

超声引导下血管穿刺长短轴的选择: Meta 分析

吕炎基 余璞琳 刘 森 王桂月 李禹杭 王常松

摘要 **目的** 通过 Meta 分析比较通过长短轴途径的超声引导对血管穿刺的影响。**方法** 笔者分别检索了 Cochrane Library、Embase、Medline、Cinahl 和 Web of Science 5 个数据库,共收录 7 篇评估超声通过长短轴引导下进行血管穿刺的随机对照实验。主要的终点是第一次穿刺成功率,次要终点包括平均成功时间,平均穿刺成功次数。笔者通过随机效应模型计算了具有 95% CI 的二分结果的 95% 可信区间(CI)和相对风险(RR)的连续结果的加权平均差异(WMD)。**结果** 随机效应模型 Meta 分析结果显示,两组超声引导方式在穿刺成功率($RR = 1.064, 95\% \text{ CI}: 0.924 \sim 1.225, P = 0.387$),穿刺成功时间($MD = 1.761, 95\% \text{ CI}: -7.087 \sim 10.609, P = 0.696$),平均成功尝试次数($MD = -0.021, 95\% \text{ CI}: -0.282 \sim 0.240, P = 0.876$),差异无统计学意义。**结论** 对于行超声引导下血管穿刺的患者来说,选择长轴法或短轴法比较,差异无统计学意义。

关键词 超声 血管穿刺 长轴 短轴 荟萃分析

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Evaluating the Long - axis and Short - axis Approaches for Ultrasound - guided Vascular Access Cannulation: A Systematic Review and Meta-analysis. Lv Yanji, Yu Pulin, Liu Miao, et al. Department of Anesthesiology, The First Affiliated Hospital of Harbin Medical University, Heilongjiang 150000, China

Abstract **Objective** To conducted a Meta - analysis of randomized controlled trials to compare the effects of long - axis(LAX) and short - axis(SAX) approaches of ultrasound - guidance for vascular access cannulation. **Methods** We searched five databases with Cochrane Central Register of Controlled Trials (CENTRAL) in the Cochrane Library, Embase, Medline, Cinahl and Web of Science. Seven randomised clinical trials assessing ultrasound - guidance for vascular access cannulation by the LAX or SAX approaches was included. The primary end point was the first - pass success rate. Secondary end points included mean time to success, average number of attempts to success. We calculated the weighted mean differences (WMDs) for continuous outcomes with 95% confidence intervals (CIs) and relative risks (RRs) for dichotomous outcomes with 95% CI by random - effects model. **Results** There were no significant differences between long axis technique and short axis technique for the first - pass success rate ($RR = 1.064, 95\% \text{ CI}: 0.924 \sim 1.225, P = 0.387$), the mean time to success ($MD = 1.761, 95\% \text{ CI}: -7.087 \sim 10.609, P = 0.696$), and the mean attempts to success ($MD = -0.021, 95\% \text{ CI}: -0.282 \sim 0.240, P = 0.876$). **Conclusion** There is no sufficient evidence to definitively choose either LAX or SAX in patients undergoing ultrasound - guided vascular access cannulation.

Key words Ultrasound; Vascular access cannulation; Long - axis(LAX); Short - axis(SAX); Meta - analysis.

血管穿刺是大多数临床科室非常常见且必要的一种侵入性操作,特别是在重症监护室和手术室。血管穿刺通常包括中心静脉穿刺、外周静脉穿刺和动脉穿刺,可用于液体输注和药物治疗。更重要的是,它可以用于连续监测,如中心静脉压监测、动脉压监测、血气分析、血液分析和其他监测等^[1]。它需要一种快捷、安全、有效且并发症最少的穿刺过程。因此,穿

刺技术的选择对穿刺成功起到关键的作用^[2]。传统的体表解剖标志定位法应用最为广泛。仅对于颈内静脉穿刺,解剖定位法的第一针失败率即达到 31%,刺破动脉概率为 5%,总体并发症比例可达到 40%^[3~5]。最常见的并发症为出血、血肿、动脉穿刺和气胸,对星状神经节、膈神经和臂丛神经结构造成的损伤较少见^[6~11]。因此,最新的指南推荐超声引导血管穿刺作为穿刺常规,特别是行颈内静脉、桡动脉穿刺和外周血管穿刺时^[1]。此外,许多研究表明超声引导下血管穿刺可以提高首次穿刺成功率,缩短穿刺时间,从而减少穿刺并发症的发生^[12~16]。

超声引导方式常用的有两种,长轴引导下和短轴引导下血管穿刺。长轴法对穿刺针的显影有优势,但

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作者单位:150000 哈尔滨医科大学附属第一医院麻醉科(吕炎基、余璞琳);150040 哈尔滨医科大学附属肿瘤医院重症医学科(刘森、王桂月、李禹杭、王常松)

通讯作者:王常松,主任医师,电子信箱:changsongwang@aliyun.

com

是对解剖结构的清晰显示有限制。而短轴法则可同时显示目标血管和其周围解剖结构,但对针尖的可控性差^[17]。两种方法各有利弊,Blaivas 等^[18]采用无生命模型进行实验,发现短轴法在穿刺时间上比长轴法快。而多项研究针对成年患者分别设计了随机对照试验,来比较两种不同超声方式在首次穿刺成功率、导管插入时间和穿刺成功为止的针刺数量上的优劣^[19~25]。然而,这些研究样本量变化很大且结果不确定。因此,笔者进行了一项针对随机对照试验的荟萃分析,以比较两种不同超声方式对接受超声引导下血管穿刺的患者的影响。

资料与方法

1. 检索方法:两名笔者共检索了 Cochrane Library、Embase、Medline、Cinahl 和 Web of Science 5 个数据库。检索时间从建库至 2017 年 2 月。同时,笔者手动搜索了相关文献的参考文献,有文献资料不全或数据不详时,均主动与原文作者联系后补全。以 Cochrane Library 为例,检索式为 #1 MeSH descriptor Catheterization, Central Venous explode all trees; #2 MeSH descriptor Central Venous Pressure explode all trees; #3 central venous line * ; #4 central venous pressure; TI, AB; #5 (venous or vein *) near (cannulation or access or catheter *); #6 pulmonary art * flotation * ; #7 central line * insertion * ; #8 hickman near line * ; #9 (#1 or #2 or #3 or #4 or #5 or #6 or #7 or #8); #10 MeSH descriptor Ultrasonics explode all trees; #11 MeSH descriptor Ultrasonography explode all trees; #12 (imag * near guid *); #13 (ultrasound * or ultrasonic * or doppler); #14 (#10 or #11 or #12 or #13); #15 (#9 and #14)。

2. 文献纳入和排除标准:符合以下标准可被纳入:①发表语言为英文;②实验类型为随机对照试验;③实验对象为成人(年龄 ≥ 18 岁);④干预措施为通过长轴或短轴进行超声引导下血管穿刺;⑤实验结果包括第 1 次穿刺成功率、穿刺时间或直到穿刺成功为止的穿刺针数。若实验对象为儿童、模型或动物则直接排除。排除评论、回顾性研究、观察性研究、病例报告、实验研究等文章类型。荟萃分析可收录其符合条件的参考文献。通过筛选,共 7 篇文章被纳入分析。

3. 资料提取:两名笔者独立阅读 7 篇文章的全文并从中提取资料,遇到争议的情况时与第 3 名笔者讨论后共同判定。提取内容包括作者、发表年份、国家、

样本量、男女性别比例、平均年龄、穿刺血管类型、超声轴方向、穿刺成功率、穿刺时间和直到穿刺成功为止的穿刺针数等。

4. 统计学方法:采用 R 软件对资料进行异质性检验及合并效应量分析。若异质性检验结果 $P < 0.05$ 或 $I^2 > 50\%$,则说明各研究结果间存在异质性,采用随机效应模型计算合并 RR 值及其 95% CI;反之采用固定效应模型^[26]。通过倒漏斗图观察纳入文献潜在的发表偏倚,通过敏感度分析评价研究结果的稳定性,以 $P < 0.05$ 为差异有统计学意义。

结 果

1. 文献检索结果:初检出相关文献 6122 篇,经逐层筛选后,最终纳入 7 个 RCT^[19~25]。

2. 纳入研究的基本特征:本研究共纳入 7 个 RCT,共包括 802 例研究对象,其中 352 例行长轴法超声引导下血管穿刺,348 例行短轴法。发表时间为 2011~2016 年,研究地区覆盖亚洲、非洲、欧洲及北美洲^[19~25]。

3. Meta 分析结果:(1)成功率:共纳入 7 个 RCT,包括 802 例患者,352 例接受长轴法超声引导下血管穿刺,348 例接受短轴法^[19~25]。随机效应模型 Meta 分析结果显示,两组超声引导方式的差异无统计学意义($RR = 1.064$, 95% CI: 0.924 ~ 1.225, $P = 0.387$)。提示无论长轴短轴哪种超声引导方式在提高穿刺成功率上无差别。(2)穿刺时间:共纳入 5 个 RCT,包括 680 例患者,291 例接受长轴法超声引导下血管穿刺,287 例接受短轴法^[19~24]。随机效应模型 Meta 分析结果显示,两组超声引导方式的差异无统计学意义($MD = 1.761$, 95% CI: -7.087 ~ 10.609, $P = 0.696$)。提示无论长轴短轴哪种超声引导方式在提高穿刺时间上无差别。(3)穿刺针数:即直到穿刺成功为止的穿刺针数,共纳入 5 个 RCT^[19~21,23,24],包括 557 例患者,229 例接受长轴法超声引导下血管穿刺,226 例接受短轴法。随机效应模型 Meta 分析结果显示,两组超声引导方式的差异无统计学意义($MD = -0.021$, 95% CI: -0.282 ~ 0.240, $P = 0.876$)。提示无论长轴短轴哪种超声引导方式在减少穿刺针数上无差别。

4. 发表偏倚:漏斗图被用于评估这些研究的发表偏倚。通过漏斗图的视觉分布没有获得明显的发表偏倚。

5. 敏感度分析:稳定性无明显变化,验证了分析的合理性和可靠性。

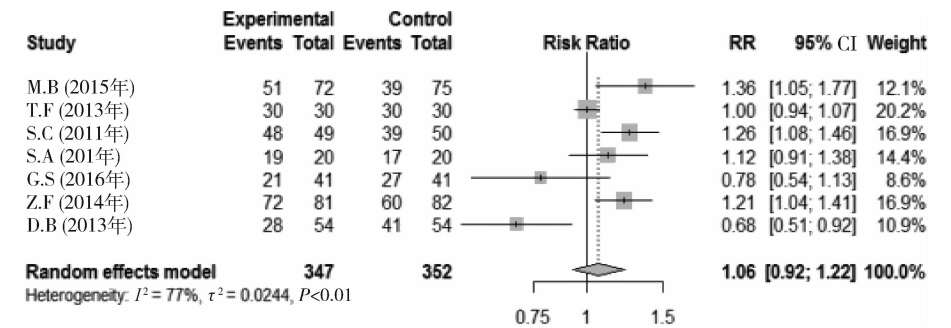


图1 森林图:超声引导下经长短轴法行血管穿刺的比较——成功率

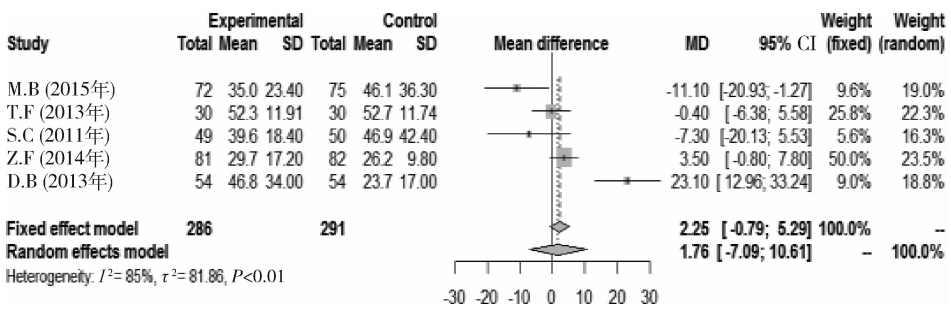


图2 森林图:超声引导下经长短轴法行血管穿刺的比较——穿刺时间

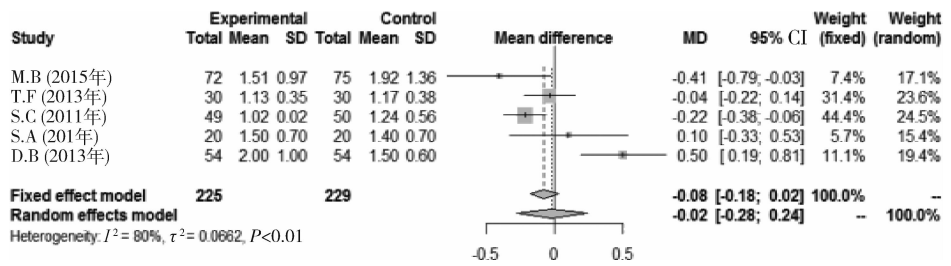


图3 森林图:超声引导下经长短轴法行血管穿刺的比较——穿刺针数

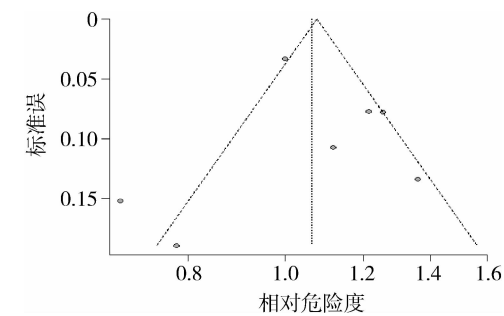


图4 纳入此研究的文章的漏斗图

讨 论

目前,许多研究已经证实超声引导下血管穿刺在各临床科室患者,特别是那些难以穿刺置管的患者中的显著作用^[27~30]。然而,两种超声引导方式,长轴法和短轴法,各有利弊。目前,针对这两种方式超声的

研究较少,也有研究进行过 Meta 分析,但是仅收录了 5 篇文章^[31]。笔者的 Meta 分析在此基础上增加两篇文章,总结了现有临床文献中关于长短轴法对超声引导下血管穿刺患者的影响的初步证据,研究结果表明,长轴和短轴组之间的穿刺成功率,穿刺成功时间,平均成功尝试次数比较差异无统计学意义。

本研究检索全面,数据包含了四个洲的实验对象,所以研究结果适用面广。但也存在一定局限性:在此方面的实验少,可供收录的文章数量较少,原始数据不足;纳入研究的基线水平差异较大,操作者水平不一,穿刺血管既有颈内静脉又有桡动脉,甚至包含外周静脉。

虽然研究结果呈阴性,但本研究仍可为未来的临床实践和研究提供一些额外的意义,由于临床患者个体差异较大,且血管类型不同穿刺难度不同,应根据

患者实际情况结合操作者实际水平选择超声引导方式;目前此类研究主要针对成人患者,对儿童患者超声引导下血管穿刺的了解很少,是今后研究需要关注的重要问题。

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