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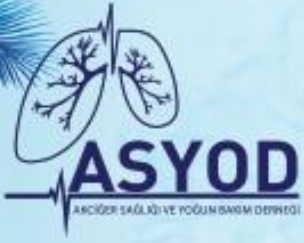
Sizin Sesiniz, Sizin Kongreniz...

9-12 Nisan 2025
Sueno Deluxe Hotel,
Belek/Antalya



Olgularla Mikst Pektus Cerrahisi

Doç. Dr. Anıl GÖKÇE
Ankara Bilkent Şehir Hastanesi
Göğüs Cerrahi Kliniği



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- Doğumsal göğüs duvarı deformiteleri; bir veya birkaç kostanın ya da kartilajın yokluğu, kısalığı, bifurkasyonu, füzyonları ile ortaya çıkan anomaliler olup, pektus ekskavatum, pektus karinatum, Poland sendromu, sternal defektler ve izole kosta kartilaj anomalileri gibi farklı şekillerde görülebilir.
- Bu deformiteler içerisinde en sık görüleni pektus ekskavatum olup toraks deformitelerine diğer iskelet sistemi deformiteleri, kardiyovasküler, gastrointestinal ve genitoüriner anomalilerin eşlik edebileceği unutulmamalıdır.

Sınıflandırma

Göğüs duvarı deformiteleri «morfolojik sınıflandırması» göğüs duvarı deformitelerini göğüs duvarının anatomik topografisine göre 5 tipe ayırmaktadır. Buna göre;

Tip 1- sternum

Tip 2- kostal kartilaj

Tip 3- kaburga

Tip 4- kombine kostal kartilaj ve kaburga

Tip 5- kostavertebral bileşkeye ait deformitelere verilen isimlerdir.

Tip 2 yani kostal kartilaj deformiteleri, Pektus ekskavatum ve karinatumun veya her ikisinin kombinasyonunu içeren geniş bir gruptur.

Göğüs duvarının morfolojik özelliklerini temel alan “Willital sınıflandırmasına” göre konjenital göğüs duvarı deformiteleri 11 farklı tipe ayrılır.

Tip 1	Normal toraksın eşlik ettiği simetrik pektus ekskavatum
Tip 2	Normal toraksın eşlik ettiği asimetrik pektus ekskavatum
Tip 3	Platytoraksın eşlik ettiği simetrik pektus ekskavatum
Tip 4	Platytoraksın eşlik ettiği asimetrik pektus ekskavatum
Tip 5	Normal toraksın eşlik ettiği simetrik pektus karinatum
Tip 6	Normal toraksın eşlik ettiği asimetrik pektus karinatum
Tip 7	Platytoraksın eşlik ettiği simetrik pektus karinatum
Tip 8	Platytoraksın eşlik ettiği asimetrik pektus karinatum
Tip 9	Pektus ekskavatum ve pektus karinatum kombine halde olması
Tip 10	Toraks duvar aplazisi veya hipoplazisi
Tip 11	Kleft stenum defektleri

Pektus Ekskavatum Sınıflandırılması

1. “Cup shaped” (lokalize derin depresyon)
2. “Saucer shaped” (diffüz yüzeysel depresyon)
3. “Grand canyon” (asimetrik uzun boru şeklinde dep-resyon)
4. **“Currarino-Silverman” (miks karinatum/ ekskavatum, “pouter pigeon” deformitesi, “horns of steer” = boğa boynuzu, atnalı deformitesi) ???**



Janssen N, Coorens NA, Franssen AJPM, Daemen JHT, Michels IL, Hulsewé KWE, Vissers YLJ, de Loos ER. Pectus excavatum and carinatum: a narrative review of epidemiology, etiopathogenesis, clinical features, and classification. J Thorac Dis. 2024 Feb 29;16(2):1687-1701. doi: 10.21037/jtd-23-957. Epub 2024 Jan 22. PMID: 38505013; PMCID: PMC10944748.

Pektus Karinatum Sınıflandırılması

Üç değişik formda görülebilmektedir

1- Kondrogladiolar tip En sık görülen formudur. Sternum korpusunun anterior çıkıklığıdır ve genellikle alt kostal kartilajların çıkıklığı da eşlik eder, 2 formda görülür. a) Simetrik (en sık) b) Asimetrik

2- Mikst tip Pektus ekskavatum ve karinatum deformitelerinin birlikte görüldüğü formdur.

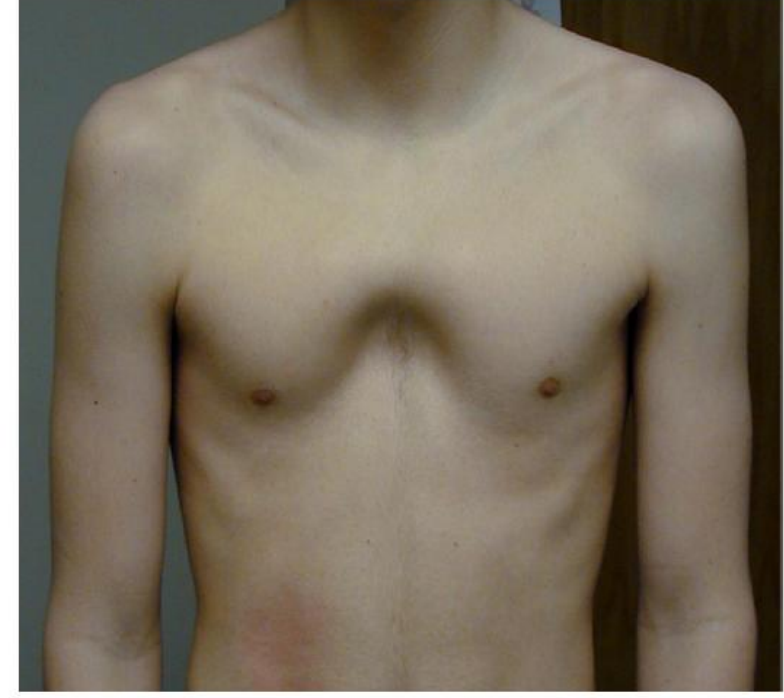
3- Kondromanubrial tip Nadir görülen bu deformite de manubrium, 2 ve 3. kostal kartilajın çıkıntısı ile sternum korpusunun göreceli basıklığından oluşur. Güvercin göğüs deformitesi olarak da adlandırılır.

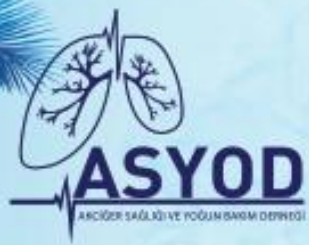


Janssen N, Coorens NA, Franssen AJPM, Daemen JHT, Michels IL, Hulsewé KWE, Vissers YLJ, de Loos ER. Pectus excavatum and carinatum: a narrative review of epidemiology, etiopathogenesis, clinical features, and classification. J Thorac Dis. 2024 Feb 29;16(2):1687-1701. doi: 10.21037/jtd-23-957. Epub 2024 Jan 22. PMID: 38505013; PMCID: PMC10944748.

Miks Pektus Deformite?

- Pektus Arkuatum
- Pektus Ekskavatum+Pektus Karinatum
- Kondromanubrial deformite
- Tip2 Pektus Karinatum
- Currarino-Silverman sendromu
- Pouter güvercin göğsü





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Journal of Pediatric Surgery (2006) 41, 1573–1581



Journal of
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www.elsevier.com/locate/jpedisurg

Arch Bronconeumol. 2013;49(5):196–200



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www.archbronconeumol.org



Classification of the dysmorphology of pectus excavatum

Mark J. Cartoski^a, Donald Nuss^{a,b}, Michael J. Goretsky^{a,b}, Virginia K. Proud^b, Daniel P. Croitoru^{a,b}, Tina Gustin^a, Karen Mitchell^{a,b}, Ellen Vasser^b, Robert E. Kelly Jr.^{a,b,*}

^aDepartment of Surgery, Eastern Virginia Medical School and Children's Hospital of The King's Daughters, Norfolk, VA 23507, USA

^bDepartment of Pediatrics, Eastern Virginia Medical School and Children's Hospital of The King's Daughters, Norfolk, VA 23507, USA

2.6. Horns of steer depression

There is a unique type of pectus depression with bilateral knobby upper sternal projections that resemble the horns of steer. These depressions, although not numerous, are quite obvious with clear anterior angulations of a thick, transverse ridge at the junction of the manubrium and body of sternum (Fig. 14). In essence, this morphology is composed of a combination carinatum/excavatum whereby the body is depressed with an accompanying protrusion of the manubrium. This may be a variant of the chondromesenchymal

Revisión

Dismorfología de las deformidades de la pared torácica: distribución de frecuencias de los subtipos de pectus excavatum típico y subtipos poco comunes☆

Robert E. Kelly Jr.^{a,b,*}, Amy Quinn^b, Patricio Varela^{c,d}, Richard E. Redlinger Jr.^a y Donald Nuss^{a,b}

^a Department of Surgery, Eastern Virginia Medical School and Children's Hospital of the King's Daughters, Norfolk, Virginia, Estados Unidos

^b Department of Pediatrics, Eastern Virginia Medical School and Children's Hospital of the King's Daughters, Norfolk, Virginia, Estados Unidos

^c Departamento de Cirugía Pediátrica, Universidad de Chile, Santiago, Chile

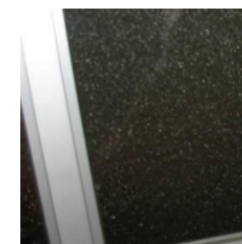
^d Hospital Pediátrico Calvo Mackenna y Centro Médico Clínica Las Condes, Santiago, Chile

R.E. Kelly Jr. et al / Arch Bronconeumol. 2013;49(5):196–200

Tabla 1

Distribución de fenotipos en el pectus excavatum típico

Forma de taza	67%
Forma de platillo	21%
Tipo trinchera	10%
Currarino-Silverman	1%



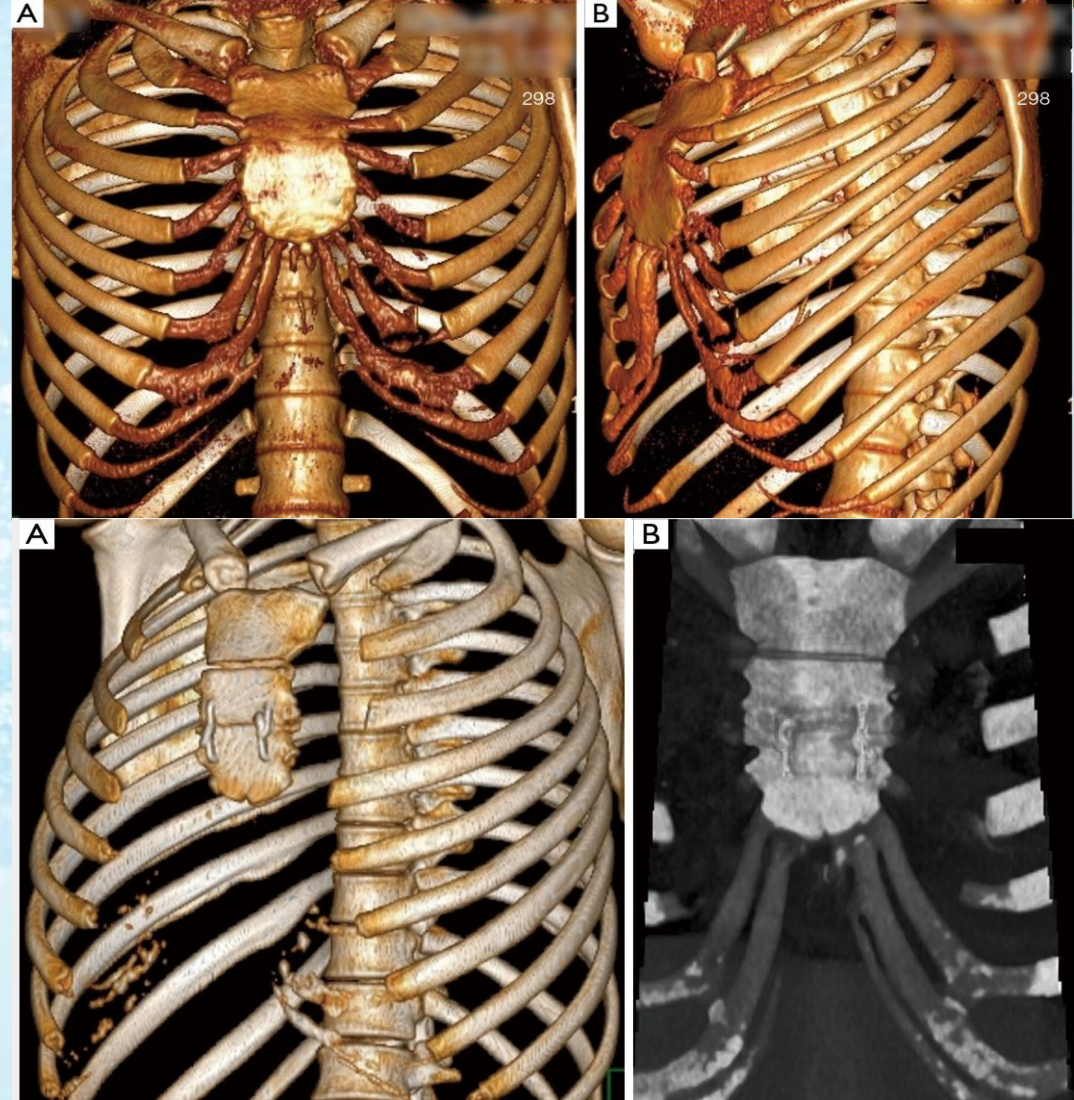
Miks Pektus Deformite

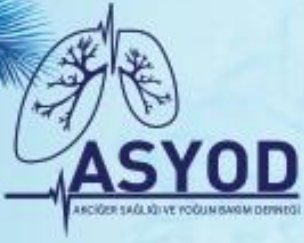
- Mikst tip pektus deformiteleri pektus ekskavatum ve pektus karinatum'a göre çok daha nadir görülürler ve tedavileri de onlara nazaran çok daha zordur. Tipik olarak mikst deformite ekskavatum komponenti de içeren pektus karinatum deformitesi olarak kabul edilebilir.
- Pektus ekskavatum 400 canlı doğumda bir görülürken, pektus karinatum 1400 canlı doğumda bir görülür. Mikst tip pektus deformitelerinin görülme oranı %0,14 kadardır.



Tanı

Bilgisayarlı tomografi (BT) aracılığıyla belirli bir düzlemde intratorakal ve ekstratorakal çap varyasyonlarının belirlenmesi, tanıda temel esastır. Buna ek olarak BT yardımlı rekonstrüksiyon ile 3 boyutlu oluşturma işlemi de preoperatif değerlendirmede kullanılmaktadır. Bu yöntemin avantajı, farklı ve spesifik vücut bölgelerinin yüksek çözünürlüklü 3 boyutlu sanal renkli modelinin oluşturulmasıdır.





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Tedavi

- Ravitch – Modifiye Ravitch Tekniği
- Hibrit Yöntem (Önen Methodu)
- Sandviç Tekniği
- Konservatif Tedavi

THE OPERATIVE TREATMENT OF PECTUS EXCAVATUM*

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BALTIMORE, MD.

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THE OPERATION FOR PECTUS excavatum was put in proper perspective by the detailed review of Ochshner and DeBailey¹ in 1939 and by the series of patients presented by Lincoln Brown² in the following year. Since the recent publications of Sweet³ and of Lester⁴ with their modifications of previous technics, pectus excavatum has been established even more firmly as a congenital deformity amenable to surgical correction.

Pectus excavatum (funnel breast, Trichterbrust) is a deformity of the thorax marked by a sharp posterior curve of the body of the sternum, deepest just before its junction with the xiphoid. The lower costal cartilages bend inward to form a depression, the lateral borders of which are angled more sharply than the superior and inferior portions. A paradoxical inward motion of the lower sternum is conspicuous on inspiration. The deformity is present at birth and usually is progressive. The chest becomes flat and thin, the dorsal spine kyphotic, the head thrust forward. In extreme instances the deepest portion of the concavity to one side of the midline may be posterior to the ventral surface of the vertebral bodies. In the undressed patient the concavity is conspicuous and unsightly and a source of embarrassment to young individuals of either sex. The deformity of rib cage and spine in the more severe instances is quite plain even when the patient is clothed. Physiologic disturbances may occur due to displacement of the heart or pressure upon it, but this is usually delayed until adolescence or later. There have been numerous reports of dyspnea and cardiac arrhythmias, such as paroxysmal tachycardia; their occurrence is not necessarily confined to the patients with the most severe deformities. It seems likely, however, that the dyspnea in the adult with shallow, rigid chest is on a pulmonary as well as a cardiac basis.

It is impossible to predict in which children the deformity will progress, since the mechanism of its production is still uncertain. The paradoxical depression of the sternum with each inspiration suggests that a short central tendon of the diaphragm might be responsible. Moreover, at operation one usually finds a tough fascial band tensely stretched between linea alba and sternum, the so-called substernal ligament. When this is divided the sternum may be elevated slightly without division of costal cartilages. On the other hand, the defect is generally obvious at birth and it seems unlikely that it has been produced solely by the pull of the diaphragm during fetal respiration.

It has been our feeling that operation should be undertaken in the more severe instances to correct the existing deformity and to prevent its progression. The younger the patient at the time of correction, the more favorable are

* Submitted for publication, October, 1948.

Ravitch Yöntemi

- A) Deformiteye katılan tüm kıkırdak kostalar tüm uzunlukları boyunca rezeke edilir
- B) Ksifoid serbestleştirilerek rezeke edilir
- C) Sternuma wedge osteotomi uygulanır ve osteotomi hattına sternumu eleve edecek şekilde çıkarılan kıkırdak dokuları implante edilir.
- D) Sternumda oluşturulan yeni form tek başına yeterli olmayacağı için Kirschner telleri ile alttan desteklenir
- E) Her iki tarafta ve deformitenin şiddetine göre değişen miktarlarda interkostal bantlar serbestleştirilir.

Modifiye Ravitch Yöntemi

- A) Ravitch tekniğinde ksifoid rezeke edilmekte iken artık rezeksiyon uygulanmadan sadece serbestleştirme ile yetinilmekte, ksifoid korunmaktadır
- B) Ravitch tekniğinde deforme olan tüm kıkırdaklar tüm uzunlukları boyunca çıkarılır iken artık bu radikal rezeksiyondan vaz geçilmiştir. Kıkırdakların sadece açılanma yapan bölgeleri 1-2 cm olacak şekilde parsiyel olarak çıkarılır veya küçük bir wedge uygulanarak direnci kırılır.
- C) Ravitch'in tüm kıkırdak kostaları rezeke etmesinin aksine, Günümüzde kostasternal bileşkede minimum 2 cm lik bir segment kıkırdak rejenerasyonuna temel oluşturması için korunmaktadır.
- D) Ravitch tarafından retrosternal kirschner teli yerleştirilir iken bu uygulamadan tamamen vaz geçilmiştir.
- E) Ravitch tüm bantların tam kat kesilmesini önerir iken artık sadece direnç oluşturan bantların kesilmesi diğerlerinin korunması ön plandadır

Case Reports > Ann Thorac Surg. 2022 Aug;114(2):e105-e107.

doi: 10.1016/j.athoracsur.2021.10.053. Epub 2021 Dec 9.

Modified Ravitch Procedure and Autologous Cartilage Graft for Pectus Arcuatum

Andrea Soria-Gondek¹, María Oviedo-Gutiérrez², Alba Martín-Lluís², Pedro López de Castro³,
Marta de Diego²

Affiliations + expand

PMID: 34896089 DOI: 10.1016/j.athoracsur.2021.10.053

Abstract



The Korean Journal of
Thoracic and Cardiovascular Surgery

<http://kjt cvs.org>

[This article](#) | [Aims and Scope](#) | [Instructions to Authors](#) | [E-Submission](#)

> Korean J Thorac Cardiovasc Surg. 2016 Jun 5;49(3):214–217. doi: [10.5090/kjtcs.2016.49.3.214](https://doi.org/10.5090/kjtcs.2016.49.3.214)

A Case of Successful Surgical Repair for Pectus Arcuatum Using Chondrosteronoplasty

[Sang Yoon Kim](#)¹, [Samina Park](#)¹, [Eung Rae Kim](#)¹, [In Kyu Park](#)¹, [Young Tae Kim](#)¹, [Chang Hyun Kang](#)^{1,✉}

> Author information > Article notes > Copyright and License information

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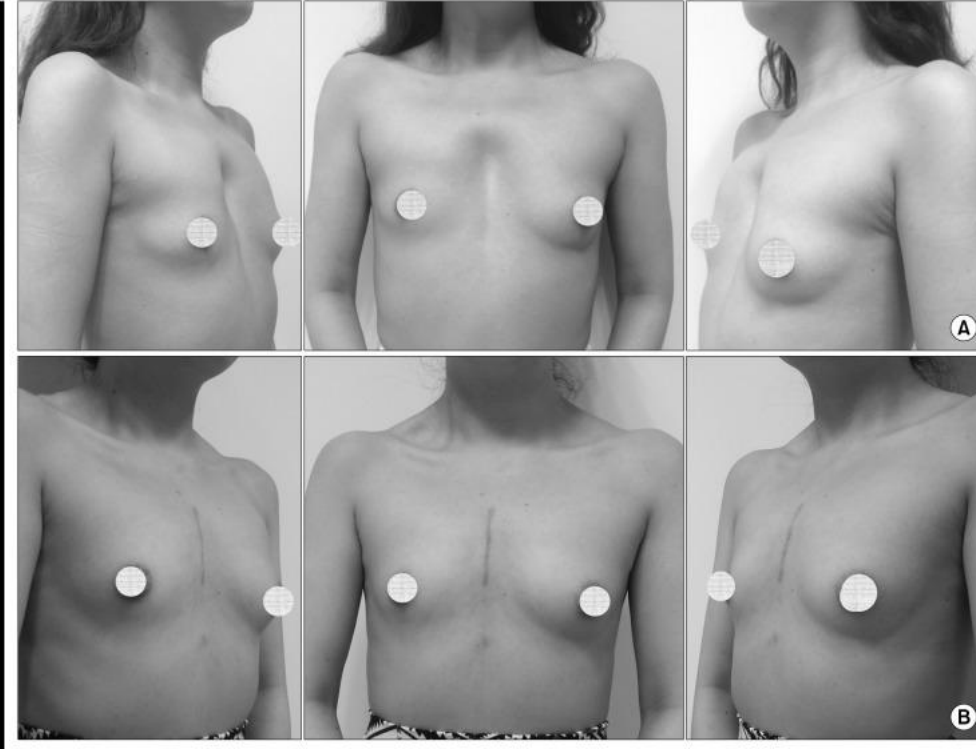
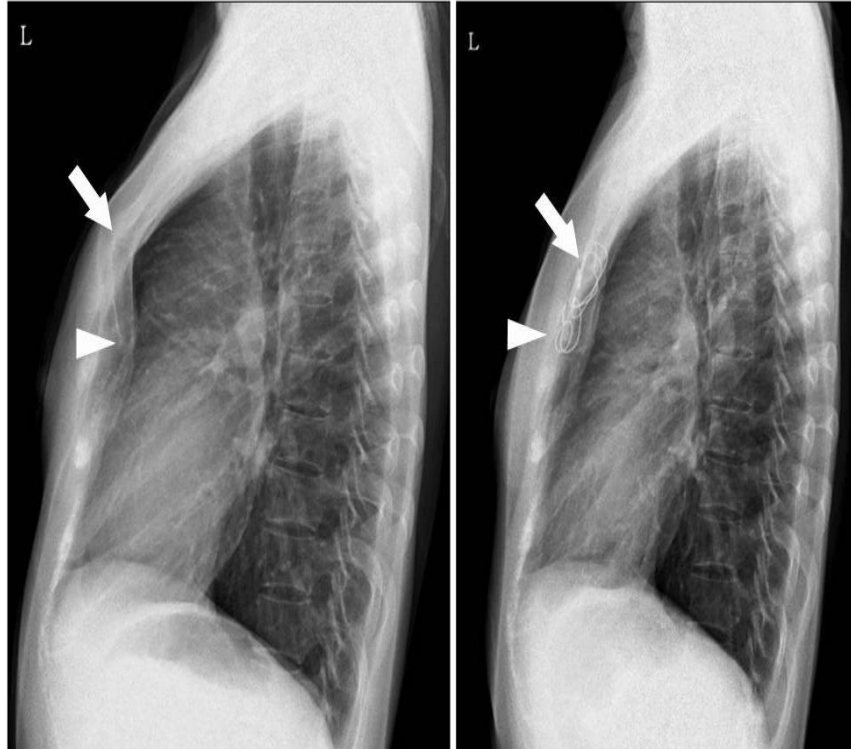
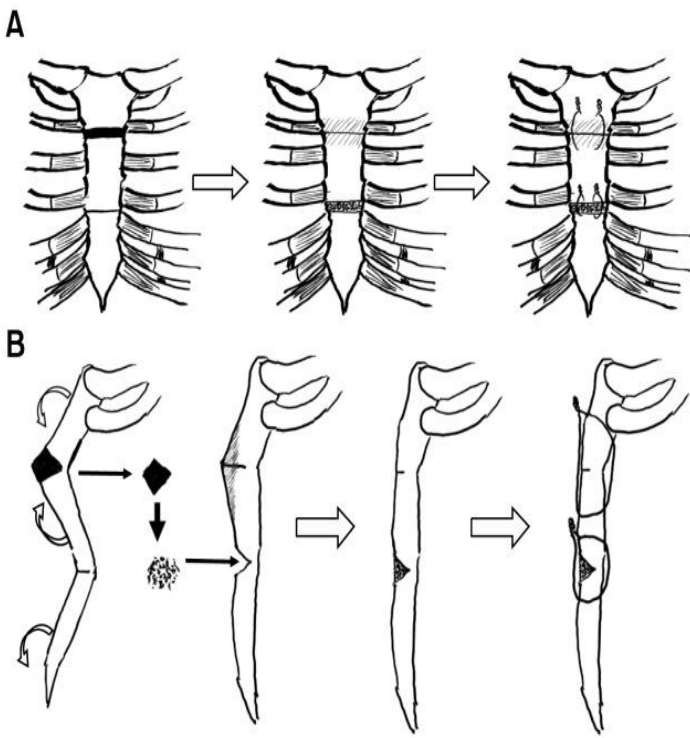
NEW TECHNOLOGY

Customized Cutting Template to Assist Sternotomy in Pectus Arcuatum

Stella Leng, MD, Kejd Bici, MD, Flavio Facchini, MD, Yary Volpe, PhD,
Francesca Uccheddu, PhD, Rocco Furferi, PhD, Lapo Governi, PhD,
Monica Carfagni, PhD, Marco Ghionzoli, MD, PhD, and Antonio Messineo, MD

Department of Pediatric Surgery, Meyer Children's University Hospital, University of Florence, Florence; and Department of Industrial Engineering, University of Florence, Florence, Italy





Kim SY, Park S, Kim ER, Park IK, Kim YT, Kang CH. A Case of Successful Surgical Repair for Pectus Arcuatum Using Chondrosterneplasty. Korean J Thorac Cardiovasc Surg. 2016 Jun;49(3):214-7. doi: 10.5090/kjtc.2016.49.3.214. Epub 2016 Jun 5. PMID: 27298803; PMCID: PMC4900868.

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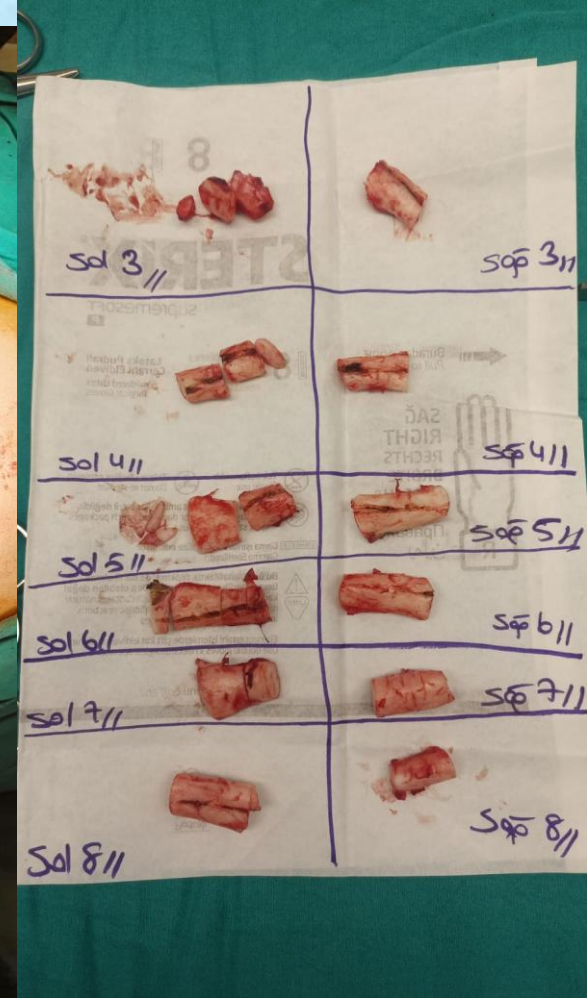
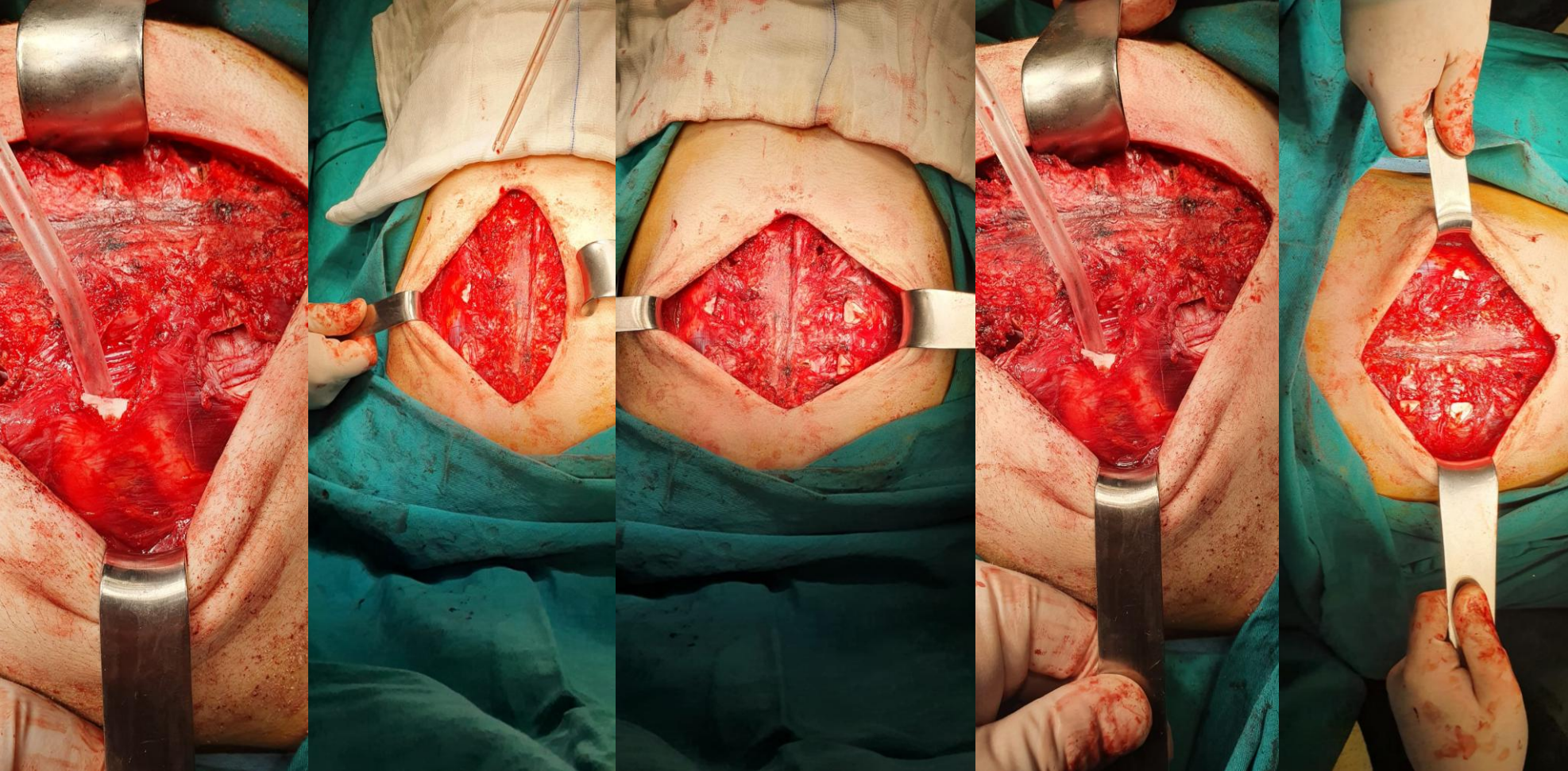
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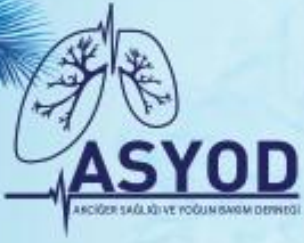


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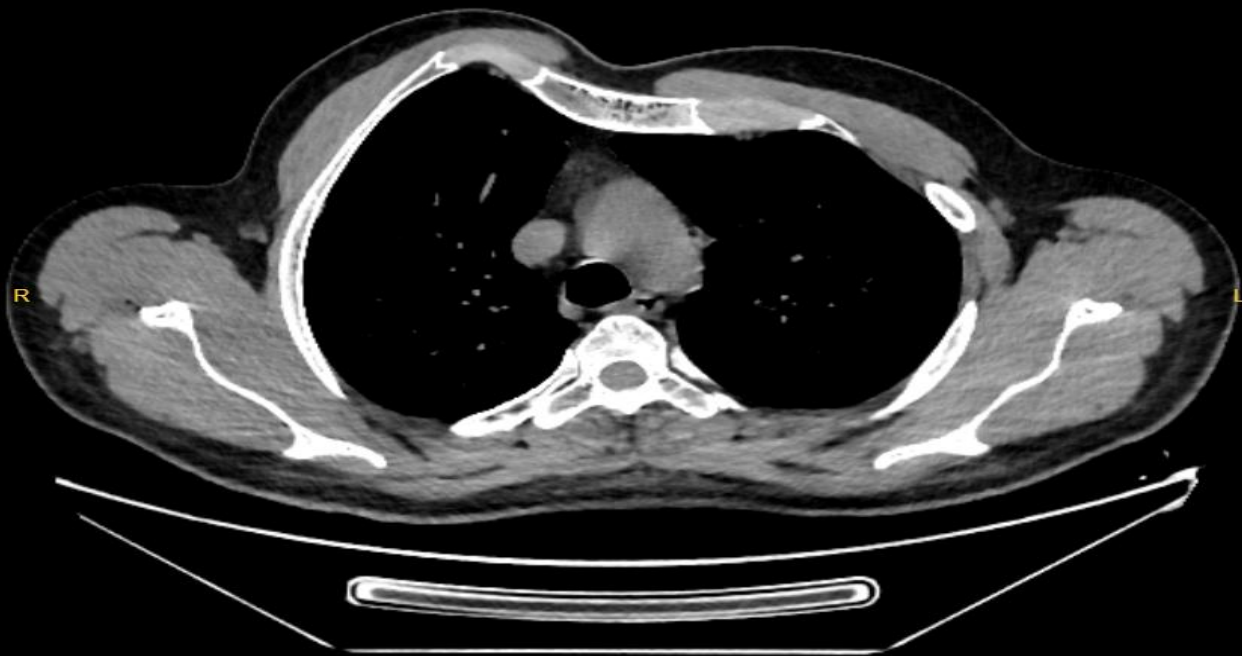
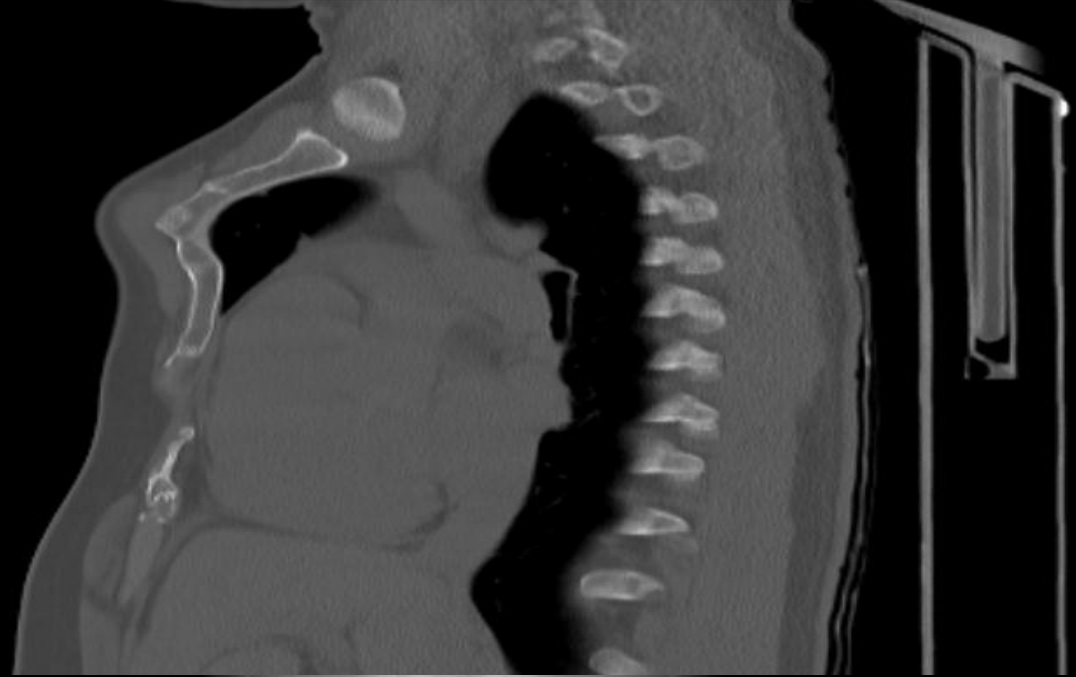


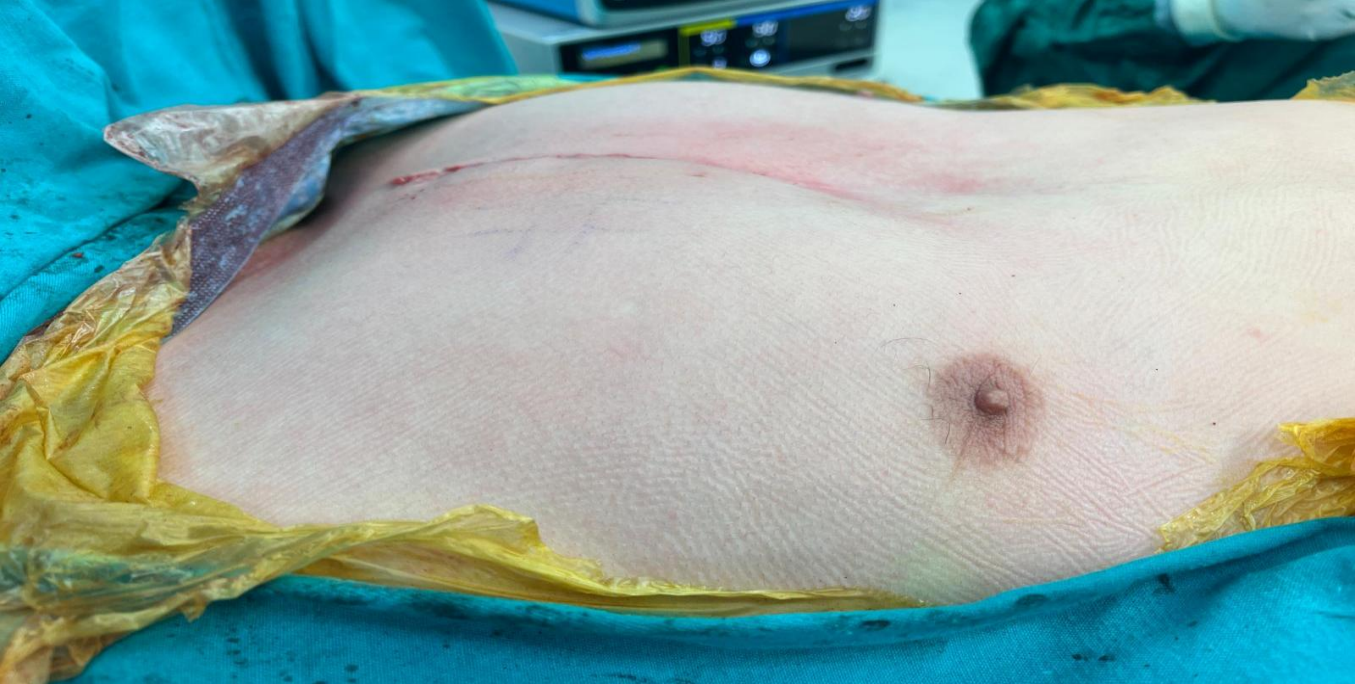
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Hibrit Yöntem

Türk Gogus Kalp Dama 2014;22(4):878-883
doi: 10.5606/tgkdc.dergisi.2014.7940

How to do it? / Nasıl yapılır?



A new surgical approach for mixed-type pectus carinatum: the Onen procedure

Miks tip pektus karinatuma yeni bir cerrahi yaklaşım: Onen yöntemi

Ahmet Önen, İsmail Ağababaoğlu, Aydın Şanlı, Volkan Karaçam, Hasan Ersöz, Nezih Özdemir

Department of Thoracic Surgery, Medical Faculty of Dokuz Eylül University, İzmir, Turkey



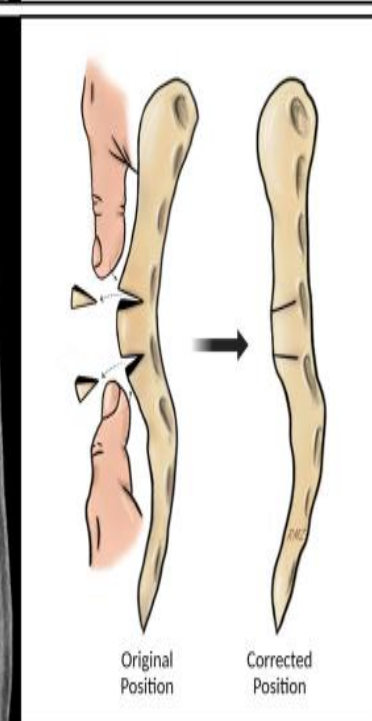
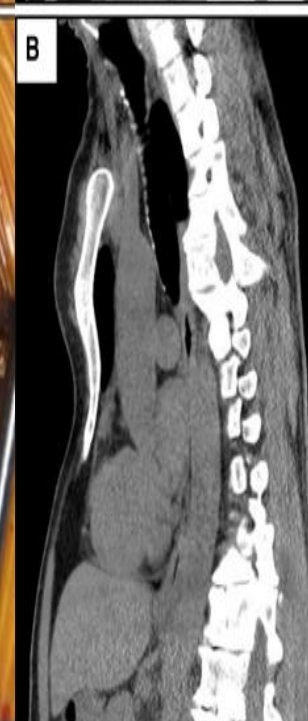
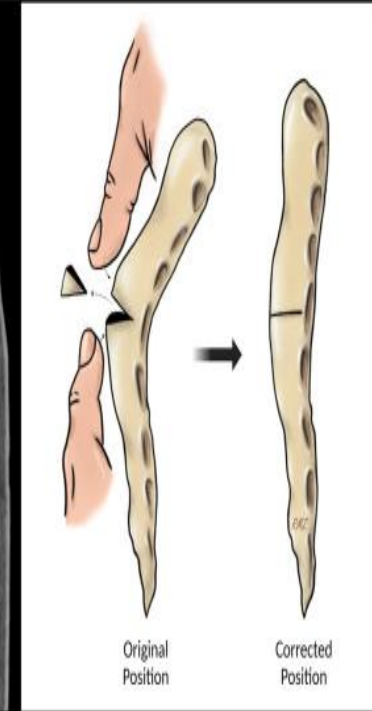
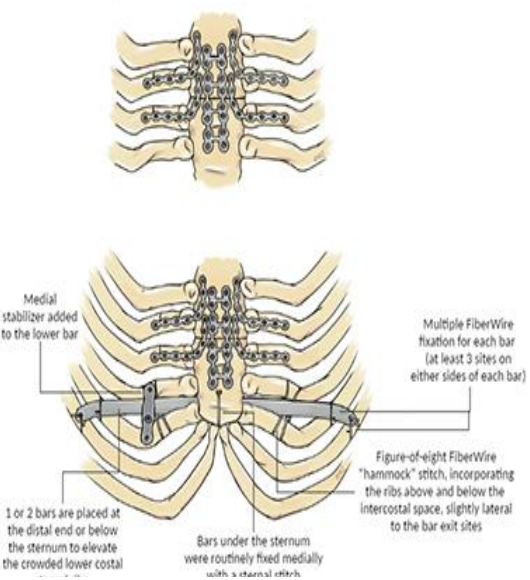
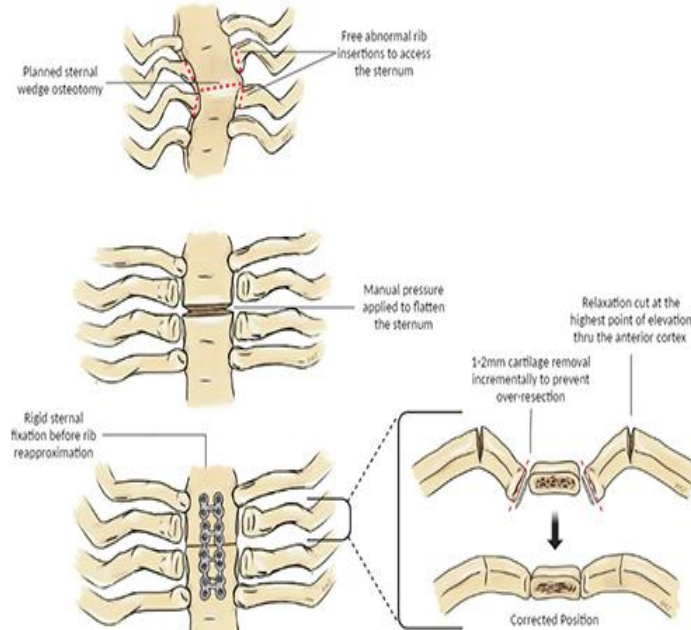
Journal of Plastic, Reconstructive & Aesthetic Surgery

Volume 93, June 2024, Pages 127-132



A minimally invasive hybrid procedure to correct pectus arcuatum

Etienne St-Louis ^{a b}, Jean-Martin Laberge ^{a b}, Hussein Wissanji ^{a b}, Sherif Emil ^{a b}  



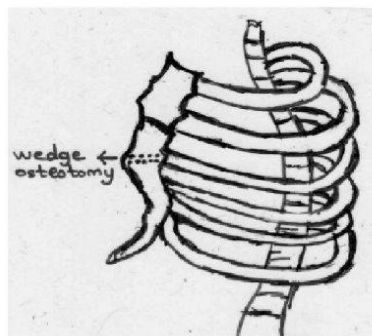
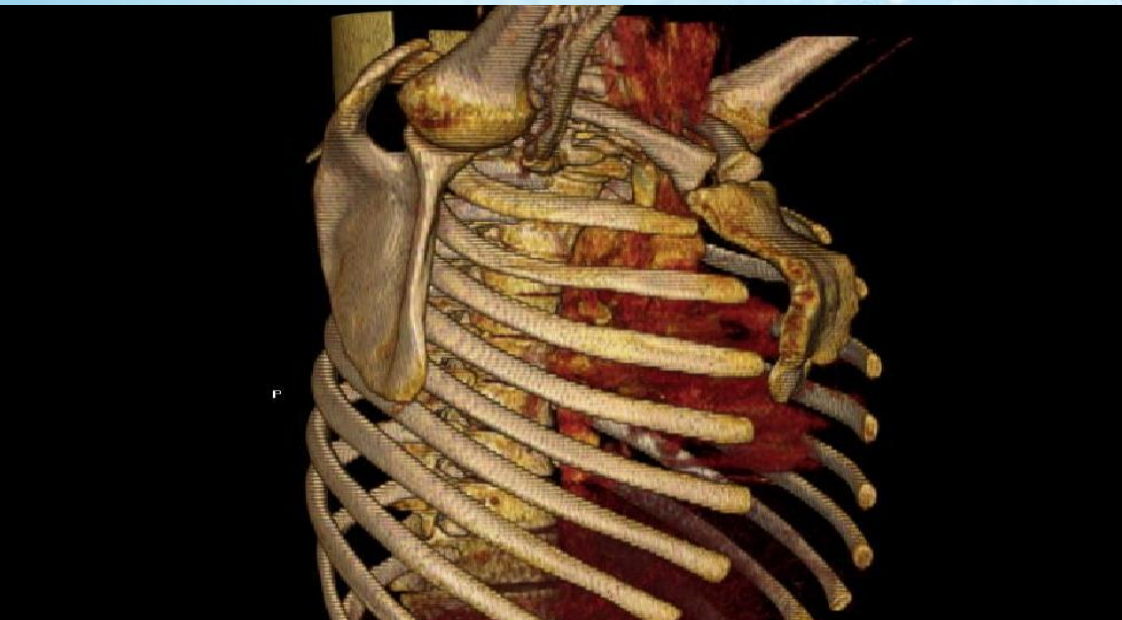


Figure 2. The wedge osteotomy in mixed-type pectus carinatum.

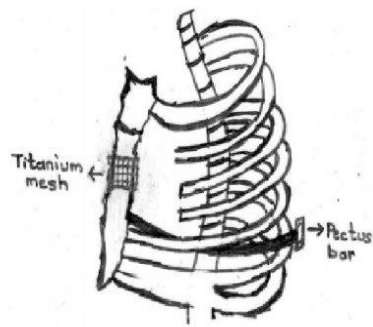
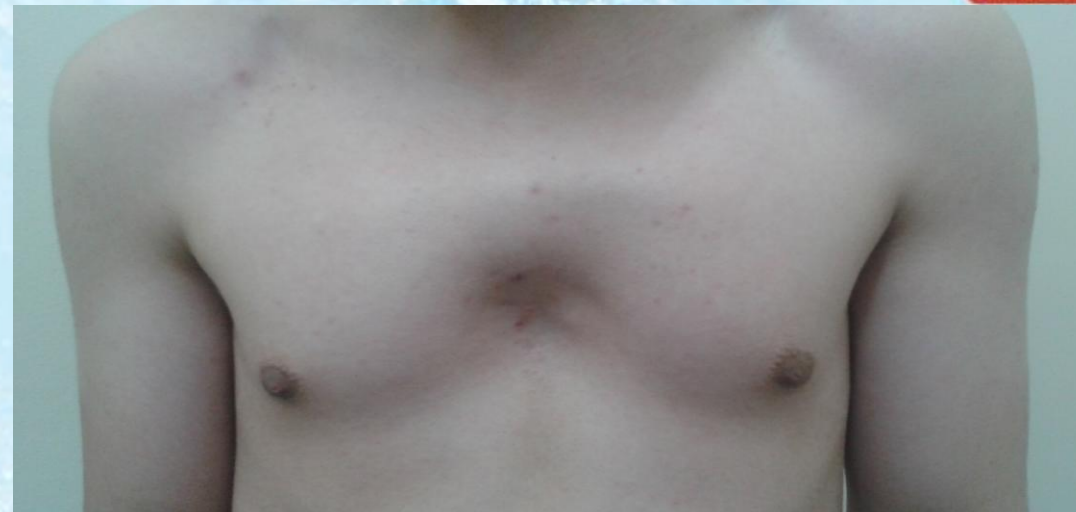
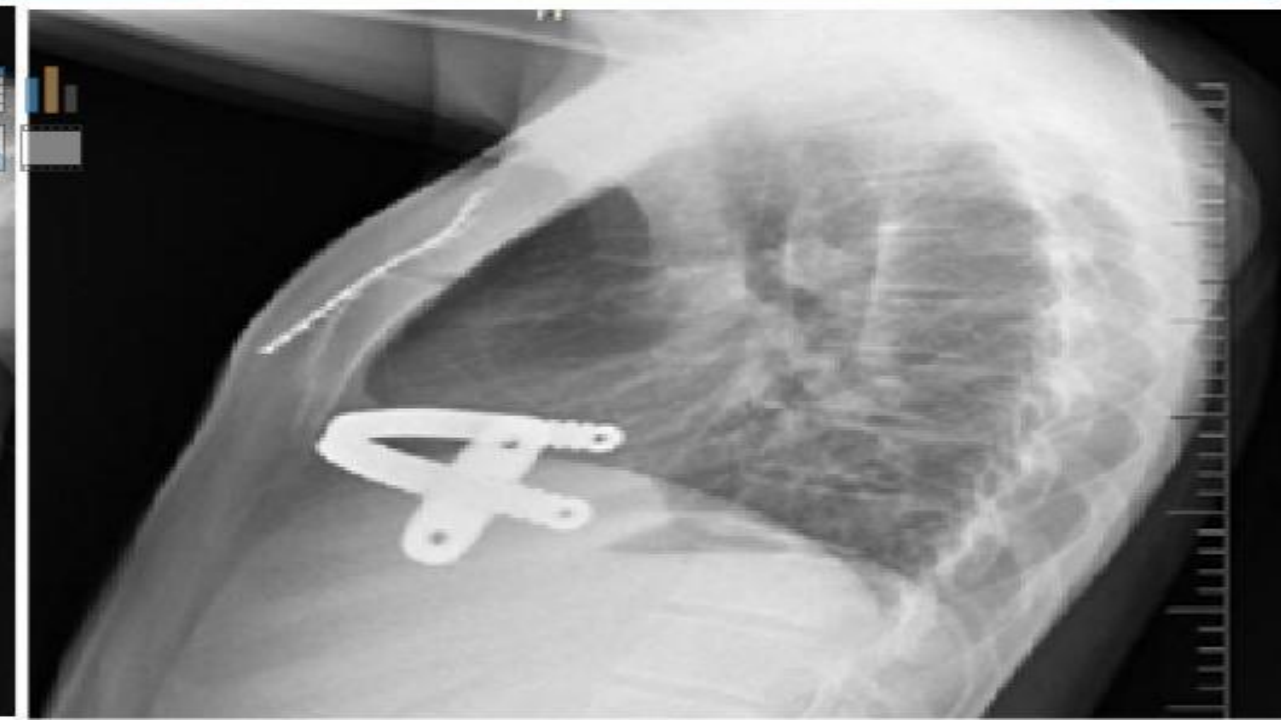
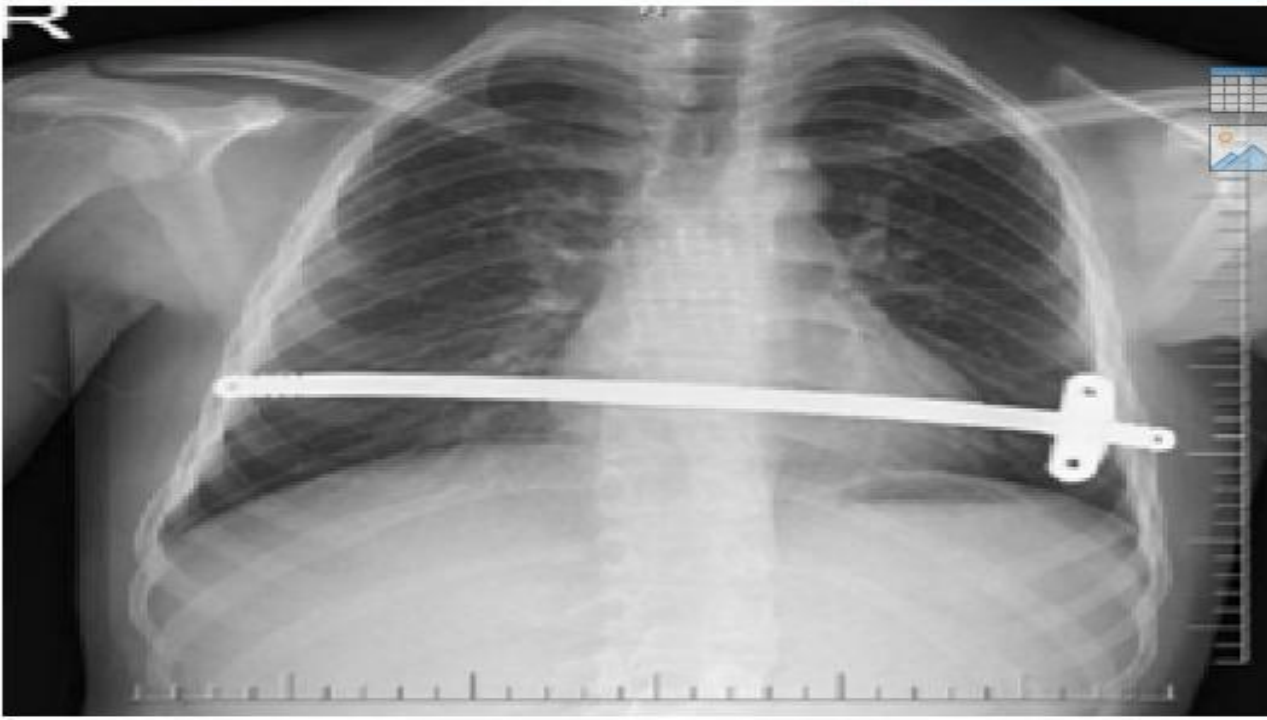


Figure 3. Stabilization of the sternum using titanium mesh and a pectus bar in mixed-type pectus carinatum.





How to Do It

A new technique for mixed-type pectus carinatum: modified Onen method

Yucel Akkas, Bulent Kocer and Neslihan Gulay Peri

Abstract

We modified the Onen method for pectus carinatum repair and used a vertical incision instead of a transverse incision. The most important advantage gained by the vertical incision is that we can switch to the Ravitch method without needing an additional incision, by elongating the existing incision in patients in whom a pectus bar cannot be placed. We successfully performed the modified Onen technique in a 16-year-old boy with a mixed-type pectus carinatum deformity.

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Asian Cardiovascular & Thoracic Annals
2016, Vol. 24(2) 227–230

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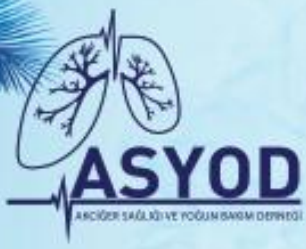
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► Ann Cardiothorac Surg. 2016 Sep;5(5):434–439. doi: [10.21037/acs.2016.08.04](https://doi.org/10.21037/acs.2016.08.04)

The sandwich technique for repair of pectus carinatum and excavatum/carinatum complex

[Hyung Joo Park](#)^{1,✉}, [Kyung Soo Kim](#)¹

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PMCID: PMC5056943 PMID: [27747176](https://pubmed.ncbi.nlm.nih.gov/27747176/)

► J Pediatr Surg. 2024 Apr;59(4):640-647. doi: [10.1016/j.jpedsurg.2023.12.012](https://doi.org/10.1016/j.jpedsurg.2023.12.012). Epub 2023 Dec 15.

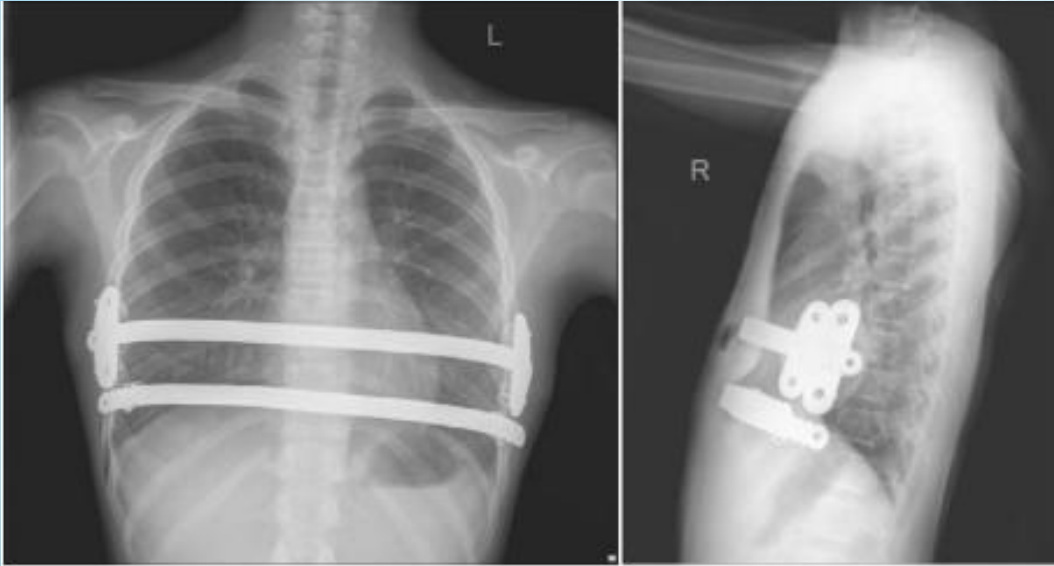
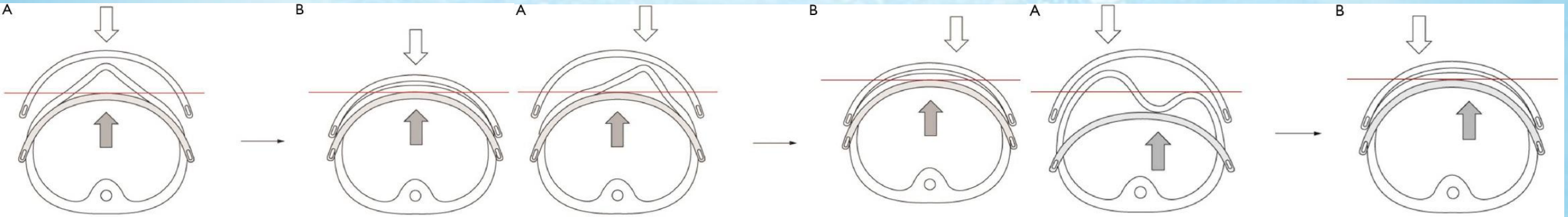
Recent Advancements in Pectus Surgery: Crane Lifting, Multiple-Bar Approach, Bridge Stabilization, and Sandwich Technique

[Hyung Joo Park](#)¹, [Gongmin Rim](#)², [Seung Keun Yoon](#)³

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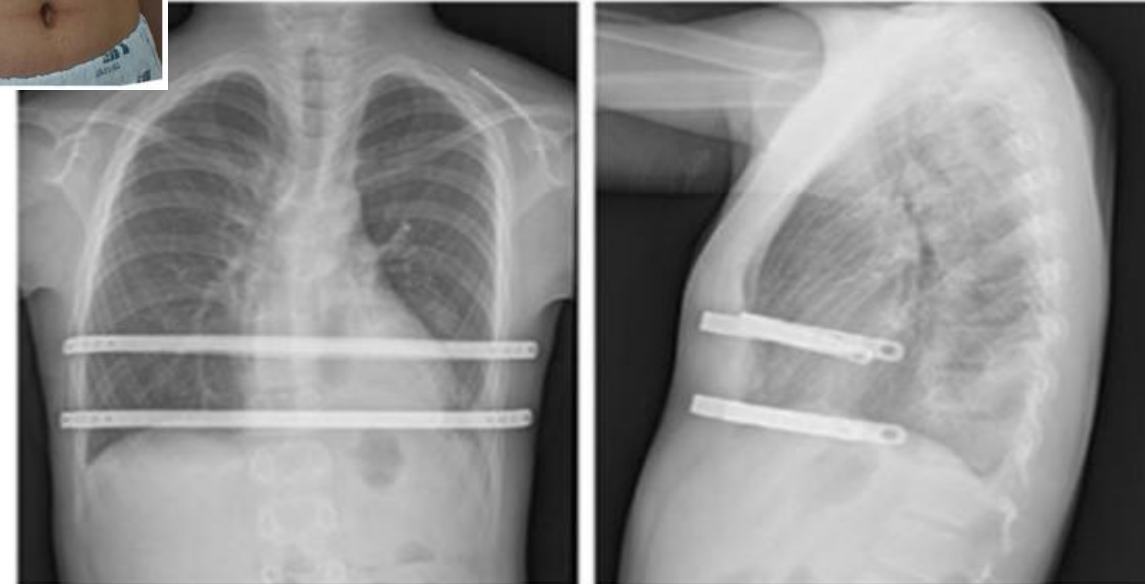
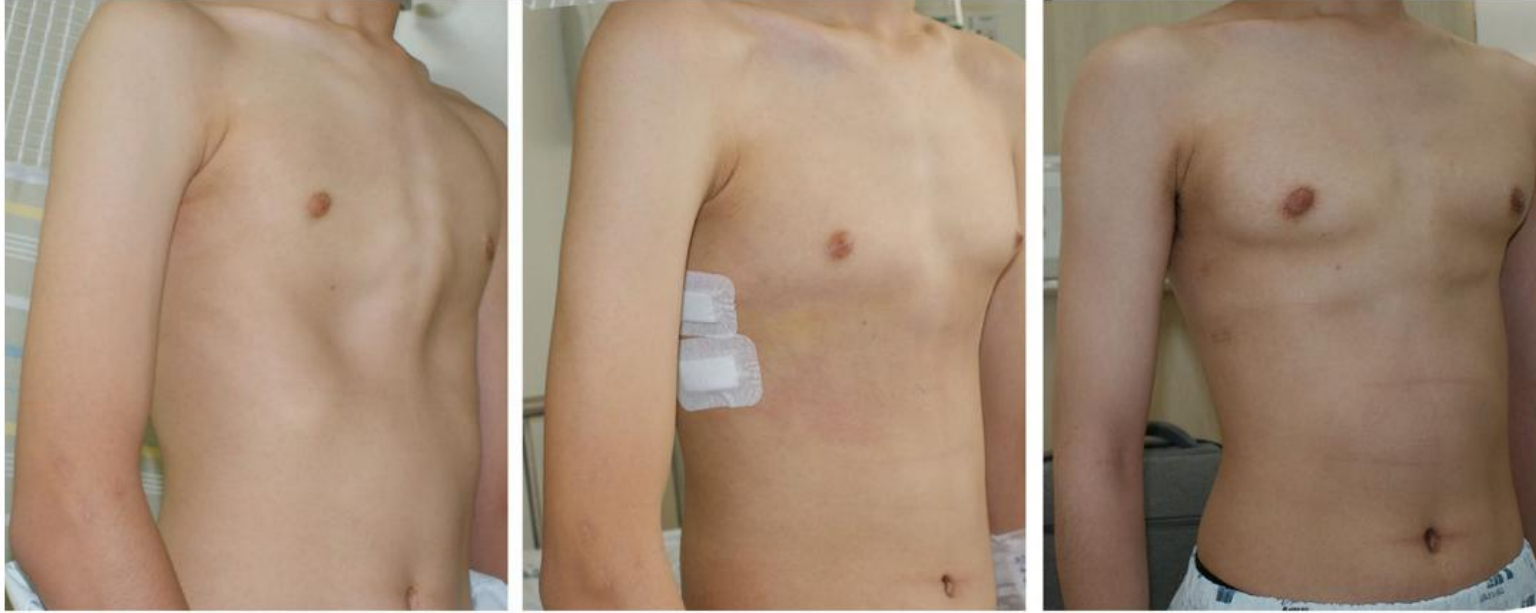
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Park HJ, Kim KS. The sandwich technique for repair of pectus carinatum and excavatum/carinatum complex. Ann Cardiothorac Surg. 2016 Sep;5(5):434-439. doi: 10.21037/acs.2016.08.04. PMID: 27747176; PMCID: PMC5056943.



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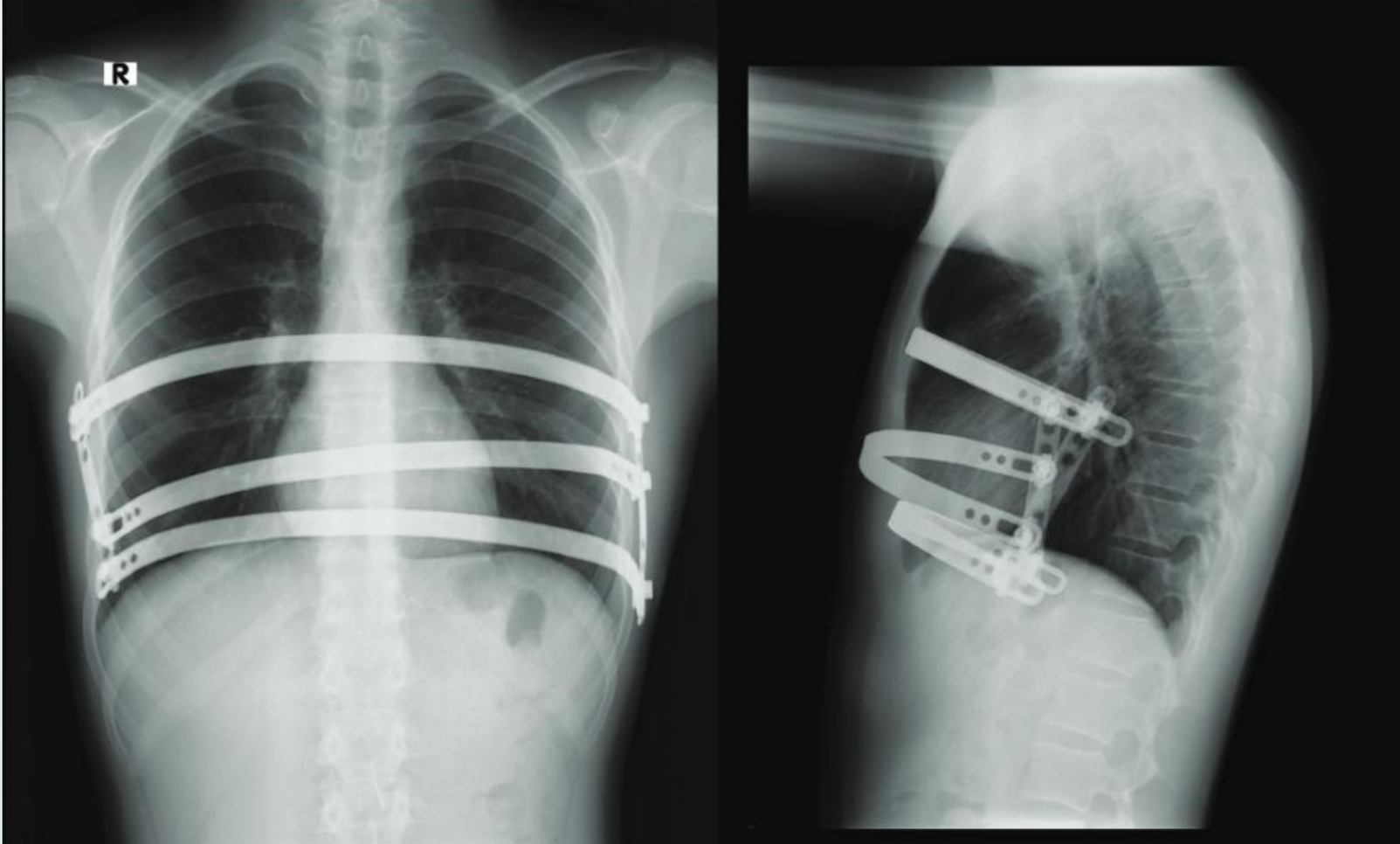


Ping W, Fu S, Li Y, Yu J, Zhang N, Fu X, Cai Y. A new minimally invasive technique for correction of pectus carinatum. J Cardiothorac Surg. 2021 Sep 28;16(1):280. doi: 10.1186/s13019-021-01663-z.

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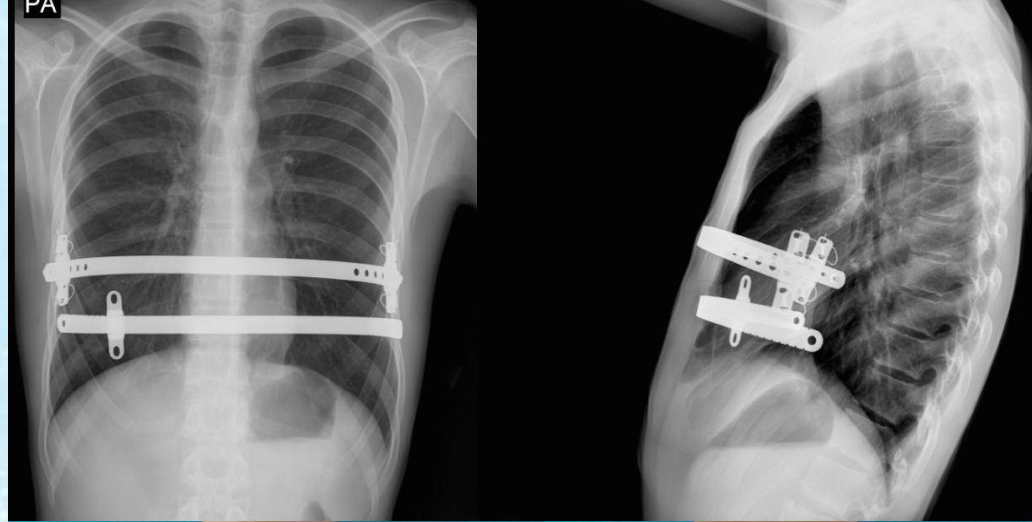
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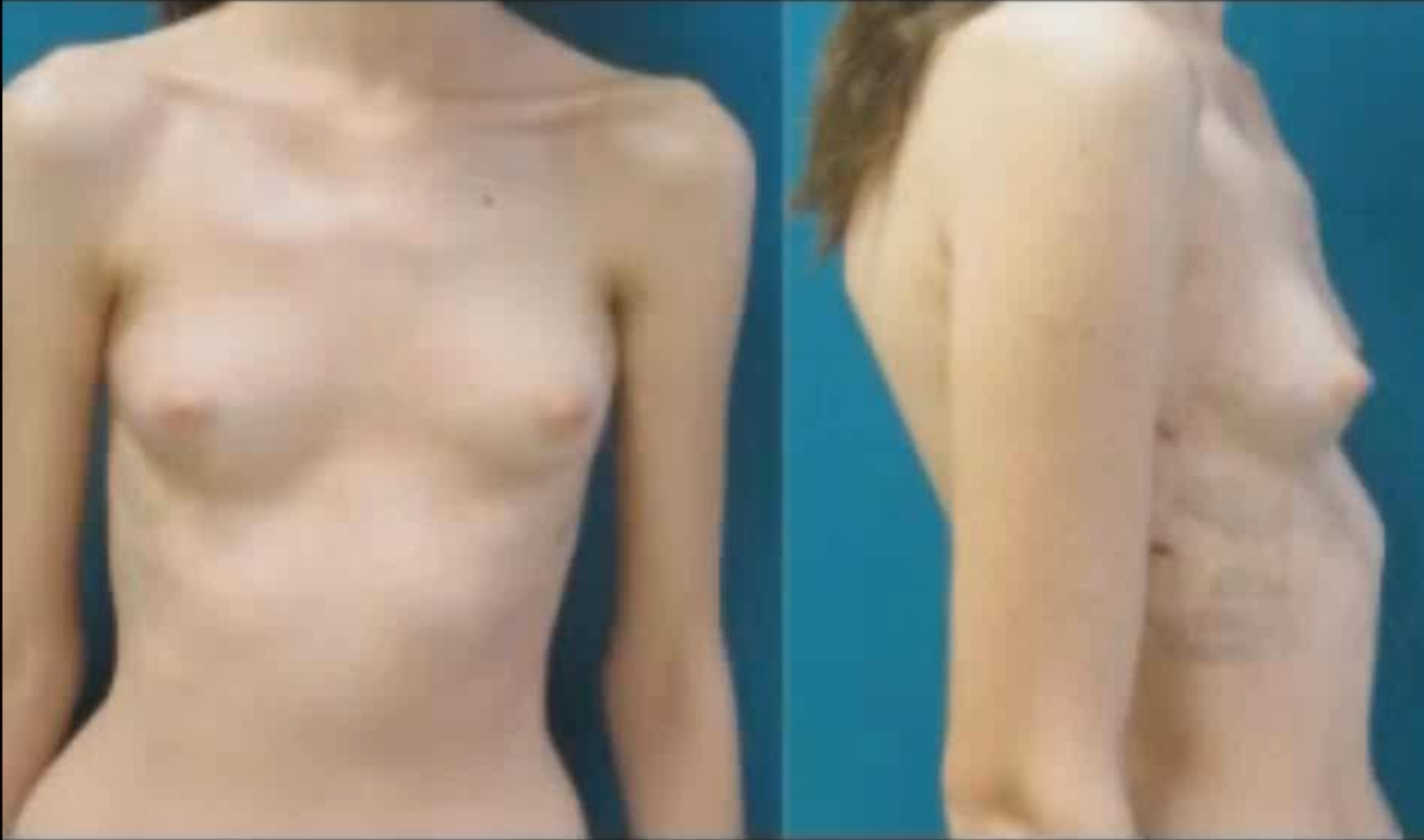
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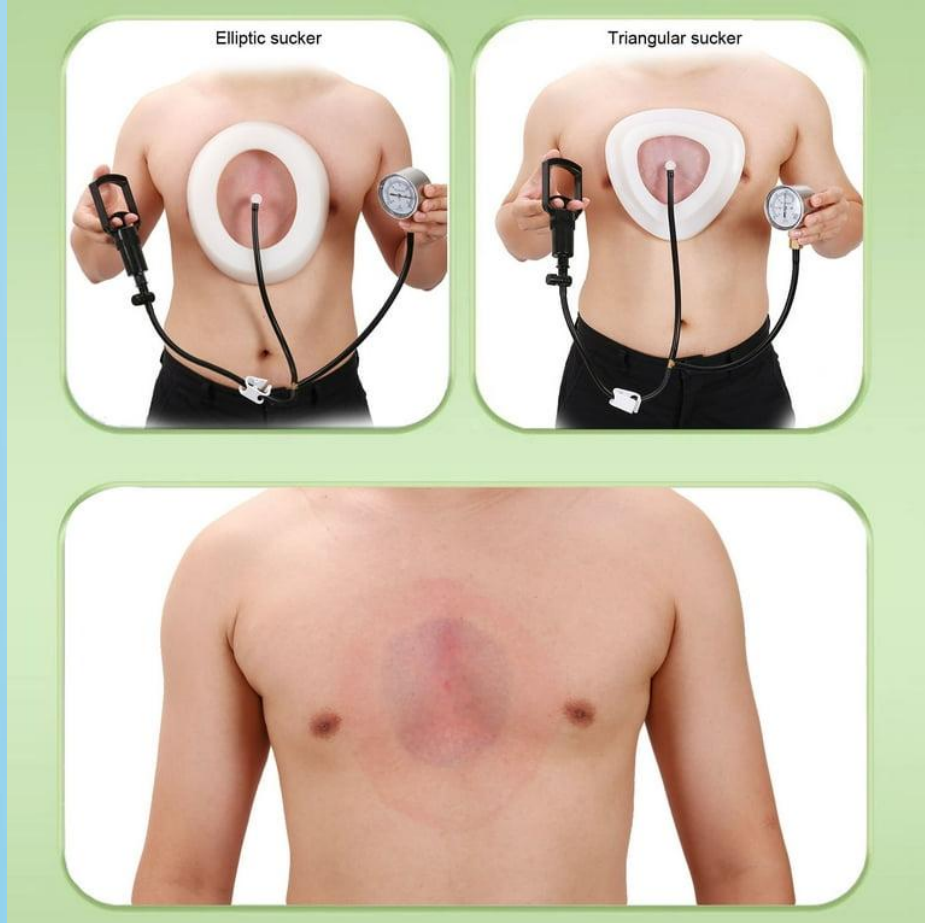
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Konservatif Tedavi



Sonuç

- Şiddetli Pektus arcuatum ve kompleks mikst deformitelerde Ravitch ve modifiye Ravitch gibi tedavi seçenekleri hala ön planda gelmektedir.
- Pektus ekskavatum ve karinatum deformitelerine göre çok daha nadir görülen mikst tip pektus deformitelerinin tedavisi için uygun hastalar; Park'ın geliştirdiği sandviç tekniği ve hibrid Önen tekniği hatta konservatif tedavi gibi minimal invazif yöntemlerle de yüksek hasta memnuniyeti sağlanarak başarılı bir şekilde tedavi edilebilirler.

An aerial night photograph of a large, modern architectural complex. The central feature is a large, dark, rectangular building with a prominent, brightly lit, circular glass-enclosed structure in its center. This central building is surrounded by several other large, multi-story buildings with flat roofs. The entire complex is illuminated by warm yellow lights, with some blue and purple accent lighting visible. The surrounding area includes roads, parking lots, and other urban structures, all visible in the background under a dark night sky.

Teşekkür Ederim