

## Preoperative Imaging-Guided Surgical Management of Horseshoe Kidney During Ileocaecal Resection

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**ABSTRACT:** Horseshoe kidney (HSK) is the most common congenital renal fusion anomaly, occurring in approximately 0.25% of the population. It is characterized by the fusion of the lower poles of the kidneys by an isthmus of functional or fibrous renal tissue, and is frequently associated with aberrant vascular supply and altered ureteral anatomy. These anatomical variations can pose significant challenges during colorectal surgery, increasing the risk of inadvertent injury to renal structures. In this article, we report the case of a 25-year-old man with ileocaecal Crohn's disease, in whom a horseshoe kidney was incidentally discovered on preoperative abdominal CT imaging. The patient underwent ileocaecal resection with ileocolic anastomosis. Intraoperative exploration confirmed the presence of the renal fusion anomaly, which required careful dissection to avoid injury to aberrant vessels and displaced ureters. This case highlights the importance of thorough preoperative imaging and surgical planning in patients with congenital renal malformations undergoing colorectal surgery. Surgeons should be aware of the potential risk for iatrogenic urological and vascular complications in such cases.

**KEYWORDS:** Horseshoe Kidney, Renal malformation, Ileocaecal Resection, Colorectal surgery.

### INTRODUCTION

Congenital anomalies of the kidney and urinary tract (CAKUT) represent a spectrum of developmental disorders, with *horseshoe kidney (HSK)* being the most common renal fusion anomaly, affecting approximately 1 in 400 to 600 individuals (Natsis et al., 2014). HSK is characterized by fusion of the lower renal poles by an isthmus of parenchymal or fibrous tissue that typically lies anterior to the great vessels at the level of the L3–L5 vertebrae (Glodny et al., 2009). This abnormal positioning alters the anatomy of the retroperitoneal space and is frequently associated with aberrant vascular supply from the aorta, iliac arteries, or inferior mesenteric artery, as well as anomalous ureteral courses (Natsis et al., 2014).

These anatomical variations pose unique challenges during colorectal surgery, particularly during right colectomies or procedures involving retroperitoneal dissection. The isthmus may lie in the operative field, and unrecognized aberrant vessels or displaced ureters increase the risk of iatrogenic

injury (Chaker et al., 2025). In such cases, comprehensive preoperative imaging, including contrast-enhanced CT or CT angiography, is critical for surgical planning and avoidance of complications (Natsis et al., 2014).

Despite the rarity of this scenario, awareness of horseshoe kidney anatomy is essential for colorectal surgeons to perform safe dissections and preserve renal function, especially during oncologic resections where extensive mobilization and lymphadenectomy are required.

### AIM OF THE ARTICLE

To emphasize the importance of preoperative imaging and careful surgical planning in colorectal surgery when a horseshoe kidney is present, in order to avoid urological and vascular complications. Special attention should be given to meticulous dissection to prevent iatrogenic injuries to aberrant vessels and ureters.

### CASE PRESENTATION

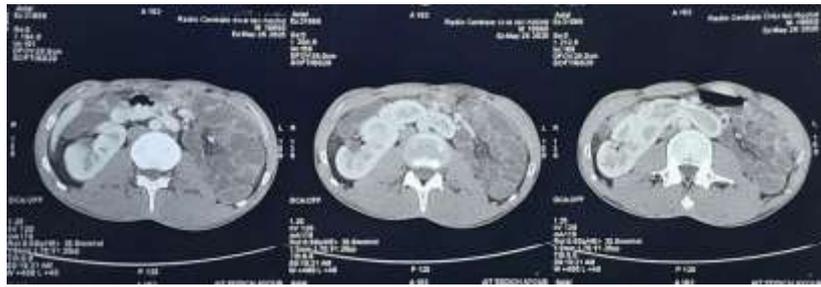
We report the case of a 25-year-old male patient with a known diagnosis of ileocaecal Crohn's disease, who was scheduled for elective surgical management due to persistent symptoms and failure of medical therapy.

As part of the routine preoperative work-up, a contrast-enhanced abdominal CT scan was performed, which revealed incidentally, the imaging also revealed a right-lateralized horseshoe kidney with displacement of the small bowel loops towards the left, characterized by fusion of the lower poles of the kidneys through an isthmus. The CT further demonstrated atypical vascular anatomy

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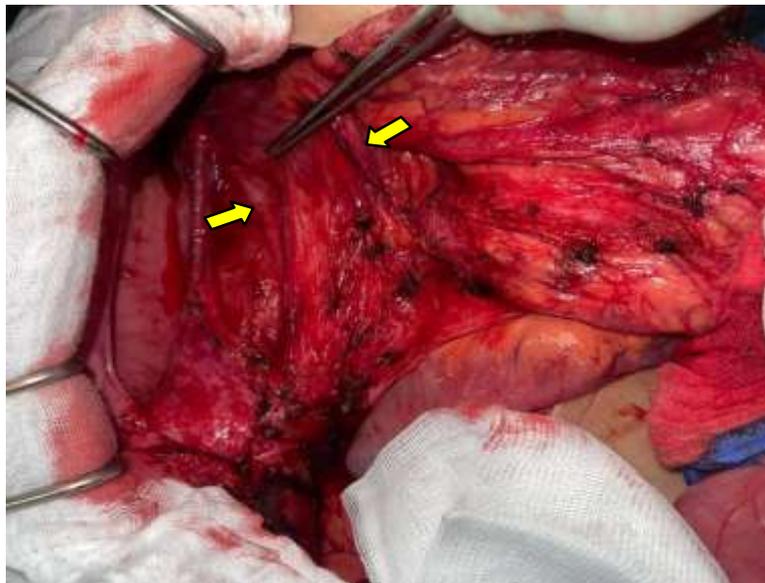
and anterior displacement of the ureters—features commonly associated with this congenital anomaly.

Moreover, the CT scan showed a stenotic thickening of the ileocaecal segment, associated with upstream small bowel dilatation measuring 4 cm, and multiple entero-enteric fistulas, all consistent with Crohn's disease.



**Figure 1: Axial Abdominal contrast-enhanced CT Scan image showing a right lateralized horseshoe kidney.**

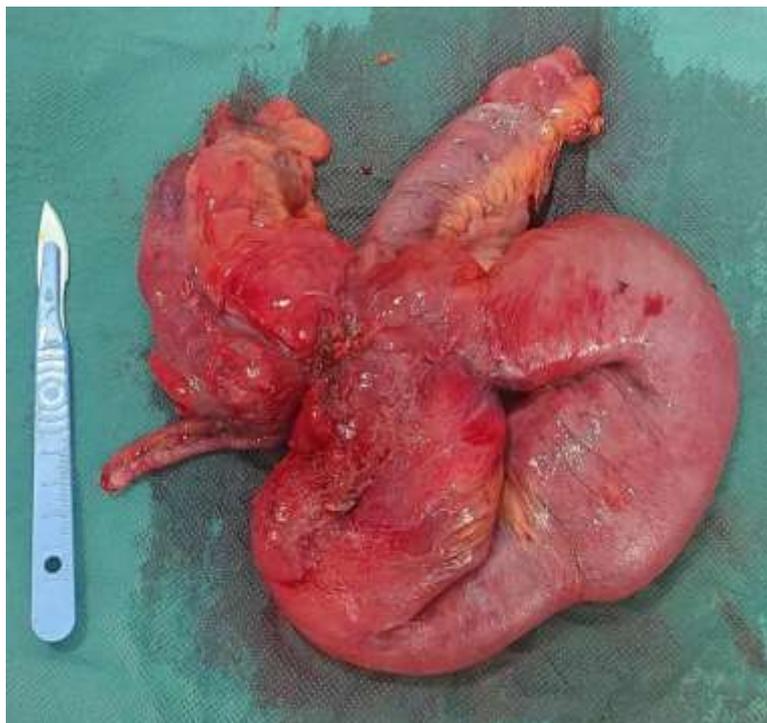
Given these findings, particular attention was paid to surgical planning. The patient subsequently underwent an ileocaecal resection with ileocolostomy. Intraoperative exploration confirmed the presence of the horseshoe kidney, with the isthmus located anterior on the right side and underlying the mesentery of the terminal ileum and cecum. The presence of aberrant renal vessels and displaced ureters necessitated meticulous dissection and mobilization of the ileocaecal segment in order to avoid iatrogenic injury. The operation was completed without complication, and the patient had an uneventful postoperative course.



**Figure 2: Intra operative view of the two ureters in the retroperitoneum (Yellow arrows).**



**Figure 3: Intraoperative view of the horseshoe kidney (Bleu arrow) after dissection of the Right Toldt Fascia stenotic thickening of the ileocaecal segment.**



**Figure 4: Post-operative specimen of the ileo caecal resection.**

This case underscores the critical role of detailed preoperative imaging in identifying anatomical anomalies that can significantly impact the surgical approach. It also highlights the importance of careful intraoperative dissection in patients with congenital renal malformations undergoing colorectal surgery.

### DISCUSSION

Horseshoe kidney (HSK) represents the most common congenital renal fusion anomaly, with an incidence of approximately 0.25% in the general population (Glodny et al., 2009). This anomaly is characterized by the fusion of the lower renal poles through an isthmus composed of functional renal parenchyma or fibrous tissue. Such an anatomical variant is frequently accompanied by aberrant vascular supply and altered ureteral anatomy, which together pose significant challenges during abdominal and colorectal surgeries (*Campbell Walsh Wein Urology*, 2020).

The presence of HSK can complicate colorectal resections, particularly procedures involving the right colon and terminal ileum, such as ileocaecal resection, due to the proximity of the fused kidneys and their abnormal vascular and ureteral anatomy. Preoperative identification through contrast-enhanced computed tomography (CT) or CT urography is critical for surgical planning (Glodny et al., 2009). In the presented case, preoperative imaging enabled the surgical team to anticipate the anatomical variations and adjust the surgical approach accordingly.

Surgical dissection in patients with HSK requires meticulous technique to avoid injury to vital renal structures. The renal isthmus often lies anterior to the aorta and inferior vena cava, and can contain functional renal tissue with independent vascular supply from aberrant arteries originating variably from the aorta, common iliac, or inferior mesenteric arteries (Glodny et al., 2009).

Failure to identify and preserve these vessels during dissection risks significant hemorrhage and ischemic injury to renal tissue. Therefore, careful retroperitoneal dissection under direct visualization is paramount.

Moreover, the ureters in HSK often exhibit an anomalous course, frequently crossing anteriorly over the isthmus rather than following the typical retroperitoneal path. This displacement increases the risk of ureteral injury during mesenteric division or mobilization of the right colon (*Campbell Walsh Wein Urology*, 2020). Intraoperative identification and protection of the ureters through meticulous dissection techniques or the use of intraoperative ureteral stents may reduce this risk (Kojima et al., 2023).

The clinical significance of these anatomical variations extends beyond the immediate intraoperative period. Iatrogenic injury to renal vessels or ureters can lead to severe complications including hemorrhage, urinoma, urinary fistula, or postoperative renal insufficiency (Kojima et al., 2023). Consequently, awareness and anticipation of these variations through detailed imaging and preoperative planning are essential to optimize surgical outcomes.

This case underscores the importance of integrating thorough preoperative radiological assessment with precise surgical technique. Multidisciplinary collaboration between colorectal surgeons, radiologists, and urologists can further enhance patient safety. Surgeons should maintain a high index of suspicion for congenital renal anomalies such as HSK when planning colorectal surgery, especially in young patients or those with unexplained renal symptoms.

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### CONCLUSION

Horseshoe kidney presents unique anatomical challenges in colorectal surgery due to its aberrant vascular supply and altered ureteral positioning. This case underscores the vital role of **comprehensive preoperative imaging**, such as contrast-enhanced CT scans, which enables accurate identification of the isthmus, anomalous vessels, and ureteral course prior to surgery. Such imaging not only informs surgical planning but also allows surgeons to anticipate and mitigate intraoperative risks. Furthermore, **meticulous surgical dissection** is essential to carefully navigate the altered anatomy, preserve aberrant vessels, and protect displaced ureters, thereby preventing potentially serious complications such as hemorrhage, urinary leakage, or renal ischemia.

Ultimately, integrating detailed imaging assessment with precise surgical technique enhances patient safety and outcomes, highlighting the indispensable role of thorough preparation and intraoperative vigilance when managing colorectal surgery in patients with congenital renal anomalies like horseshoe kidney.

### PROVENANCE AND PEER REVIEW

Not commissioned; externally peer-reviewed.

### INFORMED CONSENT

As per international or university standards, written consent has been collected and preserved by the authors.

### ETHICAL APPROVAL

Ethical approval for this study was waived by the Head of the Department of General Surgery at Hassan II University of Casablanca because it is a retrospective case report that does not involve experimental intervention, patient randomization, or identifiable personal data. This study was conducted in accordance with the Helsinki Declaration as revised in 2013.

As per international or university standards, written ethical approval has been collected and preserved by the authors.

### CONFLICTS OF INTEREST

The authors declare no competing interests.

### SOURCE OF FUNDING

None.

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