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“Fish-scales” and graft nephrectomy: unexpected findings at an unusual site

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ABSTRACT

Background: Kayexalate and sevelamer are resin medications commonly used in the setting of chronic renal failure for the treatment of hyperkalemia and hyperphosphatemia respectively, are known to cause bowel ischemia, ulcerations, necrosis, pseudotumors and perforations and the incidence is higher after post-transplant. Herein we report its presence on the surface of a graft nephrectomy following a masked intestinal perforation.

Case Presentation: A 30-year-old male, a renal transplant recipient for dysplastic kidney underwent graft nephrectomy due to wound infection, peri-graft collection and risk of hemorrhage from the vascular anastomotic site. Histological evaluation showed extensive acute tubular necrosis and peri-renal abscess with vegetable matter and numerous colored crystals morphologically consistent with kayexalate and sevelamer. The possibility of an underlying resin induced intestinal perforation was rendered.

Conclusions: Kayexalate or sevelamer induced mucosal injury in the gastrointestinal tract could be a clinical emergency and a high index of suspicion particularly in a post-transplant setting may allow prompt recognition and surgical cure. From the pathologists' view familiarity with the morphological appearances of these non-systemic resin medications and its histologic mimics enables accurate diagnosis and timely clinical intervention.

Implication for health policy/practice/research/medical education:

Resin medications (Kayexalate and sevelamer), commonly used in the setting of chronic renal failure are known to cause gastrointestinal mucosal damage. The incidence of which is higher in a post-transplant setting. A high level of clinical suspicion allows prompt recognition of these complications. From the pathologists' view, familiarity with the different morphological appearances of these non-systemic resin medications and its histologic mimics enables proper identification in biopsy samples and timely clinical intervention. Correlation with patient history is mandatory.

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1. Introduction

Resins are non-absorbable medications that facilitate ion exchange, commonly used in the setting of chronic renal failure. They are known to cause gastrointestinal mucosal injury sometimes with fatal complications following their oral or rectal administration. These resin medications exhibit characteristic morphological and tinctorial features on routine hematoxylin and eosin (H&E) stain and special stains. Herein we report the presence of these resin crystals on the surface of a graft nephrectomy following a masked intestinal perforation.

2. Case Presentation

A 30-year-old male, a renal transplant recipient for dysplastic kidney underwent graft nephrectomy due to wound infection, peri-graft collection and risk of hemorrhage from the vascular anastomotic site. The pathology department received a 218 gm nephrectomy measuring 10 × 7 × 5 cm, the outer surface of which was ragged and covered with exudates. Sectioning revealed renal parenchyma with preserved cortico - medullary differentiation and multiple cysts in the cortex, largest measuring 1.5 cm in diameter. The stump of hilar vessels were unremarkable. Histological

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examination revealed viable unremarkable glomeruli and extensive acute tubular necrosis. The tubulointerstitium showed no significant chronic damage. There was no evidence of tubulitis or viral inclusions. C4d immunostaining was negative in the peritubular capillaries. Sections from the peri-renal area showed suppurative inflammation, necrosis admixed with numerous colored crystals (Figure 1A). The crystals were of two types; purplish angulated crystals displaying narrowed fish-scale pattern (Figure 1B, arrow) and crystals with a 2-toned color imparted by bright pink linear accentuations with a rusty yellow background displaying broad curved irregularly shaped fish-scales (Figure 1B, arrowhead). The purplish crystals acquired a magenta color on periodic acid-Schiff staining with diastase (PAS/D) and black color on acid fast bacillus (AFB) stain (Figure 1C, arrow) while the other acquired a magenta color on AFB stain (Figure 1C, arrowhead). Vegetable/plant matter were identified in some of the sections (Figure 1D). The morphological features were in keeping with that of Kayexalate and sevelamer crystals. The only possible explanation to the presence of these crystals and the vegetable matter on the surface of an otherwise healthy graft kidney was an underlying masked intestinal perforation and peritonitis which was identified as colonic in origin on imaging studies. No further surgical intervention was possible as the patient went into septic shock. The use of these medications in this patient was confirmed.

3. Discussion

Kayexalate (sodium polystyrene sulfonate in sorbitol) and sevelamer (Renagel, Revela) are resin medications commonly used in the setting of chronic renal failure for the treatment of hyperkalemia and hyperphosphatemia respectively, are known to cause bowel ischemia, ulcerations, necrosis pseudotumors and perforations and the incidence is higher after post-transplant (1-4). These being administered orally or as enema are usually seen in gastrointestinal mucosal biopsies with characteristic morphologic appearances. Kayexalate crystals display mosaic pattern of rectangular shaped “fish-scales” with perpendicular points of intersection, are purple on hematoxylin & eosin (H&E), turn magenta on PAS/D and stain black with acid-fast stains (1,3,5). Sevelamer crystals are non-polarizable with broad, curved, and irregularly spaced “fish-scales” and display a 2-toned color imparted by bright pink linear accentuations and a rusty yellow background. They acquire magenta color on AFB stain and a violet color on PAS/D and maintain their internal structure (4).

Fish-scale patterns can be produced by gall bladder

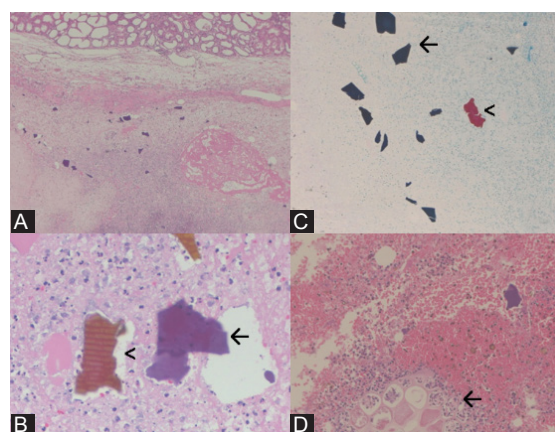


Figure 1. (A) Histological sections show renal tissue and perirenal abscess with crystals (x50, H&E staining). (B) Higher magnification shows 2 types of crystals- purplish angulated crystals (arrow) and crystals with a 2-toned color imparted by bright pink linear accentuations with a rusty yellow background (arrowhead) (x200, H&E staining). (C) Acid-fast bacillus stain shows black colored kayexalate crystals (arrow) and magenta colored sevelamer crystals (arrowhead). (D) Vegetable matter/plant matter identified in the perirenal abscess (x400, H&E staining).

calculi, dystrophic calcifications, food particles, large bile acid sequestrant fragments and specimen ink (5). Cruising the entire slide for definite features of the crystals elsewhere, supported by ancillary special stains such as acid fast –bacillus stain and PAS/D is helpful in circumventing these issues although the latter stain is reported to be inconsistent. Review of the medication history is imperative in the definite diagnosis.

Histologically, these crystals should be differentiated from crystals of cholestyramine and vegetable matter. Cholestyramine is a bile acid sequestrant that is used to treat hyperlipidemia. These crystals are bright orange-red on H&E, variably gray or hot pink on PAS/D, rhomboid in shape, lacks internal “fish-scales,” and is unassociated with mucosal injury. Plant or vegetable matter, commonly encountered in gastrointestinal biopsies can also resemble fish-scales but are more rectangular and often resemble “window panes.” In addition, vegetable material do not show any tinctorial qualities.

4. Conclusions

Kayexalate or sevelamer induced mucosal injury could be a clinical emergency so pathologists need to be familiar with the morphological appearances of these non-systemic resin medications and its histologic mimics. Correlation with patient history is mandatory.

Authors' contribution

Authors contributed to the manuscript equally.

Conflicts of interest

The authors declare that they have no conflicting interest.

Ethical considerations

Informed consent was obtained from the patient for publication as a case report.

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