Trauma and reconstruction

Ureteropelvic junction disruption associated with Chance fracture dislocation: A case of seat belt injury

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ABSTRACT

We experienced a rare case of ureteropelvic junction disruption (UPJD) as a seat belt injury. A 19-year-old female was transferred after a car accident while wearing a seat belt. Computed tomography showed multiple fractures including Chance fracture dislocation of the first lumbar spine and right renal laceration with partial infarction. Emergency posterior spinal fusion was performed. The next day, computed tomography revealed right perirenal contrast extravasation, and right UPJD was confirmed with retrograde urography and ureteroscopy. Ureteropelvic reanastomosis was performed. Computed tomography of excretory phase or repeat evaluation is recommended to prevent delayed diagnosis of UPJD including seat belt injury.

Introduction

Seat belt injury is blunt trauma sustained during car accidents. It comprises characteristic multi-organ injuries including to the skeletal system, soft tissues, and visceral organs. Ureteropelvic junction disruption (UPJD) is rare as a seat belt injury, and diagnosis of UPJD in blunt trauma is frequently delayed. We report a case of UPJD as a seat belt injury associated with multiple injuries including Chance fracture dislocation.

Case presentation

A 19-year-old female was transferred to our hospital after a traffic accident in which she was sitting in the left front seat using a three-point type seat belt (lap and diagonal). She presented mild epigastralgia and paraplegia with stable hemodynamics. Contrast-enhanced computed tomography (CT) showed multiple injuries; Chance fracture dislocation of the first lumbar spine, fractures of the right lower ribs and bilateral transverse process of the second lumbar spine, right hematoma, and partial infarction of the right kidney suggesting dissection of a renal arterial branch (Fig. 1a,b,c). Emergency right thoracic drainage and posterior spinal fusion by instrumentation was performed. On the following day, CT to reevaluate renal injuries revealed right perirenal circumferential extravasation of the contrast medium without opacified ureter (Fig. 1d). Complete disruption at ureteropelvic junction (UPJ) was confirmed with retrograde urography and ureteroscopy. Ureteropelvic reanastomosis with stenting was performed on the day.

Discussion

Unique profiles of seat belt injury are collectively termed as seat belt syndrome, which consists of a seat belt sign defined as an ecchymosis or erythema, and intra-abdominal and/or skeletal injury. Seat belt injury is caused by compression by the belt itself or between the belt and vertebra, and hyperflexion of the trunk at the belt. In Medline, UPJD in traffic accidents with a description of wearing a seat belt is rarely reported. Two cases among them were reported to be associated with Chance fracture, a horizontal splitting fracture of the thoracolumbar spine due to hyperflexion of the trunk which is considered a common mechanism of UPJD described below. Chance fracture has also been reported to be highly associated with intra-abdominal injuries, suggesting the result of high-energy trauma. In the present case, the first lumbar spine presented horizontal fracture of the anterior body and dislocation due to injury of the posterior ligamentous complex, which was equivalent to Chance fracture.

Ureteral disruption following blunt trauma is relatively rare. UPJ is the most common site of ureteral disruption. The mechanism of UPJD is considered to be hyperextension of the ureter and/or compression in deceleration injuries such as those sustained in traffic accidents and falls. In seat belt injury, most intraabdominal injuries are due to compression between the lap belt and vertebra, whereas UPJD is...
considered to be related to the anterosuperior inertia force to the kidney caused by rapid deceleration, which can swing the kidney like a pendulum with the UPJ as a fulcrum. And besides hyperflexion, compression at the belt can stretch the ureter, altogether leading to the ureteral disruption near the kidney. Palmer et al. reviewed 41 cases of UPJD and reported predominance in children and in the right side, which might be related to the movability of the kidney. The head-to-body ratio is larger in children comparing with adults, which may contribute to stronger flexion of the trunk. However these patterns are not always definite in the reports thereafter.

Treatment of UPJD is reconstruction if possible. However, diagnosis of UPJD is frequently delayed, which can lead to increased risk of complication and nephrectomy. Over half of cases in reviewed reports were diagnosed after 24 hours or more. In most cases of UPJD, there are associated injuries with or without unstable hemodynamics and no or minor hematuria in non-negligible patients, which may mean priority is given to other procedures over prompt and adequate diagnosis for urinary tract injury. Typical findings of collecting system injury on CT are contrast medium extravasation and non-opacified ureter, the latter suggesting ureteral disruption. Kawashima et al. reported ten cases of UPJ injury due to blunt trauma including five avulsion cases, and presented circumferential or medial extravasation as a distinctive pattern in UPJ injury. However, it is rather difficult to distinguish these findings from hematoma in early phase scan only, which is frequently used in emergency situations. Therefore, CT with delayed excretory phase scan or repeat evaluation is recommended in practice to rule out ureteral injury while evaluating other injuries. Also in this case, UPJD was not diagnosed with the initial CT, and was first suspected on the following day with the second CT performed to evaluate the renal injury. Boone et al. reported that the majority of UPJD patients had history of rapid deceleration injury and one of the following findings: 1) microscopic hematuria with shock, 2) gross hematuria, 3) flank ecchymosis or tenderness, 4) multisystem trauma. These findings and history would help us to indicate imaging targeted at the urinary tract to prevent diagnostic delay.

Conclusion

UPJD as a seat belt injury is rare but possible, and its diagnosis is frequently delayed mainly because of associated multiple injuries and CT without excretory phase. Delayed phase or repeat CT would be useful to assess the collecting system injury in high-energy trauma, including seat belt injury.

Declaration of competing interest

None.

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