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## 腹腔镜微创技术联合频谱照射治疗小儿阑尾炎的疗效及对血清 sICAM-1、PCT 水平的影响 \*

乔 婕<sup>1</sup> 李智敏<sup>1</sup> 段昌虎<sup>1</sup> 黄建玲<sup>1Δ</sup> 吕 杰<sup>2</sup>

(1 汉中三二〇一医院儿科 陕西 汉中 723000; 2 西安交通大学第一附属医院急诊医学科 陕西 西安 710061)

**摘要 目的:**研究腹腔镜微创技术联合频谱照射治疗小儿阑尾炎的疗效及对血清可溶性细胞间粘附分子 1(Soluble intercellular adhesion molecule-1, sICAM-1)、降钙素(Calcitonin, PCT)水平的影响。**方法:**选取 2016 年 2 月~2018 年 2 月我院收治的 87 例小儿阑尾炎患者。按照简单随机数表法将其分为观察组(n=42)和对照组(n=45),对照组采用传统手术治疗,观察组采用腹腔镜微创技术联合频谱照射治疗。观察和比较两组治疗后手术指标(手术时间、术中出血量、住院时间),肠功能恢复情况(肠鸣音恢复时间、肛门排气时间、首次排便时间),治疗前后血清 sICAM-1、PCT 水平的变化及不良反应的发生情况。**结果:**治疗后,观察组手术时间、术中出血量、住院时间显著低于对照组[(47.82± 8.33)min vs (56.97± 10.46)min, (46.97± 9.75)mL vs (90.72± 13.86)mL, (7.02± 2.41)d vs (11.84± 3.58)d]( $P<0.05$ );肠鸣音恢复时间、肛门排气时间、首次排便时间显著低于对照组[(19.38± 4.32)h vs (25.82± 6.18)h, (16.98± 4.59)h vs (36.83± 7.29)h, (32.02± 5.82)h vs (40.17± 7.60)h]( $P<0.05$ );血清 sICAM-1、PCT 水平显著低于对照组[(180.27± 23.75)ng/L vs (197.06± 27.30)ng/L (0.92± 0.20)ng/L vs (3.87± 1.03)ng/L]( $P<0.05$ );不良反应总发生率显著低于对照组[7.14% (3/42) vs 22.22% (10/45)]( $P<0.05$ )。**结论:**腹腔镜微创技术联合频谱照射治疗小儿阑尾炎疗效显著,可改善微循环,促进肠功能恢复,降低血清 sICAM-1、PCT 水平,并发症少,有利于术后恢复。

**关键词:**腹腔镜微创技术;频谱照射;小儿阑尾炎;肠功能恢复;可溶性细胞间粘附分子 1;降钙素原

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## Efficacy of Laparoscopic Minimally Invasive Technology Combined with Spectrum Irradiation in the Treatment of Appendicitis in Children and the Influence on Serum sICAM-1 and PCT Levels\*

QIAO Jie<sup>1</sup>, LI Zhi-min<sup>1</sup>, DUAN Chang-hu<sup>1</sup>, HUANG Jian-ling<sup>1Δ</sup>, LV Jie<sup>2</sup>

(1 Department of Pediatrics, Hanzhong 321 Hospital, Hanzhong, Shaanxi, 723000, China;

2 Department of emergency medicine, the First Affiliated Hospital of Xi'an Jiaotong University, Xi'an, Shaanxi, 710061, China)

**ABSTRACT Objective:** To study the efficacy of laparoscopic minimally invasive technology combined with spectrum irradiation in the treatment of appendicitis in children and its influence on the serum soluble intercellular adhesion molecule-1 (sICAM-1) and calcitonin (PCT) levels. **Methods:** 87 children with appendicitis who received therapy from February 2016 to February 2018 in our hospital were selected as research objects. According to random number table, those patients were divided into the observation group (n=42) and the control group (n=45). The control group was treated with traditional surgery, while the observation group treated with laparoscopic minimally invasive technique combined with spectral irradiation. The operation indexes (operation time, intraoperative bleeding volume, hospitalization time), intestinal function recovery (recovery time of bowel sounds, anal exhaust time, first defecation time), changes of serum sICAM-1, PCT level and incidence of adverse reactions were compared before and after treatment between the two groups. **Results:** After treatment, the operation time, intraoperative bleeding volume and hospitalization time in the observation group were significantly lower than those in the control group[(47.82± 8.33)min vs (56.97± 10.46)min, (46.97± 9.75)mL vs (90.72± 13.86)mL, (7.02± 2.41)d vs (11.84± 3.58)d]( $P<0.05$ ). The recovery time of bowel sounds, anal exhaust time and first defecation time in the control group were significantly lower than those in the control group[(19.38± 4.32)h vs (25.82± 6.18)h, (16.98± 4.59)h vs (36.83± 7.29)h, (32.02± 5.82)h vs (40.17± 7.60)h]( $P<0.05$ ). The levels of serum sICAM-1 and PCT were significantly lower than those in the control group[(180.27± 23.75) ng/L vs (197.06± 27.30), (0.92± 0.20)ng/L vs (3.87± 1.03)ng/L]( $P<0.05$ ). The total incidence of adverse reactions was signifi-

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作者简介:乔婕(1989-),女,本科,住院医师,研究方向:儿童消化系统疾病,儿童胃肠镜技术,

电话:13992604202, E-mail: wdmjyk80@126.com

Δ 通讯作者:黄建玲(1971-),女,主任医师,研究方向:小儿心血管、小儿内分泌、小儿心理疾病,

E-mail: hjl3201@126.com, 电话:13891602500

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cantly lower than that in the control group [7.14%(3/42) vs 22.22%(10/45)] ( $P<0.05$ ). **Conclusion:** Laparoscopic minimally invasive technology combined with spectrum irradiation has a significant effect in the treatment of appendicitis in children. It can improve micro-circulation, promote the recovery of intestinal function, reduce the level of serum sICAM-1 and PCT, and reduce complications, which is conducive to postoperative recovery.

**Key words:** Laparoscopic minimally invasive technique; Spectrum irradiation; Appendicitis in children; Intestinal function recovery; Soluble intercellular adhesion molecule 1; Procalcitonin

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## 前言

小儿阑尾炎是临床上常见的急腹症,具有发病迅速、病情严重的特点<sup>[1]</sup>。临床表现为发热、腹痛腹胀、呕吐、肠鸣音减弱、上呼吸道等症状,给患儿的日常生活及生命健康带来了严重的威胁<sup>[2]</sup>。若未及时得到有效的治疗,可引发弥漫性膜炎和阑尾穿孔,严重的甚至可导致患儿死亡<sup>[3]</sup>。研究表明血清可溶性细胞间粘附分子-1 (Soluble intercellular adhesion molecule-1, sICAM-1)、降钙素(Calcitonin, PCT)与该病的发生发展存在密切的关系<sup>[4,5]</sup>。

目前,临床上对于小儿阑尾炎的发病机制尚不明确,研究认为阑尾腔梗阻、细菌感染、血流障碍及神经反射等均为致病因素<sup>[6]</sup>。手术是主要的治疗方法,随着微创技术的不断发展,腹腔镜手术具有创伤小、危害小、手术时间短、视野清晰的优

点。频谱照射具有改善血液微循环、增强代谢及促进肠蠕动的的作用,可促进患儿术后恢复。因此,本研究主要探讨了腹腔镜微创技术联合频谱照射治疗小儿阑尾炎的疗效及对血清 sICAM-1、PCT 水平的影响。

## 1 资料与方法

### 1.1 一般资料

收集我院收治的 87 例小儿阑尾炎患者,按照随机数表法进行分组,观察组( $n=42$ )和对照组( $n=45$ )。观察组男 24 例,女 18 例,年龄 2~11 岁,平均( $7.03\pm 1.26$ )岁,病程 1~6 天,平均( $3.02\pm 1.07$ )d;对照组男 26 例,女 19 例,年龄 3~12 岁,平均( $6.85\pm 1.21$ )岁,病程 2~6 天,平均( $2.78\pm 1.14$ )d。两组在以上一般资料比较均无明显差异( $P>0.05$ ),见表 1。

表 1 两组一般资料的对比( $\bar{x}\pm s$ )

Table 1 Comparison of the general data between two groups( $\bar{x}\pm s$ )

| Groups            | n  | Gender | Age(year)       | Course of disease(d) | Types of disease(%)  |                    |                          |
|-------------------|----|--------|-----------------|----------------------|----------------------|--------------------|--------------------------|
|                   |    |        |                 |                      | Chronic appendicitis | acute appendicitis | Suppurative appendicitis |
| Observation group | 42 | 24/18  | 7.03 $\pm$ 1.26 | 3.02 $\pm$ 1.07      | 9(21.42)             | 20(47.61)          | 13(30.95)                |
| Control group     | 45 | 26/19  | 3.02 $\pm$ 1.07 | 2.78 $\pm$ 1.14      | 11(24.44)            | 22(48.88)          | 12(26.66)                |

### 1.2 纳入排除标准

符合《实用儿科学》中小儿阑尾炎的诊断标准。纳入标准<sup>[7]</sup>:符合相关手术指征;配合研究者;无精神疾病;排除标准:伴有弥漫性腹膜炎;患有严重器质性疾病;患有阑尾恶性病变;患有感染疾病。

### 1.3 治疗方法

对照组采用传统手术治疗,观察组采用腹腔镜微创技术联合频谱照射治疗,腹腔镜微创技术术式:指导患儿取头低足高体位,行全麻后于脐部左旁 0.5 cm 行 1 cm 弧状切口,建立人工气腹,维持气压为 10~12 mmHg,将腹腔镜置入体内探查腹腔内详情,吸出腹腔脓液,确保手术视野清晰,沿着结肠带定位阑尾,固定阑尾头端和尾部,分离组织粘连,断开阑尾系膜,结扎阑尾残端。将阑尾脱出腹腔,对残端进行消毒不行包埋,将阑尾残端和盲肠放回腹腔,观察创面无出血后解除气腹,缝合手术切口。予以常规抗生素和止痛药物。频谱照射每次 20 min,每天 2 次,治疗时间为 3 天。

### 1.4 观察指标

观察两组治疗后手术指标(手术时间、术中出血量、住院时

间),肠功能恢复情况(肠鸣音恢复时间、肛门排气时间、首次排便时间),血清 sICAM-1、PCT 水平,不良反应的发生情况。

指标检测:分别于两组治疗前一天和治疗后一天采集静脉血,离心分离血清后,采用酶联免疫吸附法检测血清 sICAM-1、PCT 水平。

### 1.5 统计学方法

数据均符合正态分布,使用 SPSS18.0 统计软件进行统计,计数资料以[例(%)]表示,组间用  $\chi^2$  检验比较,计量资料以( $\bar{x}\pm s$ )表示,组间比较采用 t 检验,以  $P<0.05$  为差异有统计学意义。

## 2 结果

### 2.1 两组手术指标对比

观察组手术时间、术中出血量、住院时间均显著低于对照组( $P<0.05$ ),见表 2。

### 2.2 两组肠功能恢复情况对比

观察组肠鸣音恢复时间、肛门排气时间、首次排便时间显著低于对照组( $P<0.05$ ),见表 3。

表 2 两组手术指标对比( $\bar{x} \pm s$ )

Table 2 Comparison of the operation index between the two groups( $\bar{x} \pm s$ )

| Groups            | n  | Operative time(min) | Intraoperative hemorrhage(mL) | Length of stay(d) |
|-------------------|----|---------------------|-------------------------------|-------------------|
| Observation group | 42 | 47.82± 8.33*        | 46.97± 9.75*                  | 7.02± 2.41*       |
| Control group     | 45 | 56.97± 10.46        | 90.72± 13.86                  | 11.84± 3.58       |

Note: Compared with the control group, \* $P < 0.05$ .

表 3 两组肠功能恢复情况对比( $\bar{x} \pm s, h$ )

Table 3 Comparison of intestinal function recovery between the two groups( $\bar{x} \pm s, h$ )

| Groups            | n  | Recovery time of bowel sounds | Anal exhaust time | Time of first defecation |
|-------------------|----|-------------------------------|-------------------|--------------------------|
| Observation group | 42 | 19.38± 4.32*                  | 16.98± 4.59*      | 32.02± 5.82*             |
| Control group     | 45 | 25.82± 6.18                   | 36.83± 7.29       | 40.17± 7.60              |

Note: Compared with the control group, \* $P < 0.05$ .

### 2.3 两组治疗前后血清 sICAM-1、PCT 水平的变化情况

( $P > 0.05$ ); 治疗后, 两组血清 sICAM-1、PCT 水平均较治疗前显著降低, 观察组以上指标均明显低于对照组( $P < 0.05$ ), 见表 4。

两组治疗前血清 sICAM-1、PCT 水平比较均无明显差异

表 4 两组治疗前后血清 sICAM-1、PCT 水平的变化比较( $\bar{x} \pm s$ )

Table 4 Comparison of the Changes of serum sICAM-1 and PCT between two groups before and after treatment( $\bar{x} \pm s$ )

| Groups            | n  | sICAM-1(ng/mL)   |                 | PCT(ng/L)        |                 |
|-------------------|----|------------------|-----------------|------------------|-----------------|
|                   |    | Before treatment | After treatment | Before treatment | After treatment |
| Observation group | 42 | 476.38± 49.21    | 180.27± 23.75** | 7.47± 2.02       | 0.92± 0.20**    |
| Control group     | 45 | 475.96± 48.50    | 197.06± 27.30#  | 7.54± 2.16       | 3.87± 1.03#     |

Note: Compared with the control group, \* $P < 0.05$ ; Comparison with before treatment, # $P < 0.05$ .

### 2.4 两组不良反应发生情况的对比

观察组总发生率显著低于对照组( $P < 0.05$ ), 见表 5。

两组均出现切口感染、腹腔脓肿、肠梗阻的不良反应, 但观

表 5 两组不良反应发生情况的对比[例(%)]

Table 5 Comparison of the incidence of adverse reactions between the two groups[n(%)]

| Groups            | n  | Incisional infection | Abdominal abscess | Intestinal obstruction | Total incidence rate |
|-------------------|----|----------------------|-------------------|------------------------|----------------------|
| Observation group | 42 | 1(2.38)              | 2(4.76)           | 0(0.00)                | 3(7.14)*             |
| Control group     | 45 | 3(6.66)              | 4(8.88)           | 3(6.66)                | 10(22.22)            |

Note: Compared with the control group, \* $P < 0.05$ .

## 3 讨论

阑尾炎是儿童的好发疾病, 与成年患者相比病情更为严重, 且发展迅速。临床研究表明<sup>[8]</sup>患儿的年龄越小, 典型症状越不明显, 可在短时间内发生穿孔、坏死。由于小儿阑尾壁较薄且呈细长状, 具有丰富的淋巴组织, 可因纤维性增厚等因素使阑尾出现排空障碍, 造成阻塞, 在细菌侵入时引发阑尾炎<sup>[9-11]</sup>。加上患儿的大网膜发育不良, 身体机能尚未发育完全, 可带来严重的并发症, 威胁患儿的健康<sup>[10]</sup>。因此, 需采取准确的诊断和有效的治疗<sup>[12]</sup>。以往的传统开放手术治疗虽具有一定的治疗效果, 但其手术切口大, 可增加术中出血量, 在实际应用中可使患儿术后出现肠粘连, 影响患儿的术后恢复及生活质量<sup>[13-16]</sup>。

腹腔镜微创技术的出现提高了手术的安全性, 其通过光学原理和电子技术, 在冷光源照明下和腹腔镜系统可充分的了解腹腔内的具体情况, 减少对周围组织的影响<sup>[17-19]</sup>。手术切口小,

可避免术中对肠管牵拉和翻转, 避免术后出现肠梗阻及腹腔粘连等并发症, 促进术后恢复; 可尽量清楚腹腔隐匿部位内的脓液, 有效清除病灶<sup>[20]</sup>。本研究显示采用腹腔镜微创手术治疗的患儿临床症状、手术时间、术中出血量、住院时间均显著优于采用传统手术治疗的患者, 说明腹腔镜微创手术在治疗小儿阑尾炎上具有显著的效果<sup>[21]</sup>。且本研究显示采用腹腔镜微创手术治疗的患儿不良反应总发生率更低。这可能是因阑尾切除后标本保存于套管中, 于体外取出有关, 避免了与腹腔内脏和筋膜产生接触, 从而减少了腹腔内感染<sup>[22-24]</sup>。

既往研究表明<sup>[25-29]</sup>手术操作和麻醉作用无法避免对患儿的胃肠功能造成抑制, 可使肛门无法正常排气及肠鸣音消失, 若长时间无改善, 可导致胃肠功能紊乱, 引起腹胀, 影响血循环, 降低肠蠕动功能, 使肠腔内压力升高, 逐步发展为病理性肠麻痹。若胃肠功能受到长时间抑制, 可引发肠梗阻、吻合口瘘, 最终导致手术失败<sup>[30]</sup>。因此, 促进胃肠功能恢复是术后的重要问

题<sup>[31]</sup>。频谱照射具有无创无痛的优点,通过电磁波辐射原理,可改善血液循环,促进肠蠕动,使创面保持干净干燥的状态,避免细菌感染,可促进创面愈合<sup>[32]</sup>。本研究显示采用腹腔镜微创手术联合频谱照射治疗的患儿肠功能恢复情况更佳,说明频谱照射对于小儿阑尾炎术后疾病的恢复具有确切的疗效<sup>[33]</sup>。

当机体存在炎症反应时,sICAM-1 属于免疫球蛋白类因子,调节免疫失衡<sup>[34]</sup>。PCT 是一种急性时相反应蛋白,在正常生理情况下稳定性较好,当人体某个系统发生感染时,其水平可发生显著的变化<sup>[35]</sup>。本研究显示阑尾炎患儿血清 sICAM-1、PCT 水平显著高于正常人,采用腹腔镜微创手术联合频谱照射治疗的患儿血清 sICAM-1、PCT 水平更低,说明腹腔镜微创手术联合频谱照射治疗可有效控制患儿机体炎症反应,缩短炎症时间,腹腔镜手术切口小、伤口愈合快,减少对机体造成的损伤和并发症,提高治疗效果。

综上所述,腹腔镜微创技术联合频谱照射治疗小儿阑尾炎疗效显著,可改善微循环,促进肠功能恢复,降低血清 sICAM-1、PCT 水平,并发症少,有利于术后恢复。

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