

- spectroscopic detection of DNA-damage effects at high and low frequencies[J]. *Methods Mol Biol*, 2011, 682(4): 165-187.
- [12] 王志刚. 多功能超声分子探针显像与增效高强度聚焦超声治疗[J]. *临床超声医学杂志*, 2017, 19(9): 577-579.
- [13] 孙阳. 超声分子探针围绕精准医学的发展及展望[J]. *临床超声医学杂志*, 2020, 22(1): 49-51.
- [14] Rybczynska AA, Boersma HH, de Jong S, et al. Avenues to molecular imaging of dying cells: focus on cancer [J]. *Med Res Rev*, 2018, 38(6): 1713-1768.
- [15] Min PK, Lim S, Kang SJ, et al. Targeted ultrasound imaging of apoptosis with Annexin A5 microbubbles in acute Doxorubicin-induced cardiotoxicity[J]. *J Cardiovasc Ultrasound*, 2010, 18(3): 91-97.
- [16] Wei X, Li Y, Zhang S, et al. Ultrasound targeted apoptosis imaging in monitoring early tumor response of trastuzumab in a murine tumor xenograft model of her-2-positive breast cancer (1.) [J]. *Transl Oncol*, 2014, 7(2): 284-291.
- [17] Zhou T, Cai WB, Yang HL, et al. Annexin V conjugated nanobubbles: a novel ultrasound contrast agent for in vivo assessment of the apoptotic response in cancer therapy [J]. *J Control Release*, 2018, 276(8): 113-124.
- [18] Zhang DJ, Jin QM, Jiang CH, et al. Imaging cell death: focus on early evaluation of tumor response to therapy [J]. *Bioconjug Chem*, 2020, 31(4): 1025-1051.
- [19] Tawakol A, Abohshem S, Zureigat H. Imaging apoptosis in atherosclerosis: from cell death, array of light [J]. *J Am Coll Cardiol*, 2020, 76(16): 1875-1877.
- [20] Chaudhry F, Kawai H, Johnson KW, et al. Molecular imaging of apoptosis in atherosclerosis by targeting cell membrane phospholipid asymmetry [J]. *J Am Coll Cardiol*, 2020, 76(16): 1862-1874.
- [21] Lee Y, Kim S, Kim D, et al. A histone H1-binding-aptamer-based apoptosis imaging probe for monitoring tumor responses to cancer therapy [J]. *Medchemcomm*, 2017, 8(2): 390-393.
- [22] Jung HK, Wang K, Jung MK, et al. In vivo near-infrared fluorescence imaging of apoptosis using histone H1-targeting peptide probe after anti-cancer treatment with cisplatin and cetuximab for early decision on tumor response [J]. *PLoS One*, 2014, 9(6): e100341.
- [23] 赵萍, 马晓菊, 杨恒丽, 等. 携 ApoPep-1 纳米微泡靶向成像评价活体内肿瘤凋亡的实验研究 [J]. *中国医学影像学杂志*, 2020, 28(12): 901-906.
- [24] Li J, Yuan J. Caspases in apoptosis and beyond [J]. *Oncogene*, 2008, 27(48): 6194-6206.

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· 病例报道 ·

Echocardiographic diagnosis of persistent truncus arteriosus in adult : a case report

超声心动图诊断成人永存动脉干 1 例

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[中图法分类号] R540.45

[文献标识码] B

患者女, 39岁, 因进展期直肠癌来我院就诊。自诉既往外院诊断法洛四联症, 未治疗。现我院心电图检查: 窦性心律, 电轴右偏, 肢体导联低电压, 不完全性右束支阻滞。超声心动图检查: 心房正位, 心室右祥, 右房血液进入右室, 左房血液进入左室; 见单一动脉干连接于心室, 骑跨于室间隔上方, 收缩期可见左、右心室血流经半月瓣(三瓣)共同流入骑跨其上的动脉干; 肺动脉主干及左、右分支均显示不清, 主动脉弓及降主动脉向右后下方走行, 显示段未见明显异常分支(图1); ②动脉干瓣下的室间隔连续中断, 可探及双向分流血流信号, 左向右分流峰值流速 4.7 m/s, 压差 55 mm Hg (1 mm Hg=0.133 kPa), 右向左分流峰值流速 2.3 m/s, 压差 21 mm Hg; ③舒张期半月瓣见反流血流信号达二尖瓣腱索水平, 反流收缩颈宽约 4 mm; 三尖瓣上可探及反流血流信号到达右房中部, 反流速度 4.7 m/s, 跨瓣压差 88 mm Hg。胸部 CT 示: 室间隔基底段局部缺损,

主动脉增粗并骑跨于左右心室, 右室壁增厚, 右位主动脉弓(图2)。胸部 CTA 示: 升主动脉、主动脉弓及降主动脉上段均增粗, 右侧颈总动脉及锁骨下动脉单独发出, 左侧颈总动脉、锁骨下动脉共干并增粗, 左下肺动脉源于增粗的共干动脉, 右肺动脉及左上肺动脉源于降主动脉(图3)。综合上述检查提示: ①永存动脉干 III 型; ②右位主动脉弓。临床会诊建议: 复杂性先天性心脏病: 永存动脉干(失去手术根治机会), 心功能 II 级。患者后行直肠癌根治手术, 术后恢复可。

讨论: 永存动脉干是一种少见的先天性心脏病, 由带有一组半月瓣的单一大动脉起源于心底部, 供应冠状动脉、肺动脉和周围动脉。该畸形是胎儿发育过程中原始动脉干分离失败的结果, 与染色体 22q11 缺失有关^[1]。永存动脉干通常分为 4 型^[2]: I 型最常见, 肺动脉主干自共同动脉干发出, 分出左、右肺动脉;

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- [19] Upshaw JN, Finkelman B, Hubbard RA, et al. Comprehensive assessment of changes in left ventricular diastolic function with contemporary breast cancer therapy[J]. JACC: Cardiovascular Imaging, 2020, 13(1 Pt 2): 198-210.
- [20] Nagueh SF, Smiseth OA, Appleton CP, et al. Recommendations for the evaluation of left ventricular diastolic function by echocardiography: an update from the American Society of Echocardiography and the European Association of Cardiovascular Imaging [J]. Eur Heart J Cardiovasc Imaging, 2016, 17(12): 1321-1360.
- [21] Timóteo AT, Moura Branco L, Filipe F, et al. Cardiotoxicity in breast cancer treatment: what about left ventricular diastolic function and left atrial function?[J]. Echocardiography, 2019, 36(10): 1806-1813.
- [22] Abdel-Qadir H, Thavendiranathan P, Fung K, et al. Association of early-stage breast cancer and subsequent chemotherapy with risk of atrial fibrillation[J]. JAMA Netw Open, 2019, 2(9): 2739-2746.
- [23] Calleja A, Poulin F, Khorolsky C, et al. Right ventricular dysfunction in patients experiencing cardiotoxicity during breast cancer therapy [J]. J Oncol, 2015, 8(3): 609194.
- [24] Keramida K, Farmakis D, Bingcan J, et al. Longitudinal changes of right ventricular deformation mechanics during trastuzumab therapy in breast cancer patients[J]. Eur J Heart Fail, 2019, 21(4): 529-535.
- [25] Arciniegas Calle MC, Sandhu NP, Xia H, et al. Two-dimensional speckle tracking echocardiography predicts early subclinical cardiotoxicity associated with anthracycline-trastuzumab chemotherapy in patients with breast cancer[J]. BMC Cancer, 2018, 18(1): 1037.
- [26] Cheng KH, Handschumacher MD, Assuncao BMBL, et al. Contraction timing patterns in patients treated for breast cancer before and after anthracyclines therapy [J]. J Am Soc Echocardiogr, 2017, 30(5): 454-460.
- [27] Li H, Liu C, Zhang G, et al. The early alteration of left ventricular strain and dys-synchrony index in breast cancer patients undergoing anthracycline therapy using layer-specific strain analysis [J]. Echocardiography, 2019, 36(9): 1675-1681.

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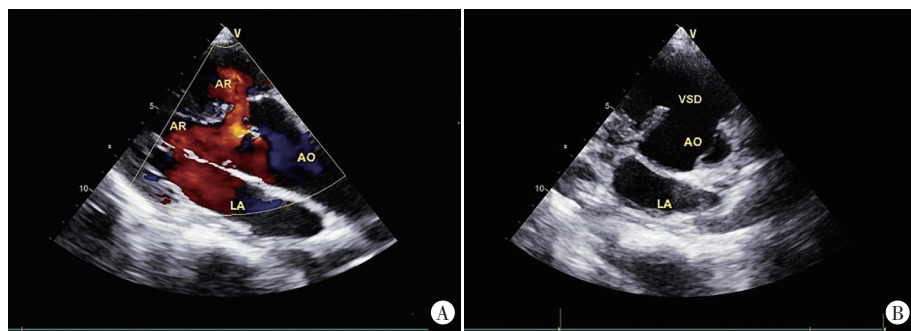


图1 永存动脉干Ⅲ型超声心动图(AR:主动脉瓣反流;AO:主动脉;LA:左房;VSD:室间隔缺损)

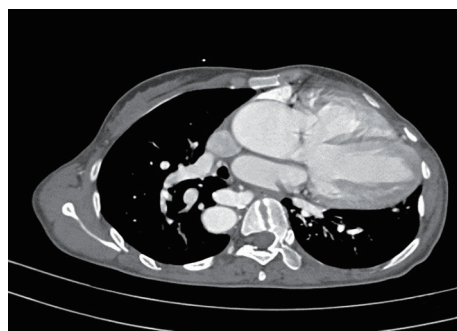


图2 胸部CT示右室壁增厚,室间隔基底段局部缺损,主动脉增粗并骑跨于左、右心室,右位主动脉弓

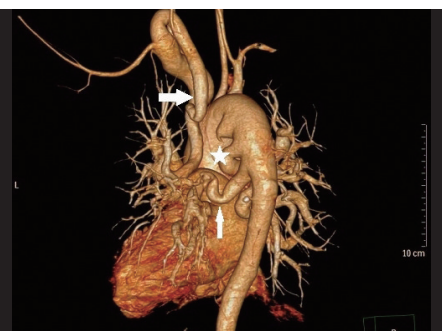


图3 胸部CTA三维重建图示,左下肺动脉(粗箭头示)来源于左侧颈总动脉与锁骨下动脉的共干动脉,右肺动脉(★示)及左上肺动脉(细箭头示)来源于降主动脉

Ⅱ型,无肺动脉主干,左、右肺动脉分别从共同动脉干的后壁发出;Ⅲ型,无肺动脉主干,左、右肺动脉分别从共同动脉干的侧壁发出;Ⅳ型,无肺动脉主干及左、右肺动脉,肺循环的血供来源于支气管动脉或其他动脉。本例患者为Ⅲ型。永存动脉干预后差,如未进行干预,6个月死亡率约65%,1年死亡率约为75%^[3]。如未及时进行手术矫正,肺血管病变将逐渐加重,且不可逆转,

最终丧失手术机会,极少数成活至成年。本例患者未行手术矫正存活39年,并维持较好的心功能,顺利完成直肠癌根治手术,实属罕见。

超声心动图是诊断永存动脉干的首选检查方法,可清晰显示心内结构和血流动力学,对其分型具有重要价值,但作为平面成像方法,其在显示复杂性先天性心脏病的空间结构及心外大血管方面存在局限性。永存动脉干声像图表现和临床症状与主、肺动脉闭锁及重症法洛四联症相似,鉴别较困难,且永存动脉干可分为不同亚型,甚至还存在大血管解剖变异。鉴别要点是寻找肺动脉起源和肺血液供应来源,但实际操作有一定难度,因此本例患者外院误诊为法洛四联症。本院超声心动图虽准确诊断,但最终依靠CTA追踪出肺动脉分支走行及心外大血管立体空间关系,明确分型。建议临床在超声心动图不能完全明确复杂性先天性心脏病的所有心血管畸形时,结合其他影像学方法进一步检查,为制定治疗方案提供更多信息。

参考文献

- [1] Sharma A, Priya S, Jagia P. Persistent truncus arteriosus on dual source CT[J]. Jpn J Radiol, 2016, 34(7): 486-493.
- [2] 韩波,王庆征,胡新颖. 彩色多普勒超声心动图产前诊断胎儿永存动脉干的价值[J]. 中国超声医学杂志, 2016, 32(1): 83-84.
- [3] 马小静,夏娟,王静静,等. 永存动脉干影像诊断、分型与手术矫治分析[J]. 中国超声医学杂志, 2014, 30(10): 905-908.

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