Incomplete bifid ureter: case report and clinical analysis

Ureter bífido incompleto: relato de caso e análise clínica

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ABSTRACT
The ureters are retroperitoneal muscle tubes that connect the kidneys to the bladder, usually present in the number of one for each kidney. Ureteral duplication is the most common congenital anomaly of this organ, and it can be complete, when the ureters enter the bladder through distinct orifices, or incomplete, when the ureters enter the bladder, united, through a single orifice. Its incidence varies from 0.8% for unilateral duplications, against 0.125% for bilateral duplications; such variation is more observed in females, and incomplete duplications are three times more common. In this study, a case of unilateral ureteral duplication was reported in a male corpse. The variation was found during a routine dissection in the Human Anatomy laboratory of Faculty of Medical Sciences of Minas Gerais, and was discussed together with its possible clinical implications.

Keywords: bifid, duplication, ureter, anatomical variation.

RESUMO
Os ureteres são tubos musculares retroperitoneais que conectam os rins à bexiga, presentes, usualmente, no número de um para cada rim. A duplicação uretérica é a anomalia congênita mais comum deste órgão, podendo ser completa, quando os ureteres adentram a bexiga por meio de orifícios distintos, ou incompleta, quando os ureteres adentram a bexiga, unidos, por meio de um orifício único. Sua incidência varia de 0,8% para duplicações unilaterais, contra 0,125% para duplicações bilaterais; tal variação é mais observada em indivíduos do sexo feminino, e duplicações incompletas são três vezes mais comuns. Neste estudo, foi relatado um caso de duplicação uretérica unilateral em um cadáver do sexo masculino. A variação foi encontrada durante uma dissecção de rotina no laboratório de Anatomia Humana da Faculdade Ciências Médicas de Minas Gerais (FCMMG), e foi discutida juntamente com suas possíveis implicações clínicas.

Palavras-chave: bífido, duplicação, ureter, variação anatômica.

1 INTRODUCTION

The ureters consist of two muscular tubes with thick, narrow walls that connect the kidneys to the bladder. Each of them measures between 25 and 30 centimeters in length, being continuous superiorly with the renal pelvis. They are retroperitoneal anatomical structures, the upper half of which is abdominal, and the lower half is pelvic. In its path, it leaves the renal pelvis at or near the hilum, posteriorly to the renal vessels, descending over the greater psoas muscle, surrounded by peritoneal connective tissue. Then, it crosses the common iliac artery or the first portion of the external iliac artery, runs through the lateral wall of the pelvis, and turns medially towards the bladder [1-3].

In its origin, the right ureter is previously related to the second portion of the duodenum and, in its path, it is related to the root of the mesentery and to the gonadal vessels, also anteriorly. Likewise, the left ureter is also crossed anteriorly by the gonadal vessels. Subsequently, the ureters relate to the psoas major muscle, the genitofemoral nerve and the common or internal iliac vessels (the right ureter being more commonly related to the external iliac vessels, and the left ureter to the common iliac vessels). In the female sex, in the final part of their path, the ureters are previously related to the uterine artery [1-3].

These organs have a diameter of 3mm, which narrows slightly at three points of constriction: at the junction of the ureters and renal pelvis (pelviureteric junction); in the upper opening of the pelvis, when they cross the common iliac arteries; and at the vesicoureteric junction, during its passage through the bladder wall [1-3].

The vascularization of these muscular tubes can be divided into two portions: an abdominal one, irrigated by branches of the renal, gonadal, common iliac arteries and abdominal aorta; and a pelvic, irrigated by branches of the bladder arteries. Its innervation comes from the upper and lower renal, aortic, and hypogastric nervous plexuses, which comprise the medullary segments from T10 to L1, and S2 to S4 [2, 3].

Congenital anatomical variations of the ureter are considered relatively common in the literature, the most common of which is ureteric duplication; this can be complete or incomplete, the latter being the most common. In this study, an analysis of the incomplete “Y” ureter duplication will be performed, originating from a renal unit with two different pyelocaliceal systems [1, 4, 5, 6].

2 CASE REPORT

During a routine dissection of the abdomen of an adult male cadaver, performed at the Human Anatomy laboratory of the Faculty of Medical Sciences of Minas Gerais, two ureters were observed emerging from the right kidney; after a more detailed dissection, it was found that each ureter belonged to a different pyelocaliceal system (figure 1). Both ureters came together shortly after midway, above the bladder dome - hence the name "in Y" - and entered the bladder through a single ureteral orifice. In the hilum, the structures did not follow the traditional order of anatomy, in which the most posterior structure is the renal pelvis, followed by the renal artery and, more anteriorly, the renal vein. In this case, the second ureter originated inferiorly to the other structures, which were in the usual position (figure 2).

3 DISCUSSION

The urinary system is formed from the intermediate mesoderm, between the 4th and 6th weeks of intrauterine life. Initially, the formation of tubules and the pronepheric duct occurs; however, such structures regress almost completely, with only part of them remaining: one part remains as tubules, and the other as a mesonephric duct. During the 5th week, a ureteral sprout appears at the distal end of the mesonephric bud (excretory portion). This ureteral button penetrates the metanephric tissue and subsequently dilates, forming the renal pelvis; such a button, in addition to forming the renal pelvis, will also form the ureter, the larger and smaller chalices and the collecting tubules. Duplication of the ureter will result from the early division of the ureteral button [7].

Ureteral duplication can occur either completely or incompletely. In complete duplication, the ureters enter the bladder through different orifices, while in the incomplete, both enter, united, through only one orifice [4, 6]. In addition, in incomplete bifid ureters, the union can occur at the vesicoureteric junction (ureter "in V") or close to half of its path (ureter "in Y"), as in the case reported (figure 3) [8, 9]. Ureteral duplication is two to five times more common in women [10], and incomplete duplication is three times more common than complete [4]. The incidence of unilateral duplication is 1 for every 125 individuals (0.8%), against 1 for every 800 individuals for bilateral duplications (0.125%) [2]. Maranhão et al. [5] also points out that a kidney with a double collecting system, such as the one presented in this case, often has a more voluminous parenchyma, in addition to an increased size, especially in its longitudinal axis.

Despite being a major asymptomatic anomaly, especially in the first years of life [11], incomplete ureteral duplication may be related to an increased formation of stones at the junction point of the duplicated ureter, as the angle formed by the union is acute [4, 12, 13, 14]; however, symptomatic patients usually have a complete duplication [12, 15]. Aiken et al. [16] reported the case of a 37-year-old woman who presented with pain in the left flank and, when computed tomography was performed, complete bilateral ureteral duplication was evidenced, and three calculations obstructing the left double ureter. Similarly, Alsayyad [17] reported the case of a 41-year-old male patient, with a previous history of bilateral flank pain for several weeks, in addition to spontaneous passage of various calculations in recent years; simple abdominal radiography and excretory urography were performed, which showed complete bilateral ureteral duplication, with bilateral hydronephrosis and calculations in the four ureters.

In addition, there is a risk of a phenomenon called yo-yo reflux, in which urine travels from one ureter to another without it reaching the bladder, causing urinary stasis and,

consequently, predisposing the individual to infections. [18, 19]; such a phenomenon occurs only in incomplete duplications. Ozdogan et al. [19] described the case of a 6-year-old patient with recurrent urinary tract infections, later diagnosed with yo-yo reflux. In the same sense, Gupta et al. [18] described the case of a 32-year-old patient, who reported left low back pain and recurrent urinary tract infections, also later diagnosed with yo-yo reflux. Blind-ended ureters - a rare abnormality that occurs in 1% of cases of duplication [20] - are more susceptible to yo-yo reflux [14].

Also, ureteral duplication increases the chances of accidental injury to this organ during an operation. Thus, surgeons operating in this area must always be aware of this anomaly, which has a relatively high incidence [4, 14]. Kalantan et al. [21] reported the case of a 40-year-old patient with 4 miscarriages and 11 previous deliveries, 3 of them by cesarean section; the patient underwent an emergency hysterectomy, evolving in the postoperative period with pain in the left flank, nausea and vomiting, and a left ureteral duplication was later discovered. Hakim et al. [22] reported the case of a 53-year-old patient who underwent an open sigmoidectomy in which there was an injury to the left ureter. It is estimated that the ureteric lesion occurs in 0.5 - 1% of pelvic surgeries [23], of these, 52 - 82% occurs during gynecological surgeries [21], which explains the fact that there is a predominance of case reports with female patients in the literature; in addition, it is worth remembering that duplication of the ureter is more common in women [10], which further increases the prevalence of these injuries in this group.

Figure 1 – Right kidney pyelocaliceal systems. (RP I: Renal Pelvis I; RP II: Renal Pelvis II)

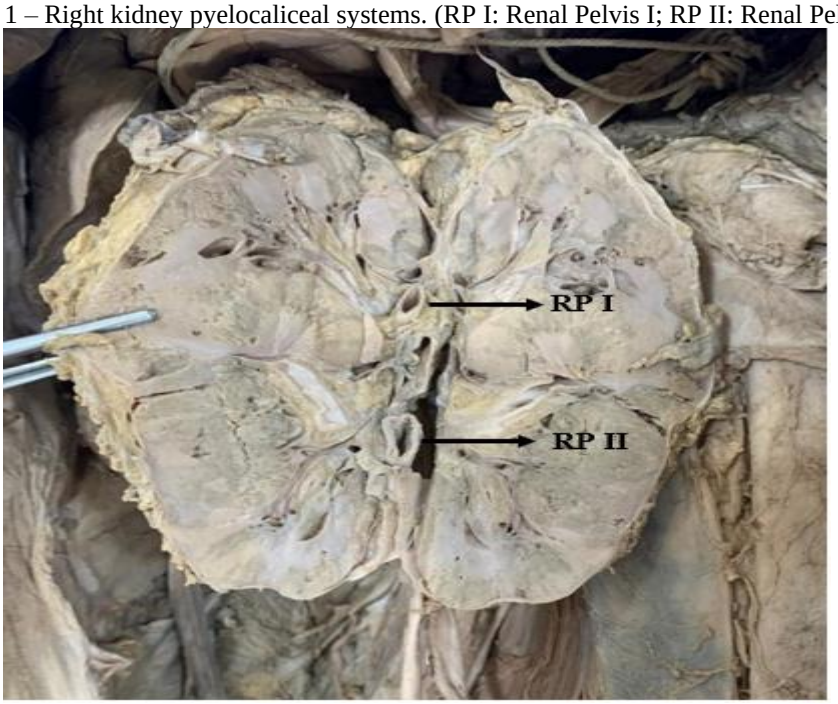

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Figure 2 – Renal hilum. (RK: Right kidney; RA: Renal artery; RV: Renal vein)

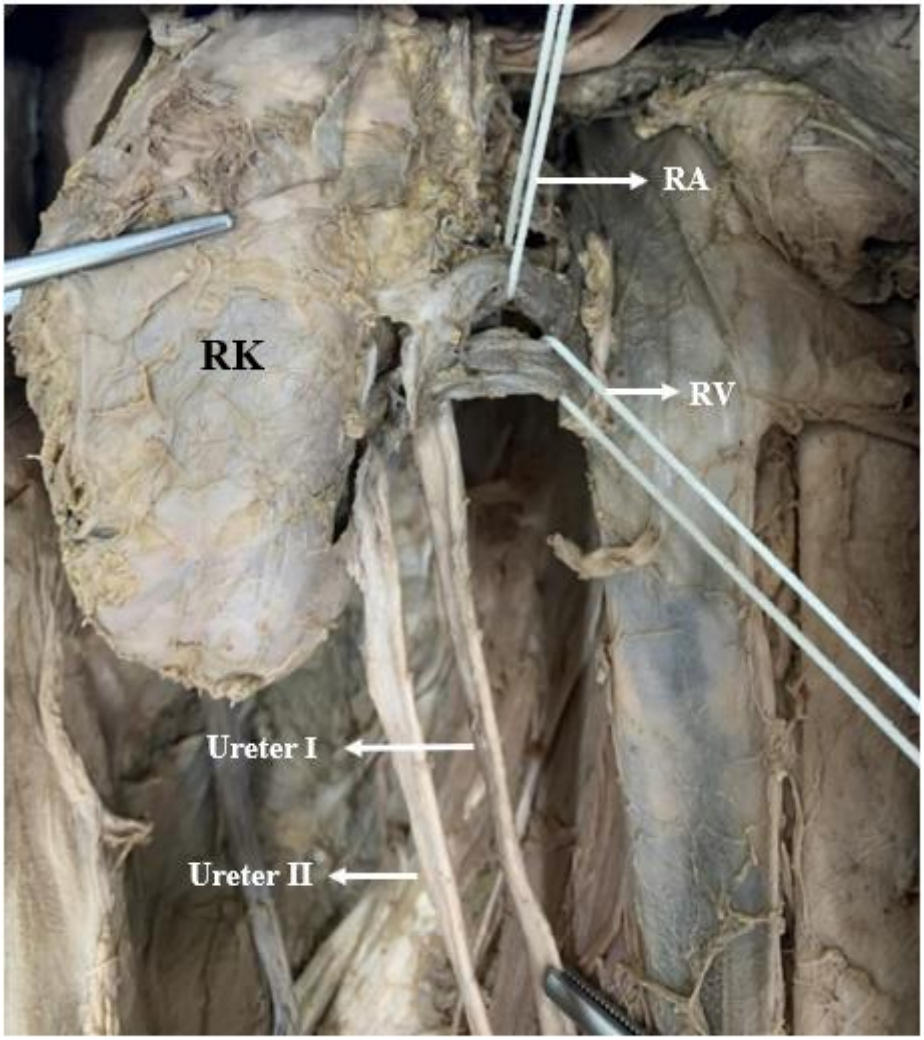

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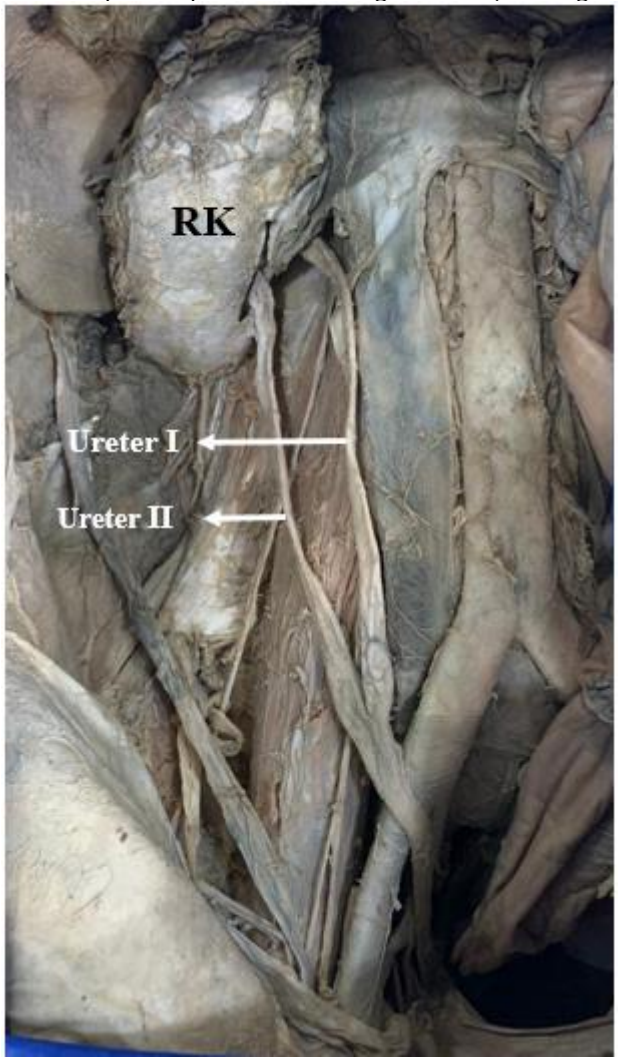
Figure 3 – Incomplete duplication of the right ureter. (RK: Right kidney)



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4 CONCLUSION

Duplication of the ureter is the most common congenital anomaly of this organ, and it may be complete or incomplete. The incomplete bifid ureter, although frequently asymptomatic, may be related to complications such as yo-yo reflux and the formation of stones, in addition to being more vulnerable to accidental surgical injuries, in case there has been no previous diagnosis. Thus, in cases with recurrent urinary tract infections or frequent stone formation, ureteral duplication should be included in the list of possible differential diagnoses, in view of its incidence (0.8%). In addition, surgeons who operate close to the renal region should always be aware of possible anatomical variations, in order to avoid accidental injuries.

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