

• 学术探讨 •

试用生理学解释几种脉象

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脉诊是中医重要的诊断方法之一,在《黄帝内经》、《脉经》中均有较详细的记载。本文从现代生理学入手,对中医脉象与心血管血流动力之间的关系问题作一初步的探讨。

当心室收缩,迫使血流进入动脉时,与心脏相连的动脉管内即刻发生两种性质不同的现象。其一是血柱由心脏力量的驱使,以每秒 0.2~0.6m 的速度在脉管内流动;其二是动脉管壁随血管内压力的增减而膨胀、回缩。这种现象首先发生于主动脉的近心端,然后沿动脉管壁向外周血管传播(脉搏波)。这种传播是动脉管壁分子间能量的传递,其速度远比血流为快,一般约每秒 5~9m。这种变化,用近代脉波描记器基本上可以记录下来。但是,中医脉象远比此更复杂,它涉及脉管内压力的大小,血量的多少,血管壁弹性的强弱,脉管紧张度的大小以及脉管内血液流动情况等,这些用脉搏仪是很难描记清楚的。

我们暂时将与心室相连的大、中动脉血管看作一个整体的、具有舒缩能力的弹性血库,其向心端由半月瓣防守,外周由小动脉加以限制。小动脉以其管径的大小和开放的数目来控制血液从动脉库流出的量和速度。当心室收缩将血液压入动脉库时,库内血量及压力急速上升,此时弹性动脉壁膨胀而将部分血量及压力储存起来。心室舒张时,随着库内血量及压力减少,动脉壁通过弹性回缩又将储存的血量及压力释放出来。

在心室收缩的最大射血期内,血液进入动脉库比它从小动脉流出更快,结果动脉库内血量增加,压力上升至最高点(收缩压),动脉壁受内部压力的作用而发生膨胀。随着心脏射血速度减慢,库内血液的进入与流出渐趋平衡,库内血量及压力开始减少,动脉壁发生弹性回缩。在心室减慢射血期的大部分时间内,直至下一次心搏周期半月瓣开放之前,小动脉血液的排出超过进入动脉库的血量,因此,库内血量及压力持续下降至最低点(舒张压)。这一系列变化在每一心搏周期中重复发生,并且处于相对的平衡状态。这种平衡状态的维持,主要与小动脉外周阻力和心输出量的变化密切相关。二者之间的任何变化都可能暂时打

乱输入输出平衡,使库内血量和(或)压力偏离正常水平,并且最终在某一新的水平上维持平衡。

弦脉 如果外周阻力突然增加(其它因素不变),则每一心搏周期中从库内流出的血液总量将少于流入的量,于是库内血液容积与压力都将相应的增加,并且这种增加以逐次减少的量在动脉内不断积蓄,直至动脉壁胀大到这种程度——库内压力足以克服小动脉增加的外周阻力,于是这一系统又在新的(高出正常值)水平上建立平衡关系,其高出正常水平的值显然与外周阻力的增加成正比例关系。有人在实验性弦脉时发现,用 0.4mg% 的去甲肾上腺素葡萄糖溶液,以每分钟 20 滴的速度滴入正常人的静脉中,于滴入一分钟内均出现典型的弦脉⁽¹⁾。此机理与本论相合。

在这一新的平衡系统中,动脉硬化性增加,动脉壁在心室收缩时膨胀幅度减小(脉象:举之无有,按之如弓弦状。《脉经》)。因此,心室收缩时,更多的能量直接用于推动库内血柱向外周前进,使血柱流速增加(脉象:端直以长。《素问》)。可见,由于外周阻力的增加,虽然最终动脉库仍达到输入输出平衡,但是库内血量、压力以及动脉壁硬性均有所增加。这种动脉壁硬性增加是功能性的,它通常发生于以神经系统调节为主的全身性反应中,例如人体对痛刺激的反应。

器质性的动脉管壁硬性增加多见于动脉硬化性疾病,如老年性动脉硬化。其特点是以动脉壁硬性增加为主(弦脉),动脉库内容积和压力的增加或不显著。

细脉 如果外周阻力增加,同时心脏每搏输出量减少(动脉库输入、输出量均减少),则库内容积和压力相应减低。因而动脉血管的膨胀幅度相应变小,脉体随之变细(脉象:小大于微而常有,细直而软,若丝线之应指。《脉经》)。江西“脉图及脉图仪科研协作组”对细脉的研究亦表明,形成细脉的主要血流动力学变化有:每搏心输出量降低,心脏喷血阻抗增加,有效循环容量减少⁽²⁾。

如果心脏每搏容积减少,同时外周血管阻力增加

更显著,那么动脉库血液输入将暂时大于输出。此时,库内容积和压力将有所升高,以抵抗小动脉血管阻力的增加,使血库的出、入量达到平衡。因此,细脉的基本特点是库内容积减少,而库内压力或者降低,或者有所上升。

洪脉 心脏每搏容积增加(外周阻力或稍有减少),则血液进入动脉库的量超过它流出的量,结果血液在库内有所积聚,血管体积随之增大(脉象:极大在指下。《脉经》)。心室收缩时,所产生的动能大多储存于胀大的动脉库壁;心室舒张时,再由动脉壁的弹性回缩而将储存的能量释放出来,推动血柱迅速通过小动脉阻力血管(脉象:来盛去衰。《素问》)。因此,虽然血液每搏输入明显增加,但由于动脉壁的弹性回缩,使血液输出量也相应增加,库内血量及压力积聚增加不多,动脉壁硬性亦增加不大。

滑脉 若每搏容积增加,而外周阻力显著减小,动脉库输入与输出量均相应增大(输入输出基本平衡)。此时库内容积和压力几乎无积聚性增加,动脉壁硬性不变。由于心收缩时大量血液涌进动脉库内,接着动脉壁又产生强大的弹性回缩力量,使血柱流动加速。若用手指触压动脉血管,指下隐约可出现血柱高峰迅速“滑”过时的感觉(脉象:往来流利,如盘走珠。《诊家枢要》;替替然如珠之应指。《脉经》)。这种情况最常见于妇女妊娠期。由于妊娠的需要,心脏每搏输出量增加,同时怀孕子宫的血管明显扩张,子宫胎盘间动静脉短路,外周血管阻力降低,使局部血液流量增加以供应胎儿的生长。

妊娠期母体总循环血量增加(约增加30%),其

中血浆增加40%,血球仅增加20%,因此,血液相对被稀释,血液粘度降低,血流阻力减小,这也是形成滑脉的原因之一。

实脉、虚脉 临床上,心搏频率的改变较为常见,其中心率加快(脉数)为最多。由于心搏周期缩短,并且主要是舒张期时间缩短,因而进入动脉库的血液大于排出,库内血量及压力积聚性增加。这种情况多见于运动、体温升高、体内代谢亢进等,其动脉管壁搏动应指有力(实脉)。

有时,由于每搏容积较少,心脏输出血量不能满足机体组织的需要,因而出现代偿性心率加快。此时心脏每搏容积增加不大,库内血量及压力仍然较低。因此,动脉管壁的搏动常常显得力量不足(虚脉)。由于心输出量不能满足组织器官代谢的要求,因此机体便出现一系列代偿性功能,如皮肤、肌肉小血管收缩,以增加有效循环血量(面色苍白、甚至四肢冰冷);稍活动便心率加快,以增加心输出血量(动则心悸、气促);病人常常感觉头昏、乏力,不能胜任较重的体力活动等。

临床上脉象变化是相当复杂的,本文只选择几种典型的中医脉象进行分析。当然,文中所论并不能反映中医脉象的全体,其中有些地方与客观事实也可能有一定差距。

参 考 文 献

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红参、三七对防止激素治疗重症肝炎时不良反应的观察

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重症肝炎常使用激素治疗,对于改善症状、消退黄疸具有一定作用,但由此出现反跳、出血等不良反应,在国内外学者对激素的使用均有争议。临床实践应用红参、三七能减少这些副作用,提高治愈率。

临床资料 本院自1973年~1979年收治重症肝炎100例,男75例、女25例,血小板6万以下34例,6~8万14例,全部病例应用不同量的激素。

治疗方法 应用红参指征:激素按常规减量停药3天,口服红参液5ml(3g),每日一次,服五天,可预防激素反跳。高度乏力,食欲不振者可口服1~2次。应用参三七指征:血小板8万以下者口服参三

七液5ml(3g),每日1~2次,有鼻衄、便血者,可日服2~3次,待症状恢复后减量或停药。

治疗结果 治愈78例,治愈率78%,死亡22例(暴肝4例,亚急性重型15例,慢性重型3例)。以上死亡病例无一例死于出血。

典型病例 俞××,男,22岁,农民,住院号51724,诊断:重症肝炎、亚急性肝坏死。曾在某医院用激素治疗三次,三次均出现反跳,转入我院按常规用激素、红参、三七治疗,痊愈出院,随访五年一直正常劳动。

附:参三七、红参制剂是浸出液,每瓶装5ml,口服用。

Changes of mast cells: The mast cells were filled with bright orange or brick-red granules. The total number of mast cells of hydrocorticoid-treated mice decreased markedly. Its small-type cells decreased while the large ones increased. The total number of mast cells of the mice treated with Chinese medicines increased markedly. Its small-type cells increased and the large ones decreased.

The B-lymphocyte originates in the pluripotential stem cells of bone marrow. The mast cell probably originates in the cell of thymus and bone marrow. The Chinese medicines mainly nourish the "kidney" and warm the "kidney" Yang in this experiment. These Chinese medicines probably improve the function of the bone marrow which produces immune activated cells and mast cells. These cells probably may regulate and decrease the syndrome of deficiency to some degree.

(Original article on page 104)

Changes in Glucocorticoid Receptor of Liver Cytosol in "Yang Deficiency" Animal Models and Effects of "Yang-Tonifiers"

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The binding capacity (Ro) and the apparent dissociation constant (Kd) of glucocorticoid receptor (GCR) of liver cytosol in "Yang deficiency" animal models were estimated by way of exchange assay, using ^3H dexamethasone as the ligand. The levels of Ro from control groups were about 270 fmol/mg protein, and Kd were about 0.40. But the levels of Ro of "Yang deficiency" animals, which were produced by chronic injections of hydrocortisone for 20 days, were significantly decreased. The value of rats decapitated in 5 hours after the last injection of hydrocortisone was 155.5, and that in 24 hours was 174.0. Kd was markedly elevated, the figures being 1.43 and 1.66 respectively. There were statistically significant differences between the "Yang deficiency" groups and the control. The Ro and Kd of "Yang deficiency" rats decapitated in 48 hours after the last injection, however, almost returned to normal values.

The addition of 4 "Yang-tonifiers" (prepared aconite root, cinnamon bark, epimedium and cistanche) had no effect on the Ro and Kd of GCR of "Yang deficiency" animals, suggesting that the 4 "Yang-tonifiers" were of little avail with respect to the decrease in GCR.

In general, the GCR level of the animal model is low, and there is an increase in Kd. This suggests that there may be some variation in the molecular structure of GCR. As for the cause of the decrease in GCR, the authors suggest that this may be due to the lowered synthesis rate of GCR as well as the influence of "down regulation" of glucocorticoids.

(Original article on page 107)

Experimental Study of Antitumor Effect of an Extract Derived from *Patrinia Scabra* Bge

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Development of transplanting sarcoma 180 (S₁₈₀) in mice was significantly inhibited by local intralesional injection of *Patrinia Scabra* Bge (PSB) extract. The inhibition rate of tumor weight was 62.5%. These mice with the regression of tumor were implanted again with sarcoma cells after one and five months: none of these mice showed signs of tumor growth. Local intralesional injection was more effective than intraperitoneal injection. Significant antitumor effect was observed when the extract was combined with an immunostimulant of *C. parvum*.

In vitro experiment showed that by peritoneal injection with the PSB extract, peritoneal macrophages were increased in the ability of phagocytosis of erythrocyte and in the effect of cytotoxic activity of S₁₈₀ cell (with ^{125}I -UdR release assay).

The acute i.p LD₅₀ of PSB in mice was $0.6 \pm 0.028 \text{ ml/10g}$, subacute toxicity in dog i.p 3-6ml/kg of PSB once every other day for 7 times produced obvious toxic actions, including leukocytosis, temporal thrombopenia and the cloudy swelling of liver cells in the two groups.

Transmission electron microscopy demonstrated that in vivo PSB-treated S₁₈₀ exhibited severe alterations. The nuclear chromatin was markedly reduced and vacuoles appeared in the mitochondria in the cytoplasm. Microvilli decreased in number and size.

(Original article on page 109)

A Physiological Interpretation of Pulse Feeling

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This paper, from the point of modern physiological theory, studied mainly the relationship between pulse feeling in traditional Chinese medicine and cardiovascular hemodynamics. Following views are held by the authors: wiry pulse (弦脉) results from the increase of arteriolar resistance which leads to the increase of content and pressure in arterial store and tensility of arterial wall; thready pulse (细脉) results from the decrease of blood content in arterial store which leads to the decrease of the inflation amplitude of the arterial blood vessel; full pulse (洪脉), contrary to thready pulse, results from the increase of blood content in arterial store; smooth pulse (滑脉) is characterized by the rapid movement of blood stream; forceful pulse (实脉) and feeble pulse (虚脉) are the reflection of the volume of cardiac output.

(Original article on page 118)