SURGICAL OPTIONS FOR PECTUS EXCAVATUM

MINIMALLY INVASIVE APPROACH “NUSS” PROCEDURE

My Teacher and My Team

The Boy Who Never Removed His Shirt

Mr Shyam Kolvekar, is a Cardiothoracic Surgeon at The Heart Hospital, UCL and The Wellington Hospital.

One afternoon, during my busy clinic, I saw a young man of 18 with his mother. He was tall and slim and seemed extremely shy. His mother, who appeared very worried handed me a letter from his GP which described him as having pectus excavatum.

I asked him remove his shirt to examine his chest, but he was extremely reluctant to do so. His mother said that she would leave the room and told me that he had never removed his shirt in front of any of his family. When she left the room I examined him and found him to have quite a deep depression of the sternum. He told me that this made him feel like a 'freak', and that he would remain covered up during the summer on the beach and even when he went swimming. His mother later told me that he had few friends, and was also surprised that he had not yet had a girlfriend.

The usual operation for pectus excavatum or 'pigeon chest' is an extensive open bone correction, which leaves a large scar in the middle of the chest. Usually the patient would remain in hospital for up to seven days and it could take up to six weeks to fully recover. This condition is developed after birth due to unequal growth of the cartilage which supports the sternum. This presses the breast bone inward pressing on the heart and lungs creating a classical defect. Usually the extensive surgery involves removing the cartilage and breaking the sternum, then stitching it back together (ravitch procedure). Patients are left with a tiny scar on either side of the chest and an additional small scar on the right side for the telescope. **(Fig 2)**

> This surgery has revolutionised the outlook and recovery time for patients, and we are receiving an increased amount of referrals from all over the UK and abroad.

The new approach (NUSS procedure) introduced by American Surgeon, Dr Donald Nuss, is a keyhole technique using a telescope which is suitable for children. A metal bar, which is pre-designed for a patient's defect, is used and is passed through under the sternum via a tiny 5mm incision. The bar is fixed on the other side with a stabiliser and the sternum is instantly pushed forward, making the defect disappear.

The bar stays in place for up to three years, after this time it is removed. This procedure is done under general anaesthesia and takes approximately half an hour from start to finish. The patient will then stay in hospital for one night and can usually return to an office job within a week. Pain control is sometimes needed for patients in the post-operative period.

This surgery has revolutionised the outlook and recovery time for patients, and we are receiving an increased amount of referrals from all over the UK and abroad. Our service was set-up in collaboration with Professor Pilegaard from Denmark, who has extensive experience in minimally invasive pectus correction surgery. We can offer this surgery to anybody from sixteen years up to forty years of age. From forty years upward the cartilages become calcified and the bar may not correct the defect sufficiently.

Below are pictures of the patient described above. He is a confident 19 year old who is happy to go swimming and now has his first girlfriend!

Before

After (Fig 2)

The beginning!!!

History at Our Unit

- Started with 2 cases a year
- Now we get 2-4 referrals every week from all over the world!
- Started in 2010 with Supervision of Prof Pilegaard from Denmark
- We do over 50-60 cases year increasing to 100
- We Modified the operation to shorter bars and single stablizer which reduced the pain
- **Most of referral comes from Social Media and blogs!**

Pectus excavatum

NUSS Procedure after Ravitch

History

- 1594 Bauhinus
  - A classical paper with features of chest wall with pulmonary compression
- 1911 Ludwig Meyer
  - Attempt correct surgically
- 1947 Ravitch
- Described and practiced surgical correction
- 1986-97 Nuss
- He revolutionized the approach initially in children but now in adults

Donald Nuss

- Pioneer Surgeon 1986 Norfolk Virginia CHKD

Traditional Scars

Traditional Scar

Another way (Plastic)

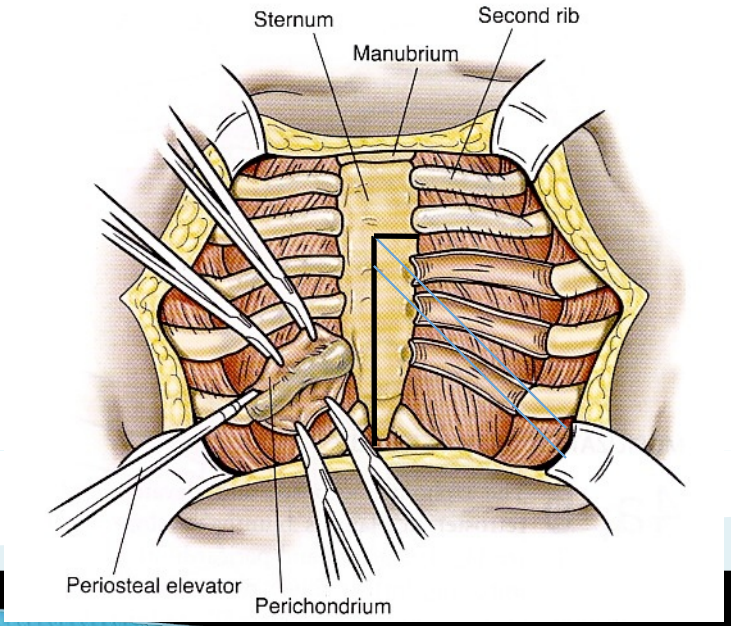
NUSS Scars

35 yr old

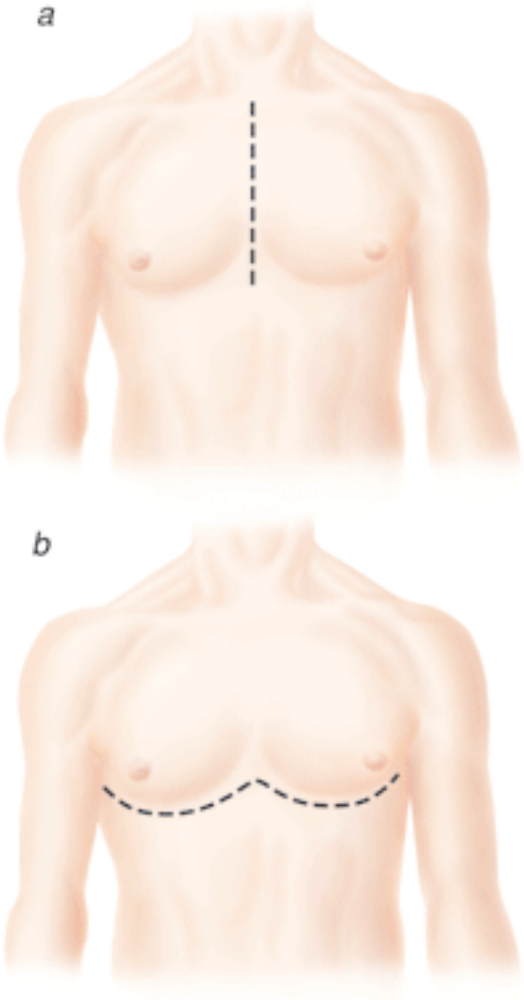
17 yr old

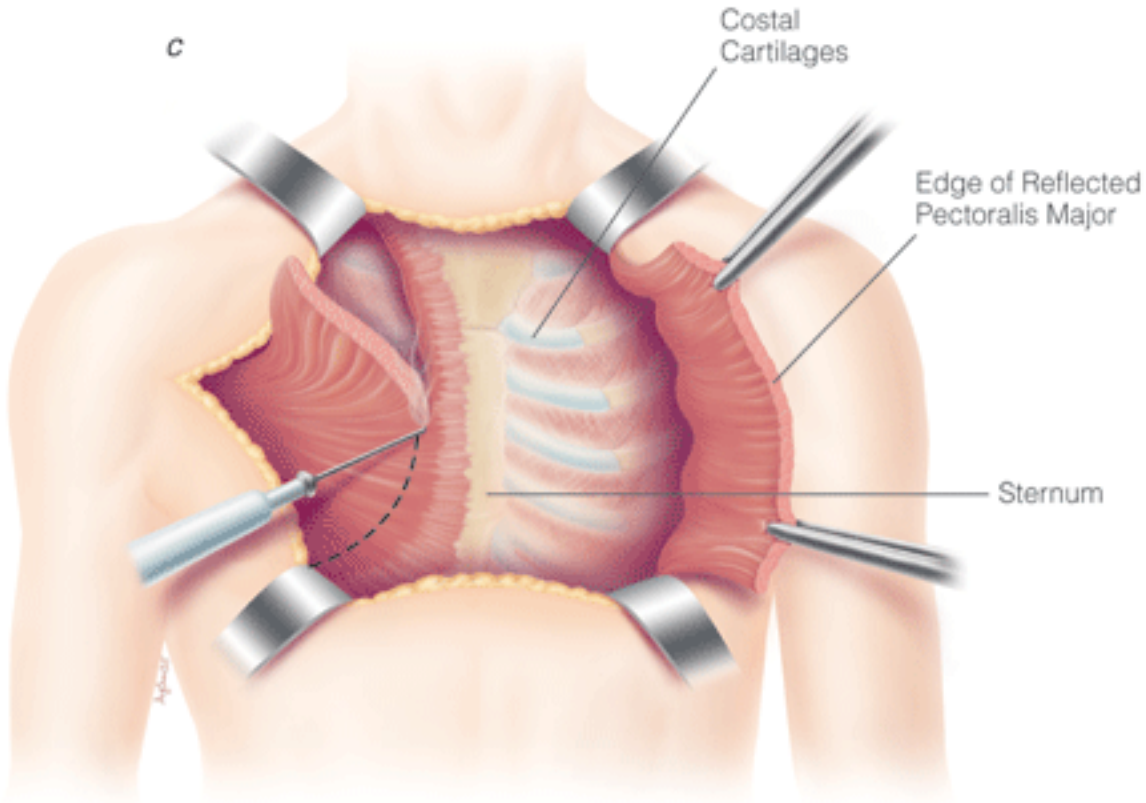
Ravitch Tech

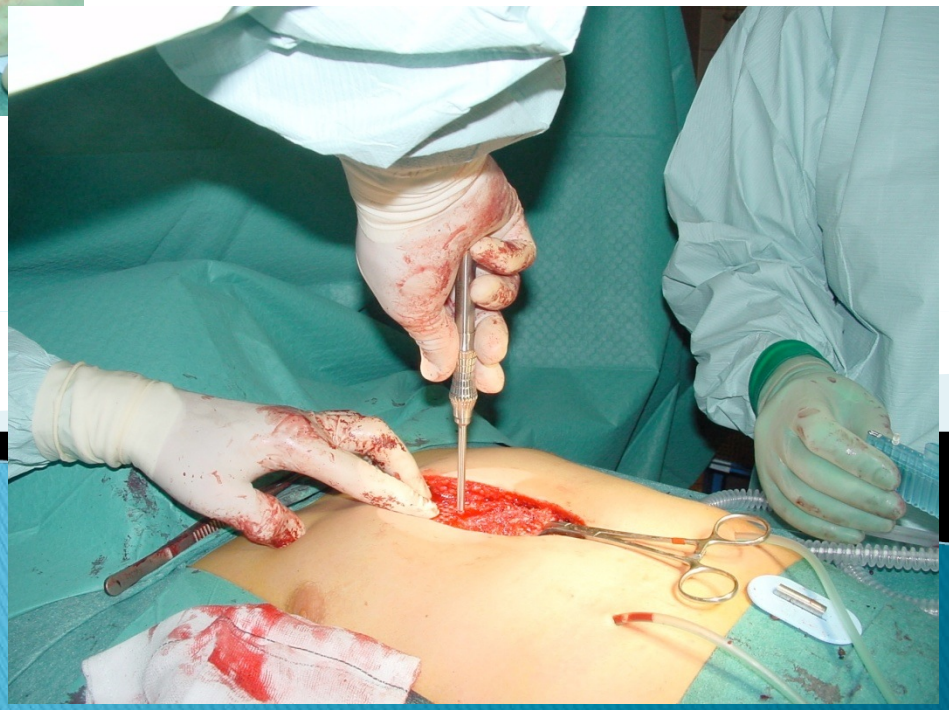
Longitudinal osteotomy in the anterior compacta of sternum



Ravitch


a
b


c
Costal Cartilages
Edge of Reflected Pectoralis Major
Sternum



Why Change?

- What's wrong with “old-fashioned” way?
- Maximally invasive
- Extensive dissection
- Pain sensation -from painful to cosalgia and then eternal numbness!!!
- Scars!! Not exactly desired beach body eh!!!!!!
- Choose and Book Revolution.

Facts

- Incidence: 1 / 400 – 1 / 1000
- Male / Female: 4-6 / 1

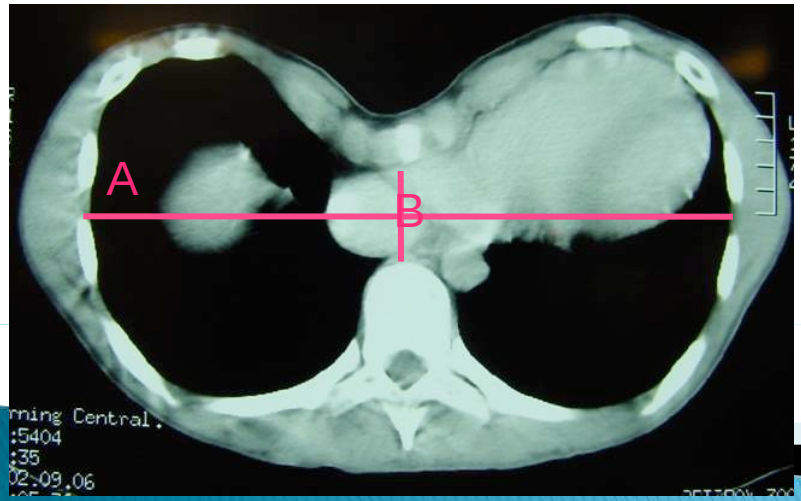
- 85% evident in the first year of life
- 40% family history

- More frequent in Marfan´s syndrome

Pectus excavatum

CT scan

Haller Index = A/B



Symptoms

- Exercise intolerance
- Lack of endurance
- Shortness of breath
- Chest pain with exercise
- Chest pain without exercise

Kelly : Sem Pediatr Surg 2008:17;181-193

Associated findings

- Asthma
- Scoliosis
- Mitral valve prolapse

Quality of life

significant improvement

(Lawson : J Pediatr Surg 2003)

(Krasopoulus, Eur J Cardiothor Surg 2006)

Diagnosis

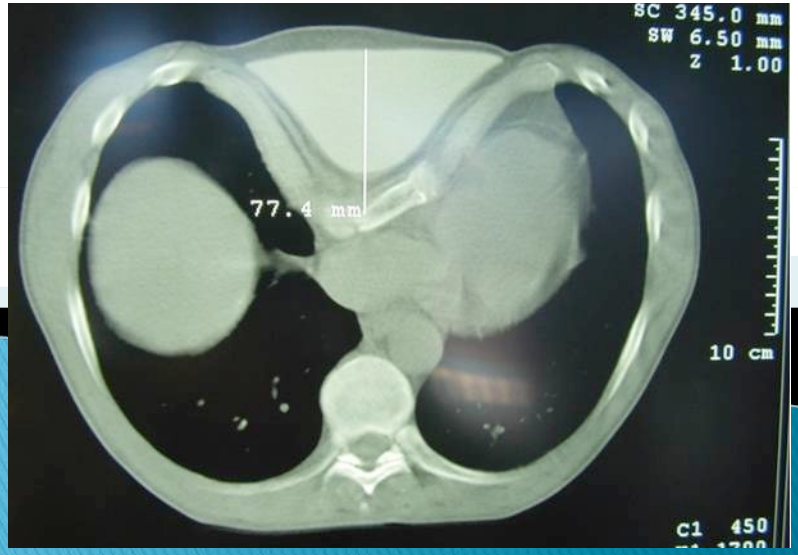
- Clinical examination

- CT-scanning

- Echocardiography

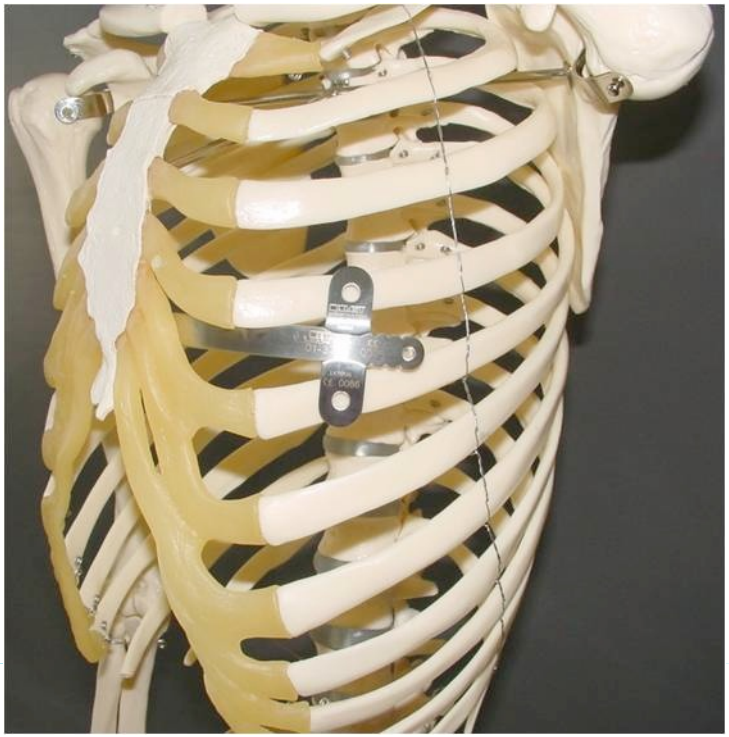
Indications for surgery

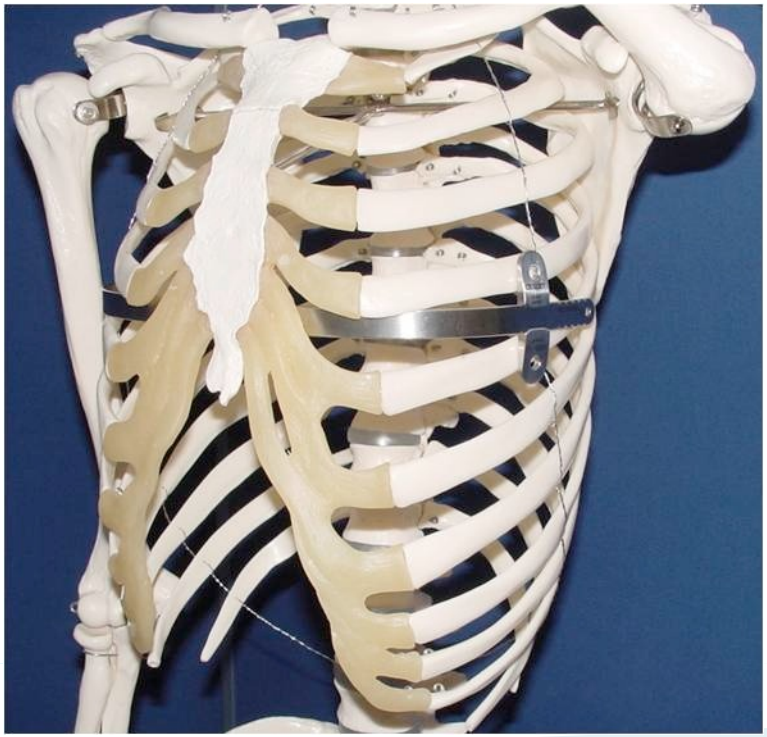
- Cosmetic
  - Haller CT-index > 3.25
- Previously implanted silicone prothesis



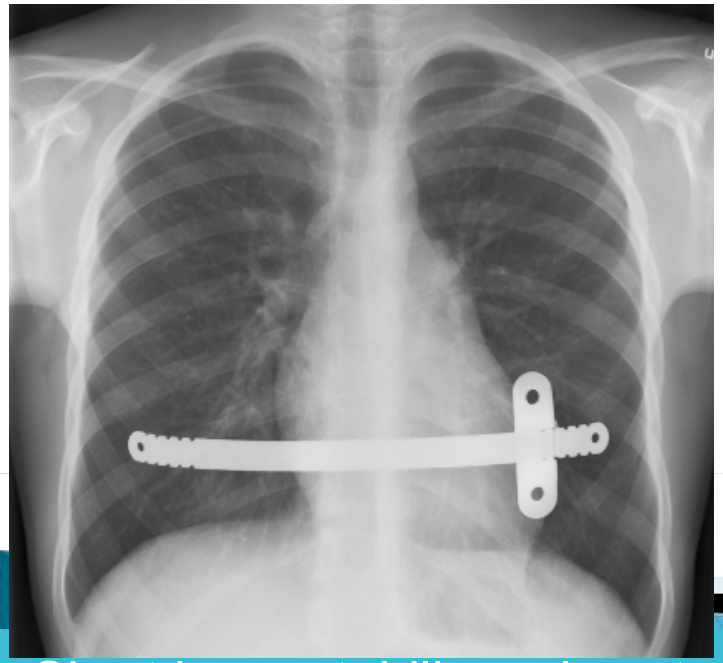
Nuss technique

- Single-/double lumen tube
  - No need for CO_2 insufflation
  - Removed on the table
- Thoracoscope
  - Right side only
- Chest tube (on the table)
- Antibiotics i.v. for 3 days



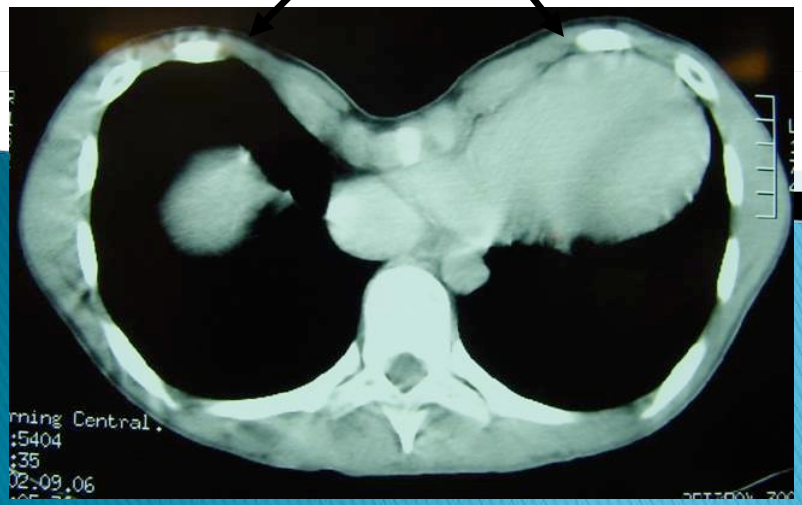


Short bar – position of the stabilizer



Short bar – stabilizer close to entry

Stabilizer at the anterior chestwall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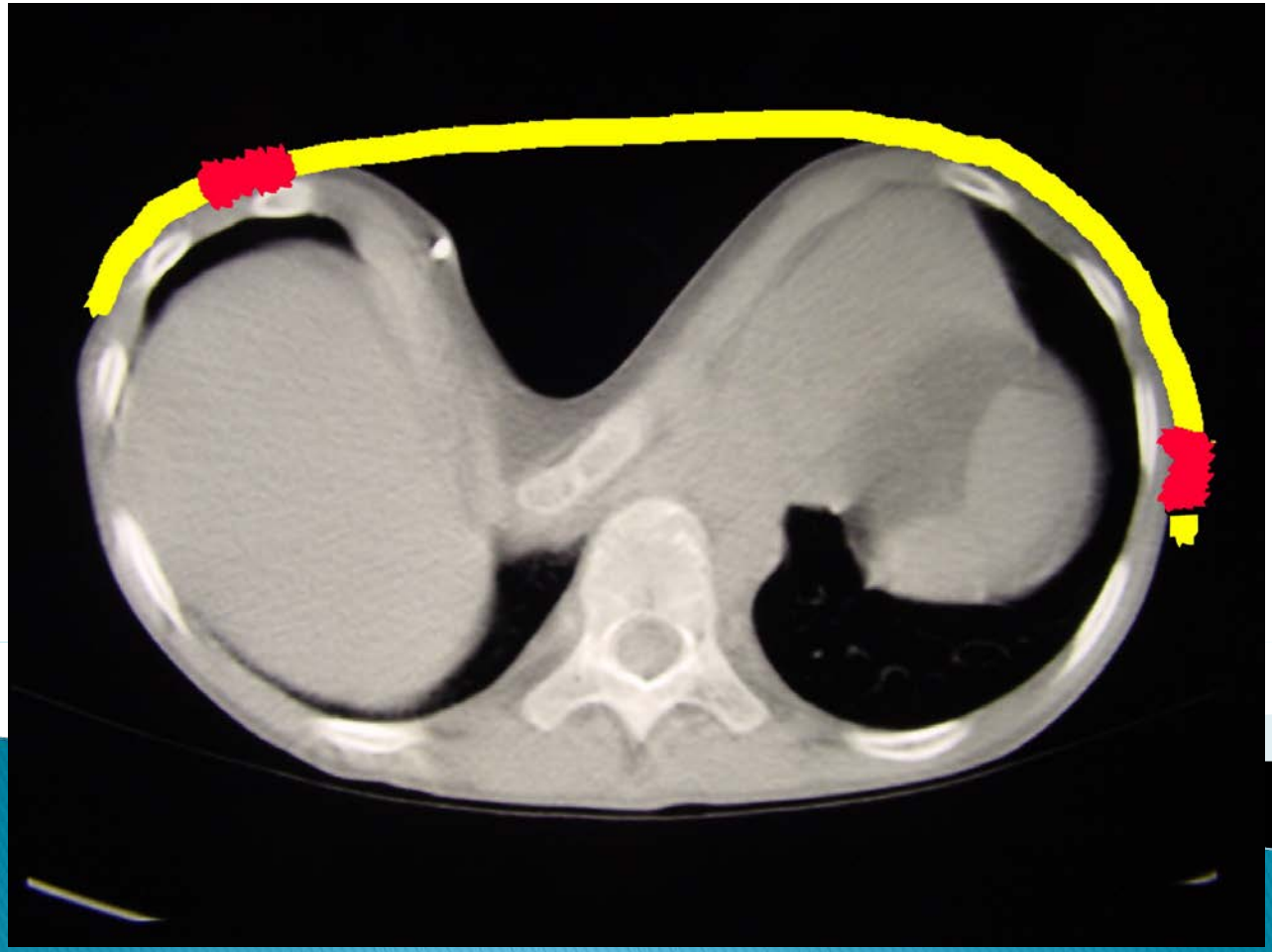
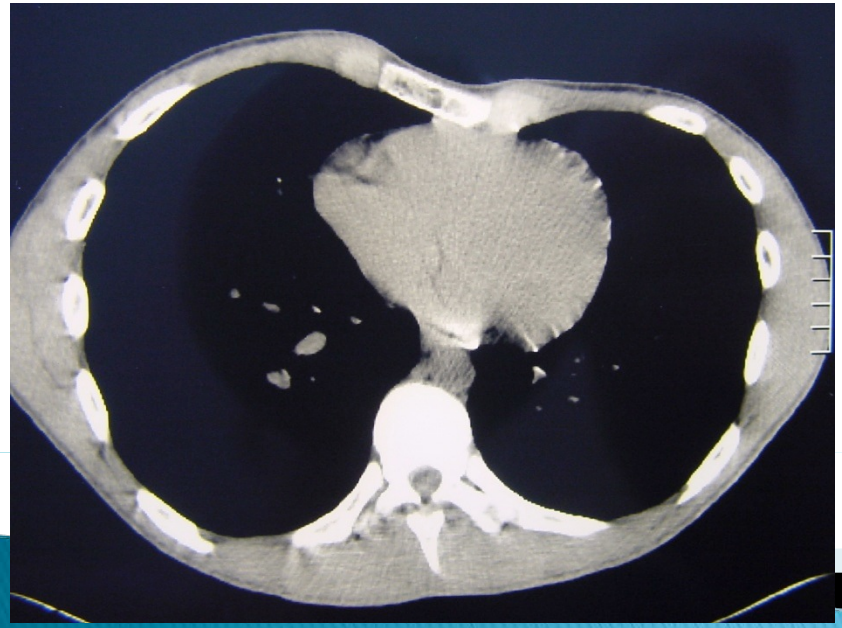
Short bar vs. Long bar

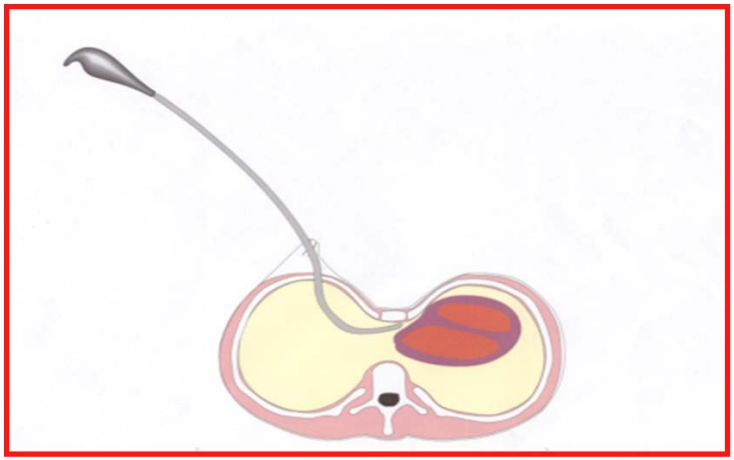


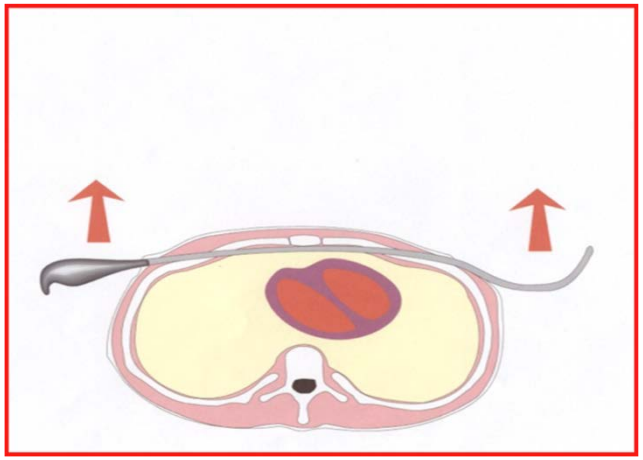
Pectus excavatum

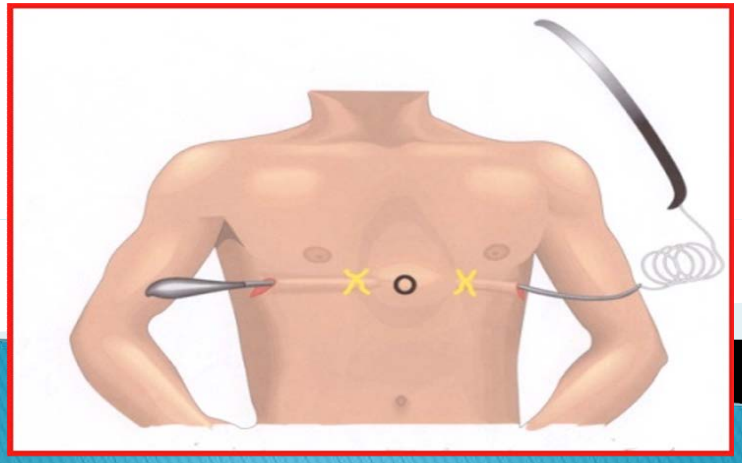
Asymmetric



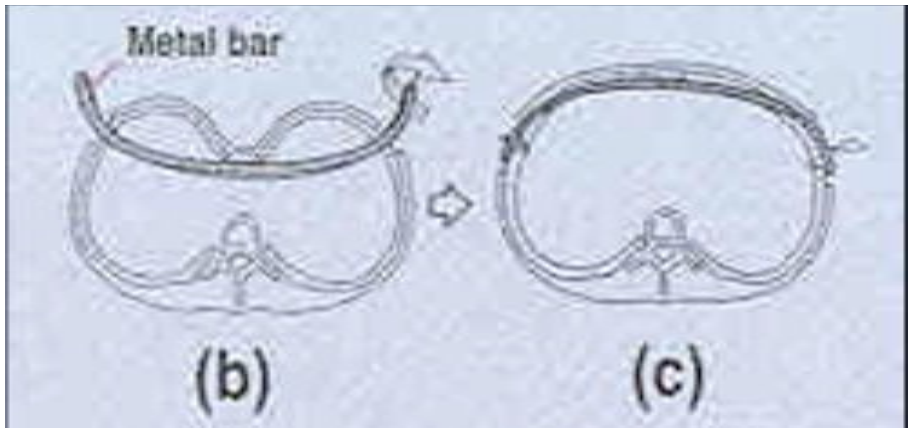
Technique

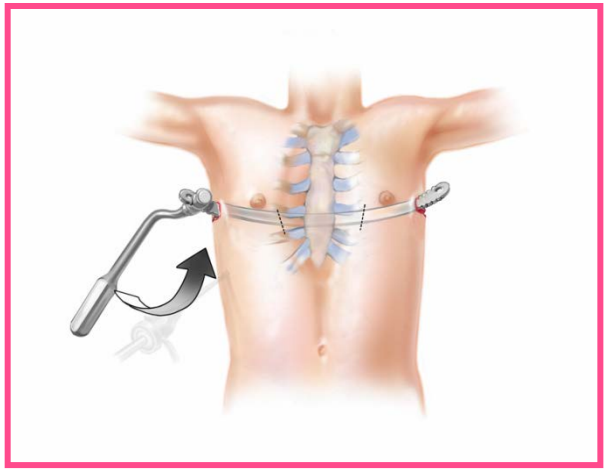






The operation



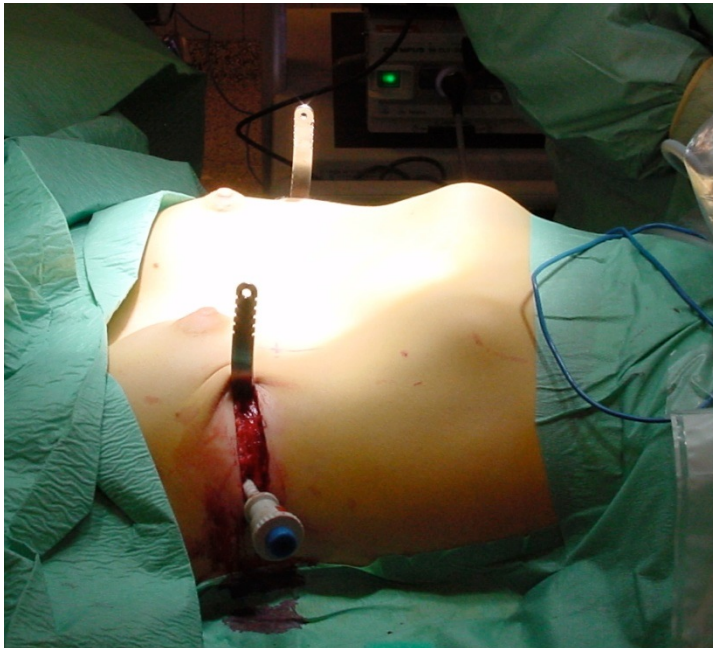


Stabilizer on the left

Absorbable sutur around rib - right

Technique – more than one bar

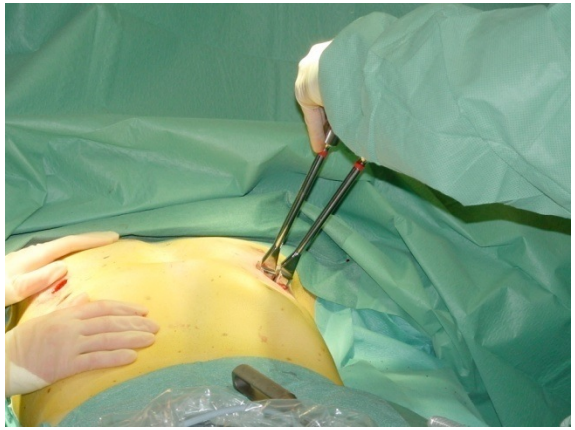
Incisions

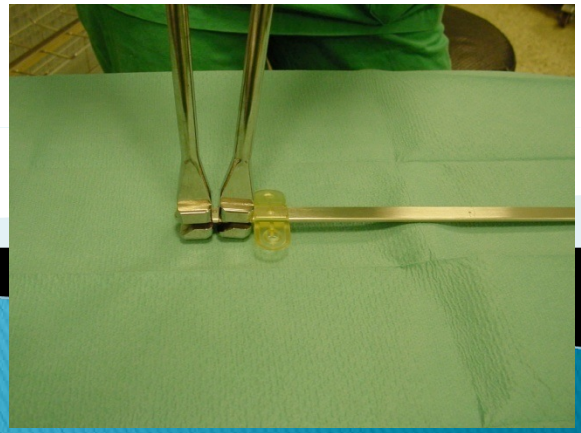


Long bar

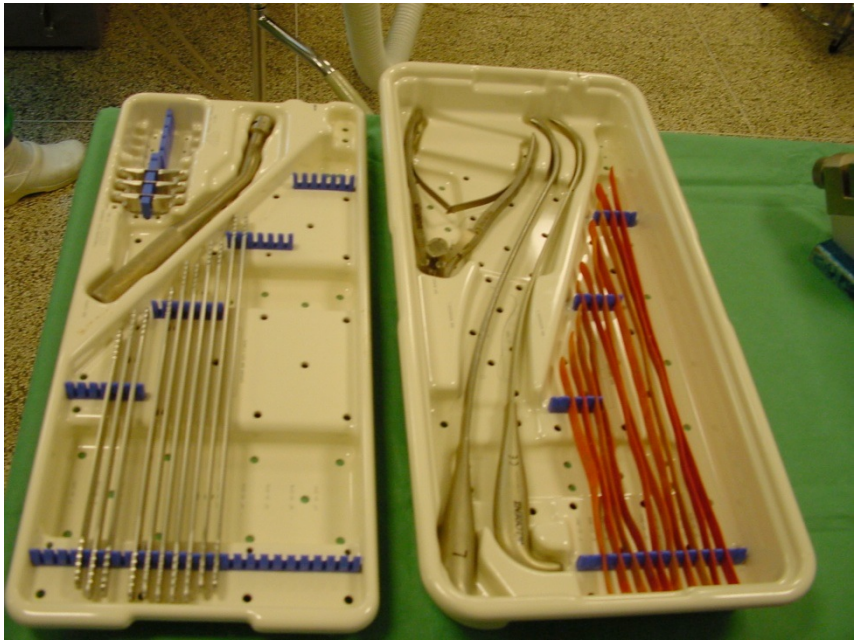
Short bar

Bending the bar in the patient



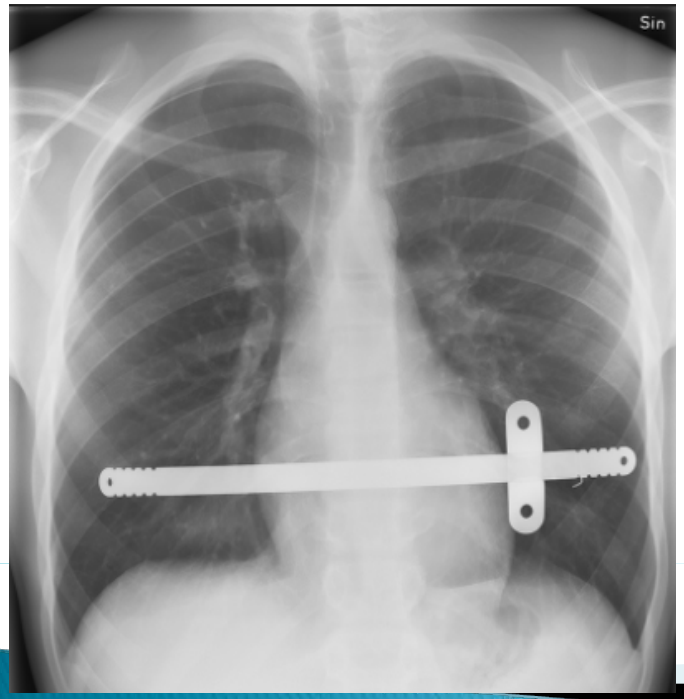


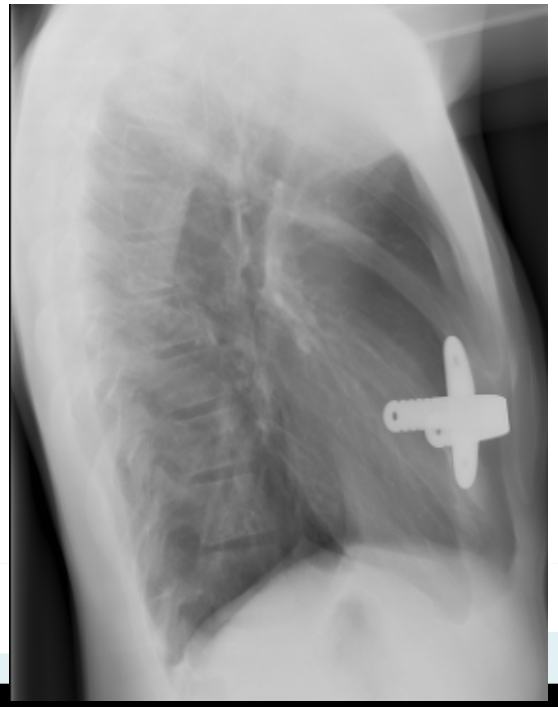
Short bar



BIOMED MICROFIXATION STEAL BARS

Flipping and De-Airing

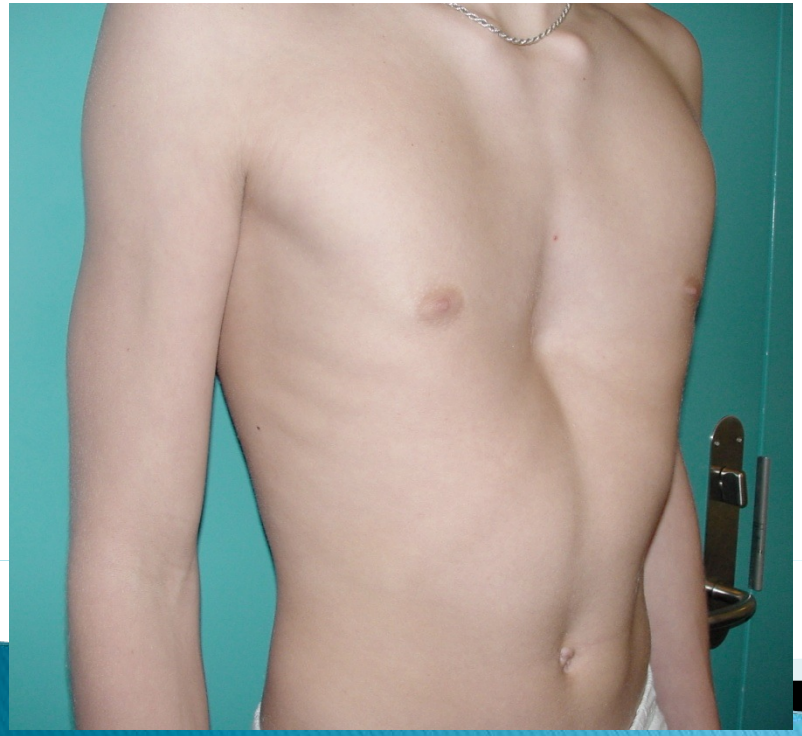

Sin

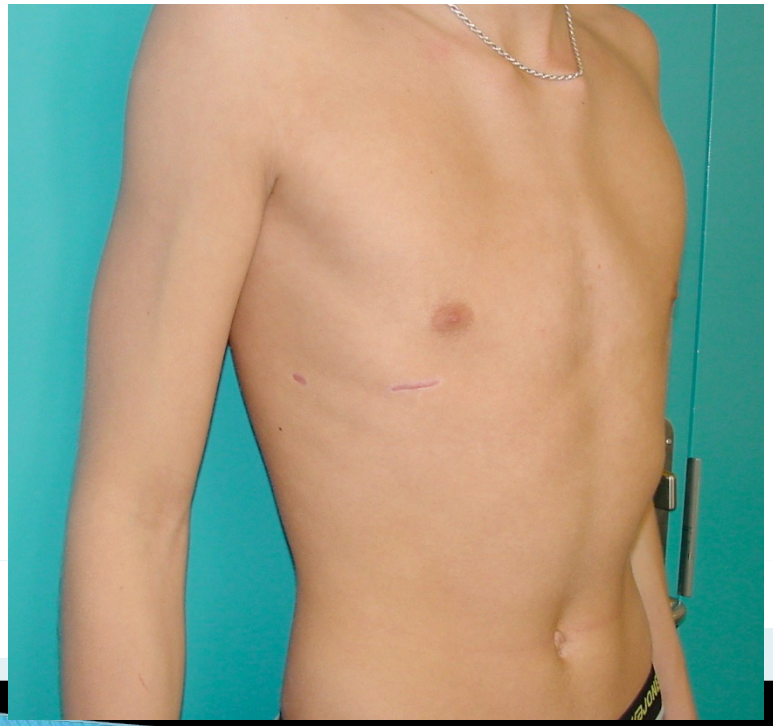


Result

Result

Result





Complications of NUSS

- Pneumothorax
- Haemothorax/effusion late presentation
- Damage to Lung
- Injury to Heart leading to sternotomy that's is the reason it should be done by cardiothoracic surgeon
- Bar misplacement
- Infection of bar
- Flipping the bar
- Pain
- Airport security
- ?CPR for patient with bar?

Treatment For PE

1.Surgical Treatment

- Nuss Procedure
- Ravitch Technique
- Chest implants
- Cosmetic Dermal Filler
- Magnetic Mini-Mover Procedure

2 Non Surgical Treatment

- Vacuum Bell
- Spirometer
- Exercise & Physiotherapy
- Bodybuilding
- External Brace

Magnetic Mini-Mover Procedure

- The procedure works by placing two magnets, one inside the chest and the other outside the chest, which, between them, creates a magnetic field. this field applies a controlled and sustained outward force on the sternum. The goal is to promote the rib cartilage to move to a more normal and cosmetically appealing position. The result is a more gradual correction of the chest wall, over a period of many months using a nominal force. As a side note, this is the same principle applied to moving teeth with orthodontic braces.

Cosmetic Dermal Filler

- Cosmetic dermal fillers can be thought of as “liquid implants” for a patients chest, and they offer many of the benefits of surgical implants, but without much of the downtime.

- Although it cannot help with the physiological symptoms associated with Pectus Excavatum, it can help to improve the cosmetic appearance of the chest. Cosmetic dermal fillers include collagen, hyaluronic acid, fat and other substances and some example dermal filler brand names include ArteFill, Radiesse, Sculptra, Juvederm, Hylaform, Restylane, Perlane and several others.

Chest implants

- Cosmetic surgery involving chest implants or, in the case of women, breast implants, provides patients with an option to add size and shape to their chest and overall physique. Many individuals with Pectus Excavatum are turning to the use of specifically designed chest implants to achieve a more natural shape and a flatter, more defined appearance to the chest. Chest implants cannot be used to remedy the physiological symptoms which are associated with (more severe cases of) Pectus Excavatum. However, they can be used to improve the cosmetic appearance of the chest to a significant degree, which for many Pectus Excavatum patients, is precisely what they are looking to achieve.

Chest Implants

Vacuum Bell

- The Vacuum Bell is a suction cup device that is used to create a vacuum at the chest wall, in order to pull the sternum out. More specifically, a vacuum of up to 15% below atmospheric pressure is created using a hand pump to draw the sternum out into a more normal position. The vacuum bell is currently available in three different sizes (16cm, 19cm and 26cm in diameter) in order to allow for treatment of a range of patients. In addition, a model specifically designed for the treatment of female patients is also available

Vaccum Bell

Spirometer

- A spirometer is a medical device used for measuring the volume of air inspired and expired by the lungs. It is a precision differential pressure transducer for the measurements of respiration flow rates. The spirometer records the amount of air and the rate of air that is breathed in and out over a specified period of time. There are numerous different types of spirometer such as a USB PC-based spirometer, a ultrasound based desktop spirometer, and a portable spirometer.
- A Tank-type spirometer works on the same principle as the gas meter. A canister of soda is usually attached to absorb carbon dioxide and a kymograph trace is produced to record changes in total volume gas. From this, vital capacity, tidal volume, breathing rate and ventilation rate (=tidal volume x breathing rate) can be calculated. From the overall decline on the graph, the oxygen uptake can also be measured.

External Brace

- A further possible treatment for Pectus Excavatum is the use of an external brace. This method involves the wearing of a specially designed brace which applies pressure to the chest a back with an aim to alter the appearance of the sternum. Most braces work by attempting to pull the shoulder blades back and down helping to address the individuals posture. The effect of this will be to produce a more appealing chest shape and potentially pull the sternum out.
- The relative effectiveness of the bracing technique is dependent on the quality of the brace used and the extent to which the patient wears the brace. Typically patients are recommended to wear a brae permanently for a sustained period of time, taking it off only for washing, or throughout the night.

External Braces

Many thanks for invite

- For information visit out web site
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