·临床研究·

脑血管重建术治疗小脑后下动脉起始部异常吻合并发动脉瘤两例并文献复习

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【摘要】 **目的** 总结2例小脑后下动脉起始部异常吻合并发动脉瘤的临床特点和治疗方案。**方法与结果** 2例小脑后下动脉起始部异常吻合并发动脉瘤患者均表现为自发性蛛网膜下腔出血，MRI表现为小脑后下动脉起始部异常吻合，伴吻合血管或吻合部位多发微小动脉瘤，均行枕动脉-小脑后下动脉（OA-PICA）搭桥术并同期电凝动脉瘤。以“PICA anastomosis”等作为关键词检索美国国立医学图书馆生物医学文献数据库（PubMed，2000年1月1日至2021年6月30日），共获得英文文献8篇计8例患者，结合本文2例病例，共计10例小脑后下动脉起始部异常吻合并发动脉瘤患者。均以自发性蛛网膜下腔出血发病；8例动脉瘤发生于吻合部位，1例发生于小脑后下动脉远端，1例发生于起源动脉的一支。5例行开颅手术，分别为OA-PICA搭桥术3例并同期电凝（2例）或夹闭（1例）动脉瘤，单纯动脉瘤夹闭术1例，动脉瘤夹闭合并切断吻合动脉1例，术后均无明确并发症；4例行血管内介入治疗，分别为弹簧圈栓塞动脉瘤2例，Glubran胶栓塞动脉瘤2例，其中3例出现术后并发症，表现为轻微脑干梗死（2例）或意识障碍（1例）。**结论** 小脑后下动脉起始部异常吻合并发动脉瘤罕见，破裂出血风险高，可选择OA-PICA搭桥术并电凝或夹闭动脉瘤的方式。

【关键词】 脑血管重建术； 颅内动脉瘤； 小脑疾病； 脑血管造影术

Cerebral vascular reconstruction in the treatment of abnormal anastomosis of origin posterior inferior cerebellar artery complicated with aneurysms: two cases reports and literature review

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【**Abstract**】 **Objective** Summarize the clinical characteristics and treatment plan of 2 cases of abnormal anastomosis at the origin of the posterior inferior cerebellar artery (PICA) complicated with aneurysm. **Methods and Results** Two cases of abnormal anastomosis of the PICA complicated with aneurysms all showed spontaneous subarachnoid hemorrhage (SAH). MRI showed abnormal anastomosis of the PICA, accompanied by multiple small aneurysms at the anastomotic vessel or anastomotic site. All patients underwent occipital artery (OA)-PICA bypass graft and electrocoagulation of the aneurysms at the same time. Use "PICA anastomosis" as the key words to search PubMed (January 1, 2000 to June 30, 2021) 8 articles in English, 8 patients, combined with 2 cases in this article cases, a total of 10 patients with abnormal anastomosis at the origin of the PICA complicated with aneurysm. All cases occurred as spontaneous SAH; 8 cases of aneurysms occurred at the anastomosis site, one case occurred at the distal end of the PICA, and one case occurred in a branch of the original artery. Five cases underwent craniotomy, 3 cases of OA-PICA bypass surgery and concurrent electrocoagulation (2 cases) or clipping (one case) of the aneurysms, one case of simple aneurysm clipping, and one case of aneurysm clipping combined with cutting off anastomotic artery, and there were no clear complications after surgery; 4 cases underwent endovascular interventional treatment, 2 cases of coil embolization of aneurysms, 2 cases of Glubran glue embolization of aneurysms, of which 3 cases had postoperative complications, manifested as mild brainstem

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infarction (2 cases) or disturbance of consciousness (one case). **Conclusions** Abnormal anastomosis at the origin of the PICA complicated with aneurysm is rare, and the risk of rupture and hemorrhage is high. OA-PICA bypass and electrocoagulation or clipping of the aneurysm can be used as a treatment option.

【**Key words**】 Cerebral revascularization; Intracranial aneurysm; Cerebellar diseases; Cerebral angiography

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小脑后下动脉(PICA)由椎动脉(VA)颅内段发出,是其最大分支,主要供血小脑扁桃体、延髓、小脑半球下部等重要部位。小脑后下动脉是颅内动脉瘤的常见部位,但仅占颅内动脉瘤的0.5%~3%,其中>95%发生于小脑后下动脉外侧襻[1-2]。虽然小脑后下动脉瘤发生率较低,但小脑后下动脉-椎动脉先天性变异临床表现多样,包括与同侧小脑前下动脉(AICA)共干、起源于对侧小脑后下动脉、小脑后下动脉-小脑前下动脉吻合、小脑后下动脉-脊髓前动脉(ASA)吻合等。血管解剖学变异通常易引发动脉瘤,然而小脑后下动脉起源异常引发吻合血管动脉瘤罕见[3],同时由于异常吻合结构的复杂和小脑后下动脉的重要性,常规动脉瘤栓塞术和夹闭术相对困难,增加治疗难度和手术相关并发症[3-4]。本研究对海军军医大学第一附属医院(上海长海医院)脑血管病中心收治的2例小脑后下动脉起始部异常吻合并发动脉瘤患者的诊断与治疗经过进行回顾,并结合文献报道的8例患者,对该病的临床表现、小脑后下动脉起源和动脉瘤部位、治疗策略、术后并发症等进行总结,以期提高神经外科医师对疾病的认识。

病例资料

例1 男性,55岁,因蛛网膜下腔出血1月余,于2019年11月25日入院。患者1个月前突发头痛、呕吐,至当地医院急诊就诊,头部CT显示蛛网膜下腔出血,以脑干腹侧显著,伴第四脑室积血(图1a);全脑血管造影显示右小脑后下动脉起始部异常,代之以起源于左脊髓前动脉和右椎动脉延髓支的异常吻合,通过细小网状血管供血右小脑后下动脉远端,吻合血管并发多个动脉瘤(图1b,1c);临床诊断为颅内多发动脉瘤。为求进一步手术治疗,转入我院。考虑吻合血管动脉瘤为责任动脉瘤,遂于全身麻醉下行右枕动脉-小脑后下动脉(OA-PICA)搭桥术并同期电凝动脉瘤。患者侧俯卧位,做右侧枕颈部倒"L"形切口,采取右侧远外侧入路(图2a),分离并获取右枕动脉;继续探查,可见右小脑后下动脉起始部硬化、闭塞,延髓外侧部多支小动脉吻合至小脑后下动脉延髓外侧段,并在齿状韧带前形成多个微小(直径<3 mm)动脉瘤(图2b),先将右枕动脉与小脑下后动脉尾襻吻合,实时吲哚菁绿荧光血管造影术(ICGA)确认吻合口通畅(图2c),再电凝动脉瘤和吻合血管(图2d);ICGA确认吻合血管通畅、无动脉瘤样结构后,结束手术。术后无新发神经系统症状,复查MRI未见新发梗死灶(图3a)。患者共住院7天,出院时Glasgow昏迷量表(GCS)评分15,无头痛和肢体活动障碍。术后3个月复查脑血管造影,动脉瘤无复发,吻合血管通畅(图3b,3c)。

例2 女性,52岁,因突发剧烈头痛5天,于2018年8月26日急诊首次入院。头部CT显示蛛网膜下腔出血,伴第三和第四脑室积血(图4a);全脑血管造影显示,左小脑后下动脉分支动脉瘤样突起,与右小脑后下动脉吻合(图4b,4c);右小脑后下动脉起源于右椎动脉,与左脊髓前动脉和左小脑后下动脉分支网状吻合,伴吻合血管"串珠"样动脉瘤,汇入右小脑后下动脉远端(图4d,4e)。临床考虑左小脑后下动脉瘤破裂致蛛网膜下腔出血。遂于2018年8月26日先行左小脑后下动脉瘤栓塞术,再择期行右OA-PICA搭桥术并同时电凝动脉瘤。患者侧俯卧位,全身麻醉下做右侧枕颈部倒"L"形切口,Marathon微导管(美国Medtronic公司)选择进入左小脑后下动脉,先后予弹簧圈(美国Medtronic公司)、25% Glubran胶(NBCA-MS,意大利GE公司)0.10 ml栓塞动脉瘤,术后即刻复查DSA显示动脉瘤栓塞完全,载瘤动脉通畅(图5)。患者共住院5天,出院后3个月复查脑血管造影显示,左小脑后下动脉瘤未显影,右小脑后下动脉无明显变化。临床考虑吻合血管多发"串珠"样动脉瘤,于2018年11月

AN，动脉瘤；ASA，脊髓前动脉；PICA，小脑后下动脉；Bulbar A，球动脉

图1 术前头部影像学检查所见 1a 横断面CT显示蛛网膜下腔出血，以脑干腹侧为著（箭头所示） 1b 正位DSA显示右小脑后下动脉起始部异常，代之以起源于左脊髓前动脉和右椎动脉延髓支的异常吻合 1c 椎动脉三维DSA显示，右小脑后下动脉起始部异常，吻合血管并发多个动脉瘤（箭头所示）

Figure 1 Preoperative head imaging findings Axial CT showed SAH, and it was obvious at the ventral side of brain stem (arrows indicate, Panel 1a). Anterior DSA showed abnormal origin of right PICA, replaced by abnormal anastomosis originating from left ASA and right VA medulla oblongata, blood was supplied to the distal end of right PICA through the small mesh vessels, and the blood vessels were anastomosed multiple aneurysms (Panel 1b). 3D-DSA of VA showed the right PICA was abnormally originated with anastomosed vascular aneurysms (arrows indicate, Panel 1c).

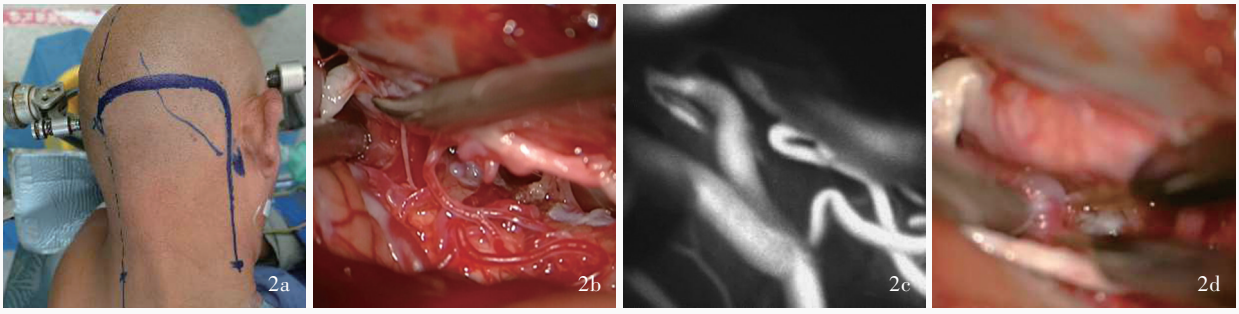


图2 术中所见 2a 患者侧俯卧位，做右侧枕颈部倒“L”形切口，采取右侧远外侧入路 2b 可见右小脑后下动脉起始部硬化、闭塞，起源于左脊髓前动脉和右椎动脉延髓支，并发吻合血管多发动脉瘤 2c ICGA显示，右枕动脉与右小脑下后动脉吻合口通畅 2d 电凝吻合血管动脉瘤

Figure 2 During the operation findings The patient was in the prone position, and an inverted "L" incision was made on the right occiput-neck. The right far lateral approach was adopted (Panel 2a). Sclerosis and occlusion of the origin of the PICA, abnormal anastomosis (left ASA and right medulla oblongata branch of VA), anastomoses multiple aneurysms on the vessel were seen (Panel 2b). ICGA showed the right OA and the right PICA anastomoses unobstructed (Panel 2c). Electrocoagulation anastomosis vascular aneurysm (Panel 2d).

14日再次入院，行右OA-PICA搭桥术并同期电凝动脉瘤。患者侧俯卧位，全身麻醉下做右侧枕颈部倒“L”形切口，采取右侧远外侧入路，分离并获得右枕动脉；继续探查右小脑后下动脉起始部，与左脊髓前动脉和左小脑后下动脉分支网状吻合，伴吻合部位动脉瘤（图6a），先将右枕动脉远端与右小脑后下动脉尾襻吻合（图6b），实时ICGA确认吻合口通畅（图6c），再电凝异常吻合血管和动脉瘤。术后无新发神经系统症状，患者共住院7天，出院时GCS评分为15，无语言和肢体活动障碍。出院后3个月复查脑血管造影显示，左小脑后下动脉瘤未复发，右侧吻合血管通畅（图6d）。

讨 论

笔者以“PICA anastomosis”等英文词汇作为关键词，检索美国国立医学图书馆生物医学文献数据库（PubMed，2000年1月1日至2021年6月30日），共获得脑血管重建术治疗小脑后下动脉起始部异常吻合并发动脉瘤相关英文文献8篇计8例患者，结合本文2例病例，共计10例小脑后下动脉起始部异常吻合并发动脉瘤患者（表1）[4-11]。男性6例，女性4例；年龄19～64岁，平均（45.70±12.75）岁；临床均表现为剧烈头痛，2例伴呕吐，1例伴四肢瘫痪；均以自发性蛛网膜下腔出血发病，2例并发脑室积血，

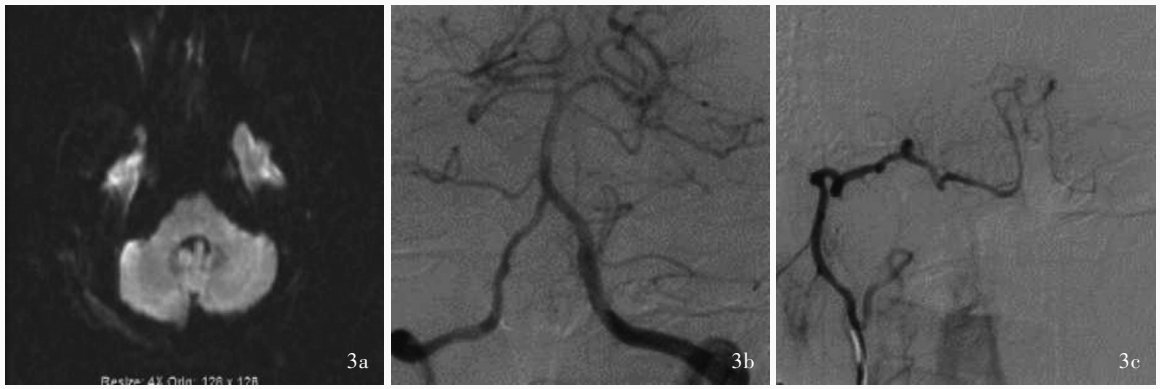


图3 术后复查影像学所见 3a 术后3天横断面DWI未见新发梗死灶 3b,3c 术后3个月椎动脉正位和侧位DSA显示,吻合血管通畅,动脉瘤不显影

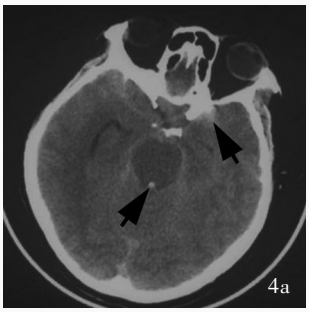
Figure 3 Postoperative head imaging findings Axial DWI 3 d after operation showed no new infarcts (Panel 3a). Anterior and lateral DSA of VA 3 months after operation showed the anastomotic vessels were unobstructed and the aneurysm was not developed (Panel 3b, 3c).

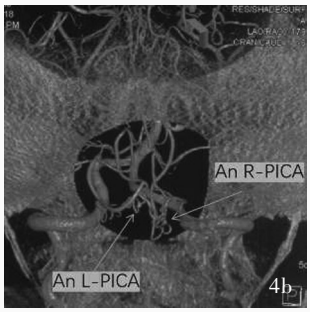
1例并发脑积水(具体性质不详)。小脑后下动脉起始于脊髓前动脉占5/10、椎动脉延髓支占2/10、其他分支占2/10、开窗畸形分叉部占1/10、小脑前下动脉占1/10、同侧小脑后下动脉占2/10、双侧小脑后下动脉占1/10;9例小脑后下动脉起源多支吻合,1例单支供应远端;7例多发动脉瘤,3例单发动脉瘤;8例动脉瘤发生于吻合部位,1例发生于小脑后下动脉远端,1例发生于起源动脉的一支。5例行开颅手术,分别为OA-PICA搭桥术3例,其中2例同期电凝动脉瘤、1例行动脉瘤夹闭术,1例单纯动脉瘤夹闭术,1例动脉瘤夹闭合并切断吻合动脉;4例行血管内介入治疗,分别为弹簧圈栓塞动脉瘤2例,Glubran胶栓塞动脉瘤2例;1例治疗方案不详。5例行开颅手术的患者术后无明确并发症。4例行血管内介入治疗的患者中3例出现术后并发症,均表现为后循环缺血症状,其中2例为轻微脑干梗死 ,经药物治疗后症状改善;1例为意识障碍,经药物治疗后仍长期卧床。10例患者仅3例有术后影像学随访资料,均无动脉瘤复发。

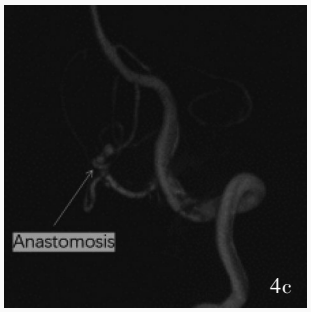
小脑后下动脉位于颅后窝,是椎-基底动脉的重要分支,亦是后循环最长的分支,包含外侧襻、尾襻和头襻共3个弯曲,走行迂曲,变异常见。大多数情况下,小脑后下动脉起源于同侧椎动脉,但是经历复杂的胚胎学演变和解剖学变异,亦可见起源于同侧小脑前下动脉、基底动脉,与对侧小脑后下动脉同干,或者与同侧小脑前下动脉吻合,偶起源于同侧椎动脉颅外段,另有文献报道,6.8%~29.8%的小脑后下动脉缺如[12]。胚胎发育第28天神经系统纵向血管形成,原始动脉呈现丛状复杂血管网络,第29天椎-基底动脉吻合,小脑后下动脉来自这些丛状血管网络的逐渐退化和发育,故可解释小脑后下动脉起源的变异性。基于胚胎学演变,小脑后下动脉起始部异常并发动脉瘤可能是先天性解剖学变异所致[12]。

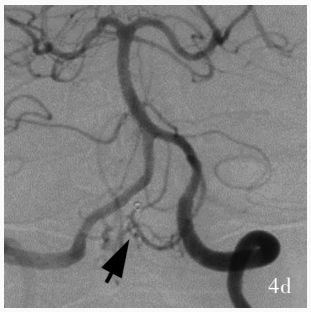
综合10例患者的临床资料,8例于30~60岁发病,平均年龄(45.70±12.75)岁,提示小脑后下动脉起始部异常吻合并发动脉瘤好发于中年人。本文例1术中探查可见右小脑后下动脉起始部硬化、闭塞,与左脊髓前动脉和右椎动脉延髓支异常吻合后供应小脑后下动脉远端,伴吻合部位多发动脉瘤。Germans等[6]和Matsumoto等[9]报告的病例术中也探查到相似情况。小脑后下动脉起始部异常也可能是小脑后下动脉起始部血管硬化、狭窄致慢性闭塞,邻近血管吻合形成侧支代偿,常见吻合血管有椎动脉延髓支、脊髓前动脉、小脑上动脉等[13]。因此认为,小脑后下动脉起始部异常吻合并发动脉瘤一方面可能与动脉的胚胎学演变和先天性解剖学变异有关,另一方面也可能是小脑后下动脉起始部硬化、狭窄致慢性闭塞,脑血流动力学改变形成异常血管吻合[3]。异常血管吻合、脑血流量增加、长期脑血流动力学改变导致吻合血管产生动脉瘤并破裂,可以解释小脑后下动脉起始部异常吻合并发动脉瘤[14]。10例患者中有8例动脉瘤发生于吻合部位,且动脉瘤呈多发、"串珠"样改变,也增加破裂的风险。

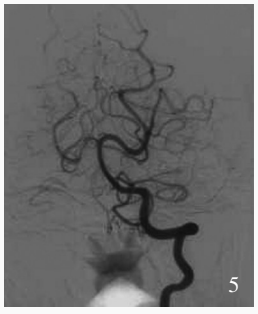
小脑后下动脉瘤的治疗主要有血管内介入治







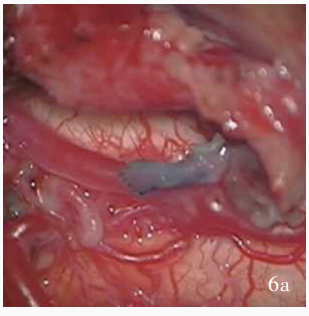


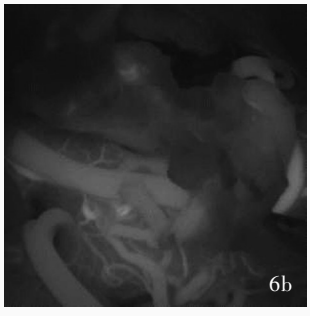


An R-PICA，右侧小脑后下动脉异常吻合动脉瘤；An L-PICA，左侧小脑后下动脉异常吻合动脉瘤；Anastomosis，吻合处

图4 术前头部影像学检查所见 4a 横断面CT显示蛛网膜下腔出血，伴第四脑室积血（箭头所示） 4b 双侧椎动脉三维DSA显示，左小脑后下动脉瘤（箭头所示），右小脑后下动脉起始部异常、吻合部位多发动脉瘤（箭头所示） 4c 左椎动脉三维DSA显示，左小脑后下动脉分支动脉瘤（箭头所示） 4d 双侧椎动脉正位DSA显示，右小脑后下动脉起始部异常，伴吻合部位动脉瘤（箭头所示） 4e 右椎动脉三维DSA显示，右小脑后下动脉起始异常（箭头所示），伴吻合部位动脉瘤 **图5** 术后即刻复查左椎动脉正位DSA显示，左小脑后下动脉瘤不显影

Figure 4 Preoperative head imaging findings Axial CT showed SAH with intraventricular hemorrhage (arrows indicate, Panel 4a). 3D-DSA of bilateral VA showed the left PICA aneurysm (arrow indicates), the origin of the right PICA was abnormal, and multiple aneurysms at the anastomosis site (arrow indicates, Panel 4b). 3D-DSA of the right VA showed the branch aneurysm of the left PICA (arrow indicates, Panel 4c). Anterior DSA of bilateral VA showed abnormal origin of the right PICA, with an aneurysm at the anastomosis site (arrow indicates, Panel 4d). 3D-DSA of right VA showed abnormal origin of the right PICA (arrows indicate), with an aneurysm at the anastomosis site (Panel 4e). **Figure 5** Postoperative anterior DSA of left VA showed no aneurysm in the left PICA.





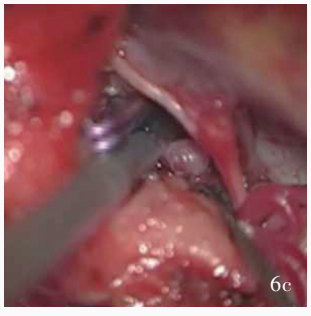


图6 右OA-PICA搭桥术中和术后所见 6a 术中将右枕动脉远端与右小脑后下动脉尾襻吻合 6b 实时ICGA显示，吻合口通畅 6c 吻合血管网可见“串珠”样动脉瘤 6d 术后3个月复查DSA显示，吻合血管通畅

Figure 6 Right OA-PICA bypass surgery and postoperative findings During the operation, the distal end of the right OA was anastomosed with the right PICA tail loop (Panel 6a). Real-time ICGA showed the anastomosis was unobstructed (Panel 6b). The anastomotic vascular network showed "beaded" aneurysm (Panel 6c). DSA reexamination 3 months after the operation showed the anastomotic vessels were unobstructed (Panel 6d).

疗和开颅手术两种术式。小脑后下动脉解剖位置特殊，在保证其血流的情况下开颅夹闭动脉瘤操作困难，并发症发生率较高[15]，血管内介入治疗有一定优势[7]。汇总的10例患者中4例行血管内介入治疗，其中2例出现轻微脑干梗死、1例出现意识障碍，这是由于小脑后下动脉起始部异常，异常血管吻合供血远端，动脉瘤多发生于吻合部位，无论是弹簧圈还是Glubran胶栓塞动脉瘤，均可造成小脑后下动脉血流阻断，导致脑干、小脑梗死等并发症；5例行开颅手术，其中3例行OA-PICA搭桥术并同期动脉瘤夹闭术或电凝术；1例术中临时阻断小脑后下动脉近端，可见脑膜支血流逆行进入小脑后下动脉远端，行动脉瘤夹闭术同时切断吻合血管；1例行单纯动脉瘤夹闭术，远端血流通畅；均未发生手术并发症。因此，对于此类小脑后下动脉起始部异常吻合并发动脉瘤患者，减少颅内动脉瘤破裂出血风险处理动脉瘤时，保留小脑后下动脉血流尤为重要。如果吻合血管粗大，处理动脉瘤的同时不影响吻合血管血流或小脑后下动脉有其他充分代偿，则开颅夹闭动脉瘤，可以直观了解血流及穿支情况；小脑

表1 10例小脑后下动脉异常起源并发动脉瘤患者的临床资料

Table 1. Clinical data of 10 patients with abnormal origin of PICA complicated with aneurysms

序号	文献来源	性别	年龄（岁）	临床表现	CT表现	PICA起源	动脉瘤部位	治疗策略	手术并发症	术后随访
1	Maeda等[5]（2020）	女性	34	剧烈头痛	SAH	同侧VA双起源	起源动脉的一支	弹簧圈栓塞动脉瘤	—	—
2	Germans等[6]（2018）	男性	49	剧烈头痛并呕吐	SAH	同侧ASA和PICA	异常起源吻合部位	动脉瘤夹闭术，同时切断吻合动脉	无	动脉瘤无复发
3	Sejkorová等[7]（2016）	男性	19	剧烈头痛	SAH	同侧ASA和VA延髓支	异常起源吻合部位	Glubran胶栓塞动脉瘤	脑干梗死	—
4	Haga等[8]（2014）	女性	47	剧烈头痛	SAH伴脑室积血	对侧VA分支和同侧PICA	异常起源吻合部位	动脉瘤夹闭术，OA-PICA搭桥术	无	—
5	Matsumoto等[9]（2011）	男性	51	剧烈头痛	SAH	同侧PICA闭塞、同侧VA分支吻合	异常起源吻合部位	动脉瘤夹闭术	无	—
6	Horiuchi等[10]（2007）	女性	64	剧烈头痛	SAH伴脑积水	同侧VA开窗畸形分叉部	PICA远端	—	—	—
7	Fujimura[11]（2003）	男性	50	剧烈头痛并四肢瘫痪	SAH	同侧AICA和ASA	异常起源吻合部位	弹簧圈栓塞动脉瘤	中度意识障碍和四肢瘫痪	—
8	Pasco等[4]（2002）	男性	36	剧烈头痛	SAH	同侧VA双起源	异常起源吻合部位	Glubran胶栓塞动脉瘤	脑干梗死	—
9	本文病例1	男性	55	剧烈头痛并呕吐	SAH	同侧ASA和VA延髓支	异常起源吻合部位	OA-PICA搭桥术并同期电凝异常吻合血管和动脉瘤	无	动脉瘤无复发、吻合通畅
10	本文病例2	女性	52	剧烈头痛	SAH伴脑室积血	双侧PICA和ASA	异常起源吻合部位	OA-PICA搭桥术并同期电凝异常吻合血管和动脉瘤	无	动脉瘤无复发、吻合通畅

—，not reported，未报道。PICA，posterior inferior cerebellar artery，小脑后下动脉；SAH，subarachnoid hemorrhage，蛛网膜下腔出血；VA，vertebral artery，椎动脉；ASA，anterior spinal artery，脊髓前动脉；AICA，anterior inferior cerebellar artery，小脑前下动脉；OA-PICA，occipital artery-posterior inferior cerebellar artery，枕动脉-小脑后下动脉

后下动脉起始部异常常合并细小吻合，并发动脉瘤多为多发微小动脉瘤，蛛网膜下腔出血时无法辨认责任动脉瘤，处理这些动脉瘤常可造成吻合血管闭塞，考虑重建小脑后下动脉血流，OA-PICA搭桥术是脑血管重建术的可靠方法，可以更好预防动脉瘤复发。

本文例1先予保守治疗，1个月后再行OA-PICA搭桥术并同期电凝动脉瘤。例2可见左小脑后下动脉头襻动脉瘤和右小脑后下动脉异常吻合部位动脉瘤，蛛网膜下腔出血考虑左小脑后下动脉瘤破裂所致，急性期栓塞左小脑后下动脉瘤，以保证载瘤动脉通畅并减少再次破裂出血的风险；同时右小脑后下动脉起始部异常并发吻合部位动脉瘤考虑为血流相关性动脉瘤，异常血管吻合导致血流动力学改变是影响动脉瘤转归的重要因素，为降低动脉瘤破裂出血风险，择期行OA-PICA搭桥术并电凝动脉瘤。因此，对于小脑后下动脉起始部异常吻合并发动脉瘤，血管迂曲，载瘤动脉纤细，血管内介入治疗和开颅手术均困难，急性出血期可增加再出血等并发症的风险[16]，建议先保守治疗，再择期行脑血管重建术并处理动脉瘤，从而减少手术相关并发症。而对于例2患者，考虑引起蛛网膜下腔出血的责任动脉瘤的载瘤动脉迂曲程度，可行血管内介入治疗，建议急性期先栓塞动脉瘤，减少再出血风险。再择期行OA-PICA搭桥术并处理动脉瘤。

OA-PICA搭桥术通常选择侧俯卧位，采取远外侧入路[17]，术中探查异常吻合和动脉瘤后先重建血流，保证小脑后下动脉远端血流的情况下再处理动脉瘤，可以降低缺血性卒中风险。结合术前影像学检查和术中所见载瘤动脉情况，可电凝切除或夹闭动脉瘤。

综上所述，对于小脑后下动脉起始部异常吻合并发动脉瘤的患者，应充分认识其病因、供血动脉、并发动脉瘤的发生发展，可行OA-PICA搭桥术并同期处理异常吻合血管和动脉瘤。由于椎-基底动脉分支较多，易再次形成侧支循环和吻合，术后定期随访是必要的。

利益冲突 无

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·小词典·

中英文对照名词词汇（六）

室周器官 circumventricular organs（CVOs）
受控口语词语联想测验 Controlled Oral Word Association Test（COWAT）
术中超声检查 operative ultrasonography（OUS）
术中磁共振成像 intraoperative magnetic resonance imaging（iMRI）
水通道蛋白4 aquaporin 4（AQP4）
丝裂原激活蛋白激酶 mitogen-activated protein kinase（MAPK）
随机对照试验 randomized controlled trial（RCT）
髓鞘碱性蛋白 myelin basic protein（MBP）
髓鞘少突胶质细胞糖蛋白 myelin oligodendrocyte glycoprotein（MOG）
胎牛血清 fetal bovine serum（FBS）
体重指数 body mass index（BMI）
8条目痴呆筛查问卷 8-Item Ascertain Dementia（AD8）
通透性转换孔 permeability transition pore（PTP）
同型半胱氨酸 homocysteine（Hcy）
Zeste同源蛋白2增强子 enhancer of Zeste homolog 2（EZH2）
铜转运体1 copper transporter 1（CTR1）
统一帕金森病评价量表 Unified Parkinson's Disease Rating Scale（UPDRS）
α-突触核蛋白 α-synuclein（α-Syn）
突触囊泡蛋白2A synaptic vesicle protein 2A（SV2A）
^{18}F-脱氧葡萄糖 ^{18}F-fluoro-2-deoxy-D-glucose（^{18}F-FDG）
微小RNA microRNA（miRNA）
无进展生存期 progression free survival（PFS）
系统性红斑狼疮 systemic lupus erythematosus（SLE）
细胞外囊泡 extracellular vesicles（EVs）