

# A Simplified Method to Pass the Bar Through the Mediastinum in the Nuss Technique

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In the minimally invasive repair of pectus excavatum, as reported by Nuss, the introducer is inserted into the thoracic cavity, making its way through the mediastinum, and emerges through a left intercostal space. Then, 2 umbilical tapes are tied to the introducer tip as a guide to pass into this tunnel the curved bar with the concave side up. When fat tissue is present in the anterior

mediastinum or bars with notched ends are used, passage of the umbilical tape could be challenging and eventually lead to bleeding. In this report, we describe a different and simple technique to allow this passage, from left to right, in a very safe and effective way.

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The minimally invasive repair of pectus excavatum, first described by Nuss and colleagues [1] in 1998, has become a standard procedure for the treatment of patients with severe pectus excavatum. In the original report, the introducer was inserted into the thoracic cavity and a way through the mediastinum was achieved by gently swinging its tip. Once the introducer had emerged through the left intercostal space, 2 umbilical tapes were tied to its tip and passed through the created substernal tunnel in the opposite direction [1]. These tapes served as traction to move, from right to left, in this tunnel, the previously curved bar with the convexity facing posteriorly.

This kind of passage can be quite difficult and sometimes can become dangerous, especially when fat tissue is found in the anterior mediastinum or bars with notched ends are used. Here we describe a different and simple technique to allow this passage, from left to right, in a very safe and effective way.

## Technique

The patient is positioned supine on the operating table, with the chest elevated, using several blankets to allow the arms to be adducted in a lower position. The patient is intubated with a single-lumen tracheal tube and ventilated with low volumes. The most depressed area of the sternal plate and hinge points on both sides of the chest ridge are identified and marked (Fig 1A).

A 5-mm thoracic port is bluntly introduced in a lateroposterior right position and carbon dioxide insufflated at 4 to 6 mm Hg pressure to partly reduce lung expansion.

Carbon dioxide diffusion will create an operative space, allowing a clear vision of the mediastinum through thoracoscopy.

Two curved lateral incisions, 3 to 4 cm long, are made just at the inferior edge of pectoralis major muscles, and a subcutaneous plane is created. If the bar overlaps the pectoralis major, its inferior bundles are released from the costal plane, thus creating a submuscular passage.

An introducer is inserted into the right chest at the selected intercostal space and under-vision dissection is done just above the pericardium. This passage is facilitated by the elevation of the depressed sternum and by gas diffusion in the left pleura due to small lacerations produced with smooth dissection. Once the left side of the desired intercostal space is reached, the tip of the introducer is pushed through the intercostal space. One side of a 40-cm-long polyvinylchloride suction connecting tube (Extrudan Surgery, Birkerød, Denmark) is plugged into the introducer tip and the other side is connected to the right end of the curved bar (Fig 1B and C). The introducer is carefully pulled backward from left to right, followed by the tube, creating a path for the bar to pass with the concave side up (Fig 1D–F).

The entire procedure is completed smoothly and easily in a few seconds under thoracoscopic vision. The bar is then rotated, in the usual way, 180 degrees around its long axis, thus pushing up the sternum.

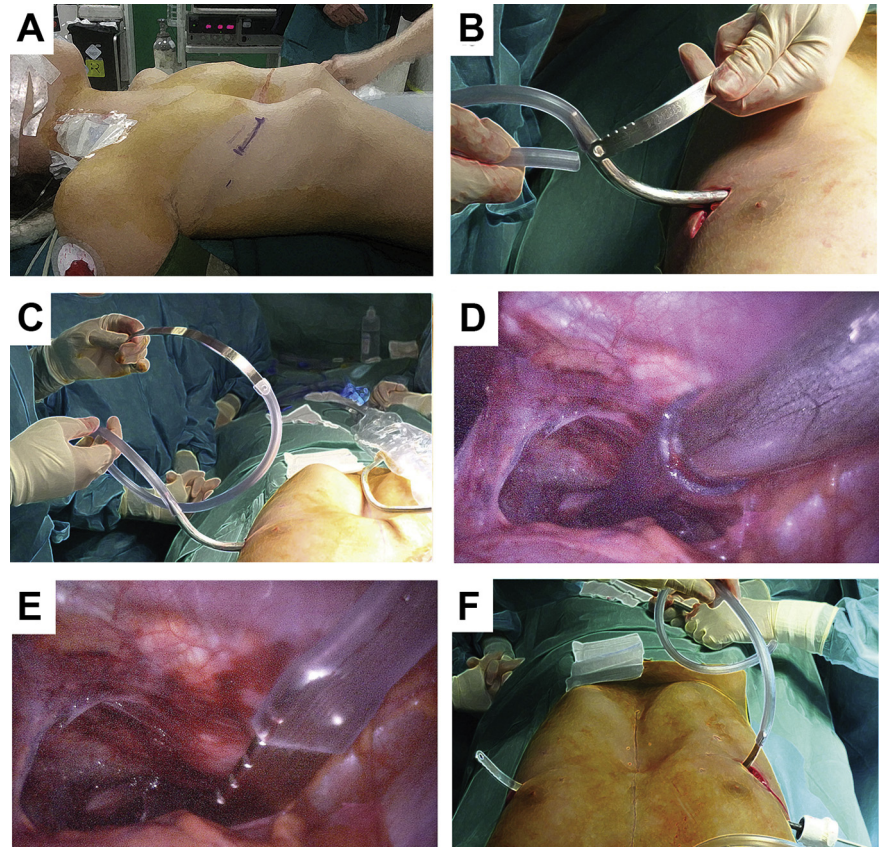
## Comment

The first major complication during a bar passage was reported by Banever and colleagues [2], who described a right internal mammary laceration during this maneuver. The idea of passing the bar through the narrow anterior mediastinal space using plastic material is not new. In a previous report, de Campos and colleagues [3] reported the removal of the bar with its sharp edges covered by a

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Fig 1. (A) The patient is positioned on the operating table. (B) A suction connecting tube is connected to the introducer tip and to the bar end, (C) the introducer-tube-bar complex is carefully pulled backward, and (D and E) its passage is checked under thoracoscopic view until (F) both bar ends are out of the chest.



protective film. Darlong [4] recently suggested a way to increase Nuss procedure safety by using a transparent hollow polyvinylchloride tube to perform a so-called tunnelscopy and pass the bar through the mediastinum under tunnelscopic vision.

The technique presented in this report is very simple: using a 40-cm piece of suction connecting tube, we force the introducer tip into one end of the tube while the other is connected to the right side of the concave preshaped bar. This composite structure is moved from left to the right, under thoracoscopic vision, retracting the introducer slowly. This procedure is accomplished smoothly and easily in a few seconds and can be repeated as many times as needed: for example, when we realize the bar is too short or too long. Nowadays, bars, with or without notched ends, are available from different suppliers; in any case, a suction connecting tube is deemed useful for covering the bar end, thus avoiding any possibility of

lacerating the mediastinal fat and vessels during the operative procedure. This technique has already been used in 60 consecutive patients, operated-on by two groups with instruments from different suppliers, without any problem.

## References

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