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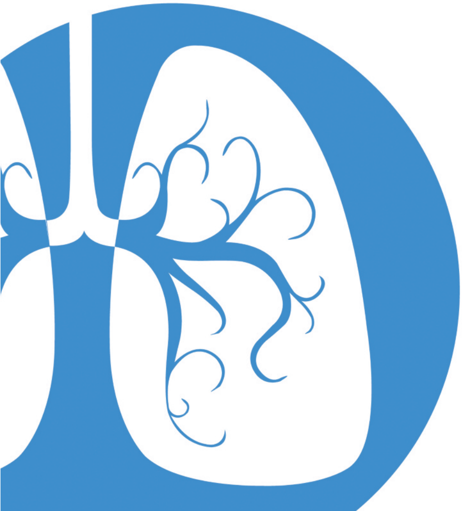
Royal Brompton & Harefield NHS
NHS Foundation Trust

Royal Brompton Hospital

Your pectus correction surgery



Contents

This leaflet gives you general information about your pectus correction surgery. It does not replace the need for personal advice from a healthcare professional. Please ask us if you have any questions.

What is pectus anomaly?

Pectus anomaly is a deformity of the sternum (breastbone). An anomaly is something different to what you would expect to find. Pectus anomaly is the most common congenital chest wall deformity. Congenital means the anomaly is present at birth.

A pectus anomaly is often noticeable at birth but usually becomes more apparent during the period of fast growth of the skeleton. This happens during early adolescence; the time when a child matures into an adult. Once growth is complete the anomaly remains unchanged.

There are two main types of anomaly:

1. Pectus carinatum (also known as pigeon chest) where the sternum is raised and the chest looks pushed out. Sometimes there may be a depression (dip) on one side and protrusion (bulge) on the other, or the anomaly can be more complex than this.
2. Pectus excavatum (also known as funnel chest or sunken chest) where the sternum is sunken inwards and the chest looks hollow.

There is a rare third type of anomaly called pectus arcuatum (curved or arched). There is a ridge high across the upper part of the sternum, with the rest of the chest falling away to a flatter shape.

How many people have pectus anomaly?

Pectus anomalies are found in about four out of every 1,000 people. It is more common in males than females.

What causes pectus excavatum / carinatum?

Pectus anomalies are thought to be caused by irregular growth of the cartilages (a strong, elastic material) between the breast bone and the ribs before a child is born. The growth can sometimes be excessive. As the cartilages grow longer, the sternum is either pushed inwards (excavatum) or outwards (carinatum).

Certain conditions can be linked with pectus anomaly, such as:

- Scoliosis – where the spine curves and becomes deformed
- Marfan's syndrome – an inherited condition of the connective tissue (a material that helps to support and connect organs in the body)
- Poland's syndrome – a rare inherited condition where the chest muscles on one side of the body are underdeveloped or do not develop at all

What are the effects of pectus anomaly?

Many people with pectus anomaly are content with the shape of their chest and do not wish to have surgery to correct this. However, some people experience physical problems, such as:

- Reduced stamina (energy and strength); a lot of effort is needed to do exercise
- Chest pain
- Frequent respiratory infections

Sometimes, there may be psychological effects, such as negative body self-image and low self-confidence. The most common concern for those with pectus anomaly is being seen without their chest covered.

What treatments are available for pectus anomaly?

Many people with pectus anomaly decide to investigate what treatment is available to them. Non-surgical support includes counselling, physiotherapy, posture improvement, silicone implants, and vacuum bell therapy. We do not offer any of these treatments at our hospital, but you can read more about them by visiting www.pectus.org. We do, however, offer the option of surgical treatment.

What surgical treatment is available at Royal Brompton Hospital for pectus anomaly?

There are two surgical treatments for pectus anomaly:

1. The Ravitch procedure / modified Ravitch procedure

Rib cartilages allow your ribs to move when you breathe. They are found between the rib and the sternum. In the Ravitch procedure, an incision (cut) is made from one side of the chest to the other. The cartilages are cut away on each side and the sternum is flattened.

In pectus excavatum (sunken sternum), one or more struts (metal bars) may then be inserted to help the sternum keep its shape. No bars are necessary in pectus carinatum (raised sternum) correction.

In the modified (slightly different) Ravitch procedure an incision is made either lengthwise (up and down) or across the chest. This allows the cartilages to be removed and the sternum can be moved either forward or backwards, to correct the pectus. The sternum is then fixed firmly in the correct position with one or more struts (metal bars), or a mesh support structure. This procedure is used for complex pectus anomalies.

Tubes to drain the wound are placed temporarily on each side of the chest to remove any fluid from around the area of your operation. The wound is closed using dissolvable stitches. Struts are permanent, but may be removed if problems develop in the future, such as pain. The mesh support stays in place permanently.

What are the advantages of the Ravitch procedure?

- It is a tried and tested method of correction for pectus anomaly. Research shows that 97 per cent of patients (97 out of every 100) stated they are happy with the post-operative results.
- Once the procedure has been performed, it is extremely unlikely that the anomaly will re-occur.
- It can also be used to correct complex pectus anomalies.

What are the disadvantages of the Ravitch procedure?

- A large scar from the cut, although this normally fades over time to a thin line.
- The procedure is a more extensive operation than the Nuss technique (explained below). Although unusual, the need for a blood transfusion is more likely than if a Nuss procedure was performed.

2. Nuss procedure (minimally invasive repair of pectus excavatum – MIRPE)

The Nuss procedure, also known as the MIRPE, is a minimally invasive technique. Invasive means a technique where the body is entered by a cut.

A curved steel bar is placed under the sternum through small cuts on either side of the chest wall. This pushes the sternum forward. The bar is fixed firmly to the chest wall with a metal wire. The cuts are closed with dissolvable stitches.

Wound drains are placed temporarily on either side of the chest to remove any fluid from around the area of your operation. This procedure can only be used for pectus excavatum, and not all patients will be suitable for the operation.

This technique was initially used for children and adolescents, but has now been used in adults for more than 10 years. In children, the bar is removed after two years once permanent reshaping has taken place. In adults, the bar is removed after three to five years.

What are the advantages of the Nuss procedure?

- It is a minimally invasive operation – only three to five small cuts are needed (a cut on each side of the chest, one cut below the tip of the sternum, and two or three small wound drain cuts), so scarring is minimal.

- There is no need for cutting or removal of cartilage.

- There is generally little blood loss during the procedure. It is rare for a patient having this operation to need a blood transfusion.

- It is generally a quicker operation than the Ravitch procedure.

- At Royal Brompton Hospital 85 per cent of patients who had a Nuss procedure thought that their decision to have this operation was the right one.

What are the disadvantages of the Nuss procedure?

- The procedure can sometimes be more difficult to carry out in adults than in children.

- It is possible that the anomaly will re-occur once the bar is removed.

- Rarely, when positioning the bar it is possible to cause an injury to the heart. Your surgeon will use various techniques to reduce this risk, and will discuss this with you before the procedure.

What are the benefits of surgical treatment for pectus anomaly?

Surgery will improve the shape of your chest and this may improve your self-confidence and self-esteem. Some people who have had the operation report that they also feel physically better following the procedure.

However, it is important to know that there is no evidence to suggest that pectus correction surgery will improve heart or lung function.

Please remember that we are not able to tell you by how much we will be able to improve the shape of your chest with surgery. Your surgeon will discuss the aims of your operation with you.

Many people feel more positive about themselves following the corrective procedure. However, some continue to need, and receive, counselling and other support for poor self-esteem or concerns over body image.

What are the risks of surgical treatment for pectus anomaly?

Complications can occur with any surgery. Both the Nuss and Ravitch procedures have good safety records.

For pectus anomaly correction surgery, the specific risks include:

- Bleeding: rare for Nuss procedure; unlikely for Ravitch procedure
- Wound infection: rare complication
- Pleural effusion (collection of fluid around one or both lungs): rare complication
- Pneumothorax (air leak from either lung): rare complication
- Keloid scarring (the scar becomes red, thickened and itchy because it has healed too quickly): rare complication

- Long term discomfort from the sternal bar: unlikely complication
- Damage to the heart from bar placement: a very rare complication

The operation

It is important to use the time before the procedure to improve your overall level of fitness. This makes sure your health is in the best shape to help you recover and avoid complications.

If you smoke, it is important you try to stop completely, or at least for several weeks, before your treatment.

Smoking is particularly bad for your lungs and heart. Stopping smoking makes your anaesthetic safer. This is because chemicals in cigarette smoke can interfere with some drugs. It reduces the risk of breathing problems, and developing a chest infection after your operation, which would increase the length of your stay in hospital.

The sooner you stop smoking, the more it will reduce your risk of complications. There is support available to help you give up smoking – you can ask your GP, pharmacist, or contact:

- SMOKEFREE, the free NHS helpline on **0800 022 4 332** – **www.nhs.uk/smokefree**
- Quit, a stop smoking charity, on **0800 002 200** – **www.quit.org.uk**

What will happen when I am admitted to hospital for my operation?

You will usually be admitted a day before your operation. We will use this time to do tests to check your general health, and to make sure that you are well enough to have surgery.

Tests may include:

- **MRSA (methicillin resistant staphylococcus aureus) swabs:** to check whether you have MRSA bacteria on your skin or in your nose. This is a routine test for all patients admitted to the hospital. It is an important test that helps to stop the spread of MRSA (sometimes referred to as a "superbug").

- **Blood tests:** to check your general state of health
- **Chest X-ray:** to check your heart and lungs
- **CT (computerised tomography) scan:** to look at the pectus anomaly
- **Electrocardiogram (ECG):** to check the electrical activity of your heart

What do I need to bring with me to hospital?

- All medication that you take – in their original packaging
- Suitable clothing – loose fitting shirts (preferably with buttons down the front)
- Comfortable, but supportive footwear
- Toiletries – we will provide towels and disposable wash cloths, so you do not need to bring these with you; just bring your normal toiletries

Please try to avoid bringing valuable items into hospital. If you do, we have a safe on the ward to store valuable items. While you are in theatre, and in the recovery room, we can lock your belongings away safely.

Which staff will I see during my time in hospital?

The nursing team will:

- Help you settle into the ward on the day you arrive.
- Check your general health, measure your height and weight, ask about allergies, and your past surgical and medical history. They will also ask you about arrangements for going home, such as who will be collecting you from hospital.
- Regularly measure your blood pressure, pulse, oxygen levels and temperature.
- Check your wound and help you with washing and going to the toilet, and mobility needs (moving around).
- Work with your doctors to manage your pain and help with any concerns you may have.

- Talk to you about your plans for going home, to make sure that you have enough support when you return home.

The surgical team

- Members of the surgical team (either a doctor or a specialist nurse) will visit you on the day you are admitted to hospital and ask you about your previous medical and surgical experiences.

  The information you give the doctor may seem similar to the history you gave to your nurse. However, each team uses your history in a different way so they can give you care related to their particular role.

- A member of the team will explain the operation to you and explain potential risks. Once we have explained the procedure we will ask you to sign a consent form. This document records that we have explained the procedure, and its risks, to you, and that you understand and consent (agree) to go ahead with the operation. If you have any questions or worries, please ask. We want you to fully understand the procedure you are having.

- The anaesthetist is part of the surgical team, but will visit you separately to discuss the anaesthetic and your pain relief after the operation. The anaesthetist will let you know when you need to stop eating and drinking fluids in preparation for surgery. In general, you need to stop eating food six hours before your surgery and stop drinking clear fluids two hours before your surgery. Do not worry – you will be given clear instructions about this.

The physiotherapists

- A physiotherapist will see you during your time in hospital.

- They will explain the importance of post-operative physiotherapy – including breathing exercises, posture correction and regular exercise. Exercise will improve how well your lungs work and improve the speed of your recovery.

What will happen on the day of the operation?

You will be asked to have a shower with an antibacterial body wash, which will be provided for you, and change into a clean hospital gown (please do not wear underwear).

There is no need to shave your chest hair before the procedure.

You will be asked to put on some anti-thrombus stockings, also known as TEDs. During and after your operation, you will be less mobile than normal. TEDs improve the circulation of blood in your legs and help to prevent blood clots.

If you have been prescribed a premedication (premed), the nurse caring for you will give this to you one or two hours before the operation. The medication will make you feel sleepy and possibly lightheaded, so you should not get out of bed unless there is a member of staff with you. If you need to go to the toilet, after your premed, please let the nursing staff know, and they will help you.

When it is time for your operation, a porter and a nurse will take you, on your bed, to the operating theatre. A member of the theatre staff will check your details with you and the nurse, and move you into the anaesthetic room. We will clip a pulse and oxygen monitor to your finger and put a cannula (small plastic tube) into a vein in your arm. The anaesthetist will give you some medications through the cannula that will send you to sleep.

Can my family and friends stay with me before the operation?

Your family and friends are welcome to stay with you until you go into the operating theatre. If they wish, they can stay on the ward while you have your operation – our staff will be happy to keep them updated on your progress.

What happens after the operation?

Immediately after the operation we will take you to the recovery unit (recovery) to wake up. A nurse will be with you at all times. You may feel quite drowsy from the anaesthetic.

- We will monitor your heart rate, blood pressure and oxygen levels.

- You may have a catheter (thin plastic tube) to drain the urine from your bladder.
- You will have a cannula (thin plastic needle) in a vein in your arm. Fluids and pain-relieving medication are given through the cannula.
- You will have wound drains in place. These remove any fluid gathering around the area of your operation.

Can my friends and family visit me in recovery?

There is a restricted visiting time in recovery. Staff will advise your visitors when they can visit. If you are going to be in the recovery room for a few hours, visiting is generally allowed in the evening only when there are less patients. The number of visitors per patient is limited to only one or two people at a time.

When will I move out of recovery?

Once you are awake we will move you to the high dependency unit (HDU). Most patients stay in HDU for the night following their operation and move back to the ward the following day. When you are in HDU, we will continue to monitor you closely. At some point during the evening following your operation, a nurse will help you get out of bed. Your nurse will help you to start moving around. You will practise walking on the spot and sit in your chair for a while. This will help to prevent any post-operative complications, such as a chest infection or DVT (deep vein thrombosis – blood clot).

When will I move back to the ward?

The surgical team will visit you in HDU in the morning following your operation to discuss your progress with you and to plan your transfer to the ward with the nursing team.

If you have wound drains in place, we will check the amount of fluid collecting in them each morning. Once there is only a small amount of fluid draining out each day, and your chest X-ray shows that your lungs are back to normal, we will remove the drains. Please remember that it may take several days before the drains are ready to be removed.

Can my friends and family visit me on the ward?

Your friends and family are welcome to visit you on the ward. Visiting times are 10am to 8pm. We have a rest period for patients from 1pm to 2pm, following their lunch. If you wish to see your visitors in the ward dayroom during this time, please discuss this with the nurse in charge.

If your relatives have to travel a distance, it may be possible to arrange visiting outside of the usual hours.

What pain relief will I receive during my time in hospital?

Please be reassured that we will do everything we can to control your pain during your time in hospital. There are several pain relief methods we can use such as:

- **Epidural:** A catheter (small, fine, plastic tube) is placed in your back, close to your spine in an area called the epidural space. This is inserted in the anaesthetic room before surgery. This gives continuous pain relief in the form of a local anaesthetic and painkillers.
- **Patient-controlled analgesia (PCA):** A PCA pump is a device that is designed to give you a preset (fixed) amount of pain-relieving medicine when you press the button. There is no risk of addiction or overdose.
- **Oral painkillers:** we will give you pain relief in tablet or liquid form regularly.

We have specialist pain management nurses. They will check your treatment plan to help find the best pain relief methods for you. A nurse will regularly check your pain following your surgery. During your time in hospital, if you experience pain, please tell us immediately and we will take steps to control it.

Managing your pain well will allow you to increase your mobility (moving around) and ability to do physiotherapy exercises. Getting up and moving around early will improve your lung function and reduce the risk of a chest infection developing after surgery.

When can I start moving around?

You will be encouraged to move about with assistance as soon as possible, at first with help of your nurse and physiotherapist. Physiotherapy will be an important part of your recovery, both on the ward and when you go home. It is important to get out of bed as soon as possible.

The physiotherapists or your nurse will show you how to sit up without risk of injury. We will encourage you to walk around the ward as much as you can. The nursing and the physiotherapy team will be there to help you. When you are ready, your physiotherapist will encourage you to progress to climbing stairs with their assistance.

We will offer you posture advice as needed, and also teach you:

- Breathing exercises
- A supported cough technique to assist the removal of sputum (mucus)
- Shoulder exercises

When will I be ready to go home?

We will discuss the date to go home with you. Before you leave, we will make sure that:

- Wound drains have been removed.
- Your bowel function is returning to normal.
- Your pain is well controlled with pain medications.
- You have a discharge letter from the surgical team.
- You have arranged transport to get you home safely.
- You have support from friends or family once you are home. You will not need 24-hour nursing care but you will need someone to help you with cleaning and any heavy tasks.
- When you are going home we will give you a letter for your practice nurse, if

necessary. Some patients go home with stitches that do not dissolve. These need to be removed by your practice nurse.

- You have a follow-up appointment booked with the surgical team.

Will I need to continue my physiotherapy at home?

It is very important to continue exercising when you return home.

If you have any questions or queries, you can contact the physiotherapist. Call the hospital switchboard on **020 7352 8121**, and ask for **bleep 7301**.

For the **first month** following surgery, you should not:

- Bend from the waist – you must only bend from the hips
- Twist your body
- Sit in a slumped position
- Push up and forward using your arms
- Lie on your side
- Lift any heavy objects

For **two months** following surgery, you should not:

- Lift any heavy objects

For **three months** following surgery, you should not:

- Drive

You will need to discuss when you can return to driving with your surgeon and your insurance company.

Some people find that wearing a seat belt after their surgery is uncomfortable. It is important to remember that you must, by law, wear a seatbelt – there are no medical conditions that allow anyone to not follow the law. If you find a seat belt too uncomfortable to wear, please use a lap belt if available at the mid-rear seat in your car.

Exercise and sport

Your doctor will let you know how long it will take for you to get back to normal. Walking for exercise will help your recovery, but speak with your surgeon about taking part in activities such as contact sports, weightlifting, golf and tennis.

You should avoid swimming until your wound is well-healed – please get advice from your practice nurse.

Who can I contact if I need further support?

Social services support individuals and families during times of difficulty. We can contact your local authority, and other agencies, to ensure your needs, and those of your carer(s), are met.

Members of the multifaith chaplaincy team are committed to supporting you during your stay in hospital. If you would like to speak to someone from the chaplaincy team, your nurse can arrange this.

If you need any further information, or would like us to refer you to another agency, please ask a member of the medical or nursing teams.

References

Krasopoulos G and Goldstraw P. (2011) Minimally invasive repair of pectus excavatum deformity. European Journal of Cardiothoracic Surgery 39:149-158

Krasopoulos G; Dusmet M; Ladas G; Goldstraw P. (2006) Nuss procedure improves the quality of life in young male adults with pectus excavatum deformity. European Journal of Cardiothoracic Surgery. 29:1-5

Who can I contact for information once I have left hospital?

You can always phone the ward if you have questions or queries or need advice. The contact numbers are listed below.

Useful contacts

Royal Brompton Hospital switchboard	020 7352 8121
Advanced nurse practitioner	020 7352 8121, and ask for bleep 7071
Princess Alexandra Ward	020 7351 8596
Sir Reginald Wilson Ward	020 7351 8483
Physiotherapist	020 7352 8121, and ask for bleep 7301
Patient advice and liaison service (PALS)	020 7349 7715
Medicines helpline	020 7351 8910
Smokefree National Helpline	0300 123 1044

Useful websites

UK pectus excavatum and pectus carinatum information
A British site giving information on pectus anomalies, their causes and possible treatments. The site has been put together by staff at Royal Brompton & Harefield NHS Foundation Trust.
www.pectus.org

About the Nuss procedure

Website of the Children's Hospital of the King's Daughters, where Donald Nuss developed and continues to perform the Nuss procedure.

www.chkd.org

National Institute for Clinical Health and Excellence (NICE) information on the Nuss procedure

This site contains a useful briefing paper on the Nuss procedure, written for members of the public and those considering having the surgery.

www.nice.org.uk/IPG310publicinfo

About pectus anomaly correction

Website of the University of Minnesota Department of Surgery. A north American website, which offers support and information on the Nuss procedure.

www.pectus.com

National Marfan Foundation (NMF)

The site of the American National Marfan Foundation, which offers support to those affected by Marfan syndrome (commonly associated with pectus anomaly).

www.marfan.org

For information and advice on giving up smoking

www.nhs.uk/smokefree

If you have concerns about any aspect of the service you have received in hospital and feel unable to talk to those people responsible for your care, call PALS on 020 7349 7715 or email pals@rbht.nhs.uk. This is a confidential service.

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إذا كنت ترغب في الحصول على ترجمة فورية لمضمون هذه الوثيقة إلى اللغة العربية، يرجى منك الاتصال بأحد
مستخدمينا بجناح المصلحة التي يتم فيها استشفائك. أحد موظفينا سيسعى لترتيب إجراءات الترجمة وإتمامها في
الوقت المناسب لك.

Brosurteki bilginin Turkçe tercumesi için tedavi goruyor oldugunuz bolume bas vurunuz. Bolum personeli tercumenin gerçeklesmesini en kisa zamanda ayarlacaktir.

February 2015