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## References

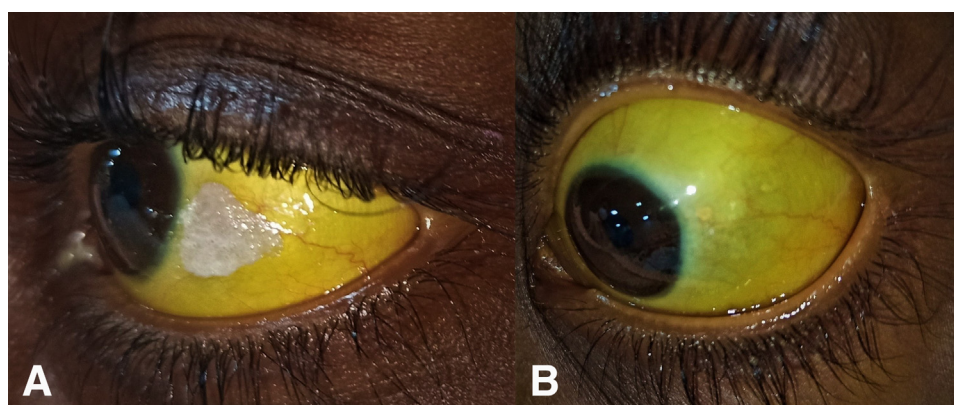
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## Bitot's Spots and a Bilirubin Ring



**A** 16-year-old girl presented with intermittent fever, progressively deepening jaundice for the last 6 weeks, and hematemesis. She presented in grade III hepatic encephalopathy. Eye examination showed Bitot's spots (foamy white triangular lesion on temporal conjunctiva) and a bilirubin ring (yellowish green circumferential hue) or pseudo Kayser-Fleischer (KF) ring at the corneoscleral junction (**Figure, A**). Magnetic resonance cholangiography showed fusiform dilatation of the extrahepatic biliary system suggestive of type I choledochal cyst. Esophagogastroduodenoscopy showed large esophageal varices requiring band ligation. She was stabilized with conservative management and wait-listed for liver transplantation. Bitot's spots disappeared within 1 week of administering vitamin A (**Figure, B**).

Bitot's spots represent an early stage of xerophthalmia. Though most commonly seen in the temporal conjunctiva, nasally situated lesions are more reliable signs of active vitamin A deficiency. In addition, these lesions are more common in children than adults. The deposit can be extensive, progressing from the conjunctiva to the cornea in advanced stages. Histologically, Bitot's spots represent keratin admixed with saprophytic bacteria or fungi. *Corynebacterium xerosis*, a gas-forming organism, is responsible for the typical "foamy" appearance. Scraping of Bitot's spots leaves an underlying xerotic base and recurs in a few days if untreated.<sup>1</sup> In liver diseases, the reasons for vitamin A deficiency are undernutrition (dietary carotenoids and fats), deficient intraluminal bile acids for micelle formation, and reduced



**Figure.** **A**, Bitot's spots on the temporal conjunctiva, bilirubin ring, and icterus at admission. **B**, Resolution of Bitot's spots (after vitamin A supplementation) with persistence of bilirubin ring and icterus after 1 week.

absorptive surface because of enteropathy. The liver stores vitamin A (retinoyl palmitate) in the cytoplasmic droplets of stellate cells (of Ito). With liver fibrosis, when stellate cells are transformed into myofibroblast-like cells, the vitamin A pool is lost. Once high dose vitamin A is supplemented, in approximately 1-2 weeks keratinisation is replaced by normal epithelial tissue. In young children, rapid disappearance of corneal and conjunctival lesions is seen in 73%-95% by 2 weeks.<sup>2,3</sup> Retinal changes of vitamin A take longer to respond, with night blindness and dark adaptation persisting for up to 4 weeks.<sup>4</sup>

Bilirubin or bile pigment rings are seen in individuals with severe cholestasis and are often mistaken as KF rings in naked eye examination. KF rings appear in superior or inferior limbus, are golden brown in color, granular in texture, and seen in the Descement layer of cornea (on slit-lamp). In contrast, bilirubin rings are circumferential, yellowish-green, homogenous in texture, and are seen in the peripheral stroma of cornea.<sup>5</sup> ■

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