·循证神经系统疾病·

颅内破裂动脉瘤夹闭术和栓塞术后分流依赖性脑积水的系统评价

刘庆国 宋志斌 高建伟 李旭光 武云利 王龙 郭兵

【摘要】 **目的** 系统评价颅内破裂动脉瘤夹闭术和栓塞术后分流依赖性脑积水发生率。**方法** 以脑积水、夹闭、介入、栓塞、颅内动脉瘤、脑动脉瘤、蛛网膜下腔出血/蛛网膜下隙出血，以及hydrocephalus、shunt、clipping、coiling、surgical、endovascular、embolization、treatment、intracranial aneurysm、cerebral aneurysm、subarachnoid hemorrhage等中英文词组，计算机检索1990年1月–2015年9月美国国立医学图书馆生物医学信息检索系统、荷兰医学文摘、Cochrane临床对照试验中心注册库、中国知网中国知识基础设施工程、万方数据库，辅助手工检索《中华神经外科杂志》、《中国现代神经疾病杂志》和《中国脑血管病杂志》等相关杂志，查阅关于颅内破裂动脉瘤夹闭术和栓塞术后分流依赖性脑积水发生率的临床研究。采用Jadad量表和Newcastle-Ottawa量表评价文献质量，RevMan 5.3和Stata 13.1统计软件进行Meta分析。**结果** 共获得731篇文献，经剔除重复和不符合纳入标准者，最终纳入18项临床试验共计15 920例颅内破裂动脉瘤患者，行夹闭术者10 038例、行栓塞术5882例。Meta分析显示：两种治疗方式术后分流依赖性脑积水发生率差异无统计学意义（$OR = 0.860$，95%CI：0.720～1.030；$P = 0.110$）；分析结果的稳定性较差，但不存在发表偏倚（Egger法：$P = 0.795$）。**结论** 颅内破裂动脉瘤夹闭术和栓塞术后分流依赖性脑积水发生率无显著差异，但尚待进一步的高质量临床研究加以证实。

【关键词】 脑积水； 颅内动脉瘤； 栓塞，治疗性； 显微外科手术； Meta分析

The incidence of shunt-dependent hydrocephalus after treatment of ruptured intracranial aneurysms by microsurgical clipping versus endovascular coiling: a systematic review

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【**Abstract**】 **Objective** To systematically review the risk of shunt-dependent hydrocephalus after treatment of ruptured intracranial aneurysms by microsurgical clipping versus endovascular coiling. **Methods** A comprehensive literature search from January 1990 to September 2015 was conducted in electronic databases, such as PubMed, EMBASE/SCOPUS, Cochrane Central Register of Controlled Trials (CENTRAL), China National Knowledge Infrastructure (CNKI) and Wanfang data, for randomized controlled trials (RCTs) or observational studies. Key words were defined as hydrocephalus, shunt, clipping, coiling, surgical, endovascular, embolization, treatment, intracranial aneurysm, cerebral aneurysm, subarachnoid hemorrhage both in Chinese and English. Manual search was also conducted on several relevant journals, such as *Chinese Journal of Neurosurgery*, *Chinese Journal of Contemporary Neurology and Neurosurgery*, *Chinese Journal of Cerebrovascular Diseases*, and so on. Data were extracted and evaluated by two reviewers independently. Jadad Scale was used to assess the quality of RCTs. Newcastle-Ottawa Scale (NOS) was used to evaluate the quality of nonrandomized controlled trials. RevMan 5.3 and Stata 13.1 were used for Meta-analysis. **Results** Eighteen observational studies were finally included, involving 15 920 patients with ruptured intracranial aneurysms, among whom 10 038 patients underwent clipping and 5882 underwent coiling. The result of Meta-analysis indicated that there was no statistical significance on the incidence of

doi：10.3969/j.issn.1672-6731.2016.02.003

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shunt-dependent hydrocephalus between clipping and coiling (*OR* = 0.860, 95%CI: 0.720–1.030; *P* = 0.110). However, the findings showed low stability as the results of fixed effects model and random effects model were different. The result of Egger´s test indicated no publication bias (*P* = 0.795). **Conclusions** The frequency of shunt-dependent hydrocephalus was not significantly different between clipping and coiling. However, the conclusion still needs to be further verified by high-quality studies.

【Key words】 Hydrocephalus; Intracranial aneurysms; Embolization, therapeutic; Microsurgery; Meta-analysis

脑积水是颅内动脉瘤破裂致蛛网膜下隙出血所引起的常见并发症，发生率为6%～67%，其中10%～20%为分流依赖性脑积水，需行脑室-腹腔分流术（VPS）[1-2]。而无论是分流依赖性脑积水还是分流手术相关并发症均严重危害患者健康、增加医疗费用，因此，减少颅内破裂动脉瘤夹闭术和栓塞术后分流依赖性脑积水的发生，对提高患者生活质量、减少医疗费用具有重要意义。对于颅内破裂动脉瘤，究竟选择何种治疗方式（夹闭术或栓塞术）疗效更佳、患者受益更大，应强调根据患者全身情况和动脉瘤特点进行个体化治疗。本研究旨在系统评价颅内破裂动脉瘤夹闭术和栓塞术后分流依赖性脑积水发生情况，以为颅内破裂动脉瘤治疗方式的选择提供参考。

资料与方法

一、纳入与排除标准

1. 研究类型　随机或非随机对照临床试验。

2. 研究对象　（1）纳入标准：经夹闭术或栓塞术治疗的颅内动脉瘤破裂致蛛网膜下隙出血；分流依赖性脑积水定义为需行脑室-腹腔分流术的脑积水；所纳入的临床研究包含完整的试验数据或数据可通过计算获得。（2）排除标准：颅内动脉瘤未破裂的临床研究、无法获得试验数据的临床研究、存在明显选择偏倚的临床研究、重复发表的文献。

3. 干预措施　试验组为颅内破裂动脉瘤夹闭术组，对照组为颅内破裂动脉瘤栓塞术组。

4. 结局指标　颅内破裂动脉瘤夹闭术和栓塞术后分流依赖性脑积水发生率。

二、文献检索

计算机分别检索美国国立医学图书馆生物医学信息检索系统（PubMed）、荷兰医学文摘（EMBASE/SCOPUS）、Cochrane临床对照试验中心注册库（CENTRAL），以及中国知网中国知识基础设施工程（CNKI）、万方数据库等国内外知名数据库；手工检索《中华神经外科杂志》、《中国现代神经疾病杂志》和《中国脑血管病杂志》等相关杂志；同时查阅纳入临床试验的参考文献以补充可能遗漏的相关研究。检索时间为1990年1月–2015年9月，语言限制为中文和英文。英文检索词包括hydrocephalus、shunt、clipping、coiling、surgical、endovascular、embolization、treatment、intracranial aneurysm、cerebral aneurysm、subarachnoid hemorrhage；中文检索词为脑积水、夹闭、介入、栓塞、颅内动脉瘤、脑动脉瘤、蛛网膜下腔出血/蛛网膜下隙出血。

三、数据提取和质量评价

由两位评价者独立检索文献、提取数据并交叉核对，如有分歧通过讨论或征求第三方意见予以解决。分别采用Jadad量表[3]和Newcastle-Ottawa量表（NOS）[4]评价所纳入随机或非随机对照临床试验的方法学质量水平。

1. Jadad量表对随机对照临床试验质量的评价标准　（1）随机分组序列的产生方法：通过计算机产生的随机分组序列或经随机数字表法产生的序列，2分；试验中提到随机分配，但文中未交待随机序列的产生方法，1分；半随机或准随机试验，指采用交替分配病例的方法，例如按照入院顺序、出生日期单双数，0分。（2）随机化隐藏：医疗中心或药房控制分配方案、采用编号一致的容器、现场计算机控制、采用密封不透光的信封或其他使临床医师或受试者无法预知分配序列的方法，2分；仅表明采用随机数字表法或其他随机分配方案，1分；交替分配、系列号、系列编码信封，以及任何不能阻止分组可预测性的措施或未采用随机化隐藏，0分。（3）双盲法：描述实施双盲的具体方法并被认为是恰当的，如采用完全一致的安慰剂，2分；文中仅提及双盲但是方法不恰当，1分；文献中未提及盲法，0分。

(4)退出与失访:对退出与失访的病例数和退出的理由进行详细描述,1分;未提及退出或失访,0分。总评分为7分,评分≥4分者为高质量文献,评分<4分者为低质量文献。

2. NOS量表对非随机对照临床试验质量的评价标准　参照队列研究的3项质量评价标准进行评分:(1)研究对象的定义和选择(selection,4分),分别为暴露队列的典型性(1分)、非暴露队列的选择方法(1分)、暴露的确定方法(1分)、研究初始时没有出现结局(1分)。(2)研究对象的可比性(comparability,2分)。(3)预后评价(outcome,3分),包括对于结果的评价是否充分(1分)、随访时间对于结局的发生是否足够(1分)、暴露组和非暴露组的随访时间是否充分(1分)。总评分为9分,评分≥6分者为高质量文献、评分<6分者为低质量文献。

四、统计分析方法

采用Cochrane协作网提供的RevMan 5.3统计软件行Meta分析。计数资料以比值比(*OR*)表示,计量资料以均数差(*MD*)表示,区间估计以95%CI表示,效应量检验水准为$\alpha=0.05$。各项研究之间的异质性检验采用χ^2检验,当$P>0.100$和$I^2<50.000\%$时,无异质性,采用固定效应模型进行合并效应分析;当$P\leq0.100$和$I^2\geq50.000\%$时,存在异质性,采用随机效应模型进行合并效应分析,对于不宜行Meta分析的数据,仅进行描述性分析。采用敏感性分析对Meta分析结果稳定性进行评价,将固定效应模型与随机效应模型相互转换,若转换后研究结论相一致则表明Meta分析结果稳定,反之则不稳定。采用Stata 13.1统计软件中的Egger法对所纳入文献的潜在发表偏倚进行评价,以$P>0.05$为不存在发表偏倚。

结　果

一、文献检索结果

经初步检索共筛出相关文献731篇,其中PubMed检出373篇、EMBASE/SCOPUS检出305篇、中国知网中国知识基础设施工程检出14篇、万方数据库检出39篇、Cochrane临床对照试验中心注册库未检出相关文献,通过阅读文题和摘要,剔除个案报道、综述和重复报道等不符合纳入标准的文献697篇;进一步仔细阅读全文排除16篇,最终共纳入18篇文献[1-2,5-20],英文16篇、中文2篇。文献检索流程和纳入文献的基线资料参见图1、表1。

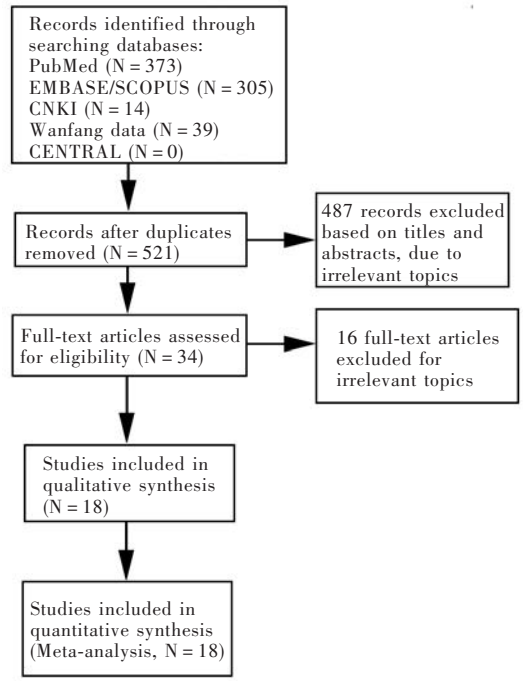

图1　文献检索流程图

Figure 1　Flow diagram of screening articles.

二、文献质量评价

18项临床试验中4项为前瞻性研究[1,6,8,16],余为回顾性研究[2,5,7,9-15,17-20]。4项前瞻性研究中3项为非随机对照临床试验[6,8,16],1项为随机对照临床试验[1],但该项研究在试验设计时未将术后分流依赖性脑积水发生率作为评价指标,而是在随后的回顾性分析中进行评价,实际上不属于随机对照试验。本研究方法学质量评价参见表2。

三、Meta分析结果

18项临床试验[1-2,5-20]共纳入15 920例颅内破裂动脉瘤病例,其中接受夹闭术治疗者10 038例、接受栓塞术治疗者5882例,两组患者术后分流依赖性脑积水发生率分别为12.82%(1287/10 038)和13.89%(817/5882)。经异质性检验,各项研究之间存在异质性($P=0.060$,$I^2=37.000\%$),故采用随机效应模型进行合并效应分析。结果显示:两组患者术后分流依赖性脑积水发生率差异无统计学意义(*OR*=0.860,95%CI:0.720~1.030,$P=0.110$;图2)。

四、敏感性分析

通过转换固定效应与随机效应模型对其敏感性进行分析,结果显示:颅内破裂动脉瘤夹闭术后分流依赖性脑积水发生率低于栓塞术,差异具有统计学意义(*OR*=0.870,95% CI:0.790~0.960,$P=$

表1　所纳入18项临床试验的基线资料

Table 1.　Baseline characteristics of 18 included studies

Study	Group	N	Sex [case (%)]		Age (year)	Determination of treatment modality	Design
			Male	Female			
Zaidi, et al [1] (2015)	Clipping	280	85 (30.36)	195 (69.64)	53.21 ± 12.80	Random allocation	Prospective RCT (retrospectively reviewed)
	Coiling	128	38 (29.69)	90 (70.31)	54.30 ± 12.00	Random allocation	Prospective RCT (retrospectively reviewed)
Rincon, et al [2] (2010)	Clipping	309	Not available		Not available	Not available	Retrospective study
	Coiling	95	Not available		Not available	Not available	Retrospective study
Bae, et al [5] (2014)	Clipping	157	58 (36.94)	99 (63.06)	56.94	By a vascular neurosurgeon	Retrospective study
	Coiling	58	17 (29.31)	41 (70.69)	55.67	By a vascular neurosurgeon	Retrospective study
Dehdashti, et al [6] (2004)	Clipping	180	68 (37.78)	112 (62.22)	49.00	By a neurosurgeon and a neuroradiologist	Prospective nonrandomized study
	Coiling	65	20 (30.77)	45 (69.23)	52.00	By a neurosurgeon and a neuroradiologist	Prospective nonrandomized study
Dorai, et al [7] (2003)	Clipping	684	Not available		Not available	Not available	Retrospective study
	Coiling	34	Not available		Not available	Not available	Retrospective study
Gruber, et al [8] (1999)	Clipping	125	Not available		Not available	By a neurosurgeon and a neuroradiologist	Prospective nonrandomized study
	Coiling	62	Not available		Not available	By a neurosurgeon and a neuroradiologist	Prospective nonrandomized study
Jartti, et al [9] (2008)	Clipping	102	48 (47.06)	54 (52.94)	52.00	By a neurosurgeon and a neuroradiologist	Retrospective study
	Coiling	107	44 (41.12)	63 (58.88)	53.00	By a neurosurgeon and a neuroradiologist	Retrospective study
Koh, et al [10] (2013)	Clipping	33	15 (45.45)	18 (54.55)	54.10 ± 13.90	Not available	Retrospective study
	Coiling	22	8 (36.36)	14 (63.64)	52.80 ± 11.60	Not available	Retrospective study
Kong, et al [11] (2014)	Clipping	55	Not available		52.90 ± 12.40	Not available	Retrospective study
	Coiling	51	Not available		54.30 ± 11.90	Not available	Retrospective study
Hoh, et al [12] (2011)	Clipping	6593	2044 (31.00)	4549 (69.00)	53.00 ± 13.00	Not available	Retrospective study
	Coiling	4306	1378 (32.00)	2928 (68.00)	55.00 ± 15.00	Not available	Retrospective study
Premananda, et al [13] (2012)	Clipping	204	Not available		Not available	Not available	Retrospective study
	Coiling	64	Not available		Not available	Not available	Retrospective study
Nam, et al [14] (2010)	Clipping	498	191 (38.35)	307 (61.65)	54.18	By a neurosurgeon and a neuroradiologist	Retrospective study
	Coiling	238	71 (29.83)	167 (70.17)	57.03	By a neurosurgeon and a neuroradiologist	Retrospective study
Natarajan, et al [15] (2008)	Clipping	105	37 (35.24)	68 (64.76)	Not available	By a physician	Retrospective study
	Coiling	87	29 (33.33)	58 (66.67)	Not available	By a physician	Retrospective study
de Oliveira, et al [16] (2007)	Clipping	212	Not available		Not available	By a neurosurgeon and a neuroradiologist	Prospective nonrandomized study
	Coiling	173	Not available		Not available	By a neurosurgeon and a neuroradiologist	Prospective nonrandomized study
Sethi, et al [17] (2000)	Clipping	50	14 (28.00)	36 (72.00)	Not available	Not available	Retrospective study
	Coiling	50	23 (46.00)	27 (54.00)	Not available	Not available	Retrospective study
Shen, et al [18] (2015)	Clipping	291	Not available		Not available	Not available	Retrospective study
	Coiling	266	Not available		Not available	Not available	Retrospective study
Taha, et al [19] (2006)	Clipping	25	Not available		Not available	Not available	Retrospective study
	Coiling	28	Not available		Not available	Not available	Retrospective study
Varelas, et al [20] (2006)	Clipping	135	46 (34.07)	89 (65.93)	53.00 ± 14.00	By a neurosurgeon and a neuroradiologist	Retrospective study
	Coiling	48	21 (43.75)	27 (56.25)	51.00 ± 15.00	By a neurosurgeon and a neuroradiologist	Retrospective study

RCT, randomized controlled trial, 随机对照试验

0.005；图3），提示Meta分析结果稳定性较差。

五、发表偏倚评价

根据Egger法检验结果，所纳入的18项颅内破裂动脉瘤夹闭术和栓塞术后分流依赖性脑积水临床试验不存在发表偏倚（$P=0.795$）。

讨　论

动脉瘤夹闭术和栓塞术是目前治疗颅内破裂

表2 所纳入18项临床试验的NOS量表方法学质量评价(评分)

Table 2. Results of quality assessment on 18 included studies by NOS (score)

Study	Selection				Comparability		Outcome			Total
	Typicality of the exposed cohort	Select the non exposed cohort	Ascertain the exposure	Prove that outcome of interest was not present at start of study	Controls for most important factor	Controls for any additional factor	Assess outcome	Was follow-up long enough for outcomes to occur	Adequacy of follow up	
Zaidi, et al [1] (2015)	1	1	1	1	1	1	1	0	0	7
Rincon, et al [2] (2010)	1	1	1	1	0	1	1	0	0	6
Bae, et al [5] (2014)	1	1	1	1	1	1	1	0	0	7
Dehdashti, et al [6] (2004)	1	1	1	1	1	1	1	0	0	7
Dorai, et al [7] (2003)	1	1	1	1	1	1	1	0	0	7
Gruber, et al [8] (1999)	1	1	1	1	1	0	1	0	0	6
Jartti, et al [9] (2008)	1	1	1	1	1	0	1	0	0	6
Koh, et al [10] (2013)	1	1	1	1	0	1	1	0	0	6
Kong, et al [11] (2014)	1	1	1	1	1	0	1	0	0	6
Hoh, et al [12] (2011)	1	1	1	1	1	0	1	0	0	6
Premananda, et al [13] (2012)	1	1	1	1	1	1	1	0	0	7
Nam, et al [14] (2010)	1	1	1	1	1	1	1	0	0	7
Natarajan, et al [15] (2008)	1	1	1	1	1	1	1	0	0	7
de Oliveira, et al [16] (2007)	1	1	1	1	1	1	1	0	0	7
Sethi, et al [17] (2000)	1	1	1	1	1	0	1	0	0	6
Shen, et al [18] (2015)	1	1	1	1	1	0	1	0	0	6
Taha, et al [19] (2006)	1	1	1	1	1	0	1	0	0	6
Varelas, et al [20] (2006)	1	1	1	1	1	1	1	0	0	7

动脉瘤的主要方法,究竟选择何种治疗方式应综合Hunt-Hess分级,动脉瘤部位、形态、大小,以及是否合并脑室内出血、脑积水、手术医师技术等多种因素进行判断。一般认为,Hunt-Hess分级 ≤ Ⅲ级、低龄、大型或巨大型动脉瘤、宽颈或形态不规则的大脑中动脉动脉瘤、伴脑积水或颅内血肿的动脉瘤应首选夹闭术;Hunt-Hess分级 > Ⅲ级、高龄、患者一般情况较差、处于亚急性期的后循环动脉瘤则应首选栓塞术;对于两种治疗方式均为适应证者,无论动脉瘤位于何部位,循证医学证据表明均应首选栓塞术[21]。然而,从减少术后分流依赖性脑积水风险的角度考虑,选择何种治疗方式仍存有争议。

鉴于夹闭术术中开放脑池、终板造瘘等措施可清除蛛网膜下隙和脑室内血肿,有利于改善脑脊液循环,对术后分流依赖性脑积水的发生有一定预防作用;而动脉瘤栓塞术则无法清除蛛网膜下隙和脑室内血肿,故术后较易发生分流依赖性脑积水。迄今有3项系统评价对夹闭术与栓塞术后分流依赖性脑积水发生率进行比较[16,18,22]:de Oliveira等[16]纳入5项临床试验共1720例颅内破裂动脉瘤患者,其结果显示,栓塞术后发生分流依赖性脑积水的风险更高(RR = 0.740, 95% CI: 0.580 ~ 0.940; P = 0.010),而且两种术式间的差异可能是夹闭术可以清除蛛网膜下隙出血所致。Li等[22]纳入7项临床试验,包括1981例颅内破裂动脉瘤患者,其结论为,两种术式术后分流依赖性脑积水发生率差异无统计学意义(OR = 0.840, 95% CI: 0.660 ~ 1.070; P = 0.160),与de Oliveira等[16]的结果不同;但Li等[22]的研究未纳入

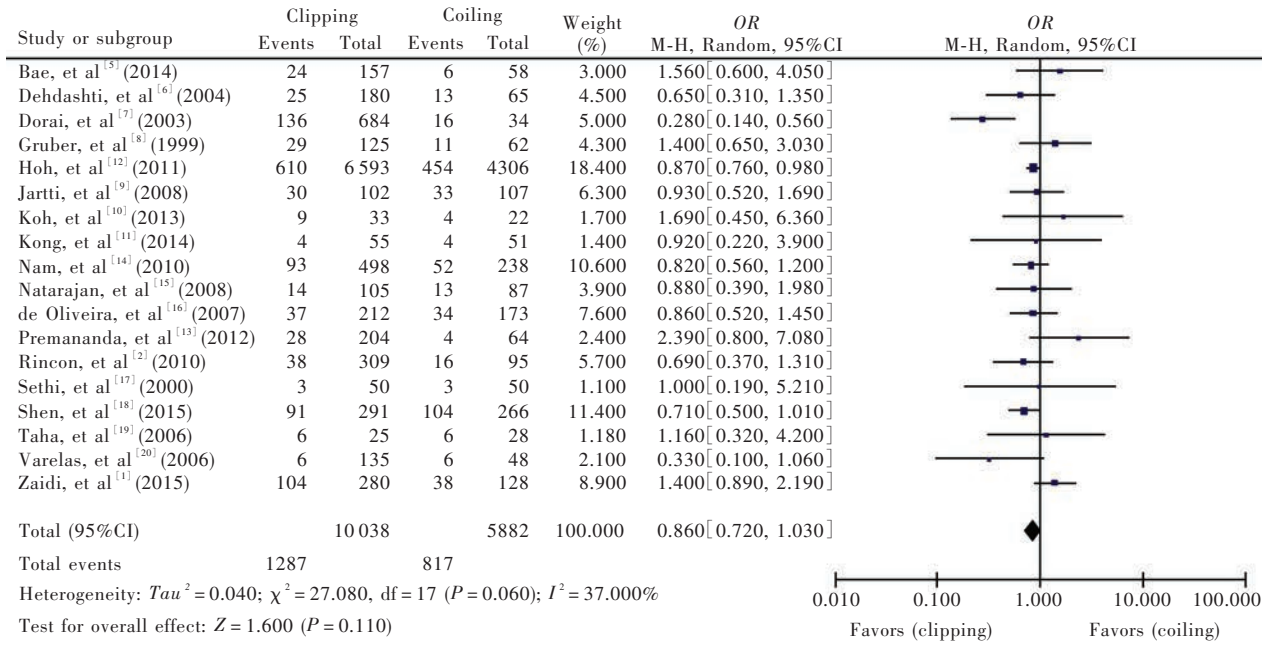

图2　颅内破裂动脉瘤夹闭术与栓塞术后分流依赖性脑积水发生率比较的森林图

Figure 2　Forest plot of the incidence of shunt-dependent hydrocephalus after treatment of ruptured intracranial aneurysms by clipping versus coiling.

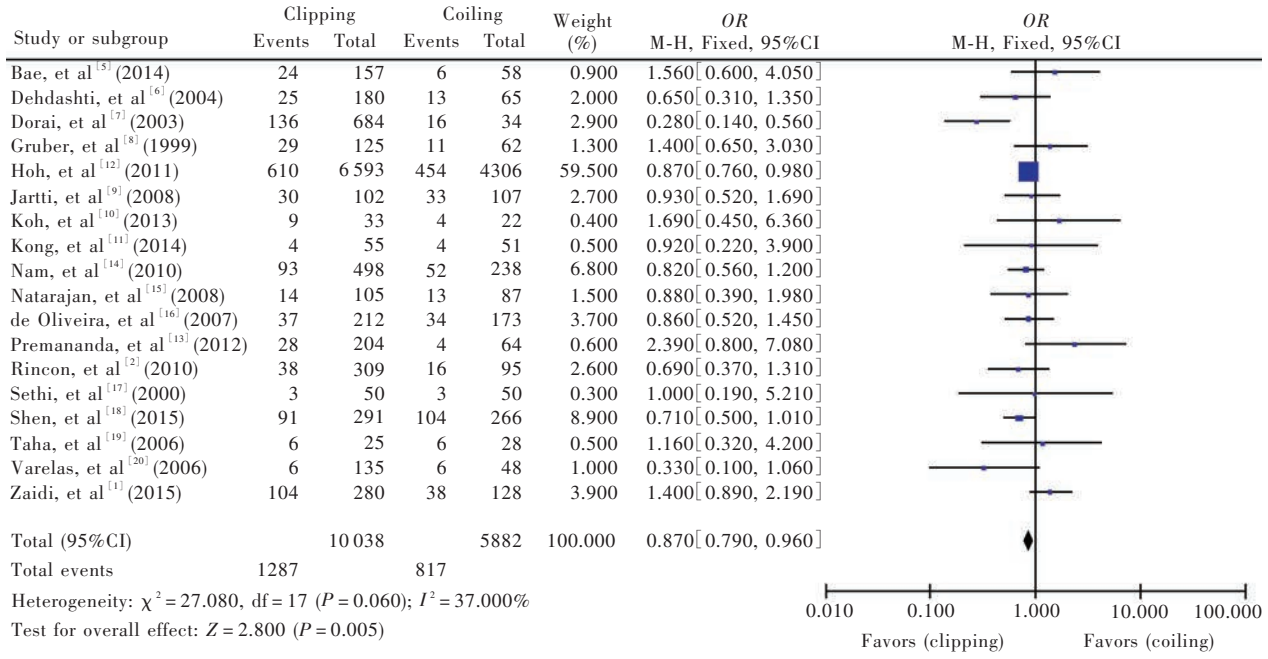

图3　转换效应模型后颅内破裂动脉瘤夹闭术与栓塞术后分流依赖性脑积水发生率比较的森林图

Figure 3　Forest plot of the incidence of shunt-dependent hydrocephalus after treatment of ruptured intracranial aneurysms by clipping versus coiling after exchanging effects model.

Dorai等[7]的研究，这是由于该项研究中栓塞术组Hunt-Hess ≥ Ⅳ级者占38%，而夹闭术组仅为12%，可能存在选择偏倚而影响结论。申汉威等[18]的研究共纳入5093例颅内破裂动脉瘤患者，所得结论与Li等[22]相同，即夹闭术和栓塞术后分流依赖性脑积水发生率差异无统计学意义（*OR* = 0.840，95% CI：0.640 ~ 1.120；*P* = 0.240）。考虑到目前的临床试验均为观察性研究，存在选择性偏倚等各种偏倚，无

法完全均衡各种影响因素，鉴于此，我们本着只要是比较两种治疗方式术后分流依赖性脑积水发生率且不存在明显选择性偏倚的研究均纳入本系统评价。但是申汉威等[18]纳入的1篇文献[23]，经仔细阅读全文后发现可能包括非分流依赖性脑积水，故予以排除。本研究结果显示，两种治疗方式术后分流依赖性脑积水发生率差异无统计学意义，推测可能是由于相当一部分栓塞术患者施行脑室外引流术，引流出蛛网膜下隙或脑室内血肿，达到与夹闭术相似的治疗效果。本系统评价所纳入的各项研究亚组设立不尽相同且数据较少，无法进行亚组数据合并，但仍有研究从减少术后分流依赖性脑积水发生率的角度为颅内破裂动脉瘤治疗方式的选择提供了有益线索，例如：Nam等[14]的研究显示，Fisher分级为4级的颅内破裂动脉瘤患者，夹闭术和栓塞术后分流依赖性脑积水发生率分别为22.81%（26/114）和43.75%（28/64，$P=0.004$）；而Fisher分级为2级的患者，夹闭术和栓塞术后分流依赖性脑积水发生率为13.01%（16/123）和2.08%（1/48，$P=0.043$）。Dehdashti等[6]的研究显示，对于Fisher分级为4级且伴脑室内出血的患者，夹闭术后分流依赖性脑积水发生率低于栓塞术（$OR=0.320$，95%CI：0.140～0.750；$P<0.05$）。

本系统评价存在以下局限性：（1）所纳入文献的研究质量一般，均为非随机对照临床试验。非随机对照临床试验的最大缺陷是更易受偏倚的影响，无法均衡未知的混杂因素[24]。（2）所纳入临床试验在夹闭术或栓塞术治疗时间方面可能不尽一致。（3）所纳入临床试验对施行脑室外引流术无统一标准。（4）Meta分析结果稳定性较差。上述局限性在一定程度上影响了本系统评价结果的可靠性，限制了结论的临床推广。尽管如此，本研究结果仍提示：颅内破裂动脉瘤究竟采用何种治疗方式，从伦理学和可行性上看，在已有较多循证医学证据的情况下进行大样本随机对照临床试验较为困难；而非随机对照临床试验在医学研究中占较大比例，可提供重要信息，尤其是设计良好的非随机对照临床试验亦可较准确地判断疗效[24]。因此，对于颅内破裂动脉瘤治疗方式的选择，本系统评价仍可以提供一定参考信息。建议在今后的研究中，对可能影响术后分流依赖性脑积水的危险因素进行亚组分析，如合并脑室内出血、Hunt-Hess分级或Fisher分级等，使研究数据尽可能完整、评价标准尽可能统一，以获得更为可靠的结论。

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（收稿日期:2016-01-02）

第十六次中国脑血管病大会2016征文通知

由中华医学会、中华医学会神经病学分会主办，中华医学会神经病学分会脑血管病学组、浙江省医学会、浙江省医学会神经病学分会承办的第十六次中国脑血管病大会2016拟定于2016年4月7–9日在浙江省杭州市召开。届时将邀请国内外著名脑血管病和神经病学专家进行专题报告。会议内容包括脑血管病基础研究、脑血管病病因学与病理学研究、脑血管病一二级预防、脑血管病影像学诊断与评估、缺血性脑血管病急性期治疗、出血性脑血管病诊断与治疗、血管内介入诊断与治疗新进展、脑静脉系统血栓形成诊断与治疗、少见脑血管病诊断与治疗、脑血管病康复治疗与研究、重症脑血管病、脑血管病护理、脑血管病转化医学研究、精准医学在脑血管病的应用、复杂疑难脑病病例讨论、最新指南解读。欢迎全国神经科同道积极参会，踊跃投稿。

1. 征文内容　脑血管病流行病学；脑血管病危险因素研究；脑血管病遗传学研究；脑血管病一二级预防；脑血管病病因、发病机制与病理学研究；脑血管病评估与诊断；神经血管影像学；脑血管病急救与组织管理体系；短暂性脑缺血发作；脑梗死、脑出血、蛛网膜下隙出血、脑静脉系统血栓形成、少见脑血管病、血管性认知障碍与痴呆、脑卒中后抑郁；神经血管介入；脑血管病外科治疗；重症脑血管病与神经重症监护；脑血管病并发症；脑血管病护理学；脑血管病康复治疗与研究；脑血管病与转化医学；精准医学与脑血管病；脑血管病规范化诊断与治疗。

2. 征文要求　尚未在国内外公开发表的论文摘要1份，字数800～1000字，请按照目的、方法、结果、结论四部分格式书写，并于文题下注明作者姓名（第一作者和通讯作者）、工作单位、邮政编码、联系方式和Email地址。优秀论文将刊登于论文汇编中并推荐至相关脑血管病杂志发表。

3. 投稿方式　会议仅接受网络投稿，请登录官方网站www.cmaccvd.org在线注册并投稿。

4. 联系方式　北京市东城区东四西大街42号226室中华医学会学术会务部。邮编:100710。联系人:张悦（会务咨询），陈华雷（网上投稿咨询）。电话:(010)85158559、89292552转816，18600959473。传真:(010)65123754。Email:zhangyue@cma.org.cn，cmaccvd@cma.org.cn。详情请登录会议网址www.cmaccvd.org。