

CT 平扫对成人绞窄性小肠梗阻的诊断价值*

田晶¹ 康星² 周竹萍³ 汪灏² 管文贤² 王军¹ 何健³

【摘要】 目的:探讨对成人绞窄性小肠梗阻(SSBO)有预测价值的 CT 征象。方法:回顾分析南京医科大学鼓楼临床医学院 11 年内住院治疗的 487 例急性小肠梗阻(SBO)资料,采集临床表现、15 种 CT 平扫征象、手术及病理学资料。用多因素回归法比较绞窄性梗阻和单纯性梗阻患者 CT 征象的差异。结果:绞窄组 259 例,单纯组 228 例。单因素分析结果显示,有 7 个 CT 平扫征象与 SSBO 相关,分别是肠系膜积液征、肠壁增厚征、腹水征、肠系膜脂肪密度增高征、肠壁密度增高征及缆绳征、鸟嘴征。多因素回归分析结果提示,有 5 个 CT 征象与 SSBO 密切相关,按其作用强弱依次为:肠系膜积液征($OR = 15.165$)、腹水($OR = 6.359$)、肠系膜脂肪密度增高($OR = 5.891$)、肠壁密度增高征($OR = 4.026$)、肠壁增厚征($OR = 2.026$)。结论:Logistic 回归方程显示,肠系膜积液征、腹水、肠系膜脂肪密度增高、肠壁密度增高征、肠壁增厚征等 CT 征象对成人 SSBO 具有一定预测价值。

【关键词】 急性小肠梗阻;绞窄性肠梗阻;CT

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The diagnostic value of CT plain scan for adult strangulated small bowel obstruction

TIAN Jing¹ KANG Xing² ZHOU Zhuping³ WANG Hao²
GUAN Wenxian² WANG Jun¹ HE Jian³

(¹Department of Emergency, Nanjing Drum Tower Hospital Clinical College of Nanjing Medical University, Nanjing, 210008, China; ²Department of General Surgery, the Affiliated Drum Tower Hospital of Nanjing University Medical School; ³Department of Radiology, the Affiliated Drum Tower Hospital of Nanjing University Medical School)

Corresponding author: GUAN Wenxian, E-mail: guanwx@163.com

Abstract Objective: To explore the predictive variables of CT signs for adult strangulated small bowel obstruction(SSBO) and investigate the diagnostic value of CT scan for SSBO. **Methods:** The clinical data of 487 cases with small bowl obstruction(SBO) who were admitted to the hospital of Drum Tower Clinical College of Nan-

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¹南京医科大学鼓楼临床医学院急诊中心(南京,210008)

²南京大学医学院附属鼓楼医院普外科

³南京大学医学院附属鼓楼医院放射科

通信作者:管文贤,E-mail:guanwx@163.com

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jing Medical University from June 2010 to January 2021 were analyzed retrospectively. The clinical manifestations, 15 kinds of CT scan signs, clinical operation and pathological data were collected in each patient. The differences of CT scans between SSBO group and simple group were compared by multivariate regression equation. **Results:** There were 259 patients in the strangulation group and 228 patients in the simple group. Univariate analysis of the data indicated that there were 7 significant factors related to SSBO, including mesenteric effusion sign, bowel wall thickening sign, ascites sign, mesenteric fat density syndrome, increased intestinal wall density sign, cable sign, and beak sign. The multivariate logistic regression analysis showed that there were statistically significant in 5 risk factors, according to the intensity of the effects was as follows: mesenteric effusion($OR = 15.165$), ascites($OR = 6.359$), mesenteric fat density syndrome($OR = 5.891$), increased intestinal wall density ($OR = 4.026$), bowel wall thickening ($OR = 2.026$). **Conclusion:** Regression analysis of multiple preoperative criteria demonstrates that mesenteric effusion, ascites, mesenteric fat density syndrome, increased intestinal wall density, and intestinal wall thickened signs are the variables predictive of SSBO.

Key words small bowel obstruction; strangulated small bowel obstruction; CT

急性小肠梗阻(small bowel obstruction, SBO)一旦进展为绞窄性小肠梗阻(strangulated small bowel obstruction, SSBO),病情凶险,是急诊医师必需重视的急腹症。以往的腹部平片检查,其检出率仅为50%~60%^[1],且病因学诊断价值较小。近年研究表明,螺旋CT具有较高的分辨率,对SBO的梗阻位置、程度、病因、肠绞窄等评估,显著优于传统腹部平片^[2]。本研究回顾了本院2010年6月—2021年1月诊疗的成人SBO患者的临床资料,探讨对预测SSBO有诊断价值的CT征象。

1 资料与方法

1.1 研究对象

本研究为回顾性研究,获得南京医科大学鼓楼临床医学院伦理委员会批准。纳入标准:①年龄 ≥ 18 岁;②在急诊室按SBO的临床与CT结果收治住院;其中,SSBO需有手术或病理结果证实,保守治疗患者出院前需复查CT证实SBO缓解。③资料完整,包括临床、实验室及放射学报告。排除标准:慢性肠梗阻、术后早期肠梗阻、麻痹性肠梗阻、腹腔转移瘤、肠系膜血管病变。病因包括肠粘连、肿瘤、肠扭转、阑尾炎、腹外疝、腹内疝、肠套叠、粪石、小肠异物等。

1.2 研究方法

1.2.1 分组方法 按梗阻性质将487例SBO患者分为绞窄组($n = 259$)和单纯组($n = 228$)。两组CT图像均符合SBO的CT标准:发现扩张肠袢与塌陷肠袢之间的“移行带”,且小肠肠管扩张,肠管横径(肠外壁之间) ≥ 2.5 cm,伴或不伴有气液平面^[3-4]。“肠壁增强征象”因增强CT样本量过小未纳入统计。由急诊科和普外科医生采集患者各种临床资料。CT图像由两位高年资放射学医生按盲法(对手术及病理结果不知)独立分析。遇到分歧要求急诊科、普外科及放射科医生讨论形成共识。

1.2.2 研究指标 基于国内外文献定义^[5-8]及本院临床经验分析两组患者的CT征象,包括:肠壁密度增高征、腹水征、游离气体征、高密度肠液征、

肠壁增厚征、肠系膜脂肪密度增高征、肠系膜血管扩张征、缆绳征、鸟嘴征、漩涡征。

1.2.3 扫描条件 扫描前训练患者深吸气后屏气,不口服造影剂。使用GE Lightspeed pro16多层螺旋CT,扫描参数:管电压120 kVp,管电流210 mA,层厚5 mm,层间距5 mm,重建层厚0.625 mm,视野(field of view, FOV)35~40 cm,矩阵 512×512 ,螺距1.375,旋转时间0.5 s/圈。扫描范围:平扫,膈肌至耻骨联合水平。

1.3 统计学方法

用SPSS 22.0统计软件统计,先做全部变量的单因素分析,正态分布的计量资料以 $\bar{x} \pm s$ 表示,用 t 检验行组间比较。分类变量用频数或百分比表示,用 χ^2 检验或Fisher's确切概率法比较组间差异。然后,进一步进行单因素和多因素Logistic回归分析,计算各变量的OR值和95%CI。以 $P < 0.05$ 为差异有统计学意义。

2 结果

2.1 患者一般资料

共收集487例SBO患者,其中男314例,女173例;年龄18~102岁,平均(59.0 ± 19.4)岁。其中,绞窄组住院时间显著长于单纯组[(14.3 ± 10.4) d vs. (10.2 ± 9.8) d, $P < 0.001$],绞窄组急诊室滞留时间显著短于单纯组[(69.2 ± 63.7) h vs. (95.5 ± 89.2) h, $P < 0.001$]。住院期间死亡:单纯组0例,绞窄组5例。

2.2 单因素分析

单因素分析结果显示,共有7种CT平扫征象与SSBO相关,分别是肠系膜积液征、肠壁增厚征、腹水征、肠系膜脂肪密度增高征、肠壁密度增高征、缆绳征、鸟嘴征(表1、2)。分别对以上7个CT征象进行单因素Logistic回归分析(表2,图1、2)。

2.3 多因素 Logistic 回归分析

以有无SSBO为因变量(0=无,1=有),以单因素分析中差异有统计学意义的7种CT平扫征象作为自变量,进行Logistic多因素回归分析

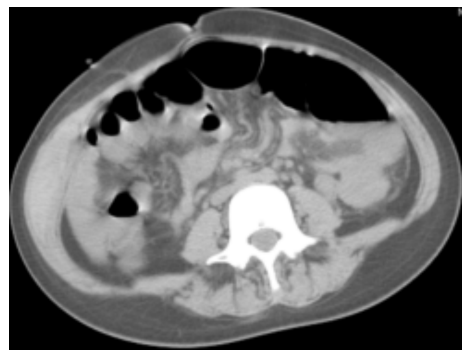
(Backward;conditional),结果显示共有 5 个 CT 征象进入 Logistic 回归方程,按其作用强弱依次为:肠系膜积液征(OR=15.165)、腹水(OR=6.359)、肠系膜脂肪密度增高(OR=5.891)、肠壁密度增高征(OR=4.026)、肠壁增厚征(OR=2.026),见表 3。

表 1 CT 平扫征象的单因素分析 例

CT 平扫征象	绞窄组 n=259	单纯组 n=228	χ^2	P	Fisher 精确值
肠系膜积液征					
是	235	147	49.442	<0.001	<0.001
否	24	81		<0.001	<0.001
肠壁密度增高征					
是	180	8	222.783	<0.001	<0.001
否	79	220		<0.001	<0.001
肠壁增厚征					
是	156	69	43.814	<0.001	<0.001
否	103	159		<0.001	<0.001
腹水征					
是	198	16	237.293	<0.001	<0.001
否	61	212		<0.001	<0.001
鸟嘴征					
是	187	10	231.499	<0.001	<0.001
否	72	218		<0.001	<0.001
肠系膜脂肪密度增高征					
是	215	28	242.653	<0.001	<0.001
否	44	200		<0.001	<0.001
缆绳征					
是	184	10	224.791	<0.001	<0.001
否	75	218			
漩涡征					
是	67	56	0.11	0.74	0.755
否	192	172			
游离气体征					
是	6	3	0.67	0.413	0.512
否	253	225			
肠壁内缘模糊征					
是	47	35	0.677	0.411	0.467
否	212	193			
高密度肠液征					
是	32	25	0.227	0.634	0.673
否	227	203			
肠系膜血管扩张征					
是	16	13	0.049	0.825	0.850
否	243	215			
小肠粪征					
是	43	42	0.278	0.598	0.633
否	216	186			

表 2 CT 平扫征象的单因素 Logistic 回归分析 例

CT 平扫征象	绞窄组	单纯组	P	OR	95%CI	
					下限	上限
肠系膜积液征						
是	235	147	<0.001	5.395	3.273	8.895
否	24	81	<0.001			
肠壁密度增高征						
是	180	8	<0.001	62.658	29.497	133.099
否	79	220	<0.001			
肠壁增厚征						
是	156	69	<0.001	3.49	2.395	5.086
否	103	159	<0.001			
腹水征						
是	198	16	<0.001	43.008	23.994	77.091
否	61	212	<0.001			
鸟嘴征						
是	187	10	<0.001	56.619	28.408	112.847
否	72	218	<0.001			
肠系膜脂肪密度增高征						
是	215	28	<0.001	34.903	20.929	58.207
否	44	200	<0.001			
缆绳征						
是	184	10	<0.001	53.483	26.869	106.456
否	75	218				



患者,女。手术证实为 SSBO,小肠扭转。术中见小肠管壁充血,浆膜散在出血点。

图 1 CT 平扫提示缆绳征



患者,女。手术证实为 SSBO,小肠扭转。术中见小肠明显水肿,浆膜显著渗出。

图 2 CT 平扫提示肠系膜积液

2.4 CT征象的诊断效能

7种CT征象的诊断效能见表4。其中,肠系膜积液征的特异度为35.5%,敏感度为90.7%,阳性预测值为74.4%,阴性预测值为86.0%;肠壁密度增高征的特异度为96.5%,敏感度为69.5%,阳性预测值为45.0%,阴性预测值为9.2%;肠壁增

厚征的特异度为60.2%,敏感度为69.7%,阳性预测值为49.5%,阴性预测值为40.1%;腹水征的特异度为93.0%,敏感度为76.4%,阳性预测值为48.3%,阴性预测值为20.8%;肠系膜脂肪密度增高征的特异度为87.7%,敏感度为83.0%,阳性预测值为51.8%,阴性预测值为38.9%。

表3 CT平扫征象的多因素Logistic回归分析

征象	B	S. E.	Wald	df	P	OR	95%CI	
							下限	上限
肠系膜积液征	2.719	0.498	29.853	1	<0.001	15.165	5.718	40.218
肠壁增厚征	0.706	0.288	6.015	1	0.014	2.026	1.152	3.562
肠壁密度增高征	1.393	0.653	4.546	1	0.033	4.026	1.119	14.487
肠系膜脂肪密度增高征	1.773	0.454	15.229	1	<0.001	5.891	2.418	14.355
腹水征	1.85	0.734	6.354	1	0.012	6.359	1.509	26.791
常数	-4.156	0.524	62.871	1	<0.001	0.016		

表4 7种CT征象的诊断效能

项目	肠系膜 积液征	肠壁密度 增高征	肠壁增厚征	腹水征	鸟嘴征	缆绳征	肠系膜脂肪 密度增高征
特异度	35.5	96.5	60.2	93.0	95.6	95.6	87.7
敏感度	90.7	69.5	69.7	76.4	72.2	71.0	83.0
阳性预测值	74.4	45.0	49.5	48.3	46.2	45.8	51.8
阴性预测值	86.0	9.2	40.1	20.8	12.2	11.8	38.9

3 讨论

本研究讨论了对SSBO有一定早期鉴别价值的CT征象,旨在帮助急诊医生早期发现和治疗。肠系膜积液征指CT图像见小肠系膜边缘模糊,见浑浊液体。一般认为,该征象和肠系膜静脉充血外渗有关,提示肠系膜血管梗阻的动态过程。节段性肠系膜积液为阳性征象,敏感度较高(89%,95%CI:75~96,阴性LR=0.16)而特异度较低,该征象特异度在肠系膜损害范围较大时增高^[9-10]。本研究中,肠系膜积液征的敏感度在各CT征象中最高(90.7%),特异度较低(35.5%),与此前的研究结果一致。肠系膜积液阴性能可靠的排除SSBO,但应结合临床排除肠道肿瘤与炎症。

肠壁增厚征在SBO中的发生率为26%~96%^[10-11]。其中,移行带肠壁增厚常见于单纯性梗阻,可提示肠道肿瘤、克罗恩病等原发病;扩张肠袢的肠壁增厚征需警惕肠绞窄。研究提示,肠壁增厚征的敏感度为48%(95%CI:41~54,阳性LR=2.84),特异度为83%(95%CI:74~89,阴性LR=0.62)^[12]。

肠壁密度增高征一般提示肠壁出血性改变。杨栋梁等^[13]的研究中,该征象的诊断特异度为100%,敏感度为9.3%,且和肠绞窄相关,这和本研究结果一致。本研究提示,腹水征能预测SSBO

发生,这和国外多项研究结果一致^[14-16]。其中,O'Daly等^[14]使用多因素回归法,回顾分析了88例急性粘连性小肠梗阻病例,结果提示腹水征可预测肠绞窄(OR=3.0,95%CI:1.15~7.84)。但Sheedy等^[17-18]的研究结果未获得阳性结论。目前腹水征的病因学尚未明确,或与绞窄处血浆外渗以及肿瘤、肝硬化等多因素有关,需结合病史仔细鉴别。

肠系膜脂肪密度增高征对早期发现SSBO的价值,目前尚未形成共识。有研究支持该征象可提示肠系膜血管充血和水肿,对鉴别SSBO具有较高的敏感度和特异度^[15];也有研究提示克罗恩病、局部炎症等病变中也会出现该征象,因而应结合多种临床检查综合判别^[19]。缆绳征在CT上表现为肠系膜血管扭曲聚集,缆绳状增粗,呈扇形分布,常出现于肠缺血初期,提示肠壁及系膜水肿较重,如能及时治疗可有逆转机会^[20-21]。鸟嘴征常见于肠扭转、闭孔疝、腹内疝、股疝等,需结合轴位、矢状位及冠状位等多种图像观察以减少漏诊。在本研究中,尽管仅在单因素分析中显示以上3种征象和小肠绞窄具有相关性,在诊断时也应予以重视。

在基层医院,腹部平片也是广泛应用的SBO评估技术,但与CT相比,平片提供的相关征象较少,更难对肠绞窄做到早期发现。增强CT技术对早期小肠绞窄尤其小肠系膜血管病变具有优势,但

其成本明显高于 CT 平扫,且慎用于肾功能不全,其普遍应用受到限制。

综上所述,目前尚未发现单一的 CT 征象对早期诊断肠绞窄具有高特异度和高敏感度;目前仍需综合多种 CT 征象鉴别 SBO 病因和肠绞窄。此外,CT 扫描也无法替代病史、体格检查和实验室检查的价值。本研究存在一些局限性:本研究属于回顾性研究,存在选择性偏倚,需要进一步的前瞻性研究;由于样本量限制,本研究未能研究 X 线和增强 CT 的价值,需进一步完善。

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