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腹主动脉下段球囊临时阻断术时钙蛋白 T 水平的变化及临床意义 *

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摘要 目的:探讨腹主动脉下段球囊临时阻断术时钙蛋白 T(TnT)水平的变化及临床意义。**方法:**回顾性分析 2015 年 5 月至 2016 年 12 月我院收治的 58 例难治性盆腔类手术患者的临床资料,包括骨盆骨折 11 例、凶险性前置胎盘并发胎盘植入 22 例、骶骨肿瘤切除术 12 例、盆腔肿瘤切除术 13 例。以上全部操作均给予腹主动脉下段球囊临时阻断术。分别于术前、球囊阻断时、术后的血液样本对钙蛋白 T(TnT)进行检测。手术时间 2~5 h,平均 3.6 h。**结果:**术前,所有患者血清 TnT 水平为 (90 ± 5) pg/mL。阻断时,血清 TnT 升高至 (109 ± 3) pg/mL,与术前比较差异有统计学意义($p < 0.05$)。解除阻断后 1 小时,TnT 升高至 (113 ± 2) pg/mL;解除阻断后 2 小时 TnT 较阻断时升高至 (115 ± 3) pg/mL,较阻断前明显升高,差异有统计学意义($p < 0.05$)。解除阻断后 6 小时,TnT 较阻断时下降 (95 ± 5) pg/mL,较阻断后 2 h 明显下降并恢复至正常值,差异有统计学意义($p < 0.05$)。**结论:**腹主动脉下段球囊临时阻断术不可避免引起心肌细胞不同程度的缺血再灌注损伤,但是此类损伤不大,为一过性、可代偿的损害。

关键词:腹主动脉;缺血;再灌注损伤;出血;肌钙蛋白 T(TnT)**中图分类号:**R656 **文献标识码:**A **文章编号:**1673-6273(2018)11-2132-04

Change and Clinical Significance of the Changes of TNT in Ischemia-reperfusion Injury of Lower Abdominal Aorta*

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ABSTRACT Objective: To investigate the changes and clinical significances of TnT during the temporary balloon occlusion of the lower abdominal aorta. **Methods:** The clinical data of 58 patients with intractable pelvic surgery from May 2015 to December 2016, including 11 cases of pelvic fracture, 22 cases of placenta previa complicated with placenta accreta, 12 cases of sacral tumor resection, 13 cases of pelvic tumor resection were retrospectively analyzed. All the patients were given temporary balloon blocking-up of the lower abdominal aorta. The serum level of TnT were detected preoperation, balloon blocking-up and postoperation. The operation time was 2 ~ 5 h, with an average of 3.6 h. **Results:** Before operation, the level of serum TnT of all patients was (90 ± 5) pg/mL. When blocking, the serum TnT increased to (109 ± 3) pg/mL, which was significantly higher($p < 0.05$). After 1 hour, the TnT increased to (113 ± 2) pg/mL, and the TnT increased to (115 ± 3) pg/mL at 2 hours after the blockade($P < 0.05$). After 6 hours of interruption, TnT decreased (95 ± 5) pg/mL compared with blocking, and significantly decreased and recovered to normal value compared with 2 h after blocking ($p < 0.05$). **Conclusion:** Temporary occlusion of the inferior segment of the abdominal aorta could inevitably cause different degrees of ischemia-reperfusion injury of the myocardial cells, but this kind of injury was a transient and compensable damage.

Key words: Abdominal aorta; Ischemia; Reperfusion injury; Hemorrhage; TnT**Chinese Library Classification (CLC):** R656 **Document code:** A**Article ID:** 1673-6273(2018)11-2132-04

前言

难治性盆腔类手术包括骨盆骨折、凶险性前置胎盘并发胎盘植入、骶骨肿瘤、盆腔肿瘤等,手术是主要的治疗方式,手术成功的关键在于使用球囊阻断从而减少术中出血量^[1-3]。临时性

腹主动脉阻断可有效减少出血,但患者的心血管系统会因阻断后所引起的血流动力学改变而受到可逆或不可逆的影响^[4-6]。阻断时间的控制过长(> 60 min)还能导致其他脏器功能的损害、全身炎症反应综合征等并发症^[7,8]。本研究通过回顾性分析 2015 年 5 月至 2016 年 12 月我院收治的 58 例难治性盆腔类

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手术患者的临床资料,观察和比较患者术前 5 min、术中、术后 1、2、6 h 血清 TnT 水平的变化,旨在探讨腹主动脉下段球囊临时阻断术所致的缺血再灌注损伤程度及手术风险。

1 资料与方法

1.1 一般资料

选择 2015 年 5 月至 2016 年 12 月我院收治的 58 例接受难治性盆腔类手术的患者为研究对象。其中,骨盆骨折 11 例,凶险性前置胎盘并发胎盘植入 22 例,骶骨肿瘤切除术 12 例,盆腔肿瘤切除术 13 例。术前监测肝肾功能正常、心功能(TnT)、肺通气功能及肺动脉压正常且肢体动脉血流通畅。

1.2 手术方法

在配置有 DSA 成像系统或 B 超的手术室内,平卧位,常规腹股沟处消毒铺巾,局麻下右股动脉穿刺置入 8F 血管鞘,经鞘管引入 Cobra 导管,放置髂动脉分叉以上,肾动脉以下。通过 B 超测量腹主动脉阻断处直径后,选择大小合适的阻断球囊。在阻断前 5 min,抽血监测 TnT。待术中需要后可扩张球囊给予阻断动脉,并监测血清 TnT 水平。待手术完成可撤出球囊导管,拔除导管鞘管,穿刺点加压包扎。于术后 1 h、2 h、6 h 再次检测血清 TnT 水平,并观察其波动情况。

1.3 观察指标

观察阻断前、阻断中、阻断解除后各个时间段血清 TnT 水平的波动情况。TnT 监测采用双抗体夹心法,即生物素化人体 TnT 的单克隆抗体和标记的抗 TnT 的单克隆抗体与标本混匀,形成夹心复合物,再加入链霉亲和素包被微粒,通过生物素和亲和素的特异性作用将夹心复合物结合到磁性微粒上,磁性微粒被电极下的磁铁吸附而留在电极板表面,在加压的阳极电场条件下,产生化学发光,通过光电倍增管进行测定。

1.4 统计学方法

应用 SPSS 18.0 软件进行统计分析,计量资料以均数±标准差表示,不同时间点组间比较采用单因素方差分析,进一步两两比较采用 t 检验,以 $P < 0.05$ 为差异有统计学意义。

2 结果

术前,所有患者血清 TnT 水平为 (90 ± 5) pg/mL。阻断时,血清 TnT 升高至 (109 ± 3) pg/mL,与术前比较差异有统计学意义($p < 0.05$)。解除阻断后 1 小时, TnT 升高至 (113 ± 2) pg/mL;解除阻断后 2 小时 TnT 较阻断时升高至 (115 ± 3) pg/mL,较阻断前明显升高,差异有统计学意义($p < 0.05$)。解除阻断后 6 小时, TnT 较阻断时下降 (95 ± 5) pg/mL,较阻断后 2 h 明显下降并恢复至正常值,差异有统计学意义($p < 0.05$)。见表 1。

表 1 血清 TnT 水平在不同时段的变化($n=8, \bar{x} \pm s$)

Table 1 Changes of serum TnT level at different time points

	At 5min pre-blocking	Blocking	At 1h after blocking	At 2h after blocking	At 6h after blocking
TnT (pg/ml)	90 ± 5	$109 \pm 3^*$	$113 \pm 2^\Delta$	$115 \pm 3^\Delta$	$93 \pm 4^\Delta$
Compared with 5min pre-blocking	0	$+21 \pm 1.1\%^*$	$+25 \pm 2.5\%^\Delta$	$+27 \pm 3.3\%^\Delta$	$3 \pm 0.5\%^\Delta$
Percentage of loci with previous time	0	$+21 \pm 1.1\%$	$+3.6 \pm 0.6\%$	$+1.7 \pm 0.7\%$	$-19.1 \pm 1.9\%^\Delta$

注: * 与阻断前 5min 比较 $p < 0.05$, Δ 与阻断前 5 min 和阻断中比较 $P < 0.05$, Δ 与阻断后 2h 比较 $P < 0.05$, 与阻断前 5 min 比较 $P > 0.05$ 。

*Compared with pre-blocking 5min, $p < 0.05$, Δ Compared with pre-blocking 5min and blocking, $p < 0.05$, Δ Compared with 2h after blocking, $P < 0.05$;

Compared with pre- blocking 5min, $P > 0.05$.

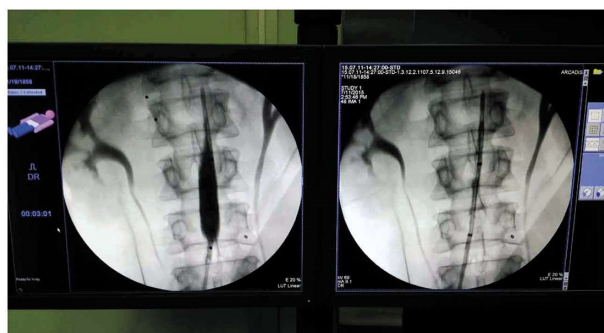


图 1 DSA 下行球囊阻断

Fig.1 Balloon occlusion therapy under interventional therapy
在 DSA 下确认球囊放置在肾动脉以下、髂动脉开口以上后给予扩张球囊行腹主动脉阻断。

Under DSA, the balloon was confirmed below the renal artery and above the iliac artery, and the dilated balloon was given to the abdominal aorta.



图 2 B 超下观察腹主动脉

Fig.2 Abdominal aorta was observed by B-ultrasound
在 B 超下测量腹主动脉直径以及血流情况,以便选择适当的球囊,并确认肾动脉和髂动脉位置。

The diameter of the abdominal aorta and the blood flow were measured in the B-ultrasound. To select the appropriate balloon and identify the position of the renal and iliac arteries.



图3 B超下球囊阻断

Fig.3 Balloon occlusion was performed by B-mode ultrasound in B超引导下确认球囊放置肾动脉以下并扩张球囊,监测扩张后球囊扩张近心端及远心端血流情况。

Under B-ultrasound guidance, the balloon was placed below the renal artery and the balloon was dilated. Monitoring of the blood flow in the proximal and distal end of balloon dilatation.

3 讨论

3.1 腹主动脉下段球囊临时阻断术血清 TnT 水平的变化

心脏并发症是腹主动脉球囊阻断后的主要并发症,常见的有心功能不全、心肌缺血等^[9,10]。阻断和开放腹主动脉时的血流动力学波动可影响术后心脏并发症的发生率。本研究结果显示:TnT在腹主动脉阻断时较阻断前5 min升高,平均增加了 $21 \pm 1.1\%$,阻断后1 h较阻断中升高 $25 \pm 2.5\%$,阻断后2 h较阻断后1 h升高 $27 \pm 3.3\%$,均具有统计学意义。总的来讲,在腹主动脉阻断时,因血流动力学改变,心脏前后负荷明显改变,导致TnT升高。阻断解除后TnT为 $93 \pm 4 \text{ pg/mL}$,较阻断前5 min升高 $3 \pm 0.5\%$,无明显统计学意义。以上现象考虑与血流阻断后肢体缺血缺氧导致细胞膜功能减退,致使大量液体离开血液循环、机体血容量不足及血流动力学紊乱,从而引起了TnT升高的应激临床表现。因此,在一定时限内的腹主动脉阻断,机体可充分代偿心脏前后负荷变化所导致的TnT的改变,该改变为一过性,6 h后达到正常水平,对器官功能无明显影响。

3.2 阻断的时间限制与血清 TnT 水平的关系

腹主动脉球囊阻断是有时间限制的,如时间过长,将会引起脏器功能损害^[11,12]。如术中仍存在出血或无法止血等情况,可在开放10-15 min后再次给予阻断^[13-17]。国内学者^[18,19]认为阻断时间的选择最好为60 min,如超过上述时间将可引起组织不可逆的损伤。我们术中阻断采用的时间为50 min,如手术未完成,则开放球囊一次,10 min后再次阻断。如部分肿瘤切除或胎盘剥离时就开放球囊阻断,可给予加压或钳夹主要血管的方法暂时止血10 min后可继续使用球囊阻断。本此研究单次阻断的时间均控制在50 min以内。在监测阻断中与阻断前5 min、阻断后1 h与阻断中的TnT变化比较均具有统计学意义,提示在阻断血管时TnT发生明显变化,可引起一定程度的心功能损

害,并且在持续的1 h内仍存在。而TnT在阻断后6 h与阻断前5 min比较差异无明显统计学意义,由此可见在阻断后6 h,TnT可恢复至正常,提示心功能也可再术后6 h代偿至正常。由此可见,当阻断时间不超过50 min时,TnT的波动均可通过心、肺的代偿功能调节至正常状态,从而防止多器官功能不可逆的损伤所引起的心力衰竭等一系列并发症。

3.3 TnT 球囊阻断位置对 TnT 的影响

我们观察腹主动脉下段阻断后再灌注损伤因子TnT变化发现:腹主动脉阻断中TnT与阻断前5 min相比,平均增加了 $21 \pm 1.1\%$;阻断后TnT 1 h与阻断中比较,平均增加了 $25 \pm 2.5\%$;而阻断后6 h TnT与阻断后2 h,平均减少了 $19.1 \pm 1.9\%$,以上均具有统计学意义。在肾动脉以下阻断腹主动脉时,突然增加心脏后负荷,阻断部位以下器官的血液会再次分布,并可大量转移到内脏器官,从而使血液回流量大大减少^[20-22],但此时发生的血流动力学改变并不会影响血液对敏感组织器官供应。由此可见,在规定时间内肾动脉以下的阻断所引起的缺血再灌注损伤因子TnT的改变,对血液动力学的干扰比较轻微,有利于减少围手术期心脏并发症。

3.4 球囊阻断后缺血-再灌注损伤与 TnT 的关系

目前,大多数学者认为代谢产物毒素及氧自由基是发生缺血再灌注损伤的重要关节^[23-26]。球囊阻断后对机体各个器官均可引起不同程度的缺血损伤。当阻断开放后血液由心、肺、肝、肾等血管快速再灌注至阻断远端的组织,可使机体处在一过性的低血容量状态。而远端器官恢复缺血后产生的酸性代谢、氧自由基产物被转移至体循环中,可出现不同程度的代谢性酸中毒,从而引起TnT的改变^[27]。由于在限定时间内阻断,并且阻断部位以下组织仍有侧枝循环建立,因此远端器官组织未形成大量的酸性代谢产物,在阻断开发后无致死性的酸性代谢产物进入体循环中。我们之前的研究显示^[28]:心脏是重要的损害器官,因此可不同程度的损失心肌功能,从而导致TnT的波动。本研究观察腹主动脉阻断解除后再灌注1 h与2 h的钙蛋白T分别为 $113 \pm 2 \text{ pg/mL}$ 与 $115 \pm 3 \text{ pg/mL}$,TnT较阻断开发前有明显升高。解除后再灌注期6 h的钙蛋白T为 $95 \pm 4 \text{ pg/mL}$,基本恢复到阻断前时的水平,钙蛋白T变化与酸性产物、氧自由基的变化基本一致。

正常时,心肌细胞内含有大量的TNT,对于早期的心肌细胞损伤,肌膜通透性明显升高,细胞内TNT可进入体循环中,随着心肌功能损伤程度的加重,TNT可持续性的增加,其总量的变化可显著的反映出心肌细胞损伤的严重程度^[29,30]。通过本次试验研究,我们认为球囊阻断不可避免引起心肌细胞在不同程度的缺血再灌注损伤,但是此类损伤不大,为一过性、可代偿的损害;并且通过限制阻断时间可有效启动机体的内、外源性保护措施,对损伤心肌产生保护作用。因此对组织器官的有效循环无明显影响,使机体的心、肺、肝、肾等组织器官的功能可正常维持。机体在阻断开发后,不会引起重要器官再灌注损伤从而导致不可逆的功能衰竭,并可在6 h后恢复至正常水平。本组58例患者在球囊阻断的一定时限内降低了手术风险,减少了术后并发症的发生。

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