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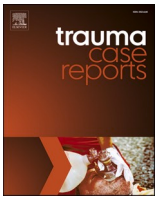

Case Report

Trauma resulting in rare avulsion-type renal injury and lobe migration: An uncommon case report

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ABSTRACT

In this case report, we discuss a rare incident of avulsion-type renal injury in a 24-year-old male with no significant medical history. The injury occurred during a traffic accident, where he was involved in a direct impact collision between a motorcycle and a vehicle, leading to altered corticomedullary differentiation in the right kidney, a retroperitoneal hematoma, and free fluid in the cavity. The patient underwent successful emergency abdominal surgery, which involved the removal of the damaged kidney due to the severity of the injury. During his postoperative recovery in the ICU, he received extensive care, including sedation, mechanical ventilation, and vasopressor support. Ultimately, he made a successful recovery and was discharged after rehabilitation.

This case highlights the complexities involved in managing patients with renal injuries resulting from high-energy impact accidents. It emphasizes the importance of a multidisciplinary approach in treatment, the challenges associated with deciding on surgical intervention, and the significance of rehabilitation in patient recovery. The uniqueness of this case, characterized by its distinct mechanism of injury and the severity of the trauma, contributes to our broader understanding of renal trauma management in the field of trauma medicine. It underscores the need for personalized patient care strategies and emphasizes the effectiveness of surgical interventions in severe cases of renal trauma.

Abbreviations: MVAs, Motor Vehicle Accidents; EFAST, Extended Focused Assessment with Sonography for Trauma; CT, Computed Tomography; ICU, Intensive Care Unit.

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Introduction

The kidney, located within the retroperitoneum, is vulnerable to closed trauma despite its secure positioning. Renal injuries constitute a significant portion of closed abdominal traumas, with an incidence of 17.33 per 100,000 population from 2012 to 2016, according to recent nationwide data [1]. These injuries can be categorized as closed or penetrating, with closed trauma being the most common cause [2]. Deceleration and acceleration forces, often seen in motor vehicle accidents (MVAs), pose a major risk, causing the kidney to collide with adjacent structures such as ribs and the vertebral column and resulting in parenchymal and vascular injuries [3].

Blunt trauma, direct abdominal or flank impacts, rapid deceleration, or high-velocity collisions during sports activities can cause renal injuries. A systematic review identified motor vehicle accidents (63 %), falls (43 %), and sports (11 %) as the main causes of blunt renal trauma in adults [4]. This case report presents an instance where a 24-year-old patient suffered renal trauma from an impact during a traffic accident involving a collision between a motorcycle and a vehicle, highlighting the risk in traffic accidents [5].

With its surrounding fat and Gerota's fascia, the kidney's vulnerable renal pedicle and ureteropelvic junction are subject to deceleration forces, resulting in various forms of renal injuries, including rupture or thrombosis [6]. Renal trauma commonly occurs in car accidents, followed by falls, sports accidents, and pedestrian incidents [7].

Renal traumas can involve a range of anatomical injuries, such as those affecting the renal parenchyma, renal hilum, leading to hemorrhages, or affecting the collecting system. Uncommon manifestations include avulsion and migration of renal segments [8,9].

The management approach to renal trauma has evolved significantly in recent years, favoring non-operative management. Most patients with renal trauma are now treated conservatively, with close monitoring, possible reimaging, and minimally invasive interventions [10]. However, a surgical approach may be necessary for adult patients who are hemodynamically stable but exhibit clinical or radiographic signs of ongoing bleeding [11,12].

This report presents a distinctive case of a 24-year-old male with no significant medical history who experienced an avulsion-type renal injury with subsequent migration of a renal lobe after being struck in a traffic accident involving a motorcycle and a vehicle. The rarity of this case and the unusual injury mechanism provide a noteworthy topic for clinical and surgical discussions, warranting a detailed exploration.

Case report

A 24-year-old male with no significant medical history was admitted to the emergency department following a traffic accident involving a direct impact between a motorcycle and a vehicle while playing in an inebriated state. Upon arrival, the patient exhibited non-specific abdominal pain and hematuria. Diagnostic assessments were performed, including an Extended Focused Assessment with Sonography for Trauma (EFAST), which revealed altered corticomedullary differentiation in the right kidney, raising concerns of multiple injuries.

A computed tomography (CT) scan of the abdomen clearly depicted a right-sided retroperitoneal hematoma, free fluid within the

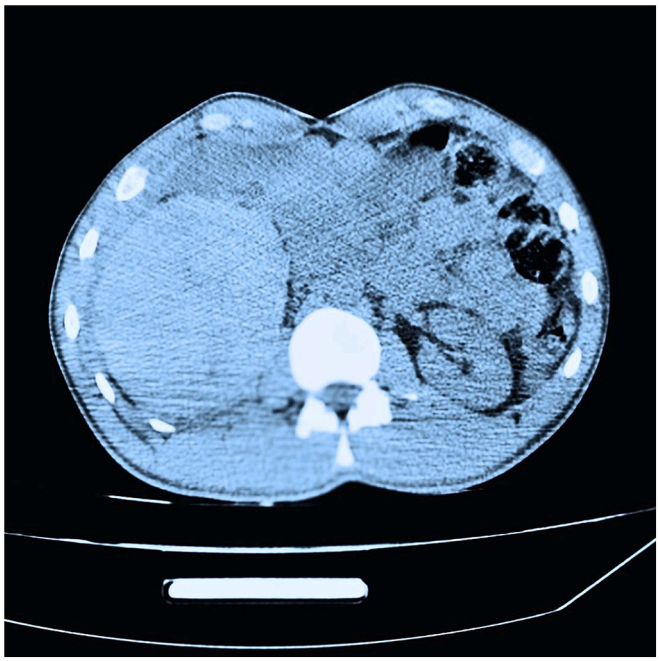

Fig. 1. A computed tomography (CT) scan of the abdomen revealing a right-sided retroperitoneal hematoma, free fluid within the peritoneal cavity, and structural changes in the right kidney consistent with traumatic injury.

peritoneal cavity, and structural changes in the right kidney indicative of trauma (see Fig. 1).

Laboratory tests indicated leukocytosis (28.57 cells/mm^3), which is within the normal range for adult males, normal hemoglobin levels (12.4 g/dl), and an elevated creatinine level (1.75 mg/dl). These findings necessitated an assessment by the surgical department, leading to emergency abdominal surgery. During the procedure, a right-sided retroperitoneal hematoma and hemoperitoneum containing clots were discovered (see Fig. 2).

The surgery revealed the right kidney with traumatic lesions and hemorrhage, alongside an extensive retroperitoneal hematoma. These conditions warranted surgical cleaning and a subsequent right nephrectomy (see Fig. 2).

An avulsion injury to the right kidney and renal ileus were also identified, requiring surgical cleaning and a right nephrectomy. Fig. 3 illustrates the intraoperative management of the renal ileus and the avulsion injury (see Fig. 3).

Following the surgery, the patient was admitted to the Intensive Care Unit (ICU), where he required sedation, assisted mechanical ventilation, and vasopressor support. Two units of red blood cells were administered. Post-surgical examinations revealed mixed acidosis, persistent leukocytosis, and a drop in hemoglobin levels. The patient remained hemodynamically unstable, requiring continued vasopressor support. Acute kidney injury, hyperkalemia, and elevated liver enzymes were also observed.

On the third day, the patient was transferred to a higher complexity hospital for further management. Leukocyte counts normalized but renal function impairment, thrombocytopenia, elevated acute phase reactants, and elevated muscle enzymes persisted. On the fourth day, sedation tapering commenced, and the weaning process for mechanical ventilation was initiated. On the fifth day, extubation was performed, followed by the initiation of nasal high-flow oxygen therapy. On the sixth day, the patient maintained spontaneous respiration with an adequate ventilatory pattern. By the seventh day, renal function parameters returned to normal ranges. On the eleventh day, the patient was medically cleared and subsequently discharged (see Fig. 4 Timelines).

Discussion

This case illustrates the complexities and challenges involved in managing patients with multiple injuries, particularly those resulting from high-energy trauma. It emphasizes the significance of a multidisciplinary approach, thorough evaluation, effective injury management, and dedicated rehabilitation for optimal recovery [13,14].

The avulsion-type renal injury resulting from a traffic accident involving a motorcycle and a vehicle in this 24-year-old patient, underscore the potential severity of such incidents. Research indicates that sports like soccer, skiing, snowboarding, and contact sports traffic accidents often result in closed renal traumas, which can lead to functional impairments and significant structural changes [15].

The decision regarding clinical resolution or surgical intervention in renal trauma cases remains a subject of debate. Current trends lean towards conservative management, especially when there is no persistent hemodynamic instability. In traumatic injuries from traffic accidents, the likelihood of concurrent pelvic or thoracic injuries is relatively higher compared to other causes of renal trauma, as observed in this case [16,17].

The presented case is a rare occurrence of kidney avulsion due to a high-energy impact on the thoracoabdominal wall, resulting in a total nephrectomy. It stands out in the literature due to limited reports on similar incidents. For example, Boukhannous et al. [18]

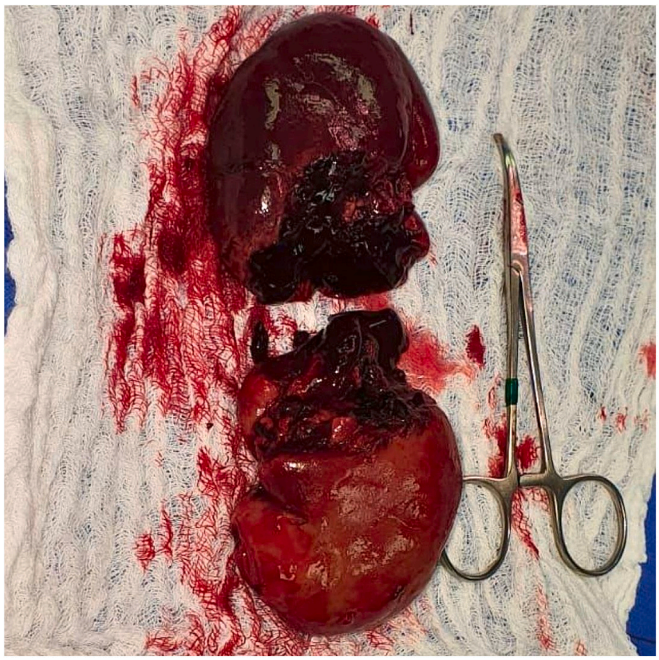

Fig. 2. Post-surgical image displaying the right kidney with traumatic lesions and hemorrhage, and an extensive retroperitoneal hematoma.

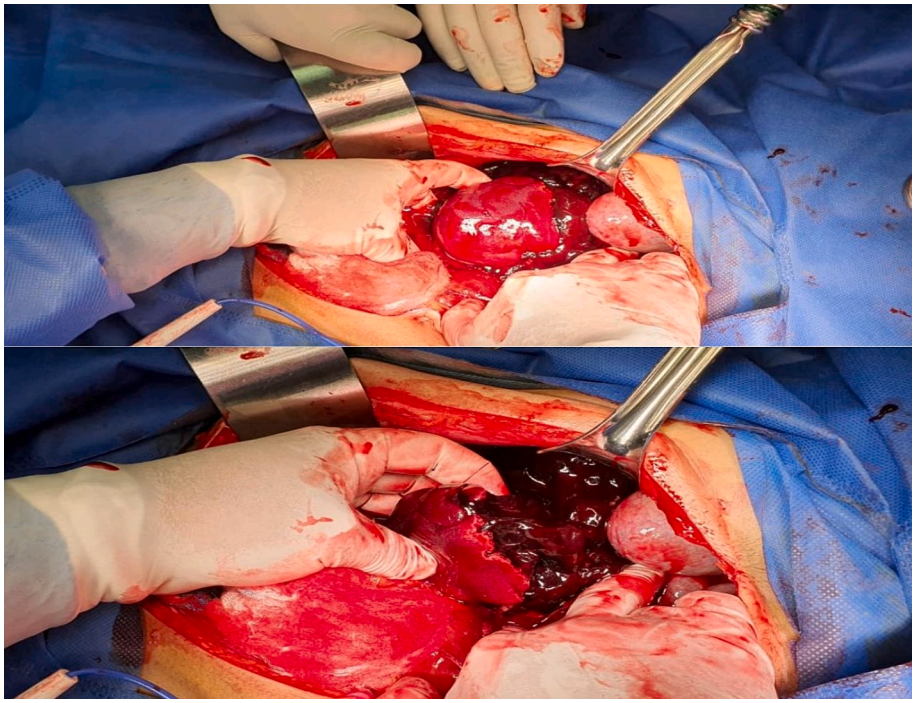

Fig. 3. Intraoperative photograph showing the right kidney during the surgical procedure, with visible avulsion injury and the management of renal ileus before nephrectomy.

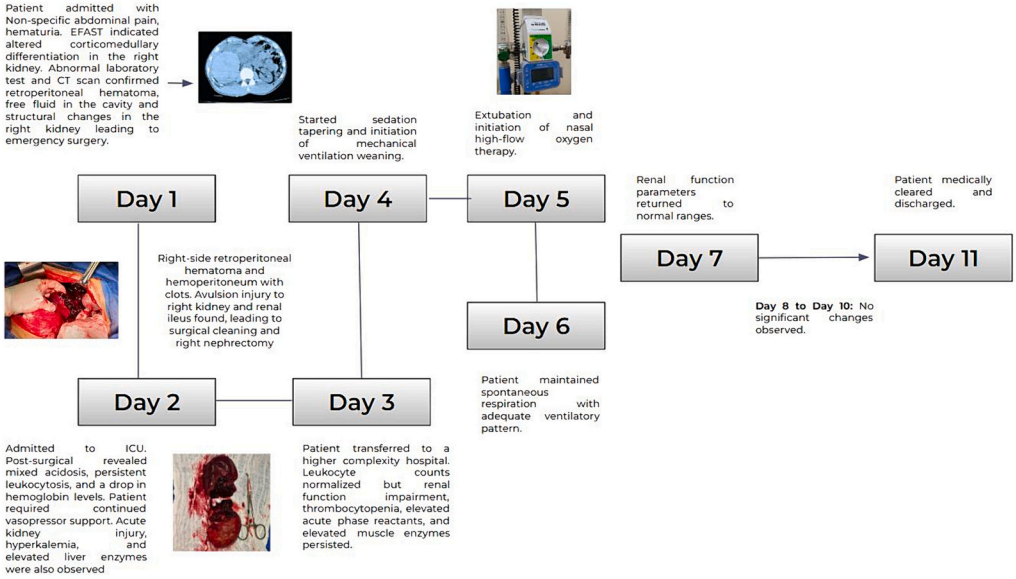

Fig. 4. Timeline graphic illustrating the sequence of events from initial injury through diagnosis, surgical intervention, and recovery in the case report.

described a renal avulsion in a 26-year-old male following a motor vehicle accident, which is a more common mechanism for such injuries. The unique aspects of our case, such as the injury mechanism a through traffic accident involving a motorcycle and a vehicle and subsequent migration of a renal lobe, contribute to its clinical relevance.

In our patient, the complete detachment of the kidney from its supporting structures caused significant hemorrhage and renal ischemia, necessitating emergency surgical exploration. Despite attempts at reimplantation through vascular repair, the extent of damage led to the decision for nephrectomy [19]. This decision was influenced by vascular damage, the duration of ischemia, and the

patient's hemodynamic instability [20].

During the postoperative phase, the patient was closely monitored for potential complications [20]. Despite the challenges, successful management and recovery were evident through negative culture results and a stable condition after surgery. This demonstrates the effectiveness of surgical intervention and postoperative care in handling severe renal injuries [21].

Comparing our case with others in the literature, it is evident that while conservative management is preferred for hemodynamically stable patients, surgical intervention, as in our case, is essential under specific circumstances [22]. This highlights the need for an individualized approach to managing renal traumas, considering the nature of the injury and the patient's overall condition [23,24].

The uniqueness of our case lies in the injury mechanism and the severity that necessitated nephrectomy, distinguishing it from cases where conservative treatment sufficed. This emphasizes the importance of tailored management strategies in renal trauma, with consideration for both the injury's nature and the patient's overall condition [25].

In conclusion, this case report presents a compelling instance of avulsion-type renal injury resulting from a traffic accident involving a motorcycle and a vehicle in a 24-year-old male. It is a rare and informative occurrence in the field of trauma medicine, providing valuable insights into the management of similar high-energy trauma cases.

Site where this research was conducted

Intensive Care Unit, Ecuadorian Institute of Social Security (IESS), Babahoyo, Ecuador.

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Ethics statement

Ethical decision-making in trauma management and the importance of informed consent for surgical interventions.

The authors confirm that they have obtained written informed consent from the legally authorized representative of the subject for the publication of this case report.

The authors understand and respect the guidelines set by the Committee on Publication Ethics.

CRediT authorship contribution statement

Killen H. Briones-Zamora: Writing – review & editing, Writing – original draft, Visualization, Validation, Supervision, Software, Resources, Project administration, Methodology, Investigation, Funding acquisition, Formal analysis, Data curation, Conceptualization. **Mónica H. Briones-Claudett:** Visualization, Validation, Supervision, Software, Resources, Project administration, Methodology, Investigation, Funding acquisition, Formal analysis, Data curation, Conceptualization. **Francisco Antonio Rambay Ayala:** Visualization, Supervision, Software, Resources, Investigation, Funding acquisition, Formal analysis, Data curation. **Marcia Julieth Rivera Mera:** Validation, Supervision, Software, Resources, Project administration, Methodology, Investigation, Funding acquisition, Formal analysis, Data curation, Conceptualization. **Maria Antonieta Touriz Bonifaz:** Software, Resources, Project administration, Methodology, Investigation, Funding acquisition, Formal analysis, Data curation, Conceptualization. **Absalón Quiroz Farfán:** Software, Resources, Project administration, Methodology, Investigation, Funding acquisition, Formal analysis, Data curation, Conceptualization. **Jaime Benites Solis:** Visualization, Validation, Resources, Project administration, Methodology, Investigation, Funding acquisition, Formal analysis, Data curation, Conceptualization. **Pedro Barberan-Torres:** Supervision, Software, Resources, Project administration, Methodology, Investigation, Funding acquisition, Formal analysis, Data curation, Conceptualization. **Michelle Grunauer:** Visualization, Validation, Software, Resources, Project administration, Methodology, Investigation, Funding acquisition, Formal analysis, Data curation, Conceptualization.

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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