

## · 标准 · 方案 · 指南 ·

# 胎盘输血专家共识

中国医师协会新生儿科医师分会  
中国妇幼保健协会新生儿保健专业委员会  
《发育医学电子杂志》编辑委员会

## 1 概述与定义

20世纪60年代前,新生儿出生时多予以延迟脐带结扎(delayed cord clamping, DCC)。此后,由于担心产妇产后出血,生后立即结扎脐带(immediate cord clamping, ICC)迅速成为了操作标准,但ICC缺乏循证医学证据支持。近年来,围产医学各专业对DCC和脐带挤压(umbilical cord milking, UCM)<sup>[1]</sup>进行的多项研究证实,胎盘输血对新生儿有多项益处<sup>[2-5]</sup>,不增加产妇产后出血风险<sup>[6-7]</sup>。

胎盘输血易于推广,对于促进新生儿健康有较大的作用。中国医师协会新生儿科医师分会、中国妇幼保健协会新生儿保健专业委员会联合《发育医学电子杂志》编辑委员会对现有文献进行了全面客观的评价,制定了本专家共识。

本共识中定义的胎盘输血方式<sup>[8-10]</sup>:①DCC:结扎脐带的时间多在生后30~60s;②UCM:将脐带内的血液挤向新生儿,所需时间为10~20s,分为完整脐带挤压(intact-umbilical cord milking, I-UCM)和切断脐带挤压(cut-umbilical cord milking, C-UCM);③I-UCM:脐带保持完整,将约20cm脐带的内容物轻柔地向着新生儿挤压,速度10cm/s,等待2s使脐带充盈后可再次挤压,对于绝大多数新生儿,挤压3~4次是合适的<sup>[3,5,11]</sup>,但对于超早产儿(胎龄<28周),挤压4次可能增加Ⅲ~Ⅳ级颅内出血(intraventricular hemorrhage, IVH)的风险<sup>[12]</sup>;④C-UCM:新生儿侧脐带保留30~40cm,切断后将脐带提起,让脐血流向新生儿,再以10cm/s的速度将

脐带内剩余血液轻柔地挤向新生儿。

本共识已在国际实践指南注册平台注册(IPGRP-2020CN121)。专家组全面检索和评价了截至2020年11月1日的中英文文献,检索范围包括PubMed、UpToDate、Cochrane Library、中国知网、国家卫生健康委员会发布的相关规范。本共识服务于围产医学相关的医护人员,适用人群为所有新生儿,包括极早产儿(胎龄28~31<sup>+6</sup>周)和超早产儿(胎龄<28周)。

证据水平说明:①A级:多中心随机对照研究或具备足够数据的随机对照研究;②B级:有限数据的随机对照研究;③C级:尚缺乏系统的研究数据。推荐水平说明:①强推荐:推荐的获益远大于副作用;②弱推荐:推荐的获益不确定。

## 2 适应证与禁忌证

胎盘输血适用于绝大多数足月儿和早产儿<sup>[8-10]</sup>。

胎盘输血不增加产妇产后出血的风险,但紧急情况(如大量子宫出血等)下需要行ICC,避免延误对产妇的救治。不适宜胎盘输血的情况还包括所有无活力、需要立即复苏的新生儿。

以下情况缺乏足够的循证证据,但以产妇和新生儿健康为出发点,专家组仍然建议以下情况行ICC:①缺氧缺血性事件继发的出生窒息:前置胎盘、胎盘早剥、脐带脱垂、子宫破裂、肩难产、血管前置破裂、产妇虚脱、羊水栓塞、产妇心脏骤停等;②单绒毛膜双胎妊娠以及胎胎输血综合征;③人免疫缺陷病毒(human immunodeficiency virus, HIV)阳性产妇所分娩的新生儿;④胎儿水肿伴胎儿心功能不全;⑤胎盘和脐带完

整性可能受到破坏;⑥全身麻醉下行剖宫产。

### 3 胎盘输血的益处

胎盘输血可以补充血容量<sup>[13]</sup>,也能减少血流动力学的短期波动。生后随着自主呼吸建立和肺循环开放,右心房的血液主要进入肺循环,进入体循环的血液显著减少,胎盘输血使得部分血液继续通过卵圆孔进入体循环,有效改善了体循环血流动力学的稳定性,也减少了与血流动力学改变相关的并发症<sup>[14-18]</sup>,DCC有利于胎儿向新生儿期过渡。Meta分析证实DCC可以减少1 min低Apgar评分的发生率<sup>[19]</sup>。

胎盘输血体现了多种益处。①可以补充血容量,提升血红蛋白水平,减少新生儿期输血治疗,减少婴儿期铁缺乏<sup>[19-22]</sup>。②胎盘输血与多种并发症减少有关,如IVH、晚发败血症(late onset sepsis, LOS)、坏死性小肠结肠炎(necrotizing enterocolitis, NEC)等,在各研究中住院期间死亡率均有不同程度的降低<sup>[11,23-27]</sup>。

世界卫生组织<sup>[10]</sup>提出,在结扎脐带前进行刺激,绝大多数足月儿和早产儿能够在生后1 min内建立自主呼吸<sup>[28-30]</sup>。但胎盘输血的研究多未将“需要复苏的新生儿”纳入<sup>[23,31-34]</sup>。相比建立了自主呼吸的早产儿,DCC期间未能建立自主呼吸者更可能进行气管插管,发生慢性肺疾病(chronic lung disease, CLD)和严重IVH风险显著增高<sup>[32]</sup>。

已有研究证实,即使需要复苏,在正压通气时予以DCC也是可行的<sup>[24,30]</sup>。但正压通气时予以DCC对生后早期指标和结局无改善<sup>[30]</sup>。复苏团队应持续评估,必要时考虑提前终止DCC。UCM对复苏的影响小于DCC<sup>[35-36]</sup>,有利于呼吸循环系统的过渡和稳定<sup>[7,14]</sup>。

长期随访证实,胎盘输血对婴儿和儿童期神经系统发育有多项益处,在认知、语言、精细运动、社交等方面均有正面意义<sup>[38-43]</sup>。但还缺乏对机制的探索,以及高质量循证医学证据的支持。

推荐:①无胎盘输血禁忌证的新生儿,出生时均应接受胎盘输血,而不应ICC,DCC是胎盘输血的首选方式(A级,强推荐)。②胎盘输血期间,有复苏经验的新生儿科医师应在产妇床旁进行评估,未能及时建立自主呼吸的新生儿,应积极建立自主呼吸,效果不佳者应ICC(A级,强推荐)。③复苏团队中应有专人从出生开始进行计时和通报所耗时间(C级,强推荐)。

### 4 足月儿的胎盘输血

多项研究证实,DCC能提升生后早期血红蛋白和红细胞比容水平<sup>[44-46]</sup>,也能提升婴儿期的铁储备<sup>[21,47]</sup>。

足月顺产的新生儿,DCC期间新生儿置于产妇产腹部或会阴水平不影响DCC的效果<sup>[48-49]</sup>。也有研究证实新生儿位于较低的位置(相对于会阴)更有利于DCC<sup>[50]</sup>。新生儿的位置还应结合是否有利于新生儿保暖和母婴接触,是否影响新生儿安全进行综合考虑。

剖宫产对新生儿-胎盘的血容量分布有影响,剖宫产时胎盘保留了更多的血容量,而新生儿的红细胞比容更低,红细胞数量更少<sup>[51-53]</sup>,产妇自身血压偏低、子宫收缩乏力、脐动脉收缩不良可能是影响胎盘输血效果的原因。虽然剖宫产可能是影响DCC效果的因素,但目前仅有意大利胎盘输血指南<sup>[54]</sup>对两种分娩方式的足月儿分别做了推荐。分娩方式对胎盘输血的影响还需要开展更多的研究。

与ICC相比,DCC对产妇健康无负面影响<sup>[21,44,55]</sup>。DCC对新生儿可能的副作用包括导致红细胞增多症或高胆红素血症。多项研究表明,DCC不会导致光疗需求显著增加<sup>[46,56-57]</sup>。即使部分研究显示DCC与红细胞增多症的发生相关<sup>[21]</sup>,但并不影响新生儿的预后。

UCM用于足月儿时,多采用C-UCM技术<sup>[58-64]</sup>。与ICC相比,UCM可以补充血容量,提升婴儿铁储备,改善生后早期的血流动力学稳定性<sup>[58,60-61]</sup>。与DCC相比,UCM具有类似的益处,并且不引起新生儿和产妇的并发症<sup>[65]</sup>。有Meta分析提示接受UCM处理的新生儿,6周龄时血红蛋白水平高于接受DCC的新生儿<sup>[66]</sup>。

两种UCM方法进行比较的研究较少,一项非随机对照研究纳入了60例足月儿,与C-UCM相比,I-UCM能提供更多血容量<sup>[3]</sup>。另一项研究将足月儿随机分配至C-UCM、DCC、DCC+C-UCM组,DCC+C-UCM对生后6周血清铁水平的提升最显著,其次为DCC<sup>[59]</sup>。

推荐:①足月儿生后结扎脐带的时间应延迟至少30~60 s,未能及时建立自主呼吸者应ICC(A级,强推荐)。②理想的结扎时间尚未确定,3 min DCC可能改善3~6月龄时的铁储备,若法定监护人要求,可

以延长 DCC 的时间,如直到脐带搏动停止时(B级,弱推荐)。<sup>③</sup> DCC 期间,新生儿放置在产妇的腹部或胸部有利于行母婴接触,也有利于保持新生儿的体温;将新生儿置于会阴水平可能更有利于胎盘输血,但同时应注意保暖;不建议将新生儿放置在低于产床/手术台的位置(B级,强推荐)。<sup>④</sup> 如果不适合实施 DCC, UCM 作为替代选项可以提升血红蛋白水平和铁储备, I-UCM 和 C-UCM 都可行(B级,弱推荐)。

## 5 中晚期早产儿的胎盘输血

中晚期早产儿包括胎龄 32 ~ 36<sup>+6</sup> 周的新生儿。与 ICC 相比, DCC 能提升新生儿期甚至婴儿期的血红蛋白水平<sup>[67-69]</sup>,但剖宫产新生儿提升水平低于顺产新生儿<sup>[67]</sup>。DCC 也能减少婴儿期缺铁性贫血的发生率<sup>[47]</sup>,且接受 DCC 处理的早产儿呼吸窘迫综合征(respiratory distress syndrome, RDS)发病率更低,呼吸支持治疗的需求也更少,提示 DCC 不仅有利于补充血容量,也有利于生后早期呼吸循环系统的稳定性,降低住院期间死亡率<sup>[19,58,69-72]</sup>。

与 ICC 相比, UCM 可以改善生后早期的血红蛋白水平和血清铁蛋白浓度<sup>[73]</sup>。在一项 Meta 分析中,与 DCC 相比, I-UCM 组 1 min Apgar 评分较高,其他指标和结局无显著差异<sup>[74]</sup>。也有随访发现, UCM 组在 2 岁时的 Bayley 评分优于 DCC 组<sup>[75]</sup>。

推荐:①中晚期早产儿生后结扎脐带的时间应延迟至少 30 ~ 60 s,未能及时建立自主呼吸者应 ICC (C级,强推荐)。②理想的结扎时间尚未确定,3 min DCC 可能改善婴儿期铁储备(B级,弱推荐)。③当 DCC 不可行时, UCM 是补充血容量和提高铁储备的有效方法, I-UCM 和 C-UCM 都可行(B级,弱推荐)。

## 6 极早产儿的胎盘输血

极早产儿包括胎龄 28 ~ 31<sup>+6</sup> 周的新生儿,本节包括超早产儿。

与 ICC 相比, DCC 不仅能提升血红蛋白水平和减少输血治疗<sup>[19,28]</sup>,而且能改善生后早期血流动力学稳定性<sup>[28]</sup>和脑组织氧饱和度<sup>[76]</sup>,减少 III ~ IV 级 IVH 和脑白质损伤的发生率,减少 II ~ III 级 NEC 的发生,降低住院期间死亡率<sup>[19,77]</sup>。DCC 可能增加红细胞增多症和高胆红素血症的发生率,但不增加换血治疗的需求<sup>[19]</sup>。

澳大利亚的多中心研究纳入了 1 566 例胎龄 <

30 周的早产儿,并随机分配至 DCC 和 ICC 组,研究发现至少 60 s 的 DCC 在 III ~ IV 级 IVH、住院期间死亡率、严重脑损伤、LOS、早产儿视网膜病、NEC、CLD 方面,两组比较差异无统计学意义<sup>[34]</sup>。由于 DCC 期间部分早产儿需要正压通气复苏, DCC 组胎盘输血失败率较高(DCC 组约 1/4 的早产儿提前终止 DCC,予以 ICC)。

一些研究认为,结扎脐带的时机应当基于生理和临床情况进行个性化调整,而不是提前设定好结扎时间<sup>[78]</sup>。绝大多数极早产儿经初步复苏可以建立自主呼吸,在生后 1 min 内可以等待和评估,同时予以 DCC。对于无自主呼吸的新生儿,在 30 ~ 60 s 的 DCC 期间予以轻柔刺激可能有利于胎儿向新生儿过渡<sup>[28,30]</sup>。

与 ICC 相比, UCM 能降低极早产儿输血治疗的需求,以及 IVH、CLD 的风险<sup>[11]</sup>。与 DCC 相比, UCM 对极早产儿的重要并发症或住院期间死亡率无显著影响<sup>[2,33]</sup>。

2019 年发表的多中心随机对照研究纳入了胎龄 <32 周的早产儿,对比 I-UCM (20 cm,挤压 4 次)和 DCC (至少 60 s)的处理对于 IVH 等结局的影响,中期分析后研究提前终止,分析发现 UCM 与更高的严重 IVH 风险相关;亚组分析证实,胎龄 <27 周或顺产者接受 UCM 显著增加了严重 IVH 的发生率<sup>[12]</sup>。在该研究中,挤压脐带的操作重复 4 次,目前尚无证据证实在超早产儿(胎龄 <28 周)群体中进行 4 次 UCM 是否存在输血过快或过多的风险。

也有研究探索了 C-UCM 用于极早产儿,极早产儿 30 cm 的残余脐带能提供(17.7±5.5) ml/kg (8.9 ~ 29.0 ml/kg) 的血量<sup>[79]</sup>。与 I-UCM 相比,接受 C-UCM 处理的早产儿(胎龄 <29 周)在输血治疗需求方面无显著区别,且均未发生严重 IVH<sup>[80]</sup>。现有证据还不足以说明对于极早产儿, C-UCM 是安全而有效的选择,还需要更多的研究予以证实。

长期随访显示,与 ICC 相比, DCC 有助于促进 18 ~ 22 月龄婴儿的运动能力发育<sup>[81]</sup>,但结论尚不统一<sup>[82]</sup>。部分研究认为 DCC 或 UCM 处理没有显著差异<sup>[83]</sup>,但一些研究发现接受 UCM 处理的极早产儿比 DCC 有更好的语言和认知评分。

推荐:①极早产儿推荐予以 DCC 至少 30 s,未建立自主呼吸者可予以刺激,根据情况予以正压通气及



气管插管(B级,弱推荐)。②出生30s时评估自主呼吸和心率。若心率>100次/min且自主呼吸好,或者可见自主呼吸的动作,则推荐DCC达到60s;若心率<100次/min并伴有呼吸暂停或喘息样呼吸,应停止胎盘输血并予以ICC,进行新生儿复苏(B级,弱推荐)。③I-UCM技术不推荐用于超早产儿,C-UCM技术尚需更多研究,了解其安全性和有效性(B级,弱推荐)。

执笔人:悦光,赵奇思,孟佳,高淑强

本共识编写专家委员会(排名不分先后):电子科技大学医学院附属妇女儿童医院·成都市妇女儿童中心医院(杨霄,巨容,胡旭红,高淑强,魏素梅,悦光,赵奇思,孟佳),解放军总医院儿科医学部/解放军总医院第七医学中心八一儿童医院(封志纯,李秋平),广东省妇幼保健院(杨杰,叶秀楨,许芳),广州市妇女儿童医疗中心(张华岩),首都医科大学附属北京儿童医院(黑明燕,李耿),中国疾病预防控制中心妇幼保健中心(徐韬),重庆医科大学附属儿童医院(史源,包蕾),新疆医科大学第一附属医院(李明霞,朱艳萍),哈尔滨医科大学第一附属医院(王竹颖,姜春明),柳州市妇幼保健院(陈继昌,韦义军),南京医科大学附属妇产医院·南京市妇幼保健院(韩树萍,钱苗),南方医科大学附属深圳市妇幼保健院(杨传忠),四川锦欣妇女儿童医院(贺铮,杨萍萍),青岛妇女儿童医院(刘秀香),绵阳市妇幼保健院(李花),解放军总医院第五医学中心(张雪峰),天津市中心妇产科医院(郑军,田秀英),湖南省妇幼保健院(曹蓓,彭湘莲,房巧燕),成都医学院第一附属医院(鲁利群),浙江大学医学院附属妇产科医院(吴明远),泉州市儿童医院(陈冬梅),南充市中心医院(何刚),甘肃省妇幼保健院(石静云),广西壮族自治区妇幼保健院(高晓燕,韦秋芬),贵阳市妇幼保健院(刘玲),宜宾市第二人民医院(蔡强),济南市妇幼保健院(范秀芳),西北妇女儿童医院(李占魁),西昌市人民医院(黄仕琼,罗吉平),西南医科大学附属医院(董文斌,雷小平),陆军特色医学中心大坪医院(胡章雪),河北省儿童医院(马莉),山西省儿童医院(冀湧),自贡市妇幼保健院(邓刚),上海市第一妇婴保健院(刘江勤),吉林省妇幼保健院(王静竹),河南省妇幼保健院(徐发林),海南省妇幼保健院(羊玲)

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(收稿日期: 2021-03-08)

(本文编辑: 李醒)