· 研究快报 ·

经皮肾动脉交感神经消融术中消融点位对顽固性高血压患者降压效果的影响

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[摘要]　目的　探索不同消融位点对经皮肾动脉交感神经消融术治疗顽固性高血压降压效果的影响。方法　选择 16 例顽固性高血压患者,随机分为近中段消融组和全段消融组,每组 8 例。完善相关检查后行经皮肾动脉交感神经消融术治疗。术中记录消融参数(起始阻抗值、最低阻抗值、消融实际功率、消融实际温度),术后即刻复查肾动脉造影。所有患者术后继续监测血压,随访至术后 3 个月。结果　全部 16 例患者均成功完成经皮肾动脉交感神经消融术。所有患者消融起始阻抗平均值为(180.0±12.3)Ω,消融最低阻抗平均值为(157.8±12.8)Ω,阻抗下降率平均为(12.4±2.6)%;实际消融温度为 40～50℃,功率为 5～18 W。术后肾动脉造影显示全段消融组 2 例发生肾动脉痉挛,近中段消融组无一例发生肾动脉痉挛,两组肾动脉痉挛发生率差异无统计学意义(P＝0.08)。术后 3 个月随访,两组患者血压未见明显差异。结论　在肾动脉近中段进行消融,特别是在肾动脉开口处消融,可能不会影响经皮肾动脉交感神经消融术的降压效果,并可一定程度上减少肾动脉狭窄的发生率。

[关键词]　经皮肾动脉交感神经消融术;消融位点;顽固性高血压

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Effect of ablation sites in catheter-based renal sympathetic denervation on anti-hypertension results in patients with resistant hypertension

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[Abstract]　Objective　To study the effects of ablation site in catheter-based renal sympathetic denervation (RDN) on antihypertensive results in patients with resistant hypertension. Methods　A total of 16 patients with resistant hypertension were evenly randomized into two groups: proximal or distal ablation group. RDN was performed after examination. The ablation parameters, including impedance starting value, minimum impedance, actual wattage, and the actual temperature, were recorded intraoperatively. Renal angiography was done again immediately after RDN. Standardized BP measurements were obtained in all patients for 3 months after operation. Results　All the 16 patients underwent RDN successfully. The average initial impedance of the 16 patients was (180.0±12.3) Ω, average minimum impedance was (157.8±12.8) Ω, and average impedance drop rate was (12.4±2.6)%. The actual ablation temperature was 40-50℃, with the actural ablation wattage being 5-18 W. The renal angiography showed two cases of renal artery spasm in the distal ablation group and none in the proximal group, with no significant difference found in the incidence between the two groups (P＝0.08). There was no significant difference in BP between the two groups 3 months after RDN. Conclusion　Proximal ablation, particularly at the opening of renal artery, may not influence the antihypertensive effect of RDN, and to some extent it can reduce the incidence of renal artery stricture.

[Key words]　catheter-based renal sympathetic denervation; ablation position; resistant hypertension

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原发性高血压的发生发展与肾脏和自主神经系统的调节密切相关[1-3]。肾脏和自主神经系统通过肾交感神经相连接。肾交感神经分为肾交感传入神经(afferent renal sympathetic nerves,ARN)和传出神经(efferent renal nerves,ERN)。经皮肾动脉交感神经消融术(renal sympathetic denervation,RDN)是一种新型临床介入治疗方法,它可以同时阻断ARN和ERN[4]。在顽固性高血压的治疗中,RDN显示出卓越的疗效。在目前已进行的各类临床试验中,均采用"Symplicity HTN"系列试验的消融方法(环形消融1周,每侧动脉消融4~6个点,每个点相距5 mm)[5-9]。肾动脉不同节段所占消融比例、不同的消融侧重部位是否会对手术效果产生影响,均未见报道。本研究旨在探讨RDN术中不同消融部位与消融效果的关系。

1　对象和方法

1.1　研究对象　根据入选标准和排除标准,选择本院心内科2013年2月至5月间顽固性高血压患者共16例。入选标准:年龄18~85岁,收缩压>160 mmHg(1 mmHg=0.133 kPa;合并糖尿病的患者,收缩压>150 mmHg),服用3种或3种以上降压药物(包含一种利尿剂)。排除标准:肾小球滤过率(estimated glomerular filtration rate,eGFR;采用MDRD公式计算)低于45 mL/(min·1.73 m²),瓣膜性心脏病患者,怀孕或准备怀孕的患者。所有患者入院后均采用5点测血压法监测血压(每天测5次血压,时间分别是6:00、10:00、14:00、18:00、22:00)。

1.2　治疗方法　所有患者随机分为两组(全段消融组、近中段消融组),每组8例,于基本检查完善后行RDN。患者术前一次嚼服肠溶阿司匹林300 mg,术中静脉注射普通肝素6 000 U。行右侧腹股沟处消毒,于股动脉处进行穿刺,置入7F血管鞘。先以6FJR导管进行左右肾动脉造影,明确肾动脉的走行、个数、有无狭窄。造影结束后,沿鞘管送入7F导引导管(RDC mach1,55 cm,波士顿科学公司),于7F导引导管内置入5F射频消融导管(IBI-Therapy,St. jude Medical公司),分别在双侧肾动脉行RDN。将肾动脉分为近、中、远3段,全段消融组近、中、远段均消融,近中段组仅消融近、中段。消融模式:温控45~50℃,5~15 W,进行螺旋式消融,每个点消融30~60 s。

1.3　主要观察指标　术中记录消融参数(起始阻抗值、最低阻抗值、消融实际功率、消融实际温度),记录消融点位并统计消融位点在肾动脉近、中、远3段的分布情况。术后即刻复查肾动脉造影,检查有无肾动脉狭窄。所有患者RDN术后继续监测血压。出院后患者使用电子血压计自测血压,每天测血压3~5次并记录取平均值。术后1周、2周、1个月、3个月随访并记录血压。

1.4　统计学处理　使用SPSS软件进行分析,检验所有指标数值是否符合正态分布,若符合正态分布,则以$\bar{x}\pm s$表示,并采用两样本t检验比较组间差异;若不符合正态分布,则以中位数(最大值,最小值)表示,并采用Wilcoxon符号秩检验比较组间差异。检验水准(α)为0.05。

2　结　果

2.1　患者临床基线资料及RDN消融参数　患者的临床基线资料如表1所示,近中段消融组和全段消融组间各项资料差异均无统计学意义。所有患者均成功进行了RDN,每例患者消融点数8~16个,平均(11.2±2.4)个;消融肾动脉数2~4条,平均(2.25±0.7)条;消融起始阻抗160.8~209.4 Ω,平均(180.0±12.3)Ω;消融最低阻抗140.1~186.5 Ω,平均(157.8±12.8)Ω;阻抗下降率7.1%~16.4%,平均(12.4±2.6)%。实际消融温度在40~50℃之间,功率在5~18 W之间,每个点消融时间在30~60 s,以60 s居多(占68.2%,112/179)。

2.2　不同消融点位分布对患者随访血压及肾动脉的影响　比较2组不同消融点位方案(近中段消融、全段消融)患者的平均血压及并发症的发生率,结果显示,2组患者在消融前、术后1周、术后2周、术后1个月、术后3个月均无明显差异(表2)。2组患者消融术后即刻复查肾动脉造影结果显示,在近中段消融组均未见任何狭窄和痉挛,在全段消融组有2例患者出现肾动脉痉挛(静脉推注硝酸甘油后好转),两组相比差异未见统计学意义($P=0.08$)。

2.3　术中及术后并发症　所有患者均未发生任何外周血管并发症;2例患者术后股动脉穿刺处出现瘀斑,经热敷后好转;1例患者术中出现一过性心动过缓,使用阿托品后好转;1例患者术中无法耐受疼痛,予静脉麻醉后成功完成手术。

表 1 两组患者的临床基线资料

Tab 1 Clinical characteristics and background medications of the two groups

$n=8$

Index	Proximal ablation group	Distal ablation group
Systolic blood pressure p/mmHg,$\bar{x}\pm s$	191.2±11.3	181.4±14.2
Diastolic blood pressure p/mmHg,$\bar{x}\pm s$	98.3±7.1	98.5±11.4
Age (year),$\bar{x}\pm s$	67.5±6.2	65.3±7.4
Sex (male/female) n/n	8/0	8/0
Race (yellow) $n(\%)$	8(100)	8(100)
Body mass index (kg·m^{-2}),$\bar{x}\pm s$	31.3±5.4	32.5±4.3
Complicated diseases $n(\%)$		
Type 2 diabetes	2(25)	3(37.5)
Coronary artery disease	1(12.5)	1(12.5)
Hypercholesterolaemia	1(12.5)	1(12.5)
Atrial fibrillation	1(12.5)	0(0)
Heart failure $n(\%)$	1(12.5)	1(12.5)
eGFR(mL·[min·1.73 m^2]$^{-1}$),$\bar{x}\pm s$	76.4±15.2	75.3±13.5
eGFR 45-60 mL/(min·1.73 m^2) $n(\%)$	0(0)	0(0)
Serum creatinine c_B/(μmol·L^{-1}),$\bar{x}\pm s$	87.4±14.3	85.5±12.4
Heart rate f/min^{-1},$\bar{x}\pm s$	72.5±8.3	71.4±9.5
Receiving hypertension medication for more than 5 years $n(\%)$	8(100)	8(100)
Antihypertensive agents received $n(\%)$		
CCB	8(100)	8(100)
Diuretics	8(100)	8(100)
ACEI/ARB	8(100)	8(100)
Direct renin inhibitors	1(12.5)	0(0)
β-Blockers	8(100)	8(100)
α-Blockers	1(12.5)	0(0)
Centrally acting sympatholytics	0(0)	0(0)

eGFR:Estimated glomerular filtration rate;CCB:Calcium-channel blockers;ACEI:Angiotensin-converting enzyme inhibitors;ARB:Angiotensin-receptor blocker. 1 mmHg=0.133 kPa

表 2 不同消融位点分布对患者随访血压的影响

Tab 2 Effect of different ablation sites on blood pressure during follow-up

$n=8$,$\bar{x}\pm s$,p/mmHg

Group	Baseline	1 week after RDN	2 weeks after RDN	1 month after RDN	3 months after RDN
Systolic pressure					
Proximal ablation	191.2±11.3	152.4±12.1	151.3±11.4	144.5±12.3	136.3±9.2
Distal ablation	181.4±14.2	149.3±12.3	142.3±13.2	141.3±16.4	136.5±12.3
P value	0.14	0.62	0.15	0.69	0.91
Diastolic pressure					
Proximal ablation	98.3±7.1	86.2±4.3	84.3±5.2	81.4±4.2	80.2±3.6
Distal ablation	98.5±11.4	85.3±8.5	83.4±5.3	83.1±4.2	79.5±6.2
P value	0.94	0.73	0.53	0.52	0.76

RDN:Renal sympathetic denervation. 1 mmHg=0.133 kPa

3 讨 论

ARN 从肾脏发出,进入脊柱背根投射至中枢神经元(脑干及下丘脑的部分区域)。ARN 将分布于肾脏的化学感受器(感受内环境的改变)和压力感受器(监测肾脏的静水压的改变)所发出的信号输送致

中枢神经系统(central nervous system,CNS)[10-11]。ERN 上起自第 10 胸椎,下至第 1 腰椎,随肾动脉进入肾脏。ERN 的激活可致肾素释放、钠离子重吸收增加、肾血流减少。ARN 和 ERN 以网状交叉的形式均广泛分布于肾动脉外膜,有证据表明,ARN 和 ERN 在顽固性高血压的发生、发展中均占有重要的地位[12-14]。

我们在临床治疗中也发现,部分患者肾动脉迂曲,消融导管无法到达肾动脉远端。因此,探讨 RDN 的消融点位分布特点显得尤为关键。我们的研究结果显示,在肾动脉近中段进行消融,特别是在肾动脉近段靠开口处进行密集的点消融,即可达到有效的降压效果,无需对肾动脉全段进行消融。在进行 RDN 特别是对肾动脉迂曲的患者进行 RDN 时,采用肾动脉近段消融方案可一定程度上降低手术操作难度率。

我们的结果显示,当起始阻抗在 160～200 Ω、消融温度在 40～45℃ 时,使用 5F 射频消融导管进行 RDN 安全可行,不会出现肾动脉狭窄;在肾动脉近中段进行消融,可能不会影响 RDN 的降压效果,并可在一定程度上减少肾动脉狭窄的发生率。

4　利益冲突

所有作者声明本文不涉及任何利益冲突。

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