

Operative Technique

Regarding some elements of surgical anatomy in treatment of pyelo-ureteral segments (PUS) in children

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Abstract

Referitor la unele elemente de anatomie chirurgicală în tratamentul PUS la copii

Frecvența complicațiilor postoperatorii (recurență, fistulă etc.) variază între 3% și 17%, considerându-se că acestea sunt cauzate de întreruperea vascularizării ureterului în timpul intervenției chirurgicale, ne existând date concludente cu privire la prevenirea intraoperatorie a leziunilor vasculare.

Autorul prezintă un studiu ce reflect vascularizarea ureterului, constatând prezența unei teci vasculo-nervoasă (mezo a ureterului), precum și ramuri vasculare și nervoase aferente și eferente situate într-o masă de țesut conjunctiv liber, circumscriind ureterul exterior. Această teacă participă în acoperirea pelvisul renal spre hilul renal și continuă în fascia renală.

Autorul conchide că pentru a preveni trauma ureterală, în timpul mobilizării intraoperatorii a ureterului, peritoneul nu trebuie detașat de ureter, iar ultimul nu trebuie fixat cu nicio ancoră, care să poată aluneca de-a lungul lui și să contribuie la leziunea vasele mezo. Pentru a evita deteriorarea vaselor mezo se recomandă fixarea ureterului cu forcepsul Allisca. Este necesar de a recurge la mobilizarea doar a segmentului care necesită de a fi eliminate, iar anastomoza trebui să implice învelișul care înconjoară ureterul cu vasele care îl vascularizează.

Cuvinte cheie: segment pieloureteral, anatomie chirurgicală, complicații postoperatorii, copii

Abstract

The frequency of postoperative complications (recurrence, fistula, etc.) varies between 3% and 17%, considering that they are caused by interruption of vascularization of the ureter during surgery, there are no conclusive data on the intraoperative prevention of vascular damage.

The author presents a study that reflects the vascularization of the ureter, finding the presence of a vascular-nervous sheath (meso of the ureter), as well as afferent and efferent vascular and nervous branches located in a mass of free connective tissue, circumscribing the outer ureter. This sheath participates in covering the renal pelvis to the renal hilum and continues into the renal fascia.

The author concludes that in order to prevent ureteral trauma, during intraoperative mobilization of the ureter, the peritoneum should not be detached from the ureter, and the latter should not be fixed with any anchor that could slide along it and contribute to the injury of the meso vessels. To avoid damage to the meso vessels, it is recommended to fix the ureter with Allis forceps. It is necessary to resort to the mobilization of only the segment that needs to be removed, and the anastomosis must involve the envelope that surrounds the ureter with the vessels that vascularize it.

Keywords: pyelo-ureteral segments, surgical anatomy, postoperative complications, children

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Introduction

Hydronephrosis is one of the most common kidney diseases requiring surgical treatment (1 in 100 children). After surgery complications occur, sometimes being severe, which according to the data of different authors range from 3% to 17%. In our clinic until 2015 complications accounted for 2-3% of recurrent fistulas (stenosis). There were recurrences (stenoses) with rapid evolution, especially after ureterolysis, the hydronephrotic kidney being nonfunctional during 8-12 months. Currently, ureterolysis is not performed in the clinic, because often the PUS remains devascularized after the stents are removed [1, 2, 7].

Purpose of the paper: to present an original method of PUS plastic surgery with the preservation of vascularization.

The vascular-nervous and fundamental components of the ureter, such as the predominantly loose connective tissue at this level, having an important role in its vascularization, innervation and protection, morpho-functionally constitute a *conjunctival-vascular-nervous sheath* [3].

This sheath is made by the passage of the connective tissue from the muscular-conjunctive sheath to the periphery as well as the passage of the connective tissue from the retroperitoneal cellular-adipose tissue in a loose connective plate, consisting of fine collagen and elastic fibers of varied condensation, anchoring the ureter in the retroperitoneal space [4, 5]. The sheath comprises the renal pelvis towards the renal hilum and continues into renal fasciae. From the renal pelvis segment, it partially becomes part of the external longitudinal muscular layer

of ureters, simultaneously dispersing to the urocyt, in the pelvic subperitoneal space, thus serving as a *conjunctival-vascular-nervous sheath* of the ureter.

Normally, this sheath is in close relationship with the ureter (fig. 1), and a distance from the muscular sheath can be observed in malformations due to the distribution of correlation between loose and cellular-adipose tissues (fig. 2). Depending on the ureteral segments, the sheath has a rather varied density, being denser in the pelvico-ureteral, subperitoneal and pre-urocystic region.

Histomorphologically, it has been established that the afferent and efferent vascular-nervous branches are located in a network (rețea) of loose connective tissue, circumscribing the ureter externally.

Although according to the histomorphological peculiarities the sheath is an intimate part of the ureter, between the sheath (conjunctival-vasculo-nervous sheath) and the ureteral muscular layer, the connective tissue is devoid of vascular anastomoses, only afferent and efferent arterio-venous vessels being present, allowing its detachment on insignificant areas.

The results obtained, confirm the existence of a cleavage plane between the sheath and muscular layer, which allows the mobilization of the ureter within various limits. Detachment of the ureteral sheath induces amputation of afferent and efferent arterial and venous branches (fig. 3), with disruption of local circulation in the ureteral meso, including the ureter within the detachment limits, especially in ureteral malformations (fig. 4).

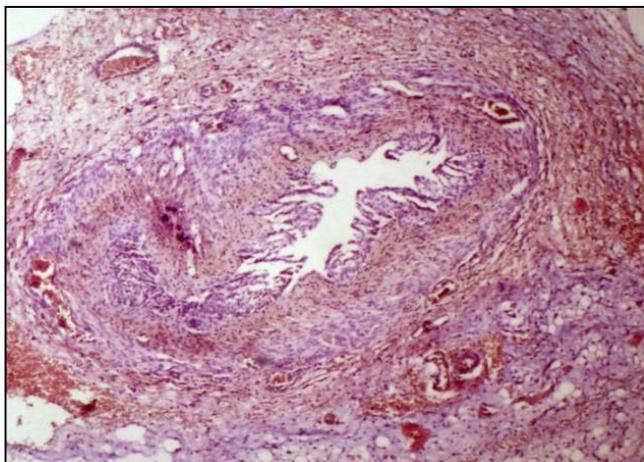


Fig. 1. Conjunctival-vascular-nervous sheath in the middle part of the ureter in a 6-month child. $\times 25$. H&E staining

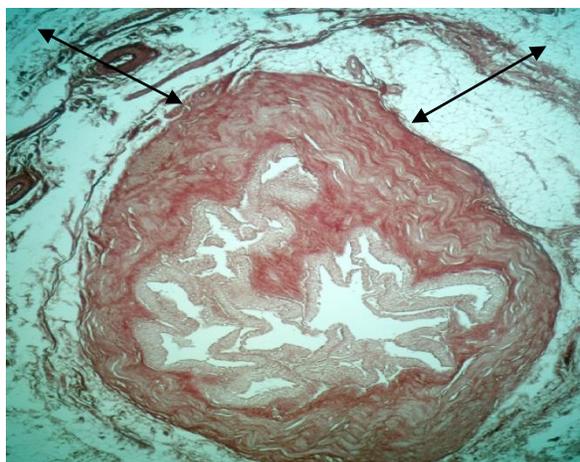


Fig. 2. Conjunctival-vascular-nervous sheath in megauretero-hydro-nephrosis of the ureter in the retroperitoneal space in a 1-year-old child

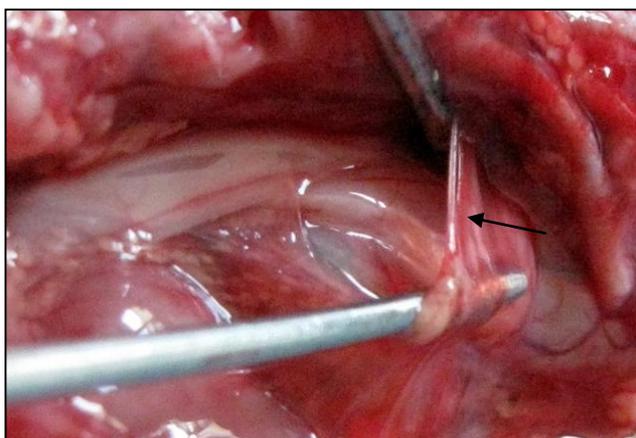


Fig. 3. Detachment of the periureteral conjunctival-vascular-nervous sheath (tunic) with ureter mobilization. Macropreparation.

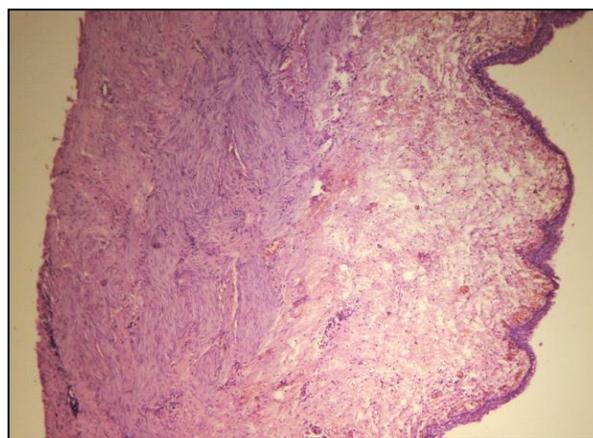


Fig. 4. Severe anemia of the ureter in the resection area after detachment of the conjunctival-vasculo-nervous sheath $\times 25$. H&E staining

Detachment of the ureter sheath over large areas, 1.0-1.5 cm, especially in malformations or inflammatory processes, generate severe circulatory disorders in the ureteral segments, intended for anastomosis. Therefore, in dissections performed on ureters, the integrity of the conjunctival-vasculo-nervous sheath should be kept maximally in order to avoid the onset of hemorrhage or ischemic and necrotic processes, which can be direct causes of anastomoses, hernias or anastomotic fistulas. The ureteral conjunctival-vasculo-nervous sheath, due to the prevalence of loose connective tissue, is quite

resistant, protecting both the vascular devices of the ureter and the ureter itself from invasive inflammatory processes or retroperitoneal infiltrative neoplasms. This property of the sheath has also been observed in infiltrative tumors of the *nephron* in which the ureter remains intact, crossing the tumor area. Similar observations have been made by other authors [6].

No postoperative complications were practically recorded in the last 3 years. Between 30 and 35 children are annually operated.

Surgery description: By lumbar approach, the PU segment is visualized, the peritoneum is detached from the ureter. The ureter is not mobilized to protect the meso (vessels) that is attached to the peritoneum.

It is recommended mobilizing only the PUS to be excised so as not to devascularize the ureter. According to Handren, a surgery meeting these requirements should be performed. The sheath should be involved in anastomosis.

In most cases, in children the renal pelvis should not be modeled (resected) because after removing the obstruction it returns to normal. Resection is performed only in a large, inflamed, thickened renal pelvis. Stents are applied in infants, while in newborns ureteropyelonephrostomy is performed.

According to Lopatkin N.A. (1973) and our data, drainage-free plastic surgery is indicated if only:

1. Urinary tract infection is absent.
2. On scintigraphy, there are signs of occlusion without disruption of secretion and discharge.
3. The transport of isotope in the parenchyma is disrupted.
4. The function of the contralateral kidney is not disrupted.
5. Normal or slightly disturbed intra-basal pressure.

The vascular-nervous sheath (meso) is also involved in suture-based plastic surgery in underdeveloped young children, being more visible in older children; thus, covering the ureter. In this way, vascularization can be protected, and anastomosis is sealed.

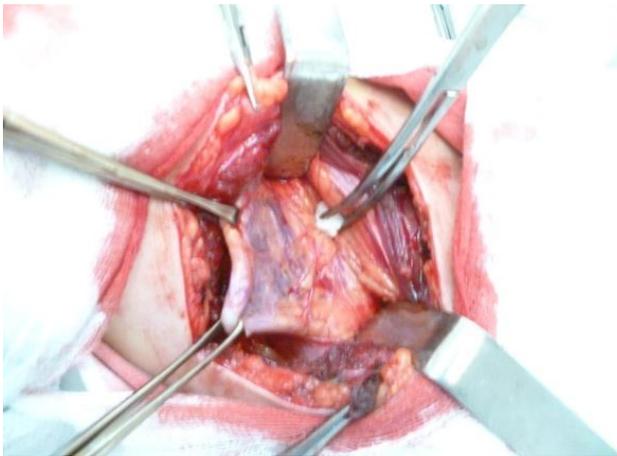


Fig. 5. Macroscopic appearance of the vascular-nervous sheath after detachment of the paranephral adipose layer. Ureter fixed with Alisca forceps

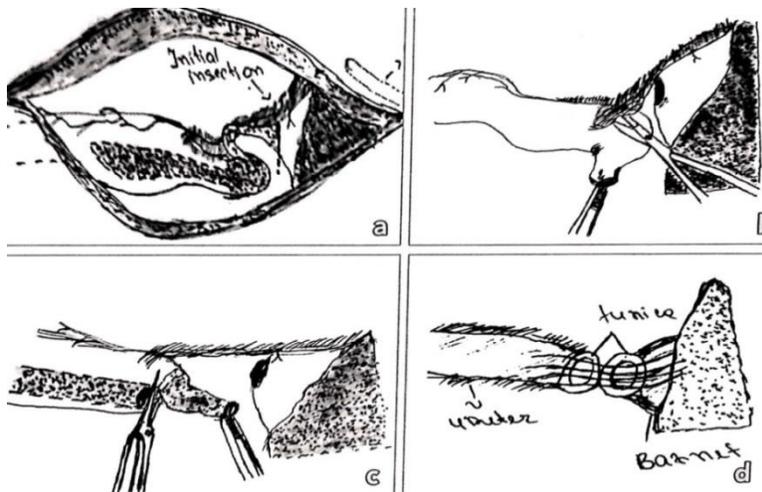


Fig. 6. Scheme. Pyelo-ureteral segment (PUS) plastic surgery. W.H. Hendren - Curajos B.: A - PUS causing hydronephrosis; B - PUS mobilization only within the resection limits; C - PUS resection; D - uretero-pelvic anastomosis with the involvement of the vascular-nervous sheath.

Conclusion.

To improve the results of surgical treatment of obstruction of the pyeloureteral segment, the described

method should be extensively used, based on the morphological study and providing good follow-up results.

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Conflicts of interest: authors have no conflict of interest to declare