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◇临床医学◇

经食管超声心动图在无球囊预扩张经导管主动脉瓣置换术中的临床意义

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摘要: 目的 比较经食管超声心动图(TEE)在球囊预扩张(BPD)和无球囊预扩张经导管主动脉瓣置换术(TAVI)中的差异,评估经食管超声心动图在无球囊预扩张经导管主动脉置换术中的临床意义。**方法** 回顾性分析2016年1月至2019年1月在郑州市第七人民医院行TAVI的149例重度主动脉狭窄病人的经食管超声心动图资料,比较主动脉环及根部、瓣叶活动度和钙化程度以及瓣膜面积等数据,从而评估经食管超声心动图在无球囊预扩张经导管主动脉置换术中的临床意义。**结果** 病人年龄(82.73±5.26)岁,59例病人接受了无球囊预扩张经导管主动脉瓣置换术。主动脉瓣面积(0.61±0.15)cm^2,主动脉瓣环长径(22.14±2.31)mm。共14例病人在TAVI术后出现瓣周漏,其中无球囊预扩张组5例,与球囊扩张组瓣周漏发生率差异无统计学意义。其余受访病人均未出现严重并发症。**结论** 经食管超声心动图可对心脏结构进行准确的测量,帮助选择无球囊预扩张TAVI的合适病人,对临床治疗具有重要的临床价值。

关键词: 经导管主动脉瓣置换; 经食管超声心动图; 无球囊预扩张; 主动脉瓣狭窄

Clinical significance of transesophageal echocardiography during patient selection for transcatheter aortic valve implantation without balloon predilation

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Abstract: Objective To compare the difference in transesophageal echocardiography (TEE) between patients undergoing transcatheter aortic valve implantation (TAVI) with balloon predilation (BPD) and those without BPD, and to evaluate the clinical significance of TEE during patient selection for TAVI without BPD.**Methods** TEE data of 149 patients with severe aortic stenosis, who underwent TAVI from January 2016 to January 2019, were retrospectively analyzed. Three-dimensional TEE imaging was used to evaluate the aortic annulus and root, leaflet mobility, degree of calcification, valve area, etc. After TEE data were reviewed, clinical significance of TEE during patient selection for TAVI without BPD was evaluated.**Results** The mean age of patients was (82.73±5.26) years. Totally 59 patients underwent TAVI without BPD. The mean aortic valve area was (0.61±0.15) cm^2, and the mean aortic annular diameter was (22.14±2.31) mm. A total of 14 patients had peri-valve leakage after TAVI, including 5 patients without BPD . There was no significant difference in peri-valve leakage between the patients who underwent TAVI with BPD and those without BPD. In addition, no significant complications were found in other patients.**Conclusion** TEE is able to accurately measure the aortic structure and better select appropriate patients undergoing TAVI without BPD, which is of great significance for clinical treatment.

Key words: Transcatheter aortic valve replacement; Transesophageal echocardiography (TEE); Without balloon predilation (BPD); Aortic stenosis

经导管主动脉瓣置换术(transcatheter aortic valve implantation,TAVI)是近年来兴起的一种介入治疗技术[1]。对于高龄、严重心功能不全或伴有其他疾病不宜行外科手术的主动脉瓣狭窄病人,TAVI是一种有效的微创治疗手段[2-3]。TAVI术前对主动脉根部进行精确评估,对人工瓣膜的选择和手术成功与否起着重要作用[4]。主动脉球囊预扩张是TAVI术前的常规操作,其可促进瓣环延展从而有利于人工瓣膜的植入。但最近的研究发现球囊预扩张也可能导致一些不良事件发生,例如脑血管栓塞、急性主动脉瓣反流等[5]。因此一些研究探索报道了无球囊预扩张的TAVI术,病人取得了良好疗效[6]。为此,我们进一步采用经食管超声心动图对心脏结构进行评估,从而帮助选择无球囊预扩张行TAVI的合适病人,评估经食管超声心动图在治疗过程中的指导意义。

1 资料与方法

1.1 一般资料 对2016年1月至2019年1月在郑州市第七人民医院行TAVI的149例主动脉狭窄病人的临床资料进行回顾性分析。所有病人经评估具有外科手术高危或禁忌(美国胸外科医师学会危险评分≥10%)。术前经食管超声心动图评估后,59例病人最终接受主动脉无球囊预扩张TAVI,其他90例病人采用了球囊预扩张TAVI。病人及近亲属均签署手术知情同意书。本研究符合《世界医学协会赫尔辛基宣言》相关要求。

1.2 三维经食管超声心动图(TEE)测量 病人经食管局部麻醉后,将TEE探头较快速插入食道约35 cm处,观察超声图像,于左心室长轴切面(110°~130°)和大动脉短轴切面(45°~60°)测量心脏收缩中期主动脉根部各内径以及主动脉瓣环的周长和面积,并观察主动脉瓣瓣叶数目和钙化程度等。上述所有测值均取3~5个心动周期的平均值。其中瓣膜钙化程度分为轻、中、重度,轻度钙化定义为瓣叶厚度<3 mm,且瓣尖和瓣环无钙化;瓣叶厚度在3~5 mm之间,有钙化结节则为中度钙化;瓣叶厚度大于5 mm且有主动脉环弥漫性钙化为重度钙化。主动脉瓣活动度根据瓣环融合程度分为轻、中、重度受限。主动脉瓣膜面积采用超声心动图测量下的连续方程进行计算。主动脉反流根据欧洲瓣膜疾病指南分为无、轻度、中度和重度。

1.3 病人随访 病人行TAVI术后在本院门诊定期(术后7 d和1、3、6个月)复查超声心动图,评估主动脉瓣面积、左心室射血分数、跨瓣压差等指标。

1.4 统计学方法 连续性变量采用$\bar{x} \pm s$表示,各测量值之间比较采用两独立样本资料的t检验。分类变量之间的比较采用χ^2检验,所有数据均采用SPSS 22.0软件进行统计学分析,P<0.05为差异有统计学意义。

2 结果

2.1 临床资料 149例主动脉狭窄行TAVI术病人的年龄(82.73±5.26)岁,78例(52.3%)为女性。149例病人中59例(39.6%)接受了无球囊预扩张TAVI,90例(60.4%)接受了球囊预扩张TAVI,两组在人口

学基线资料方面差异无统计学意义。见表1。

表1 经导管主动脉瓣置换术的主动脉狭窄病人149例的临床资料

临床资料	无球囊预扩张(n=59)	球囊预扩张(n=90)	$t(\chi^2)$值	P值
年龄/(岁,$\bar{x}\pm s$)	82.43±5.52	82.81±5.73	−0.402	0.644
女/例(%)	30(50.8)	48(53.3)	(0.088)	0.763
左室流出道直径/(mm,$\bar{x}\pm s$)	19.32±0.34	19.43±0.22	−2.399	0.726
主动脉瓣环直径/(mm,$\bar{x}\pm s$)	22.14±2.31	21.68±2.63	1.095	0.234
主动脉根部直径/(mm,$\bar{x}\pm s$)	29.14±5.13	29.53±4.14	−0.511	0.515
主动脉根部面积/(cm^2,$\bar{x}\pm s$)	6.72±2.03	7.09±2.34	−0.994	0.500
主动脉瓣尖厚度/(mm,$\bar{x}\pm s$)	4.68±1.42	5.02±1.28	−1.518	0.213
左室射血分数/(%,$\bar{x}\pm s$)	56.92±12.47	58.43±13.36	−0.693	0.348
跨瓣压差/(mmHg,$\bar{x}\pm s$)	47.33±14.68	49.07±16.32	−0.662	0.238
瓣叶面积/(cm^2,$\bar{x}\pm s$)	0.61±0.15	0.58±0.21	0.949	0.431

2.2 无球囊预扩张TAVI术适应证 经过回顾性分析,病人满足以下经食管超声心动图测量条件可行无球囊预扩张TAVI术:(1)瓣膜面积大于0.4 cm^2,(2)中央孔型瓣膜,(3)钙化中度及以下,左室流出道无钙化,(4)瓣膜活动度中度受限及以下,(5)无钙化结节,(6)主动脉反流中度及以下。

2.3 经食管超声心动图测量结果 经食管超声心动图测量的结果主要包括:左室流出道长径、主动脉瓣环长径、主动脉根部面积、主动脉瓣尖厚度、左室射血分数、跨瓣压差、瓣叶面积等。经统计分析表明,59例接受无球囊预扩张TAVI术的病人,其主动脉瓣环长径为(22.14±2.31)mm,主动脉根部面积为(6.72±2.03)cm^2,左室射血平均分数为(56.92±12.47)%,跨瓣平均压差为(47.33±14.68)mmHg,瓣叶平均面积为(0.61±0.15)cm^2。两组病人在超声心动图测量结果方面差异无统计学意义。见表1。

2.4 手术及随访结果 无球囊预扩张组手术时间显著少于球囊扩张组(P<0.01);共有15例病人术中接受了起搏器植入,其中无球囊扩张组为5例,球囊扩张组为10例。无球囊预扩张组病人术后早期有5例发生了瓣周漏,其中2例为中度;而球囊预扩张组病人9例发生了术后瓣周漏,其中3例为中度,1例为重度,两组之间无明显差异。两组病人均有1人出现了人工瓣环再狭窄,均未出现瓣环破裂、瓣环移位、脑卒中、操作相关死亡及术后死亡等严重并发症。见表2。

3 讨论

近年经导管瓣膜成形术及瓣膜置入术在国内外逐步开展,部分重度主动脉瓣病变病人因为高龄或者伴有其他疾病常无法接受传统心脏外科瓣膜置换手术,在此情况下经导管主动脉瓣膜置入术作为一种新型的治疗主动脉瓣病变的方法,成为临床研究的热点[7-8]。主动脉瓣球囊预扩张是TAVI术前重要的操作步骤,其可通过粉碎钙化结节,分离融合的裂隙并延展主动脉环从而利于TAVI手术的进行,因此也被欧洲心胸外科协会推荐为TAVI术的常规操作[9-10]。

然而球囊预扩张也带来了种种风险例如脑卒中、心室传导障碍、主动脉反流急性心脏填塞等。为此,部分研究探索了无主动脉球囊预扩张的操作,Grube等[6]首先报道了成功的病例队列,其无球囊预扩张手术成功率高达96.7%,同时仅有11.7%的病人需要植入起搏器;此后陆续有各项研究报道了无球囊预扩张操作的可行性和有效性。我们的研究也报道了2016-2019年进行的59例无球囊预扩张TAVI术,病人手术成功率高同时无瓣环破裂、死亡等严重并发症发生。

在我们的研究中,经食管超声心动图(TEE)起到了至关重要的作用,它为我们提供了精准的解剖构象和心功能参数,与经胸超声心动图相比,其可不受肥胖、肺部气体、肋骨狭小等因素影响,从而提供质量较高的图像[11-12],Perlman等[13]报道三维TEE在操作时可更好的控制轴向角度,从而更好的获得主动脉瓣环横截面积,此外,Kolte等[14]也发现三维TEE得到的瓣环/假体面积是病人预后的独立危险因素。而与多层计算机断层扫描(MSCT)相比,TEE无需考虑病人肾功能和特殊仪器的限制,同时研究

表2 主动脉狭窄病人149例经导管主动脉瓣置换术手术及随访结果

临床资料	无球囊预扩张(n=59)	球囊预扩张(n=90)	$\chi^2(t)$值	P值
平均手术时间/(min,$\bar{x}\pm s$)	103.22±38.53	125.34±32.86	(−3.751)	0.000
术中起搏器植入/例(%)	5(8.5)	10(11.1)	0.274	0.601
瓣周漏/例(%)	5(8.5)	9(10.0)	0.097	0.755
瓣环再狭窄/例(%)	1(1.7)	1(1.1)	0.092	0.762
主动脉瓣反流/例(%)	8(13.6)	20(22.2)	1.753	0.186
中转开放手术/例(%)	0(0.0)	2(2.2)	1.329	0.249

发现三维TEE的测量平均值较MSCT小1.3 mm,从而可以选择更合适的瓣膜减少瓣周漏发生[15-16]。因此经食管超声心动图是目前评估主动脉瓣各类参数最合适的检测方法。

TAVI术后并发症的发生率是评估手术成功的重要部分之一,常见的并发症包括瓣周漏、急性心脑血管事件等[17]。研究表明球囊预扩张是病人TAVI术后发生脑卒中的危险因素之一,一些研究报道球囊预扩张相关脑卒中发生率从2%到4.2%不等[18-19]。在本项研究中,共14例病人发生瓣周漏,其中无球囊预扩张组5例,球囊预扩张组9例,无急性心脑血管事件发生。为了降低脑卒中等事件的发生,我们在经食管超声心动图的帮助下考虑了多种风险因素,例如主动脉瓣面积大于0.4 cm^2者可行无球囊预扩张,因为研究表明瓣叶面积越小术后早期发生心脑血管事件的风险越高[20];此外评估和分级瓣叶钙化程度和活动度也可帮助避免球囊预扩张的使用,从而降低并发症的发生。

本研究在经食管超声心动图的帮助下评估了无球囊预扩张TAVI的可行性和有效性。我们制定了适宜行无球囊预扩张的病人人群,保证手术成功率的同时降低并发症的发生。未来我们将借助经食管超声心动图进一步筛选更为具体的病人纳入标准,从而进行更安全有效的TAVI术。

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