

Content available at: <https://www.ipinnovative.com/open-access-journals>

Indian Journal of Pathology and Oncology

Journal homepage: www.ijpo.co.in

Case Report

Crystal associated colitis

Uttara Krishna Aloorker^{1*}, Meenakshi Swain¹, Tejal Modi¹

¹Dept. of Pathology, Apollo Hospital, Hyderabad, Telangana, India



ARTICLE INFO

Article history:

Received 15-02-2024

Accepted 11-03-2024

Available online 17*-04-2024

Keywords:

Crystalassociated colitis

Kayexalate

Sorbitol

ABSTRACT

Cation exchange resins such as sodium polystyrene sulfonate (Kayexalate) are used to treat life threatening hyperkalaemia caused due to electrolyte imbalances. These are usually administered as an enema, orally or via nasogastric tube along with a hypertonic mixture of sorbitol to prevent constipation. Although effective, it might lead to development of rare, but serious consequences involving the gastrointestinal tract. There is a need for awareness of the rare potential adverse effects associated with its widespread use. Here, we report 2 cases of colitis induced by the administration of sodium polystyrene sulfonate which were evidenced by luminal and impacted/adherent crystals of kayexalate causing mucosal injury.

This is an Open Access (OA) journal, and articles are distributed under the terms of the [Creative Commons Attribution-NonCommercial-ShareAlike 4.0 License](https://creativecommons.org/licenses/by-nc-sa/4.0/), which allows others to remix, tweak, and build upon the work non-commercially, as long as appropriate credit is given and the new creations are licensed under the identical terms.

For reprints contact: reprint@ipinnovative.com

1. Introduction

Kayexalate, an ion exchange resin used along with sorbitol to treat hyperkalaemia which may crystallize in the gastrointestinal tract leading to ischemia, ulceration and erosions. Colon is the most commonly involved site.¹ These crystals are luminal or adherent to intact surface epithelium or mixed with an inflammatory infiltrate at the site of ulcer or erosion.² Since the associated adverse effects are linked to fatality, this should be treated as a medical emergency. We report 2 such cases with kayexalate-induced mucosal damage in the gastrointestinal tract who responded positively after discontinuation of the causative medication.

2. Case Report

A 64-year old, male patient presented with non-specific abdominal pain. Lower gastrointestinal endoscopy was performed to evaluate the mucosa. It revealed multiple colonic erosions. These sites were biopsied. Histopathological examination showed microscopic

findings of colitis and ulceration with associated crystals having fish scale-like appearance (Figure 1). Later, after detailed review of the history, it was found that the elderly patient had chronic renal failure who was treated with sodium polystyrene sulfonate (Kayexalate) for hyperkalaemia caused due to electrolyte imbalance.

In another case, a resected segment of colon from a child with Hirschsprung's disease was referred for histopathological examination which revealed similar crystals associated with the ulcerated mucosa (Figure 2 A, B, C). This patient had a history of administration of enema for constipation.

Correlating HE, AFB, PAS and alcian blue staining with the history, the mucosal damage in both the cases was found to be associated with sodium polystyrene sulfonate (Kayexalate) due to sorbitol administration and enema.

These patients, on follow up, showed significant improvement and eventually recovered completely after the withdrawal of the causative agent.

* Corresponding author.

E-mail address: uttaraalooraker@yahoo.in (U. K. Aloorker).

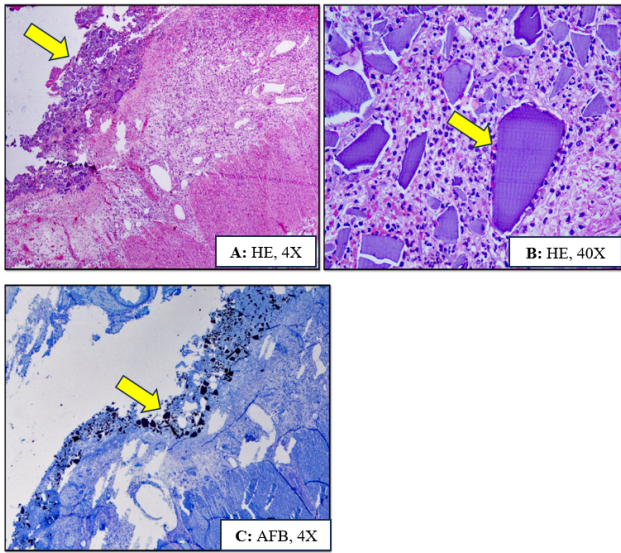


Figure 1: Photomicrographs showing colonic biopsies with features of colitis associated with kayexalate crystals (marked by arrows)

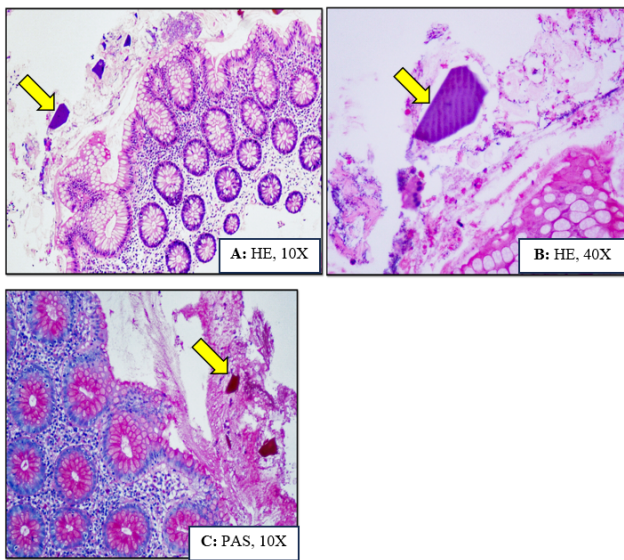


Figure 2: Photomicrographs showing microscopic features of colitis associated with kayexalate crystals in a resected segment of colon (marked by arrows)

3. Discussion

Resins are nonabsorbable medications that are used to treat conditions such as hyperkalaemia (Kayexalate), hyperphosphatemia (Sevelamer) and elevated bile acids (Cholestyramine) and are commonly referred to as medication crystals. These work via exchange of ions as they course through the gastrointestinal tract.

Sodium polystyrene sulfonate (Kayexalate) is a Food and Drug Administration (FDA) approved medication for

management of hyperkalaemia. It is administered orally or via rectal route. This polymer is designed to exchange sodium ions against potassium ions from the intestinal cells which, then is eliminated from the body in stool. After administration, it should be retained within the colon for 30 to 60 minutes and should be followed by irrigation to remove the residual resin.³

In 2009, FDA warned against the use of Kayexalate sorbitol due to its adverse GI side effects.^{4,5}

These include small bowel and colorectal necrosis, intestinal ulcers, ischaemia, thrombosis and even perforation.^{6,7} Many have questioned the association of sodium polystyrene sulfonate and adverse gastrointestinal effects in absence of sorbitol. However, in recent times, reports do mention about the possible toxic effects of kayexalate alone.¹

Identification of these resins on histopathological sections is a challenge, more so since there is a morphological overlap between the various types of resins. Kayexalate crystals are rectangular with internal narrow, regular creases or strokes resembling “fish scales”; also termed as “mosaic pattern”.⁸ These crystals are purple on haematoxylin-eosin staining (Figure 1 A, B and Figure 2 A, B), black on AFB (Figure 1 C) and magenta coloured on PAS staining (Figure 2 C) as seen in our cases. These crystals concentrate around the ulcerated mucosa or are embedded within it with associated inflammation and necrosis.^{8,9} Other resin crystals simulating kayexalate crystals are of Sevelamer and bile acid sequestrants which have their own characteristic morphologies.⁸ The Sevelamer crystals are deep eosinophilic, broad, curved with “irregularly spaced” fish-scales. Also, these stain magenta on AFB and appear two-toned on PAS-D (pink linear accentuations over a rusty yellow background). In contrast to these, the bile acid sequestrants (Cholestyramine) crystals are glassy, smooth, bright orange to pink and lack the fish scale appearance on HE. They are neon green on AFB, grey or sometimes bright pink on PAS-D.¹⁰ Bisphosphonates which are used to prevent bone resorption may sometimes lead to crystal deposition in the GI mucosa, where the crystals are non-polarizable and are associated with non-specific histological findings.¹⁰

This case report highlights kayexalate as a cause of lower gastrointestinal mucosal injury. The abdominal symptoms are vague in crystal associated colitis and recognition of kayexalate crystals in histologic sections is challenging without a proper medical history. Ancillary staining can come handy along with proper patient history for accurate recognition and timely diagnosis. Finding these crystals on endoscopic biopsies marks the sorbitol induced mucosal damage and thus may aid in establishing the correct diagnosis in scenarios where we encounter clinically and endoscopically misleading signs and symptoms.

4. Source of Funding

None.

5. Conflict of Interest

Authors declare no conflict of interest.

References

- Harel Z, Harel S, Shah PS, Wald R, Perl J, Bell CM. Gastrointestinal adverse events with sodium polystyrene sulfonate (Kayexalate) use: a systematic review. *Am J Med.* 2013;126(3):264.
- Mcgowan CE, Saha S, Chu G, Resnick MB, Moss SF. Intestinal necrosis due to sodium polystyrene sulfonate (Kayexalate) in sorbitol. *South Med J.* 2009;102(5):493–7.
- Lehnhardt A, Kemper MJ. Pathogenesis, diagnosis and management of hyperkalemia. *Pediatr Nephrol.* 2011;26(3):377–84.
- Margassery S, Bastani B. Life threatening hyperkalemia and acidosis secondary to trimethoprim-sulfamethoxazole treatment. *J Nephrol.* 2001;14(5):410–4.
- Weir MR, Rolfe M. Potassium homeostasis and renin-angiotensin-aldosterone system inhibitors. *Clin J Am Soc Nephrol.* 2010;5(3):531–48.
- Hsu CF, Tsung SH. Kayexalate or Kalimate crystals: are they the culprits or the bystanders? *Open J Gastroenterol Hepatol.* 2020;8(1):28.
- Watson MA, Baker TP, Nguyen A, Sebastianelli ME, Stewart HL, Oliver DK, et al. Association of prescription of oral sodium polystyrene sulfonate with sorbitol in an inpatient setting with colonic necrosis: a retrospective cohort study. *Am J Kidney Dis.* 2012;60(3):409–16.
- Gonzalez RS, Lagana SM, Szeto O, Arnold CA. Challenges in diagnosing medication resins in surgical pathology specimens: a crystal-clear review guide. *Arch Pathol Lab Med.* 2017;141(9):1276–82.
- Lillemoie KD, Romolo JL, Hamilton SR, Pennington LR, Burdick JF, Williams GM. Intestinal necrosis due to sodium polystyrene (Kayexalate) in sorbitol enemas: clinical and experimental support for the hypothesis. *Surgery.* 1987;101(3):267–72.
- Arnold C, Lam-Himlin D, Montgomery EA. Lippincott Williams & Wilkins. 2018.

Author biography

Uttara Krishna Aloorker, PG Student

Meenakshi Swain, Senior Consultant

Tejal Modi, Senior Consultant

Cite this article: Aloorker UK, Swain M, Modi T. Crystal associated colitis. *Indian J Pathol Oncol* 2024;11(1):84-86.