

·临床研究与实践·

新生儿膈疝术后 ECMO 支持下治疗腹腔间隔室综合征



全文二维码

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【摘要】 目的 总结新生儿体外膜肺氧合(extracorporeal membrane oxygenation, ECMO)支持下行膈疝修补术后腹腔间隔室综合征(abdominal compartment syndrome, ACS)的处理经验。**方法** 回顾性分析广州市妇女儿童医疗中心1例ECMO支持下行经腹膈疝修补术、术后发生ACS经使用切口保护器行开腹减压术成功救治的患儿临床资料。以“congenital diaphragmatic hernia”、“extracorporeal membrane oxygenation”和“abdominal compartment syndrome”为检索词检索Pubmed、Web of science数据库相关文献;以“先天性膈疝”、“体外膜肺氧合”和“腹腔间隔室综合征”为检索词检索万方医学网、中华医学期刊网及中国知网相关文献;剔除重复病例后进行文献复习,总结新生儿于ECMO下行膈疝修补术后ACS的诊治方法。**结果** 本例患儿于孕中期产检发现胎儿左侧膈疝,产前评估为重度肺发育不良。于39⁺6周剖宫产娩出,生后收入新生儿外科监护室。因呼吸不能维持,于生后第19小时行ECMO支持,生后第2天在ECMO支持下行经腹膈疝修补术。术后第4天出现ACS经保守治疗无效后于监护室床旁行开腹减压术,术中应用切口保护器保持腹腔开放取得良好效果。开腹减压术后第3天撤离ECMO,第5天关腹,生后第38天痊愈出院,随访至术后4个月无膈疝复发。共检索到相关文献16篇(共报道53例ACS患者),均为英文文献,其中4篇报道了CDH术后合并ACS共6例,其中4例行开腹减压术治疗;另外12篇报道了ECMO术后发生ACS共47例,其中37例行开腹减压术治疗。**结论** 开腹减压术是新生儿于ECMO支持下行膈疝修补术、术后发生ACS的有效外科治疗手段,切口保护器应用于新生儿开腹减压术效果良好,值得推广。

【关键词】 先天性膈疝; 体外膜肺氧合; 外科手术; 儿童

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Treatment of abdominal compartment syndrome with extracorporeal membrane oxygenation support during neonatal diaphragmatic hernia surgery: one case report with a literature review

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【Abstract】 Objective To summarize the experiences of diagnosing and treating abdominal compartment syndrome (ACS) after patch repairing of neonatal congenital diaphragmatic hernia (CDH) under extracorporeal membrane oxygenation (ECMO). **Methods** Retrospective reviews were conducted for the clinical data of ACS neonates due to CDH undergoing patch repairing under ECMO. Management and surgical procedure of ACS were systematically summarized. The databases of PubMed, Web of Science, Wanfang, China Academic Journals (CAJ) and China National Knowledge Infrastructure (CNKI) were searched with such keywords as “congenital diaphragmatic hernia”, “extracorporeal membrane oxygenation” and “abdominal compartment syndrome”. Duplicate literatures were excluded and managements of ACS after patch repairing of neonatal CDH under ECMO summarized. **Results** One fetus with left-side CDH ultrasonically detected in second trimester was diagnosed as severe pulmonary hypoplasia. He was transferred immediately into our unit after a delivery by cesarean sec-

tion at 39 + 6 weeks. ECMO support was provided after 19-hour mechanical ventilation and laparotomy patch repair of CDH was performed at 2 days post-birth. ACS was detected and treated with decompressive laparotomy (DL) at 4 days after repairing CDH. And a wound protector was utilized for keeping abdominal open during DL. ECMO was withdrawn at Day 3 and abdominal closure occurred at Day 5 post-DL. He was discharged at Day 38 post-birth. No recurrence occurred during a follow-up period of 4 months. A total of 16 English literature reports were reviewed. Four reports described 6 cases of CDH with postoperative ACS and 4 of them underwent DL. While another 12 reports examined 47 cases ACS under ECMO support and 37 of them underwent DL.

Conclusions DL is effective for ACS during patch repair of neonatal CDH under ECMO. And wound protector is recommended for DL in neonates.

【Key words】 Congenital Diaphragmatic Hernia; Extracorporeal Membrane Oxygenation; Surgical Procedures, Operative; Child

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腹腔间隔室综合征(abdominal compartment syndrome, ACS)是膈疝手术后少见的并发症,文献报道其发生率低于1%,且以右侧膈疝多见^[1]。但是近年来随着 ECMO 技术的开展,越来越多的中、重度膈疝患儿在 ECMO 支持下进行膈疝修补术,术后出血、肠管水肿等因素增加了 ACS 的发生风险。本文回顾性分析广州市妇女儿童医疗中心 1 例于 ECMO 支持下经腹膈肌修补术、术后发生 ACS 经使用切口保护器行开腹减压术获成功救治的患儿临床资料经验,旨在探讨新生儿膈疝修补术后 ACS 的早期识别与处理方法。

病例资料

一、本例患儿临床资料

患儿于孕中期(孕 19 周)发现左侧膈疝,后转入本院胎儿医学中心进行程序化管理,产前综合评估为重度肺发育不良。孕 39⁺₆周因“胎心减慢”于本院剖宫产娩出,男性,出生体重 2 900 g,生后产房内即予气管插管,接呼吸机转运至新生儿外科监护室。本研究经广州市妇女儿童医疗中心伦理委员会审批通过(穗妇儿科伦通字[2020]第 06000 号),患儿家属知情同意。

入室后予监测导管前、后血氧饱和度,建立脐静脉置管及外周静脉通路,有创动脉血压监测,胸腹平片提示左侧膈疝,B 超提示疝入物为脾脏、胃泡、部分肝与部分肠道,心脏彩超提示动脉导管未闭(右向左分流)、肺动脉高压。高频振荡通气(high-frequency oscillatory ventilation, HFOV)(吸氧浓度 100%)辅助下导管后氧饱和度 50%~70%,氧

合指数 > 40 持续超过 4 h,符合 ECMO 应用指征。于出生后第 19 小时行 ECMO 支持。第 2 天患儿呼吸、循环稳定,符合我科制定的 ECMO 支持下膈疝修补手术时机,于 ECMO 支持下经腹膈肌补片修补术^[2]。手术采用左侧肋缘下切口长约 8 cm,术中见膈肌巨大缺损约 6.0 cm × 5.0 cm × 4.5 cm,予牛心包补片修补。关腹前腹部张力不高、术中未测膀胱压,术中同时留置胸、腹腔引流管各 1 条。术后前 3 天腹腔每日引流量 10 ~ 30 mL,胸腔每日引流量 100 ~ 150 mL,术后第 4 天胸腔引流量明显增加,达 230 mL。腹胀逐渐加重,ECMO 流量反复下降,输注大量红细胞悬液后不能维持 ECMO 平稳运行,伴管道内多发血栓形成,考虑管道急性弥漫性血管内凝血(disseminated intravascular coagulation, DIC),予更换管道。更换膜肺及管道后 ECMO 流量及血压逐渐稳定,但 5 h 后再次出现 ECMO 流量反复下降,床旁 B 超提示胸腹腔大量积液,伴引流不畅。患儿腹胀愈发明显,伴双下肢淤血、无尿,测膀胱压 33 mmHg(1 mmHg = 0.133 kPa),结合床旁心脏彩超排除管道位置异常、心脏填塞等因素后,诊断为腹腔间隔室综合征。经充分镇静、镇痛、肌松等对症处理膀胱压未下降,遂紧急行床旁开腹减压术。患儿取仰卧位,经脐旁左侧取长约 5 cm 横切口进入腹腔,见腹腔内大量血凝块,吸尽腹腔积血后见补片与膈肌残端缝合处有渗血,但无法有效止血,以温生理盐水冲洗腹腔后经切口放置 50 mm 切口保护器,腹腔外露部分约 5 cm,顶端用丝线结扎后以无菌纱布及棉垫覆盖、保护切口,将腹腔暂时开放并留置腹腔引流管 1 条。术后患儿 ECMO 流量恢复稳定,腹胀缓解,腹壁及下肢淤血消

失,小便恢复至 $2 \text{ mL} \cdot \text{kg}^{-1} \cdot \text{h}^{-1}$ 以上,但腹部切口每日渗血量达 $800 \sim 1\,500 \text{ mL}$,于开腹减压术后第 3 天撤离 ECMO 后出血逐渐停止,于术后第 5 天再次手术关闭腹腔;生后第 38 天时痊愈出院;术后 4 个月随访患儿生长发育良好,复查胸腹平片未见膈疝复发。

二、文献检索情况

截止日期 2021 年 12 月,以“先天性膈疝+腹腔间隔室综合征”、“体外膜肺氧合+腹腔间隔室综合征”为检索词检索万方医学网、中华医学期刊数据库及中国知网数据库,未检索到中文相关文献。以“congenital diaphragmatic hernia + abdominal compartment syndrome”为检索词检索到 4 篇英文文献,共报道了 6 例膈疝手术后腹腔间隔室综合征,其中 4 例行开腹减压术,术后应用真空装置闭合皮肤 3 例(表 1)。以“abdominal compartment syndrome + extracorporeal membrane oxygenation”检索到文献 12 篇,报道 ECMO 合并 ACS 共 47 例,均为儿童或成人病例。其中 37 例行开腹减压术(表 2),6 例行腹腔引流,1 例行结肠镜辅助水灌肠,5 例行保守治疗。

讨 论

世界腹腔间隔室综合征联合会(world society of the abdominal compartment syndrome, WSACS)对于成人 ACS 有明确的定义,即腹内压持续大于 20 mmHg (1 mmHg = 0.133 kPa) 并有新发腹腔脏器功能不全或衰竭,但对于新生儿 ACS 的诊断尚无统一标准^[15]。有文献报道新生儿在膀胱压低于 20 mmHg 时即有可能发生 ACS,因此新生儿诊断 ACS 不应过分强调膀胱压,更应注重临床症状^[16]。在 ECMO 运行下发生 ACS 的临床表现,除了持续腹胀、少尿、低血压和下肢淤血以外,更早期的表现往往是 ECMO 运行时频繁出现流量下降。本例患儿最初亦表现为 ECMO 流量反复下降,胸腔引流增加、提示出血,经积极处理后腹胀仍进行性加重,伴无尿、双下肢严重淤血。

ECMO 支持下 ACS 的发生机制通常包括腹腔渗漏综合征、大量腹水、肠管水肿、腹腔出血等。在临床诊断 ACS 后可先通过充分镇静、肌松、胃肠减压、留置肛管等方法缓解腹腔压力。进一步明确诱因后可针对性采用抗感染、利尿、限制液体入量、维持胶体渗透压、改善凝血功能等方法进行保守治疗。若保守治疗无效,则可行床旁超声明确有无大量腹水及肠管扩张积液。若 B 超提示腹水,则可行床旁腹腔穿刺、置管持续引流。根据文献报道,采用放置腹腔引流管对腹腔渗漏、大量腹水所致的 ACS 可能有效,但对于腹腔出血的患儿则可能因为引流不畅而影响效果^[12,16]。对于肠管扩张积液的患儿,亦有文献报道可采用经肠镜、直视下结肠灌洗的方法进行腹腔减压^[17]。

表 1 CDH 术后合并 ACS 文献汇总

Table 1 Review of the literatures of ACS After patch repair of CDH

作者	例数	年龄	侧别	手术方式	补片	ACS 诊断依据	处理	死亡
Fenton 等 ^[3]	3	39 d	-	-	-	-	开腹后真空装置闭合皮肤	-
Dalencourt 等 ^[4]	1	16 岁	左	经腹,开放	是	膀胱压	内科治疗	否
Panagiotis 等 ^[5]	1	19 岁	左	经胸,开放	否	临床症状	开腹减压术	否
Suzuki 等 ^[6]	1	63 岁	左	经腹,开放	是	膀胱压	内科治疗	否

注 CDH:先天性膈疝; ACS:腹腔间隔室综合征; -:未报道

表 2 ECMO 运行下 ACS 行开腹减压术文献汇总

Table 2 Review the literatures of DL for ACS due to ECMO

作者	例数	年龄(岁)	切口	腹腔开放方式	死亡(例)
Brown 等 ^[7]	6	1~6	-	-	2
Glowka 等 ^[8]	11	25~80	正中	无菌袋+无菌敷料	8
Boulos 等 ^[9]	9	23~63	-	真空装置或无菌敷料	4
Rollins 等 ^[10]	7	2~17	正中	无菌敷料	7
Weiss 等 ^[11]	1	61	-	真空装置	0
Lam 等 ^[12]	1	13	-	筋膜补片	1
Augustin 等 ^[13]	1	72	-	-	1
Nishi 等 ^[14]	1	77	正中	无菌袋	0

注 ECMO:体外膜肺氧合; ACS:腹腔间隔室综合征; -:未报道

对于以上方法无效的患儿,开腹减压术是最佳选择。开腹减压术减压效果确切,但最大的缺点在于创伤大,对于 ECMO 支持下的患者进行开腹减压术最大的风险在于不可控制的出血。对于开腹减压的方式,文献报道主要有采用真空装置包扎切口、缝合皮肤但保持筋膜层开放、缝合皮肤+筋膜补片、置入 Silo 袋等方式^[3]。值得一提的是,对于术后出血要有充分的准备,部分患者可能因为术后出血无法停止且短期内又不能撤离 ECMO 而死亡,这是区别于非 ECMO 运行下进行开腹减压术的特别之处。

综上所述,新生儿膈疝手术后 ECMO 支持下反复出现流量下降伴有进行性腹胀的患儿应该高度警惕 ACS,及时进行膀胱压监测以利于早期诊断。开腹减压术是 ACS 最有效的外科治疗手段,切口保护器应用于新生儿开腹减压术效果良好。

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