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改良颅窝减压术在 Chiari 畸形 I 型患者中的应用 及其对脑脊液动力学的影响 *

王江峰¹ 刘金道¹ 董涛¹ 徐松¹ 张婉^{2Δ}

(1 陕西中医药大学第二附属医院 神经外科 陕西 咸阳 712000; 2 陕西中医药大学第二附属医院 影像科 陕西 咸阳 712000)

摘要 目的: 分析改良颅窝减压术在 Chiari 畸形 I 型患者中的应用及其对脑脊液动力学的影响。**方法:** 收集我院 2013 年 3 月至 2015 年 3 月诊治的 82 例 Chiari 畸形 I 型患者,按照抽签法分为对照组和观察组,各 41 例,对照组予以传统颅窝减压术,观察组予以改良颅窝减压术,比较两组临床疗效、并发症、脑脊液动力学[包含脑导管层面、脑桥腹侧平面、C3 腹侧平面头端最大峰值流速(VDmax)、尾端最大峰值流速(VUmax)、每搏出量(SV)]以及颅脊角变化。**结果:** 观察组疾病控制率(95.12%)显著高于对照组(80.49%)($P<0.05$),并发症发生率(4.88%)低于对照组(19.51%)($P<0.05$)。术后,观察组脑导管层面、脑桥腹侧和 C3 腹侧平面 VDmax、VUmax、SV 和颅脊角、枕骨大孔径值均明显优于对照组($P<0.05$)。**结论:** 改良颅窝减压术在 Chiari 畸形 I 型患者中的临床效果值得肯定,能够改善患者的脑脊液动力学。

关键词: Chiari 畸形 I 型;改良颅窝减压术;脑脊液动力学

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Application and the Influence of Modified Cranial Fossa Decompression on the Cerebrospinal Fluid Dynamics of Patients with Type I Chiari Malformation*

WANG Jiang-feng¹, LIU Jin-dao¹, DONG Tao¹, XU Song¹, ZHANG Wan^{2Δ}

(1 Department of Neurosurgery, the Second Affiliated Hospital of Shaanxi TCM University, Xianyang, Shaanxi, 712000, China;

2Department of imaging, the Second Affiliated Hospital of Shaanxi TCM University, Xianyang, Shaanxi, 712000, China)

ABSTRACT Objective: To analyze the application and the influence of modified cranial fossa decompression on the cerebrospinal fluid dynamics of patients with type I chiari malformation. **Methods:** 82 patients with Chiari malformation type I from March 2013 to March 2015 were collected and divided into the control group and the observation group according to the drawn method with 41 cases in each group. The control group was treated by the traditional cranial fossa decompression, the observation group was treated by modified cranial fossa decompression, the clinical curative effect and complications, cerebrospinal fluid dynamics and cranial spinal Angle change were compared between two groups. **Results:** The disease control rates (95.12%) of observation group was significantly higher than that of the control group (80.49%) ($P<0.05$), the incidence of complications (4.88%) of observation group was lower than that of the control group (19.51%) ($P<0.05$). The postoperative brain catheter level, pons, abdomen and C3 ventral plane VDmax, VUmax, SV and cranial ridge Angle, the occipital large aperture value of observation group were significantly better than those of the control group ($P<0.05$). **Conclusion:** Modified cranial fossa decompression had good clinical effect on Chiari deformity I types, which could improve the cerebrospinal fluid dynamics.

Key words: Chiari malformation type; Modified cranial fossa decompression; Cerebrospinal fluid dynamics

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前言

Chiari 畸形是先天性发育异常的常见疾病,临床上多见于 I 型,且多发于儿童与成人,小脑扁桃体下疝进入枕骨大孔是其主要特征,常合并脊髓空洞,能够引起系列的临床症状^[1]。手术是 Chiari 畸形的首选治疗方法,目前临床上存在多种手术方

式,传统颅窝减压术虽可起到一定的临床效果,然而疗效并不理想^[2,3]。如何改良手术方式使患者生活质量提高是临床治疗的一大难点,近年来,改良颅窝减压术已逐步应用于临床,但其有效性尚存争议^[4]。临床研究显示脑脊液动力学变化在 Chiari 畸形的发生发展中起着关键作用,现已受到广泛重视^[5]。本研究主要分析了改良颅窝减压术在 Chiari 畸形 I 型患者中的应用及

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作者简介:王江峰(1980-),男,硕士,主治医师,研究方向:神经系统疾病临床研究与治疗,电话:15592062396

Δ 通讯作者:张婉(1982-),女,硕士,主治医师,研究方向:神经系统影像诊断,电话:13992049092

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其对脑脊液动力学的影响,报道如下。

1 资料与方法

1.1 一般资料

收集我院 2013 年 3 月至 2015 年 3 月诊治的 82 例 Chiari 畸形 I 型患者,入选标准^[6]:符合 Chiari 畸形 I 型诊断标准,经头颈部 CT、MRI 等影像学检查提示小脑扁桃体下疝深度在 5mm 以上;伴小脑损伤、颅神经及颈神经受累、颈髓及延髓受压症状;伴程度不一的脊髓空洞;手术指征明确。排除伴心、肝肾严重病变,颅底凹陷、扁平颅底及寰枢椎脱位等畸形。对照组男性有 19 例,女性有 22 例;年龄在 18~60 岁,平均(37.68±2.51)岁;小脑扁桃体下疝深度在 5~16 mm,平均(9.67±0.42) mm;临床表现:小脑损伤有 28 例、颅神经及颈神经受累有 37 例、颈髓及延髓受压有 19 例;脊髓空洞位置:中颈端有 20 例,颈-上胸端有 12 例,颈-下胸端有 9 例。研究组男性有 20 例,女性有 21 例;年龄在 18~59 岁,平均(37.65±2.47)岁;小脑扁桃体下疝深度在 5~15 mm,平均(9.66±0.44)mm;临床表现:小脑损伤有 29 例、颅神经及颈神经受累有 35 例、颈髓及延髓受压有 17 例;脊髓空洞位置:中颈端有 22 例,颈-上胸端有 11 例,颈-下胸端有 8 例。本研究已通过我院伦理委员会审核,且患者及家属均已签署知情同意书,按照抽签法分为对照组和研究组,各 41 例。比较两组一般资料无差异($P>0.05$),有比较性。

1.2 治疗方法

指导患者为俯卧位,全身麻醉后使头部固定于头架上,避免头部过度前屈。于枕下正中处取切口,切口上缘于自枕外粗隆上 1.0 cm,切口下缘取决于小脑扁桃体下疝程度,使头皮切开,沿中线取电刀使项肌逐步切开,将枕骨、寰枢椎棘突、颈 3、颈 4 椎板充分暴露。对照组予以传统颅窝减压术,将枕骨鳞部形成 5.0 cm×4.0 cm 的骨窗咬除,枕骨大孔咬除宽度在 2.5 cm 左右,勿伤及椎动脉,寰椎后弓咬除宽度在 2.0 cm 左右,依据下疝程度判断是否保留颈 2 椎板。于显微镜下将硬膜以 "Y" 形剪开,分离蛛网膜,将同周围组织粘连的小脑扁桃体松解,尽可能恢复小脑扁桃体至正常位置,小脑扁桃体过长者需于软膜下

予以切除,将小脑扁桃体缓慢分开,观察第四脑室的中间孔状态,并使周围的粘连分解,待脑脊液可通畅流出,将蛛网膜缘严密修补、缝合,并重建枕大池。观察组予以改良颅窝减压术,即枕骨大孔区减压及硬膜外层松解术,将枕大孔后缘及枕骨鳞部咬除 2.5 cm 左右,形成一个 3.0 cm×4.0 cm 左右的骨窗,寰椎后弓两侧均咬除 1.0 cm 左右。于显微镜下将枕骨大孔周围的增厚、钙化筋膜彻底切除,寰枕与枕部交界处硬膜取尖刀纵形密集减张划开,保持间隔在 1.5 mm 左右,仅需处理硬膜外层,保留蛛网膜下腔的完整性,待下方脑脊液能够自由流动,使颈部肌肉、韧带及皮肤逐层缝合。两组术后均常规予以抗生素预防感染,同时配合补液、营养支持等治疗,统计术后并发症情况。

1.3 观察指标

参照相关文献评估患者术后 1 年时临床疗效:临床表现消失即好转,临床表现未改变即为稳定,临床表现有所加重即恶化,疾病控制率=(好转+稳定)/例数×100%^[7]。术前及术后 1 年均行脑脊液动力学检测:采用超导型磁共振仪,予以相位对比序列,脑脊液编码速率设置为 20 cm/s、矩阵为 256×128、层厚为 3~6 mm、视野为 16 mm×16 mm、翻转角为 15°,扫描时间为 5~6 min。选择中脑导水管层面、脑桥腹侧平面、C3 腹侧平面作为感兴趣区域。均测量头端最大峰值流速(VD-max)、尾端最大峰值流速(VUmax)、每搏出量(SV)水平。术前及术后 1 年均行颅脊角检测:采用超导型磁共振仪进行头颈部矢状位的薄层 MRI 扫描,待明确正中矢状面后测量颅脊角、枕骨大孔直径。

1.4 统计学分析

选择 spss18.0 实施数据统计,以均数±标准差($\bar{x} \pm s$)表示计量资料,用 t 检验比较;以[(n)%]表示计数资料,用 χ^2 检验比较,等级资用秩和检验,以 $P<0.05$ 表示差异具有统计学意义。

2 结果

2.1 两组患者的临床疗效比较

观察组疾病控制率显著高于对照组,差异具有统计学意义($P<0.05$),见表 1。

表 1 两组患者的临床疗效比较[例(%)]

Table 1 Comparison of the clinical curative effect between two groups of patients[n(%)]

Groups	n	Better	Stable	Deterioration	Disease control rate
Control group	41	15(36.59)	18(43.90)	8(19.51)	33(80.49)
Observation group	41	25(60.97)	14(31.15)	2(4.88)	39(95.12)
P			0.013		0.043

2.2 两组患者手术前后脑脊液动力学变化比较

术前,两组脑脊液动力学指标比较差异均无统计学意义($P>0.05$);术后,两组脑脊液动力学指标均较治疗前显著改善,且观察组改善更为明显,差异具有统计学意义($P<0.05$),见表 2、3、4。

2.3 两组患者手术前后颅脊角的变化比较

术前,两组颅脊角及枕骨大孔径比较无差异($P>0.05$);术后,两组颅脊角及枕骨大孔径均较治疗前显著改善,且观察组较对照组更显著,差异具有统计学意义($P<0.05$),见表 5。

2.4 两组患者并发症发生情况的比较

对照组有 5 例术后发热,2 例术腔感染、1 例脑脊液漏,观察组有 1 例术后发热,1 例术腔感染,观察组并发症率为 4.88%,显著低于对照组(19.51%),差异具有统计学意义($P<0.05$)。

3 讨论

Chiari 畸形的发病比较缓慢,是因胚胎发育异常导致小脑扁桃体下部进入枕骨大孔以下及颈椎管内,甚者部分延髓下段

表 2 两组患者手术前后脑导管层面脑脊液动力学变化比较($\bar{x} \pm s$)

Table 2 Comparison of the cerebrospinal fluid dynamics of cerebral catheter level before and after surgery between two groups of patients

Groups	n	VDmax(cm/s)		P	VUmax(cm/s)		P	SV(mL)		P
		Preoperative	Postoperative		Preoperative	Postoperative		Preoperative	Postoperative	
Control group	41	8.01± 2.40	6.85± 1.63	0.012	5.11± 1.42	4.38± 1.20	0.014	0.02± 0.01	0.03± 0.01	0.000
Observation group	41	8.02± 2.39	5.64± 1.27	0.000	5.13± 1.41	3.21± 1.16	0.000	0.02± 0.01	0.04± 0.01	0.000
P		0.985	0.000		0.949	0.000		1.000	0.000	

表 3 两组患者手术前后脑桥腹侧脑脊液动力学变化比较($\bar{x} \pm s$)

Table 3 Comparison of the ventral cerebrospinal fluid dynamics in the pons of before and after surgery between two groups of patients($\bar{x} \pm s$)

Groups	n	VDmax(cm/s)		P	VUmax(cm/s)		P	SV(mL)		P
		Preoperative	Postoperative		Preoperative	Postoperative		Preoperative	Postoperative	
Control group	41	9.51± 1.96	6.77± 1.50	0.000	6.86± 1.37	4.64± 1.35	0.000	0.04± 0.01	0.05± 0.01	0.000
Observation group	41	9.53± 1.97	5.89± 1.42	0.000	6.88± 1.36	3.78± 1.31	0.000	0.04± 0.01	0.06± 0.01	0.000
P		0.963	0.008		0.947	0.004		1.000	0.000	

表 4 两组患者手术前后 C3 腹侧平面脑脊液动力学变化比较($\bar{x} \pm s$)

Table 4 Comparison of the cerebrospinal fluid dynamics of C3 ventral surface before and after surgery between two groups of patients($\bar{x} \pm s$)

Groups	n	VDmax(cm/s)		P	VUmax(cm/s)		P	SV(mL)		P
		Preoperative	Postoperative		Preoperative	Postoperative		Preoperative	Postoperative	
Control group	41	7.36± 2.11	5.29± 1.15	0.000	4.20± 1.23	3.08± 0.70	0.000	0.02± 0.01	0.03± 0.01	0.000
Observation group	41	7.35± 2.13	4.15± 1.12	0.000	4.22± 1.24	2.51± 0.65	0.000	0.02± 0.01	0.04± 0.01	0.000
P		0.983	0.000		0.942	0.000		1.000	0.000	

表 5 两组患者手术前后颅脊角的变化比较($\bar{x} \pm s$)

Table 5 Comparison of the cranial spinal angle before and after surgery between two groups of patients

Groups	n	Cranial angle(°)		P	Large occipital bone(mm)		P
		Preoperative	Postoperative		Preoperative	Postoperative	
Control group	41	36.48± 5.12	32.47± 3.58	0.000	32.84± 2.42	34.69± 2.70	0.002
Observation group	41	36.46± 5.11	28.30± 2.85	0.000	32.83± 2.40	36.62± 2.87	0.000
P		0.986	0.000		0.985	0.002	

及四脑室下部也可疝入椎管内,能够引起吞咽困难、头痛、眩晕、肢体感觉障碍、共济失调等症状^[8]。其中,Chiari 畸形 I 型是其常见类型,是原发性的小脑异位,临床表现相对比较轻微,由于髓内同周围蛛网膜下腔的力量不均,容易产生相对较高的髓内搏动压,且可使脊髓组织出现由内之外的扩张,形成一种脊髓空洞^[9]。相关研究显示脑脊液动力学变化与 Chiari 畸形有着密切的联系,后颅脑发育畸形与小脑扁桃体下疝容易导致后颅窝的容积出现拥挤、减小,进而引起枕骨大孔区蛛网膜的下腔发生狭窄,导致脑脊液的搏动受到影响,进一步诱导脑脊液的流速异常并增加潜在阻力,使脊髓蛛网膜下腔脑脊液流动空间及每次心脏搏动减少,相应增加压力梯度,使小脑组织的下疝加剧,导致小脑形态发生进一步改变,同时形成一种异常的张

力,作用于血管和神经组织并引起系列临床症状^[10,11]。本研究结果显示治疗后脑导管层面、脑桥腹侧、C3 腹侧平面的脑脊液动力学中 VDmax、VUmax 低于治疗前,SV 高于治疗前,证实 Chiari 畸形 I 型患者均存在程度不一的脑脊液动力异常。手术能够使枕骨大孔及上颈椎对脑干脊髓、小脑、第四脑室的神经压迫受到解除,进而使神经症状得到缓解,改善脑脊液的循环障碍,缓解脊髓空洞^[12,13]。

传统颅窝减压术的骨窗范围较大,容易使小脑的骨性结构丧失,以至于重力下坠移位对上髓、延髓形成再次压迫,甚者可导致颅颈交界区的脑脊液循环出现再次梗阻或者颅颈压力分离;同时术中需于颈椎上端及枕骨的骨面剥离较大范围的枕部肌群,引起术后出现持续发热、术区积液等^[14,15]。改良颅窝减

压术是以小骨窗为主的术式,无需使脑组织切除,使上颈髓及延髓有效减压的同时还可保持小脑良好的重力支撑,避免剥离不必要的枕部肌群,尽可能的保持骨面及骨窗缘肌肉的粘合^[16]。本研究结果显示改良术式组疾病控制率高于传统术式,表明改良颅窝减压术更能有效改善患者的临床症状。同时,经改良颅窝减压术后脑导水管、脑桥腹侧、C3 腹侧平面的脑脊液动力学均显著优于传统手术,表明改良颅窝减压术能够有效改善脑脊液障碍,考虑与此术式能够使钙化、增厚的寰枕筋膜完整切除,使粘连彻底松解,确保脑脊液能够畅通引流^[17,18]。颅脊角是第四脑室下方延长线与斜坡延长线的夹角,是评估脑干受压的标准^[19]。本研究结果显示改良术式组术后颅脊角、枕骨大孔直径均优于传统术式组,提示经改良颅窝减压术更能有效缓解脑干受压。此外,经改良术式组并发症率更低,表明改良颅窝减压术的安全性较高,考虑与其能够使蛛网膜下腔的完整性得到保留,进而避免术后颅内感染、脑脊液漏等^[20]。硬膜外层的剥离范围需达到或者超出小脑扁桃体下疝的最底端,并再次彻底减压;且硬膜外层处理时动作应小心、轻柔,避免使硬膜内侧损伤,加剧脊髓、延髓的压迫,导致术后产生刺激性疼痛。

综上所述,改良颅窝减压术在 Chiari 畸形 I 型患者中的临床效果肯定,能够显著改善患者脑脊液动力学。

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