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The Significance of Evaluating the Variation of Mechanical Microstructure for Hypertrophic Cardiomyopathy Using Diffusion Tensor Magnetic Resonance Imaging

The Editor,

Sir,

Hypertrophic cardiomyopathy (HCM) is a genetic and familial cardiovascular disease which can cause severe arrhythmia and heart failure. With irregular hypertrophy and disorganized arrangement of cardiomyocytes on histological picture, the normal myocardium macrostructure appears in whole or part as ventricular wall thickness, especially ventricular septal thickness (1).

The variation of myocardial microstructures is associated with a range of clinical outcomes. However, common examinations such as echocardiography and delayed enhancement magnetic resonance (DE-MR) can only diagnose HCM after cardiac dysfunction and macro structural changes. Although histology is the gold standard for HCM, it is unable to quantify changes and display 3D spatial structure. Therefore, highly sensitive and ultra-early examination techniques are in urgent need for the diagnosis of HCM.

Based on anisotropy of water molecules movement in different tissues, diffusion tensor imaging (DTI) can be used to quantify the diffusion characterization of internal water molecules in tissues (2). In the clinical setting, DTI is widely used in tractography of the central nervous system.

Intrinsically, DTI is a multi-parametric method to quantify myocardial fibres by means of multiple aspects, such as orientations using primary eigenvector, mechanical function using helix angle (HA) and transmural angle (TA), diffusion characteristic using fractional anisotropy (FA) and apparent diffusion coefficient (ADC).

Recently, DTI has been applied to trace myocardial fibre of animal heart *in vitro*. Healy *et al* found that the range of helix angle and transmural angle through the left ventricle was significantly different among species (3). Their results proved the sensitivity of DTI to explore variation of microstructures in myocardial fibres and laid the foundation for further studies.

Despite great challenges of DTI for *in vivo* heart due to cardiac motion, Toussaint *et al* successfully reconstructed the architecture of myocardial fibre in healthy volunteers *in vivo* (4). Wei *et al* also developed a multi-modal approach to assess the effects of cardiac motion on the human heart by diffusion tensor parameters. Their research is impressive and encouraging for improving imaging methods and evaluating myocardial fibres *in vivo* (5).

We propose that DTI is a sensitive method to diagnose the micro alternations of myocardial fibre in hypertrophic cardiomyopathy before occurrence of severe clinical symptoms or cardiac dysfunction in non-invasive and quantitative measurement. Three-dimension myocardial fibre architecture and corresponding quantitative parameters of patients will be revealed by DTI for *in vivo* heart in the very near future. This technique enables dynamic observation of patients and long-term follow-up to detect lesions promptly. Combining mechanical method with molecular imaging, DTI has excellent ability to solve clinical problems and achieve translational medicine.

Diffusion tensor imaging, an essential examination method, will have extensive application in clinical diagnosis to benefit more patients with HCM in future.

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Keywords: Diffusion tensor imaging, hypertrophic cardiomyopathy

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Adrenal Cystic Lymphangioma

The Editor

Sir,

A previously healthy five-year old boy was evaluated for intermittent abdominal pain lasting for six months. Physical examination was normal but abdominal ultrasonography revealed a 3.5 × 4 cm lobulated cystic mass located in the right adrenal region. Laboratory results were all normal except for slightly elevated serum neuron-specific enolase [NSE] (31.2 µg/L). Magnetic resonance imaging evaluation reported the mass could be a simple adrenal cyst or cystic lymphangioma (CL). The patient was scheduled for laparoscopic exploration and excision of the mass. In the operating room, he was placed in the left semi-lateral position; a 10-mm umbilical trocar and three additional 5-mm working ports were inserted. A vessel sealing device was used to open the peritoneum, to dissect and completely excise the cyst (Figure). He was discharged home on the 2nd postoperative day without any complication. During a one-year follow-up period, there was no cyst recurrence.

Figure: The peritoneum is opened and the retroperitoneum is reached with vessel sealing device. CL: cystic lymphangioma; asterisk: upper pole of right kidney; dotted line: cut edges of peritoneum

Cystic lymphangioma is a rare, congenital benign tumour, and most commonly reported in the head and neck regions. Intra-abdominal CL is rare (5−10% of all cases), and can be located either intra- or retroperitoneal. Presumed percentage of the retroperitoneal lymphangiomas is approximately 1% of all intra-abdominal cases (1−3). Symptoms of an intra-abdominal CL such as mild abdominal pain, nausea, and vomiting are neither pathognomonic nor specific to the pathology (2, 4, 5).

Both ultrasonography and computed tomography (CT) are useful to diagnose CL and determine its extensions. Computed tomography assists the diagnosis of retroperitoneal lesion (2, 6). Magnetic resonance imaging is also a useful modality in assessing its extension (3, 7).

Management options of intra-abdominal CL include observation, drainage and sclerotherapy, laser therapy, irradiation, and surgical excision with laparotomy, laparoscopy assisted laparotomy and laparoscopy (4, 7−12). Since the reported complications and recurrence rates are very high in observed cases, in cases treated with drainage and sclerotherapy, or with irradiation, the preferred treatment of an abdominal CL is prompt and complete surgical excision, which should prevent recurrence (4).

Laparoscopic excision of the retroperitoneal CL in children is rarely reported in the literature (5, 9). According to a recent literature review, there are only three reported retroperitoneal CL cases which were successfully excised by laparoscopy in children, but none of them was located in the adrenal region (13). Although laparoscopic excision of a CL located in the adrenal gland region has not been reported previously, several laparoscopic approaches have been described to access the adrenal gland regions (14).

In our case, we preferred the transabdominal-transperitoneal way to reach the right adrenal gland region, and we found that laparoscopic excision of retroperitoneal CL in adrenal region is safe and effective with the help of a vessel sealing device. We report this rare case to draw attention to how laparoscopic excision is feasible even in such rare cases.

Keywords: Adrenal gland, cystic lymphangioma, laparoscopy, retroperitoneum

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