

Ghana Journal of Echocardiography

Introduction and Welcome!

Welcome to the first issue of the Ghana Journal of Echocardiography! It is my sincere hope that this journal becomes an important source of information and communication for Ghana echocardiographers (and beyond..). The first issue includes an article which provides an overview of mitral stenosis and provides the recommendations of the American Society of Echocardiography (ASE) on how to assess the severity of mitral stenosis. A Sonographer Communication discussing the advantages and disadvantages of sonographer credentialing is presented.

There is an invitation to contribute to one or more of the following sections of the journal:

Original Investigation

Pathology Review

Physician Communications

Sonographer Communications

Ghana Echocardiography News and Calendar

Reader Services

Authors are encouraged to submit to one or more of the above – please submit to

reynoldsterry58@gmail.com

The Ghana Journal of Echocardiography will be published quarterly.

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Guidelines and Standards

Mitral Stenosis (MS)

Echocardiography plays a major role in decision-making for mitral stenosis, allowing for confirmation of diagnosis, quantitation of stenosis severity and its consequences, and analysis of valve anatomy. The American Society of Echocardiography (ASE) published echocardiography guidelines for the evaluation of mitral stenosis – the following is a review of the pathology and a presentation of the ASE recommendations.

Definition

Mitral stenosis is the narrowing of the mitral valve orifice impeding the diastolic flow of blood from the left atrium to the left ventricle.

Etiology

- Rheumatic fever (99%) Mitral stenosis is the most frequent valvular complication of rheumatic fever. Even in industrialized countries, most cases remain of rheumatic origin as other causes are rare. Given the decrease in the prevalence of rheumatic heart diseases, MS has become the least frequent single left-sided valve disease. However, it still accounts for 10% of left-sided valve diseases in Europe and it remains frequent in developing countries.
- Congenital (e.g.; parachute mitral valve, cor triatriatum, Shone's syndrome, double-orifice mitral valve)
- Non-rheumatic acquired mitral stenosis
- Severe mitral annular calcification
- Left atrial ball-valve thrombus
- Left atrial tumor (e.g.; left atrial myxoma)
- Infective endocarditis with obstructive vegetation
- Systemic lupus erythematosus
- Ergotamine induced; methysergide induced
- Antiphospholipid antibody syndrome
- Whipple's disease
- Pseudoxanthoma elasticum
- Rheumatoid arthritis
- Iatrogenic (e.g.; prosthetic mitral valve, mitral valve annuloplasty, MitraClip, radiation valvular injury)

History

- Dyspnea upon exertion (principal symptom) (80%)
- Hemoptysis (second most common presenting symptom)
- Chest pain (15%)
- Palpitations (due to atrial fibrillation)
- Syncope
- Heart failure
- Right heart failure

Physical Examination

- Irregularly irregular pulse
- Malar flush (mitral facies)
- Small-absent left ventricular impulse
- Parasternal right ventricular heave (suggests pulmonary hypertension)
- Blood pressure low normal;
- Ortner's syndrome (hoarseness)

Complications

- Mitral regurgitation (coexistent)
- Passive-Reactive pulmonary hypertension
- Left atrial thrombus (7 to 15%)
- Systemic embolization (20%) (80% of those in atrial fibrillation)
- Infective endocarditis (more common in mild mitral stenosis)
- Pulmonary edema, hemorrhage, embolism and/or infarction
- Decreased stroke volume, cardiac output, cardiac index
- Right heart failure

Cardiac Auscultation

- Opening snap
- Low pitched diastolic rumble best heard at the cardiac apex (pan-diastolic, mid-diastolic, pre-systolic)
- Crescendo presystolic accentuation of the diastolic rumble (due to atrial systole)
- Loud S1
- Accentuated P2 (pulmonary hypertension)
- Murmur of mitral, aortic, tricuspid and/or pulmonary regurgitation

Electrocardiogram

- Left atrial enlargement (P mitrale)
- Atrial fibrillation (50%)
- Evidence of pulmonary hypertension (e.g.; right ventricular hypertrophy, P pulmonale)

Chest X-Ray/CMR/CT

- Left atrial enlargement with normal left ventricular size (pure mitral stenosis) ("double density")
- Pulmonary venous hypertension with flow redistribution from the base to the apices ("cephalization of flow")
- Pulmonary edema (Kerley A lines, Kerley B lines)
- CMR demonstrates valve morphology, chamber dimensions, peak velocity, pressure gradient(s), and mitral valve area with planimetry

Cardiac Catheterization

- Coronary arteriography to identify underlying coronary artery disease (25%) (primary role)
- Transvalvular diastolic pressure gradient across the mitral valve (hallmark finding)
- Determines the mitral valve area by the Gorlin formula
- Exercise may be utilized to evaluate the change in the transmitral mean pressure gradient and pulmonary artery pressures
- Percutaneous mitral balloon valvuloplasty (PMBV) may be performed

Medical/Surgical Treatment

Medications may be useful to treat the secondary effects of mitral stenosis

- Diuretics
- Rate-controlling medications (beta-blockers, calcium channel blockers)
- Anticoagulants
- Antibiotics

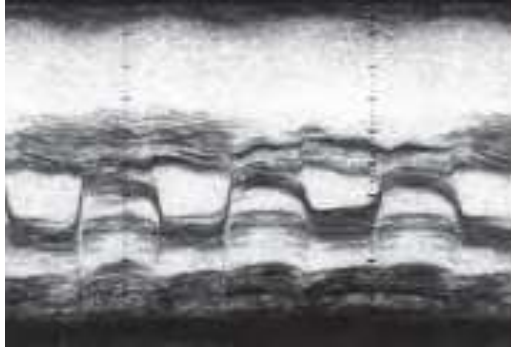
Surgical treatment may be indicated for moderate to severe mitral stenosis

- Open or closed commissurotomy
- Mitral valve replacement (MVR)

M-mode

The three cardinal M-mode findings for mitral stenosis are:

- Thickened mitral valve leaflets
- Decreased E-F slope
- Anterior motion of the posterior mitral valve leaflet



Two-Dimensional (2-D)

The three cardinal 2-D findings for mitral stenosis are:

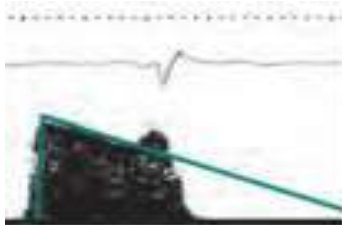
- Thickened mitral valve leaflets especially at the leaflet tips
- Diastolic doming ("hockey-stick") appearance of the anterior mitral valve leaflet
- Left atrial dilatation



Cardiac Doppler

The three cardinal cardiac Doppler findings for mitral stenosis are:

- Increased mitral peak E velocity (> 1.3 m/sec)
- Increased deceleration time (indicates increased mitral valve pressure half-time)
- Valvular regurgitation – mitral - due to the abnormal mitral valve leaflets; aortic regurgitation due to possible rheumatic involvement, tricuspid regurgitation due to possible rheumatic involvement and is associated with pulmonary hypertension; pulmonary regurgitation because of possible pulmonary hypertension



How to Assess the Severity of Mitral Stenosis according to the ASE

The ASE proposes three levels of assessment for mitral stenosis

- CW Doppler tracings acquired from the apical window
- In patients with atrial fibrillation, average five cycles with the least variation of R-R intervals and as close as possible to normal heart rates

Level One

- Mitral valve area planimetry using the parasternal short axis of the mitral valve in mid-diastole
- Determine the mitral valve area by the Doppler pressure half-time method ($220 \div \text{Pressure half-time}$)
- Determine the mean pressure gradient

Level Two

- Determine mitral valve area by the continuity equation
- Determine mitral valve area by the PISA method
- Determine mitral valve area and systolic pulmonary artery pressure with stress echocardiography

Level Three

- Determine mitral valve resistance

Mitral Stenosis Severity Scales – American Society of Echocardiography (ASE)

	Mild	Moderate	Severe
Specific findings			
Valve area (cm ²)	>1.5	1.0-1.5	<1.0
Supportive findings			
Mean gradient (mmHg) ^a	<5	5-10	>10
Pulmonary artery pressure (mmHg)	<30	30-50	>50

^aAt heart rates between 60 and 80 bpm and in sinus rhythm.

Multiple Choice Review Questions – Mitral Stenosis (MS)

1. The most common etiology (cause) of mitral stenosis is:
 - A. Rheumatic fever
 - B. Congenital
 - C. Severe mitral annular calcification (MAC)
 - D. Left atrial tumor (e.g.; left atrial myxoma)
2. The most common presenting symptom for mitral stenosis is:
 - A. Dyspnea upon exertion
 - B. Hemoptysis
 - C. Chest pain
 - D. Palpitations
3. Which is **NOT** considered a classic auscultatory finding for mitral stenosis?
 - A. Opening snap
 - B. Diastolic rumble
 - C. Accentuated P2
 - D. Ejection click

4. The **MOST** likely EKG finding for mitral stenosis is:
 - A. Atrial fibrillation
 - B. Premature ventricular contractions
 - C. Ventricular tachycardia
 - D. Sinus bradycardia
5. Which of the following is **LEAST** likely to be considered a treatment for mitral stenosis?
 - A. MitraClip
 - B. Catheter balloon valvuloplasty
 - C. Open commissurotomy
 - D. Mitral valve replacement
6. Which of the following is **NOT** considered a classic M-mode finding for mitral stenosis?
 - A. Thickened mitral valve leaflets
 - B. Reduced E-F slope
 - C. Anterior motion of the posterior mitral valve leaflet
 - D. Fine diastolic flutter
7. Which of the following is **NOT** considered a classic two-dimensional echocardiography finding for mitral stenosis?
 - A. Thickened mitral valve leaflets especially at the leaflet tips
 - B. Diastolic doming of the anterior mitral valve leaflet
 - C. Flail mitral valve
 - D. Left atrial dilatation
8. Which of the following would be a **LEAST** likely cardiac Doppler finding for mitral stenosis?
 - A. Increased peak E-wave velocity (greater than 1.3 m/sec)
 - B. Increased mitral valve deceleration time
 - C. Mitral regurgitation
 - D. Pulmonary valve stenosis
9. A mitral valve area of 0.9 cm^2 is calculated. The severity of the mitral stenosis is:
 - A. Normal finding
 - B. Mild
 - C. Moderate
 - D. Severe
10. A mean pressure gradient of 12 mm Hg is calculated for a patient with mitral stenosis. The severity of the mitral stenosis based on the mean pressure gradient is:
 - A. Normal finding
 - B. Mild
 - C. Moderate
 - D. Severe
11. The systolic pulmonary artery pressure using the tricuspid regurgitation method is calculated to be 52 mm Hg in a patient with mitral stenosis. How severe is the pulmonary hypertension?
 - A. Normal finding
 - B. Mild
 - C. Moderate
 - D. Severe

12. Which of the following is **NOT** considered a Level 1 method recommended for evaluating the severity of mitral stenosis?

- A. Mitral valve planimetry using the parasternal short axis of the mitral valve
- B. Mitral valve resistance
- C. Mitral valve area by the pressure half-time method
- D. Calculation of the mean pressure gradient

Answers: 1.A; 2.A; 3.D; 4.A; 5.A; 6.D; 7.C; 8.D; 9.D; 10.D; 11.C; 12.B

Original Investigations

The Ghana Journal of Echocardiography is currently accepting echocardiography - related original research investigations – **Please submit to reynoldsterry58@gmail.com**

Pathology Review

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Physician Communication

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Sonographer Communication

The Advantages and Disadvantages of Cardiac Sonographer Credentialing in Ghana and Beyond

In the United States, there are two organizations which provide testing for credentialing (certification) of cardiac sonographers in adult echocardiography and pediatric echocardiography.

American Registry for Diagnostic Medical Sonography (ARDMS) and Cardiovascular Credentialing International CCI are the two organizations which administer the echocardiography board examinations for sonographers.

The ARDMS requires two tests to be successfully passed in order to receive the registered diagnostic cardiac sonographer (RDCS) recognition. The sonography principles and instrumentation (SPI) examination is the ultrasound physics examination for ARDMS and the adult echocardiography (AE) examination is the ARDMS clinical specialty examination for adult echocardiography – both the SPI and the AE must be passed to earn the RDCS credential.

The CCI requires one examination to be passed to earn the registered cardiac sonographer (RCS) credential. Ultrasound physics, cardiovascular principles and adult echocardiography are presented in a 170 multiple choice questions format for the CCI adult echocardiography board examination.

Advantages of the RDCS or RCS Credential

Enhanced Employability

In the United States only four (of 50) states require cardiac sonographers to be credentialed. Due to a competitive job market though, most hospitals and cardiology clinics in the United States require registry status or will require successful completion of either the ARDMS or CCI credential within one year of employment.

Improved Salaries

Cardiac sonographers who are credentialed are recognized by the employer for their effort in earning their credential and pay is often higher compared to a cardiac sonographer who is not credentialed.

Clinical Knowledge

The ARDMS and CCI adult echocardiography board examinations are challenging with a pass rate of approximately 70%. Earning the RDCS or RCS credential demonstrates to the medical community and to each patient the sonographer has the privilege of serving that a certain level of clinical knowledge has been achieved.

Career Advancement

Becoming registered in adult echocardiography certainly will enhance a sonographer's opportunity for advancement in management and leadership roles. Teaching, research and manufacturer representative positions prefer registered cardiac sonographers versus non-registered.

Facility Accreditation

In the United States, echocardiography laboratories may acquire accreditation of their laboratory from the Intersocietal Accreditation Commission (IAC). The accreditation approval process is simplified if the cardiac sonographers employed in the laboratory possess the cardiac sonographer credential.

Disadvantages of the RDCS or RCS Credential

Cost

The primary disadvantage of becoming credentialed is that it is very expensive. Test fees, renewal fees and completing mandatory continuing medical education (CME) credits represents a financial challenge especially in Ghana.

For the ARDMS, the SPI exam costs \$275.00 and the adult echocardiography specialty exam costs \$250 – a total of \$525. There is a \$100 non-refundable processing fee plus a \$50 non-refundable fee if the test(s) are administered outside of the United States.

The CCI adult echocardiography exam costs \$365 which includes a \$100 non-refundable filing-resource fee.

In addition, the ARDMS requires a \$95 yearly renewal fee. The CCI requires a \$165 triennial (3-year) renewal fee.

Both the ARDMS and CCI require continuing medical education (CME) credits to be earned over a three-year period after becoming credentialed. The ARDMS requires 25 CME's and the CCI requires 36 CME's. Earning CME's usually incurs a cost.

Conclusion

ARDMS and CCI credentials have improved the quality of sonographers in the United States – the tests are challenging, requiring significant study time and the CME requirement assures that the sonographer is trying to keep pace with the ever-changing field of echocardiography. The costs involved represent a significant challenge for cardiac sonographers in Ghana. One solution is to establish a Ghana testing organization that would provide a board examination for ultrasound specialties which could include separate board examinations for the specialties of adult echocardiography, pediatric echocardiography, fetal echocardiography, vascular ultrasound, abdominal ultrasound, and obstetrics-gynecology (OB-GYN), and musculoskeletal ultrasound (MSK).

Who is up to for it in Ghana!

Important to Note

Physicians may also become echocardiography board certified by successfully passing the ASCeXAM - Examination of Special Competence in Adult Echocardiography. This exam is administered by the National Board of Echocardiography (NBE). The physician earns a Testamur or Diplomate (Board Certified) status. In addition, the NBE offers three other primary echocardiography examinations corresponding to different subspecialties, Basic PTEeXAM and an Advanced PTEeXAM – board examinations for perioperative transesophageal echocardiography and the CCEeXAM for special competence in critical care.

Ghana Echocardiography News and Calendar

Continuing education and meetings as well as noteworthy news related to echocardiography will be placed here. **Please submit to reynoldsterry58@gmail.com**

Reader Services

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West Africa School of Heart and Vascular Ultrasound (WASHVU)

Tamale, Ghana

12-month cardiovascular program – Adult Echocardiography – Carotid Ultrasound – Abdominal Aorta

Online one-on-one classroom lecture and hands-on training

Tuition free

All course materials provided without fees

Ultrasound machine – Ultrasound device provided without charge (Situation dependent)

Course Instructor – Terry Reynolds BS, RDCS

For further information and application, please contact: reynoldsterry58@gmail.com