

doi: 10.13241/j.cnki.pmb.2017.10.026

双容积重建技术在显示颅内动脉瘤栓塞程度中的临床应用价值

徐立 孙向宇 陶志娟 黄延浩 钱新

(南京中医药大学附属张家港医院 ICU 江苏 张家港 215600)

摘要 目的:探讨双容积重建技术在显示颅内动脉瘤栓塞程度中的临床应用价值。**方法:**随机抽取 2013 年 11 月~2015 年 3 月于我院诊治的 48 例颅内动脉瘤患者,所有患者均行血管内栓塞术,在传统三维重建的基础上,进行双容积重建技术处理,并将他们的影像及病例资料加以整理,综合评定颅内动脉瘤栓塞的情况。**结果:**48 例患者中共发现 56 枚动脉瘤,动脉瘤在颅内分布以后交通支及大脑中动脉最多,分别占 30.36%和 21.43%;通过对影像资料进行分析发现,动脉瘤的栓塞程度以完全栓塞所占的比例最大,占 71.43%,其次为几乎完全栓塞,占 21.43%,以基本栓塞所占比例最小,占 7.14%;经图像及数据分析发现,动脉瘤最大径在 6~10 mm 范围所占比例最大,为 55.36%,≤5 mm 次之,占 30.36%。≥22 mm 所占比例最小,为 5.35%。**结论:**双容积重建技术在血管内栓塞术中及术后复查中具有不可替代的作用,能够准确地显示弹簧圈在颅内动脉瘤栓塞的程度,有助于指导临床治疗,减轻患者痛苦。

关键词:双容积重建;颅内动脉瘤;血管内栓塞术;栓塞;价值

中图分类号:R739.4 文献标识码:A 文章编号:1673-6273(2017)10-1900-03

The Clinical Application Value of the Double Volume Reconstruction Technique in the Display of Intracranial Aneurysm Embolization Degree

XU Li, SUN Xiang-yu, TAO Zhi-juan, HUANG Yan-hao, QIAN Xin

(Department of ICU, Zhangjiagang Hospital affiliated to Nanjing University of Chinese Medicine, Zhangjiagang, Jiangsu, 215600, China)

ABSTRACT Objective: To explore the clinical application value of the double volume reconstruction technique in the display of intracranial aneurysm embolization degree. **Methods:** Randomly choose 48 cases of intracranial aneurysm patients were diagnosed and treated in our hospital from November 2013 to March 2015, all patients with endovascular embolization, on the basis of traditional three-dimensional reconstruction, processing double volume reconstruction technology and tidying their image and case data, synthetically evaluation embolization of intracranial aneurysms. **Results:** 56 aneurysms were found in 48 case patients, the most distribution of aneurysms in the brain was after ramus communicans and middle cerebral artery, 30.36% and 21.43% respectively. Through the analysis of image data, found that the complete embolism is the largest proportion in the aneurysm embolization degree, accounting for 71.43%, followed was almost entirely embolism, accounted for 21.43%, the basic embolism was the minimum proportion, accounted for 7.14%; The images and data analysis showed that the largest diameter of aneurysm was the 6~10mm range, accounted for 55.36%, followed was 5 mm, accounting for 30.36%, the smallest proportion was 22 mm, proportion of 5.35%. **Conclusion:** Double volume reconstruction technique in the endovascular embolization and postoperative has irreplaceable function, can accurately show the spring coil in the degree of embolization of intracranial aneurysms, helps to guide the clinical treatment, relieve the pain of patients.

Key words: Double volume reconstruction; Intracranial aneurysm; Endovascular embolization; Embolism; Value

Chinese Library Classification(CLC): R739.4 **Document code:** A

Article ID: 1673-6273(2017)10-1900-03

前言

颅内动脉瘤中约 51%~80%的患者会因瘤体破裂所引起蛛网膜下腔出血^[1-3],一旦发生蛛网膜下腔出血,致死率、致残率均比较高。故早期正确诊断和治疗意义重大。介入血管内栓塞术目前已作为颅内动脉瘤治疗的重要方法被广泛应用^[4-5],由于旋转血管造影及血管三维重建技术的应用,周围血管与动脉瘤的结构及毗邻关系可以被清晰的显现,从而提高颅内动脉瘤的检出率及血管内栓塞术的成功率均明显提高,但均无法准确反

映动脉瘤颈部与弹簧圈之间的关系。随着数字减影机功能的不断研发,双容积重建技术应运而生,为颅内动脉瘤的进一步诊断及血管内介入栓塞治疗提供更好的图像和数据。本文随机抽取 2013 年 11 月~2015 年 3 月于我院诊治的 48 例颅内动脉瘤患者,以三维重建为依托,并将他们的影像及病例资料进行双容积重建技术处理,旨在研究双容积重建技术在显示颅内动脉瘤栓塞程度中的临床应用价值,现报道如下。

1 资料与方法

1.1 临床资料

选取 2013 年 11 月~2015 年 3 月于我院诊治的 48 例颅内动脉瘤患者,所选病例均有完整影像及临床资料。男 36

作者简介:徐立(1979-),男,本科,副主任医师,研究方向:脑血管病及重度颅脑损伤,E-mail: liydg@163.com

(收稿日期:2016-07-15 接受日期:2016-08-11)

例,女 12 例,年龄 45-73 岁,平均年龄(59.47 ± 5.79)岁,所有患者均行血管内栓塞术。

1.2 方法

采用 Philips 数字血管减影系统获得图像, 首先将检查程序设定为 5sDSA 检查, 平板视野调节为 42, 操纵操作杆, 进行程序测试, 通过进行正侧位透视确定兴趣区在旋转中心点上, 然后确定起始点, 设置高压注射器参数, 颈内动脉正侧位采用 Mark Provis 高压注射器注射非离子型对比剂碘帕醇(mg/mL) 进行 DSA 造影, 以 300PSI 的压力限制保护, 2 mL/s 的速率注射 12 mL, 注射器延时 1s, 按住曝光开关, 平板从起始位到终止位进行蒙片采集, 然后自动回到初始位置, 反复操作三次进行影像采集。然后将所的影像资料自动转至 Allura 3D-RA 工作站, 进行血管重建及双容积重建处理, 再选择 A+B 模式对血管及弹簧圈栓塞情况进行观察。诊断由两名放射科医生和两名神经外科医生共同完成, 意见不一致时协商处理。

2 结果

2.1 动脉瘤的颅内分布情况

48 例患者中共发现 56 枚动脉瘤, 动脉瘤在颅内分布以后交通支及大脑中动脉最多, 分别占 30.36% 和 21.43%, 见表 1。

表 1 动脉瘤的颅内分布情况

Table 1 The distribution of intracranial aneurysm

Position	Number of aneurysm (piece)	Proportion(%)
Internal carotid	6	10.71
After ramus communicans	17	30.36
Before ramus communicans	9	16.07
Anterior cerebral artery	6	10.71
Middle cerebral artery	12	21.43
Posterior cerebral artery	2	3.57
Basal artery	4	7.14
Total	56	100.00

2.2 动脉瘤栓塞的程度分布情况

通过对影像资料进行分析发现, 动脉瘤的栓塞程度以完全栓塞所占的比例最大, 占 71.43%, 其次为几乎完全栓塞, 占 21.43%, 以基本栓塞所占比例最小, 占 7.14%, 见表 2。

表 2 动脉瘤栓塞的程度分布

Table 2 The degree of aneurysm embolization

The degree of stenosis	Number of aneurysm (piece)	The proportion(%)
Complete embolism	40	71.43
Almost completely embolism	12	21.43
Basic embolism	4	7.14
Total	56	100.00

2.3 动脉瘤的最大径的分布情况

经图像及数据分析发现, 动脉瘤最大径在 6~10 mm 范围所占比例最大, 为 55.36%, ≤ 5 mm 次之, 占 30.36%。 ≥ 22 mm 所占比例最小, 为 5.35%, 见表 3。

表 3 动脉瘤的最大径的分布

Table 3 The distribution of the biggest diameter of aneurysms

The biggest diameter of aneurysms	Number of aneurysm (piece)	The proportion(%)
5 mm	17	30.36
6~10 mm	31	55.36
11~22 mm	5	8.93
>22 mm	3	5.35
Total	56	100.00

3 讨论

颅内动脉瘤主要是由于颅内动脉管壁局部先天性缺陷或腔内压力增高, 颅内动脉管壁逐渐变薄并异常膨出而造成的, 动脉瘤发生破裂的危险随着局部血流压力的增大而加大。目前, 介入血管内栓塞术作为颅内动脉瘤治疗的重要方法, 主要是尽可能地致密填塞动脉瘤腔及颈部, 临床应用疗效好且创伤小、术后并发症较少, 可谓安全有效^[6-8], 能够有效地缓解患者病情, 减少颅内动脉瘤破裂, 蛛网膜下腔出血的发生率。但其栓塞方案的制订主要依靠数字减影血管造影技术(DSA)的影像质量^[9,10]。在治疗过程中, 若填塞不当或者过度填塞, 可能造成弹簧圈突入载瘤动脉, 使其狭窄或者闭塞的情况, 在宽颈的动脉瘤中尤为明显^[11,12]。因此, 精确地评定颅内动脉瘤栓塞的程度尤为重要。

常规 DSA 常被认为是诊断颅内动脉瘤的金标准^[13,14]。但是由于手术中, 弹簧圈相互重叠缠绕后密度会出现加大的情况, 使得对比剂的显影会在某些角度被遮挡, 虽然我们可以从多角度进行观察, 但确定造影角度对术者要求较高, 而且可加大对对比剂使用, 在手术过程中患者亦可能会承受较大的射线辐射剂量等缺点限制了常规 DSA 的应用^[15-17]。与此同时, 旋转血管造影三维重建技术(3D-DA)提供立体影像利于研究动脉瘤各项指标, 但血管影像和骨质同时显示, 即便采用三维容积重建后亦相互混淆, 无法辨别。并且可能出现血管假性狭窄的伪影。旋转 DSA 造影, 虽可以从不同角度观察动脉瘤的情况, 但头位和脚位角度的情况无法观察^[18,19]。传统的三维重建技术对动脉瘤血管内栓塞术前诊断有着重要的作用, 但亦无法准确判断动脉瘤颈部与弹簧圈之间的关系^[20]。双容积重建技术在传统三维重建技术基础上, 用两种颜色来区分弹簧圈和对比剂, 可以清楚区分高密度组织或物体, 如动脉瘤、载瘤动脉、支架、弹簧圈等, 可以从不同的角度来观察弹簧圈与载瘤动脉之间的关系以及瘤颈处、动脉瘤内部的栓塞情况。除此之外, 还可以直观观察支架、弹簧圈等在血管内的具体位置, 评估支架释放情况, 显示在对比剂充盈的血管内的钙化组织。

在采用血管内栓塞术治疗颅内动脉瘤的过程中, 我院坚持

采取双容积重建技术,在 48 例患者中发现 56 枚动脉瘤,动脉瘤在颅内分布以后交通支及大脑中动脉最多,分别占 30.36% 和 21.43%,提示通过对影像资料进行分析,双容积重建技术可以清楚地反应动脉瘤发病的具体部位。动脉瘤的栓塞程度以完全栓塞所占的比例最大,占 71.43%,其次为几乎完全栓塞,占 21.43%,以基本栓塞所占比例最小,占 7.14%,说明双容积重建技术在反映颅内动脉瘤栓塞情况方面具有优越性。且经图像及数据分析发现,动脉瘤最大径在 6~10 mm 范围所占比例最大,为 55.36%, ≤ 5 mm 次之,占 30.36%。 ≥ 22 mm 所占比例最小,为 5.35%,说明双容积重建可以明确地测得患者动脉瘤最大径,清楚地了解动脉瘤的大小状况。且在本次研究的 48 例介入治疗的患者中,有 4 名患者依据双容积重建的结果将介入治疗的方案进行了调整。其中,2 例发现部分弹簧圈突入载瘤动脉,不得不将弹簧圈撤出并重新调整,1 例患者继双容积重建后填充弹簧圈,1 例发现动脉瘤宽颈,弹簧圈突入载瘤动脉,调整后用支架辅助治疗。证明双容积重建对血管内栓塞术具有十分重要的意义,有效地防止了不当栓塞及过度栓塞造成弹簧圈突入载瘤动脉、动脉瘤破裂造成蛛网膜下腔出血或者动脉瘤复发的现象,有助于提高临床治疗效果,减轻手术给患者带来的痛苦。

综上所述,双容积重建技术在颅内动脉瘤血管内栓塞术中及术后复查中具有不可替代的作用,能够更直观、清晰、系统地反映弹簧圈在颅内动脉瘤栓塞的程度,有效预防手术中弹簧圈过度栓塞引起动脉瘤破裂,进而造成蛛网膜下腔出血或者栓塞不致密造成术后复发,避免给患者生命及健康带来巨大威胁。

参考文献(References)

- [1] Tonkopi E, Al-Habsi AH, Shankar JJ. Radiation Dose from 3D Rotational vs. Conventional 2D Digital Subtraction Angiography in Intracranial Aneurysm Coiling [J]. Can J Neurol Sci, 2015, 42(3): 176-180
- [2] Lescher S, Samaan T, Berkefeld J. Evaluation of the pontine perforators of the basilar artery using digital subtraction angiography in high resolution and 3D rotation technique [J]. AJNR Am J Neuroradiol, 2014, 35(10): 1942-1947
- [3] Lauric A, Heller RS, Schimansky S, et al. Benefit of cone-beam CT angiography in visualizing aneurysm shape and identification of exact rupture site[J]. J Neuroimaging, 2015, 25(1): 56-61
- [4] Shi WY, Li YD, Li MH, et al. Differential diagnosis of infundibular dilation versus a small aneurysm of the internal carotid artery: assessment by three-dimensional rotational angiography with volume rendering[J]. Neurol Sci, 2013, 34(7): 1065-1070
- [5] Schneiders JJ, Marquering HA, Antiga L, et al. Intracranial aneurysm neck size overestimation with 3D rotational angiography: the impact on intra-aneurysmal hemodynamics simulated with computational fluid dynamics[J]. AJNR Am J Neuroradiol, 2013, 34(1): 121-128
- [6] Wong SC, Nawawi O, Ramli N, et al. Benefits of 3D rotational DSA compared with 2D DSA in the evaluation of intracranial aneurysm[J]. Acad Radiol, 2012, 19(6): 701-707
- [7] Serafin Z, Strzeżewski P, Lasek W, et al. Follow-up after embolization of ruptured intracranial aneurysms: a prospective comparison of two-dimensional digital subtraction angiography, three-dimensional digital subtraction angiography, and time-of-flight magnetic resonance angiography [J]. Neuroradiology, 2012, 54(11): 1253-1260
- [8] Wang C, Tian Z, Liu J, et al. Flow diverter effect of LVIS stent on cerebral aneurysm hemodynamics: a comparison with Enterprise stents and the Pipeline device[J]. J Transl Med, 2016, 14(1): 199
- [9] Ren Y, Chen GZ, Liu Z, et al. Reproducibility of image-based computational models of intracranial aneurysm: a comparison between 3D rotational angiography, CT angiography and MR angiography[J]. Biomed Eng Online, 2016, 15(1): 50
- [10] Gao Z, Zeng Y, Sun J, et al. Application of low injection rate and low contrast agent dose in three-dimensional rotational digital subtraction angiography of the intracranial aneurysm [J]. Interv Neuroradiol, 2016, 22(3): 287-292
- [11] Namyong J, Aurboonyawat T, Chankaew E, et al. Computerized Tomographic Angiography for Detection of Cerebral Vasospasm after Ruptured Intracranial Aneurysm [J]. J Med Assoc Thai, 2015, 98(8): 804-811
- [12] Fischer S, Aguilar-Pérez M, Henkes E, et al. Initial Experience with p64: A Novel Mechanically Detachable Flow Diverter for the Treatment of Intracranial Saccular Sidewall Aneurysms[J]. AJNR Am J Neuroradiol, 2015, 36(11): 2082-2089
- [13] Pereira BJ, Holanda VM, Giudicissi-Filho M, et al. Assessment of Cerebral Blood Flow with Micro-Doppler Vascular Reduces the Risk of Ischemic Stroke During the Clipping of Intracranial Aneurysms [J]. World Neurosurg, 2015, 84(6): 1747-1751
- [14] Jing L, Fan J, Wang Y, et al. Morphologic and Hemodynamic Analysis in the Patients with Multiple Intracranial Aneurysms: Ruptured versus Unruptured[J]. PLoS One, 2015, 10(7): e0132494
- [15] Koc K, Cabuk B, Anik İ, et al. Detection and Evaluation of Intracranial Aneurysms with 3D-CT Angiography and Compatibility of Simulation View with Surgical Observation [J]. Turk Neurosurg, 2015, 25(3): 410-418
- [16] Mine B, Tancredi I, Aljishi A, et al. Follow-up of intracranial aneurysms treated by a WEB flow disrupter: a comparative study of DSA and contrast-enhanced MR angiography [J]. J Neurointerv Surg, 2016, 8(6): 615-620
- [17] Kapsas G, Budai C, Toni F, et al. Evaluation of CTA, time-resolved 4D CE-MRA and DSA in the follow-up of an intracranial aneurysm treated with a flow diverter stent: Experience from a single case[J]. Interv Neuroradiol, 2015, 21(1): 69-71
- [18] Anderson JR, Thompson WL, Alkattan AK, et al. Three-dimensional printing of anatomically accurate, patient specific intracranial aneurysm models[J]. J Neurointerv Surg, 2016, 8(5): 517-20
- [19] Goto Y, Ebisu T, Mineura K. Ruptured intracranial aneurysm during pregnancy with false-negative computed tomography angiography findings: a case report[J]. Emerg Radiol, 2015, 22(3): 343-346
- [20] Kooshkabadi A, Jankowitz B, Choi PA, et al. Thrombosis and spontaneous recanalization of a giant intracranial aneurysm: diagnostic and management pearls in a pediatric patient [J]. J Neurosurg Pediatr, 2015, 15(1): 78-81