PROCEDURE

Swan-ganz - right heart catheterization

Right heart catheterization uses a thin tube to measure pressures and blood flow through the heart and lungs.

PURPOSE
Measure heart-lung pressures and guide treatment

PROCEDURE TYPE
Diagnostic, minimally invasive catheter procedure, sometimes bedside

WHERE IT IS DONE
Catheterization lab, operating theatre, or at the bedside

ANAESTHESIA
Local anaesthesia; sometimes moderate sedation

HOW LONG IT TAKES
About 30 to 60 minutes

PREPARATION
Possible fasting, medication review, and blood tests

RECOVERY
Same day if stable; no driving after sedation

MAIN RISKS
Bleeding, infection, abnormal rhythms, lung or artery injury

RESULTS
Pressure measurements available immediately

Overview

Right heart catheterization is a procedure that measures pressure and blood flow inside the right side of your heart and the arteries leading to your lungs.

A Swan-Ganz catheter is one type of long, flexible tube used for this procedure. It is also called a pulmonary artery catheter. The catheter enters through a vein in your neck, arm, upper chest, or groin. It then passes through the right side of your heart into the pulmonary artery, which carries blood to your lungs.

The catheter can measure:

A diagnostic catheter is usually removed when the measurements are complete. In an intensive care unit or during major surgery, a Swan-Ganz catheter may remain in place so the

team can monitor you and adjust treatment.

- Pressure in the right heart and pulmonary artery
- The amount of blood your heart pumps each minute
- Blood oxygen levels in different heart chambers
- Pulmonary artery wedge pressure, an estimate of pressure on the heart's left side

Why the procedure is performed

Right heart catheterization gives direct measurements that an echocardiogram, or heart ultrasound, can only estimate.

It is often used to confirm pulmonary hypertension, which means increased pressure in the blood vessels of the lungs. The results can help identify what type of pulmonary hypertension is present and which treatments may be appropriate.

Your healthcare team may also recommend it to investigate unexplained shortness of breath, assess severe or advanced heart failure, or understand why blood pressure and circulation are unstable.

Other reasons include evaluating certain heart valve or congenital heart conditions, assessing you before a heart or lung transplant, and monitoring selected people during major surgery or intensive care.

Sometimes measurements are repeated while you exercise or receive a short-acting medicine. This can show how your heart and lung circulation respond under stress.

Who should and should not have it

You may be offered this procedure when direct pressure measurements are likely to change your diagnosis, treatment, or suitability for another procedure. It is not routinely needed for every person with heart failure, breathing problems, or suspected pulmonary hypertension.

The procedure may be delayed if you have an infection near the planned insertion site, an untreated bloodstream infection, or a bleeding problem that can be corrected first. A blood clot blocking the intended vein may require a different access site or another plan.

Certain mechanical heart valves, a mass or clot in the right heart, or unusual heart anatomy may prevent safe passage of the catheter. People with some electrical conduction problems in the heart may need extra precautions because the catheter can trigger a temporary rhythm

disturbance.

If the information is urgently needed in critical illness, the benefits may outweigh risks that would normally lead to delay. Your team should explain why the procedure is being recommended, what they expect to learn, and how the result could affect your care.

How to prepare

Your treating facility's own instructions take priority because preparation differs between a planned outpatient procedure and bedside monitoring in critical care.

You may be asked not to eat or drink for several hours, especially if sedation is planned. Ask whether you can take your usual morning medicines with a small sip of water.

Tell the team about all medicines and supplements you use. This is particularly important for blood thinners like warfarin or apixaban , diabetes medicines, and medicines affecting blood pressure. Do not stop a prescribed blood thinner unless the treating team gives you specific instructions.

Tell them about medication allergies, previous reactions to sedation or contrast dye, bleeding problems, kidney disease, and any chance of pregnancy. Contrast dye is not routinely required, but it may be used in some catheterization procedures.

Blood tests may be arranged to check blood counts, kidney function, and clotting. If you will receive sedation, arrange for a responsible adult to take you home and follow the facility's instructions about staying with you afterward.

What happens during the procedure

You will lie on a procedure table or hospital bed. The team attaches monitors to check your heart rhythm, blood pressure, and oxygen level.

The insertion area is cleaned and covered with sterile drapes. Local anaesthetic is injected to numb the skin. This may sting briefly. You may also receive medicine to help you relax, but many people remain awake and able to answer questions.

Using ultrasound, the clinician places a short access tube into a vein. The catheter is passed through this tube into the right atrium, right ventricle, and pulmonary artery. X-ray guidance may be used in a catheterization lab. At the bedside, pressure waveforms on a monitor help show the catheter's position.

A small balloon at the catheter tip is briefly inflated to help it move with the blood flow and to

obtain wedge pressure. You may be asked to hold your breath or lie still for short periods.

The team records pressure, blood flow, and oxygen measurements. You should report chest discomfort, breathing difficulty, or a racing or pounding heartbeat. These symptoms can be assessed immediately.

The catheter is removed after testing unless continued monitoring is needed. Pressure is applied to the insertion site, and a dressing is placed over it.

Recovery and what to expect afterward

The insertion area may feel sore or bruised for a few days. Mild discomfort usually improves with simple pain relief approved by your healthcare team. Increasing pain or swelling is not expected and should be reported.

You can usually eat and drink once the team says it is safe. If you had sedation, begin with light food if you feel nauseated.

Your activity instructions depend on the insertion site. You may need to keep an arm or leg straight for a period after removal. Avoid strenuous exercise and heavy lifting until the site has sealed and your team says normal activity is safe.

Do not drive home after sedation. Many facilities advise avoiding driving until at least the next day, but follow the restriction given to you. If you did not receive sedation, ask whether the insertion site or your underlying condition affects driving.

People having a planned test often return to desk work within a day or two. Recovery may take longer if the catheter was used during major surgery, severe illness, or an extended hospital stay.

Risks and possible complications

Bruising, tenderness, and minor bleeding at the insertion site can occur. Passing the catheter through the heart may cause extra beats or a brief abnormal rhythm. These often stop when the catheter is repositioned or removed.

Other possible complications include infection, a blood clot in the vein, injury to a blood vessel or heart valve, and reactions to sedation. Neck or upper-chest access can occasionally allow air around a lung, called a pneumothorax.

More serious complications include a sustained abnormal heart rhythm, heart perforation, or injury and bleeding from the pulmonary artery. These are uncommon but may require urgent

treatment. Risk can be higher when a catheter remains in place for prolonged monitoring.

Your personal risk is affected by your health, the reason for the procedure, the access site, and whether the catheter will remain in place.

Results and follow up

Pressure and blood-flow measurements appear on the monitor during the procedure. Your team may be able to discuss the main findings immediately, although a full interpretation may come later after all measurements and other tests are reviewed.

Results are considered together rather than one value at a time. They can show whether pressure is elevated before or after blood passes through the lungs, whether the heart is pumping enough blood, and whether treatment changes the measurements.

If you are in hospital, the results may guide fluids, diuretics like furosemide or hydrochlorothiazide , medicines supporting blood pressure, or other treatment right away. After an outpatient procedure, routine follow-up may be with your cardiology, pulmonary hypertension, or heart failure team. Ask when to expect the final report and who will explain the next steps.

Alternatives

An echocardiogram is the main non-invasive alternative. It is easier, does not require a catheter, and shows heart structure and function. However, it estimates pulmonary pressure and cannot provide all the direct measurements obtained during right heart catheterization.

Cardiac MRI or CT can provide detailed images of the heart, lungs, and blood vessels. These tests may identify structural disease or blood clots, but they do not directly measure pressures inside the heart.

Blood tests, breathing tests, exercise testing, and oxygen measurements can help explain breathlessness or reduced exercise ability. They provide different information and cannot confirm pulmonary hypertension by themselves.

A central venous line can measure pressure near the right atrium in a critically ill person, but it cannot measure pulmonary artery or wedge pressure. Choosing monitoring based only on less invasive tests avoids catheter-related risks but may leave uncertainty when precise measurements are needed.

When to call your healthcare team

Mild bruising, slight tenderness, and a small spot of dried blood under the dressing can be part of routine recovery. Follow the instructions you received for dressing care and planned follow-up.

Contact your healthcare team promptly for:

Seek emergency help for severe chest pain, major difficulty breathing, fainting, coughing up blood, stroke-like symptoms, or bleeding that does not stop after firm pressure. If you are already in hospital, tell your nurse or clinical team immediately.

- Increasing redness, warmth, swelling, pain, or drainage at the site
- Fever or chills
- A growing lump or repeated bleeding under the dressing
- New palpitations, dizziness, or worsening shortness of breath
- A cold, pale, numb, or swollen arm or leg near the access site

Common questions

Will I be asleep?

Usually not. Local anaesthetic numbs the insertion site, and you may receive moderate sedation to make you relaxed and drowsy. General anaesthesia is generally used only when the catheterization is part of surgery or another procedure requiring it.

Can I drive home?

Not if you received sedation. Arrange for someone to take you home and follow the facility's driving restriction. Your underlying heart or lung condition may also affect when driving is safe.

How painful is it?

The numbing injection can sting. You may feel pressure where the catheter enters, but you should not feel it moving through the heart because blood vessels and the inside of the heart do not sense touch in the same way as skin.

When will I know the results?

The measurements are available immediately. Your clinician may explain the main findings after the procedure, while the complete interpretation may follow after comparison with scans, blood tests, and previous results.

Will the catheter stay in place?

For a planned diagnostic test, it is usually removed before you leave the procedure area. In intensive care or during major surgery, it may remain temporarily for repeated monitoring.

Does this test use radiation?

Right heart catheterization in a catheterization lab commonly uses X-ray imaging. Bedside placement may rely on pressure waveforms and other positioning methods. Tell the team if you are or could be pregnant.

Sources

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