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输尿管镜钬激光治疗输尿管上段结石防止结石逃逸方法的研究进展

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[摘 要] 在输尿管镜钬激光治疗输尿管上段结石中，结石及结石碎片向肾盂逃逸是治疗失败的常见问题，往往需要进一步处理，甚至再次手术，增加治疗成本和时间。辅助装置的应用明显降低结石逃逸的发生率，提高单次手术的结石清除率。

[关键词] 输尿管镜；钬激光；输尿管上段结石；结石逃逸；输尿管导管；封堵器

Research progress of preventing migration of ureteral stones during the ureteroscopic holmium: YAG laser lithotripsy for proximal ureteral stones

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Abstract Migration of ureteral stones or stone fragments is quite common failure during the ureteroscopic holmium:YAG laser lithotripsy for proximal ureteral stones. Such complications require additional procedures and even operation, which increases the cost and time of treatment. Auxiliary devices can prevent the migration and improve stone-free rate of a single operation.

Keywords ureteroscopy; holmium: YAG laser; proximal ureteral calculi; migration of ureteral stones; ureteral catheter; occlusion devices

目前治疗输尿管上段结石的方法主要有体外冲击波碎石术(extracorporeal shock wave lithotripsy，ESWL)、输尿管镜碎石术(ureterorenoscope lithotripsy，URL)、经皮肾镜取石术(percutaneous nephrolithotomy，PCNL)、腹腔镜输尿管切开取石术(laparoscopic ureterolithotomy，LUL)及开放输尿管切开取石术。大部分患者通过ESWL可获得满意疗效。ESWL治疗失败或有禁忌者，可考虑使用URL，PCNL或LUL治疗，而开放性输尿管切开取石术在临床上已经很少应用[1]。URL因为其具有结石清除率高、创伤小、并发症少、恢复快等优点，成为输尿管结石的主要治疗方法之一，近年也更多地应用于输尿管上段结石的治疗。

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2014年中国泌尿外科疾病诊断治疗指南输尿管镜治疗输尿管上段结石手术指征为：1)ESWL失败者；2)结石长径<1.5 cm；3)结石停留在输尿管内时间超过8周或炎性息肉包裹，肾积水中度以上[1]。

目前输尿管镜治疗输尿管上段结石主要的碎石方法有气压弹道和钬激光。传统的气压弹道碎石通过机械性震动方法把结石打碎，钬激光主要通过热效应碎石，水吸收激光能量后汽化形成的小球随即裂解瞬间产生冲击波粉碎结石，形成细小的碎粒排出体外[2-3]。其中，钬激光碎石具有微创、可控、直视、定位准确、安全、碎排一体化的特点，被公认为是当今治疗尿路结石的首选方法。

然而，单纯输尿管镜钬激光碎石术对治疗输尿管上段结石效果不甚理想，成功率低，国外报道[4-6]成功率为35%~87%。影响输尿管镜钬激光治疗输尿管上段结石因素很多，主要有结石逃逸、输尿管狭窄扭曲、息肉黏膜出血及结石碎屑、输尿管穿孔、肾盂及输尿管积水程度。其中最主要的是结石逃逸进入肾盂肾盏内。有报道[7]显示：钬激光治疗输尿管上段结石时结石进入肾盂的发生率可高达25%。文献[8]报道： 手术失败的原因中以结石向肾盂逃逸比例最高(76%)，这是输尿管镜钬激光碎石术式所难以避免的。结石逃逸的相关因素主要包括结石大小硬度位置及结石近端输尿管扩张、进镜进水压力、碎石能量等，由此造成辅助治疗、二次手术以及尿路感染等并发症，增加患者的痛苦及经济负担[9-11]。

如何对手术方法进行改良，防止术中结石逃逸、提高碎石成功率、结石清除率成为输尿管镜钬激光治疗输尿管上段结石的一个关键问题[12]。为防止结石逃逸，已有的报道[9,13-15]中采取的方法有输尿管导管法、封堵器法、联合利尿剂法、头高臀低位或侧卧位、减小或关闭输尿管镜进水开关低灌注、降低碎石能量等。

1 输尿管导管法

输尿管镜抵达结石下方后，将一根输尿管导管越过结石向上插入，必要时可插入肾盂，经导管持续推注或泵入生理盐水，在输尿管内形成的向下水流冲刷碎石，降低结石逃逸可能。

夏国建等[16]研究发现旁置输尿管导管碎石组及常规碎石组结石清除率分别93.0%(40/43)和83.7%(36/43)。孙路等[17]研究报道旁置输尿管导管进行的30例输尿管结石(各段结石)患者单次手术结石粉碎率100%。之后孙路等[18]又在传统旁置输尿管导管的基础上，改良旁置输尿管导管持续顺行灌流输尿管镜钬激光碎石技术治疗48例输尿管中上段结石患者，单次手术结石粉碎率达91%。

旁置输尿管导管的优点：在不增加患者手术费用的前提下克服传统手术冲洗不畅导致视野不清、肾盂输尿管压力过大的弊端，有效降低术中结石逃逸或碎片残留的风险，降低输尿管损伤和尿路感染、尿源性败血症、感染性休克及肾功能损害的发生率。

旁置输尿管导管的缺点[19]：1)旁置输尿管导管耗时，尤其早期开展此手术时，逆行置管有一定阻力，为避免假道形成和置管过程中结石上移，常需消耗一定时间；2)旁置输尿管导管后输尿管镜再次进镜操作空间变小，进镜退镜及碎石操作有一定困难。

为改良输尿管导管置入后输尿管管腔操作空间变小问题，肖武周等[20]采用输尿管镜腔内旁置输尿管导管钬激光碎石取石术，克服了传统输尿管导管旁置时输尿管腔空间减小、进镜困难、多次进镜易损伤输尿管等不足，效果良好。

为阻止结石向上移位，黄永斌等[21]采用单J管置入结石上方，减少了结石移位残留的概率。

2 封堵器法的应用

近年来国内外出现球囊导管、拦截网篮、锥形导丝、多层折叠阻石膜及利多卡因凝胶等各种辅助材料用于提高输尿管上段结石的碎石成功率，效果明显[22]。

2.1 球囊导管法

置入输尿管气囊导管，并将导管跨越结石，注入生理盐水，导管尖段气囊扩张阻挡结石，目前报道的有球形、管状形。

气囊导管除阻挡作用外，灌注水流抵达气囊时所产生的折返波也能带动结石下移，在两者的共同作用下促进了结石排出，同时降低肾盂压力，减少感染概率。

王喻等[23]将输尿管球囊扩张导管应用于74例输尿管上段结石患者中，一次碎石成功率为97%。薛东芳等[24]将大fogarty球囊导管应用于55例输尿管上段结石患者中，单次手术成功率为100%。

2.2 拦截网篮

装置整体柔软且有弹性，在结石上方展开后呈帽子状结构，大大减少结石上移率，提高了碎

石成功率。

Feng等[25]对比研究156例应用拦截网篮与152例未应用拦截网篮治疗输尿管上段结石，发现应用网篮组明显提高碎石成功率；任晓磊等[26]利用输尿管镜钬激光联合拦截网篮治疗输尿管上段结石，术中对照组和观察组结石上移率分别为24.29%和6.67%；周高峰等[27]对比研究输尿管镜钬激光碎石术治疗输尿管上段结石手术中联合应用拦截网篮治疗以及未联合应用的患者，一次性治疗成功率分别为98.5%，90%。

2.3 锥形导丝

曾被称为新一代的套石篮装置，越过结石后在结石上方展开形成螺圈状结构阻止结石向上逃逸。

Maislos等[28]对19例输尿管上段结石采用锥形导丝(Stone Cone)封堵，单次碎石成功率为100%；Netsch等[29]报道使用锥形阻石器可大大降低输尿管镜手术中结石漂移；陈俊泳等[30]对51例输尿管上段结石中应用锥形导丝，碎石成功率为96.1%。输尿管镜钬激光处理输尿管上段结石配合使用锥形导丝，能够有效防止结石逃逸，提高碎石成功率。

2.4 多层折叠阻石膜

由叶片、导丝、外管以及手柄组成。叶片越过结石后叶片折叠成球在结石上端起到封堵作用。

吕承勋等[31-32]在输尿管镜钬激光治疗输尿管上段结石中，对比研究采用管路封堵器及未采用管路封堵器进行碎石，结果发现输尿管镜钬激光碎石联合管路封堵器治疗输尿管结石，可降低结石上移发生率、提高结石清除率。

陈苏等[33]联合管路封堵器治疗51例输尿管上段结石患者，出现3例结石上移；朱新胜等[34]治疗57例输尿管上段结石，54例使用管路封堵器一次碎石成功。管路封堵器能显著减少输尿管镜上段结石碎石术中结石逃逸，提高输尿管上段结石的一次碎石成功率。

2.5 利多卡因凝胶

利多卡因凝胶并不算严格意义上的封堵装置，偶然发现其凝固特性后将其应用于输尿管上段结石的封堵。

Mohseni等[35-36]采用此法治疗输尿管上段结石，得出利多卡因凝胶注射到输尿管近端对于防止结石向上迁移效果良好，显著提高了结石清除率。

新型封堵装置的出现，降低了结石逃逸率，提高了碎石成功率，有研究[37]表明使用拦截网篮、多层折叠阻石膜及锥形导丝等各类输尿管封堵器结石清除率报道相近。但在临床应用中发现结石封堵器也存在一些缺点，如小结石嵌顿网孔致网篮无法正常回缩、金属网丝容易被钬激光烧断损毁，且烧断脱落的金属丝有残留于肾输尿管内的风险，术后套石网篮嵌顿出现输尿管损伤，甚至撕脱或进退两难而需改开放手术补救[38]。封堵取石导管也存在运用不当结石易被叶片带入肾盂肾盏及叶片打碎进入肾盂的可能，且各类封堵装置费用较高，增加患者的经济负担。

3 结语

输尿管镜钬激光治疗输尿管上段结石中，各种防止结石逃逸方法能显著降低结石逃逸率，提高手术碎石成功率，方法各有利弊，可根据个人经验及实际情况选择合适的一种。随着技术的不断进步和成熟，相信会有更好的辅助材料或方法治疗输尿管上段结石，减少并发症、缩短手术时间、降低费用并减少住院时间，减轻患者的痛苦及负担。

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