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应用管路封堵器处理输尿管上段结石的随机对照研究

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摘要 目的:研究辅助使用管路封堵器后,采用输尿管镜下碎石术处理输尿管上段结石的效果及安全性。**方法:**选取自 2012 年 6 月至 2013 年 2 月需输尿管镜处理输尿管上段结石的病例 198 例,随机分为应用管路封堵器组 98 例和对照组 100 例。封堵器组术中输尿管镜发现结石后,封堵器组患者使用英诺伟 IVX-SC10 型管路封堵器超越结石远端封堵结石,再予钬激光碎石,对照组术中输尿管镜发现结石后,直接予钬激光碎石,术后留置双 J 管 2 至 4 周。记录并随访患者输尿管镜术后结石清除率及肾脏出血相关并发症。**结果:**管路封堵器组碎石成功率 95.9 % (94/98),对照组碎石成功率 81.0 % (81/100),两组有统计学差异($P=0.0011$)。碎石成功后管路封堵器组出现 3 例 (3.2 %) 肾脏破裂出血,而对照组无肾脏破裂出血,两组无统计学差异($P=0.1048$)。**结论:**辅助应用管路封堵器能提高输尿管镜对于输尿管上段结石的碎石成功率;其使用并没有增加术后肾脏出血并发症的发生。

关键词:管路封堵器;输尿管结石;输尿管镜碎石

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Randomized Controlled Study on Application of Pipeline Occluder in the Treatment of Upper Ureteral Calculi

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ABSTRACT Objective: To assess the efficiency and safety of assistant using pipeline occluder with ureteroscopic lithotripsy in the treatment of upper ureteral calculi. **Methods:** From June 2012 to 2013 February, 198 cases of upper ureteral calculi were divided into using pipeline occluder group (98 cases) and control group (100 cases). In the pipeline occlude group, Yingnuowei IVX-SC10 type pipeline occluders were put into the distal side of the calculus before holmium laser lithotripsy. In the contrast group, holmium laser lithotripsy was applied without pipeline occlude. The double-J tube was indwelled 2 to 4 weeks postoperatively. The successful rate of lithotripsy and the incidence of renal hemorrhage related to operation was observed and recorded. **Results:** The successful rate of lithotripsy was 95.9 % (94/98) in the pipeline occluder group and 81.0 % (81/100) in the control group with significant difference between two groups ($P=0.0011$). After lithotripsy, 3 cases (3.2 %) in the pipeline occluder group appeared hemorrhagic complication due to rupture of kidney, while the control group had no rupture of kidney, and there was no significant difference between two groups ($P=0.1048$). **Conclusions:** The assistant application of pipeline occluder can improve the successful rate of lithotripsy of upper ureteral calculi and it does not increase the incidence of hemorrhagic complication due to renal rupture.

Key words: Pipeline occlude; Ureteral calculi; Ureteroscopic lithotripsy

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前言

输尿管镜碎石术已成为治疗输尿管结石的一种常规技术。其开展初期多运用于输尿管中、下段结石病例。而输尿管上段结石由于碎石过程中结石及其碎片更易漂移进入肾盂、肾盏,制约了输尿管镜的应用^[1-3]。因此以往对于上段结石患者,较少采用输尿管镜技术,而较多采用体外冲击波、腹腔镜及经皮肾镜技术^[4-6]。随着腔内辅助器械研发的进步,各类输尿管封堵器的出现降低了碎石过程中结石漂移的发生^[7-11],使得输尿管镜

技术被更多地使用到输尿管上段结石的病例中。然而,在前期研究中,普遍存在病例数偏少,非随机对照研究等缺点。本单位自 2012 年 6 月成立结石亚学科后,集中开展管路封堵器辅助下输尿管镜下输尿管上段结石钬激光碎石技术。为评估该技术的安全性和有效性,我们特开展了一项临床随机对照研究。现将结果呈现如下。

1 材料与方法

1.1 研究对象

选取上海交通大学附属第一人民医院泌尿外科自 2012 年 6 月至 2013 年 2 月 198 例输尿管上段结石患者 198 例,其中男性 103 例,女性 95 例,年龄 14~75 岁,平均年龄 44 岁,结石直径 8~15 mm,平均 11 mm。所有患者均无严重基础疾病史,麻

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醉风险评分(ASA 评分)I-II 级。利用电脑产生的随机列表随机将其分为两组,使用管路封堵器组 98 例,对照组 100 例。入组条件:术前影像学确认输尿管结石直径大于 8 mm,位于骶髂关节平面以上。

1.2 手术方法

198 例输尿管镜手术皆由同一医师操作完成,并统一使用 Wolf F8/9.8 输尿管硬镜、瑞柯恩 60 W 钬激光。对照组直接采用钬激光碎石,管路封堵器组使用英诺伟 IVX-SC10 型管路封堵器封堵后再行钬激光碎石。操作过程如下:输尿管镜检查发现结石后,通过工作腔道置入管路封堵器,监视器直视下将封堵器头段透明导丝和叶片经由结石与输尿管壁间的缝隙穿越通过结石段输尿管,见穿越结石的封堵器导丝由透明变成蓝色时,后拉封堵器手柄卡锁到位,使叶片完全折叠成球状从而封闭结石上行通道。置入钬激光光纤碎石,将结石粉碎至 2 mm

以下后,将封堵器手柄完全复位,球状叶片完全展开后退出封堵器。留置 D-J 管 2 至 4 周。

1.3 评估指标

记录术中碎石情况和术后肾脏出血相关并发症,术后 2-4 周 KUB 平片确认碎石残留情况。

1.4 统计学分析方法

计量数据采用均数 $\pm$ 标准差表示,用 SPSS 18.0 软件处理数据,两组间均数比较用 t 检验,率的比较用 χ^2 检验。检验水准 $\alpha=0.05$, $P<0.05$ 有统计学意义。

2 结果

2.1 患者术前基本资料

表 1 显示了患者术前的基本资料:性别,年龄,结石位置,结石直径。以上指标两组间无统计学差异(P 值 >0.05)。

表 1 术前患者基本资料

Table 1 Baseline characteristics

	Pipeline occluder group	Control group	P value
Sex			0.7716
Male	52	51	
Female	46	49	
Age(year)	43.2 $\pm$ 23.7(14-72)	45 $\pm$ 35.3(22-75)	0.6547
Calculi position			
Left	53	56	0.7862
Right	45	44	0.6838
2 nd lumbar plane	2	5	
3 rd lumbar plane	32	33	
4 th lumbar plane	40	41	
5 th lumbar plane	24	21	
Calculi diameter (mm)	11.04 $\pm$ 3.4(8-15)	11.78 $\pm$ 2.1(8.5-14)	0.3356

2.2 输尿管镜碎石术后结果分析

封堵器组 98 例患者中,94 例患者在管路封堵器的辅助下成功完成了输尿管镜下碎石,成功率 95.9%,手术时间自 15 分钟至 45 分钟,术后 2 至 4 周复查 KUB 平片,均未见残留碎石。对照组 100 例患者中,81 例患者成功完成输尿管镜下碎石,成功率 81%,手术时间 10 分钟至 30 分钟,术后 KUB 也未见残留碎石。两组比较有统计学差异($P=0.0011$),使用封堵器能明显提高患者输尿管镜的碎石成功率。

本研究中,23 例患者输尿管镜下碎石失败,其中封堵器组 4 例,对照组 19 例。具体原因有:输尿管穿孔改开放,2 组各一例;输尿管镜无法到达结石部位,对照组 1 例;结石上移至肾盂,封堵器组 3 例,1 例为麻醉后结石自行上移,2 例为封堵器上推结石至肾盂(1 例放置封堵器时其头段叶片平面与结石管壁间缝隙平面成角明显,封堵器穿越结石时叶片将结石上推入肾盂;1 例放置封堵器时过早下拉手柄,叶片在结石远端折叠时将结石上弹入肾盂),对照组 17 例,均为输尿管镜水流或激光冲击至肾盂(表 2)。这 23 例患者通过开放手术或者体外冲

击波碎石术均得到满意的结石清除。

2.3 输尿管镜碎石术后并发症

表 3 为输尿管镜下成功碎石术后并发症的发生率。封堵器组 94 例成功碎石的患者中,有 3 例男性患者(第三腰椎水平 2 例、第 4 腰椎水平 1 例)术后即发生了肾脏破裂出血。返回病房后,3 名患者都立即出现了剧烈的患侧腰背部疼痛、导尿管血尿加深,急查血常规血红蛋白均较术前明显下降 2 g/dL 以上,即予绝对卧床、止血、抗感染、对症支持等保守治疗措施。其中 2 例患者在术后第二天开始出现血尿颜色转淡,血红蛋白回升,腰部症状明显改善等出血得到控制之表现,进一步 CT 检查证实均存在肾包膜下血肿,观察至术后 1 周病情好转稳定后予以出院。另 1 例患者经保守治疗无效,血红蛋白第一天下降 3 g/dL,以后每天以 1 g/dL 的速度下降,于术后第 3 天行 DSA (digital subtraction angiography,血管造影)栓塞治疗,证实肾脏中部有一微小静脉破裂,介入治疗后肾脏出血即停止,病情好转稳定 1 周后出院。此 3 例肾脏出血患者,术前普遍存在以下情况:输尿管结石导致尿路梗阻的病程均在 1 年以上;肾脏重

度积水合并明显肾实质萎缩，术前 ECT 肾动态显像提示患肾 GFR 11 mL/min 至 17 mL/min;2 例患者合并有糖尿病。术后 7 例患者出现高热(体温 >38.5℃),其中封堵器组 3 例,对照组 4 例,两组间无统计学差异(P=0.7054)。选取合适抗生素抗感染治疗后体温均恢复正常。.

表 2 输尿管镜碎石失败原因
Table 2 Reasons for the failure of lithotripsy

	pipeline occluder group	control group
Ureteral perforation	1 [#]	1
Ureteroscope can not reach the calculi	0	1
Calculi move to renal pelvis		
spontaneous after anaesthesia	1	0
push up by pipeline occluder	2 ^{###}	/
push up by water flow/laser	/	17
Total	4	19

Note: [#]: Perforation occurred in the distal side of the calculi where the ureter was severely twisted, normal lumen of the ureter could not be found and ureterolithotomy was performed. ^{###}: In one case, the calculi was pushed up while placing the pipeline occluder; in another case, the pipeline occlude did not completely cross the calculi while opening the pipeline occluder, and the calculi was bounced into the renal pelvis by the blade of the pipeline occluder.

表 3 输尿管镜成功碎石术后并发症发生情况
Table 3 Postoperative complications after ureteroscopic lithotripsy

Complications	pipeline occluder group(%)	control group(%)	P value
Renal rupture	3(3.19)	0(0)	0.1048
Fever>38.5℃	3(3.19)	4(4.94)	0.7054

3 讨论

国外报道显示，输尿管镜对上段结石完全击碎率为 35 % ~87 %^[12-15]。李逊等报道输尿管镜治疗嵌顿性上段结石,42 % 的病例需要辅助其它方法的治疗^[16]。本单位开展的管路封堵器辅助下的输尿管镜下输尿管上段结石碎石手术，成功率可达到 95.9 % (94/98)，若考虑到封堵器使用经验积累过程的影响 -- 有 2 例患者的失败由于操作不当直接造成结石漂移,成功率可进一步提高。

而成功完成管路封堵器辅助下的输尿管镜下碎石的关键步骤在于正确操作下形成有效封堵。我们总结了以下注意点：1)术前应仔细检查管路封堵器头段叶片收缩、展开是否正常，避免术中无法使用。2)发现结石后首先寻找结石与输尿管壁间的缝隙,此时不应为避免结石漂移而完全关闭灌注液,调整适当的灌注压力更有助于绝大多数的结石展示缝隙所在,而对于少数严重嵌顿而无法展示缝隙的结石,可先用钛激光击碎结石一角以人造缝隙。3)封堵器叶片穿越结石部位时,注意通过旋转封堵器导丝调整叶片平面方向,避免使该平面外缘成角经过结石边缘,从而避免叶片助推(特别是体积较小嵌顿不紧的)结石漂移。4)结石近段输尿管的扩张程度与封堵效果成反比,对于扩张较明显的病例,在碎石过程中,随着结石体积逐渐变小,反复适当地向外牵拉封堵器以固定待碎结石,有助于降低封堵失败的可能。而对于那些输尿管扩张程度远远超过封堵器规格的病例,则不推荐使用。

94 例成功碎石病例中出现了 3 例肾脏破裂出血患者（发

生率达 3.19 %),引起了我们的思考。肾脏出血作为输尿管镜手术的一种并发症也有报道,发生率很低,约 0.2 %^[17,18]。考虑梗阻时间长、肾脏萎缩、合并糖尿病等因素也与出血有一定关系。但在术者以往无管路封堵器辅助下进行过的输尿管镜下输尿管上段结石碎石术的病例中,未出现过肾脏出血的并发症。出血发生率较过去的突然提高是否与管路封堵器的使用也有一定的关系? 我们发现封堵器须超越结石的透明导丝段长约 5 cm,且透明导丝头端较常用的斑马导丝头端硬度略高,是否在其辅助处理输尿管上段结石时，其头端透明导丝易进入肾盂内,而更易刺破肾脏组织,在梗阻时间长、肾脏萎缩、合并糖尿病等因素同时存在时发生了肾脏出血^[19,20]? 我们认为进一步的大样本的随机对照研究有助于探寻封堵器的使用是否会增加肾脏出血的发生率,也可以进行动物试验观察封堵器头端导丝对动物肾脏损伤的可能,建议在技术条件允许的情况下改良封堵器头端透明导丝的长度与质地。

总之,管路封堵器的使用对于输尿管镜处理输尿管上段结石具有积极的作用,输尿管镜碎石成功率的提升意味着患者创伤的减少,住院时间与费用的降低。碎石成功的关键在于正确掌握封堵器的使用技巧。而封堵器的使用是否增加了肾脏出血的发生值得进一步研究。

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