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超早期三维钛网颅骨修补术的临床研究

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摘要 目的:探讨重型颅脑损伤去骨瓣减压手术后颅骨缺损在超早期(4~6周内)行三维钛网颅骨修补的可行性和对患者长期预后的影响,探讨超早期颅骨修补手术中是否较常规手术存在优势。**方法:**回顾性分析自2012年1月-2015年1月行颅脑损伤后颅骨缺损手术修补患者99例。将所有患者根据去骨瓣减压术后行颅骨修补的间隔时间分为两组,4~6周以内为超早期组,共52例,3~6个月为常规组,共47例。采用不同国际评分标准比较两组患者在颅骨修补术后1个月、3个月、12个月的生存质量;对比分析两组患者的术中头皮剥离时间及术中出血量;比较两组患者术后1个月、3个月、12个月相应并发症的差异。**结果:**超早期组患者术后1个月的格拉斯哥评分(Glasgow outcome scale, GOS)、美国国立卫生研究院神经功能缺损评分(NIHSS)和远期卡氏功能状态(Karnofsky performance status, KPS)评分较常规组比较无统计学意义($P>0.05$);超早期组患者术后3个月和12个月的GOS、NIHSS和KPS评分较常规组均有显著提高($P<0.05$)。超早期组患者头皮剥离时间较常规组明显缩短($P<0.05$),出血量明显减少($P<0.05$);两组颅骨修补术后硬膜下积液发生率明显降低,差异有统计学意义($P<0.05$),然而总体并发症发生率并无明显差异($P>0.05$)。**结论:**重度颅脑损伤去骨瓣减压术后患者在超早期(4~6周内)行颅骨修补在临床上是安全有效的,能够改善患者的预后和减少术后并发症的发生概率,并且能够减少术中出血,手术中头皮剥离时间也有缩短。

关键词: 颅脑损伤; 颅骨修补; 三维钛网; 超早期

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Ultra Craniectomy Early Clinical Study Three-dimensional Titanium Mesh Skull Repair Surgery Reduced Pressure

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ABSTRACT Objective: To investigate the severe brain injury after decompressive surgery of skull defects ultra-early (4-6 weeks) the feasibility of row three-dimensional titanium mesh skull patch and its impact on the long-term prognosis of patients, and to explore ultra-early skull repair surgery Are compared with conventional surgery exist advantages. **Methods:** A retrospective analysis from January 2012 - January 2015 after the Brain Injury skull defect repair surgery 99 patients all patients after decompression interval skull patch into two groups according to craniectomy, 4. within -6 weeks for ultra-early group, 52 cases, 3-6 months for the conventional group, 47 cases. Skull patch after 1 month, 3 months, quality of life between the two groups of patients with different international scoring 12 months; comparative analysis peeling scalp surgery time and blood loss between the two groups; two groups were compared after 1 month, 3 months, 12 months, corresponding to the difference complications. **Results:** Ultra-early group patients after one month of GCS (Glasgow outcome scale, GOS), the US National Institutes of Health neurological deficits (NIHSS) and long-term Karnofsky functional status (Karnofsky performance status, KPS) score compared with the conventional group no significant difference ($P>0.05$); super-early group patients 3 months and 12 months of GOS, NIHSS and KPS scores were significantly increased ($P<0.05$) than the conventional group. Patients with ultra-early scalp skull patch set release time than conventional repair group was significantly shorter ($P<0.05$), the amount of bleeding was significantly reduced ($P<0.05$); the next two cranioplasty subdural effusion were significantly lower, the difference statistics significance ($P<0.05$). However, the overall complication rate was no significant difference ($P>0.05$). **Conclusion:** Severe brain injury patients after decompression craniectomy in the ultra-early (4-6 weeks) skull patch is clinically safe and effective, it can improve patient outcomes and reduce the probability of occurrence of postoperative complications, and can reduce blood loss during surgery scalp peeling time shortened.

Key words: Brain injury; Cranioplasty; Titanium Mesh; Ultra-early

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前言

重型颅脑损伤是指在外界直接或间接的暴力作用下,颅脑发生的危及生命的创伤,包括颅内出血(硬膜下血肿、硬膜外血肿、脑内出血等)、外伤性蛛网膜下腔出血、脑挫裂伤、脑干损伤等。在重型颅脑损伤的发生和发展过程中,其主要病理生理学变化是颅内压力急剧恶性升高,当前神经外科界,去骨瓣减压术是其最主要的治疗措施,并且在临床上显著降低了患者的致死率和致残率。去骨瓣减压手术造成的大的颅骨缺损在患者的早中期身体恢复阶段会导致循环脑脊液流体动力学和脑皮层血灌注的紊乱,从而影响患者神经功能的恢复,颅骨修补术是目前解决颅骨缺损的唯一治疗方法,并且三维钛网颅骨修补已经在临床上趋于成熟^[1-3]。一般认为,颅骨修补手术的时机是减压术后3~6个月,而如果患者存在感染的潜在风险或者正处于感染期,则修补手术至少要推迟到减压术后6个月以后进行。近年来,不少学者提出早期(3个月内)甚至超早期(4~6周内)行修补手术对于患者神经功能康复更有效果^[4,5]。本研究通过对比分析我院神经外科2012年1月-2015年1月进行三维钛网颅骨修补术的99例患者的相关资料进行分析,探讨不同治疗时期行颅骨修补术对于患者预后的影响。

1 材料和方法

1.1 一般资料

纳入标准^[5,6]:获得患者及其家属知情同意;入选患者年龄在16到55岁之间;由于重度闭合性颅脑损伤导致的颅内压力急剧骤然增高,危及患者生命,后行面积大于6厘米×8厘米的单侧去骨瓣减压手术的患者;颅骨修补术前行各项化验、检查评估全身高危因素(心肺等器官衰竭、心脑血管新发梗死、重度家族遗传病史的患者)和其他颅内器质性病变(包括颅内出血、脑积水、颅内感染、头皮下积液、硬膜下积液等)。排除标准:患者行颅骨修补手术前出现手术侧头皮愈合不良、感染的患者。入组患者总数为99例,共分两组,其中,去骨瓣术后4~6周内为超早期颅骨修补组(共52例,其中男患40例,女患12例,年龄在18~50岁,平均年龄33岁;颅骨缺损面积大小48~77 cm²,平均缺损面积66.8 cm²)去骨瓣术后3~6个月行颅骨修补术的为常规组(共47例,其中男患37例,女患10例;年龄在17~49岁,平均年龄32岁;颅骨缺损面积大小48~75 cm²,平均面积66.6 cm²)。两组病例比较在性别、种族、年龄、职业、术前评分等众多方面,均无统计学差异($P > 0.05$),具有可比性。

1.2 治疗方法

所有入选患者的手术均在同一消毒标准的手术室完成,术中麻醉方式均为气管插管全身麻醉,切口均使用原去骨瓣减压手术时的手术切口。入选患者的手术均由同一主刀完成,患者在术中成功剥离出颅骨缺损部位周围的自体颅骨边缘后,均采用同一器械生产厂家的颅骨修补三维钛网材料进行严密贴合修补,后数枚钛钉在骨缘严密固定。皮瓣游离过程中出现硬膜撕裂者,手术中均予以丝线严密缝合,后使用人工硬脑膜补片严密贴敷。当颅骨修补材料与周围颅骨边缘达到良好粘合后,头皮下放置引流管,并连接负压引流袋,后依次逐层缝合手术切口。头部引流管拔出的时间根据患者病情决定,一般在术

后3天内拔除。在跟台巡回护士和麻醉医师的共同协助下记录所有入组患者修补术中从切开头皮到完全游离皮瓣所需时间、从切开头皮到伤口缝合完毕所需时间以及手术过程中的估计失血量。

1.3 观察指标

(1)采用不同国际评分标准(格拉斯哥评分(Glasgow outcome scale, GOS)、美国国立卫生院神经功能缺损评分(NIHSS)和远期卡氏功能状态(Karnofsky performance status, KPS)评分)比较两组患者在颅骨修补术后1个月、3个月、12个月的生存质量。患者随访评分均有同一住院医师在主刀协助下完成,负责医师于术后1个月、3个月和12个月电话通知入组患者,在患者及其家属知情后,对患者整体状况给予随访评分,路途等原因不方便来院随访者,行电话随访。

(2)术中出血量由麻醉医师及其巡回护士协助配合主刀医师根据负压吸引器存储装置、术野引流袋液体量估算,术野中丢失血量由手术者估算,每台手术的总时长根据麻醉记录单计时,头皮剥离时间由巡回护士计算从主刀医师切皮结束到完全分离皮瓣暴露硬脑膜所需要的时间。

(3)两组患者均于术后1个月、3个月、12个月来我院复查脑磁共振或者CT、血生化、血常规等,必要时住院行腰穿检查,观察患者术后是否出现常见并发症,如颅内出血、硬膜下积液、癫痫头皮下积液、脑积水、感染、头皮愈合不良等。因各种原因患者没有条件来院随访者,电话通知后,家属将资料传递到负责医师邮箱^[5,6]。

1.4 统计学方法

采用SPSS 16.0统计软件进行分析,数据以 $\bar{x} \pm s$ 表示,两组间比较采用t检验, $P < 0.05$ 表示组间差异有统计学意义。

2 结果

2.1 评分结果

超早期组患者术后1个月的格拉斯哥评分(Glasgow outcome scale, GOS)、美国国立卫生院神经功能缺损评分(NIHSS)和远期卡氏功能状态(Karnofsky performance status, KPS)评分较常规组比较无统计学意义($P > 0.05$);超早期组患者术后3个月和12个月的GOS、NIHSS和KPS评分较常规组均有显著提高($P < 0.05$)。详见表1。虽然在颅骨修补术后1个月超早期组患者没有表现出明显优势,但是在术后3个月和12个月的随访情况中,超早期组却明显优于常规组。

2.2 术中情况比较

超早期患者头皮剥离时间较常规修补组明显缩短($P < 0.05$),出血量明显减少($P < 0.05$)详见表2。超早期组术中出血量的明显减少,降低了再次开颅手术的风险,减少了患者的经济负担,缩短了麻醉时间,术中的表现明显优于常规组。

2.3 术后并发症

超早期颅骨修补组随访52例有0例发生硬膜下积液,常规组随访47例中有5例发生硬膜下积液,超早期组比率较常规组明显降低,比较差异有统计学意义($P < 0.05$)。超早期组52例中共有5例出现硬膜下积液等并发症,常规组8例出现并发症,超早期组较常规组总体并发症发生率差异无统计学意义($P > 0.05$)。详见表3、4。硬膜下积液这个困扰神经外科医生的

早期颅骨修补后的常见并发症在超早期组无一例出现,表现出 症发生率却没有表现出明显的优势。极大的优势,但是 1 个月、3 个月和 12 个月随访中,总体并发

表 1 患者预后情况比较

Table 1 Comparison of the prognosis of patients

Groups	GOS score			KPS score			NIHSSI score		
	after 1 month	after 3 months	after 12 months	after 1 month	after 3 months	after 12 months	after 1 month	after 3 months	after 12 months
Ultra early	2.8± 0.7	3.9± 0.3*	4.2± 0.1*	53.3± 7.6	64.5± 7.1*	75.3± 6.4*	6.2± 0.1	4.1± 0.2*	2.5± 0.9*
Conventional group	2.8± 0.4	3.1± 0.4	3.8± 0.2	52.1± 4.7	55.5± 6.3	67.5± 6.2	6.1± 0.3	5.8± 0.3	3.9± 0.9
P	0.071	0.042	0.025	0.06	0.044	0.021	0.09	0.026	0.047

表 2 两组患者手术总时间、皮瓣游离时间及术中失血量比较($\bar{x} \pm s$)Table 2 The total time of the two groups of patients surgery, free flap time and intraoperative blood loss comparison ($\bar{x} \pm s$)

Analysis of indicators	Ultra early	Conventional group
Quantity	52	47
The total time of surgery(min)	91.17± 4.31*	133.25± 3.67
Scalp peeling time (min)	13.4± 1.27*	47.5± 2.43
Blood loss (mL)	285.87± 23.5*	535.66± 31.2

Note: between the two groups, *P<0.05.

表 3 患者术后并发症的比较

Table 3 Comparison of postoperative complications

Groups	Intracranial hemorrhage			Hydrocephalus			Subdural effusion		
	after 1 month	after 3 months	after 12 months	after 1 month	after 3 months	after 12 months	after 1 month	after 3 months	after 12 months
Ultra early	0	1	0	0	0	1	0	0	0
Conventional group	1	0	0	0	0	0	1	1	3

表 4 患者术后并发症的比较

Table 4 Comparison of postoperative complications

Groups	Epilepsy			Scalp effusion			Scalp nonunion, infection, etc.		
	after 1 month	after 3 months	after 12 months	after 1 month	after 3 months	after 12 months	after 1 month	after 3 months	after 12 months
Ultra early	1	0	0	0	1	0	0	1	0
Conventional group	0	0	0	0	1	0	0	1	0

3 讨论

目前,重型颅脑损伤引起的急剧恶性颅内压增高是导致患者致残、致死的重要原因^[2-7]。伤后脑组织膨隆,引起颅内高压,随后导致脑组织的低灌注压,引起脑缺血,脑血流减少并伴随供氧减少加剧了脑水肿,进一步致使颅内压提高,成为颅脑损伤和致残、致死的主要决定因素。有研究表明,对于弥漫性脑水肿患者,早期手术干预行单纯去骨瓣减压术或者去骨瓣减压术+颅内血肿清除能够有效地降低颅内压,降低对脑干生命中枢的挤压,目前全球颅脑创伤救治指南一般将其推荐为恶性高颅压治疗的二线治疗中的首选策略,去骨瓣减压术也在国内外临床工作中起到了良好的效果和认可^[3-8],挽救了很多患者的生命。

去骨瓣减压手术在重度颅脑损伤早期挽救了患者的生命,

提高生存机会,但是术后的颅骨缺损同样也带来了许多并发症^[9,10],例如 1. Treohined 综合征(颅骨缺损综合征、皮瓣内陷综合征):主要表现为癫痫、头晕、头痛、精神障碍及各种不适等状况是影响患者康复的重要原因之一;2.脑积水,有蛛网膜下腔出血就有可能发脑积水,是颅脑创伤常见的并发症,有学者报道硬脑膜切开减压患者脑积水发生率明显升高,这些情况一般出现高压性脑积水。另外,目前国内外少数学者也在提到外伤术后特别是去骨瓣术后的低颅压脑积水,作用机制尚不明确,主要考虑因去骨板减压术患者的患侧脑血管的血流减慢并恢复到正常状态,但是患者的颅骨缺损时间加长,就会导致缺损区脑组织得到严重受损,会加重导致脑组织的器质性损害^[3,7,9]。3.硬膜下积液,术后硬膜下积液和术中脑组织移位、硬脑膜缝合不严密等有关,也有文献提到颅脑创伤导致蛛网膜瓣裂口进

入硬膜下腔不能反流引起。

颅骨修补手术在国内外神经外科领域已经有 500 多年的历史^[21],最初,其主要目的是出于修复美观患者的颅脑外形和保护脑组织。近些年来,国内外越来越多的临床及其基础研究关注颅骨修补术后颅脑生理功能及脑正常血流的恢复和改善,虽然其作用机制和具体原理尚不完全明确,但是近年来三维钛网颅骨修补术在临床上应用广泛并起到了良好的诊疗效果,颅骨修补术已经发展成为目前唯一治疗颅骨缺损的方法^[4,8]。传统认为颅骨修补最好在去骨瓣减压手术治疗后 3 个月以上施行,而对于有感染患者或者潜在感染风险的患者至少需要延长至去骨瓣减压术后 6 个月进行,随着对颅骨修补术研究的不断深入,国内外学者在颅骨修补时间上开始出现了争议,有学者提出了早期颅骨修补术的概念^[12-18]。虽然对于早期甚至超早期颅骨修补术的认识还不够成熟,但是尽早颅骨修补可以减少去骨瓣减压术后并发症所带来的负面作用^[19-23]。

重型颅脑损伤后进行去大骨瓣减压的患者,尽早行颅骨缺损修补,尽早的恢复颅腔完整性和安全性,是促成神经功能恢复的重要条件,本研究的结果显示重型颅脑损伤后,进行去大骨瓣减压术后的 4~6 周内进行修补颅骨缺损是治疗该病的重要时间。在此时间,患者的骨窗就会逐渐形成塌陷、骨窗局部结缔组织,及时进行颅骨修补术可以减少局部脑组织受压,而且可以阻碍患者的局部脑组织中静脉回流,改善和恢复患者的动脉血流动力学,进一步促进脑神经功能的恢复,患者的预后良好,同时,也可以提高患者的生存质量。由此可见,根据患者的具体情况来个性化选择合适的手术时间,对患者尽早行三维钛网颅骨修补术,不仅能够恢复患者的脑部完整性,还可以提高患者的生活质量和自信心,加快患者的神经功能的恢复。同时,超早期修补明显减少了二次手术过程中的失血量,并且缩短了手术时间和麻醉时间,降低手术风险的同时也减少了患者的痛苦。

通过 3 年多对于 99 例颅骨修补术后患者的随访,不仅发现超早期的修补的种种益处,还在手术操作中又增加了不少经验和心得体会,比如在去骨瓣减压手术中贴敷了人工硬脑膜补片的患者,再次修补手术时明显减少了剥离肌肉的难度和出血量。硬膜下积液一直是困扰神经外科医生的颅骨修补后常见并发症,并且在以前,很多患者因为术后硬膜下积液延迟出院并且很多再次手术,通过随访在超早期组无一例发生。因此,超早期颅骨修补是切实可行的。

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