

CASE REPORT

RIGHT-SIDED URETEROPELVIC JUNCTION OBSTRUCTION WITH SEVERE HYDRONEPHROSIS AND CORTICAL THINNING SECONDARY TO CROSSING VESSEL COMPRESSION SUCCESSFULLY MANAGED BY A VASCULAR HITCH PROCEDURE IN A PEDIATRIC PATIENT

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Summary

Background: Ureteropelvic junction obstruction (UPJO) is a common cause of pediatric hydronephrosis and may lead to progressive renal parenchymal damage and functional impairment if left untreated. Early diagnosis and timely surgical intervention are essential to preserve renal function. Vascular hitch procedures have emerged as a minimally invasive alternative to dismembered pyeloplasty in selected patients with extrinsic ureteropelvic junction compression.

Case Presentation: A 12-year-old male presented with intermittent right flank pain, nausea, and vomiting. Clinical examination revealed mild right flank tenderness, while laboratory investigations showed preserved renal biochemical parameters. Ultrasonography demonstrated gross right hydroureteronephrosis with marked cortical thinning. Computed tomography of the kidneys, ureters, and bladder confirmed severe hydronephrosis with significant dilatation of the renal pelvis and moderate thinning of the renal parenchyma, consistent with ureteropelvic junction obstruction. A 99mTc-diethylenetriamine pentaacetic acid (DTPA) renal scan revealed gross right hydronephrosis with significantly impaired cortical function and an obstructive drainage pattern. Differential renal function was 30% in the right kidney and 70% in the left kidney. The patient underwent a vascular hitch procedure for relief of obstruction caused by a crossing vessel.

Outcome: The postoperative course was uneventful. The patient received appropriate antimicrobial therapy, analgesics, hydration, and supportive pharmaceutical care. Follow-up ultrasonography performed three months after surgery demonstrated marked reduction in hydronephrosis and improvement in cortical thickness. Serum creatinine remained stable at 0.64 mg/dL, and the patient remained asymptomatic.

Conclusion: This case highlights the importance of comprehensive diagnostic evaluation in pediatric UPJO and demonstrates that a vascular hitch procedure can be an effective treatment option in carefully selected patients with extrinsic ureteropelvic junction obstruction. Early intervention and multidisciplinary perioperative care are crucial for preserving renal function and optimizing clinical outcomes.

Key words: Ureteropelvic junction obstruction; Hydronephrosis; Cortical thinning; Pediatric urology; Vascular hitch; Renal function; Case report

Introduction

Ureteropelvic junction obstruction (UPJO) is one of the most common congenital abnormalities of the urinary tract and represents the leading cause of hydronephrosis in children. It is characterized by impaired urine flow from the renal pelvis into the proximal ureter, resulting in progressive dilatation of the pelvicalyceal system and increased intrapelvic pressure (1). If left untreated, persistent obstruction may lead to renal cortical thinning, tubular atrophy, interstitial fibrosis, and irreversible deterioration of renal function (2). The widespread use of prenatal ultrasonography has significantly improved the detection of UPJO, with many cases being identified antenatally as hydronephrosis. However, a proportion of patients continue to present later in childhood with symptoms such as flank pain, abdominal discomfort, urinary tract infections, hematuria, nausea, vomiting, or an abdominal mass (3,4).

The etiology of UPJO may be congenital or acquired and can be broadly classified into intrinsic and extrinsic causes. Intrinsic abnormalities include aperistaltic ureteral segments, ureteral hypoplasia, abnormal smooth muscle arrangement, and high ureteral insertion into the renal pelvis, all of which can impair urinary drainage (5). Extrinsic causes are most commonly associated with compression by aberrant or lower-pole crossing vessels, which produce intermittent or persistent obstruction at the ureteropelvic junction (6,7). Acquired causes, although less common in children, include ureteral scarring secondary to infection, urolithiasis, inflammation, trauma, or iatrogenic injury. The underlying cause of obstruction has important implications for surgical decision-making and long-term outcomes (8).

Accurate diagnosis of UPJO requires a combination of clinical assessment and radiological investigations. Ultrasonography remains the initial imaging modality of choice because it is non-invasive, readily available, and highly sensitive for detecting hydronephrosis and cortical thinning (9). Computed tomography may provide additional anatomical information in selected cases, particularly when crossing vessels or other structural abnormalities are suspected. Functional assessment is most commonly performed using diuretic renography with technetium-99m-labelled tracers, which allows evaluation of drainage patterns and differential renal function. Reduced differential renal function, progressive hydronephrosis, worsening cortical thinning, recurrent symptoms, or recurrent urinary tract infections are widely accepted indications for surgical intervention (10).

For several decades, Anderson-Hynes dismembered pyeloplasty has been considered the gold standard treatment for UPJO, achieving long-term success rates exceeding 90% (11). Nevertheless, advances in minimally invasive surgery have expanded the range of treatment options available for carefully selected patients (12). In cases where obstruction is caused exclusively by extrinsic compression from a crossing vessel and no intrinsic narrowing of the ureteropelvic junction is present, the vascular hitch procedure offers an effective alternative. This technique involves cephalad transposition of the crossing vessel away from the ureteropelvic junction, thereby relieving obstruction without ureteral dismemberment or reconstruction (13). A Systematic review and meta-analysis concluded that the vascular hitch procedure provides favorable outcomes, shorter operative times, and low complication rates in appropriately selected pediatric patients with ureteropelvic junction obstruction caused by crossing vessels (14).

We report the case of a 12-year-old male with right-sided ureteropelvic junction obstruction presenting with severe hydronephrosis, cortical thinning, and impaired renal function. The patient was successfully managed using a vascular hitch procedure following comprehensive anatomical and functional evaluation. This case highlights the importance of early recognition, objective assessment of renal function, individualized surgical planning, and multidisciplinary perioperative care in achieving favorable clinical outcomes and preserving renal function in pediatric UPJO. The chronological sequence of clinical events, diagnostic investigations, treatment interventions, and follow-up assessments is summarized in Table 1.

Case Presentation

A 12-year-old male presented to the outpatient department with a six-month history of intermittent right-sided flank pain. The pain was dull in nature, non-radiating, and occasionally aggravated by increased fluid intake. The patient also experienced episodes of nausea and vomiting. There was no history of fever, dysuria, hematuria, urinary tract infection, urinary frequency, trauma, or previous urological surgery. His developmental milestones were appropriate for age, and there was no significant past medical or family history of renal or urological disorders.

Table 1. Timeline of Clinical Events.

Timeline	Clinical Event
6 months before admission	Intermittent right-sided flank pain aggravated by increased fluid intake
Day of admission	Presented with right flank pain, nausea, and vomiting
Day 1	Clinical examination and laboratory investigations performed
Day 1	Ultrasonography demonstrated gross right hydroureteronephrosis with cortical thinning
Day 1	CT KUB confirmed severe hydronephrosis with renal parenchymal thinning
Day 1	DTPA renogram demonstrated obstructive drainage pattern with differential renal function of 30% in the right kidney and 70% in the left kidney
Day 2	Vascular hitch procedure performed under general anesthesia
Postoperative period	Supportive pharmaceutical care, analgesia, antibiotic therapy, and monitoring of renal function
6 weeks	Double-J stent removal
3 months follow-up	Resolution of symptoms and improvement in hydronephrosis without complications

On physical examination, the patient was conscious, cooperative, and hemodynamically stable. His temperature was 98.6°F, blood pressure was 110/80 mmHg, pulse rate was 105 beats/min, and respiratory rate was 20 breaths/min. Mild tenderness was noted over the right flank region, while the remainder of the systemic examination was unremarkable.

Laboratory investigations revealed a hemoglobin level of 13.5 g/dL, total leukocyte count of 11,100 cells/mm³, red blood cell count of 4.79 million/mm³, and platelet count of 282,000/mm³. Serum biochemical parameters were within normal limits, including sodium (140 mmol/L), potassium (4.1 mmol/L), chloride (101 mmol/L), random blood glucose (72 mg/dL), and serum creatinine (0.64 mg/dL). Urinalysis was unremarkable, and electrocardiography demonstrated normal sinus rhythm.

Ultrasonography demonstrated severe right-sided hydroureteronephrosis with marked cortical thinning. Ultrasonographic findings are shown in Figure 1.

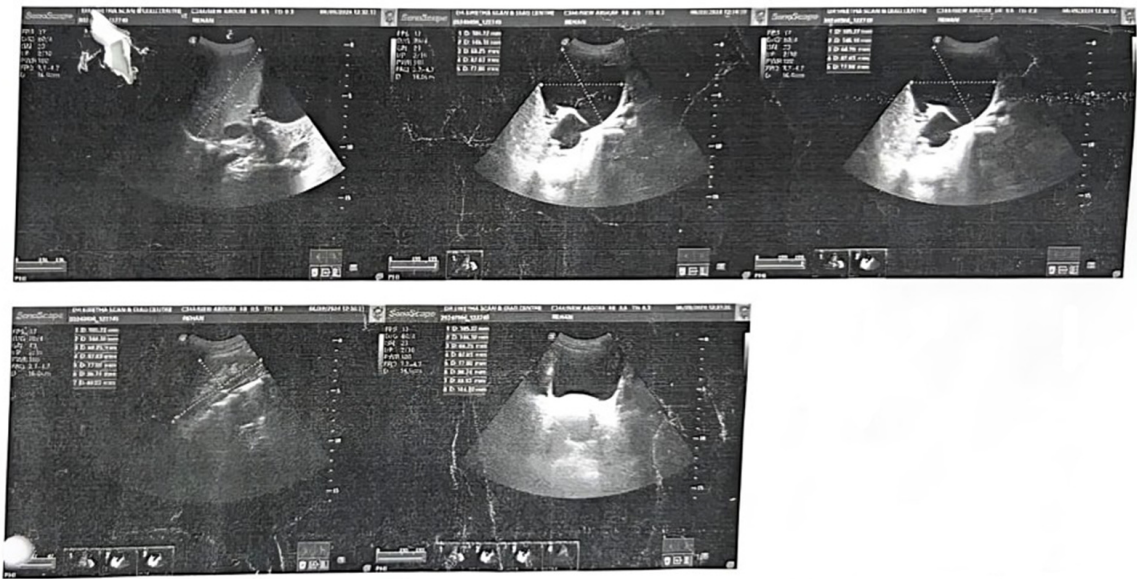


Figure 1. Preoperative ultrasonography of the abdomen and pelvis demonstrating severe right-sided hydronephrosis with marked dilatation of the pelvicalyceal system and significant cortical thinning, findings consistent with ureteropelvic junction obstruction (UPJO).

CT KUB confirmed severe hydronephrosis with marked dilatation of the renal pelvis and associated renal parenchymal thinning, consistent with ureteropelvic junction obstruction.

A 99mTc-diethylenetriamine pentaacetic acid (DTPA) renal scan revealed gross hydronephrosis of the right kidney with significantly impaired cortical function and an obstructive drainage pattern. Differential renal function was 30% in the right kidney and 70% in the left kidney. Renographic findings demonstrating the obstructive drainage pattern and reduced differential renal function are shown in Figures 2A and 2B.

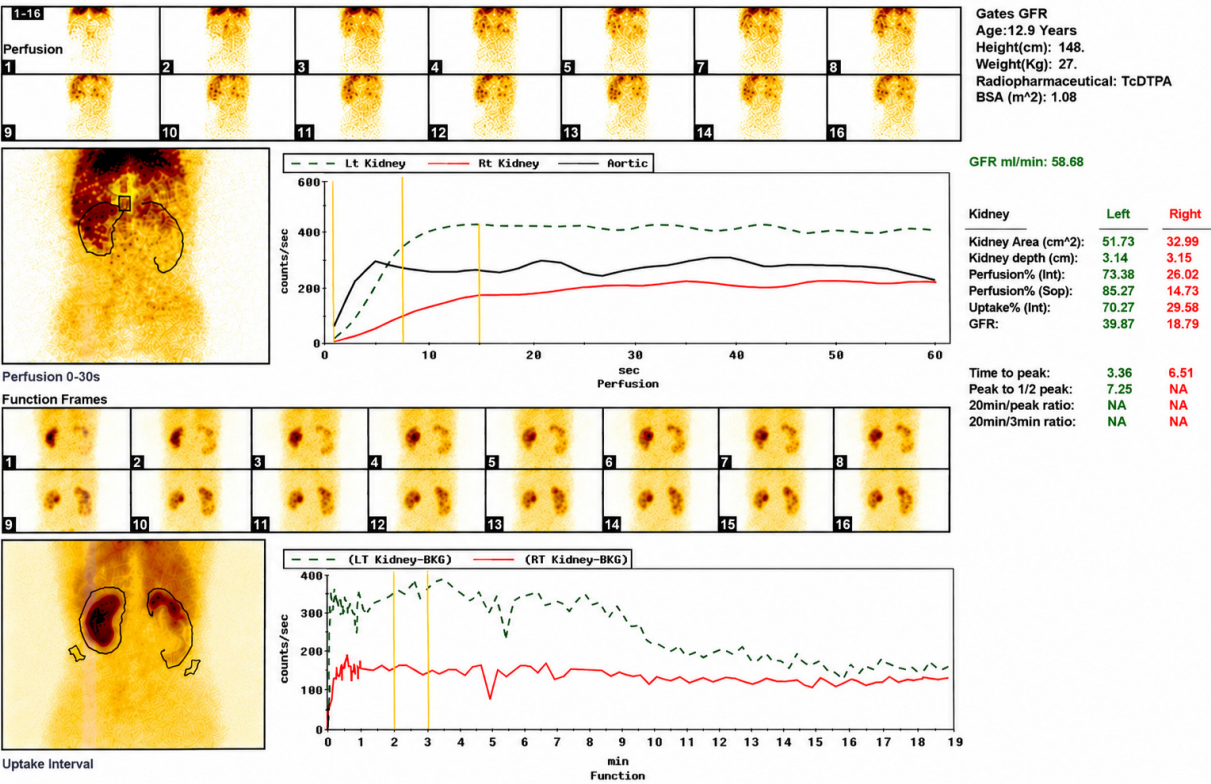


Figure 2A. Preoperative 99mTc-DTPA diuretic renogram demonstrating reduced perfusion, impaired cortical uptake, and decreased differential renal function of the right kidney (30%) compared with the left kidney (70%).

Differential diagnoses considered included vesicoureteral reflux, obstructive megaureter, ureterovesical junction obstruction, nephrolithiasis, and other congenital urinary tract anomalies. These conditions were excluded based on the imaging findings, absence of ureteric calculi, normal urinalysis, and renographic evidence of obstruction localized to the ureteropelvic junction.

Based on the clinical, radiological, and functional findings, a diagnosis of right-sided ureteropelvic junction obstruction with severe hydronephrosis, cortical thinning, and impaired renal function was established.

Therapeutic Intervention and Pharmaceutical Care

Following confirmation of right-sided ureteropelvic junction obstruction with severe hydronephrosis, cortical thinning, and impaired differential renal function, the patient was scheduled for surgical correction. After preoperative evaluation and optimization, surgery was performed under general anesthesia.

Intraoperatively, a lower-pole crossing vessel was identified compressing the ureteropelvic junction, confirming extrinsic vascular obstruction. A vascular hitch procedure was performed by careful dissection and cephalad

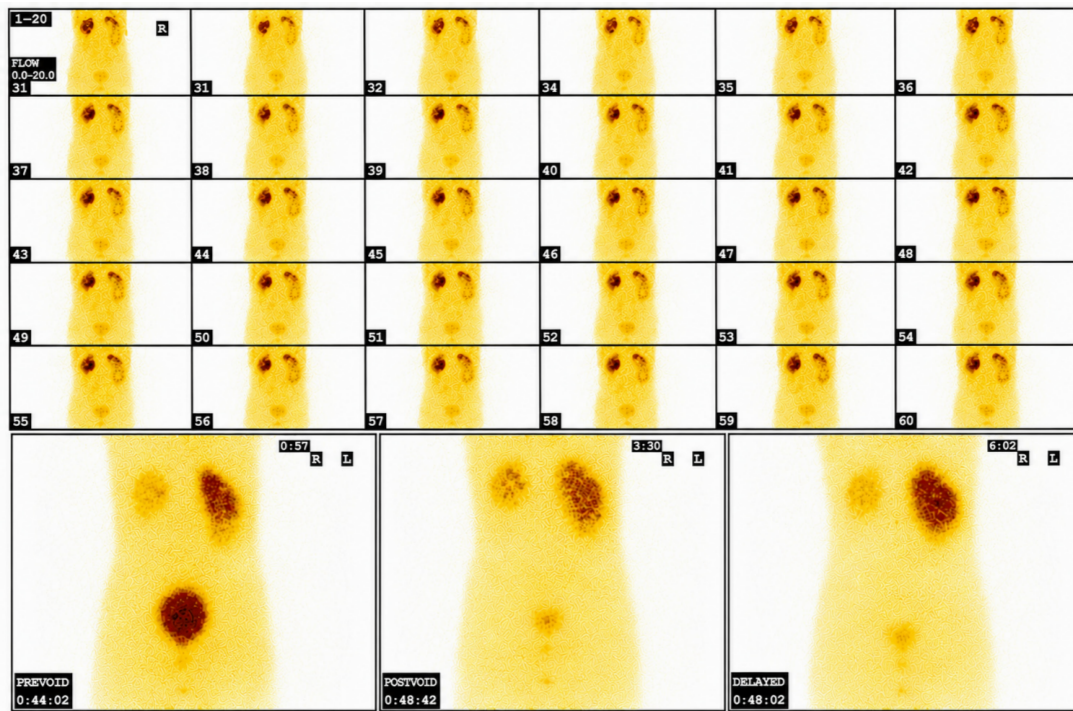


Figure 2B. Dynamic and delayed scintigraphic images from the 99mTc-DTPA renogram showing progressive tracer accumulation and delayed drainage within the grossly dilated right pelvicalyceal system, consistent with obstructive ureteropelvic junction obstruction.

transposition of the crossing vessel away from the ureteropelvic junction, thereby relieving the obstruction without ureteral dismemberment. A double-J ureteral stent was placed to ensure adequate urinary drainage during the postoperative healing period. The procedure was completed successfully without any intraoperative complications.

Postoperatively, the patient was managed with intravenous fluids, including Ringer's lactate, to maintain hydration and renal perfusion. Antimicrobial therapy consisted of cefoperazone-sulbactam (1 g intravenously twice daily) and amikacin (250 mg intravenously twice daily) for infection prophylaxis. Pain management included intravenous paracetamol (500 mg) and diclofenac administered as required. Ondansetron (4 mg intravenously) was prescribed for the prevention and management of postoperative nausea and vomiting, while pantoprazole (40 mg intravenously once daily) was administered for gastrointestinal protection.

Pharmaceutical care focused on ensuring the safe and effective use of medications throughout hospitalization. Medication orders were reviewed for appropriate drug selection, dosage, route of administration, and potential drug-related problems. Renal function parameters, electrolyte levels, urine output, and clinical response to therapy were monitored during treatment. The patient and caregivers received counseling regarding medication adherence, adequate hydration, recognition of symptoms suggestive of urinary tract infection or stent-related complications, and the importance of scheduled follow-up visits.

Follow-up and Outcomes

The patient's postoperative recovery was uneventful, and he remained hemodynamically stable throughout hospitalization and demonstrated progressive clinical improvement without evidence of infection, adverse drug reactions, or surgical complications. The patient was discharged with oral medications, including cefuroxime-clavulanic acid, rabeprazole-domperidone, tolterodine, ofloxacin-ornidazole, aceclofenac-paracetamol, and multivitamin supplementation, together with instructions regarding hydration, medication adherence, and follow-up care. The double-J stent was subsequently removed six weeks after surgery.

Follow-up ultrasonography performed after stent removal demonstrated significant improvement in right-sided hydronephrosis compared with preoperative imaging findings. Renal function remained stable, with serum creatinine values within the normal range during follow-up evaluation.

Clinically, the patient reported complete resolution of flank pain, nausea, and vomiting. No recurrent urinary symptoms, episodes of urinary tract infection, or flank discomfort were noted during follow-up visits. The patient was able to resume normal daily activities and remained asymptomatic.

Overall, the favorable clinical and radiological outcomes observed during follow-up suggest successful relief of ureteropelvic junction obstruction following the vascular hitch procedure. No evidence of recurrent obstruction or deterioration of renal function was identified during the available follow-up period.

Discussion

Ureteropelvic junction obstruction (UPJO) is one of the most common causes of hydronephrosis in the pediatric population and may result in progressive deterioration of renal function if left untreated (15). Although many cases are detected antenatally through routine ultrasonography, some patients present later in childhood with symptoms such as intermittent flank pain, nausea, vomiting, hematuria, or urinary tract infections (16). In the present case, a 12-year-old male presented with a six-month history of intermittent right-sided flank pain associated with nausea and vomiting, highlighting the variable clinical presentation of UPJO beyond infancy.

The diagnosis of UPJO requires a combination of anatomical and functional assessment. Ultrasonography remains the initial imaging modality for evaluating hydronephrosis, while computed tomography and diuretic renography provide additional information regarding the site of obstruction and renal functional status (17). In our patient, ultrasonography demonstrated gross hydroureteronephrosis with cortical thinning, while CT KUB confirmed severe hydronephrosis and renal parenchymal thinning. Functional evaluation using a DTPA renogram revealed an obstructive drainage pattern with impaired differential renal function of the affected kidney, supporting the need for surgical intervention.

Several differential diagnoses were considered, including vesicoureteral reflux, obstructive megaureter, nephrolithiasis, and ureterovesical junction obstruction. These conditions were excluded based on the patient's clinical presentation and imaging findings, which localized the obstruction to the ureteropelvic junction. Careful evaluation of differential diagnoses is essential because treatment strategies vary depending on the underlying cause of urinary tract obstruction (18).

Crossing vessels are recognized as an important cause of extrinsic UPJO and have been reported in approximately 11–20% of affected patients (19). These vessels may compress the ureteropelvic junction, particularly during periods of increased diuresis, resulting in intermittent symptoms such as flank pain (20). In the present case, a lower-pole crossing vessel was identified intraoperatively as the cause of obstruction. This finding explains the patient's intermittent symptom pattern and highlights the importance of intraoperative assessment in determining the most appropriate surgical approach.

Anderson-Hynes dismembered pyeloplasty remains the gold standard treatment for UPJO, with long-term success rates exceeding 90% (21). However, when obstruction is caused solely by extrinsic compression from a crossing vessel and there is no evidence of intrinsic narrowing, the vascular hitch procedure offers an effective alternative. The technique avoids ureteral dismemberment and reconstruction while preserving urinary drainage (22). A Systematic review and meta-analysis concluded that the excellent success rates, low complication rates, and shorter operative times in carefully selected patients undergoing vascular hitch procedures (23).

The favorable outcome observed in our patient is consistent with findings reported in the literature. Following surgical correction, the patient experienced complete resolution of symptoms and demonstrated radiological improvement of hydronephrosis without postoperative complications. Stable renal function during follow-up further supports the effectiveness of the procedure. Similar outcomes have been reported in systematic reviews and pediatric case series evaluating vascular hitch procedures for extrinsic UPJO caused by crossing vessels (23,24).

Pharmaceutical care also played an important role in the patient's perioperative management. Appropriate antimicrobial therapy, analgesia, hydration, monitoring of renal function, and patient counseling contributed to successful postoperative recovery. Clinical pharmacist involvement helped optimize medication use, monitor for adverse effects, and reinforce adherence to follow-up recommendations.

This case emphasizes the importance of comprehensive diagnostic evaluation, objective assessment of renal function, and individualized surgical planning in pediatric UPJO. In selected patients with obstruction secondary to crossing vessels, the vascular hitch procedure represents a safe and effective alternative to dismembered pyeloplasty and may provide excellent clinical and functional outcomes.

Conclusion

Ureteropelvic junction obstruction is an important cause of hydronephrosis and progressive renal impairment in pediatric patients. This case highlights the value of comprehensive diagnostic evaluation using ultrasonography, computed tomography, and diuretic renography for accurate assessment of both anatomical obstruction and renal function. In the present patient, a lower-pole crossing vessel was identified as the cause of extrinsic ureteropelvic junction obstruction and was successfully managed using a vascular hitch procedure. The patient demonstrated favorable clinical and radiological outcomes, with resolution of symptoms and stable renal function during follow-up. This case supports the role of the vascular hitch procedure as a safe and effective alternative to dismembered pyeloplasty in carefully selected patients with extrinsic obstruction caused by crossing vessels. Early diagnosis, individualized surgical planning, and multidisciplinary perioperative care are essential for preserving renal function and optimizing patient outcomes.

Patient's parent perspective

The patient's parents reported significant improvement in the child's quality of life following surgery. They noted complete resolution of flank pain and a return to normal daily activities and school attendance. They expressed satisfaction with the surgical outcome and follow-up care provided.

Declarations:

Declaration of Competing Interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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Ethics Statement

Ethical approval was waived according to institutional policy because this report describes a single clinical case and does not involve experimental interventions.

Declaration on the Use of Artificial Intelligence

The authors declare that no generative artificial intelligence (AI) tools were used in the collection, analysis, interpretation of clinical data, or preparation of the scientific content of this manuscript. AI-assisted tools, if used, were limited to language editing and grammar improvement. The authors take full responsibility for the accuracy, integrity, and originality of the manuscript.

Author's Contributions

Maryam: Conceptualization, literature review, manuscript drafting, and final approval of the manuscript.

Syed Arbaz Ali: Data collection, manuscript drafting, and final approval of the manuscript.

Mohammed Hussain: Critical revision of the manuscript, interpretation of clinical findings, and final approval of the manuscript.

Muhammad Abdullah: Critical revision of the manuscript and final approval of the manuscript.

All authors have read and approved the final version of the manuscript.

Data Availability Statement

All data generated or analyzed during this study are included in this published article.

Consent for Publication

Written informed consent for publication of this case report.

CARE Guideline Statement

This case report was prepared in accordance with the CARE (CAsE REport) guidelines.

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