

相变与空化起到了决定性作用。通过不断地优化和尝试,本实验结果发现,LIFU 辐照 DDFP 相变纳米粒的参数设置为功率 6 W,时间 20 min 时,既可保证微泡在人工血管内的相变效率及溶栓效率,又具有较好的生物安全性。因此,在优化参数设置后,LIFU 联合 DDFP 相变纳米粒这种兼顾溶栓效率与生物安全性的治疗方法的创新技术,对 AMI 冠状动脉急性血栓栓塞的治疗有较大的潜力,具有推进临床应用的可行性。

本实验尚有一定的局限,虽然在人工血管血栓栓塞模型及细胞实验中已证实 LIFU 联合 DDFP 相变纳米粒所达到的高效溶栓作用及良好的生物安全性,但仍需在动物实验中进一步综合评价。此外,DDFP 纳米粒以液体相在体内的传输效率、靶向相变及溶栓效率仍有待验证,这也是该方法在推进临床应用前的基础。

综上所述,本实验结果证实 LIFU 联合 DDFP 相变纳米粒的治疗方法有较好的溶栓能力及生物安全性,能够推进其临床应用为 AMI 冠状动脉急性血栓栓塞的创新性治疗方法,具有较大的潜力。

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#### · 病例报道 ·

## Echocardiographic diagnosis of congenital single aortic valve malformation: a case report

### 超声心动图诊断先天性主动脉瓣单瓣畸形 1 例

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患儿男,4岁,发现心脏杂音4年余。体格检查:于胸骨左缘第2肋间可闻及2~6级收缩期杂音。超声心动图提示:主动脉瓣稍厚、回声稍强,呈单瓣启闭活动,收缩期开放受限,开口径 0.6 cm(图 1A);CDFI 示主动脉瓣口射流加速(图 1B),连续性多普勒测得主动脉腔内射流速度增快,峰值血流速度 5.1 m/s,峰值压差 104 mm Hg(1 mm Hg=0.133 kPa),平均速度 3.4 m/s,平均压差 58 mm Hg(图 1C)。主动脉冠状窦可分辨为 3 个窦,窦

部增宽,宽径约 3.1 cm。超声心动图提示:主动脉瓣单瓣畸形并重度狭窄,主动脉窦部增宽。增强 CT 见:主动脉瓣呈拱顶状凸向主动脉窦部,收缩期主动脉瓣呈“鱼口状”,瓣叶不对称(图 2)。增强 CT 诊断:主动脉瓣畸形,考虑单叶畸形,主动脉窦部增宽。

讨论:主动脉瓣单瓣畸形是一种罕见的先天性畸形,发病

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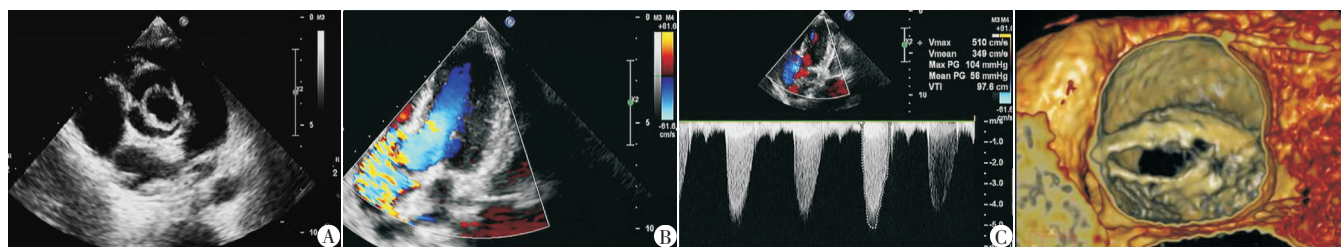


图1 先天性主动脉瓣单瓣畸形超声图像  
A:二维超声图;B:CDFI图;C:连续性多普勒频谱图

率约占瓣膜疾病的万分之2,多见于男性,是引起1岁以下婴幼儿最常见的致命性瓣膜狭窄病变<sup>[1]</sup>。根据其解剖特点的不同,将其分为单交界型和无交界型。主动脉瓣单瓣畸形和主动脉瓣二瓣畸形均可以引起狭窄或反流,但通常在出生时和儿童时期并无症状,即使成年早期退行性纤维化和钙化导致主动脉瓣狭窄,也很少发生反流,导致两个瓣膜病变间的症状仍然难以区分,特发性肥厚性心肌病、晕厥、心绞痛、呼吸短促均是本病最常见的临床表现<sup>[2]</sup>。单瓣主动脉瓣临床少见,常与双叶瓣混淆,超声心动图可有效鉴别两者,前者是整个主动脉瓣未分叶,形成一个完整的主动脉瓣膜附着在主动脉壁上,瓣口狭小,对血流动力学影响明显;后者主要有前后型和左右型两种,两者尖端大小几乎相同,有2个共瓣明显地附着在主动脉壁上<sup>[3]</sup>。本例患者主动脉单瓣叶二维超声有其特征性表现:左室长轴切面见主动脉瓣收缩期开放时呈拱形,瓣尖部不能贴近主动脉壁;主动脉短轴切面见主动脉瓣开放时呈偏心环形,瓣口狭小、未见分割瓣叶的交界线,CDFI示过瓣血流信号呈五彩镶嵌的高速血流信号,频谱多普勒测得主动脉瓣前向血流速度明显增快,因此确诊。心脏增强CT虽然在心血管尤其是心外结构的诊断上有独特优势,但其有一定创伤;X线的电离辐射较大,均

不宜作为婴幼儿的首选常规检查。超声心动图不仅可以准确诊断主动脉瓣瓣叶数目,还可以精确评估瓣口流速及反流,根据狭窄和关闭不全的程度评估患者病情,且还能动态观察心脏结构、血流和功能的变化情况,但其在主动脉瓣单瓣畸形与主动脉瓣二瓣畸形的鉴别方面仍有一定难度,需要多切面多角度地探查主动脉瓣形态和启闭活动,结合多种影像检查方法帮助判断。

图2 先天性主动脉瓣单瓣畸形增强CT图

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