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Review Article

Neonatal circumcisions and parental refusal of intramuscular vitamin K: A review of the literature and current guidelines

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Summary

Introduction
Parental refusal of intramuscular (IM) vitamin K in newborns poses challenges, particularly for pediatric urologists assessing the safety of neonatal circumcision. Vitamin K deficiency bleeding (VKDB) is a known risk, with lack of prophylaxis increasing bleeding complications. This study evaluates the safety of neonatal circumcision without IM vitamin K, reviews guidelines, and explores alternative prophylaxis options.

Objective
To assess if neonatal circumcision can be safely performed on infants lacking IM vitamin K and to identify both optimal timing and alternative prophylactic approaches.

Methods
We conducted a literature review using PubMed and Google Scholar to gather data on neonatal circumcision and VKDB in the context of IM vitamin K refusal. Additionally, we searched for relevant guidelines from the American Urological Association (AUA), American Academy of Pediatrics (AAP), and other organizations. Our study included analysis of ten recent cases of neonatal circumcision without IM vitamin K, focusing on safety outcomes and timing.

Results
IM vitamin K is the most effective prophylaxis against VKDB, significantly reducing bleeding risk up to sixfold in neonatal circumcision. Oral vitamin K, sometimes used as an alternative in Europe, shows variable effectiveness and lacks standardization in the U.S. Newborn prothrombin (PT) levels fluctuate significantly in the first week: PT levels are high at birth, drop within 24 h, reach a nadir at 24—72 h, then rebound. Circumcisions performed at 14 days on ten patients without IM vitamin K showed no bleeding complications, suggesting that timing circumcisions after PT stabilization may be safer.

Conclusions
IM vitamin K prophylaxis should remain standard care. In cases of refusal, alternative prophylaxis and timing circumcision after the PT nadir may improve safety. This study underscores the need for updated guidelines from professional organizations, including the AUA, to address the growing trend of IM vitamin K refusal and its implications for neonatal circumcision.

Introduction

Vitamin K deficiency bleeding (VKDB) in newborns was first described in 1894 [1]. A relative lack of vitamin K leads to a coagulopathy which may lead to an increased risk of bleeding in the neonatal period. Though it typically manifests within the cranium and gastrointestinal tract, VKDB may cause bleeding in any organ system. Clinical trials conducted in the 1960s demonstrated that intramuscular (IM) vitamin K administered at birth significantly reduced the incidence of VKDB [2,3]. However, in contemporary medical practice, parental refusal of IM vitamin K in hospital-born newborns presents a significant challenge for clinicians, in particular pediatric urologists, tasked with evaluating the safety of circumcision in infants lacking vitamin K prophylaxis. Refusal rates vary widely, ranging from 3.2 % in U.S. hospitals to 14 % following at-home births and peaking at 31 % in birthing centers [4].

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When parents decline IM vitamin K for their newborns in the hospital setting, they often seek consultation with pediatric urologists for neonatal circumcision in the outpatient setting. Depending on individual practice preferences, urologists may opt to defer circumcision until the infant is older or may agree to perform the procedure with the stipulation that the parents/guardians acknowledge the heightened risk of bleeding by signing a waiver. Urologists frequently express reluctance to proceed with circumcision in non-prophylaxed newborns due to concerns regarding post-circumcision bleeding. We sought to determine if and when there is an increased risk of post-circumcision bleeding in infants who did not receive IM vitamin K at birth.

The primary aim of this study was to determine whether it is safe for clinicians to perform neonatal circumcision on infants who do not receive IM vitamin K prophylaxis. The secondary goals were to determine when it may be safer to perform neonatal circumcision in this patient population and explore alternatives to IM vitamin K in the setting of parental refusal.

Methods

To examine these questions, we first reviewed the coagulation pathways and the pathophysiology related to VKDB. A thorough literature review was conducted which predominantly focused on neonatal circumcision bleeding risk and coagulation factor levels in infants from the time of birth to one month of age. The review encompassed studies available through March 2024 and was conducted using both PubMed and Google Scholar databases. Search terms included: "neonatal circumcision bleeding risk," "prothrombin concentration in newborns," "parental refusal of vitamin K," "vitamin K and childhood cancer," "alternatives to vitamin k intramuscular prophylaxis," "circumcision with oral vitamin K," "circumcision without vitamin k prophylaxis," and "historical complications of circumcision in newborns." Exclusion criteria included non-English language articles and case reports that did not directly pertain to post-circumcision bleeding risk without vitamin K prophylaxis. Relevance was adjudicated by three authors and articles were excluded on a case-by-case basis if deemed not relevant by the authors. Articles not directly linked to our primary aim were similarly included on a case-by-case basis as adjudicated by the authors so as to provide relevant background information to our primary aim. Distinct topics were then identified so as to provide relevant background information and organization to the results of our literature search.

The American Academy of Pediatrics (AAP), American Association of Pediatric Urologists (AAPU), American Urological Association (AUA), European Association of Urology (EAU), National Health Service (NHS), the Societies for Pediatric Urology (SPU), and the World Health Organization (WHO) were also reviewed for guidelines and recommendations, if present. These guidelines served to both supplement our review of the literature and support our eventual recommendations.

Our recent experience with ten patients who underwent neonatal circumcision without complication despite parental refusal of IM vitamin K prophylaxis at birth also served to supplement our review of the literature and guidelines. The use of these various sources ensured a comprehensive exploration of both empirical evidence and expert recommendations in addressing the several research questions posed in this study.

Results

Our literature search yielded a total of 317 unique articles pertaining to the search phrases as outlined above. Of these, 38 articles were adjudicated as relevant and thus included within this manuscript for analysis based on the methodology outlined above.

Vitamin K physiology and infantile vitamin K deficiency

Vitamin K, a fat-soluble vitamin, plays a crucial role as a necessary cofactor in the synthesis and activation of coagulation factors II (prothrombin), VII, IX, and X, along with proteins C and S in the liver [5]. It functions as a cofactor for gamma-glutamyl carboxylase, which converts glutamic acid to gamma-carboxyglutamic acid residues in the N-terminus of vitamin K-dependent pro-coagulant factors and proteins C and S [6]. Vitamin K exists in three forms: vitamin K1 (phylloquinone), vitamin K2 (menaquinones), and vitamin K3 (menadione) [7]. Vitamin K1 is the dominant circulating form and is predominantly obtained from dietary sources like green, leafy vegetables. Vitamin K2 is found in other dietary sources such as egg yolks, chicken, beef, vegetables, and fermented products like natto, and is also synthesized from gut flora [7–9]. Vitamin K3 is a synthetic form of the vitamin and is not used for IM vitamin K prophylaxis due to an increased risk of hemolytic anemia in glucose-6-phosphate dehydrogenase (G6PD)-deficient infants [10].

Infantile vitamin K deficiency is widespread and can occur due to a variety of factors, such as poor placental transfer, low vitamin K content in breast milk, inadequate intestinal absorption, immature gut flora, and low activity level of vitamin K epoxide reductase [9]. Cord blood often exhibits undetectable levels of vitamin K, while breast milk contains significantly lower levels compared to formula milk [9]. Immature gut flora in neonates contributes to insufficient synthesis of vitamin K, as evidenced by both lower levels of vitamin K1 and the absence of menaquinones (MK4-10) in infant fecal samples compared to adult samples [11].

Consequently, infants are predisposed to low vitamin K levels with limited hepatic reserves at birth and are therefore at risk for VKDB [9]. VKDB is classified based on when it presents: early (from 0 to 12 h of life), classic (from 1 to 7 days), and late (from 2 to 12 weeks). Late-onset VKDB, in particular, can be life-threatening. The diagnosis of VKDB is initially based on prolonged activated partial thromboplastin time (aPTT) and prothrombin time. It is then confirmed via either increased serum levels of proteins induced by vitamin K absence or antagonists (PIVKAs) or rapid normalization of coagulation parameters after vitamin K administration.

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Fluctuation of prothrombin levels

Furthermore, studies on infant prothrombin (factor II) levels indicate significant fluctuations throughout the first week of life. Quick et al. demonstrated that prothrombin levels in 6-h-old infants are high, similar to cord blood levels, but decrease significantly after 24 h, only to return to normal after 48 h [12]. The study attributed this phenomenon to a lack of prothrombin reserve, which leads to decreased clotting factors and hemorrhagic tendencies which ultimately respond well to vitamin K therapy [12]. Another study by Grossman et al. found that neonatal prothrombin levels nadired at 48 h and rebounded before 72 h [13]. Sanford et al. similarly demonstrated that prothrombin levels nadired at 48—72 h, though neonatal prothrombin concentration did not return to normal until day of life four in patients who received vitamin K prophylaxis and day of life seven in those who did not [14]. These results are summarized within Fig. 1. Though these studies are fairly outdated, they are the only studies to our knowledge within the existing literature to directly examine the fluctuations in prothrombin levels that occur in the immediate neonatal period. Despite this, a 2021 study by Nielsen et al. reinforced Quick's finding that newborn venous blood is very similar to cord blood in regards to various coagulation parameters [15]. A case report from Botswana highlights the danger of performing neonatal circumcision while these prothrombin levels are at their nadir. A neonatal circumcision was performed on a two-day-old infant that had been born at 39 weeks' gestation. Despite the application of local pressure, the infant experienced bleeding for more than 90 min. Once 2 mg of IM vitamin K was administered, the bleeding was successfully stopped after just 30 min [16].

Historical context of circumcision

Contemporary discussions surrounding circumcision are enriched by delving into its historical backdrop. While guidelines for vitamin K prophylaxis during neonatal circumcision didn't emerge until the 20th century, the practice of circumcision itself dates back to 2300 B.C., exhibiting historically low complication rates among ancient Semitic people, including Egyptians and those of the Jewish faith [17]. Furthermore, in Jewish tradition, circumcisions are traditionally conducted by a mohel in a non-medical setting, with complications remaining rare occurrences. The Encyclopedia of Jewish Medical Ethics references several large contemporary studies from the 1950s—1970s, as vitamin K prophylaxis was just starting to become routine practice, which collectively examined more than 24,000 total neonatal circumcisions and revealed a complication rate of just 0.06 %—0.25 % [17]. A 2014 retrospective review of more than 1.3 million circumcisions performed in the U.S. between 2001 and 2010 revealed an overall complication rate of just 0.40 % for those circumcised during infancy [18]. Notably, circumcision within Jewish communities often takes place on the eighth day of life regardless of vitamin K prophylaxis status — excluding only patients whose families have previously been diagnosed with severe hemophilia — coinciding with the resurgence of prothrombin activity in non-prophylaxed neonates that was demonstrated by Sanford in the 20th century [14,19,20].

Efficacy of IM vitamin K prophylaxis

Prior to the widespread adoption of vitamin K prophylaxis, Vietti et al. randomized half of the male infants in a newborn nursery to receive prophylactic vitamin K immediately upon arrival to the nursery and subsequently demonstrated a six-fold decrease in post-circumcision bleeding compared to the infants who had not received vitamin K [2]. Modern interpretation of this study is challenging, however, as the patients had a mean age slightly over 24 h, at which point the patients' prothrombin levels were likely quite low, if not quite at their nadir [12,13]. Although, several years later Sutherland et al. randomized patients to receive placebo, 0.1 mg IM vitamin K, or 5.0 mg IM vitamin K and demonstrated a significantly higher incidence of moderate-to-severe bleeding in the placebo group compared to either treatment group [3]. When considering historical context alongside our current understanding of physiologic prothrombin activity, it appears that either the

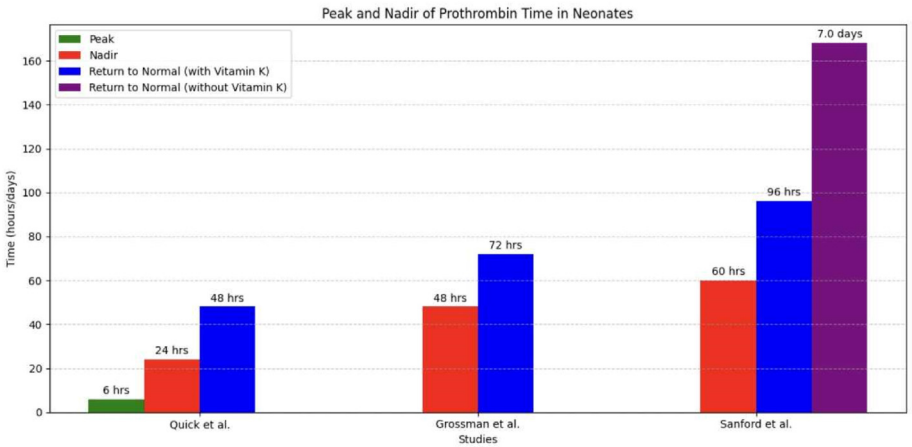

Fig. 1 A visual representation of the results from several studies examining prothrombin levels in neonates.

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initial 24 h of life or day eight of life onward may be the safest periods to perform neonatal circumcisions without vitamin K supplementation.

Alternatives to IM vitamin K prophylaxis

While IM vitamin K remains the principal — and sole approved — route of administration for newborn prophylaxis for VKDB in the United States, European countries also sometimes employ oral regimens as alternatives [21]. Oral vitamin K prophylactic dosing in Europe varies, though it most often involves 2 mg at birth followed by 1 mg or 2 mg weekly for three months in breastfed, full-term, and late preterm infants (over 32 weeks' gestation) [22]. Some U.S. clinicians offer oral vitamin K prophylaxis when parents refuse IM administration, but the absence of both FDA-approved oral formulations and standardization of dosing complicates this decision-making process [23]. The effectiveness, too, of oral vitamin K prophylaxis in the prevention of neonatal post-circumcision bleeding remains unclear, as estimates from several studies have demonstrated significantly variable rates. In countries where oral vitamin K is the primary form of prophylaxis, the incidence of late VKDB (per 100,000 infants) varies from 1.6 in the U.K. to 1.9 in Japan, 5.1 in Sweden, and 6.4 in Switzerland [24]. A German study demonstrated an incidence of late VKDB after one dose of oral prophylaxis alone to be 1.4 per 100,000 infants, while the incidence after a single IM administration was just 0.25 per 100,000 infants [25]. A similar study from the U.K. demonstrated a failure rate of 0.42 per 100,000 for oral prophylaxis [26]. These two studies revealed relative risk values of oral vitamin K prophylaxis (compared to IM vitamin K prophylaxis) to be 5.97 and 28.75, respectively, underscoring the comparative efficacy of IM administration [24]. The relative inferiority of oral vitamin K prophylaxis is thought to be due to neonates' immature gut flora, which leads to an inability to completely digest the vitamin K.

Review of current guidelines

Notably, the AUA does not provide any specific guidance regarding vitamin K prophylaxis in the setting of circumcision. Instead, AUA guidelines simply emphasize that neonatal circumcision is generally safe and well-tolerated when performed by an experienced operator. In contrast, the AAP has recommended IM vitamin K prophylaxis for the prevention of VKDB, including post-circumcision bleeding, since 1961. This recommendation persists today. Current guidelines state that newborns weighing >1500 g should receive a single IM dose of 1 mg vitamin K within 6 h of birth, while preterm infants weighing <1500 g should receive a single IM dose of 0.3 mg/kg to 0.5 mg/kg vitamin K. Notably, the AAPU, EAU, NHS, SPU, and WHO lack any clear guidelines on the safety of performing newborn circumcisions with or without vitamin K prophylaxis.

Recent cases

We performed ten circumcisions between January 2024—December 2024 on patients who did not receive IM vitamin K. Circumcision was performed at 14 days of life using a gomco clamp after the patients' parents had refused administration of routine vitamin K prophylaxis at birth. None of the patients were premature. All patients weighed under ten pounds at the time of circumcision. Lidocaine-prilocaine cream was utilized 15 min prior to circumcision as is routine in our practice. Each of these procedures were tolerated well without any complications. There was no increased bleeding noted either intra-operatively or post-operatively for any of these patients. Notably, none of these patients received oral vitamin K prophylaxis either in the setting of parental refusal of IM vitamin K.

Discussion

Despite widespread evidence demonstrating the potential benefits of IM vitamin K prophylaxis, parental refusal of IM vitamin K at birth has been increasing. As rates of refusal continue to increase, it is imperative to both understand the reasons behind parental refusal and potentially explore alternative measures for prophylaxis.

One recent study estimated the incidence of parental refusal of IM vitamin K to range from 0 % to 3.2 % in U.S. hospitals, up to 14.5 % in home births, and up to 31.0 % in birthing centers [4]. Extrapolating a 3.2 % refusal rate in the U.S. to an estimated six million annual live births yields 192,000 neonates without IM vitamin K prophylaxis and, by proxy, at increased risk of VKDB [4]. Cited reasons for parental refusal include concerns about harm from the injection, a preference for "natural" approaches, and belief in alternative prophylactic methods [4]. Concerns regarding harm from vitamin K prophylaxis likely stem from a 1990 study by Golding et al. in the *British Journal of Cancer,* which found an association between IM vitamin K administration and childhood cancer [27]. In 1992, a similar study reported that the incidence of childhood leukemia was significantly higher in children that had received IM vitamin K at birth [28]. Despite numerous subsequent studies in the 1990s and six major case-controlled studies in the 2000s disproving this association, some parents — and health professionals to some degree — still harbor these concerns [21,29—37].

Some parents and providers have explored alternative approaches to IM vitamin K prophylaxis in the setting of parental refusal, including both administering oral vitamin K prophylaxis and increasing the mother's own prenatal dietary vitamin K intake [38]. However, prenatal maternal vitamin K supplementation does not protect against VKDB due to poor placental transfer [22]. Though oral vitamin K prophylaxis has been shown to be inferior to IM vitamin K, it is perhaps better than no prophylaxis at all. In the setting of persistent parental refusal, oral vitamin K could serve as an intermediate measure to try to protect against VKDB.

Based on our review of the literature and current guidelines, it is our clear recommendation that routine IM vitamin K prophylaxis at birth continue to be the standard of care. In scenarios where parents refuse IM vitamin K prophylaxis at birth, pediatric urologists may consider performing neonatal circumcision either within 24 h of birth, at which point maternal vitamin K is still present in the neonate's circulatory system, or after day eight of life, when endogenous prothrombin concentration rebounds to

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its baseline peak. In either of these circumstances, we recommend oral vitamin K prophylaxis as an alternative, as we believe any method of delivering vitamin K to the neonate is beneficial, though it has been proven repeatedly that oral prophylaxis is inferior to IM prophylaxis. Although vitamin K is readily available at U.S. pharmacies by prescription, it needs to be compounded to a liquid suspension for delivery to neonates at a compounding pharmacy. We also believe that, given the increasing incidence of parental refusal of IM vitamin K prophylaxis at birth, the AUA's and other relevant professional organizations' guidelines should include formal recommendations regarding performing neonatal circumcisions in patients who did not receive vitamin K via consensus expert opinion. Further study into this topic, including the future development of randomized trials, is assuredly warranted.

Conclusion

Based on our comprehensive review of the current literature and professional organizations' guidelines, as well as our recent experience, it is our opinion that neonatal circumcision may be performed in certain situations without IM vitamin K prophylaxis.

Ethical approval

This study did not involve human participants or animal subjects, and therefore, ethical approval was not required. The study is based on a literature review and analysis of previously published cases and guidelines.

Declaration of Generative AI and AI-assisted technologies in the writing process

No generative AI was used in the writing of this manuscript.

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Conflict of interest

The authors declare no conflicts of interest related to this study. No financial or personal relationships with other individuals or organizations have influenced the work presented in this manuscript.

References

[1] Townsend CW. The haemorrhagic disease of the newborn. Arch Paediatr. Published online 1894:559—65. https://doi.org/10.1001/archpedi.1961.04020030105016.
[2] Vietti TJ, Murphy TP, James JA, Pritchard JA. Observations on the prophylactic use of vitamin K in the newborn infant. J Pediatr 1960;56(3):343—6. https://doi.org/10.1016/S0022-3476(60)80185-0.
[3] Sutherland JM. Hemorrhagic disease of the newborn. Am J Dis Child 1967;113(5):524. https://doi.org/10.1001/archpedi.1967.02090200056003.
[4] Loyal J, Shapiro ED. Refusal of intramuscular vitamin K by parents of newborns: a review. Hosp Pediatr 2020;10(3):286—94. https://doi.org/10.1542/hpeds.2019-0228.
[5] Newman P, Shearer MJ. Vitamin K metabolism. Subcell Biochem. Published online 1998:455—88. https://doi.org/10.1007/978-1-4899-1789-8_19.
[6] Stafford DW. The vitamin K cycle. J Thromb Haemostasis 2005;3(8):1873—8. https://doi.org/10.1111/j.1538-7836.2005.01419.x.
[7] Shearer MJ. Vitamin K metabolism and nutriture. Blood Rev 1992;6(2):92—104. https://doi.org/10.1016/0268-960X(92)90011-E.
[8] Takada T, Yamanashi Y, Konishi K, Yamamoto T, Toyoda Y, Masuo Y, et al. NPC1L1 is a key regulator of intestinal vitamin K absorption and a modulator of warfarin therapy. Sci Transl Med 2015;7(275). https://doi.org/10.1126/scitranslmed.3010329.
[9] Araki S, Shirahata A. Vitamin K deficiency bleeding in infancy. Nutrients 2020;12(3):780. https://doi.org/10.3390/nu12030780.
[10] Cornelissen M, von Kries R, Loughnan P, Schubiger G. Prevention of vitamin K deficiency bleeding: efficacy of different multiple oral dose schedules of vitamin K. Eur J Pediatr 1997;156(2):126—30. https://doi.org/10.1007/s004310050570.
[11] Majid A, Blackwell M, Broadbent RS, Parker DP, Al-Sallami HS, Edmonds L, et al. Newborn vitamin K prophylaxis: a historical perspective to understand modern barriers to uptake. Hosp Pediatr 2019;9(1):55—60. https://doi.org/10.1542/hpeds.2018-0104.
[12] Quick AJ, Grossman AM. Prothrombin concentration in newborn. Exp Biol Med 1939;41(1):227—8. https://doi.org/10.3181/00379727-41-10630P.
[13] Grossman BJ, Heyn RM, Rozenfeld IH. Coagulation studies in the newborn infant. Pediatrics 1952;9(2):182—91. https://doi.org/10.1542/peds.9.2.182.
[14] Sanford HN. IS adminIStration of vitamin K to the newborn of clinical value? JAMA, J Am Med Assoc 1942;118(9):697. https://doi.org/10.1001/jama.1942.02830090015004.
[15] Nielsen ST, Strandkjær N, Juul Rasmussen I, Hansen MK, Lytsen RM, Kamstrup PR, et al. Coagulation parameters in the newborn and infant - the Copenhagen Baby Heart and COMPARE studies. Clin Chem Lab Med 2021;60(2):261—70. https://doi.org/10.1515/cclm-2021-0967.
[16] Plank RM, Steinmetz T, Sokal DC, Shearer MJ, Data S. Vitamin K deficiency bleeding and early infant male circumcision in africa. Obstet Gynecol 2013;122(2):503—5. https://doi.org/10.1097/AOG.0b013e31828b2f5c.
[17] Avraham Steinberg. Encyclopedia of Jewish medical Ethics, vol. 1. Feldheim Publishers; 2003.
[18] El Bcheraoui C, Zhang X, Cooper CS, Rose CE, Kilmarx PH, Chen RT. Rates of adverse events associated with male circumcision in US medical settings, 2001 to 2010. JAMA Pediatr 2014;168(7):625. https://doi.org/10.1001/jamapediatrics.2013.5414.
[19] Aballi AJ, de Lamerens S. Coagulation changes in the neonatal period and in early infancy. Pediatr Clin 1962;9(3):785—817. https://doi.org/10.1016/S0031-3955(16)31311-6.
[20] Fukushima S, Tanaka T, Sato T, Shirakawa Y, Asayama K, Shirahata A. Prothrombin levels in newborn infants by the carinactivase-1 method. Semin Thromb Hemost 2002;28(6):539—44. https://doi.org/10.1055/s-2002-36698.
[21] Cheng JH, Loyal J, Wood KE, Kair LR. Oral vitamin K prophylaxis in newborns: a survey of clinician opinions and practices. Hosp Pediatr 2020;10(2):153—8. https://doi.org/10.1542/hpeds.2019-0219.

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[22] Fiesack S, Smits A, Rayyan M, Allegaert K, Alliet P, Arts W, et al. Belgian consensus recommendations to prevent vitamin K deficiency bleeding in the term and preterm infant. Nutrients 2021;13(11):4109. https://doi.org/10.3390/nu13114109.
[23] Hand I, Noble L, Abrams SA. Vitamin K and the newborn infant. Pediatrics 2022;149(3). https://doi.org/10.1542/peds.2021-056036.
[24] Ng E, Loewy AD. Position statement: guidelines for vitamin K prophylaxis in newborns: a joint statement of the Canadian paediatric society and the college of family physicians of Canada. Can Fam Physician 2018;64(10):736–9.
[25] von Kries R, Göbel U. Vitamin K prophylaxis and vitamin K deficiency bleeding (VKDB) in early infancy. Acta Paediatr 1992;81(9):655–7. https://doi.org/10.1111/j.1651-2227.1992.tb12326.x.
[26] McNinch AW, Tripp JH. Haemorrhagic disease of the newborn in the British Isles: two year prospective study. BMJ 1991;303(6810):1105–9. https://doi.org/10.1136/bmj.303.6810.1105.
[27] Golding J, Paterson M, Kinlen L. Factors associated with childhood cancer in a national cohort study. Br J Cancer 1990;62(2):304–8. https://doi.org/10.1038/bjc.1990.283.
[28] Golding J, Greenwood R, Birmingham K, Mott M. Childhood cancer, intramuscular vitamin K, and pethidine given during labour. BMJ 1992;305(6849):341–6. https://doi.org/10.1136/bmj.305.6849.341.
[29] Klebanoff MA, Read JS, Mills JL, Shiono PH. The risk of childhood cancer after neonatal exposure to vitamin K. N Engl J Med 1993;329(13):905–8. https://doi.org/10.1056/NEJM199309233291301.
[30] Olsen JH, Hertz H, Blinkenberg K, Verder H. Vitamin K regimens and incidence of childhood cancer in Denmark. BMJ 1994;308(6933):895–6. https://doi.org/10.1136/bmj.308.6933.895.
[31] Ansell P, Bull D, Roman E. Childhood leukaemia and intramuscular vitamin K: findings from a case-control study. BMJ 1996;313(7051):204–5. https://doi.org/10.1136/bmj.313.7051.204.
[32] von Kries R, Gobel U, Hachmeister A, Kaletsch U, Michaelis J. Vitamin K and childhood cancer: a population based case-control study in Lower Saxony, Germany. BMJ 1996;313(7051):199–203. https://doi.org/10.1136/bmj.313.7051.199.
[33] Roman E, Ansell P, Bull D. Leukaemia and non-Hodgkin's lymphoma in children and young adults: are prenatal and neonatal factors important determinants of disease? Br J Cancer 1997;76(3):406–15. https://doi.org/10.1038/bjc.1997.399.
[34] McKinney PA, Juszczak E, Findlay E, Smith K. Case-control study of childhood leukaemia and cancer in Scotland: findings for neonatal intramuscular vitamin K. BMJ 1998;316(7126):173–7. https://doi.org/10.1136/bmj.316.7126.173.
[35] Passmore SJ, Draper G, Brownbill P, Kroll M. Case-control studies of relation between childhood cancer and neonatal vitamin K administration. BMJ 1998;316(7126):178–84. https://doi.org/10.1136/bmj.316.7126.178.
[36] Roman E, Fear NT, Ansell P, Bull D, Draper G, McKinney P, et al. Vitamin K and childhood cancer: analysis of individual patient data from six case–control studies. Br J Cancer 2002;86(1):63–9. https://doi.org/10.1038/sj.bjc.6600007.
[37] Fear NT, Roman E, Ansell P, Simpson J, Day N, Eden OB. Vitamin K and childhood cancer: a report from the United Kingdom childhood cancer study. Br J Cancer 2003;89(7):1228–31. https://doi.org/10.1038/sj.bjc.6601278.
[38] Loyal J, Weiss TR, Cheng JH, Kair LR, Colson E. Refusal of vitamin K by parents of newborns: a qualitative study. Acad Pediatr 2019;19(7):793–800. https://doi.org/10.1016/j.acap.2019.04.003.

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