in Table 1, the mean gestational age and weight was no different between the two groups. Group B was younger and had a lower serum bilirubin concentration and a lower Uca/Ucr ratio. In Group A, the median of urinary calcium excretion did not differ before and after phototherapy. Using a Uca/Ucr>0.85 as the definition of hypercalciuria, 6 out of 27 icteric cases had a value above the cut off point during phototherapy. This difference was shown to be statistically significant by the nonparametric Chi-square test (P=0.003).

The Uca/Ucr ratio during phototherapy was lower if body weight was $\leq$2.5 kg and gestational age was <37 weeks (P<0.05).

Urine calcium excretion in the first week of life is correlated inversely with gestational age and directly with urine sodium excretion. In addition, glomerular filtration rate, urinary cAMP, and potassium may affect calcium excretion [9, 10].

Increased vasoactive intestinal peptides (VIP) in infants under phototherapy may be the cause of intestinal water and electrolyte secretion [11]. VIP lead an to increase in renal vascular resistance and fractional sodium excretion. Reabsorption of calcium in the proximal tubule and loop of Henle is sodium-dependent. Thus, natriuresis affects urinary calcium excretion. VIP and natriuresis were not investigated in our preliminary study.

We cannot currently identify the reason for increased urinary Ca excretion before phototherapy in Group A and the increase of Uca/Ucr during phototherapy. A more complex, controlled study has been designed to solve these questions.

In conclusion phototherapy might increase urinary calcium excretion in infants so a further investigation should be conducted on more newborns.

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Table 1 Clinical and laboratory data of neonates with (group A) and without (group B) indication of phototherapy

	Group A		Group B	*P* value
	n=27		*n*=23	(A vs B)
Gestational age (wks)[a]	38.45 (±2)		37.4(±1.9)	NS
Male/female	15/12		14/9	NS
Age (day)[a]	6.1 (±3.3)		3.7 (±2.5)	0.008
Weight (g)[a]	2963 (±579)		3000 (±797)	NS
Bilirubin (mg dL^{-1})[a]	17.73 (±4.11)		10.22 (±2.69)	0.001
	Before Pht	During Pht		
Uca (mg dL^{-1})[b]	4.75 (1.2–15.5)	4 (1–38)	2 (0.5–20)	0.01
Ucr (mg dL^{-1})[b]	25.75 (7–101)	22 (1.2–80)	53 (6.6–120)	0.01
Uca/Ucr (mg mg^{-1})[b]	0.17 (0.01–0.83)	0.17 (0.02–7.33)	0.03 (0–0.25)	0.001
Uca/Ucr>0.85 (n)	0	6[c]	0	0.003

[a] Mean (±SD)
[b] Median (range)
[c] *P*< (before compared with after Pht)
Pht=Phototherapy

References

1. Jain BK, Singh H, Sing D, Too NS (1998) Phototherapy induced hypocalcemia. Indian Pediatr 35:566–567
2. Eghbalian F, Monsef A (2002) Phototherapy-induced hypocalcemia in icteric newborns. IJMS 27:169–171
3. Kermanifar H, Pishva N, Amirhakimi GH (2002) Prevalence of phototherapy-induced hypocalcemia. IJMS 27:166–168
4. Hakanson DO, Bergstrom WH (1981) Phototherapy-induced hypocalcemia in newborn rats: prevention by melatonin. Science 214:807–809
5. Hakanson DO, Penny R, Bergstrom WH (1987) Calcemic response to photic and pharmacologic manipulation of serum melatonin. Pediatr Res 22:414–416
6. Zecca E, Romagnoli C, Tortorolo G (1983) Ineffectiveness of vitamin 25(OH)D3 in the prevention of hypocalcemia induced by phototherapy. Pediatr Med Chir 5:317–319
7. Gillies DR, Hay A, Sheltawy MJ, Congdon PJ (1984) Effect of phototherapy on plasma 25(OH)-vitamin D in neonates. Biol Neonate 45:225–227
8. Sargent JD, Stakel TA, Kresel J, Klein RZ (1993) Normal values for random urinary calcium to creatinine ratios in infancy. J Pediatr 123:393–397
9. Aladangady N, Coen PG, White MP, Rae MD, Beatie TJ (2004) Urinary excretion of calcium and phosphate in preterm infants. Pediatr Nephrol 19:1225–1231
10. Bert S, Gouyon JB, Semama DS (2004) Calcium, sodium and potassium urinary excretion during the first five days of life in very preterm infants. Biol Neonate 85:37–41
11. Gounaris A, Alexiou N, Costalos C, Daniilidou M, Bakoleas V, Constantellou E (1998) Gut hormone levels in neonates under phototherapy. Early Human Development 51:57–60