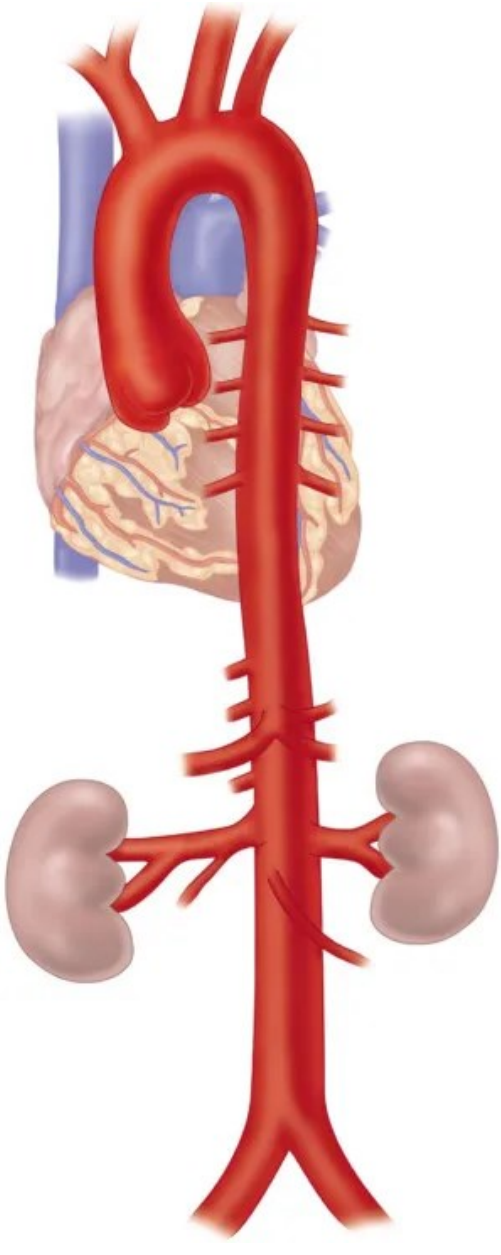
Acute Aortic Syndrome

Patient Education



University of Vermont Health

Center for Aortic Diseases

Questions for Your Aortic Team

Welcome Letter

Being diagnosed with aortic disease can be very anxiety producing and comes with many questions about treatment and management options. We appreciate this and the serious nature of your condition.

At UVM Medical Center, we have a multidisciplinary team of experts to help guide you through your treatment options and recovery. We are dedicated to providing the best, most comprehensive, care to help manage your **chronic and/or acute aortic disease**. Acute aortic disease requires prompt diagnosis, immediate intervention which sometimes will be life-saving surgery. Chronic aortic disease is appropriately managed through lifelong care with visits by your surgeons and imaging tests. Your aortic team will work closely with you to explain and offer appropriate treatment options, unique to each patient.

To help navigate this process our team, including our Aortic Nurse Program Coordinator, will work closely with you to answer any questions you may have and to discuss next steps. Please feel free to contact them throughout this process. We are thankful for the opportunity to work with you and your family along this journey.

Sincerely, Your UVM Aortic Team

Fuyuki Hirashima, MD
Division Chief of Cardiothoracic Surgery
Cardiothoracic Surgeon
Co-Director UVM Health -
Center for Aortic Diseases

Daniel Bertges, MD
Division Chief of Vascular Surgery and
Endovascular Therapy
Vascular and Endovascular Surgeon
Co-Director UVM Health -
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Caitlyn King, RN BSN
Clinical Program Coordinator
UVM Health - Center for Aortic Diseases

Table of Contents

Our Aortic Team

Cardiothoracic Surgery

Fuyuki Hirashima, MD - Division Chief: Thoracic and Cardiac Surgery
Frank Ittleman, MD - Thoracic and Cardiac Surgery
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Monica McDonald, MD - Thoracic and Cardiac Surgery
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Mead Ferris III, MD - Vascular Surgery and Endovascular Therapy
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Joshua Price, MD - Pediatric and Adult Congenital Heart Disease

Radiology

Pedro Staziaki, MD - Cardiothoracic Radiologist
Ryan Walsh, MD - Program Director, Diagnostic Radiology

Clinical Program Coordinator for Aortic Diseases

Caitlyn King, RN BSN

University of Vermont Center for Aortic Diseases is the only clinic of its kind in the region, bringing together a multidisciplinary team of vascular and cardiothoracic surgeons, cardiologists, radiologists, emergency room attendings, and critical care intensivists to diagnose and treat complex aortic diseases. Our team will work closely with you to develop a comprehensive and personalized treatment plan that minimizes your risk of serious complications and helps you live a full, healthy life.

Excellent outcomes: We track patient outcomes in national quality improvement registries, such as the Vascular Quality Initiative (VQI) and The Society of Thoracic Surgeons. Our outcomes consistently meet and exceed national benchmarks.

Advanced treatments: We offer cutting-edge, minimally invasive procedures to treat serious aortic conditions, including endovascular surgery.

State-of-the-art imaging: Our vascular laboratory and hybrid operating room are equipped with the modern aortic imaging equipment required for accurate diagnoses and perform advanced endovascular aortic procedures.

UVM Medical Center

Pharmacy Locations and Hours

- **1 South Prospect St, Level 1 Lobby Burlington, VT**
  Monday—Friday, 8:30 am—5:00 pm
- **111 Colchester Ave, Main Campus, Level 3 Lobby, Burlington, VT**
  Monday—Friday, 7:30 am—9:00 pm
  Saturday—Sunday, 8:30 am—5:00 pm
- **792 College Parkway, Fanny Allen, Medical Office Building, Suite 103, Colchester, VT**
  Monday—Friday, 8:30 am—5:00 pm

Laboratory Locations and Hours

- **1 South Prospect St, Level 1 Lobby Burlington, VT**
  Monday—Friday, 8:00 am—4:30 pm
- **111 Colchester Ave, Main Campus, Level 2, Burlington, VT**
  Monday—Friday, 8:30 am—5:00 pm
  Saturday—Sunday, 7:00 am—3:30 pm
- **792 College Parkway, Fanny Allen, Medical Office Building, Colchester, VT**
  Monday—Friday, 7:00 am—3:30 pm
  (By appointment only)

Other Services

- **Billing/Patient Financial Services**
  802-847-8000
- **Case Management and Social Work**
  802-847-3553
- **Patient Information**
  802-847-0000
- **Patient and Family Advocacy**
  802-847-3500

Parking

When you arrive at UVM Medical Center Main Campus, you can park in the underground parking garage. This is a paid garage that accepts cash, checks, and credit cards. You can also pull up to the front entrance, and we will valet park your car.

Valet parking is available from 6 am—5 pm and pick up is available until 9 pm. For pick-up after 9 pm, please call 802-847-2812. There is no charge for parking or valet if you have a handicap plate or tag.

Hotels and Lodging

UVM Medical Center has arrangements with several local Vermont hotels to provide discounted room rates (when available) to patients and family members who have to travel to Burlington from out of town.

For information about room rates and availability, contact the hotel or motel directly and mention that you're inquiring about UVM Medical Center patient and family discount.

For more information, check our uvmhealth.org webpage—Patients & Visitors > Visitor Information & Amenities > Hotels & Accommodations.

At UVM Medical Center, we never forget that the people we treat are fathers, sisters, children, loved ones. When you turn to us for your health care needs, we provide you with the kind of care you deserve – nationally recognized medical treatment, informed by the latest thinking and delivered with an individualized touch.

University of Vermont Health

Meds to Beds Program

What is Meds to Beds?

Discharging from the hospital should be about healing— not hassle. We know that after a hospital stay, the last thing you want to do is wait in line at the pharmacy. The Meds to Beds program is a free, convenient service that brings your prescriptions directly to your hospital room before you leave— so you can skip the pharmacy stop and head straight home to rest and recover. We work closely with your care team to ensure you go home with all the medications you need.

Getting your medications delivered to your room before discharge helps prevent missed doses, supports your recovery, enhances knowledge about your treatment plan, and reduces the chance of returning to the hospital— all while saving you time and stress.

How Does it Work?

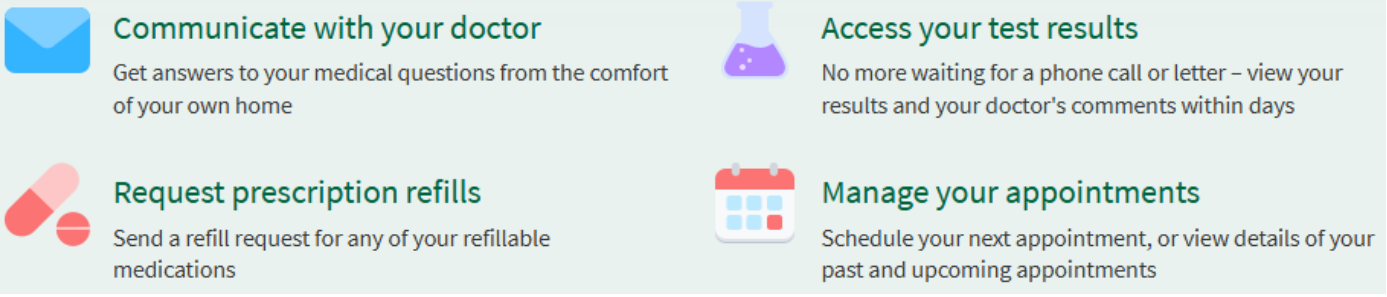
Step #1: As your discharge is approaching, your hospital provider will send medication orders to the ACC Outpatient Pharmacy.

Step #2: Our team of pharmacists will work with social work, nursing team, and providers to triage medication related issues and find the best medication therapy to fit your needs.

Step #3: One of our pharmacy team members will deliver your discharge medications to your bedside and provide education about your treatment plan.

MyChart

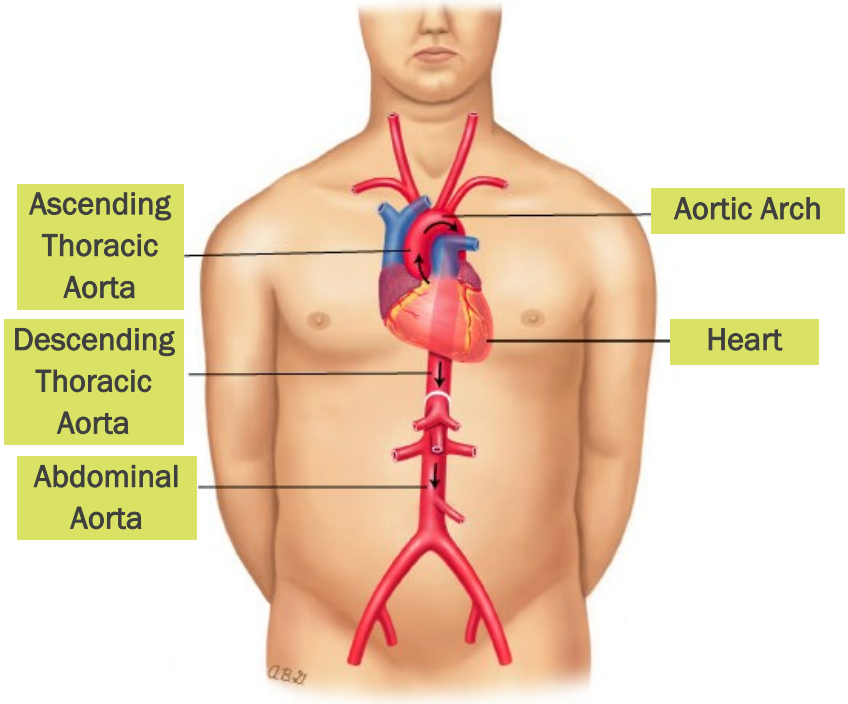
MyChart, your personalized patient portal, is simple to use and keeps you connected to your health care — from wherever you are. If you need further assistance, our technical support team is available 24 hours a day, seven days a week at 1-888-979-1414.



Scan QR Code for quick link to MyChart

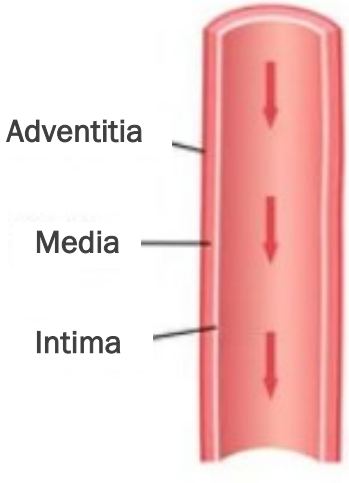
The Aorta

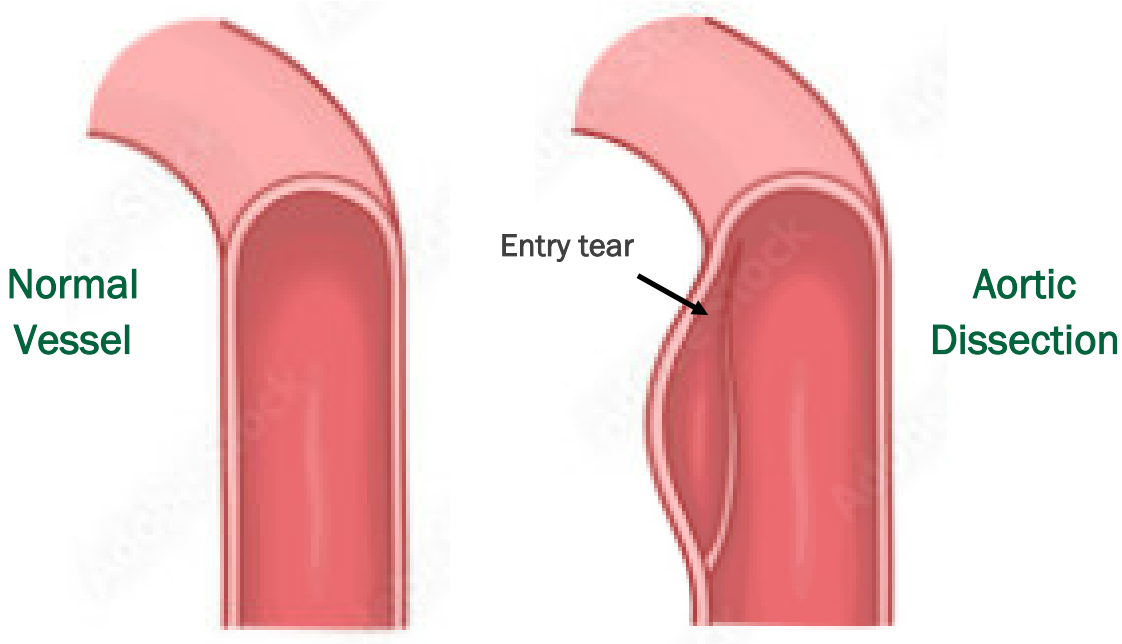
- The aorta is the largest artery in the body. Blood flows out of the top of the heart through the aortic valve into the aorta. Blood then flows down through the chest (**Thoracic Aorta**), into the abdomen (**Abdominal Aorta**) where lastly it splits into two blood vessels that supply each leg (**Iliac Arteries**).



The Aortic Wall is divided into 3 parts:

- Tunica intima – This is the deepest layer, which is in contact with blood. This layer is very thin and prone to injury.
- Tunica media – This is thick, muscular, middle layer of the aorta. It forms the largest part of the wall.
- Tunica adventitia – This is the outermost layer of the aortic wall. It has the greatest flexible strength of all the three layers.





Aortic Dissection

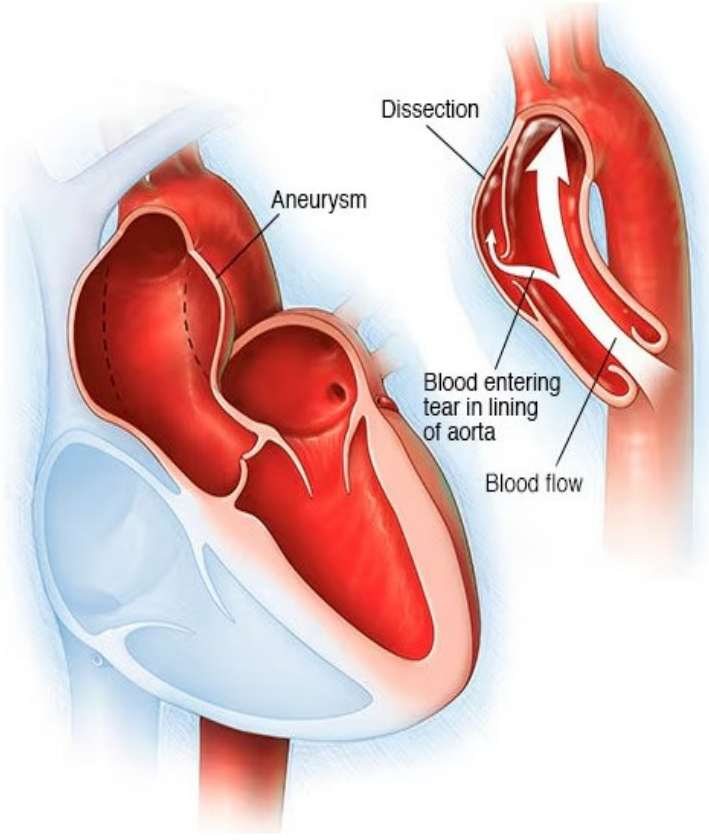
What is an Aortic Dissection?

Involves the aorta (the largest blood vessel in the body) and is a condition that causes sudden and severe pain the chest, back or belly.

An **aortic dissection** can happen anywhere in the aorta. The innermost wall layer of the aorta gets damaged and tears (see page 8 for anatomy of the aortic wall) and separates from the other layers (dissects).

This allows blood to enter between the layers of the wall, creating an abnormal “false” channel through which the blood travels.

It can cause less blood flow to the vessels that branch off the aorta to different organs and limbs.



This can lead to problems like:

- Heart attack
- Spinal cord or Brain damage
- Kidney damage
- Intestinal problems
- Lack of enough blood flow to arms or legs

A dissection can occur suddenly (acute) or be present for years (chronic).

These are emergencies!

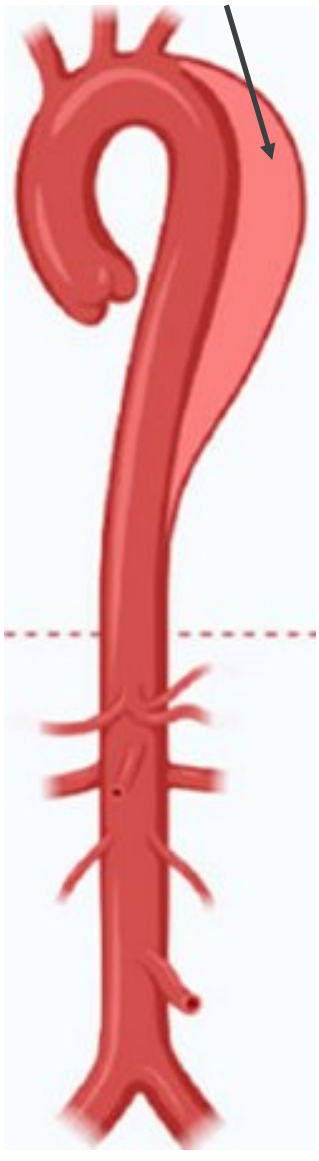
The wall of the aorta can burst open (RUPTURE) and cause internal bleeding and even death.

Risk Factors for Aortic Dissection

Aortic Dissections can happen as a result of:

- High blood pressure (hypertension)
- Smoking (past or present)
- Hardened arteries and high cholesterol (atherosclerosis)
- Certain genetic diseases or Connective Tissue Disorders
- A preexisting growing aneurysm
- Spontaneous occurrence
- After Trauma (blunt injury or during instrumentation in surgery)
- Inflammation
- Bicuspid Aortic Valve (congenital disease of the aortic valve, the patient has two leaflets instead of three)

Aortic Dissection



Other potential risk factors for aortic dissection include:

- **Sex.** Men are more likely to have aortic dissection than women.
- **Age.** Aortic dissection is more likely in people age 60 and older.
- **Cocaine use.** This drug raises blood pressure quickly
- **Pregnancy.** Dissections can occur in otherwise healthy women during pregnancy (not common)
- **High-intensity weightlifting** and other strenuous resistance training may raise your risk of aortic dissection by increasing blood pressure sharply during the activity.

Symptoms of an Aortic Dissection

An aortic dissection causes sudden, severe, sharp, and "tearing/ripping" pain in the chest, neck, back (between shoulder blades) or belly.

People can have other symptoms depending on the location of the aortic dissection.

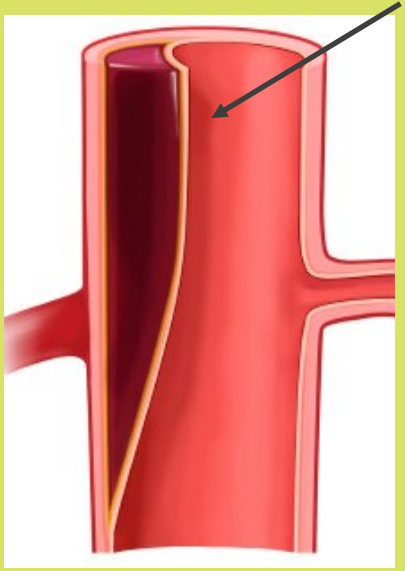
- If blood flow to the brain is affected, a person might faint or pass out, have trouble talking or moving part of their body
- If blood flow to the heart is affected, a person might feel like they are having a heart attack
- If blood flow to the arms or legs is affected, a person's arms or legs might feel cool to the touch or become painful

Other Signs and Symptoms:

- Shortness of breath
- Weak pulse in one arm or leg compared to the other
- Difficulty walking
- Heart murmur
- Low Blood pressure (common in **Type A**)
- Hypertension or high blood pressure (common in **Type B**)

*see pages 14-16 for location and dissection types

Aortic Dissection with Flap



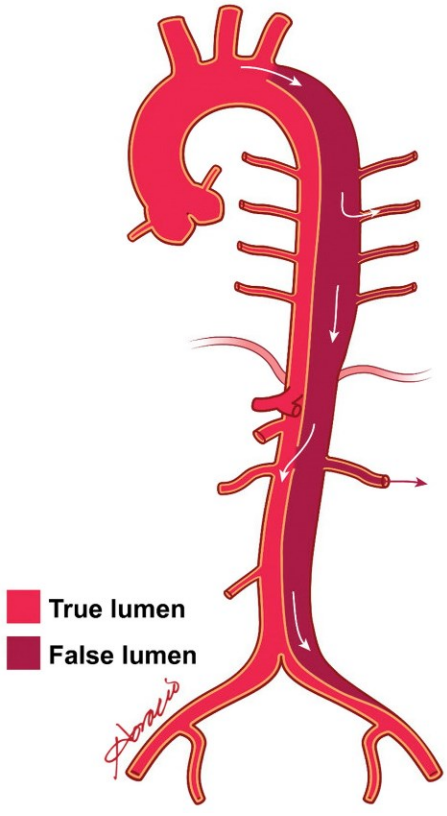
All these symptoms indicate a serious complicated disease and need intervention!

Once the acute dissection is managed, symptoms usually go away. Aortic dissections can develop without any symptoms, although this is uncommon.

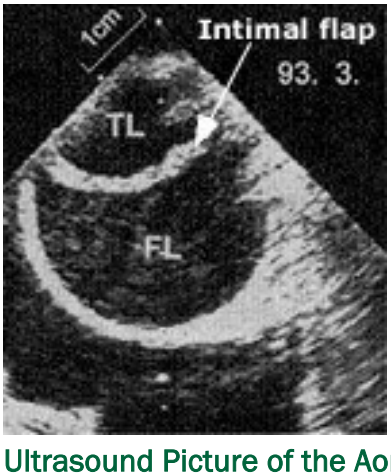
Tests for an Aortic Dissection

Tests that show the doctor that there is a tear in the aorta include:

- **Chest X-Ray** - this does not show the tear or dissection, but can show whether the aorta is wider than normal
- **CT Angiogram (CT scan with IV contrast)** - this test shows the blood vessels and can show where the tear is located. It can also help the doctor see if blood flow to important organs or limbs is affected. This is usually done if an aortic dissection just happened because of speed in which it can provide information
- **MRI Angiogram** – is similar to a CT angiogram, but is not as readily available or as fast for an urgent diagnosis. A MRI might be performed later to check the aorta after treatment
- **Echocardiogram (ECHO)** - this is an ultrasound of the heart and first part of the aorta. It can be done:
  - **Transthoracic** – meaning the doctor puts a thick wand on a persons chest and movies it around (non-invasive)
  - **Transesophageal** – meaning the doctor puts a tube with a wand down a person's mouth into the esophagus where they can view the heart and aorta from the back side.

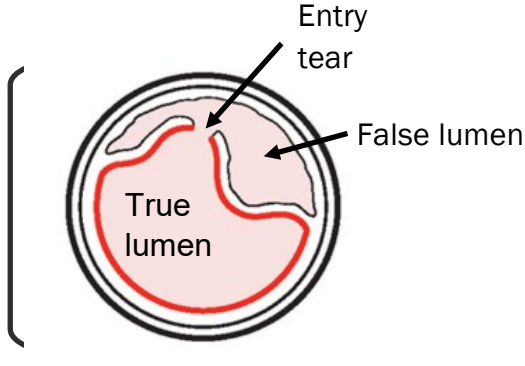


Imaging diagnosis of aortic dissection requires the identification of two distinct lumens (two different channels, or a separation of the vessel by a **"FLAP"**).
These two channels are called the **"TRUE"** and **"FALSE"** lumen.
Sometimes the flap may or may not be obvious. There may also be evidence of clot.



Ultrasound Picture of the Aorta
TL—True lumen
FL– False lumen

Looking Down the Aorta with Dissection **(Top View)**



Locations of Aortic Dissection

Type A Dissection

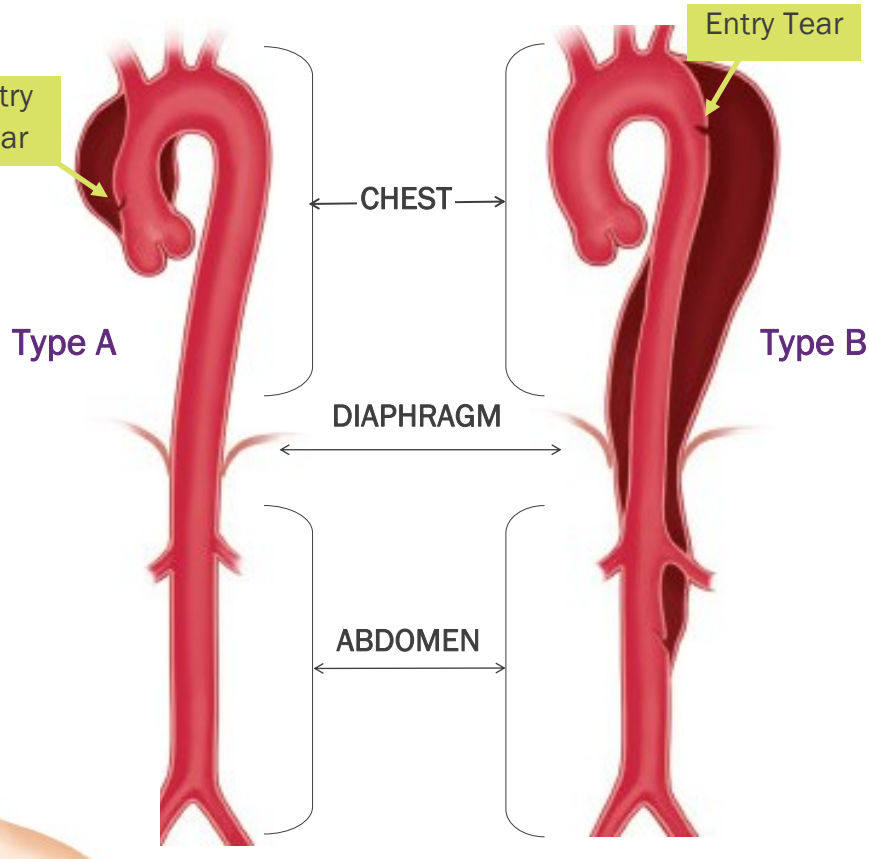
The entry tear is found in the beginning of the aorta, right next to the heart. Can involve the **aortic root** and **ascending aorta**, and can extend into the **aortic arch.**

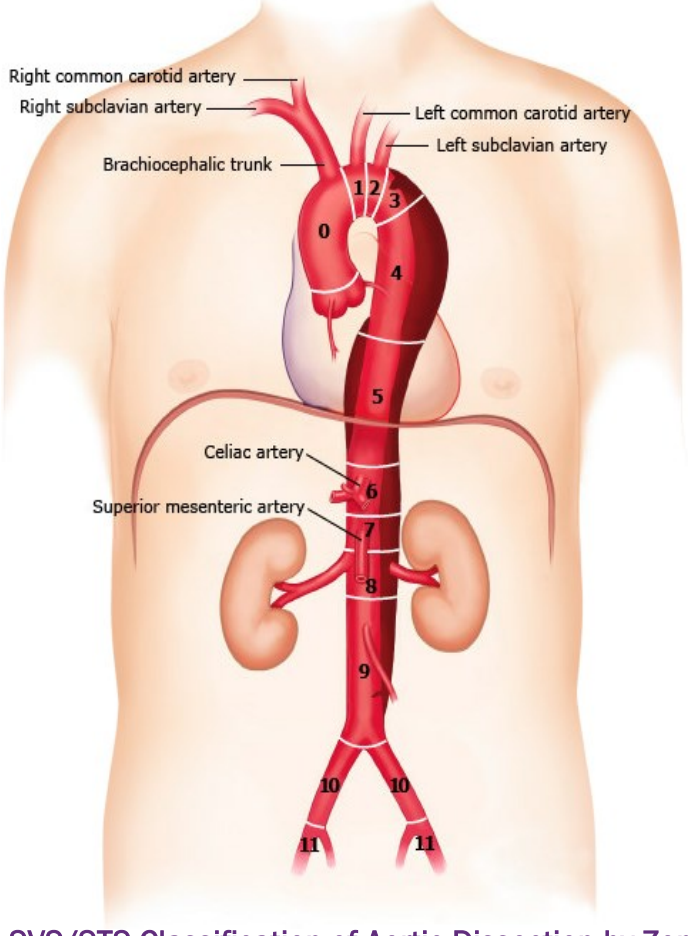
*Further discussed on *page 15*

Type B Dissection

The entry tear is found in the **descending thoracic aorta** and can extend to the lower abdominal aorta.

*Further discussed on *page 16*





SVS/STS Classification of Aortic Dissection by Zone

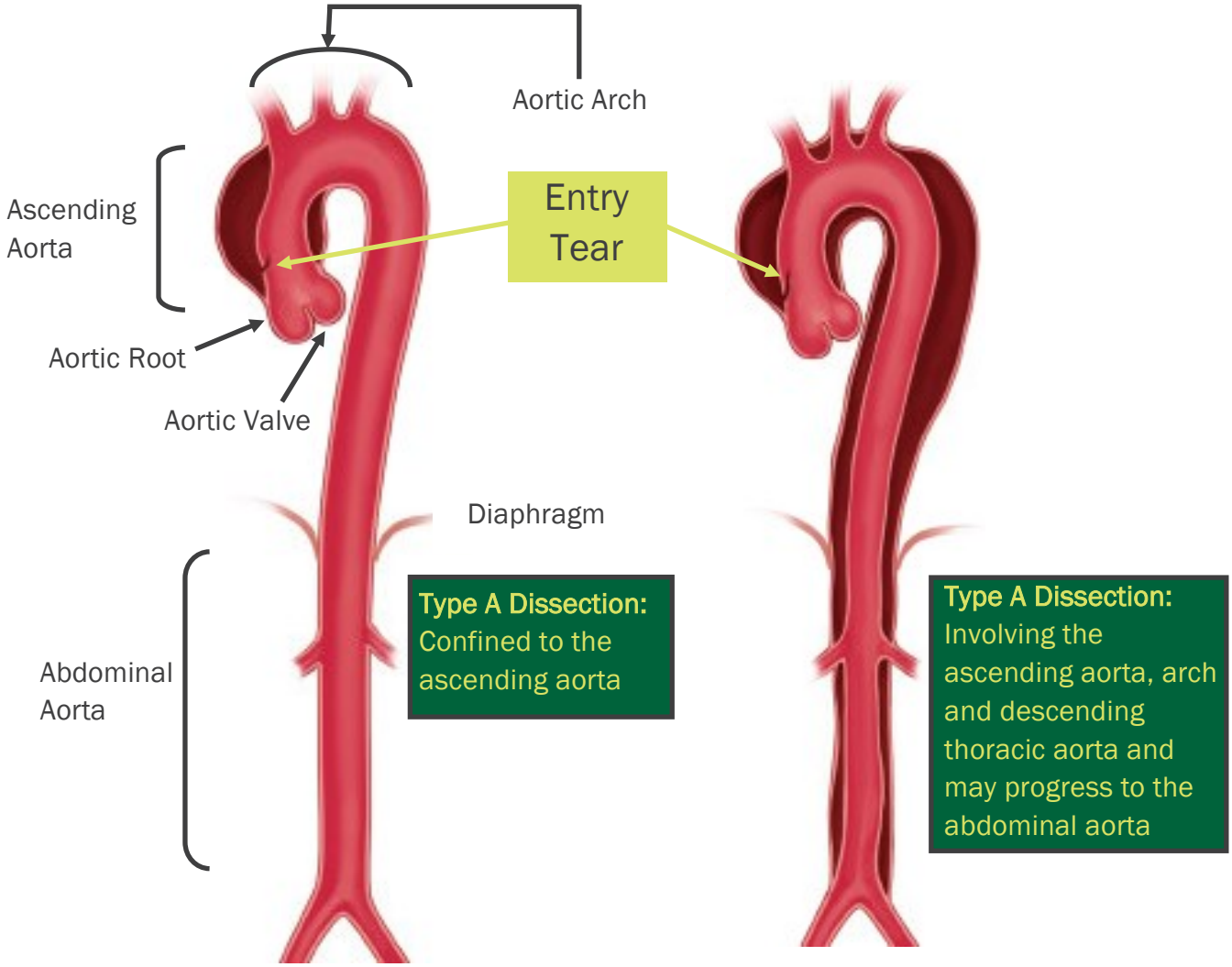
Classification of Aortic Dissection by Zone

Type A - Originates in Zone 0
Type B - Originates in Zone 3 and can terminate in Zone 9.

Type A Dissection

A dissection involving the **aortic root** or **ascending aorta** is treated right away with surgery**.** This type of aortic dissection is an **EMERGENCY**. If not promptly repaired it can damage the heart (cause bleeding around the heart, aortic valve can malfunction, stroke, aortic rupture, or heart attack) and lead to death.

- Surgery should happen quickly, but initial therapy can include efforts to normalize blood pressure and heart rate and control bleeding if present.
- There is limited role for endovascular repair in a Type A Dissection
- Typically a Type A dissection needs immediate Open Surgery. Often times, after a Type A Dissection is surgically repaired, a **residual Type B Dissection** (see page 16) needs close monitoring long term.
- Please reference pages 19 & 20 for an overview of Open Surgical Repair



Type B Dissection

Treatment depends on a person's symptoms with a Type B Dissection

- Often after a Type A Dissection is repaired, a residual Type B Dissection remains.
- **Lifelong imaging and follow-up is required.** Frequent at first, then yearly thereafter if stable

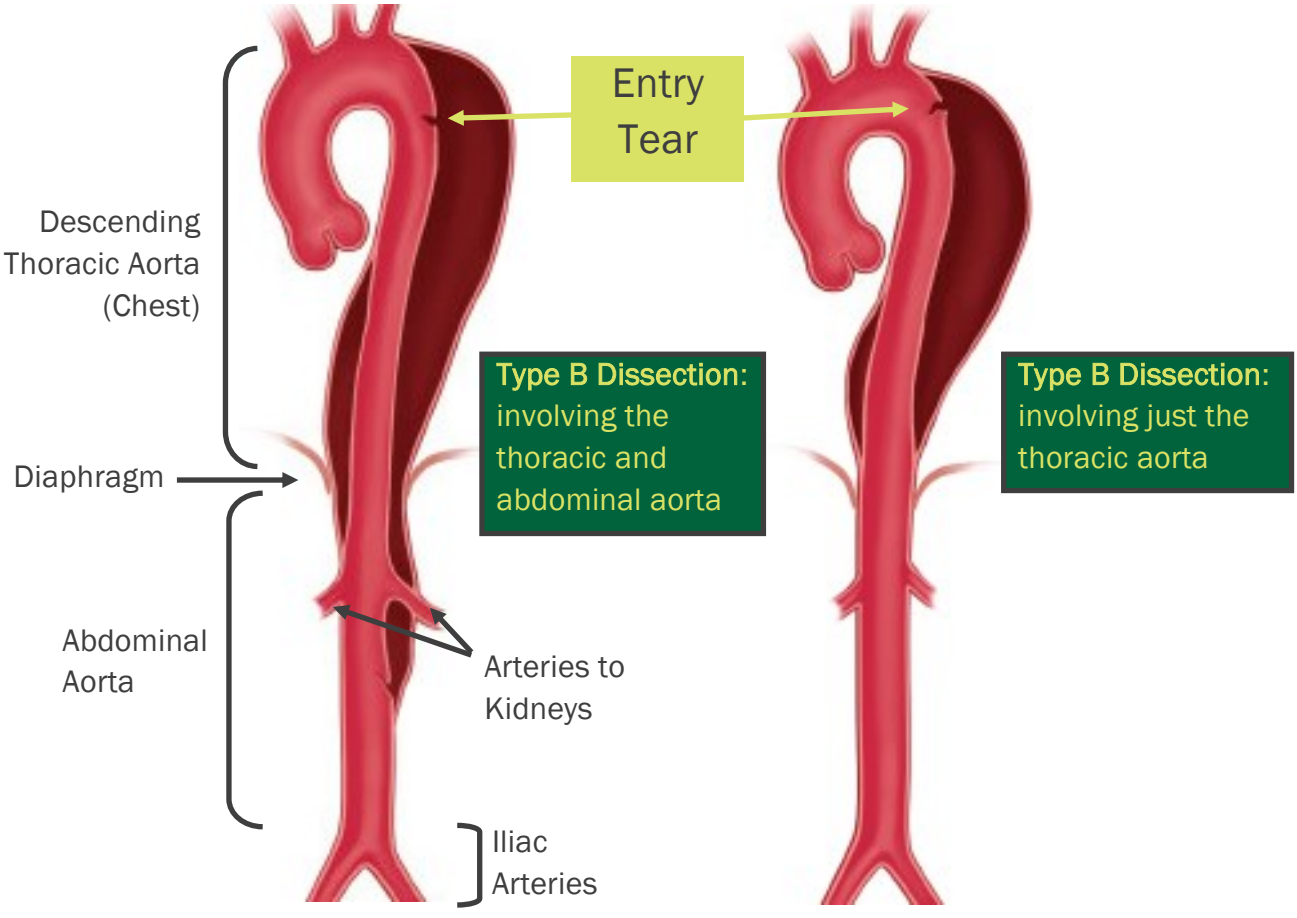
Stable vs Unstable

Stable (Uncomplicated): means no evidence of limb or organ damage, and pain and blood pressure are well controlled The primary treatment of an uncomplicated Type B Dissection is **medical.** Focused on strict **heart rate** and **blood pressure** control

- Heart rate goal 60-80
- Blood pressure goal less than 120/80
- The goal is to reduce stress on the aortic wall to:
  - Prevent progression of the dissection
  - Prevent ischemia to organs and limbs (reduced blood flow)
  - Prevent aneurysm growth
  - Reduce risk of aortic rupture

Unstable (Complicated): means there is: evidence of aortic rupture or impending rupture, uncontrolled pain, damage to organs or limbs, uncontrolled blood pressure, and/or rapid aortic diameter expansion (increasing aneurysm size).

- **Surgical repair** is indicated, see pages 21-23 for more information



Long-Term Management

- Ongoing Medical Therapy - consists of heart rate and blood pressure control with medications.
  - **Target blood pressure is 120/80 (or as advised by your providers).** Take your blood pressure 3 times a day at home, keep a log of those readings, and report at your physician appointments. Bring your home blood pressure device to your appointments occasionally to calibrate and ensure accuracy.
  - **Target heart rate 60-80 beats per minute.** This will be managed by your primary care doctor and cardiologist
- Smoking & Substance Use - Cigarette smoking and tobacco are major risk factors for complications (rupture/growth/dissection) for aortic disease.
  - Quit smoking now! Call 1-800-QUIT-NOW (1-800-784-8669); visit smokefree.gov; visit cdc.gov/tips
  - DO NOT TAKE STIMULANTS such as ephedra, cocaine, amphetamines and prescription medication that increase blood pressure, as these may trigger acute dissection or worsen the existing dissection.
- Starting a Statin or other cholesterol lowering medication and Aspirin are common for cardiovascular health.
- Activity & Exercise - Avoidance of strenuous physical activity or heavy lifting will be discussed with your doctor. *If your dissection was recent, you may have stricter weight-lifting and activity restrictions for a certain period of time.*
  - Before starting exercise, make sure your blood pressure is well controlled.
  - Exercise is part of a healthy lifestyle because it can lower your blood pressure. It should be included in the treatment plan for all patients with aortic disease.
  - Moderate aerobic activities (walking, jogging, running, yoga, pilates) are SAFE.
  - Lifting light weights is OK, as long as you stop well before you can't do another rep. Heavy weightlifting (like bench pressing) should be avoided as this movement can sharply and quickly increase blood pressure. In general, limit weight lifting to less than 50lbs.
  - Sexual activities are safe.
  - Avoid contact sports.
- Screening of genetic conditions for yourself and family members
- Lifelong Imaging Surveillance (determined by your medical team)
  - Aortic dissection causes the aortic wall to be weaken and the aorta is at risk for expanding in size (aneurysm). You will need tests to see if and how quickly yours is growing. Depending on how big your aorta has dilated or how fast it is growing, a plan will be developed by the surgery team to determine how often imaging needs to be done and the need for treatment. Your surgeon and radiologist will measure your aortic diameter from the tests
- Avoid a Class of Fluoroquinolone Antibiotics (such as ciprofloxacin and levofloxacin commonly used to treat urinary and respiratory infections) as they may be associated with an increased risk of aortic aneurysm or dissection.
  - Discuss this with your PCP or prescribing provider. There are many different antibiotics under this Class.

Mental Health and Well-being

Living with Aortic Disease

Individuals who have experienced aortic disease (dissection or those who are at risk of aortic dissection) often experience diverse emotional reactions due to their health status.

Navigating the recovery and management of aortic disease is often confusing and overwhelming. Aortic disease is a lifelong chronic disease that is often accompanied by feelings of isolation, anxiety and/or depression and sometimes PTSD. It is important to help patients validate their feelings and establish healthy relationships that can help them cope with their diagnosis.

Aortic Hope

aortichope.org

Mission: serves a community of patients, survivors, and caregivers living with aortic disease.

Aortic Dissection: The Patient Guide (free booklet on website)

John Ritter Foundation for Aortic Health

johnritterfoundation.org

The foundation words to fund research, provide education and raise awareness of thoracic aortic aneurysm and dissection.

johnritterfoundation.org/mental-health

The John Ritter Foundation for Aortic Health has supported the development of educational resources addressing mental health topics.

Life With Aortic Disease: Caring For Your Mental Health (free booklet on website)

THINK AORTA US

www.thinkaorta.us

thinkaorta.us/think-family

#ThinkAortaThinkFamily

Campaign committed to saving lives by increasing the correct identification and diagnosis of aortic dissection. #ThinkAortaThinkFamily

Aortic Dissection: The Patient Guide (free booklet on website)

Aortic Bridge

www.aorticbridge.org

Public charity whose members include patients with aortic disease, survivors of aortic operations, care givers, medical professionals, nurses and physicians.

Goal: to provide support and education for patients, families, care givers, health care professionals and physicians with respect to aortic disease.

Aortic Dissection Awareness

aorticdissectionawareness.org

National patient charity for Aortic Dissection in the UK & Ireland.

Mission: to ensure that every family affect by this disease has access to the best available information, care and support.

Aortic Dissection: The Patient Guide (free booklet on website)

Type A Dissection Surgery

Open Surgical Repair

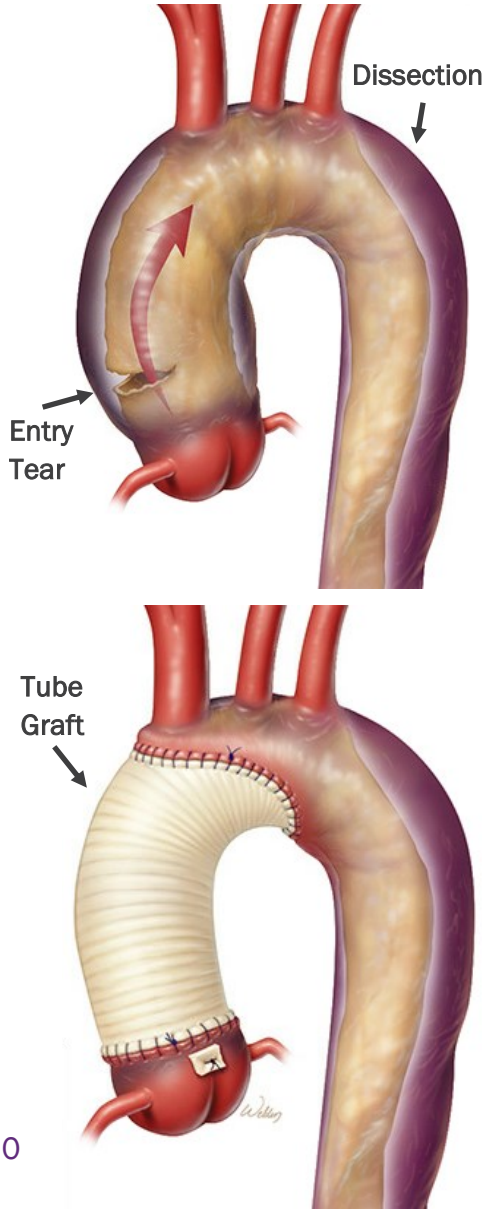
Treatment aims to replace the part of the aorta with the defect, the entry tear. The goal is to preserve the integrity of the artery (blood vessel) and prevent the tear from expanding and causing damage to the heart. Sometimes your aortic valve will also need to be replaced or repaired if it is effected by the dissection.

If the dissection involves the aortic root and/or ascending thoracic aorta (**Type A dissection**: the part closet to the heart), it needs to be repaired with open surgery.

- Thoracic aortic dissection repair involves open heart surgery, cardiopulmonary bypass and sometimes circulatory arrest.

Procedure

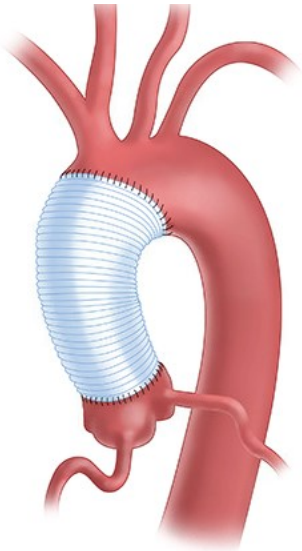
- Performed under general anesthesia.
- The doctor will need to cut open your chest/breastbone or make an incision in the side of your chest to get to your aorta.
- They will place clamps on the aorta to stop blood from flowing through.
- Then, they will replace the damaged part of the aorta with a prosthesis made of synthetic fabric material (known as a tube **graft**) that is sutured into place. If there are problems with other parts of the aorta, its branches, or the heart valves, these can also be fixed during open surgery.
- The doctor might need to stop your heart for a short time and place you on cardiopulmonary bypass (also called the "heart-lung machine"). This machine takes over the work of your heart while the aorta is being fixed. The machine keeps blood flowing throughout your body. After the graft is in place, the doctor restarts your heart, remove the clamps, and blood flows normally through the graft.
- If work is being done on the aortic arch, blood flow to your brain may be stopped for a short period of time. Your brain is protected by cooling the body during surgery and helps reduce the risk of stroke or brain damage (called deep circulatory hypothermic arrest).
- The doctor will close the incision with skin glue and either cover with clean bandages or leave open to air
- This procedure often takes 6-8 hours, sometimes longer



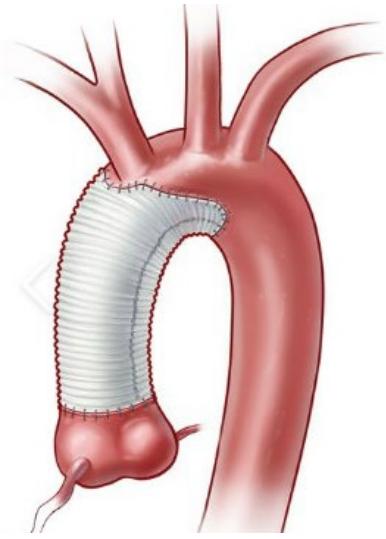
- Types of Open Thoracic Aortic Surgery are discussed on page 20
- Risks of Surgery are discussed on page 24
- Post-Operative Care is discussed on page 28

Type A Dissection Surgery

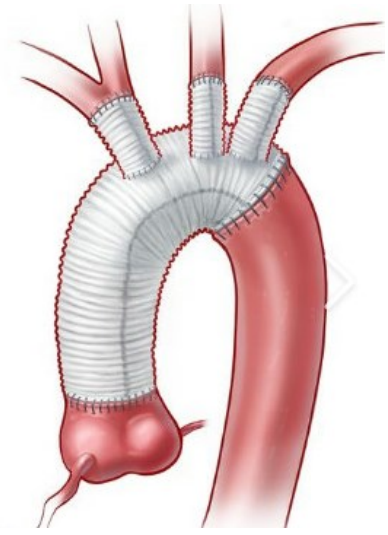
Types of Open Thoracic Aortic Surgery



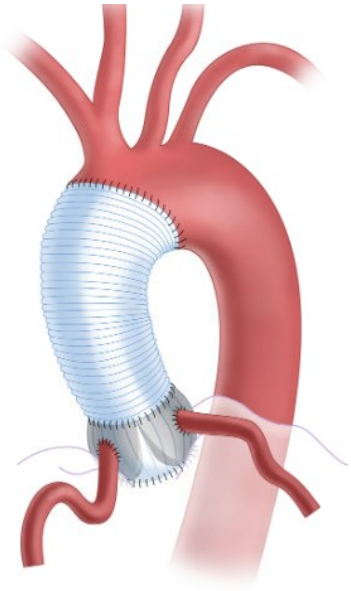
Ascending Aortic Replacement



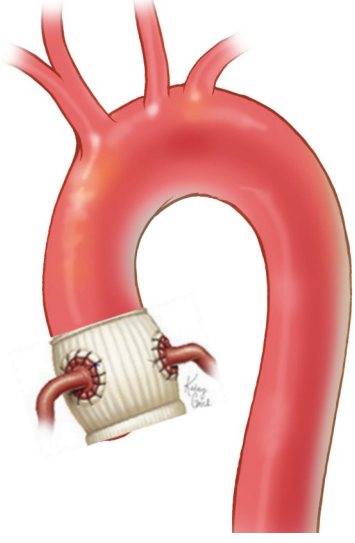
Ascending and Hemiarch Replacement:
Ascending aortic replacement with extension in the lesser curve of the aortic arch



Total Arch Replacement:
Ascending aortic replacement and reconstruction of the aortic arch vessels (branches)



David Procedure:
Aortic valve-sparing aortic root replacement & ascending aortic repair with coronary artery reimplantation (preserves the patient's own aortic valve)



Aortic Root Replacement

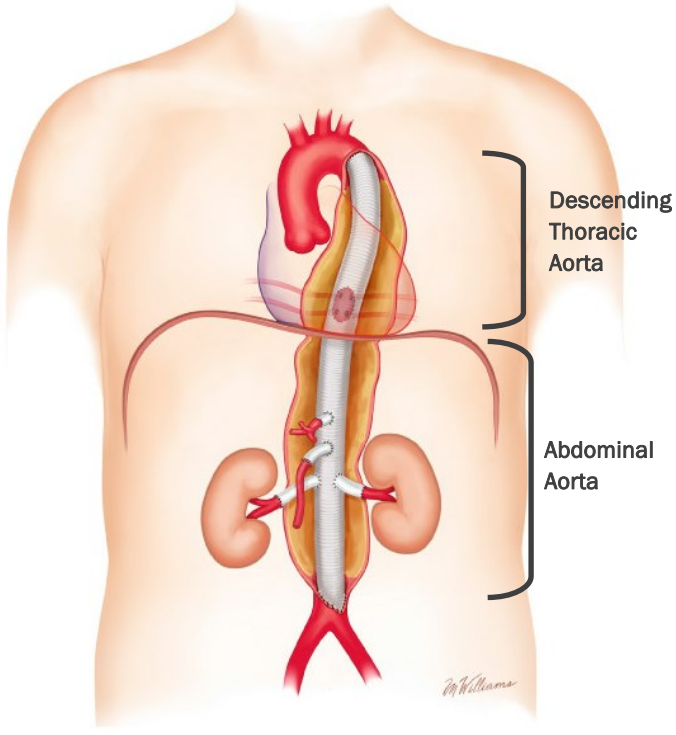
Bentall Procedure:
A composite graft replacement of the aortic valve (with a prosthetic valve: mechanical or biological), the aortic root and the ascending aorta, with coronary artery reimplantation

Type B Dissection Surgery

Open Surgical Repair

If your dissection is anywhere in the descending thoracic and/or abdominal aorta, open surgery might also be indicated if there is evidence of organ or limb injury (Unstable Type B Dissection), if there is aneurysmal degeneration of the aorta (the blood vessel is expanding in size) and endovascular surgery repair is not an option (unsuitable anatomy).

Treatment aims to replace the part of the aorta with the defect (entry tear) or where the aorta has dilated to a size that puts it at risk for rupture. The goal is to preserve the integrity of the remaining aorta and prevent the tear from expanding in either direction. Sometimes this is also to restore blood flow to effected organs and/or limbs.



Descending Thoracic and Abdominal Aorta Replacement

Procedure

- Performed under general anesthesia.
- The doctor will to make an open incision in your chest and/or abdomen to get to your aorta.
- They will place clamps on the aorta to stop blood from flowing through.
- Then, they will replace the damaged or dilated part of the aorta with a prosthesis made of synthetic fabric material (known as a tube **graft**) that is sutured into place.
- The doctor might need to stop your heart for a short time and place you on cardiopulmonary bypass (also called the "heart-lung machine"). This machine takes over the work of your heart while the aorta is being fixed. The machine keeps blood flowing throughout your body. After the graft is in place, the doctor restarts your heart, remove the clamps, and blood flows normally through the graft.
- The doctor will close the incision(s) with skin glue, staples, or sutures.

These procedures are much more technically demanding, sometimes involving stage procedures. Often involves reimplanting arteries that feed organs and limbs. These procedures often take a long time in the OR.

► Risks of Surgery are discussed on page 24

► Post-Operative Care is discussed on page 27 & 28

Type B Dissection Surgery

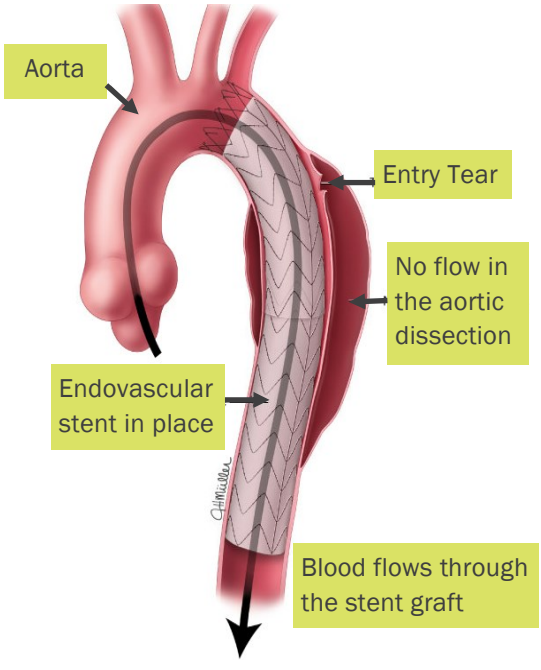
Endovascular Repair

If your dissection is anywhere in the descending thoracic or abdominal aorta, with evidence of organ or limb injury (Unstable Type B Dissection) or if there is further aneurysmal degeneration (increased size) of the aorta, endovascular stent repair may be an option.

- Goal of endovascular repair is to seal the aortic tear, expand the "**true lumen**" in the aorta, and assist with aortic remodeling. If an aneurysm has formed, the goal is to also seal off the aneurysm.
- Not everyone is a candidate - those with bad peripheral arterial disease (unable to obtain artery access) and those with unsuitable anatomy (this is determined by measurements on a CT scan) may need open repair.
- **Endovascular stents can extend down further into your abdominal aorta** if a larger area needs to be covered.

Thoracic Endovascular Stent-Graft

- The doctor makes an incision in a blood vessel in your groin and inserts a folded graft.
- Then threads the graft up to the damaged or dilated part of the aorta and unfolds it.
- This type of graft does not need to be sewn into place.
- Blood flows through the graft instead of the area that is damaged/weakened or expanded, which decreases the stress on the aortic wall (and prevents rupture).
- The doctor will close your incisions(s) and cover them with clean bandages.
- This procedure often takes 2-4 hours and is performed under general anesthesia.



Preoperative Preparation

- **Measures to prevent kidney injury**– contrast given through the vessel is used during the procedure to look at your aorta. Contrast can be toxic to kidneys, especially those with existing kidney disease. Your team will perform prophylactic measures to protect your kidneys (ex. Hydration, lower contrast dosing, identifying those patients at risk, etc)
- **Minimizing spinal cord injury**– if the stent graft covers a large portion of the aorta, you might be more at risk for spinal cord injury which can lead to paralysis of your legs. Your team may decide to insert a spinal drain in the operating room to help prevent this.

► Risks of Surgery are discussed on page 24 & 25
► Post-Operative Care is discussed on page 26

**If a patient is receiving endovascular repair of their aorta, they MUST comply with required follow up surveillance* (see page 26 for more information.)

Aortic Dissection Surgery

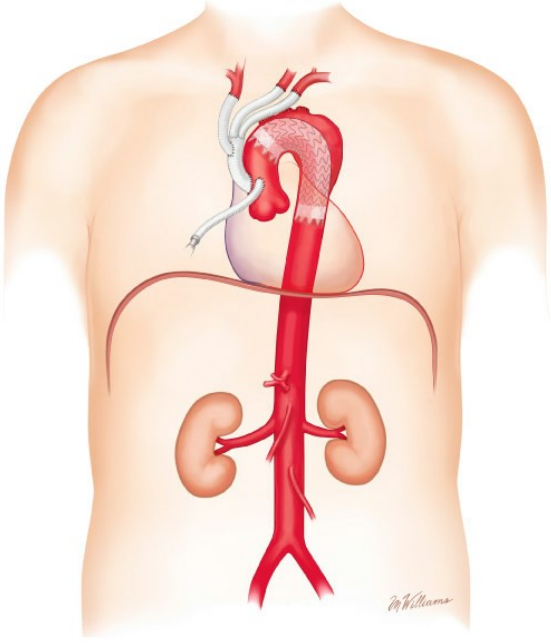
Hybrid Repair

It depends on where your dissection is and how big it is. It also depends on your age, health, and other medical conditions. **Aortic anatomy**, **extent of the disease,** and **available landing zones** (where the graft will land) dictate whether endovascular repair can be performed with open repair.

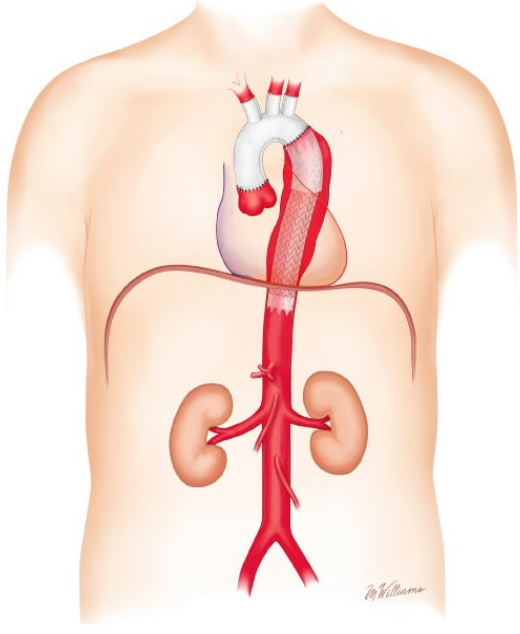
Combination (or "Hybrid") Repair – This involves **open thoracic surgery** followed by an **endovascular graft**. It is usually used if your aneurysm or dissection is located in the ascending aorta or the aortic arch. Hybrid repair is performed in stages.

- The first stage uses an "open" approach (incision through the chest/breastbone):
  - The dilated/damaged section of the aorta is replaced with a prosthesis made of synthetic fabric material (known as a tube graft) that is sutured into place.
  - Or a "de-branching" procedure is performed with the goal is to bypass critical vessels supplying the brain and arms, giving room for the stent graft to land safely.
- The second stage is to deploy a stent graft **(TEVAR)** in the disease portion of the aorta (the aneurysm or dissection), to seal off blood flow to the weakened blood vessel walls.

Most of the time, this is performed in **two separate procedures**, but in special cases it can be performed by the cardiothoracic and vascular surgeon in special operating rooms at the same time.



The arch vessels are **debranched**, which provides adequate tissue and area for a stent-graft to land in the proximal ascending aorta.



Open "Elephant Trunk" Repair (type of surgery): When the ascending aorta and branch vessels are replaced, followed by endovascular stent-graft repair of the descending thoracic aorta, the stent is landed into the new tube graft.
*This can be used if a **Type A Dissection** extends to involve more than just the ascending aorta.

- Risks of Surgery are discussed on page 24
- Post-Operative Care is discussed on 26 & 28

Risks of Aortic Surgery

Although complications associated with aortic repair are minimized, every surgery carries a certain degree of risk. The doctor will also take into account your existing health problems when deciding for or against surgery. Your surgeon will talk to you and your family about all of the possible risks and answer your questions. **Aortic dissection is often sudden / without warning and surgery is used to save your life. Often times an uncomplicated Type B Dissection can be medically managed and it is good to know your risks of surgery if the time comes for that.**

Endovascular Surgery Risks

- Endoleak or improper seal (discussed on page 25)
  - Need for additional procedures
- Vascular injury at the access site or where the stent is deployed (causes dissection or rupture)
- Migration or movement of stent
- Blood clots or bleeding
- Ischemia (reduced blood flow) to organs or limbs
- Paralysis can happen during TEVAR
- Infection

Open Aortic Surgery Risks

- Blood clots or bleeding
- Ischemia (reduced blood flow) to organs or limbs
- Stroke (THORACIC SURGERY)
- Paralysis (THORACIC SURGERY)
- Damage to organs
- GI Complications (ABDOMINAL SURGERY)
- Kidney or lung problems
- Infection
- Heart failure, heart attack, irregular rhythm
- Need for reoperation
- Death

Your surgeon will discuss the options. You should ask:

- What are the risks of each procedure for me? Is it safe to keep monitoring?
- What kind of follow-up will I need with each option?
- What is likely to happen if I do not have treatment?

Endoleak - After Endovascular Surgery

- An endoleak is defined as the persistence of blood flow outside an endovascular stent–graft, but within the dilated aortic sac or damaged vessel. There are five main types of endoleaks to be aware of *(see below)*.
- The main danger of endoleaks is rupture of aorta

Types of Endoleaks

Type I: blood flowing into the dilated or damaged vessel because of an incomplete/ineffective seal

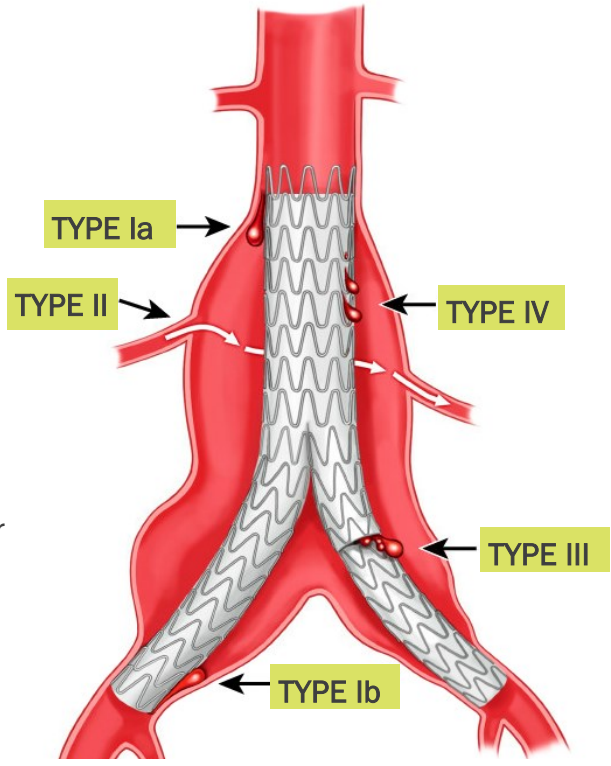
- **Type Ia:** incomplete seal at the top of the graft
- **Type Ib:** incomplete seal at the bottom of the graft

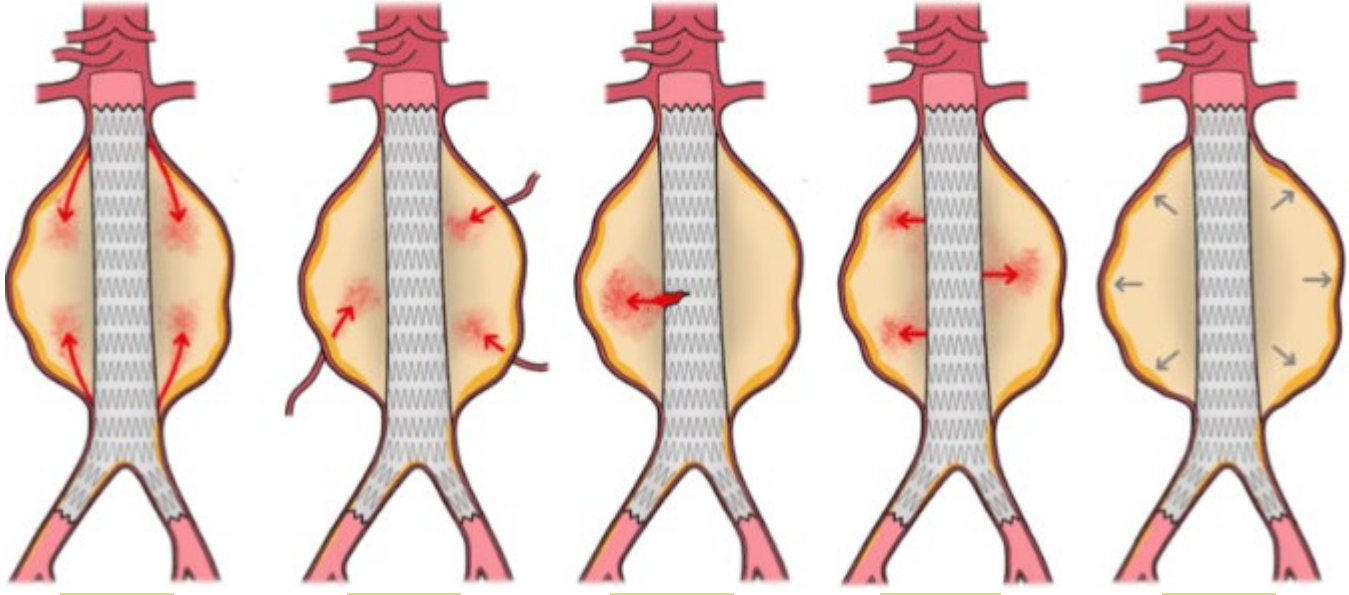
Type II: **Most common -** retrograde (backward) blood flow into the dilated aortic sac or damaged vessel from side arterial blood vessel branches (most common are from lumbar arteries or the inferior mesenteric artery)

Type III: blood flowing into the dilated aortic sac or damaged vessel through a fabric defect in the endograft or between separate graft components

Type IV: blood flowing into the dilated aortic sac or damaged vessel through the stent–graft fabric (porous)

Type V: Aortic sac expansion without radiographic evidence of a leak site (also known as “endotension”)

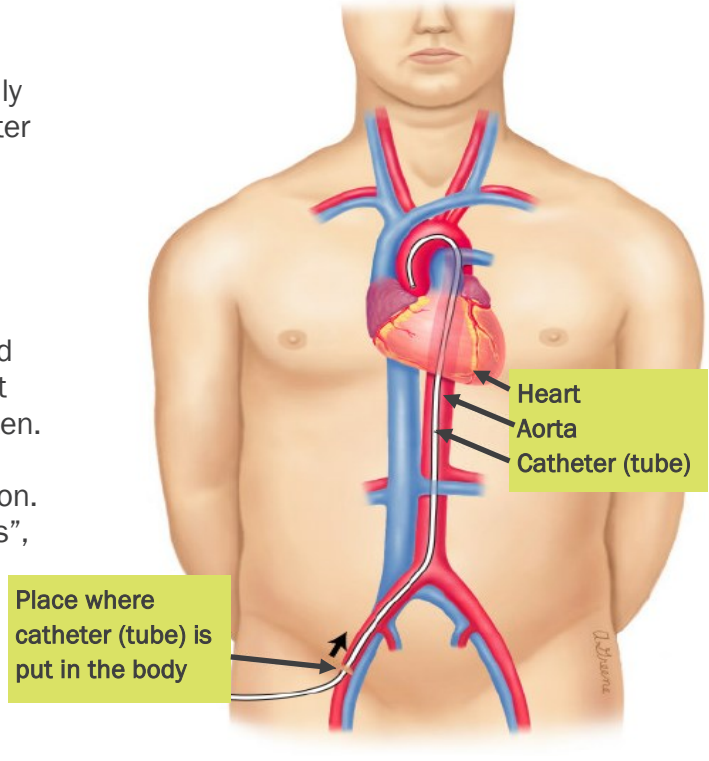




Postoperative Care After Surgery

Endovascular Aortic Surgery

- Patients are transferred to the intensive care unit (ICU) after surgery for **close monitoring of their blood pressure and heart rate.** If you have a spinal drain (sometimes placed with TEVARs) this is also managed in the ICU. You may feel groggy or confused at first, this will improve with time.
- Your team will often check your pulses and your strength at regular times and compare them to your baseline pre-op examination.



Diet: you will drink clear fluids and advance to a regular diet, as tolerated. Consume a cardiac friendly diet. Do not skip meals. Do not consume alcohol after surgery or while taking any prescription pain medications.

Pain: You will receive different kinds of pain medications to control your surgical pain.

Medications: it is important to take newly prescribed medications EXACTLY as prescribed. Keep a current list of your medicines, dosages, and times to be taken. Common medications after aortic surgery: blood pressure medications, aspirin, cholesterol medication. Other medications can include: diuretics "water pills", blood thinners, and stool softeners. Please see page 36 for information on medication management.

Activity: Walking is resumed on the first postoperative day. Slowly increase your activity. Do not lift heavy objects (more than 10lbs) or engage in strenuous activity/exercise for at least two weeks. This may be extended based on the extent of your dissection.

Surgical Incision: Your incision(s) will be in your groin area, and it is necessary to keep them dry and clean to avoid infection. Typically your incision will be closed with skin glue. Occasionally there may be staples or sutures if the incision is bigger. Incision care is addressed on page 35

Discharge: Most are discharged home within a few days following endovascular repair, provided no complications have occurred. You can be discharged once your blood pressure and heart rate are in a safe range on the appropriate medications. You will be encouraged to drink plenty of fluids after surgery to minimize the risk of kidney injury after the use of contrast during your procedure. Please monitor your blood pressure with a home blood pressure cuff. Keep a log of these readings 3 times a day and review with your primary care provider or cardiologist. Please attend any scheduled post op appointments and imaging. Your surgeon will want to see you about 1 month after surgery in clinic with a CT scan.

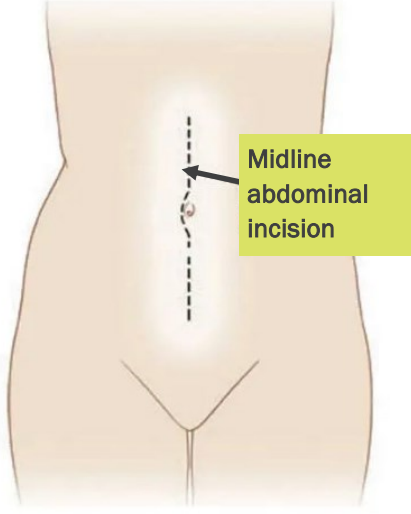
Endograft Surveillance: Routine surveillance is MANDATORY to assure the integrity of the repair. You may not feel if a malfunction with the stent is present. We suggest that surveillance should be performed at 1 month and then yearly thereafter for uncomplicated repairs to prevent late problems. Sometimes sooner follow up is recommended.

Postoperative Care After Surgery

Open Abdominal Aortic Surgery

- Patients are transferred to the intensive care unit (ICU) after surgery for **close monitoring of their blood pressure and heart rate.**
- You might feel groggy or confused for a short time. You might also feel nauseous or vomit. The doctor or nurse can give you medicine to help with this. You will have a tube in your nose and a bladder catheter, it will be removed sometime in the next few days.
- Your team will often check you pulses at regular times and compare that to your baseline preop examination.

Diet: You will not be able to eat or drink until you have return of bowel function, which can take days to return. When you are ready to eat, you will start with clear liquids. Then, you can start eating as you are able. You might feel better if you start with bland foods. Consume a cardiac friendly diet.



Pain: You will receive different kinds of pain medications to control your surgical pain. Some patients receive an epidural to help with pain.

Medications: You will resume many your usual medications post op once you have return of bowel function. It is important to take newly prescribed medications EXACTLY as prescribed. Keep a current list of your medicines, dosages, and times to be taken. Common medications after aortic surgery: blood pressure medications, aspirin, cholesterol medication. Other medications can include: diuretics “water pills”, blood thinners, and stool softeners. Please see page 36 for information on medication management.

Activity: The staff will help you get out of bed and start moving around early in your recovery.

- Walking is resumed 1-2 days after surgery. Slowly increase your activity.
- You can expect that your energy level will be reduced for about 8 weeks.
- Going up stairs is okay, just go slowly.
- Do not lift anything heavier than 10 pounds (the weight of a gallon of milk) for about 6 weeks. This may be extended based on the extent of your dissection.
- No strenuous activities
- No driving following your surgery until you are completely healed and have follow up appointment with your surgeon.

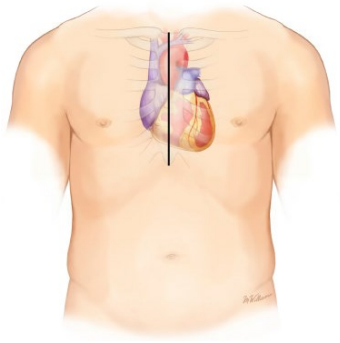
Surgical Incision: You might have stitches, staples, or skin glue. Directions will be given by your team at the time of discharge. Incision care is addressed on page 35

Discharge: The majority of patients can be discharged home within a week after surgery. Continue to wear TED compression/stockings on your legs daily. You can remove these at night. Please monitor your blood pressure with a home blood pressure cuff. Keep a log of these readings 3 times a day and review with your primary care provider. Please attend any scheduled post op appointments and imaging. Your surgeon will want to see you about 1 month after surgery in clinic, possibly with repeat imaging.

Surveillance: Usually patients have a scan 1 year after surgery and every 5 years thereafter for uncomplicated repairs. More often if there is residual aortic disease.

Postoperative Care After Surgery

Open Thoracic Aortic Surgery



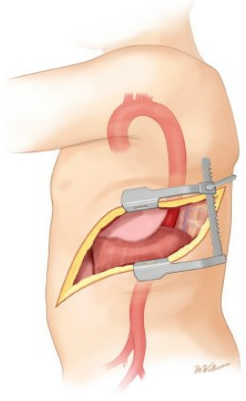
Sternotomy - opening the breast bone

- Patients are transferred to the intensive care unit (ICU) after surgery for **close monitoring of their blood pressure and heart rate.** You might feel groggy or confused for a short time.
- You will have a breathing tube, and this will be removed in the ICU as soon as it is safe. You will have a bladder catheter, chest tubes and pacing wires coming out of your chest. These will all be removed over the next few days.

Diet: You will drink clear fluids and advance to a regular diet, slowly as tolerated. Consume a heart healthy diet.

Pain: You will receive different kinds of pain medications post op to control your surgical pain.

Medications: it is important to take newly prescribed medications EXACTLY as prescribed. Keep a current list of your medicines, dosages, and times to be taken. Common medications after aortic surgery: blood pressure medications, aspirin, cholesterol medication. Other medications can include: diuretics "water pills", blood thinners, and stool softeners. Please see page 36 for information on medication management.



Thoracotomy - opening the side of the chest between the ribs (rare)

Activity: The staff will help you get out of bed and start moving around early.

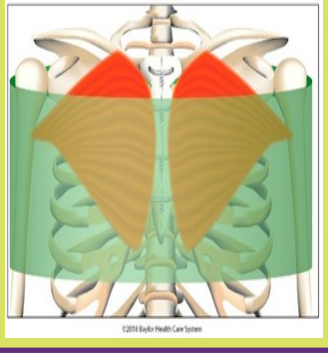
- Walking is resumed 1 day after surgery. Slowly increase your activity.
- You can expect that your energy level will be reduced.
- Going up stairs is okay, just go slowly.
- **Sternotomy incision - "Keep Your Move In The Tube" (see below)**
  - ◊ Surgical bra for females
- **Thoracotomy** - 10lb weight restriction on the side of the surgery for 2 weeks
- No driving following your surgery for 4 weeks.

Surgical Incision: Typically, the incision is closed by skin glue/stitches. Incision care info is on page 35

Discharge: The majority of patients can be discharged home within 5-7 days after surgery. Continue to wear TED compression/stockings on your legs daily. You can remove these at night.

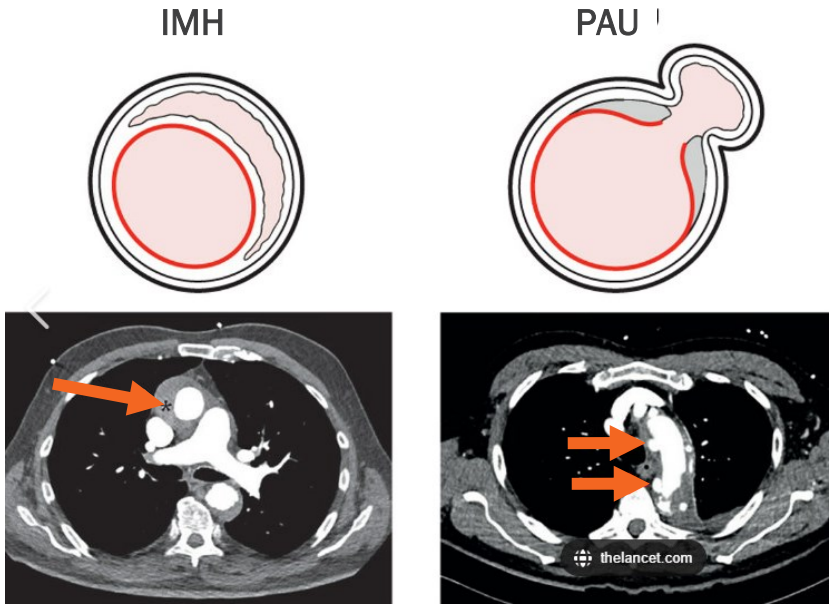
Surveillance: Patients have a scan within 1 year post repair, sometimes sooner, with stretched out intervals thereafter if no complications occurred. This also depends on if there is still an unrepaired/ diseased section of the aorta (residual dissection).

KYMITT
(Keep Your Move In the Tube)



Imagine a tube around your upper body. During weight-bearing activities (like getting out of bed, lifting, or pushing), keep both arms inside this tube.

- **Weight-bearing activities:** Keep arms close to the body, avoiding stretching across the chest or using chest muscles in a way that would stress the sternum.
- **Non-weight-bearing activities:** Patients are allowed freedom of movement during activities like hygiene, toileting, and bathing, as long as it's pain-free.
- **Pain as a guide:** Pain and discomfort should be used as a guide for safe limits of movement.
- Brace your chest with a pillow/arms when coughing/sneezing/laughing.
- Sleeping on either side or on your back is permitted. DO NOT sleep on your stomach.



Other Acute Aortic Syndromes

- Intramural Hematoma (IMH)
- Penetrating Atherosclerotic Ulcer (PAU)
- Blunt Thoracic Aortic Injury (BTAI)

Intramural Hematoma (IMH)

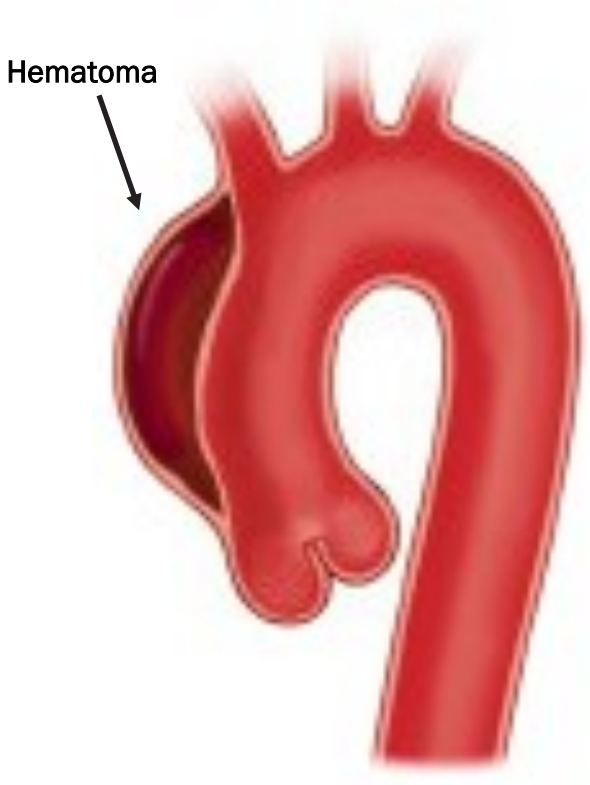
A collection or pocket of blood clot confined to the middle layer of the aortic wall with the absence of a tear (essentially a bruise contained within the aortic wall).
IMH is considered a precursor to aortic dissection and usually originates from ruptured small vessels within the middle layers of the aortic wall. The also can happen as a result of dissection.

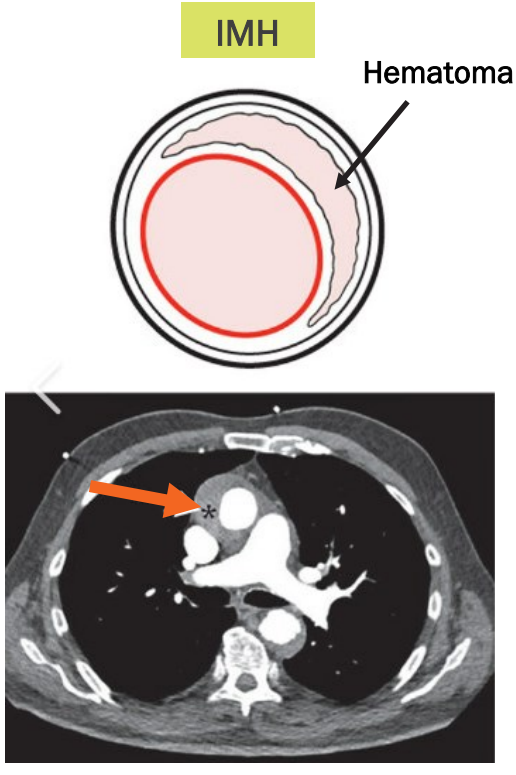
The outer layer of the aortic wall is now thinner, which creates a high risk for rupture. They should be monitored.

Treatment is dependent on location of the IMH and if it is causing symptoms.

- **Surgical treatment** is recommended for patients with IMH in the ascending aorta (**Type A**)
- **Aggressive medical treatment** is advocated for patients with IMH in the descending aorta (**Type B**), and surgically treated if they become complicated or unstable.

Treatment is similar to aortic dissection. Please see pages 19-23 for treatment and management options.





Penetrating Atherosclerotic Ulcer (PAU)

Plaque Rupture

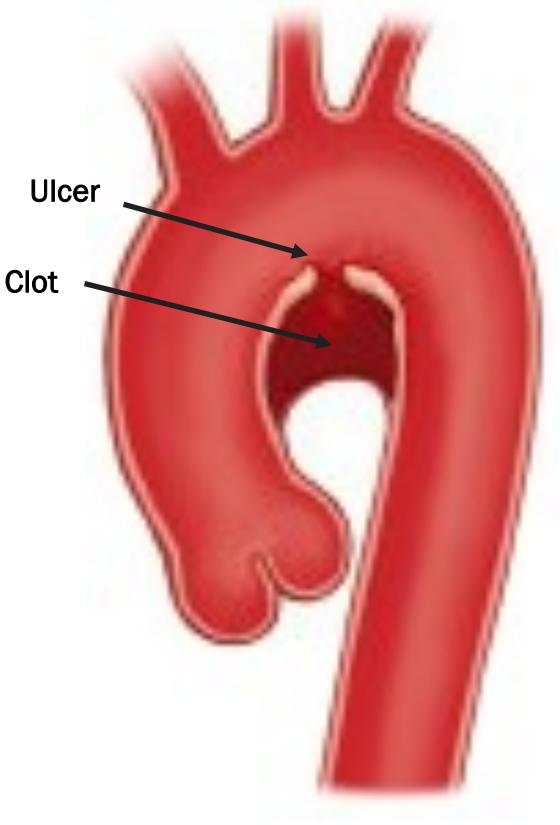
An area of the aorta that has an ulcer-like projection where the innermost layer of the aortic wall has a disruption. Many are associated with the build up of plaque/fats in the aorta. There may be presence of clot in the wall.

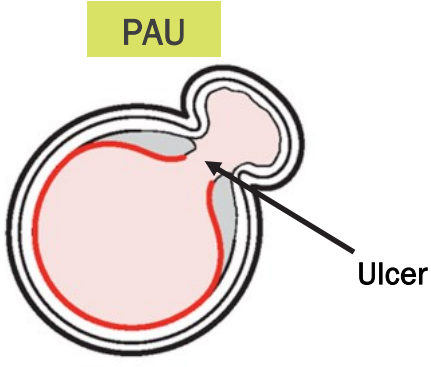
PAUs can lead to aortic dissection or perforation. They should be monitored.

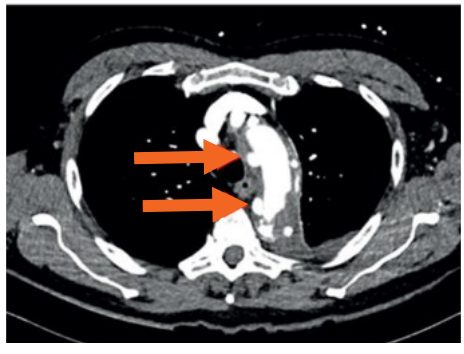
Treatment is dependent on location of the PAU and if it is causing symptoms.

- **Surgical treatment** is recommended for patients with PAU in the ascending aorta (**Type A**)
- **Aggressive medical treatment** is advocated for patients with PAU in the descending aorta (**Type B**), and surgically treated if they become complicated or unstable.

Treatment is similar to aortic dissection. Please see pages 19-23 for treatment and management options.

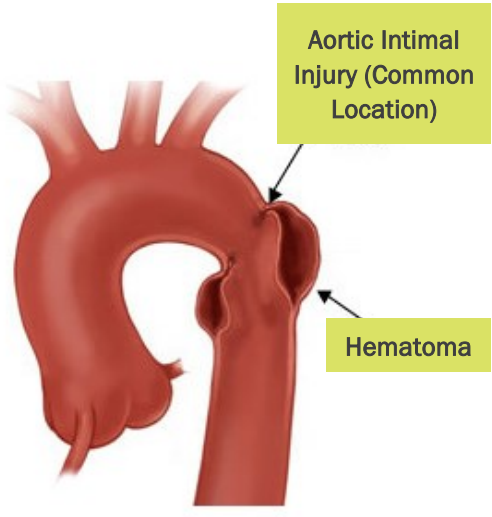






Blunt Thoracic Aortic Injury (BTAI)

Patients involved in high-energy blunt trauma are at significant risk for blunt aortic injury, which can be life-threatening. It usually occurs in the descending aorta, but other sites can be affected. Early diagnosis is **CRITICAL.**



The majority of blunt aortic injuries are due to motor vehicle accident.

In the United States, blunt aortic injury is the second leading cause of death behind head injury after motor vehicle accident.

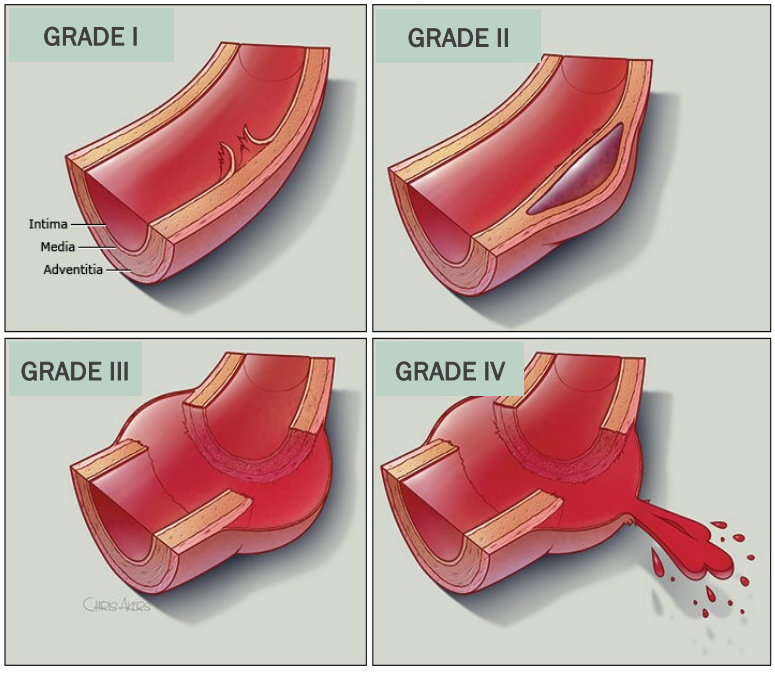
The Trauma patient might present with: Chest pain, difficulty breathing or swallowing, low blood pressure, or decreased level of consciousness.

CT scan with contrast or trans-esophageal echocardiogram are the main imaging modalities used to diagnose.

Aortic Injury Grading

Type I: Intimal tear or flap
(innermost layer of aortic wall)
Type II: Intramural hematoma
Type III: Pseudoaneurysm
(also known as a false aneurysm, is a contained hematoma outside the aorta due to damage to the vessel wall)
Type IV: Rupture

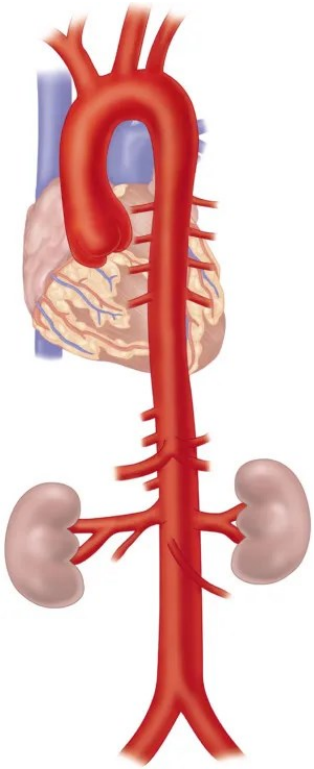
Classification of Aortic Injury



- Prompt surgery is **indicated** for patients with blunt aortic injury **Grades III, and IV.**
- Grade II injury is dependent on patient stability.

Aortic repair is generally not indicated for patients with Type I injury, as these can usually be successfully managed nonoperatively with interval imaging surveillance, but repair may become necessary if the injury progresses.

- Repair options are similar to those for aortic dissection.
- Endovascular repair is preferred when patient anatomy is suitable, and there is option and favor for open repair in certain patient scenarios.
- Please see pages 19-23 for info on open vs endovascular treatment and management.



More General Information

- Symptoms Needing Attention
- Care of Your Incision - After Surgery
- Medication Information - After Surgery
- Keeping Pain Tolerable - After Surgery
- Heart Healthy Diet

Symptoms Needing Attention

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Needs Immediate Attention **Go to the Emergency Room or Call 911!**	**Urgent Problems** **Call a Doctor/Clinic**	**Non-Urgent Issues** **Call the clinic nurse, Care Coordinator, Case manager**

▶ Feel short of breath or have trouble breathing, not relieved by rest
▶ Have sharp or severe chest pain when you breathe
▶ Are coughing up blood
▶ Sustained chills and fever
▶ Severe abdominal pain
▶ Uncontrollable bleeding
▶ Fast or irregular heartbeat
▶ Have signs of stroke, like sudden:
  ▶ Numbness or weakness of the face, arm, or leg, especially on 1 side of the body
  ▶ Confusion, or trouble speaking or understanding
  ▶ Trouble seeing in 1 or both eyes
  ▶ Trouble walking, dizziness, or loss of balance or coordination
  ▶ Severe headache
▶ Have signs of a heart attack—Severe chest pain, pressure, or discomfort with:
  ▶ Breathing trouble, sweating, upset stomach, or cold and clammy skin
  ▶ Pain in your arms, back, or jaw
  ▶ Worse pain with activity like going up stairs
	▶ Elevated temperature more than 100.4°F (38°C) two times in 24 hours
	▶ Extreme fatigue, feeling dizzy, faint or weak
	▶ Worsening shortness of breath
	▶ Persistent but controllable bleeding/oozing/drainage from your incisions
	▶ Bright red stool
	▶ New onset of nausea, vomiting, or diarrhea
	▶ Signs of infection: redness, drainage, or swelling around incisions
	▶ Pain or tightness in the calf that gets worse when pointing toe up to head
	▶ Sharp pain when taking a deep breath
	▶ Skin rash
	▶ Have a urinary tract infection
	▶ Weight gain of more than 1-2lbs in 24 hours
	▶ Worsening ankle swelling or leg pain
		▶ Directions for incisional care
		▶ Questions about your post-operative recovery
		▶ Questions about discharge instructions
		▶ Questions about your surgery
		▶ Management of stable symptoms
		▶ Home health care
		▶ Helpful community services or agencies

Care of Your Incision After Surgery

Preventing Infection

Keep your incision **dry.**

Once you no longer need to keep your incision dry, **shower daily** with a gentle soap allowing the shower water to rinse off the soap. Water from the shower may directly hit your incisions. Make sure to gently pat incisions completely dry with a clean towel.

Do not use perfumed soaps or body washes.

Do not submerge fresh incisions in a bath or pool, this can cause infection.

Avoid vigorously scrubbing the incision. Do not pick at scabs or the incisional glue.

Incisions can sunburn easily, be sure to protect them from overexposure to sunlight during the first year after surgery. The scar will become darker after prolonged exposed to the sun.

Do not apply lotions, creams, oils or powders to your incision unless prescribed by your doctor.

Be compliant with your weight and activity restrictions. If you over-exert yourself you can cause damage to your incision.

Check your temperature twice a day for two weeks

Check your incisions every day. Mild redness and or bruising at the incision site is normal. If you have home health or a visiting nurse after surgery have them look at your incisions.

Call your doctor if:

- There is drainage from the incision
- Increased redness or swelling around the edges of your incision, or if the edges separate.
- Increased tenderness
- A persistent fever—could indicate infection

Medication Information

Your doctor will prescribe medications when you are discharged from the hospital.
Sometimes these medications will be sent electronically to your pharmacy, or you will receive a paper prescription.

Take your prescribed medications EXACTLY as prescribed. Keep a current list of your medicines, dosages, and times to be taken in your wallet or purse.

You will usually resume your medications after surgery, HOWEVER if you need to **HOLD** or **STOP** one or more of your current medications you will be instructed to do so and have close follow up with your primary care provider, cardiologist and surgeon about when to resume.

Do not take other medications, supplements, or herbal preparations without telling your doctor. These can have interactions with your medications.

Medications you may be prescribed or instructed to take (you may not need all of these):

Blood pressure medications– make sure to monitor you blood pressure at home, good control is essential for those with aortic disease. Keep a log to give to your PCP or cardiologist.

- Beta blockers like "metoprolol" keep your heart strong after surgery and reduce the risk of heart arrythmias. They are also used to control heart rate and reduce stress on the blood vessel wall.
- There may be other classes of medication used to help keep your blood pressure in a safe range.

Aspirin – you will most likely be on this medication lifelong. Aspirin reduces the risk of cardiac events.

Cholesterol Medication – Most patients go home with a "statin" to help keep their cholesterol under control, it can provide patients with vascular disease with positive cardiac effects

Diuretic ("water pill") – to help decrease swelling/ water retention after surgery

Blood thinners – some patients go home on blood thinners (ex. Warfarin, Eliquis), sometimes for life or a short time as instructed by their provider.

Stool Softeners– helps prevent constipation and helps prevent straining

Keeping Pain Tolerable

Uncontrolled pain is associated with increased blood pressure and heart rate (two things you want to keep under control with aortic disease). It can also impact appetite, ability to move, and taking deep breaths.

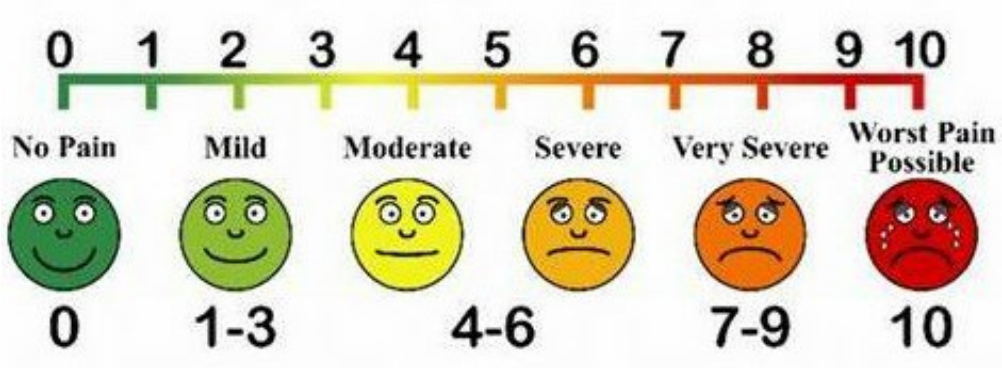
Although you will have some pain after surgery, the goal is to adequately control your pain AND minimize negative side effects from commonly use pain medications called opioids. Opioids can lead to nausea, excessive, drowsiness, constipation, confusion, and delayed return of bowel function.

Multimodal Pain Control consists of medications and nonpharmaceutical techniques:

Medications are used to help keep your pain tolerable. Some medicines (non-opioids) will be scheduled and others (like opioids) will be reserved for when your pain is uncontrolled by non-opioids.

- Non-opioids can include: Acetaminophen (Tylenol), Methocarbamol (Robaxin), or Gabapentin (Neurontin).
- You will be asked to rate your pain on a 0-10 scale.
  0 = no pain.
  10 = the worst pain you can imagine.
  The goal of pain medication is to find the "sweet spot" keeping pain low enough to tolerate activities, but not aimed to removed all the pain. For reference, a pain score of 4 would be considered tolerable.

Nonpharmaceutical Techniques



- Distraction: Watch TV, Read, Listen to music, Meditation, Journaling
- Talking with a support person
- Guided imagery
- Belly breathing / relaxation techniques
- Heat or cold therapy
- Massage
- Pillows for splinting or positioning
- Relaxing shower

Heart-Healthy Eating Plan

What you eat makes a difference to your heart. A heart-healthy eating plan emphasizes vegetables, fruits, and whole grains, includes fat-free or low-fat dairy products, and limits foods high in saturated fat and sugar-sweetened beverages and sweets. Use the guide below to determine how much you should eat from each food group.*

Food Group	Heart-Healthy Options
 **Whole Grains** Bread, cereal, starchy vegetables, rice, and pasta (6 ounces for women and 8 ounces for men)	♥ Whole grain versions of sliced bread, sandwich buns, dinner rolls, pita, English muffins, bagels ♥ Unsalted, low-fat crackers (such as graham crackers), pretzels, and popcorn ♥ Cooked hot cereals (not instant) and whole grain cold cereals ♥ Rice and pasta (such as whole grain noodles, spaghetti, and macaroni)
 **Vegetables** (without added fat) (2½ cups)	♥ Fresh, frozen, or no-salt-added canned vegetables (such as green beans, string beans, carrots, cabbage, tomatoes, squash, broccoli, and okra)
 **Fruits** (2 cups)	♥ Fresh, frozen, canned (in fruit juice rather than syrup), or dried fruits
 **Fat-free or low-fat milk and milk products** Milk, yogurt, and cheese (3 cups)	♥ Fat-free or low-fat (1 percent) milk ♥ Fat-free or low-fat yogurt ♥ Cheeses lower in fat and sodium
 **Protein** Meat, poultry, fish, eggs, nuts, seeds, and legumes (5½ ounces)	♥ Chicken or turkey without the skin ♥ Fish ♥ Lean cuts of beef, such as round, sirloin, chuck, loin, and extra-lean ground beef ♥ Lean cuts of pork, such as the leg, shoulder, tenderloin, and lean ham ♥ Eggs ♥ Cooked dry beans and peas (such as field peas, crowder peas, black-eyed peas) ♥ Frozen butter beans and lima beans ♥ Nuts and seeds
 **Fats and oils** (less than 22 grams of saturated fat)	♥ Soft tub margarine ♥ Oils (canola, corn, safflower, olive, peanut, or sesame)
 **Sweets and added sugars** Limit sugar and other sweeteners. Ask your healthcare provider about how much sugar or other sweetener is okay for you.	♥ Frozen desserts (such as frozen juice pops, low-fat frozen yogurt, or low-fat ice cream) ♥ Low-fat cake and cookies (such as angel food cake, fig bar cookies, ginger snaps, animal crackers, vanilla wafers, and graham crackers)

***Serving sizes** depend on how many calories you need, which is based on your age, gender, and physical activity.

NIH National Heart, Lung, and Blood Institute THE heart TRUTH

hearttruth.gov

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