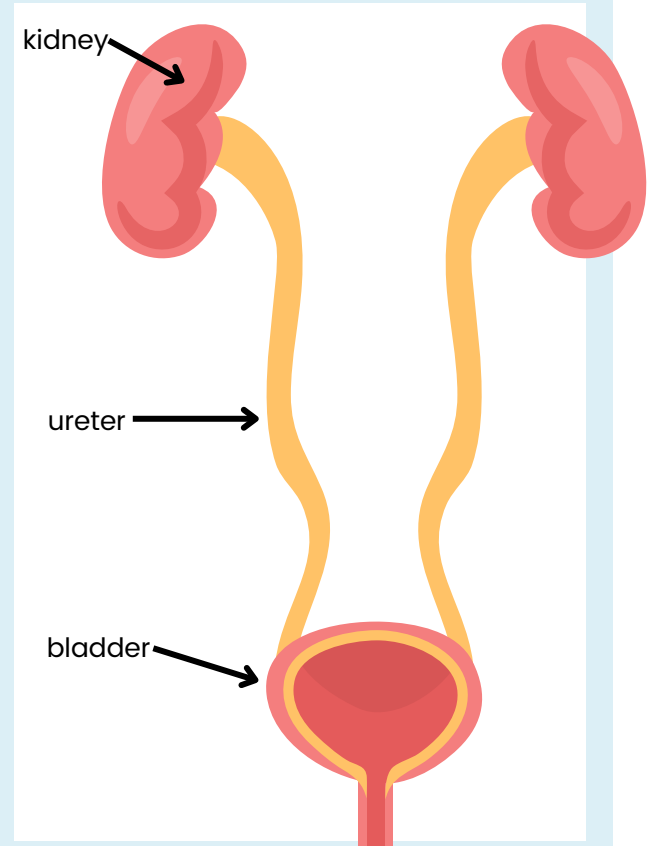


Overview

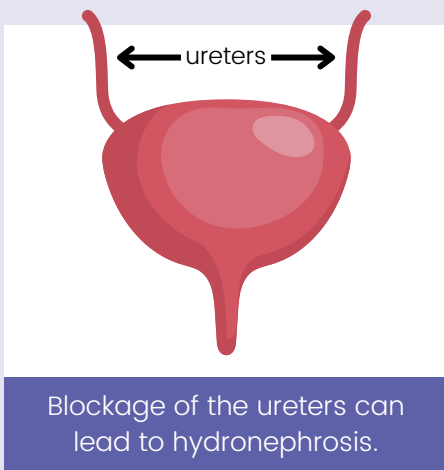
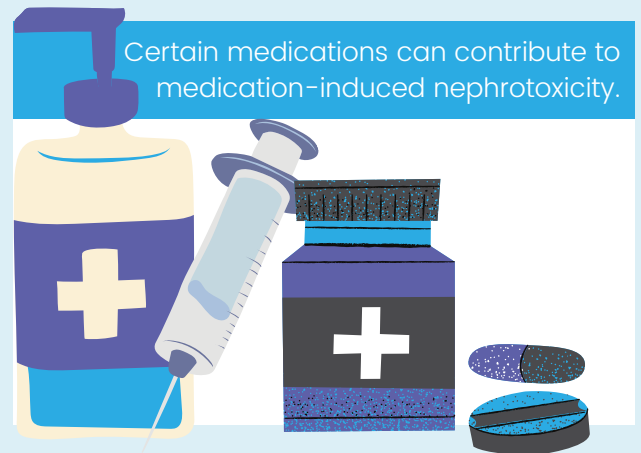
The kidneys are responsible for filtering blood in the body and maintaining appropriate fluid balance in the blood. When blood is filtered through the kidneys, it becomes concentrated into urine which then passes through the ureters to the bladder where it can be expelled. Problems with the filtration mechanism of the kidneys or blockage of the ureters can lead to impaired kidney function and subsequent health concerns.

Individuals with IBD and ostomies may be predisposed to particular kidney (also sometimes referred to as renal or nephrological) manifestations due to malabsorption, dehydration or use of certain medications. Listed below are some of the most common kidney conditions associated with IBD and ostomies:



- **Nephrolithiasis (kidney stones):** Kidney stones are hard deposits of minerals and salts that can stick together when the urine becomes concentrated. These deposits can then travel through the urinary tract from the kidney causing pain during their movement. This pain is typically one-sided, felt in the back or abdomen and can be quite painful. Kidney stones are the most common renal manifestation of IBD and are more common in those with ileal malabsorption or resection (Malik).
- **Glomerulonephritis:** The glomerulus is a structure of the kidney which filters the blood. Once blood is filtered through the glomerulus, the remaining fluid travels through tubules of the kidney where it is concentrated into urine. In glomerulonephritis, this filtering mechanism becomes inflamed leading to impaired filtration and the subsequent buildup of toxins, metabolic waste and fluid in the body.
- **Tubulointerstitial nephritis:** In tubulointerstitial nephritis, the tubules of the kidney that help to concentrate urine as well as the surrounding kidney tissue (interstitial tissue) become inflamed. This inflammation impairs kidney function and can lead to buildup of toxins, metabolic waste and fluid in the body.

- **Renal amyloidosis:** Renal amyloidosis is an incredibly rare renal manifestation of IBD in which a protein, called amyloid, builds up and deposits within the kidney tissue. These amyloid deposits can impair kidney function and ultimately lead to kidney failure.
- **Medication-induced nephrotoxicity:** Certain medications utilized in treatment of IBD may contribute to damage of the kidney over time.



- **Hydronephrosis:** The ureter is a small tube connecting the kidney to the bladder. The ureters (there are two - one for each kidney) allow for urine concentrated by the kidney to travel to the bladder. In hydronephrosis, this passageway somehow becomes obstructed leading to reduced flow and backup of fluid into the kidney. This manifestation is more common in Crohn's patients and more likely to present on the right side. The ilium is closest to the right kidney and inflammatory activity can cause the ilium to press against the ureter impeding flow (Angelberger).

Causes and Risk Factors in the General Population

- **Drug allergy:** The most common cause of acute tubulointerstitial nephritis is an allergic reaction to a certain medication option. NSAIDs in particular are associated with acute tubulointerstitial nephritis; however, other medication options, such as certain antibiotics, can be associated with tubulointerstitial nephritis as well (Finnigan).
- **Genetics:** Individuals with a family history of kidney complications are at an elevated risk of kidney issues themselves.
- **Hypercalcemia:** Elevated levels of calcium in the blood, also called hypercalcemia, can elevate risk of kidney damage as well as development of kidney stones. Excess calcium can either impact the kidneys directly or accumulate into deposits of calcium forming kidney stones.



Causes and Risk Factors in the General Population (continued...)

- **Urinary tract infections:** In severe cases, urinary tract infections may ascend from the urethra/bladder into the kidneys. This can cause inflammation within structures of the kidney leading to damage as well as elevate risk of hydronephrosis due to ureter obstruction.

Causes and Risk Factors in IBD/Ostomy Patients

- **Certain medications:** Particular medication options utilized in treatment of IBD have been associated with nephrotoxicity. Aminosalicylates, tacrolimus, cyclosporine and anti-TNF agents may contribute to kidney damage in certain individuals – it is important to note that this risk is quite low and with regular lab work, any issues should be quickly identified and resolved upon ceasing medication use (Oikonomou). As always, reach out to a healthcare provider prior to changing a medication regimen.
- **Chronic inflammation:** Chronic inflammation specifically from IBD has been associated with increased risk of certain kidney manifestations. In one study, individuals with IBD were found to have a higher incidence of IgA nephropathy than those without IBD. In IgA nephropathy, immune complexes called immunoglobulins adhere to the kidney causing damage. There is thought that inflammation of the gastrointestinal mucosa nephropathy may be interlinked through some complex reaction. Likewise, other kidney manifestations could be influenced by gastrointestinal inflammation as well (Corica).
- **Dehydration:** IBD and ostomies can lead to dehydration which can then contribute to certain kidney issues (particularly kidney stones). In IBD, frequent and/or watery diarrhea can lead to significant water loss. Those with colostomies are at heightened risk of dehydration as the colon is largely responsible for uptake of water – in removing the colon, this ability is disrupted. Individuals with ileostomies will experience output with a higher amount of water than regular stool. Having high output with an ileostomy can also elevate risk of dehydration. Individuals with short bowel syndrome due to multiple bowel resections and/or an ostomy will be at heightened risk of dehydration due to poor water uptake by the intestine.
- **Malabsorption:** Individuals with Crohn's disease of the small intestine may have poor absorption of fat which can then contribute to formation of kidney stones (the mechanism of this is described in detail in the bullet point below). In addition, dehydration can heighten the risk of kidney stone formation as well.

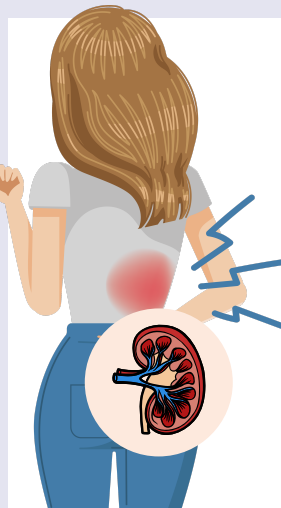


Causes and Risk Factors in IBD/Ostomy Patients (continued...)

- **Small bowel resection:** Individuals with small bowel resection are at an elevated risk of developing kidney stones – particularly kidney stones made of calcium oxalate. Although further research is needed to identify an exact cause, current thought is that small bowel resection leads to fat malabsorption. This unabsorbed fat can then bind to calcium rather than oxalate leading to elevated oxalate levels in the colon. Oxalate leaves the colon and travels to the kidneys where it can then be involved in kidney stone formation (Tseng).

Signs and Symptoms

Signs and symptoms of renal manifestations associated with IBD and ostomies can vary dependent upon the specific condition. When it comes to kidney stones, many individuals describe a severe, sharp, one-sided pain localized to the lower back. Kidney conditions associated with impaired filtration of the kidneys (e.g. glomerulonephritis or tubulointerstitial nephritis) can lead to an elevated blood pressure, swelling, decreased urine output and protein or blood in the urine (may make urine appear darker in color). Hydronephrosis can present similarly to that of kidney stones as far as a one-sided, sharp pain. Depending on the severity of hydronephrosis (how much the ureter is being constricted) and the size of the kidney stone, elevated blood pressure, swelling, decreased urine output and protein/blood in the urine may also be noted.



Kidney pain is often described as a sharp, one-sided pain felt in the mid-to-lower back. This is particularly the case with kidney stones. In certain cases, kidney pain may be felt on both sides or feel more like a dull, achy pain depending upon the specific condition.

In more severe cases, kidney conditions may lead to elevated blood pressure, swelling, decreased urine output and protein/blood in the urine.



1
elevated
blood
pressure



2
swelling



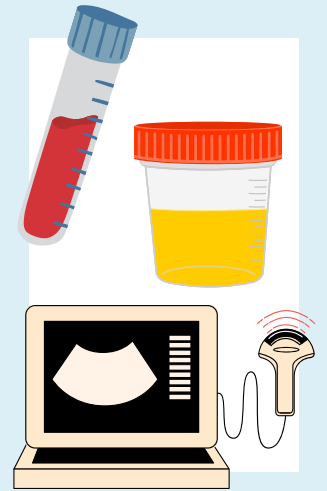
3
decreased
urine
output



4
blood/
protein in
the urine

Diagnosis

When diagnosing kidney conditions associated with IBD and/or ostomies, your healthcare provider will likely start by taking your medical history and performing a physical examination. You may be sent to do bloodwork in order to evaluate kidney function in addition to a urinalysis and urine culture to assess for infection, stones and/or blockage. Imaging of the kidneys may also be utilized and could include an ultrasound or a specialized x-ray using an injected dye to visualize the urinary tract. In certain cases, a kidney biopsy may be taken in which tissue is removed from the kidney to be evaluated under a microscope.



Treatment

The course of treatment for kidney manifestations due to IBD and/or ostomies will be highly dependent upon the specific condition experienced. Regardless of the kidney manifestation, management of IBD and ostomies can help reduce risk and disease burden. This is especially true in renal amyloidosis due to chronic inflammation in which the main treatment protocol involves easing inflammation through medication options already utilized in IBD treatment. Staying on top of your treatment plan and regularly meeting with your gastroenterologist can help to prevent extraintestinal manifestations.

Kidney stone treatment will be based on the size of the stone and whether or not it is passable. For small stones, you will likely be recommended to increase water intake in order to help flush the stone down the ureters and into the bladder where it can be passed through the urine. You may also be given pain relievers to aid with discomfort while passing the stone as well as alpha blockers in certain cases to help relax the muscles of the ureter aiding in passing the stone quickly. Larger kidney stones may require further treatment measures. Common options utilized in these cases are extracorporeal shock wave lithotripsy (ESWL) and percutaneous nephrolithotomy/nephrolithotripsy. In ESWL, strong vibrations are directed at the kidney for 45 to 60 minutes to break the stone into smaller pieces allowing it to pass. If ESWL does not work, percutaneous nephrolithotomy/nephrolithotripsy may be utilized. Nephrolithotomy is a surgical procedure involving a small excision in the back in which an instrument can be placed to remove the stone. Nephrolithotripsy is similar to nephrolithotomy except that in nephrolithotripsy, the stone is broken into smaller pieces prior to removal.



Treatment (continued...)

Treatment of glomerulonephritis and tubulointerstitial nephritis will vary depending upon the causative agent of inflammation. In mild cases, formalized treatment may not be required. In more severe cases, corticosteroids may be utilized short-term to manage inflammation. For those with swelling, diuretics (sometimes called water pills) can be utilized to remove water and sodium helping to reduce swelling. For those with high blood pressure, which can contribute to kidney conditions like glomerulonephritis and tubulointerstitial nephritis, certain lifestyle modifications and medication options may be recommended. In particular, individuals may be advised to minimize red meat and salt in addition to taking angiotensin-converting enzyme (ACE) inhibitors or angiotensin II blockers.

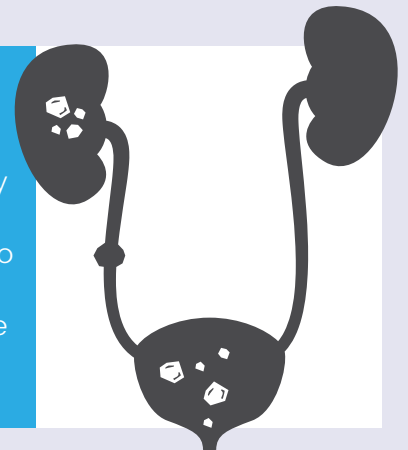
Medication-induced nephrotoxicity should be monitored through regular lab work. If your gastroenterologist identifies signs of abnormal kidney function, they may follow up with more testing as outlined in the diagnosis section. If kidney function is determined to be impaired, prompt discontinuation of the medication may be advised to prevent further damage to the kidneys. As always, never discontinue or switch medication options without consulting with your healthcare provider first.

Treatment of hydronephrosis will vary based upon severity. In mild to moderate cases, your healthcare provider may recommend no treatment unless the condition progresses. In severe cases or cases where ureter obstruction is causing reflux of fluid back into the kidney, surgery may be required to prevent further damage to the kidneys. With Crohn's disease specifically, hydronephrosis can occur when the ileum presses upon the ureter leading to obstruction. In this case, a stent may be placed to drain the urine from the kidney, while steroids and immunosuppressants are utilized to calm the IBD flare and subsequently remove pressure from the ureter. If this approach does not work, removal of the bowel section obstructing the ureter may be necessary (Jansen).

Treatment of kidney conditions varies vastly dependent upon the specific kidney complication. For this reason, it is important to consult with a trusted healthcare provider if you have any concerns.



If you have a kidney stone, you may be told to "catch" your kidney stone when urinating in order to later test the composition of the stone for future prevention.



Prevention

As with most extraintestinal manifestations associated with IBD and ostomy, management of inflammation is crucial in preventing the development of associated extraintestinal conditions. Regularly meeting with your gastroenterologist and staying on top of treatment plans can help with this. With renal manifestations associated with IBD and ostomies, there is debate over whether these manifestations are induced by chronic inflammation from underlying disease or the treatment options utilized in management. With this being said, regardless of whether your disease is active or in remission, it is crucial to get regular lab work done to assess for any abnormalities.

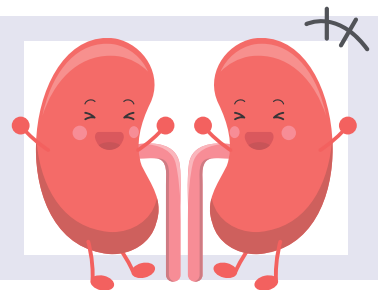
For those who specifically experience kidney stones, it is important to catch the stone when you are passing it in order to have the stone tested for its composition. If you have a kidney stone, your provider will likely provide you with a filter to attempt and catch the stone. The stone can then be sent to a lab where it will be analyzed. By understanding what a kidney stone is made of, certain steps can be taken to minimize future recurrences. For instance, most stones are made of calcium oxalate. By avoiding large amounts of these in the diet, stone formation can be minimized.

Lifestyle modifications may also help in preventing kidney malfunction. Because the kidneys are responsible for filtering the blood, high blood pressure can put additional stress on the kidneys (as well as other organs). By regularly engaging in physical activity and following a balanced diet, you can attempt to control high blood pressure and thus prevent associated health concerns.

Kidney manifestations from IBD and ostomies can seem intimidating, but it is important to note that severe complications are rare. With regular medical follow up and sustainable approaches to health, you can minimize the risk of kidney conditions due to IBD and ostomies.

Further Resources

- Crohn's and Colitis Foundation: Kidney Disorders Fact Sheet (<https://www.crohnscolitisfoundation.org/sites/default/files/legacy/assets/pdfs/kidney.pdf>)



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