# DOWNLOAD PDF ATLAS OF MITRAL VALVE REPAIR

## Chapter 1 : Atlas of Mitral Valve Repair â€“ Books Pics â€“ Download new books and magazines every da

*This full-color atlas with accompanying video DVD provides a complete and practical "how-to" guide to planning and performing mitral valve repair surgery for mitral regurgitation. The book reviews the natural history of mitral regurgitation, the functional anatomy of the mitral valve, and the use of echocardiography in preoperative evaluation and surgical planning.*

Mitral Valve Prostheses Fig. High image resolution enables the leaflets, annulus, and even sutures to be clearly demonstrated. Alfieri Stitch A year-old woman presented with long-standing mitral regurgitation, aortic regurgitation, and paroxysmal atrial fibrillation. She demonstrated increasing left atrial and left ventricular enlargement, which prompted surgical referral. Despite prominent mitral annular calcification, the surgeon was able to successfully repair her mitral valve, using plication of the middle scallop of the posterior leaflet, an Alfieri stitch, and placement of a mm annuloplasty ring. She also underwent replacement of the aortic valve with a 23 Carpentier-Edwards bovine pericardial heterograft, isolation of the pulmonary veins, and ligation of the left atrial appendage Figs. This appearance may be mistaken for mitral stenosis. The annuloplasty ring in short axis can be best appreciated at the posterior aspect of the annulus Fig. The Alfieri stitch can be seen joining the leaflet tips centrally. The annuloplasty ring is appreciated laterally. The posterior leaflet appears small and somewhat restricted, consistent with the known repair and plication of the middle posterior scallop Video  The annuloplasty ring in short axis can be best appreciated at the posterior aspect of the annulus AVI kb Video  The posterior leaflet appears small and somewhat restricted, consistent with the known repair and plication of the middle posterior scallop AVI kb  Valvuloplasty A year-old woman in previously excellent health presented with a cerebrovascular accident due to middle cerebral artery occlusion. She was emergently treated with fibrinolysis and achieved full recovery. She subsequently was found to have severe mitral stenosis, despite an absence of previous symptoms. She was anticoagulated and then referred for mitral balloon valvuloplasty, which was performed via a trans-septal puncture. This appearance is typical for rheumatic heart disease Fig. A septostomy has been performed in preparation for the valvuloplasty, and the catheter can be seen traversing the interatrial septum Fig. The leaflets are thickened, with commissural fusion and a resultant reduced valve area Fig. This appearance is typical for rheumatic heart disease AVI kb Video  A septostomy has been performed in preparation for the valvuloplasty, and the catheter can be seen traversing the interatrial septum AVI kb Video  The leaflets are thickened, with commissural fusion and a resultant reduced valve area AVI kb Video  Paravalvular Leak 1 A year-old woman with end-stage renal failure on hemodialysis presented with a severe paravalvular mitral valve leak, severe tricuspid regurgitation, and moderate aortic stenosis on a background history of previous bioprosthetic mitral valve replacement and coronary artery bypass graft surgery 3 years earlier. She underwent a mitral valve replacement with an On-X mechanical valve 33 , a tricuspid valve repair with a Carpentier ring 30 , an aortic valve replacement with a Trifecta bioprosthesis 23 , and coronary artery bypass graft surgery. Preoperative echocardiography demonstrated a paravalvular leak originating at the anterolateral aspect of the mitral annulus. The eccentric, regurgitant jet hugged the wall of the left atrium and was difficult to quantitate, but visually it appeared severe. Transvalvular peak and mean gradients of 17 and 9 mmHg were noted Figs. Paravalvular Leak 2 A year-old woman with a past history of mitral valve replacements 20 and 27 years previously now presents with hemolytic anemia, atrial fibrillation, and a small 5 mm mitral paravalvular leak with severe tricuspid regurgitation. She has symptoms of right heart failure with evidence of fluid overload. She has known biventricular dysfunction, with implantation of an implantable cardiac defibrillator. Echocardiography demonstrated biventricular enlargement. She successfully underwent her third cardiac surgery involving mitral valve replacement with an On-X mechanical valve 33 and a tricuspid valve repair with a Carpentier classic annuloplasty ring 30 Figs. A small paravalvular region of defect can be seen adjacent to the lateral aspect of the valve Fig. A small paravalvular region of defect can be seen adjacent to the lateral aspect of the valve AVI kb Video  Paravalvular Leaks 3 A year-old woman presented with mild exertional dyspnea and mild hemolytic anemia. Her background history included myxomatous mitral valve disease, for which she underwent mitral

valve replacement over 10 years ago, followed by replacement with a porcine valve and tricuspid repair 3 years ago. The vena contracta measured 0. Otherwise, there was only trivial valvular regurgitation, with no restriction of leaflet excursion. The peak and mean gradients were 22 and 6 mmHg. The tricuspid valve repair appeared intact, with only trivial regurgitation and a mean gradient of 4 mmHg Figs. Bioprosthetic Mitral Valve Replacement and Pseudoaneurysm A year-old woman was referred with a history of coronary artery bypass graft surgery and bioprosthetic aortic 21 and mitral 25 valve replacements for aortic stenosis and mitral regurgitation 2 months earlier. The surgery had been complicated by severe mitral annular calcification and bleeding from the AV groove and posterior ventricle, which required a pericardial patch. She now reported worsening symptoms of heart failure, and echocardiography demonstrated partial dehiscence of the mitral valve with a resultant severe, posterior paravalvular leak measuring 1. The aortic valve replacement was well seated, with only trivial regurgitation. Reoperation was performed involving removal of the old prosthesis, unroofing and repair of the pseudoaneurysm, and replacement of the mitral valve with a Biocor 29 prosthesis. Log In or Register to continue Share this:

# DOWNLOAD PDF ATLAS OF MITRAL VALVE REPAIR

## Chapter 2 : Mitral Valve Repair | Cleveland Clinic

*This full-color atlas provides a complete and practical "how-to" guide to planning and performing mitral valve repair surgery for mitral regurgitation. The book reviews the natural history of mitral regurgitation, the functional anatomy of the mitral valve, and the use of echocardiography in preoperative evaluation and surgical planning.*

Preoperative and intraoperative echocardiography has become an indispensable tool for guiding mitral valve surgery and has fostered the development of many innovative surgical techniques. Mitral valvuloplasty is now an established surgical method for the treatment of mitral insufficiency but the success is largely dependent on the extent of the underlying disease of the mitral valve. The book by Dr. Ng and coauthors is an extraordinary presentation of the relation between echocardiographic display of mitral valve pathology and reconstructive mitral valve surgery. The atlas provides an excellent illustrative guide to teach echocardiographic-anatomic correlations and educates the reader on the techniques of mitral valve repair. The quality of the illustrations, particularly the surgical photographs is exquisite. The book will be helpful for cardiologists and cardiac surgeons. This thorough revision of Color Atlas of Congenital Heart Surgery features vividly reproduced intraoperative images taken with a special side-mounted flash. They convey exquisite perception of depth in the operative field in full color. The atlas presents surgical techniques for the full spectrum of cardiac congenital anomalies. This includes revised and updated text on many topics such as repair of straddling tricuspid valve associated with the posterior ventricular septal defect. Throughout the text, the carefully labeled photographs provide vivid representation of three-dimensional spatial relations of congenital anomalies and surgical anatomy. Elsevier Health Sciences Format Available: Accurately identify complex geometrical distortions of cardiac anatomy using 3-D echocardiography and make more informed decisions regarding diagnosis and treatment. A highly visual, consistent, and practical format with online videos and more presents the authoritative, case-based, expert guidance you need to enhance your utilization and interpretation of this cutting-edge, dimensional diagnostic tool. Master the application of techniques to specific clinical situations with detailed case studies and discussions of challenging issues. See imaging findings as they appear in practice and discern subtle nuances with the aid of high-quality still images plus online videos. Reference the information you need quickly thanks to easy-to-follow, templated chapters, with an abundance of images and figures that facilitate visual learning. Take it with you anywhere! Access the full text, downloadable image library, videos, and more at www. Sharpen your interpretive and diagnostic skills in 3-D echo! Find Your eBooks Hereâ€¦.

## Chapter 3 : Atlas of Mitral Valve Repair

*The Mitral Valve Repair Center at Mount Sinai offers patients the highest percentage of mitral valve repair available anywhere in the world. Our mitral valve repair rates (99%) and quality (<1% mortality) are national benchmarks.*

In between the left atrium and the left ventricle is the mitral valve. Heart valve leaflets, also known as flaps or cusps, open-and-close as the heart beats so that blood is kept flowing along the correct path. When the valve is damaged, blood may leak back into the atrium or there may be insufficient room for the blood to flow properly into the ventricle. This heart valve disorder is known as mitral valve regurgitation and may require mitral valve repair surgery. Other names for this valvular defect are mitral insufficiency and mitral incompetence. To help you learn about mitral valve repair surgery, I recently filmed this video with Dr. In this video, Dr. Adams provides patients great advice about mitral valve repair surgery. Most of the approximately 99, heart valve surgeries perform annually in the United States are to replace or repair either the aortic or mitral valve. If the mitral valve insufficiency is mild, the physician may opt to use medications ACE inhibitors, beta blockers to treat the symptoms while monitoring the patient for changes. In the most severe cases, a mitral valve repair or mitral valve replacement are needed. Different Types Of Mitral Valve Repair Surgery Advances in surgical techniques now make it possible to repair many damaged valves, especially those resulting from a congenital birth defect. There are several procedures that a surgeon might use to perform a mitral valve repair. If the valve has narrowed mitral valve stenosis and the mitral leaflets have thickened or become fused, the surgeon may perform a commissurotomy. With this procedure, the surgeon cuts the points where the cusps meet, thus opening the valve. The surgeon may choose a similar technique, called reshaping, wherein a section of the mitral valve flaps are removed and the cusp is then sewn together again. Annuloplasty shown below is a technique aimed at repairing the fibrous tissue at the base of the heart valve -- the annulus. Sometimes, the annulus becomes enlarged, which enables blood to back up into the atrium. To repair this, sutures are sewn around an annuloplasty ring to make the opening smaller. If calcium has built up on the mitral valve cusps, it can be removed by a procedure called a decalcification, which may allow the calcified mitral valve to close as they should. The surgeon may also patch tears or holes in the valve leaflets. Finally, the surgeon may need to shorten or replace the cords, the papillary muscles and chordae tendineae, that support the valve. This machine keeps oxygenated blood coursing through the body while the heart is stopped for surgery. Open-heart surgery is performed while the patient is asleep, so a general anesthesia will be used. The patient will be connected to a respirator, which will control his or her breathing during surgery. Minimally Invasive Mitral Valve Repair Some patients may be able to undergo minimally invasive surgery for mitral valve repair. This technique requires a smaller incision, typically resulting in shorter hospital stays, faster recoveries, and less pain. However, patients who are obese or who have atherosclerosis are normally not candidates for this technique. Also, if your surgery requires treatment of two valves, the minimally invasive approach is not available to you. In some hospitals, the surgeon can perform robotic surgery, another minimally invasive surgical procedure. The tools of robotic mitral valve repair surgery are a control console, a system of vision, and a cart with robotic arms. Small incisions are made and instruments are placed inside the incisions. The surgeon then uses the control console to make the wrist and hand movements necessary for the surgery. Percutaneous Mitral Valve Repair In addition to minimally invasive approaches to mitral valve repair mini-thoracotomy, port access , new percutaneous devices use catheters to treat mitral regurgitation without causing trauma to the ribs or sternum. For example, the MitraClip by Abbott Laboratories is one such device. Recovering From Mitral Valve Repair Most patients spend about five days in the hospital following mitral valve surgery. As a rule, patients are advised to avoid driving for six weeks after surgery. Office workers can typically return to their jobs in six to eight weeks. Those with more physically strenuous jobs may need a longer recovery period before they return to work. Patients are normally advised to stop smoking at least two weeks before valve surgery. Some medications, such as aspirin or anticoagulants, may need to be stopped or the dosage adjusted in the days leading up to surgery. Patients should also monitor their health closely and advise their surgeon if they experience any symptoms of a cold or flu, such as chills, fever, congestion, drainage or coughing. In ,

Adam founded HeartValveSurgery. This award-winning website has helped over 10 million people fight heart valve disease.

## Chapter 4 : Mitral Valve Repair Surgery

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Our surgeons have special expertise in mitral valve repair. As a consequence, at Cleveland Clinic, nearly all leaking mitral valves are repaired rather than replaced. And for those with isolated mitral valve problems, the majority of operations are performed robotically or minimally invasively, ensuring rapid recovery. In , patients traveled to Cleveland Clinic from all 50 states and countries for their cardiovascular care. What are the symptoms of a leaking mitral valve? Many patients with mitral valve disease are asymptomatic have no symptoms , even with a leak that is severe. When symptoms develop, they include shortness of breath, fatigue, loss of energy, swelling of the ankles and palpitations extra or skipped heart beats. How is a leaky mitral valve diagnosed? The first step involves listening with a stethoscope. Using a stethoscope, the doctor hears a murmur , which represents turbulent blood flow across an abnormal valve. The diagnosis is confirmed by an echocardiogram. Ultrasound is used in an echocardiogram to allow the doctor to visualize the heart valves and determine the severity and cause of the leak. In most patients, a standard transthoracic echocardiogram a probe placed on the skin of the chest is adequate to visualize the valve. Sometimes a transesophageal echocardiogram a probe passed through the mouth into the esophagus is necessary to more closely visualize the valve; this is an outpatient procedure. What is mitral valve prolapse? Mitral valve prolapse is a common condition in which the mitral valve leaflets are floppy or loose. Mitral valve prolapse is diagnosed by echocardiography. Most patients with mitral valve prolapse do not have a leaky valve and do not require surgery. When a valve with prolapse has a severe leak, surgery should be considered. Mitral Valve Prolapse What are the indications for surgical repair of a leaking mitral valve? Surgery should be considered when the leak is severe. In most facilities, the regurgitation leak is graded on a scale from 0 to 4, with 0 being no leak and 4 being a severe leak. Surgery should be considered in virtually all patients with a leak that is graded as a 4 severe and in some patients with a leak that is graded as a 3 moderately severe. When a patient with mitral regurgitation develops symptoms, a decrease in heart function, or an increase in heart size, surgery is recommended. Surgery should also be considered when a patient develops atrial fibrillation, which is an irregular heartbeat. Surgery is also recommended in many asymptomatic patients who have a severe leak; in these patients, surgery improves long-term survival. What is the chance that a leaky mitral valve can be repaired? The most common cause of mitral regurgitation is a condition called degenerative mitral valve diseaseâ€”this is also called mitral valve prolapse, myxomatous mitral valve disease, and a floppy mitral valve. What is the chance that a leaky mitral valve can be repaired minimally invasively? We offer several different minimally invasive approaches, including a small incision on the right chest, a small incision in the mid-line, and robotically assisted procedures. Expertise with several approaches enables us to determine the best procedure for each patient, optimizing results.

## Chapter 5 : Mitral Valve Prostheses | Radiology Key

*Atlas of Percutaneous Edge-To-Edge Mitral Valve Repair by Ted Feldman The field of structural heart disease interventions is experiencing a stage of rapid growth with the development of percutaneous mitral valve repair therapies and percutaneous aortic valve replacement therapies.*

Video-atlas on minimally invasive mitral valve surgeryâ€"the Mohr technique Martin Misfeld, Friedrich W. Accepted for publication Oct 29, Minimally-invasive mitral valve surgery was introduced into the surgical routine by Alain Carpentier, one of the pioneers of mitral valve surgery, in 1. It was at this time that minimally-invasive access was also performed at the Leipzig Heart Center for the first time. Since then, this technique has become routine at our institution with an annual number of up to cases 2. It has been shown to be a safe technique not only in patients with impaired left ventricular function 3 and in patients of advanced aged 4 , but also in selected patients who have had a previous sternotomy 5. In the majority of cases, the mitral valve is operated under direct vision. However, some cases are performed using pure videoscopic vision, as it has been promoted by Hugo Vanerman and others 6. The goal of minimally-invasive mitral valve surgery is to perform the operation with the same high repair rate compared to conventional mitral valve surgery through a median sternotomy and without putting the patient at a higher surgical risk. Avoiding sternotomy has major advantages for the patient, such as decreased surgical trauma and therefore improved recovery, less postoperative pain and improved cosmesis. These issues are of major importance for patients. There are, however, specific contraindications to this access, which have to be taken into account. In particular, a heavily calcified mitral valve annulus or severe annular abscess formation with the need to perform extensive annular reconstruction techniques should necessitate a conventional approach. Previous right chest surgery with severe adhesions of the right lung to the chest wall is an additional contraindication to minimally-invasive access. In all other cases, minimally-invasive access can be used to perform the surgery. This technique simplified even complex repairs of mitral disease using initially self-manufactured polytetrafluoroethylene neochordae Gore-Tex loops , which became later available as premanufactured loops in different lengths. This technique has been shown to achieve excellent surgical results with a very high rate of mitral valve repair even in complex mitral valve pathologies 2. Description of the surgical technique The minimally-invasive approach needs to be standardized. There are, however, small variations in the individual operative set-up of different surgeons who perform this technique at our institution. Cannulation of the groin vessels Following an oblique incision of about 3 cm over the right groin, the femoral artery and vein are dissected only superficially. In all patients undergoing isolated mitral valve surgery over 75 kg in weight, an additional venous neck cannula is placed preoperatively into the superior vena cava by the anesthetist to improve venous drainage. In cases of poor venous drainage, an additional cannula can also be placed into the superior vena cava through minimally-invasive access. If the femoral artery is not suitable for cannulation due to severe calcifications, or in cases in which retrograde aortic perfusion is not recommended, cannulation of the axillary artery may be an option. The patient is put on-pump before the right chest is entered. This enables free access to the pericardium without the need to use a double lumen tube. It is very helpful to mark the anticipated area of skin incision before the foil is applied, because, especially in women, the foil is used to push the breasts anteriorly and superiorly. It is also advisable to mark the midline of the sternum, in case urgent sternotomy is required. Conversion to full sternotomy must be available at all times! In obese women with large breasts, it is very useful to enter the chest superior to the breast after the right breast has been pushed downwards. The surgical incision into the thoracic cavity should obey the following principle: Retraction sutures can be placed on the diaphragm for better visualization of the pericardium or the diaphragm can be pushed away using a flexible blade, which is fixed in between the lower rip and the retractor. The first additional incision should be positioned anteriorly in a safe distance to the right internal thoracic artery. The incision for the cross-clamp should be directed towards the ascending aorta, without putting any force onto the aorta after the left atrium has been retracted. Care must be taken to avoid interference with the camera, which should be inserted anterior and superior to the cross-clamp, achieving a direct view of the mitral valve. One or two of these additional

incisions can be used later for getting the chest drains out. Visualization of the mitral valve Following incision of the pericardium about 3 cm above the phrenic nerve, pericardial retraction sutures may be applied and brought out laterally. Using a purse string suture, a needle vent is brought into the aortic root for application of cardioplegia and later venting of the aortic root. After aortic cross clamping, the left atrium is entered through the interatrial groove. It is advisable to apply the cross-clamp during a short duration of complete circulatory arrest to avoid the potential risk of aortic dissection. The left atrium is lifted up using a retractor blade, which is available in different sizes and lengths. In some cases, the blade used for pushing the diaphragm away can also be used to improve visualization of the mitral valve by pushing the inferior part of the left atrial incision downwards. Mitral valve repair using the loop technique After assessing mitral valve pathology, adequate lengths of premanufactured Gore Tex loops are placed onto the specific papillary muscle PM. The lengths of the loops are calculated using a special measuring caliper. The measuring device is placed onto the tip of the relevant PM and at the free edge of the leaflet to measure the adequate length of the neo-chords. On average, the mean length for the posterior leaflet is between mm and for the anterior leaflet between mm. Each set of neo-chords is composed of four loops, which are anchored to the specific PM by getting two sutures through the muscle, which are then knotted over two teflon pledgets. The free edges of the loops are then positioned at the corresponding free edges of the leaflets using an additional Gore suture for each loop. It is important to anchor the loops in the body of the PM to prevent tearing of the loops and to grasp enough leaflet tissue. If less than four neo-chords are necessary, two loops may be sutured to the leaflet at once. The maximum number of loops is therefore 16, with eight loops to each leaflet and eight loops coming from each PM. For a simple posterior leaflet prolapse P2, loops in the majority of cases coming from the postero-medial PM are enough to accomplish an adequate reconstructive result. Each repair is secured and followed by stabilizing the annulus in a standard fashion. Following left atrial and left ventricular de-airing maneuvers, the cross-clamp is released again during a short period of circulatory arrest and a pacing wire is attached to the right ventricle while the heart is still empty. Finally, the patient is weaned from cardio-pulmonary bypass and the mitral valve repair is assessed by transesophageal echo. If the repair is adequate and adequate de-airing has been performed, cardiopulmonary bypass in reinstituted and the root vent is removed. The patient is then again weaned from bypass. Following decannulation and insertion of one or two chest tubes, the thorax is closed in a routine fashion. In summary Minimally-invasive mitral valve surgery can be used as a standard technique for mitral valve surgery, even in complex cases of mitral valve repair. Minimally-invasive mitral valve surgery offers decreased surgical trauma, less pain, improved cosmesis and quicker recovery, which are the major advantages of this technique over conventional access through full sternotomy and of most importance for patients. The authors declare no conflict of interest. Open heart operation under videosurgery and minithoracotomy. First case mitral valvuloplasty operated with success. Comparison of outcomes of minimally invasive mitral valve surgery for posterior, anterior and bileaflet prolapse. Eur J Cardiothorac Surg ; Mitral valve pathology in severely impaired left ventricles can be successfully managed using a right-sided minimally invasive surgical approach. Mitral valve surgical procedures in the elderly. Ann Thorac Surg ; Minimally invasive mitral valve surgery after previous sternotomy: Mitral valve surgery can now routinely be performed endoscopically. Circulation ; Suppl 1: Chordal replacement for both minimally invasive and conventional mitral valve surgery using premeasured Gore-Tex loops. How does the use of polytetrafluoroethylene neochordae for posterior mitral valve prolapse loop technique compare with leaflet resection? A prospective randomized trial. J Thorac Cardiovasc Surg ; Misfeld M, Mohr FW. Video-atlas on minimally invasive mitral valve surgeryâ€”the Mohr technique. Ann Cardiothorac Surg ;2 6:

## Chapter 6 : Atlas Of Mitral Valve Repair | Download eBook PDF/EPUB

*Mitral valve repair is the gold standard procedure for patients who require surgery for mitral valve disease. This is particularly important in the setting of degenerative disease where repair rates of close to % are achievable (2).*

Castillo, Federico Milla, Anelechi C. Adams, MD, Professor and Chairman. Median sternotomy has unquestionably evolved over recent decades. Modern sternotomy involves a cm lower midline skin incision, tunneling of the subcutaneous tissues with subsequent creation of myocutaneous flaps, full sternotomy, and standard cardiopulmonary bypass techniques with central cannulation. Modern sternotomy; complex mitral valve repair Submitted Sep 18, Accepted for publication Sep 27, Regardless of the surgical approach 3 , minimal access vs. Herein we demonstrate the less invasive approach we typically use for repair at the Reference Mitral Valve Center at Mount Sinai, the hallmark of which is a limited cm lower midline incision, tunneling, full sternotomy, and standard cardiopulmonary bypass techniques with central cannulation. Technique The patient is placed in a recumbent position with both arms tucked at each side. Prior to skin prep, a straight line is marked from the sternal notch to the xyphoid. The lower border of the ribs is marked bilaterally and the lower border of the breast is also delineated in females Figure 1A. The skin is next prepped and draped from the neck to the knees allowing exposure of subclavian and femoral vessels in the event that access is needed. A cm incision is made in the lower portion of the chest and the incision is carried down to the sternum. The fascia overlying the pectoralis muscle is freed providing more laxity to the skin and the subcutaneous tissue for better retraction and exposure. The insertion of the pectoralis muscle to the sternum is left intact. Once visualization of the sternal notch is accomplished, the midline of the manubrium and the sternum can be identified and marked with Bovie cautery for subsequent sternotomy. In the absence of xyphoid calcification, this is split in half with Bovie cautery to allow insertion of the sternal saw. Once the skin and subcutaneous tissue have been mobilized and the midline identified and marked from the xyphoid to the sternal notch, a reciprocating saw is used to divide the sternum from the xyphoid upwards as far as the skin incision allows. Hemostasis of the sternum is then obtained with Bovie cautery and bone wax. An extension to the Bovie can be attached to reach the upper manubrium and hemostasis can be obtained for the crossing veins in the region of the suprasternal notch. These can sometimes become a nuisance as the distance makes it difficult to place sutures or clips. In this scenario, hemostasis of the suprasternal notch can be accomplished after placing a retractor. We shorten the retractor blades to facilitate the use of smaller incisions while still using the same soft-tissue atrial retractors that attach to the edges of the blades Figure 1C. The thymic tissue is then lifted off the pericardium and spared, which minimizes soft tissue dissection leading to less scarring and potential venous bleeding. The pericardial sac is then opened using the aorta as the midline. Division is carried superiorly to the pericardial reflection on the ascending aorta leaving mm of pericardium that can be used by pericardial stay sutures to lift the aorta towards the incision. The division of the pericardial sac is then completed inferiorly in a standard fashion. The pericardial edge on the right side is then grasped with two soft-tissue clamps Figure 1B , the retractor is then removed and then re-applied, sandwiching the pericardium between the retractor blade and the right sternal edge Figure 1C. The clamps allow the surgeon to pull the pericardium while the retractor is opened, which further lifts the right atrium and cava towards the skin edge improving exposure and minimizing the distance between the skin edge and the heart. Once this is performed, the aorta is scanned with epiaortic ultrasound prior to cannulation. Heparin is then administered and cannulation sutures can be placed on the aorta. A clamp can be used to retract the aorta inferiorly into the field, and the skin in the upper border of the incision can be pulled superiorly with a hand-held retractor to expose the distal portion of the ascending aorta for cannulation. If the distance is too great, or the angle of exposure is too difficult, a Fem-Flex Edwards Life sciences LLC cannula is placed in the ascending aorta using a Seldinger technique. Cannulation of the vena cava is facilitated with the use of smaller cannulas, size 24 French, and we typically use vacuum assistance. Retrograde cardioplegia is used routinely on all mitral procedures via standard coronary sinus cannulation. This provides better exposure of the valve by shortening the distance from the atriotomy to the mitral valve. Once dissection is complete, CPB is instituted. A standard

antegrade is then established in the ascending aorta with a side-port for root suction. We do not routinely use caval tapes as this further crowds the field and is not required with vacuum assistance. The cross-clamp is applied and antegrade cold blood cardioplegia is infused for a 5-minute period, followed by cold blood retrograde cardioplegia given every 20 minutes for approximately four minutes. An insulation pad is placed along the inferior wall of the heart and topical slush is placed over the right ventricle. The field is also flooded with carbon dioxide. Excellent exposure of the mitral valve is achieved via a curvilinear incision extended inferiorly to the midpoint between right inferior pulmonary vein and the inferior vena cava. If further exposure of the left atrium is required, the pericardial reflection on both vena cava is released and blunt dissection is used to free the lateral aspects of both veins for about 2 to 3 cm. In addition, the left pericardial reflection can be released fully opening the left pleural space. The mitral procedure Figure 2A-C can then be performed as demonstrated in the video, with ample exposure of the valve to enable employment of the same mitral repair techniques available through any other incision including a standard size cm sternotomy. There is also sufficient exposure for tricuspid and aortic valve repair or replacement if needed. Once the procedure is completed, weaning from CPB and decannulation is standard. The protamine is then administered and once hemostasis is assured, the sternum is closed with wires in a standard fashion. Once the wires are placed, the subcutaneous tissue is closed, tacking the fascia to the periosteum of the sternum and manubrium in order to obliterate space created by the tunneling at the beginning of the procedure. If the dissection or tunneling was particularly lengthy it may be difficult to completely close the space between the soft tissues and the sternum. In this setting, in order to avoid the potential formation of a seroma, two techniques can be performed: Typically, this drain remains in place for days to ensure fluid removal and can be removed once the daily output is below 50 cc of fluid. Figure 2 Mitral valve analysis revealed a complex valve with multisegment prolapse and different degrees of subvalvular calcification and fusion A ; repair techniques included gap closure between P2 and P3, quadrangular resection of P1-P2, asymmetric sliding plasty and resection of a calcified papillary muscle to mobilize the posterior leaflet B ; final repair after ring annuloplasty shows a symmetric line of coaptation with a satisfactory saline test C ; a 7. Closure of the skin often requires the circumferential removal of 1 mm of skin from the wound, as retraction often devitalizes the skin and may lead to superficial dehiscence and a larger scar. The skin can then be closed with standard absorbable sutures Figure 2D. The postoperative care is no different than any standard-sized open sternotomy approach.