

新生儿坏死性小肠结肠炎后肠狭窄的影像学评估的应用进展

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摘要

近年来, 随着医学技术的进步, 越来越多的早产儿和低体重出生儿存活下来, 新生儿坏死性小肠结肠炎 (Necrotizing enterocolitis, NEC) 发生率逐年增加, 肠道狭窄是NEC后常见并发症, 也是婴幼儿时期常见的继发性肠狭窄。本文就影像学检查对肠道狭窄的研究进展做一综述。

关键词

新生儿坏死性小肠结肠炎, 肠道狭窄, 影像学检查

Application Progress on Imaging Evaluation of Intestinal Stricture after Necrotizing Enterocolitis in Neonates

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Abstract

In recent years, advances in medical technology have led to the survival of more and more premature and low birth weight infants, and the incidence of neonatal Necrotizing enterocolitis (NEC) has been increasing year by year. Intestinal strictures are a common complication after NEC and a

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common secondary intestinal stricture in infancy. This article reviews the research progress of intestinal stricture by imaging examination.

Keywords

Necrotizing Enterocolitis, Intestinal Stricture, Imaging Examination

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1. 引言

坏死性小肠结肠炎(Necrotizing enterocolitis, NEC)是由缺氧、感染等多种原因引起的肠道黏膜损害,肠狭窄是 NEC 后常见的并发症之一。近年来,随着对该病的深入认识和研究,以及围产期新生儿诊疗技术的发展,医疗水平大幅提高,大多数患儿包括早产儿及低出生体重儿,经过急性期积极治疗后病情逐步稳定,但 NEC 患儿继发的肠狭窄发生率逐年上升[1] [2],发病率可达到 11.0%~35.0% [3]。1976 年文献第一次报告了 43 例存活的 NEC 患儿中就有 8 例(18.6%)出现了肠狭窄[4]。肠狭窄可继发于经药物治疗或手术治疗后的 NEC 患者[5] [6] [7],其发生率与选择的手术方式无关[8] [9] [10]。文献报道,中国患儿 NEC 后肠狭窄的发生率较高,经内科治疗后的发生率可达到 37.3%,外科术后肠狭窄的发生率甚至可达到 65.2% [11]。仅次于法国学者报道的 NEC 后肠狭窄发病率,他们的患儿手术治疗后肠道狭窄发生率可高达 91%,药物治疗后也可达到 47% [12]。NEC 急性期缓解后的前三个月是肠狭窄发生的关键时期,80% 的 NEC 后肠狭窄多发生在结肠,其中脾屈曲最常受累[13],手术治疗的 NEC 患儿肠狭窄多发于升结肠,保守治疗的 NEC 后狭窄主要位于横结肠和降结肠[14]。NEC 后肠狭窄早期临床症状主要为反复腹胀、呕吐等肠梗阻表现,缺乏特异性,延误诊断易导致生长发育迟缓甚至穿孔、败血症和死亡等威胁生命的不良后果[15],因此,早期诊断 NEC 后肠狭窄至关重要,影像学检查可以提供更直观的证据辅助临床医生诊断。本文就 NEC 后肠狭窄的影像学研究进展进行综述如下。

2. 腹部 X 线检查

立卧位腹平片是检查 NEC 后肠狭窄最简单经济的方法,有一定的参考价值,NEC 后肠狭窄多表现为不全性肠梗阻表现,在平片上可表现为某一肠袢的固定扩张或低位肠梗阻表现即梗阻近端肠管扩张明显、远端表现为无肠道气体显示的密实影或只有少量肠道气体显示;狭窄若位于小肠可表现为阶梯样气液平面,此外,还可观察到肠僵直等肠道活动受限的表现[1] [16] [17]。但多篇文献报告[18] [19],腹部 X 线对低位肠梗阻的诊出率低于超声及螺旋 CT,且腹部 X 线检查时由于腹部器官解剖结构较复杂,受组织重叠的影响显影度也较低;进行 X 线检查时需患儿体位配合,较难操作,并对患儿有辐射风险。

3. 胃肠 X 线造影

相较于腹部 X 线,消化道造影可以更直观的观察肠管狭窄部位[20]。传统观点认为消化道造影是 NEC 后肠狭窄的首选检查方法[21],但造影剂无法顺利通过狭窄段,只能通过上消化道造影显示狭窄肠段近端或钡剂灌肠显示最远端的扩张肠段,而狭窄肠段内部情况无法显示。Emily 等[22]的研究发现,钡剂灌肠检出任何部位肠道狭窄的敏感性及其特异性均较高(敏感性为 66.7%,特异性为 95.1%),对结肠狭窄的敏感

性甚至可达到 76.2%，上消化道造影对小肠狭窄的特异性及敏感性也明显低于钡剂灌肠。Katherine 等[23]的研究也发现钡剂灌肠对肠狭窄的特异性(88%)及敏感性(93%)均优于远端环图(敏感性为 50%，特异性为 96%)。但钡剂灌肠的使用也增加了患儿的辐射暴露，同时可能导致吸入性肺炎、肠梗阻等严重并发症的风险，实际工作中消化道造影也给急性炎症中的肠道带来了穿孔的风险[22]。同时，NEC 后肠狭窄的形成主要是肠道炎症反应及血管内血栓形成导致的肠壁缺血性的损伤修复过程[12]，随着肠道炎症的好转，早期由于肠道炎症水肿形成的肠道狭窄可能会自发的缓解，不需手术干预[5] [24]。因此，需要多次通过钡剂灌肠观察狭窄肠段的动态变化，这也增加了患儿的辐射暴露和并发症的风险[25] [26]。

4. 磁共振成像

目前国内外尚未见到磁共振成像(MRI)对 NEC 后肠狭窄评估的报道，其对肠道狭窄的研究主要集中在炎症性肠病的患儿。目前认为，炎症性肠病并发的肠道狭窄早期是因炎症导致肠壁水肿，晚期以纤维性狭窄为主[27]。在 MRI 上，炎症性狭窄的 T2 图像上信号增强，因炎症肠段的肠系膜血管扩张增强可见梳状征；慢性狭窄在 T1 和 T2 图像上均表现为低信号或显示轻度增强[28]。小肠磁共振造影(MRE)作为一种非侵入性诊断工具，可提供更多肠腔内外的信息[29] [30]，可以区分开炎症性狭窄和纤维性狭窄[31]。在 MRE 上，炎症性狭窄表现为溃疡、水肿、梳状征象、肠壁增厚，且在动态测量早期阶段就可观察到增强的造影剂峰值；纤维化伴轻微炎症或不伴炎症反应的患儿，肠壁深层的造影增强在肠腔内或静脉阶段显示较差(50~70 秒)，这是由于此狭窄肠段血管数量少，静脉造影剂扩散较差导致的[32]。尽管如此，纤维狭窄肠段和非病变肠段在 MRE 动态研究的后期(5~7 分钟)仍表现出相似的增强水平[31] [33] [34]。

因为 MRE 捕捉的是静态图像，很难区分开是肠蠕动过程中短暂收缩的肠段还是狭窄肠段，随着肠功能成像的多相电影序列越来越多被用来评估肠运动能力，其中，稳态自由进动(SSFP)技术最常用于肠造影中[35]。SSFP 具有良好的肠腔和肠壁对比分辨率，可以实时动态成像定量评估肠道运动[36] [37]，且无辐射、操作者对结果解释无争议[38]。SSFP 还发现炎症性肠病导致的肠狭窄通常会引起肠道功能改变，炎症性肠狭窄引起肠蠕动减少，而形成纤维性肠狭窄的肠道通常保持固定[39] [40]。它可以作为磁共振成像的一种补充，无创且有选择性的检查狭窄肠段，且避免了其他有创影像学检查引起的并发症，如胶囊内镜引起胶囊滞留而导致的肠穿孔或梗阻的发生等[41] [42]。

5. 超声

近年来，随着新生儿胃肠超声迅速发展，已能检测出门静脉积气及肠壁增厚等 NEC 早期超声表现，但国内外对 NEC 后肠狭窄的诊断研究仍少见。国内学者报道了 NEC 后肠狭窄超声表现为肠壁增厚、回声减低、血流信号丰富等炎症性表现；狭窄段管腔明显细小且形态僵硬，近端肠管扩张，远端空虚；多处狭窄的肠段可表现为哑铃状即近端扩张，狭窄段形成瓶颈，远端即下一处狭窄的近端扩张；多普勒超声发现肠系膜上静脉(SMA)舒张末期血流速度较正常组新生儿低，血流阻力指数(RI)高于正常组[20]。

新生儿体型较小，MRI 表现出较低的信噪比；新生儿行 MRI 检查配合度较低需要使用镇静剂，这也会给患儿带来一定风险及不良反应；有严重肾损害的患儿不能使用静脉注射钆造影剂；MRI 不易携带，无法对病情危重的患儿进行床旁检查。因此，超声造影(CEUS)可作为 MRE 的一种替代检查方法，它具有易携带、操作方便简单等特点，且超声造影除可用于评估肠道血流灌注情况外，还可检查出肠梗死或其他肠系膜血管损伤等[43]。

超声造影(CEUS)被用于观察炎症性肠病的肠狭窄时也可以区分出炎症性狭窄与纤维化狭窄[44]。实时剪切波弹性成像(SWE)是另一种超声成像方式，它可以通过检测肠壁硬度来描述纤维化肠狭窄的形成[45]。无论肠壁炎症程度如何，SWE 都能检测出肠壁的纤维化成分，当 SWE 与 CEUS 在判断肠狭窄性质

上有分歧时, 普遍认为 SWE 检测出肠壁僵硬的证据优于 CEUS 上检测出肠壁炎症的证据, 此时, 可判断此狭窄肠段有纤维化成分存在; 当 SWE 检测出肠段僵硬时, 即使组织学上狭窄肠段中有炎症细胞浸润, 也能说明狭窄肠段中有潜在性纤维化成分存在[45], 因此, SWE 可帮助 CEUS 判断肠狭窄的组成成分[43]。但国内外也未见将超声造影用于 NEC 后肠狭窄检查的文献报告。

超声较其他影像学检查具有易携带、操作简单方便、无辐射、家长能陪同等优点。它也可替代 MRE 进行肠狭窄检查及狭窄性质判断, 有更高的空间分辨率。但结果受操作者的主观判断较大, 且行腹部检查时新生儿肠气过多也会干扰医生判断。

国内外多是对炎症性肠病后肠狭窄的影像学研究, 但对 NEC 后肠狭窄的影像学研究几乎没有。NEC 发生于新生儿时期, 而炎症性肠病常见于 15~25 岁的人群中, 儿童也较常见[46]。虽然 NEC 和炎症性肠病后肠狭窄都是早期肠壁炎症性水肿和晚期肠道自我修复过程中胶原堆积纤维化的形成[4] [27], 但新生儿和儿童腹部情况仍有一定差异, 影像学成像也有一定的区别。因此, 在未来的研究中, 我们期待更多 NEC 后肠狭窄的影像学研究, 为临床医生提供更多 NEC 后肠狭窄的诊断依据。

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