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比较常温和亚低温下连续血液透析治疗瓣膜病术后心源性休克的效果 及对患者心功能、心衰指标和炎症因子的影响*

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摘要 目的:比较常温和亚低温下连续血液透析治疗瓣膜病术后心源性休克的效果及对患者心功能、心衰指标和炎症因子的影响。**方法:**选取我院2020年1月到2022年12月收治的90例瓣膜病术后心源性休克患者,分为观察组与对照组,各45例。对照组患者采取常温下连续血液透析治疗,观察组患者采取亚低温下连续血液透析治疗,对比两组患者术后引流量、血液净化时间、呼吸机辅助时间、ICU入住时间以及死亡、心律失常、感染发生情况,对比两组患者治疗前后左心室射血分数(LVEF)、左心室收缩末期容积(LVESV)、左心室舒张末期容积(LVEDV)心功能指标,BNP(B型利钠肽)、超敏C反应蛋白(hs-CRP)、血肌酐(Cr)心衰实验室指标,炎症因子表达水平。**结果:**两组患者心律失常、感染发生率对比无差异($P>0.05$),观察组术后引流量、呼吸机辅助时间ICU入住时间、血液净化时间及死亡率较对照组低($P<0.05$);治疗前两组患者LVESV、LVEF、LVEDV对比无明显差异($P>0.05$),治疗后两组患者LVEF均升高,且观察组较对照组高,LVESV、LVEDV水平降低,观察组较对照组低($P<0.05$);治疗前两组患者BNP、hs-CRP、Cr相关心衰实验室指标对比无差异($P>0.05$),治疗后两组患者BNP、hs-CRP、Cr相关心衰实验室指标均降低,观察组低于对照组($P<0.05$);治疗前两组患者白细胞介素-6(IL-6)、白细胞介素-1(IL-1)、肿瘤坏死因子- α (TNF- α)炎症因子水平对比无差异($P>0.05$),治疗后水平均降低,且观察组较对照组低($P<0.05$)。**结论:**对瓣膜病术后心源性休克患者采取亚低温下血液净化治疗与常温下血液透析治疗相比能进一步减少患者术后引流量、血液净化时间,促进患者早日康复的同时能够降低患者死亡率,同时采取亚低温下血液透析治疗能够进一步改善患者心功能,减轻心衰情况,降低患者机体炎症因子水平。

关键词:常温;亚低温;血液透析;瓣膜病;心源性休克;心功能;炎症因子

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Comparison of the Effects of Continuous Hemodialysis at Room Temperature and Mild Hypothermia on Postoperative Cardiogenic Shock in Patients with Valve Disease and Its Impact on Cardiac Function, Heart Failure Indicators, and Inflammatory Factors*

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ABSTRACT Objective: To compare the effects of continuous hemodialysis at room temperature and mild hypothermia on postoperative cardiogenic shock in patients with valve disease, as well as its impact on cardiac function, heart failure indicators, and inflammatory factors. **Methods:** 90 patients of postoperative cardiogenic shock after valvular disease admitted from January 2020 to December 2022 were selected and divided into observation group and control group with 45 cases each. The control group patients were treated with continuous hemodialysis at room temperature, while the observation group patients were treated with continuous hemodialysis treatment at mild hypothermia. The postoperative drainage volume, blood purification time, ventilator assistance time, ICU stay time, as well as the incidence of death, arrhythmia, and infection were compared between the two groups of patients. The left ventricular ejection fraction (LVEF) before and after treatment was compared between the two groups of patients Left ventricular end systolic volume (LVESV), left ventricular end diastolic volume (LVEDV), cardiac function indicators, BNP (B-type natriuretic peptide, B-type natriuretic peptide), hyper-sensitive C-reactive protein (hs CRP), and blood creatinine (Cr) laboratory indicators for heart failure, Interleukin-6 (IL-6), Interleukin-1(IL-1), Tumor Necrosis Factor- α (TNF- α) Inflammatory factor expression level. **Results:** There was no difference in the incidence of arrhythmia and infection between the two groups ($P>0.05$), postoperative drainage rate, ventilator assisted time ICU admission time,

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blood purification time and mortality in the observation group were lower than that of the control group ($P < 0.05$); There was no significant difference in LVESV, LVEF and LVEDV between the two groups before treatment ($P > 0.05$), LVEF was elevated in both groups after treatment, and the observation group was higher than the control group, Lower levels of LVESV and LVEDV, The observation group was lower than the control group ($P < 0.05$); BNP, hs-CRP, and Cr between the two groups before treatment ($P > 0.05$), After treatment, BNP, hs-CRP, and Cr related HF laboratory indicators were decreased in both groups. The observation group was lower than the control group ($P < 0.05$); The levels of interleukin-6 (IL-6), interleukin-1 (IL-1), tumor necrosis factor- α (TNF- α) were not different between the two groups ($P > 0.05$), both levels were reduced after the treatment, and the observation group was lower than the control group ($P < 0.05$). **Conclusion:** Compared with normothermic hemodialysis, mild hypothermia blood purification treatment can further reduce postoperative drainage flow and blood purification time, promote early recovery, and reduce patient mortality. At the same time, adopting mild hypothermia hemodialysis treatment can further improve patient heart function, alleviate heart failure, and lower the level of inflammatory factors in the patient's body.

Key words: Normal temperature; Mild low temperature; Hemodialysis; Valve disease; Cardiogenic shock; Cardiac function; Inflammatory factors

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前言

随着人口老龄化加重,老年性瓣膜病以及冠心病、心肌梗死后引起的瓣膜病变逐渐增多^[1]。手术治疗是当前心脏瓣膜病的常见疗法,效果显著,能够改善患者临床症状。心源性休克作为心脏瓣膜病围术期常见的并发症之一,多表现为组织灌注不良、四肢冰凉、低血压、内环境紊乱、软酸中毒等,如果不及时进行治疗,会导致多器官功能障碍综合征等,死亡率较高^[2,3]。当前临床上对于心脏瓣膜病术后心源性休克患者多推荐采用连续血液透析治疗,来纠正机体供养失衡情况,降低患者死亡率。虽然连续血液透析治疗心脏瓣膜病术后心源性休克的效果逐渐被广大医学者和患者认可,但是对于置换液的温度应用情况尚存在一定争议^[4,5]。有研认为^[6],采用低温治疗能够进一步降低氧耗,且通过亚低温治疗可降低心脏瓣膜术后复苏之后心肌缺血

所造成的心肌损害,改善患者机体的心功能及炎症反应。还有研究认为^[7],常温下进行连续血液透析治疗能够降低患者治疗带来的应激反应水平。因此,为了进一步改善心脏瓣膜病术后心源性休克患者的临床疗效,本研究比较常温和亚低温下连续血液透析治疗瓣膜病术后心源性休克的效果及对患者心功能、心衰指标和炎性因子的影响,具体报道如下。

1 资料与方法

1.1 一般资料

选取我院 2020 年 1 月到 2022 年 12 月收治的 90 例瓣膜病术后心源性休克患者作为研究对象,分为观察组与对照组,各 45 例。两组患者一般资料对比无差异($P > 0.05$),如表 1 所示。本研究经我院伦理委员会批准。

表 1 一般资料
Table 1 General Information

| Groups | n | Gender (male/female) | Age (years) | Heart to chest ratio | Surgical type(n) | | |
|-------------------|----|-------------------------|-------------|-------------------------|--|-----------------------------|-----------------------------|
| | | | | | Double valve replacement surgery | Aortic valve replacement | Mitral valve replacement |
| Observation group | 45 | 23/21 | 47.27± 4.26 | 0.64± 0.13 | 18 | 17 | 10 |
| Control group | 45 | 25/20 | 47.21± 3.21 | 0.66± 0.14 | 16 | 20 | 9 |
| χ^2/t | - | 0.519 | 0.519 | 0.295 | | 0.268 | |
| <i>P</i> | - | 0.597 | 0.597 | 0.745 | | 0.605 | |

1.2 纳排标准

纳入标准: 所有患者均符合瓣膜病诊断标准^[8],且选择择期进行外循环下心脏直视手术;术后出现心源性休克^[9],即 $CI < 2.5 \text{ L}/(\text{min} \cdot \text{m}^2)$,且舒张压 $< 60 \text{ mmHg}$ 和收缩压 $< 90 \text{ mmHg}$;符合血液净化治疗指征;年龄 ≥ 18 岁;知情同意。

排除标准: 术后出现二次手术或围术期心肌缺血者;合并恶性肿瘤者;合并肝肾等重要器官障碍者;合并全身免疫类疾病者;合并精神类疾病不能配合研究者;合并先天性心脏

畸形者。

1.3 方法

所有患者瓣膜手术结束后均留置桡动脉测压管、三腔静脉管、5 腔导管、导尿管,手术完毕之后放置心包纵膈引流管后进入 ICU 进行监护。进入 ICU 后所有患者均进行生命体征监测,并监测患者出血量和每小时尿量,进行常规抗感染治疗,对于术后出现循环不稳定患者进行生化、心电图、胸片以及超声检查,维持血红蛋白在 100 g/L 左右。并对于术后出现心源性休

克的患者采用 Seldinger 技术进行股静脉血管通路建立,应用聚砜膜血滤器(型号:CM-100)、血液滤过机(型号:GAMBRO-PRISMAFLEX),选择连续性静脉-静脉血液滤过模式进行治疗,置换液应用改良 Port 配方,血流量设置为 200 mL/min,置换液量为 200 mL/(kg·h),进行连续 2 h 不间断治疗。其中观察组患者不采取加温处理或者将血端管理防止在冰水中,将温度控制在 34~35℃,对照组患者应用血滤机加温处理,将温度维持在 36.5~37.3℃,其余操作两者均相同。

1.4 观察指标

(1)观察并记录两组患者术后引流量、血液净化时间、呼吸机辅助时间 ICU 入住时间,并记录两组患者的死亡、心律失常、感染发生情况。

(2)心功能:对患者治疗前后进行超声检测,嘱咐患者采取左侧卧位,将三维探头放置在心尖部,调节声束力方向得到清晰四腔心图像,点击诊断仪生成左室在内的三维立体图像,采集并传输数据,收集左心室射血分数(LVEF)、左心室收缩末期容积(LVESV)、左心室舒张末期容积(LVEDV)表达水平。

(3)心衰实验室指标:应用 B 型利钠肽(BNP)、超敏 C 反应蛋白(hs-CRP)、血肌酐(Cr)水平评价患者治疗前年后心衰程度。检测方法为;抽取患者清晨空腹静脉血 3 mL,以 3000 r/min

的速度离心 5 min 后分离血浆与血清,保存在零下 80 摄氏度的冰箱内待检。应用酶联免疫吸附法检测 BNP 表达水平,检测步骤严格依照试剂盒(生产企业:南京信帆生物技术有限公司)说明书进行。采用 USA 自动生化分析仪检测患者 hs-CRP、Cr 表达水平。

(4)炎症因子:分别在治疗前与治疗后抽取患者清晨空腹静脉血,应用与上述相同的方式进行离心,应用酶联免疫吸附试验法检测白细胞介素-6(IL-6)、白细胞介素-1(IL-1)、肿瘤坏死因子-α(TNF-α)表达水平。

1.5 统计学方法

采取 SPSS 23.0 分析,计数资料以(n%)表示,进行 χ^2 检验;计量资料用($\bar{x} \pm s$)表示,采用 t 检验;以 $P < 0.05$ 为差异有统计学意义。

2 结果

2.1 临床预后情况对比

两组患者心律失常、感染发生率对比无差异($P > 0.05$),观察组术后引流量、呼吸机辅助时间 ICU 入住时间、血液净化时间及死亡率较对照组低($P < 0.05$),如表 2 所示。

表 2 临床预后情况对比

Table 2 Comparison of Clinical Prognosis

| Groups | n | Postoperative | Blood | Ventilator | ICU check-in | Mortality | Arrhythmia | Infection rate |
|-------------------|----|-------------------------|----------------------------|------------------------|----------------------------|-----------|------------|----------------|
| | | drainage volume | purification | assistance time | | | | |
| | | ($\bar{x} \pm s$, mL) | time($\bar{x} \pm s$, d) | ($\bar{x} \pm s$, d) | time($\bar{x} \pm s$, d) | (n, %) | rate(n, %) | (n, %) |
| Observation group | 45 | 567.25± 72.12 | 5.27± 1.18 | 4.27± 1.31 | 8.46± 1.37 | 4(8.89) | 18(40.00) | 21(46.67) |
| Control group | 45 | 632.27± 58.82 | 7.31± 2.27 | 7.27± 1.17 | 13.36± 2.12 | 11(24.44) | 19(42.22) | 23(51.11) |
| t | - | 6.634 | 11.622 | 15.976 | 5.674 | 3.920 | 0.046 | 0.178 |
| P | - | 0.001 | 0.001 | 0.001 | 0.008 | 0.048 | 0.830 | 0.673 |

2.2 心功能指标对比

治疗前两组患者 LVESV、LVEF、LVEDV 对比无明显差异($P > 0.05$),治疗后两组患者 LVEF 均升高,且观察组较对照组

高,LVESV、LVEDV 水平降低,观察组较对照组低($P < 0.05$)。如表 3 所示。

表 3 心功能指标对比($\bar{x} \pm s$)

Table 3 Comparison of cardiac function indicators($\bar{x} \pm s$)

| Groups | n | LVESV(mL) | | LVEF(%) | | LVEDV(mL) | |
|-------------------|----|-----------------|---------------|-----------------|---------------|-----------------|---------------|
| | | Prior treatment | Posttreatment | Prior treatment | Posttreatment | Prior treatment | Posttreatment |
| Observation group | 45 | 72.58± 6.15 | 66.26± 9.42* | 47.95± 5.02 | 57.60± 4.86* | 118.23± 17.36 | 98.62± 13.66* |
| Control group | 45 | 75.36± 10.52 | 70.51± 8.37* | 46.25± 6.95 | 52.50± 5.14* | 117.26± 18.22 | 110.26± 9.35* |
| t | - | 1.662 | 2.499 | 1.576 | 5.702 | 0.015 | 2.528 |
| P | - | 0.100 | 0.015 | 0.118 | 0.001 | 0.988 | 0.014 |

Note: compared with the Before and after treatment, * $P < 0.05$ the same below.

2.3 心衰实验室指标水平对比

治疗前两组患者 BNP、hs-CRP、Cr 相关心衰实验室指标对比无明显差异($P > 0.05$),治疗后两组患者 BNP、hs-CRP、Cr 相关心衰实验室指标均降低,观察组低于对照组($P < 0.05$),如表 4 所示。

2.4 炎症因子水平对比

治疗前两组患者 IL-6、IL-1、TNF-α 炎症因子水平对比无差异($P > 0.05$),治疗后水平均降低,且观察组较对照组低($P < 0.05$),如表 5 所示。

表 4 心衰实验室指标水平对比($\bar{x} \pm s$)
Table 4 Comparison of laboratory indicators for heart failure($\bar{x} \pm s$)

| Groups | n | BNP(ng/L) | | hs-CRP(mg/L) | | Cr(μ mol/L) | |
|-------------------|----|-----------------|---------------|-----------------|---------------|------------------|----------------|
| | | Prior treatment | Posttreatment | Prior treatment | Posttreatment | Prior treatment | Posttreatment |
| Observation group | 45 | 87.62± 13.42 | 61.80± 11.91* | 8.25± 1.83 | 4.62± 1.73* | 134.04± 28.37 | 84.50± 21.52* |
| Control group | 45 | 89.64± 15.15 | 72.68± 13.21* | 8.36± 1.47 | 6.26± 1.37* | 136.68± 36.27 | 105.62± 31.83* |
| t | | 0.787 | 4.842 | 0.060 | 3.714 | 0.314 | 2.441 |
| P | | 0.431 | 0.001 | 0.952 | 0.001 | 0.755 | 0.018 |

表 5 炎症因子水平对比($\bar{x} \pm s$)
Table 5 Comparison of Inflammatory Factor Levels($\bar{x} \pm s$)

| Groups | n | TNF- α (pg/mL) | | IL-1(μ g/L) | | IL-6(pg/mL) | |
|-------------------|----|-----------------------|---------------|------------------|---------------|-----------------|----------------|
| | | Prior treatment | Posttreatment | Prior treatment | Posttreatment | Prior treatment | Posttreatment |
| Observation group | 45 | 157.21± 15.37 | 45.12± 8.12* | 35.21± 9.17 | 14.12± 3.12* | 494.37± 51.21 | 87.13± 9.52* |
| Control group | 45 | 159.47± 18.25 | 74.21± 9.93* | 36.44± 8.31 | 24.12± 3.25* | 487.84± 62.21 | 185.68± 23.12* |
| t | - | 0.097 | 87.971 | 0.168 | 44.387 | 0.086 | 173.469 |
| P | - | 0.907 | 0.001 | 0.845 | 0.001 | 0.917 | 0.001 |

3 讨论

3.1 比较常温和亚低温下连续血液透析治疗对心源性休克患者预后影响

本研究结果表明,两组患者心律失常、感染发生率对比无差异($P>0.05$),观察组术后引流量、呼吸机辅助时间、ICU 入住时间、血液净化时间及死亡率较对照组低($P<0.05$)。提示采取亚低温下连续血液透析治疗能够降低患者死亡率,改善患者预后水平,且安全性较高,与刘延玲等^[10]研究相符。刘延玲等研究发现,对心脏复苏之后采用亚低温治疗能够改善患者肺部感染发生率,降低院内死亡率。这是因为,连续血液透析治疗能够进一步改善患者的心脏前负荷水平与机体内环境,同时还能够进一步滤过多余水分,减轻心脏负荷与做功量,进一步纠正机体内环境紊乱情况^[11,12]。同时采用亚低温技术对置换液进行精准控温,将温度控制在 34~35℃ 范围内,能够让患者机体处于亚低温状态,减少代谢速率,使得机体在不增加心脏工作量的条件下达到氧供需平衡状态,减少心肌损伤,有效控制病情发展,改善患者预后水平,降低患者死亡率^[13-15]。另外,亚低温虽然可能会增加心动过速症状,但不会增加心律失常、肌颤等发生率,安全性较高^[16];

3.2 比较常温和亚低温下连续血液透析对心功能影响

本研究结果表明,治疗前两组患者 LVESV、LVEF、LVEDV 对比无明显差异($P>0.05$),治疗后两组患者 LVEF 均升高,且观察组较对照组高,LVESV、LVEDV 水平降低,观察组较对照组低($P<0.05$)。提示采取亚低温下连续血液透析治疗能够改善提升患者心功能水平,与许文鹏等^[17]研究相似。这可能是因为,常温与亚低温下连续血液透析治疗均能够改善心源性休克患者的循环功能,帮助患者度过危险期,促进心功能恢复^[18]。但有研究发现^[19],通过连续血液透析治疗并不能够逆转心肌所引发的相关并发症。因此具体对心功能所产生的影响还

需要进一步增加观察时间,对远期预后情况进行进一步分析;

3.3 比较常温和亚低温下连续血液透析治疗对心衰实验室指标影响

本研究表明,治疗前两组患者 BNP、hs-CRP、Cr 相关心衰实验室指标对比无明显差异($P>0.05$),治疗后两组患者 BNP、hs-CRP、Cr 相关心衰实验室指标均降低,观察组低于对照组($P<0.05$)。hs-CRP 作为组织损伤和机体感染的急性标志物,也是预防冠心病发生的独立检测指标,其水平变化能够反映心血管疾病的危险程度^[20]。BNP 属于神经内分泌激素的一种,主要由心室肌细胞分泌、合成,其水平和心衰恶化程度具有明显关系^[21]。Cr 是反应肾功能的常用治疗,有研究发现^[22],Cr 水平也能够进一步反应患者心衰程度。而观察组患者 BNP、hs-CRP、Cr 低于对照组,也证明了采用亚低温下连续血液透析治疗能够改善患者心衰程度,降低肾脏损害程度。研究发现^[23],亚低温治疗能够降低患者术后去甲肾上腺素使用剂量,中二降低肾小管缺血毒副反应情况,进一步改善 Cr 水平,与本研究结果相符。但有研究发现^[24],亚低温治疗虽然能够改善心脏术后低心排情况,但可能会对凝血功能产生不良影响,导致患者出现寒战现象。因此本研究对于亚低温和常温下血液透析治疗心源性休克方面的研究还存在不足,需增加对于组织耗氧量所带来不良反应的进一步研究;

3.4 比较常温和亚低温下连续血液透析治疗对炎症因子水平影响

本研究表明,治疗前两组患者 IL-6、IL-1、TNF- α 炎症因子水平对比无差异($P>0.05$),治疗后水平均降低,且观察组较对照组低($P<0.05$)。当患者出现局部或全身损伤等,均会使得 TNF- α 大量释放,造成组织细胞受到诱导损害。IL-6、IL-1 是重要促炎因子^[25]。心脏瓣膜手术中所导致的应激创伤、缺血再灌注损伤会对机体中性粒细胞产生激活作用,进而释放炎症因子^[26]。而观察组炎症因子低于对照组也提示了采取亚低温下连

续血液透析治疗可改善炎症因子表达,与 Fernando SM 等^[27]研究相符。Fernando SM 等研究发现,亚低温治疗技术的应用能够减轻患者机体炎症因子反应。这是因为,通过血液透析治疗强大的吸附、滤过功能可将 IL-6、IL-1、TNF- α 有效清除,从而缓解心血管所受到的抑制作用,降低炎症反应^[28]。另外将置换液维持在亚低温状态下,可有效降低组织耗氧量,延缓组织缺血腺苷三磷酸消耗速度,从而增强组织对于缺血和缺氧的耐受能力,恢复需求平衡的基础上,进一步改善患者机体炎症因子水平^[29]。Ni hIci T 等^[30]研究发现,采取常温下连续血液透析治疗能够改善患者应激反应水平,进而减轻炎症反应,与本研究结果不符。这可能是因为,该研究与本研究选取的病例有所不同,因此日后还需增加样本量和不同病例进行深入研究。

综上所述,对瓣膜术后心源性休克患者采取亚低温下血液净化治疗与常温下血液透析治疗相比能进一步减少患者术后引流量、血液净化时间,促进患者早日康复的同时能够降低患者死亡率,同时采取亚低温下血液透析治疗能够进一步改善患者心功能,减轻心衰情况,降低患者机体炎症因子水平。

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(上接第 521 页)

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