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Surgical technique for Nuss bar exchange due to metal allergy

Minimally invasive repair of pectus excavatum (MIRPE) has become the procedure of choice to treat pectus excavatum. The frequency of complications is variable but remains low on most recent reports [1,2]. In rare instances such as metal allergy, the bar or bars must be replaced despite adequate an repair. Metal allergy to surgical stainless steel is estimated to occur in 1.2 to 6.6% of patients [3,4]. Reoperation poses a challenge owing to adhesions, risk of lung injury, or potential cardiac and aortic injury. We present a technique that is easy to reproduce and valuable for bar replacements when there is no need for further correction.

Both previous incisions are opened, and dissection is carried down onto the lateral ends of the bars. The bars are straightened on both sides and any residual scar or ossification is released. (Fig. 1a and 1b). A new bar is measured, and the left side is bent to the position needed to provide adequate correction (Fig. 1c). If the bar has been pre bent, the new bar is unbent on the right side only and re checked for adequate curvature on the left side (Fig. 1d).

Once the existing bar is freed from any adhesions, straightened completely, and slides easily, the straight end of the new bar is tied to the left side of the old bar using three #5 Fiberwire™ sutures and lubricated with saline (Fig. 2a and 2b). The old bar is used to guide the new bar across the mediastinum from left to right using a Backhaus towel clamp on the right. The assistant ensures a straight path for the new bar from the left side (Fig. 2c). The right side of the bar is re bent and fit into the submuscular pocket and ribcage by pulling the bar further to the right to allow medial bends (Fig. 2d). Another towel clamp on the left side will prevent it from being accidently pulled out the other side. The new bar is then secured to the rib cage. If there is very little sternal pressure on the bar, pericostal sutures are not required. Recurrent cryoablation is not required, as pain is typically minimal. Finally, the wounds are closed in 3 layers. An intraoperative chest radiograph is obtained for pneumothorax and patient is transferred to the postoperative anesthesia care unit (PACU). Patients are usually discharged the following day. In terms of postoperative care, the most patients can be safely discharged the same day or the following day on oral anti-inflammatory medications only.

Reoperative pectus surgery, as with any operation, carries some degree of risk [5]. Historically there have been reported complications related to formation of adhesions causing bleeding from the tract or the intercostal vessels at time of replacement, among others [5–7]. With this technique, the same tract is used. We have

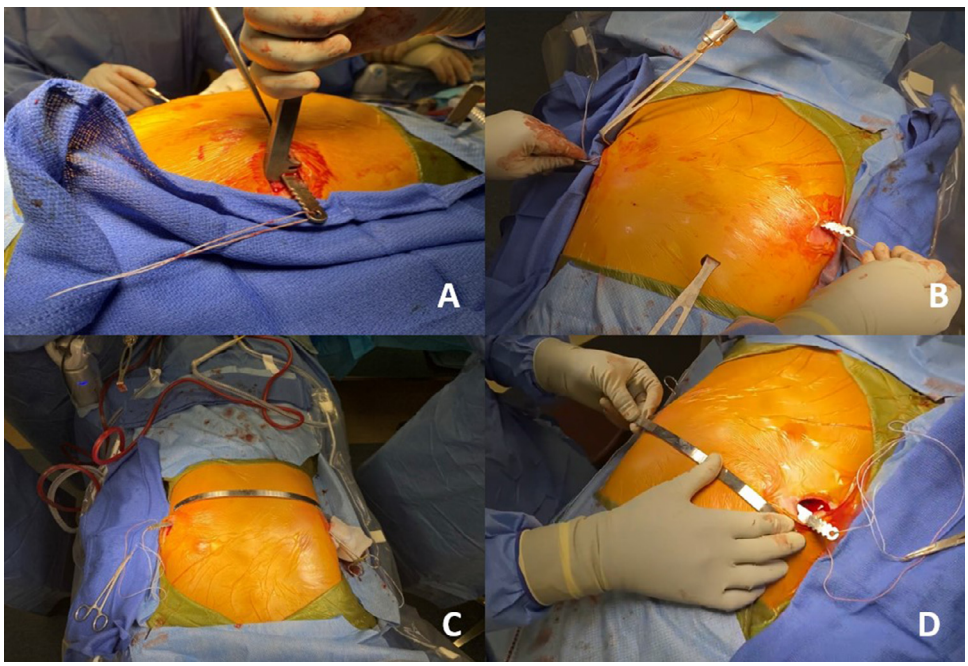

Fig. 1.. Bar Preparation After making incision, the bar is freed, unbent bilaterally and prepared for removal (Panel A). The bar should slide easily (Panel B). After ensuring adequate correction (Panel C), the new bar is unbent on the right side for replacement (Panel D).

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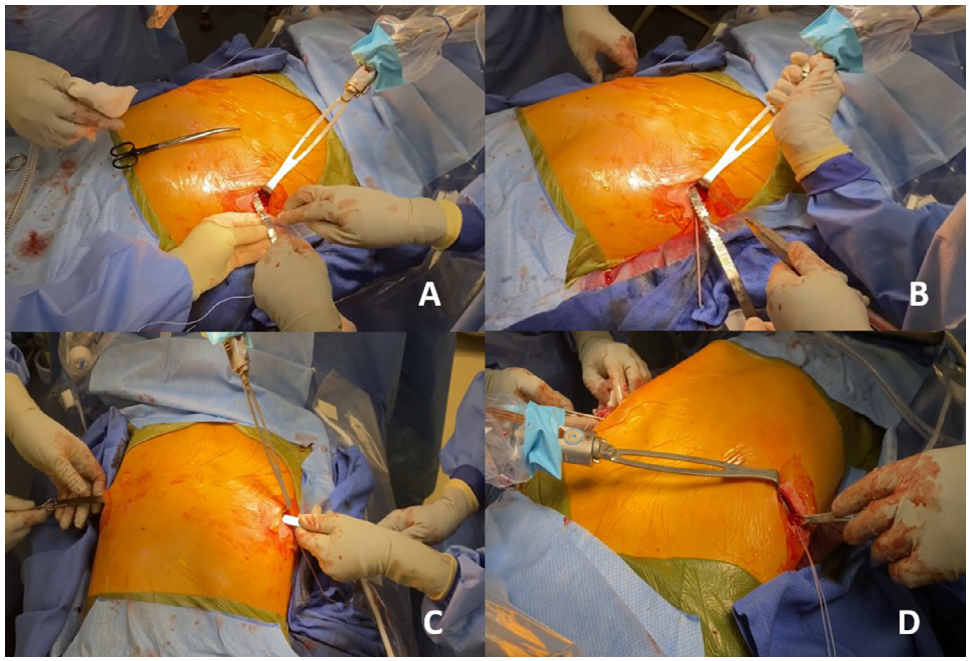

Fig. 2.. Bar Replacement. The new bar is tied to the left side of the old bar using multiple Fiberwire sutures (head is towards top of Panel A and B). The bar is guided under the sternum using the previous bar (Panel C). The Fiberwires are then cut allowing removal of the old bar. The edges of the new bar are bent around to match the rib cage and the new bar is secured using multiple PDS and Fiberwire Sutures (Panel D).

not had any issues with bleeding or intrathoracic injury with this technique. However, most of these bar exchanges have been done after a well formed tract would be expected (see video).

The major benefit of the technique presented is that it obviates the need for thoracoscopy and intrathoracic dissection which decreases the operative time and risk of injury. It is important to note the same tract is used, so the technique is not suitable for bars that have migrated. Also, if bar exchange is required soon after the initial surgery, it is not known if the technique will be applicable. At a minimum, early exchange should be done with sternal elevation to ensure the new bar can slide through without downward deflection into the heart.

Declaration of Competing Interest

Dr Notrica has consulting agreements with Atricure and KLS Martin, and done prior consulting for Zimmer BioMet. Dr. Jaroszewski reports personal fees from Zimmer BioMet, outside the submitted work. The other authors have no conflicts to report.

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Supplementary materials

Supplementary material associated with this article can be found, in the online version, at doi:10.1016/j.jpedsurg.2022.08.001.

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