PED-01

TEE in Intervention for Congenital Heart Diseases

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Transesophageal echocardiography (TEE) in comparison to transthoracic echocardiography (TTE) has the advantages of better resolution of image quality. However, it is more invasive and often needs sedation or general anesthesia. In the field of structural interventions of congenital heart diseases, TEE is useful for 1) multiple fenestrated ASD closure, 2) stenting through an ASD occluder, 3) ventricular septal defect closure, 4) patent foramen ovale closure, 5) paravalvular leak closure, and 6) Transseptal puncture.

PED-02

Application of Transesophageal Echocardiography in Pediatric Congenital Heart Surgery

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Transesophageal echocardiography (TEE) has emerged as a pivotal tool in the management of pediatric congenital heart surgery. This imaging modality provides real-time, high-resolution images of cardiac structures, which are crucial for the intricate and delicate nature of pediatric cardiac surgeries. The application of TEE in this field spans preoperative, intraoperative, and postoperative phases, significantly enhancing surgical outcomes and patient safety.

Preoperatively, TEE aids in the detailed assessment of congenital heart defects, offering superior visualization compared to transthoracic echocardiography (TTE). This detailed imaging is essential for surgical planning, allowing for precise identification of anatomical anomalies such as septal defects, valvular abnormalities, and anomalies of the great vessels.

During surgery, TEE serves as an invaluable guide, providing real-time feedback to surgeons. It facilitates the accurate placement of surgical instruments and devices, and helps in the immediate assessment of surgical repairs, ensuring that corrections are effective and complete. This real-time monitoring is particularly beneficial in complex procedures, such as those involving the repair of ventricular septal defects or the reconstruction of outflow tracts.

Postoperatively, TEE continues to play a critical role by enabling the early detection of residual defects or complications such as pericardial effusion, thrombus formation, or prosthetic valve dysfunction. This early detection allows for prompt intervention, thereby reducing the risk of adverse outcomes and improving overall patient prognosis.

In conclusion, TEE has revolutionized the field of pediatric congenital heart surgery by providing detailed, real-time imaging that enhances surgical precision and patient outcomes. Its application across the surgical continuum—from preoperative assessment to intraoperative guidance and postoperative monitoring—underscores its indispensable role in the management of congenital heart diseases in children.

PED-03

PED-04

TEE in EPS Intervention

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Electrophysiological study (EPS) and catheter ablation as a management technique for both atrial and ventricular tachyarrhythmias have significantly developed over the past decades. For atrial fibrillation (AF) ablation procedure, transesophageal

echocardiography (TEE) is useful not only in the performance of the transseptal puncture (TSP) but also in the assessment of the anatomy of the pulmonary veins and for the evaluation of baseline and procedure-associated thrombus & pericardial effusion. Real-time three-dimensional TEE has also become more widely available and allows for better visualization of cardiac structures from angles that may not be available with traditional TEE manipulation. Intraprocedural imaging with TEE can be particularly useful in patients undergoing typical atrial flutter ablation. The cavotricuspid isthmus is sometimes a complex structure with significant variation in anatomy, including the Eustachian ridge size and the presence of tissue pouches.

During the ablation of ventricular arrhythmias, TEE is particularly useful in understanding catheter-contact issues when interacting with the complex geometry of the papillary muscles in the left ventricle and ventricular trabeculations in the right ventricle. In addition, differences in the echogenicity of the myocardium on TEE evaluation can suggest possible areas of scarring and thus targets for ablation in the mid-myocardium or epicardium. Besides, TEE also serves as an important safety tool in assessing for pericardial effusion and gauging ablation lesion depth.

The use of TEE has many potential benefits. First, it may help to develop operator skills in conventional ablation procedures. Second, it allows safe and reproducible TSP with reducing a need for fluoroscopy. Third, it can help to demonstrate the relevant chamber of the heart and/or aortic or pulmonary cusps. Fourth, it can localize the tip of the ablation catheter relative to anatomic structures. Fifth, it may visualize the arrhythmic substrates in patients with structural heart disease.

PED-05

The Role of Exclusive Trans-Esophageal Echocardiography to Guide Zero-Fluoroscopic Catheter Visualization & Trans-Septal Puncture during Cardiac Ablation

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Background: Efforts to reduce radiation exposure during cardiac intervention can benefit patients & physicians tremendously. Nowadays the combination of intra-cardiac echocardiography(ICE) and 3D electro-anatomical mapping can aid non-fluroscopic cathter ablation effectively. However, ICE has the main disadvantage of higher cost due to non-reusable and hence it's not available for patients without healthy insurance coverage. To our knowledge, there is no specific alternatives reported. Therefore, we aim to investigated the role of trans-esophageal echocardiography(TEE) on non-fluoroscopic method of cardiac intervention.

Methods: Between Aug. 2019 and Feb. 2021, a total of 11 patients underwent TEE for guiding non-fluoroscopic atrial fibrillation catheter ablation were included. Under general anesthesia, TEE was performed for pre-ablation LAA thrombus and evaluation of the feasibility of catheter position and trans-septal puncture guiding. In this cohort (60.9 ± 10.39years; 4 men 7 women; left ventricular ejection fraction 66.5 ± 12.9%). We designed a step-by-step TEE acquisition protocol compatible with the need of catheter ablation procedure.

Complication events were recorded as pericardial effusion post procedure, IAS dissection, aorta puncture through, and LA posterior wall puncture through.

Results: The acquisition steps and its successful rate was as following: The corresponding TEE probe level and angle was summerized in tables and presenting as figures.

Step 1: Preablation LAA thrombus detect, LAA empty velocity (11/11)

Step 2: CS orifice (for CS catheter advancement) (6/6)

Step 3: Sheath introduction along with guidewire into SVC (avoid wire into RAA) (11/11)

Step 4: Sheath pulldown from SVC after Brockenbrough needle insertion (11/11)

Step 5: Transseptal tenting at inferior, toward anterior (11/11)

Step 6: Advanced transseptal sheath into LA

(toward LSPV, avoid into LAA) (10/11)

Step 7: J-tip wire into LSPV (8/11)

Step 8: Cryoballoon engagement of 4 pulmonary veins (0/1)

Total Fluoroscopic time : 0 mins . Complication event was 0/11.

Conclusion: The application of TEE-guided non-fluoroscopic catheter ablation enables safe, consistent and successful outcome in routine clinical practice. The pre-existing septal occluder in situ may interfere with trans-septal needle tip visualization. By now, we still needs more practice using exclusive TEE-guide for cryoballoon ablation.

PED-06

Endocarditis By Transesophageal Echocardiography

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Definite infective endocarditis

Pathologic criteria

Microorganisms: demonstrated by culture or histology in a vegetation (in situ or embolized) or in an intracardiac abscess, or

Pathologic lesions: vegetation or intracardiac abscess, confirmed by histology showing active endocarditis

Clinical criteria (2 major criteria, or 1 major and 3 minor criteria, or 5 minor criteria)

Major criteria

Positive blood cultures

Typical organisms for infective endocarditis from two separate blood cultures

Persistently positive blood cultures from cultures drawn > 12 h apart or the majority of 4 cultures spanning more than 1 h

Evidence of endocardial involvement

Positive echocardiogram

● Oscillating mass on valve or apparatus or in jet pathway or on implanted material in the absence of an alternative explanation or

● Abscess or

● New dehiscence of prosthetic valve or

New valvular regurgitation (increase or change in preexisting murmur not sufficient)

Minor criteria

I. Predisposing heart condition or intravenous drug use

II. Fever 38°C

III. Vascular phenomena: major arterial emboli, septic pulmonary infarct, mycotic aneurysm, intracranial hemorrhage, conjunctival

hemorrhage, Janeway lesions

IV. Immunologic phenomena: glomerulonephritis, Osler's nodes, Roth spots, rheumatoid factor

V. Microbiologic evidence: positive blood cultures but not meeting major criterion or serological evidence of active infection with organisms

consistent with endocarditis

VI. Echocardiogram consistent with endocarditis, but not meeting the major criteria

Possible infective endocarditis

Findings consistent with infective endocarditis but falling short of "definite" but not "rejected"

Rejected

Firm alternative diagnosis for manifestations of endocarditis or

Resolution of manifestations of endocarditis with antibiotic therapy for 4 days or

No surgical or pathologic evidence of infective endocarditis with 4 days of antibiotics

Frequent Sites of Endocarditis Vegetations

Upstream sides of the valve:

Atrial side of the mitral valve

Ventricular side of the aortic valve

Points where a high-velocity jet impinges on the valve or wall (jet lesions)

Prosthetic valves, vegetations at the prosthetic ring and/or along the edge of a high-velocity flow

Congenital heart disease with abnormal shunt

Endocarditis Diagnosis by Transthoracic Echocardiography Limitations

Resolution: invisible when less than 3mm
Underestimation the vegetation size
Need better precordial windows (20%)
Limitations in degenerative change, metallic valve and atrial appendage
Endocarditis Diagnosis By Echocardiography Sensitivity and Specificity

Sensitivity
M mode echocardiography: 52%
Two D echocardiography: 79%
TTE: 62%
TEE: 92%
Specificity: TTE and TEE > 90%

PED-P01

Panoramic Ultrasound Application in Newborn Screening Program

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Background: Panoramic ultrasound can create a consecutive elongated image by moving the transducer across the desired field and is useful for thyroid and musculoskeletal system in adult. In addition to nationwide newborn screening program conducted for congenital metabolic disorders, selective ultrasound screening is also available for brain, heart, abdomen, kidney and hip joint in Taiwan. In this study, we have tried to investigate this technique in the neonatal spinal assessment within three months old.

Materials and methods: The newborns delivered in a local women's and children's hospital during June, 2023 to July, 2024 were enrolled under the free will for self charged spinal ultrasound survey. Real-time extended field-of-view composite imaging, acquired in SonoCT mode, was operated with linear array probe via three pediatricians (one neonatologist/ two neurologists) since March, 2024.

Results: Totally 632 infants were received spinal ultrasound screening and 54 cases needed to follow up among 2242 live births. Sagittal plane panoramic vertebral image from thoracic-lumbar-sacrum to coccyx combined with spinal cord, conus medullaris and filum terminale could soon be identified. However, perfect imaging was obtained in only about one-quarter of 335 cases due to fidgety movements and primitive truncal incurvation reflex. The follow-up rate reduced from 8.27% to 6.84% after new procedure intervention. The babies suffered from intradural lumbar lipoma, enlarged filar cyst and low conus suspect tethered cord were transferred to medical center for advanced management.

Conclusion: Panoramic scanning technique could be performed by medical personnel as the quick spinal defect survey, but delicate image and final diagnosis still relied on professional physician. Artificial intelligence modules and associated robotic devices might be also engaged in the future.

(Key words: Spine, Ultrasound, Newborn screening, Spinal ultrasound, Panoramic ultrasound)