2022 흉부외과 전공의 연수교육

다한증, 흉벽기형, 흉곽출구증후군

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문덕환

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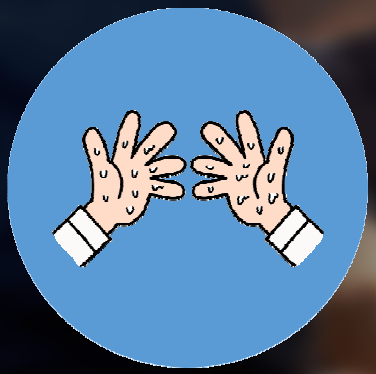
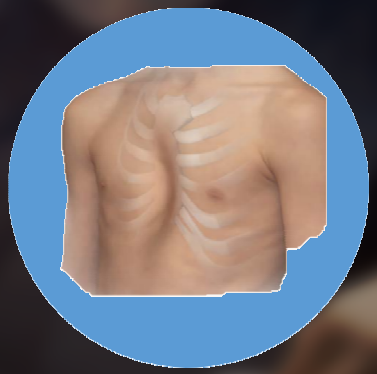
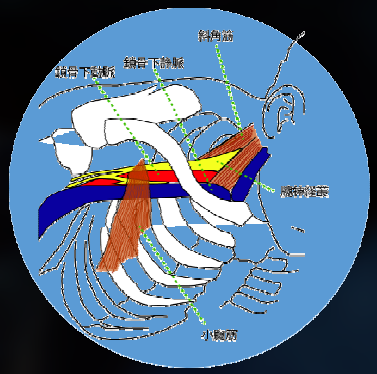


1. Hyperhidrosis



2. Chest Wall Deformity



3. Thoracic Outlet Syndrome


#1
Hyperhidrosis
Pathologic condition of *excessive sweating* in amounts *greater than physiologically needed for thermoregulation*

Hyperhidrosis - Pathogenesis

Eccrine sweat glands are responsible for hyperhidrosis

mixture of the two [apo/eccrine] glands may play a role in axillary hyperhidrosis

A sympathetic signal is carried to sweat glands by cholinergic autonomic neurons

Idiopathic (focal) hyperhidrosis

Sweat glands are usually histologically and functionally normal.

Abnormal central response to emotional stress

Genetic component

Hyperhidrosis - Pathogenesis

Types of hyperhidrosis	Commonly associated diseases and conditions
Primary hyperhidrosis	Idiopathic (focal) hyperhidrosis
	Gustatory hyperhidrosis (Frey's syndrome)
Secondary hyperhidrosis	Endocrine: hyperthyroidism, hyperpituitarism, diabetes mellitus, menopause, pregnancy, pheochromocytoma, carcinoid syndrome, and acromegaly
	Neurological: Parkinson's disease, spinal cord injury, and stroke
	Neoplastic: Hodgkin's disease and myeloproliferative diseases
	Infectious: tuberculosis and septicemia
	Drugs: fluoxetine, venlafaxine, doxepin
	Toxicity: alcoholism and illicit substance abuse

Focal or Primary HH – Craniofacial, palmar, axillary, or plantar

Hyperhidrosis - Treatment

Table 2. Comparison of Therapies for Primary Hyperhidrosis

Treatment	Cost[a]	Side Effects
Topical, 20% to 35% aluminum chloride	$288+/year	Skin irritation, localized burning, stinging, desquamation, poor efficacy, temporary (lasts about 48 hours per application)
Iontophoresis (usually 20 mA 3 to 4 treatments a week for 30 to 40 minutes each)	$500/device	Irritation, dryness or peeling of skin, burning or stinging during therapy, temporary (one treatment lasts 1 to 4 weeks). Not recommended for women who are pregnant or for persons with pacemakers or substantial implants (eg, joint replacements)
Oral therapy (glycopyrrolate, atropine, acetylcholine inhibitors)	$240+/year	Dry mouth, dry eyes, constipation, mydriasis, difficulty urinating, blurry vision
Botulinum toxin (Botox A or B)	$2,250/session	Pain from injections, muscle weakness, headache, hematoma, swelling, need for repeat procedures
Liposuction/VASER	$3,000/session	Hematoma, superficial skin erosion, alopecia, paresthesia
Endoscopic thoracic sympathotomy	$15,000	Compensatory hyperhidrosis, bradycardia, pneumothorax, postoperative pain, Horner's syndrome

[a] Approximate cost in US dollars.

+ Endoscopic Lumbar Sympathectomy (ELS)

Hyperhidrosis - Nomenclature for ETS

Rib- oriented nomenclature

- Too many patients having mediastinal fat that can obscure clear identification of the specific ganglia
- Many anatomical variations in the ganglion anatomy

Type of interruption

- Clipped, cut, or cauterized, or a segment removed

For example

- Clipped R5, top
- cauterized, top R4, bottom R4

Hyperhidrosis - “Type of interruption”

Transection?

Resection?

Ablatation with a cautery?

Division with a harmonic scalpel?

or Clipping?

✓ No clear differences(but clipping shows recurrence)

If the correct level division was achieved

✓ Enough separation between the ends of the chain

Regrowth is impossible

Hyperhidrosis - Patient Selection

Surgical consultation should include

- Secure diagnosis of **primary focal** hyperhidrosis
- **Anatomic locations** involved
- **Amount** of hyperhidrosis
- Full discussion of the options to surgery and potential complications

The patients should be made aware that the most satisfied patients are those with palmar or palmar-axillary hyperhidrosis, or both in ETS.

Endoscopic Lumbar Sympathetomy (ELS) for plantar hyperhidrosis seems to be an effective procedure, however this procedure is a challenging surgery.

Hyperhidrosis - ETS interruption level

Palmar HH : ***R4 only*** - limits the degree of CH

- may lead to moister hands

R3,4 - completely dry hands

- Higher risk of CH

Axillary HH : ***R4,5*** – less successful and has higher "regret rates" than ETS for palmar HH

CFH : ***R2 vs. R3***

KEY LEVEL – R4 in ETS

Hyperhidrosis - ETS interruption level

Original Article

Early results of new endoscopic thoracic sympathectomy for craniofacial hyperhidrosis

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Contributions: (I) Conception and design: DH Moon, S Lee; (II) Administrative support: None; (III) Provision of study materials or patients: None; (IV) Collection and assembly of data: DY Kang, DW Kim, MK Kang; (V) Data analysis and interpretation: DH Moon, S Lee; (VI) Manuscript writing: All authors; (VII) Final approval of manuscript: All authors.

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Background: Endoscopic thoracic sympathectomy (ETS) has been considered as a definitive treatment for hyperhidrosis. However, despite its well-established success rate, surgical treatment for craniofacial hyperhidrosis (CFH) is rarely performed due to the possibility of fatal complications and compensatory sweating. The aim of this study was to evaluate the safety and efficacy of our newly developed method of ETS for CFH, based on early results.

Methods: Between June 2016 and October 2017, a total of 70 patients underwent ETS with our new technique for CFH. All patients were placed under double-lumen intubation anesthesia with CO_2 gas installation. We utilized two ports, one for 2-mm endoscope and another for 3-mm instrument. Our technique involved R2 and R4–R7 sympathectomy with R4–R7 truncal ablation.

Results: There were 55 males and 15 females, with a mean age of 48 years (range, 22–75 years). The median operation time was 38 minutes (range, 28–75 minutes). There was no operative mortality and morbidity. During the short follow-up period (average 7 months; range, 1–17 months), symptoms were improved in all patients and compensatory hyperhidrosis was observed 68 patients: mild in 50 patients (71.4%), moderate in 13 patients (18.6%), and severe in 5 patients (7.1%).

Conclusions: In select patients, our technique of ETS appears to be a safe and effective treatment method for treating CFH. However, a study with long-term follow-up is still necessary to confirm our findings.

Keywords: Craniofacial hyperhidrosis (CFH); compensatory hyperhidrosis; endoscopic thoracic sympathectomy (ETS)

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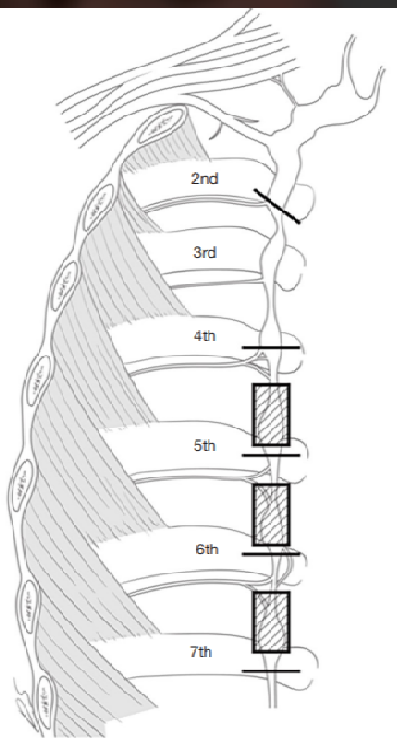


Hyperhidrosis - Compensatory HH after ETS

The most common side effect
- which occurs in the literature from 3% to 98%

The most common risk factor
- **T2 ganglion interruption(R2, R3)**
- The number of levels interrupted has been inconclusive as a risk factor

Preoperative testing? controversial
- Injecting bupivacaine
  - reversibly achieve sympathetic nerve blockade observe for CH

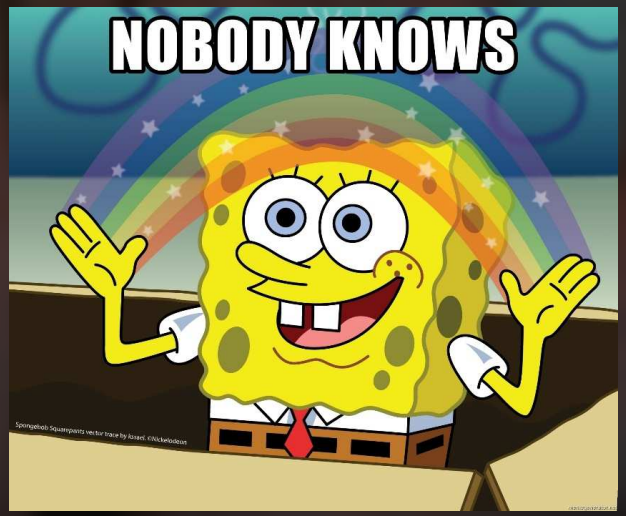
Treatment
- **Ditropan** or other **anticholinergic medications** in escalating doses

Hyperhidrosis - Compensatory HH after ETS

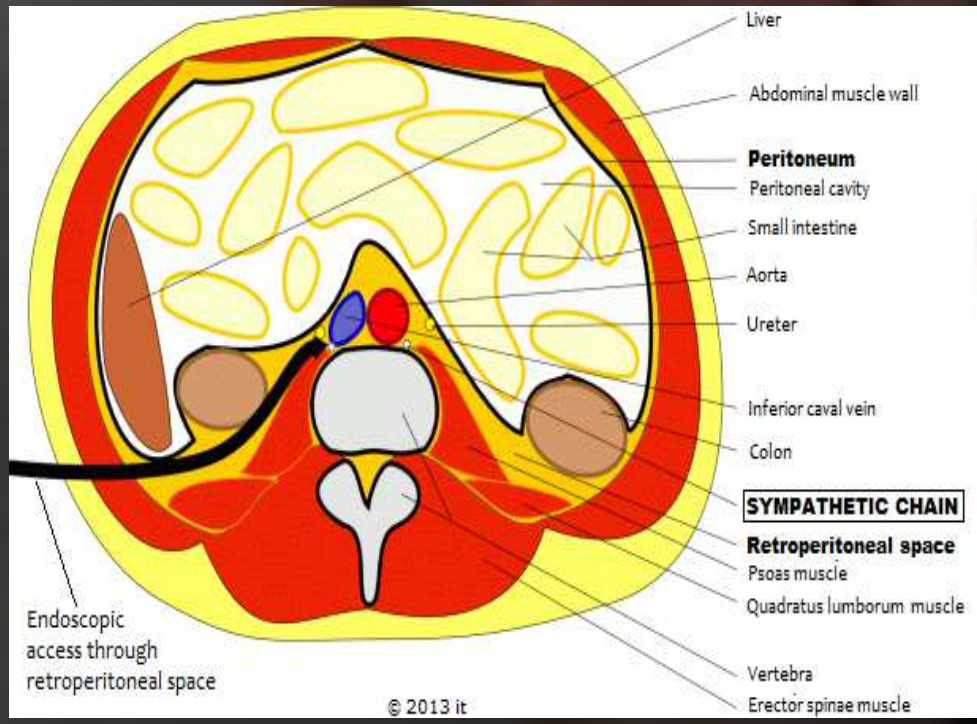
Reversal Surgery

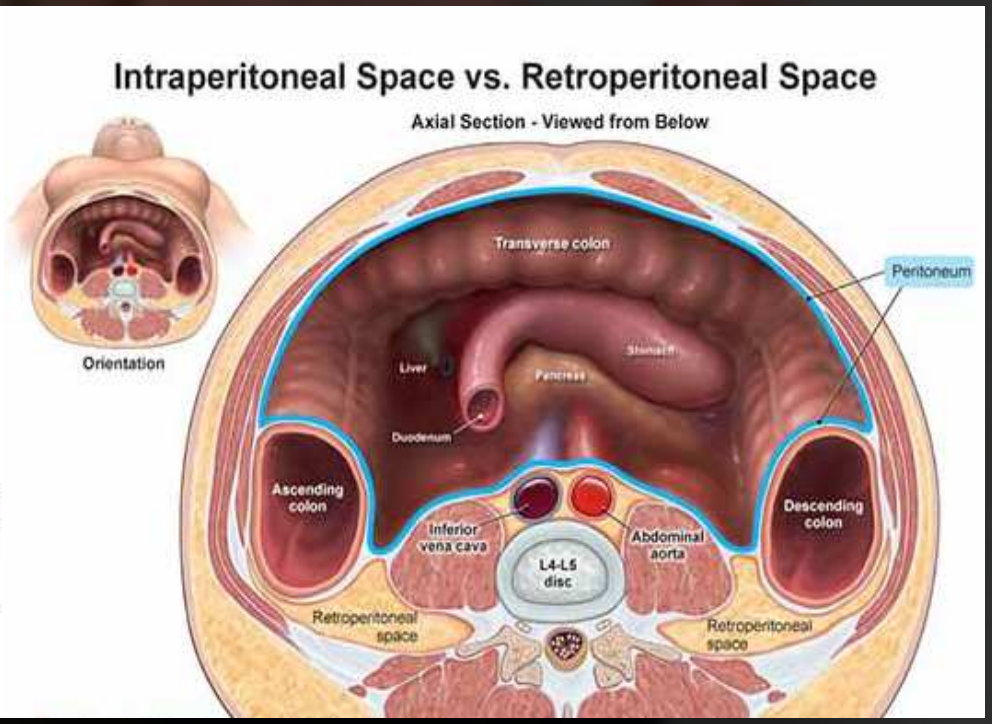
:Nerve Reconstruction

:R5, 6, 7 ± 8 , 9



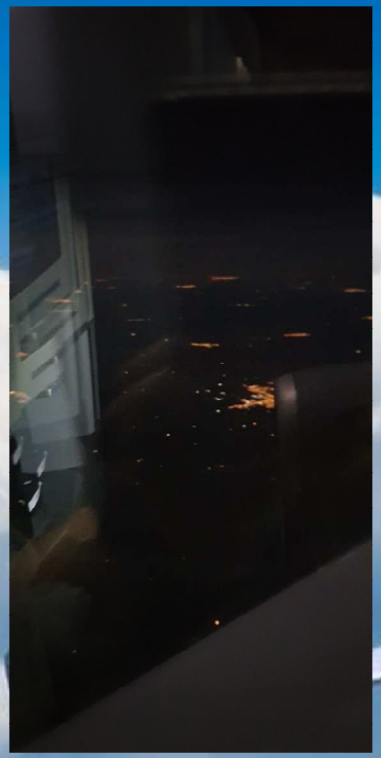
Hyperhidrosis - ELS

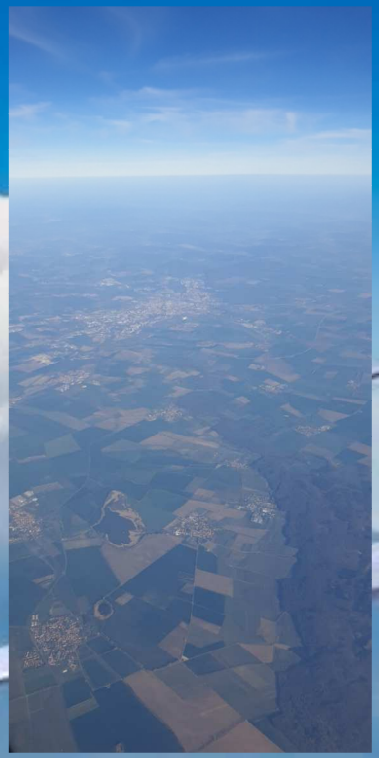




Hyperhidrosis - ELS

#1. " Go to Brazil..."

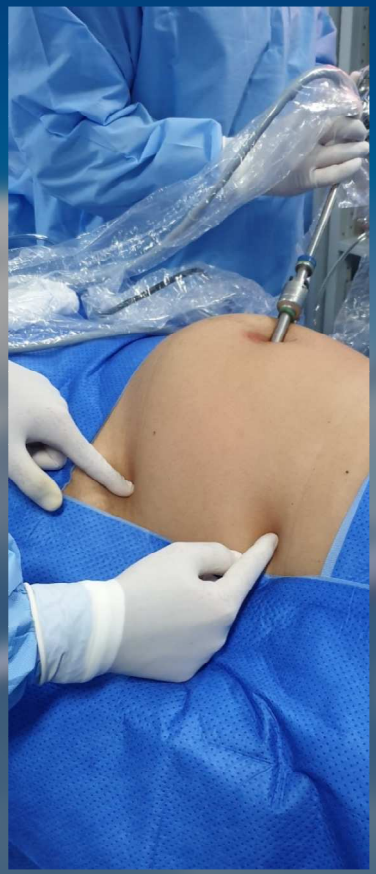
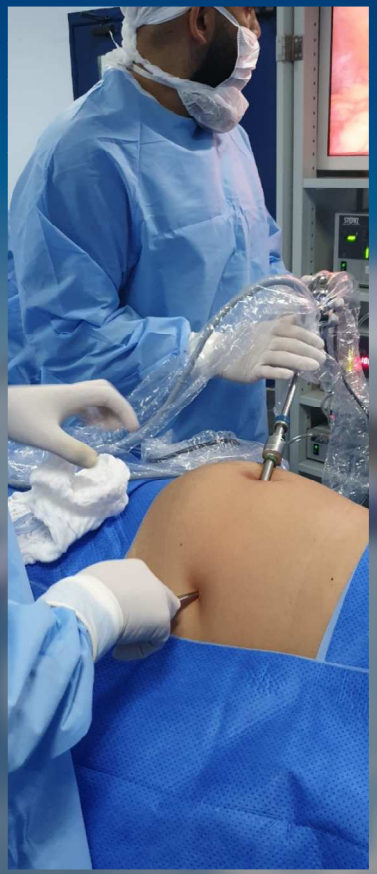




Flight Time 26 Hours

Hyperhidrosis - ELS

#1. " Go to Brazil..."


Hyperhidrosis - ELS

#2 " Go to PISA, ITALY... "

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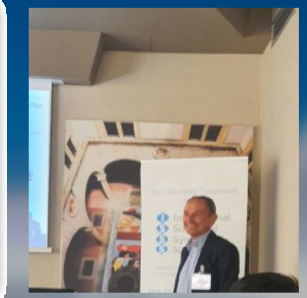
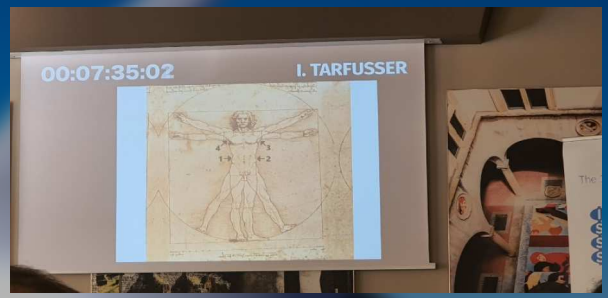
Strategies in Compensatory Sweating

Avoid Compensatory Hyperhidrosis After Sympathetic Surgery for Craniofacial Hyperhidrosis

Moon Duk Hwan (Republic of Korea)





08:40

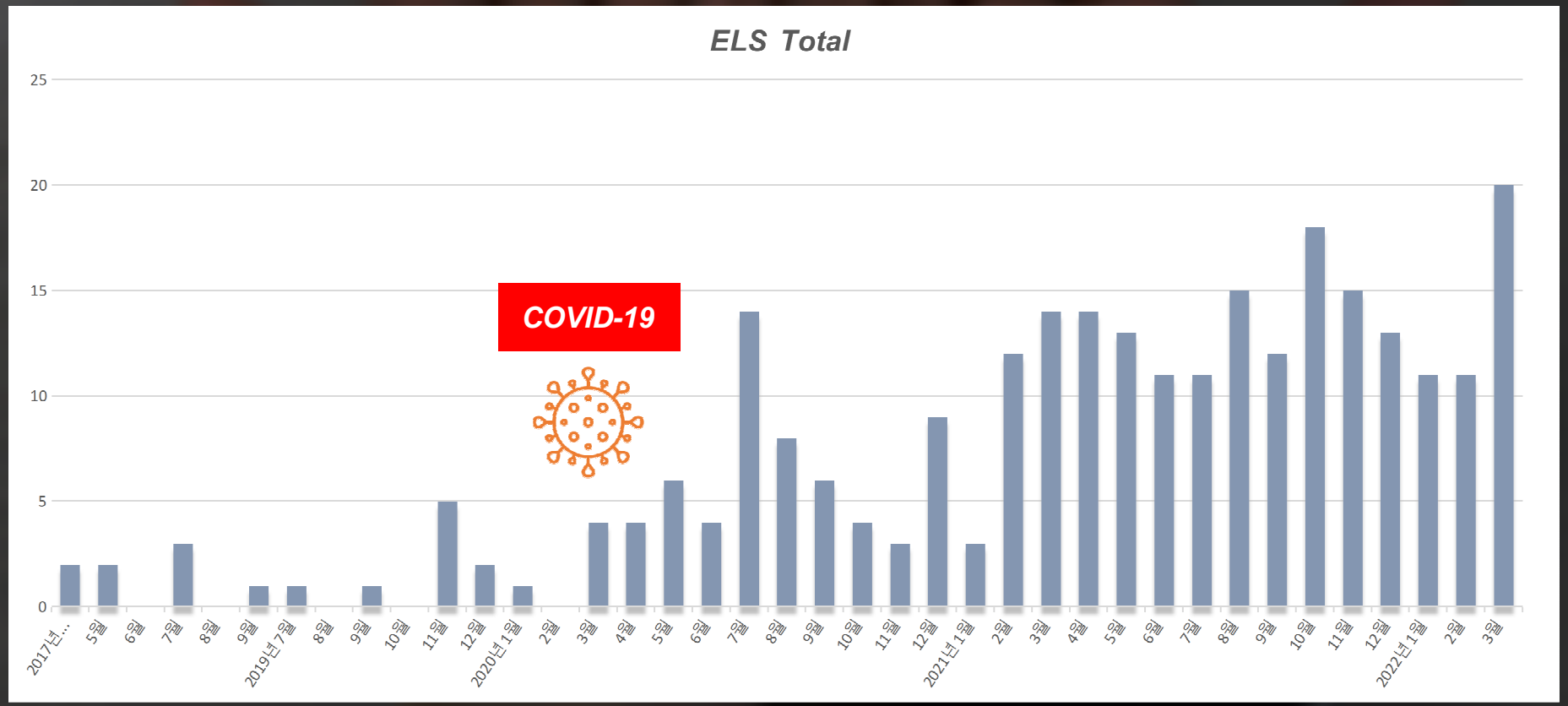
Abstracts Sessions

Hyperhidrosis, Endoscopic Thoracic Sympathectomy, and Cardiovascular Outcomes: A Korean Health Insurance Review and Assessment Service Database Cohort Study

Moon Duk Hwan (Republic of Korea)

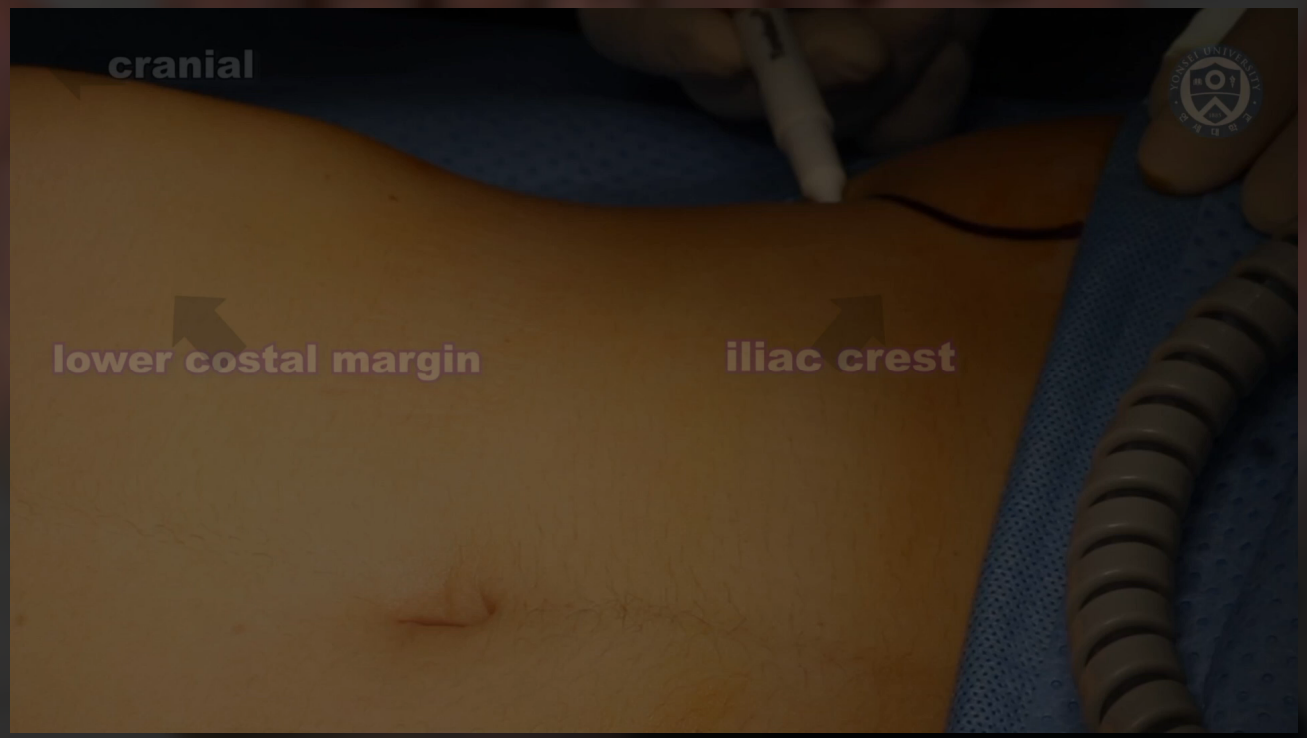
Hyperhidrosis - ELS

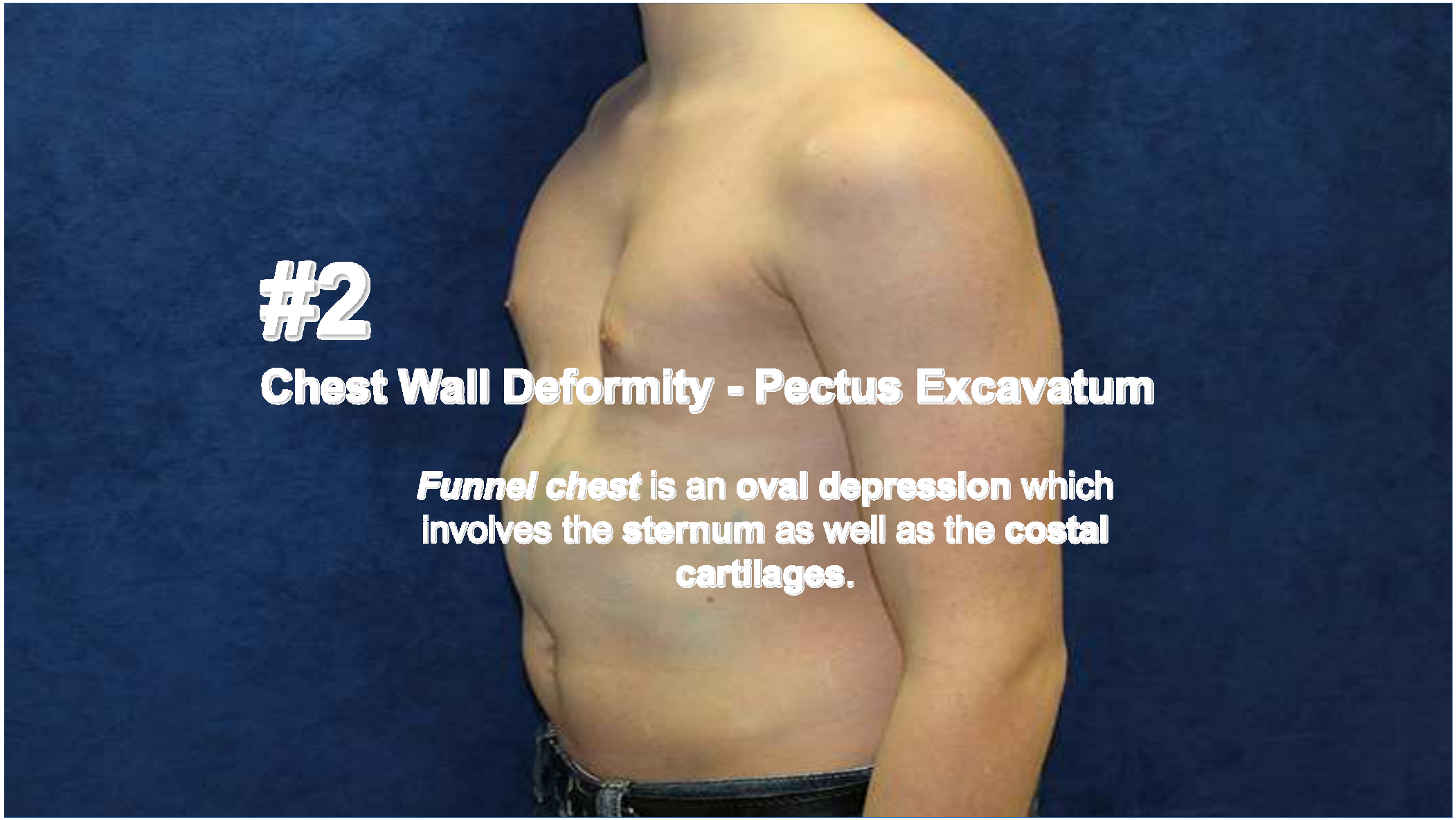
"Overcome Learning Curve"



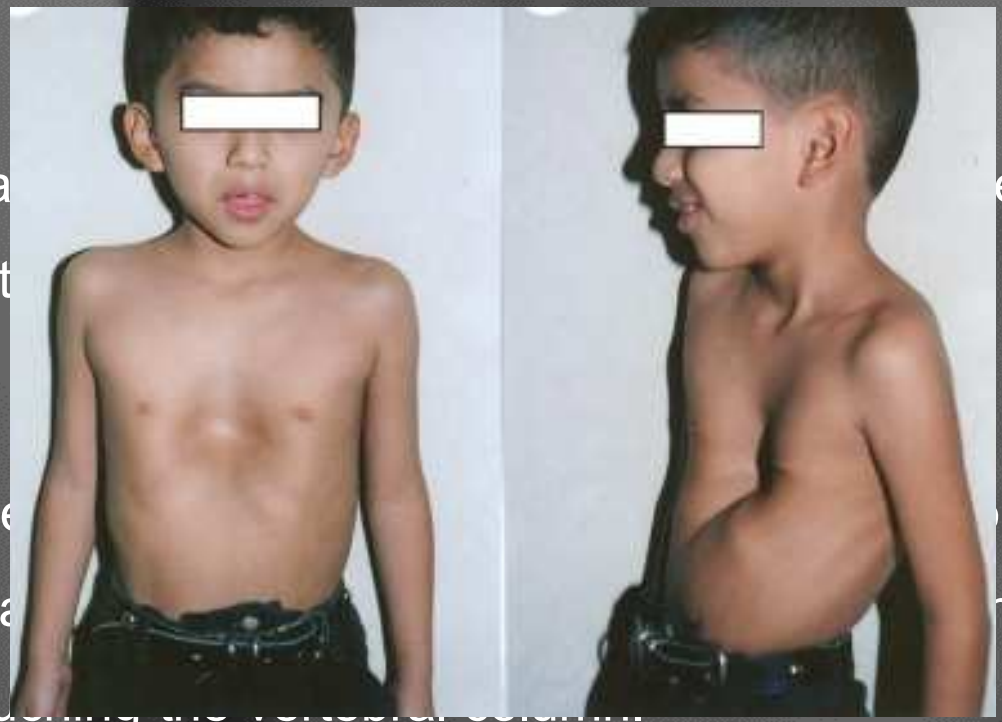
Hyperhidrosis – ELS

"Overcome Learning Curve"




#2
Chest Wall Deformity - Pectus Excavatum
Funnel chest is an oval depression which involves the sternum as well as the costal cartilages.

Chest Wall Deformity - Pectus Excavatum



Usually it is alrea e marked as the child reaches mat

The degree of the n the sterno-xiphoid angle, to a hest wall with the lower sternum tou

Chest Wall Deformity - Pectus Excavatum

Pectus excavatum is a relatively common anomaly

- occurs in about one in 300–400 live births
- three times more frequent in males
- often associated with connective tissue disorders, such as Marfan's disease or Ehlers-Danlos syndrome

Symptoms

- palpitation, exertional dyspnea, fatigue and dull precordial pain, paradoxical breathing, exercise intolerance

The deformity is also often emotionally disturbing, especially in adolescents, who often avoid active sports and become shy and retiring.

Chest Wall Deformity - Pectus Excavatum

heredity :about **20 to 50%** of patients have a **family history** of pectus deformities

- Williams 1872

an **overgrowth of the costal cartilages** – Flesch 1873 - Lincoln Brown 1939(1596)

arrested growth of the sternum - Ebstein 1882

various intrauterine compressive forces such as pressure by the chin, knee or elbow

latent mediastinitis – Raubitsch

undue traction exerted upon the sternum by the diaphragmatico-sternal ligament

- Lincoln Brown 1939(1596)

Chest Wall Deformity - Haller index

Pectus Severity Index

Used to assess severity of incursion of the sternum into the mediastinum

Maximal transverse diameter/narrowest AP length of chest

Normal HI is 2.5

Significant PE has an index greater than 3.25 → standard for determining candidacy for repair (cosmetic? function?)

Chest Wall Deformity - Pectus Excavatum

The first surgical intervention of pectus excavatum

- Wi
- res
- sig

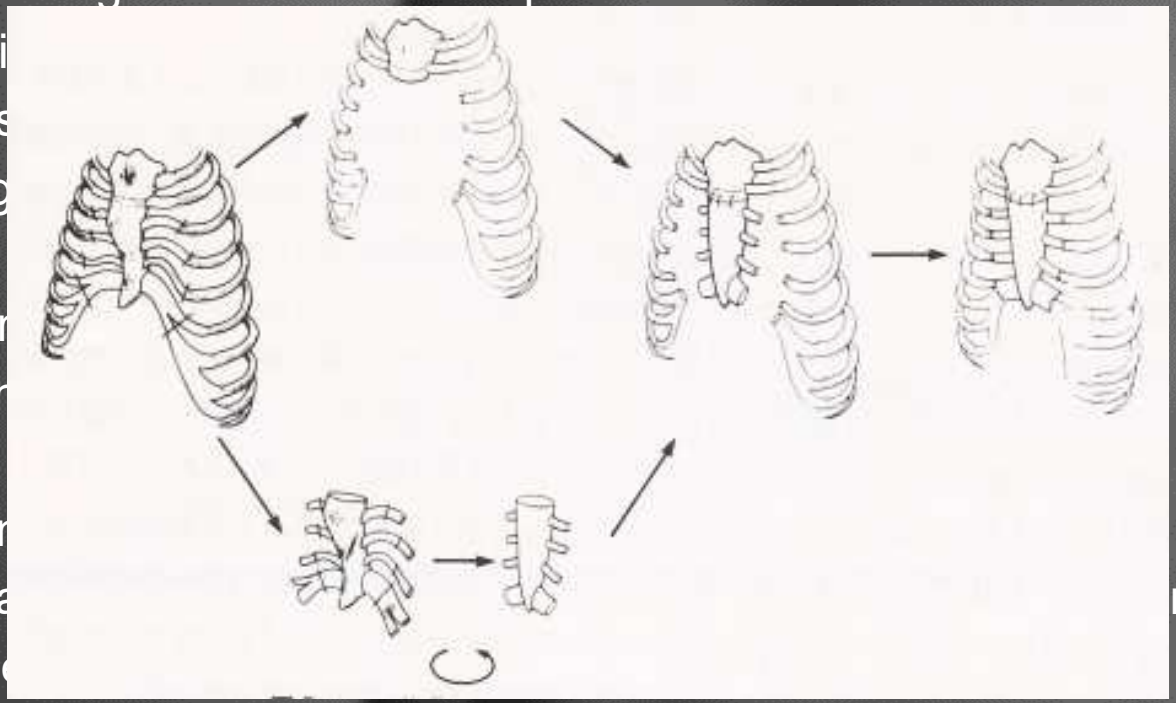
Sauerbr

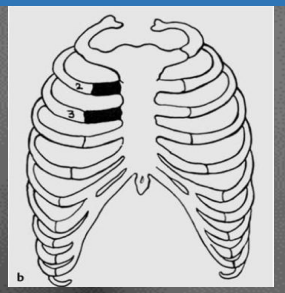
- 5th

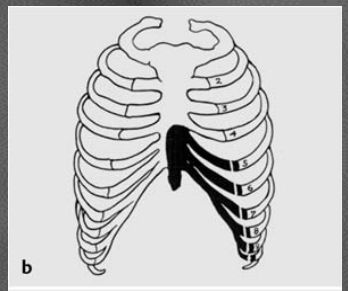
Judet ir

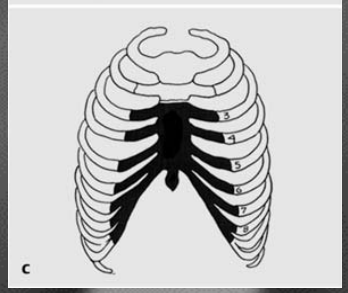
- rea rior

ch



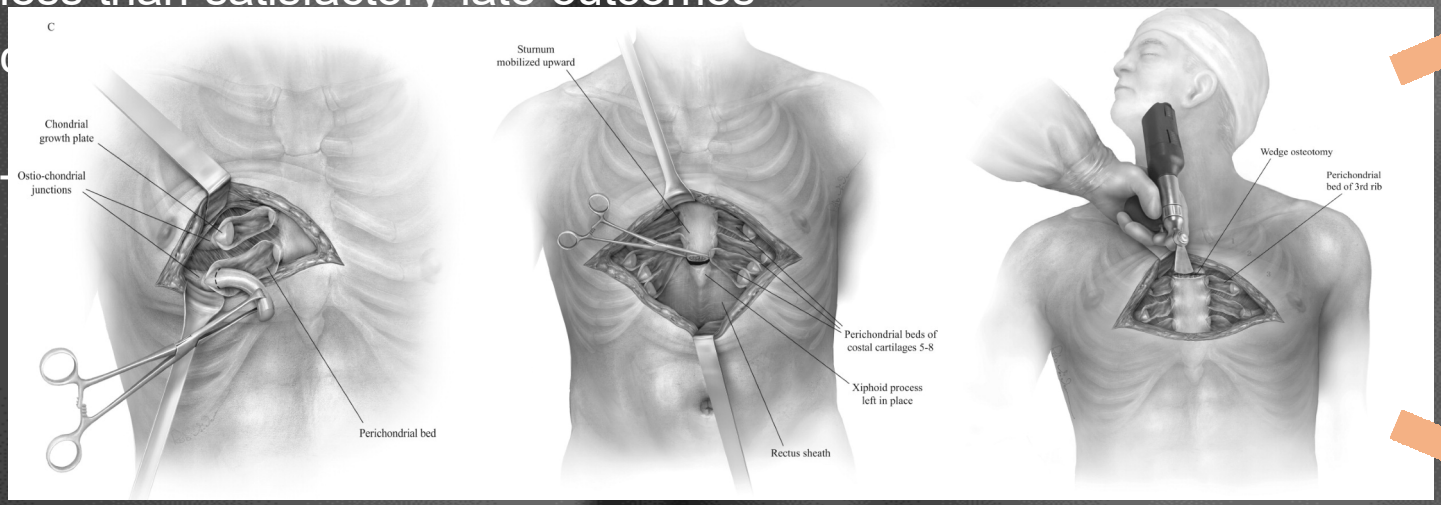


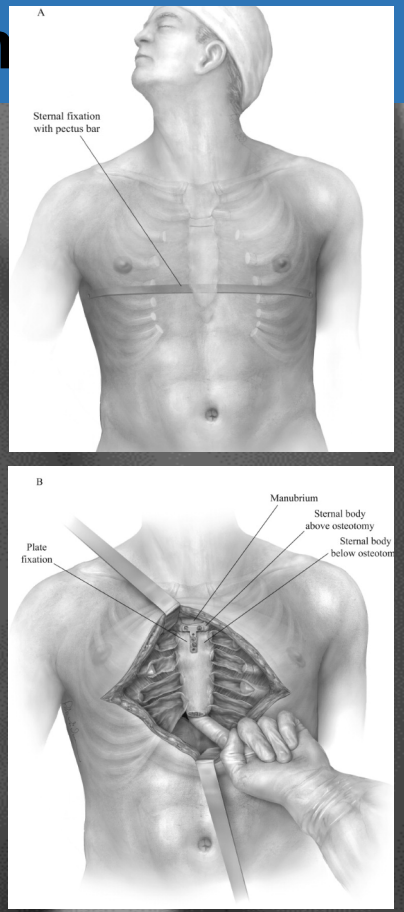




Chest Wall Deformity - Pectus Excavatum

less than satisfactory late outcomes

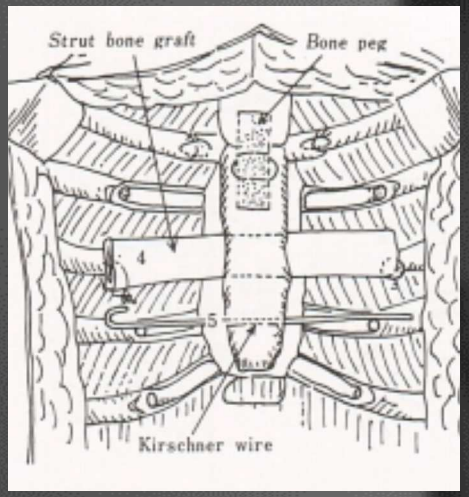


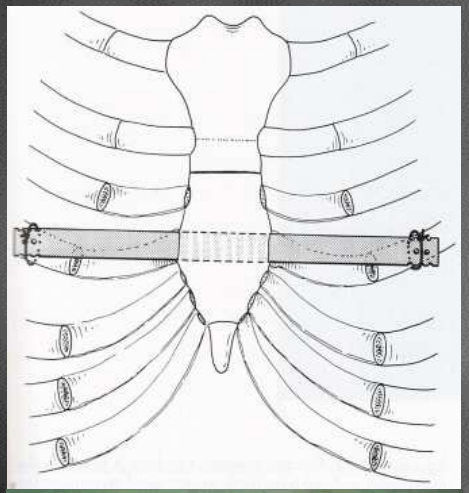


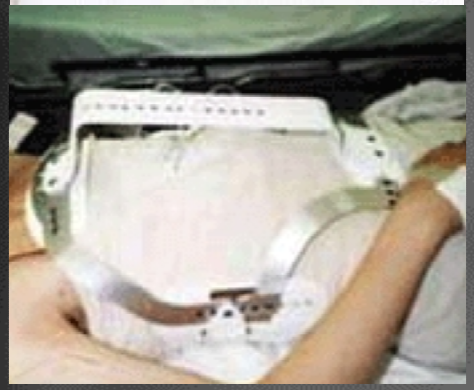
(c) transverse cuneiform osteotomy of the sternum at the upper level of the deformity

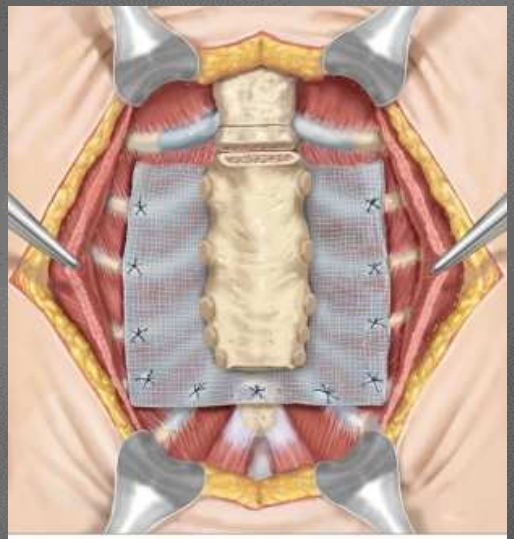
(d) maintenance of the corrected position of the sternum

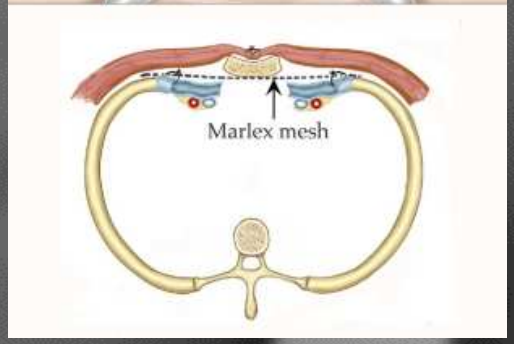
Chest Wall Deformity - Pectus Excavatum





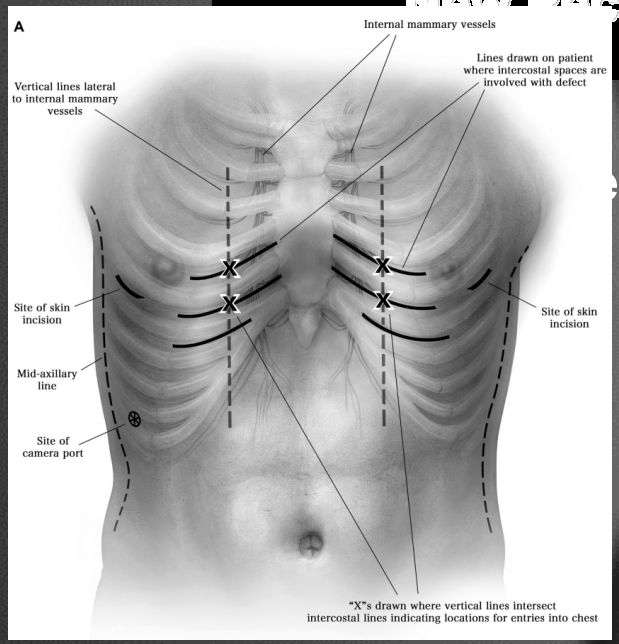


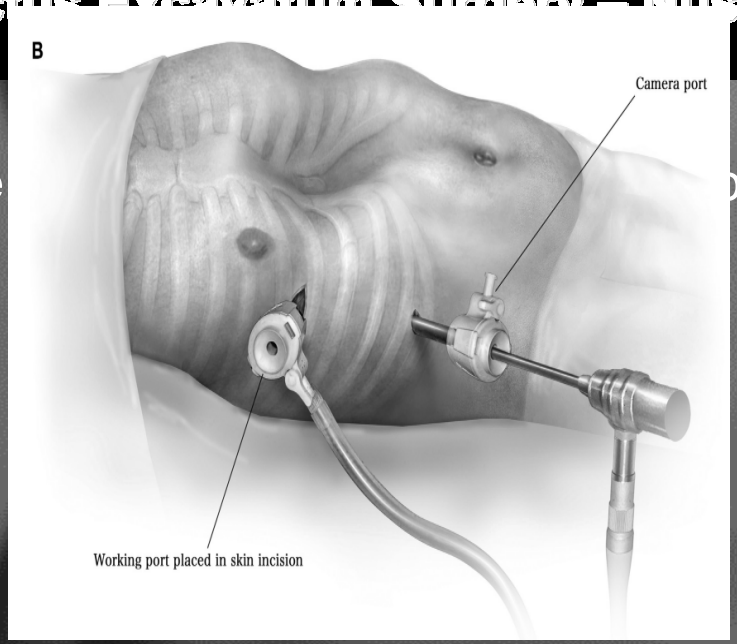


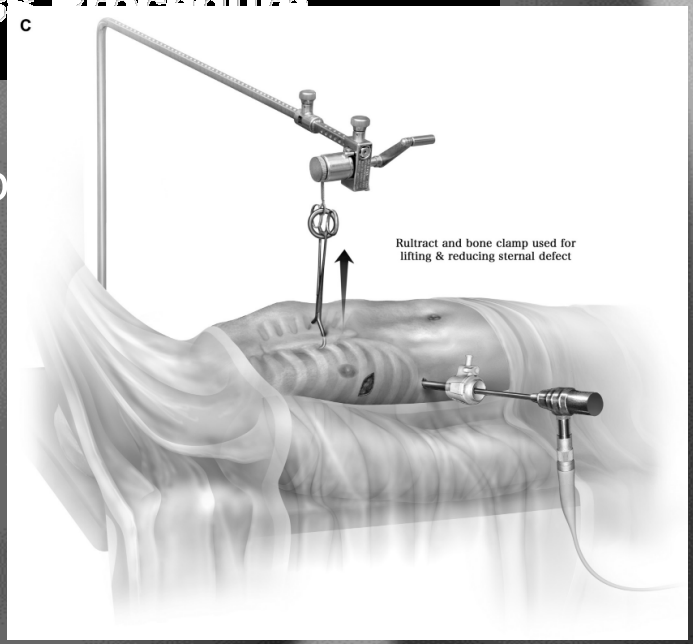


Chest Wall Deformity - Pectus Excavatum

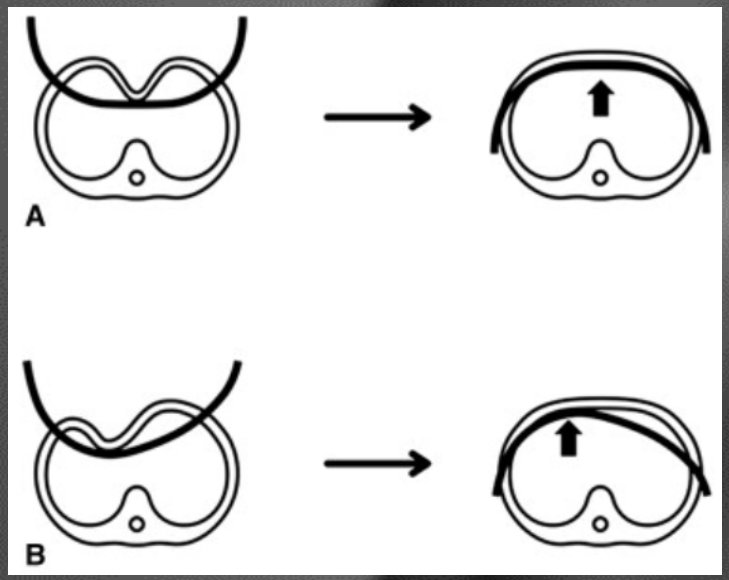
New Pectus Excavatum Surgery – Nuss Procedure

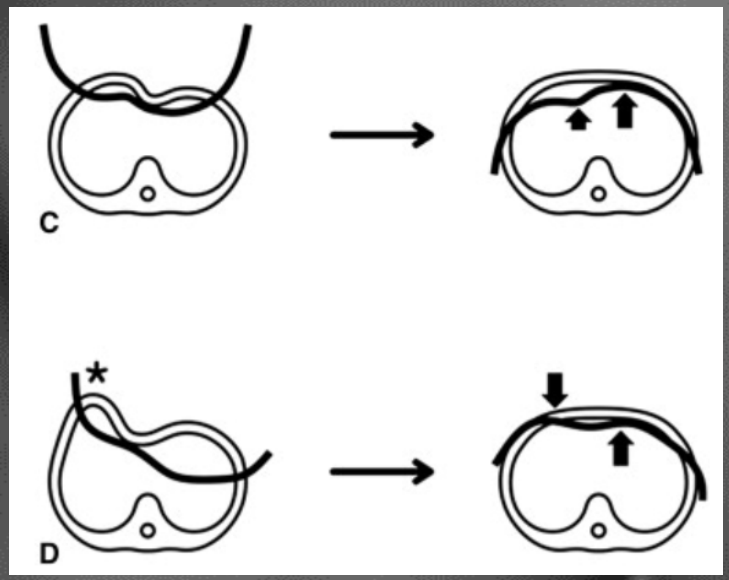






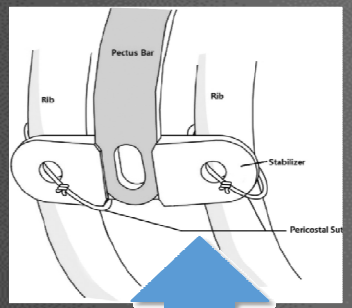
Chest Wall Deformity - Pectus Excavatum





Morphology – tailored bar shaping

HJ Park



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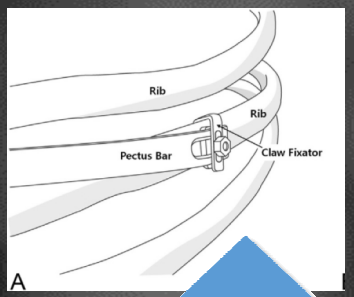
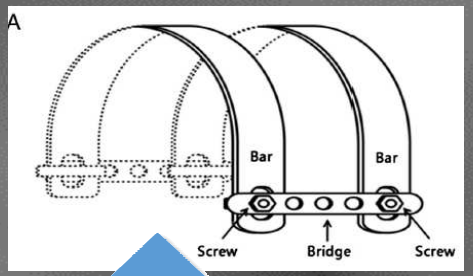


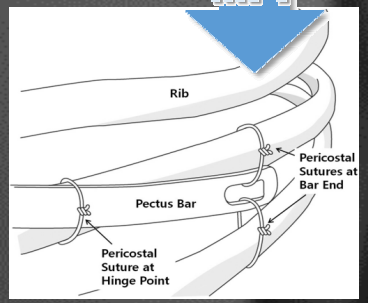
Claw fixation



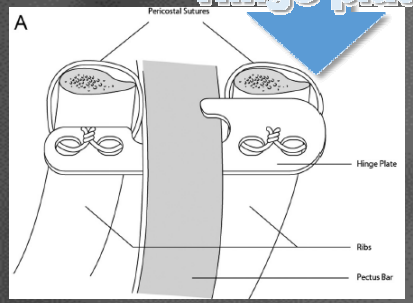
Bridge technique

1999 2001 2007 2009 2013

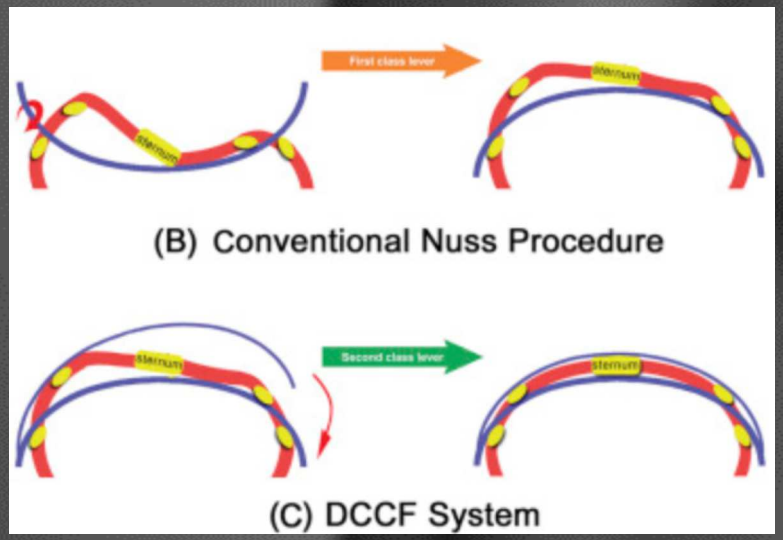
MPF

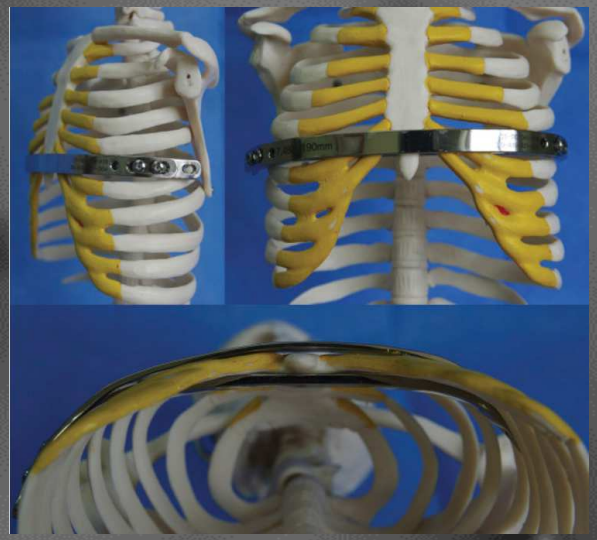


Hinge plate



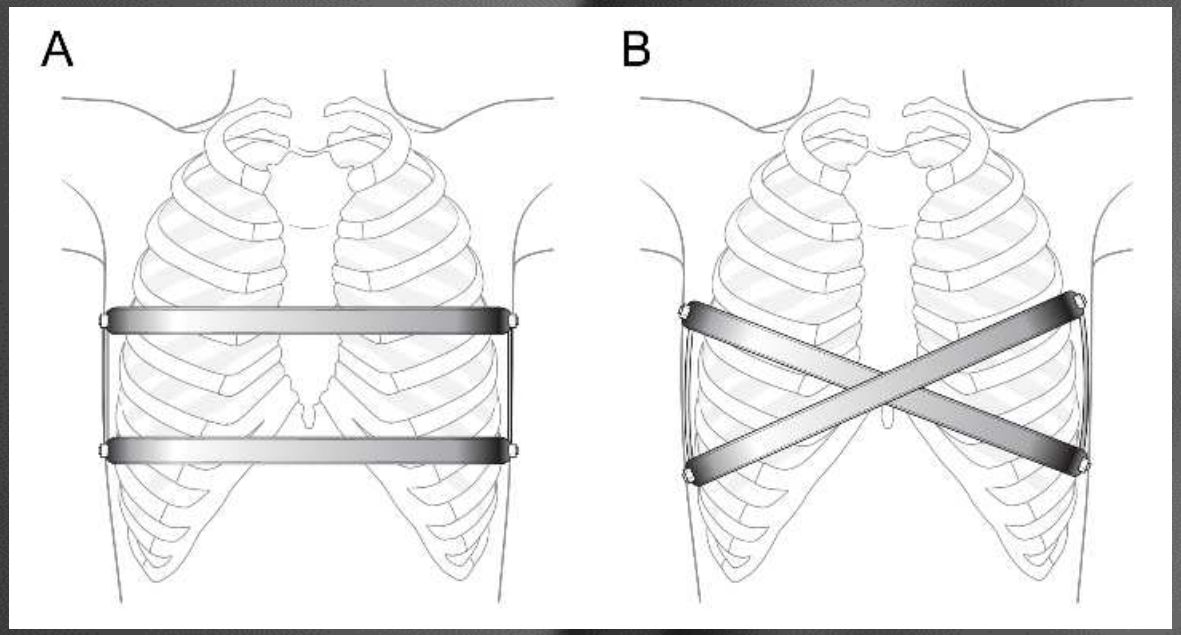
Chest Wall Deformity - Pectus Excavatum



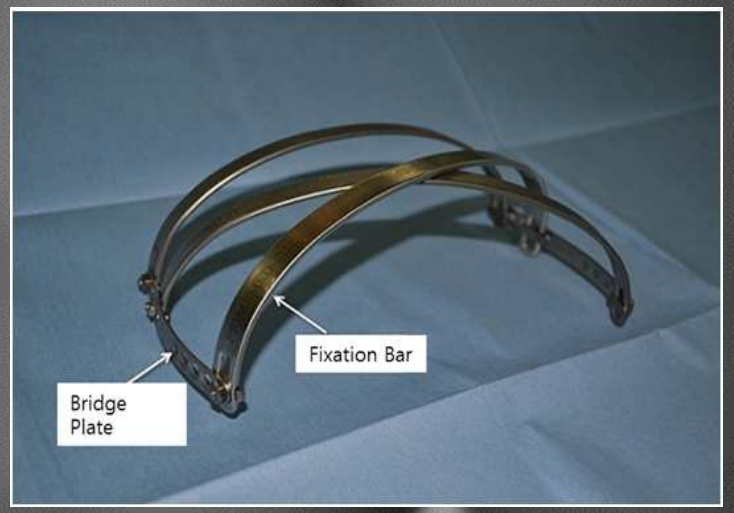


Double Compression and Complete Fixation bar system (DCCF)

Chest Wall Deformity - Pectus Excavatum

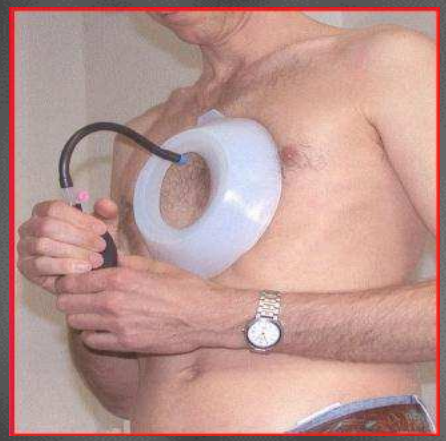
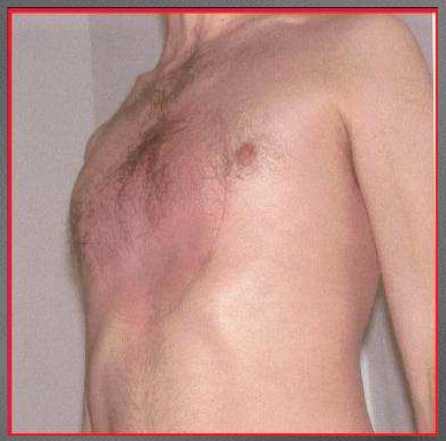
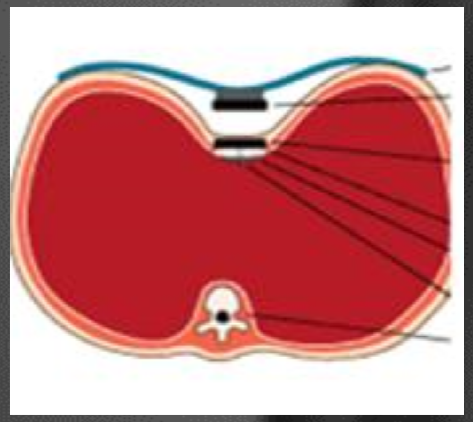
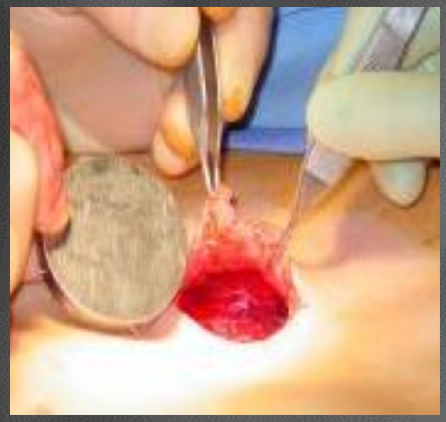
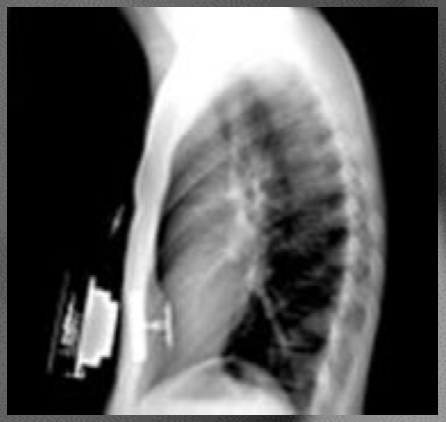


2 – bar technique : Parallel vs. Cross



3 – bar technique

Chest Wall Deformity - Vacuum Bell and 3MP

Chest Wall Deformity - Advice

Adults with severe complex chest wall deformity

Connective tissue disease

Stiff chest wall from prior thoracic or cardiac surgeries

Selection of proper indications and adequate surgical method is crucial for the successful and safe chest wall correction !!!

Chest Wall Deformity - Pectus Carinatum

Pectus carinatum is 16.7% of all chest wall deformities in the Boston children's hospital experience.

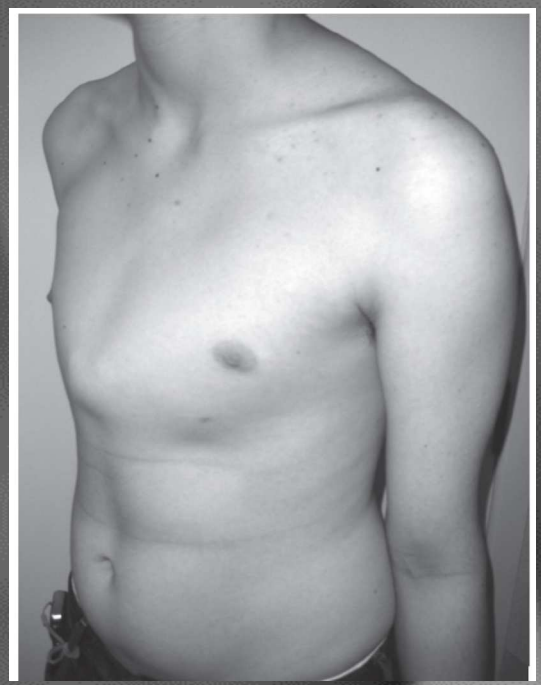
Chondrogladiolar type : most frequent form

- anterior protrusion of the body of the sternum
- protrusion of the lower costal cartilages

Chondromanubrial or "pouter pigeon" deformity

: least frequent form

- protrusion of the upper costal cartilages
- relative depression of the body of the sternum.



Chest Wall Deformity - Pectus Carinatum

Etiology : not clear

- an overgrowth of the costal cartilages with forward buckling of the cartilages and anterior displacement of the sternum
- genetic basis : 26% had a family history of chest wall deformity and 12% of scoliosis.
- more frequent in boys than in girls - 3:1

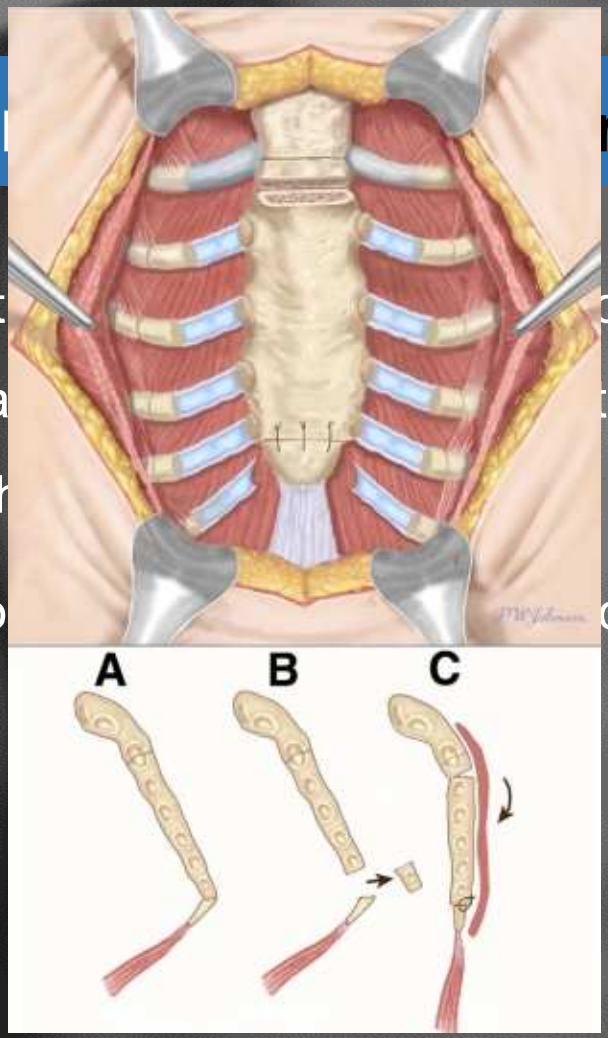
PC is rarely present at birth

- deformity was not identified until after the eleventh birthday
- deformity often progresses during early childhood particularly in the period of rapid growth at puberty.

Chest Wall Defo rinatum

The current correction of Pect often involving resection of costal cartilages and sterna there are minimally invasive modifications using th

The majority of these operatio ocedure first described in 1949 by Ravitch.



Chest Wall Deformity - Pectus Carinatum

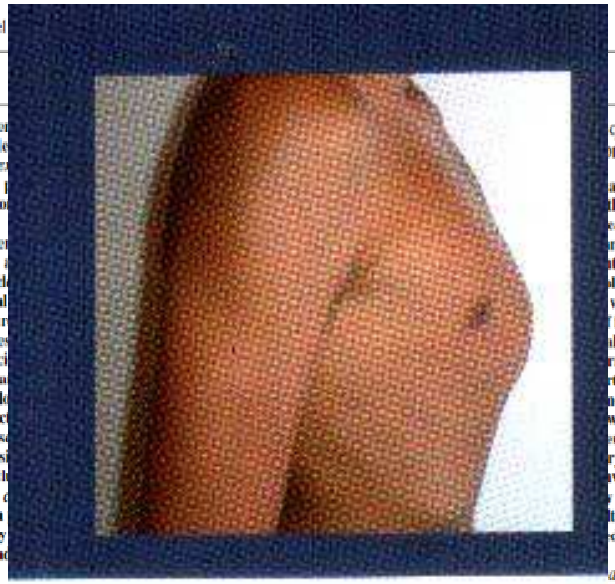
NOTAS CLINICAS

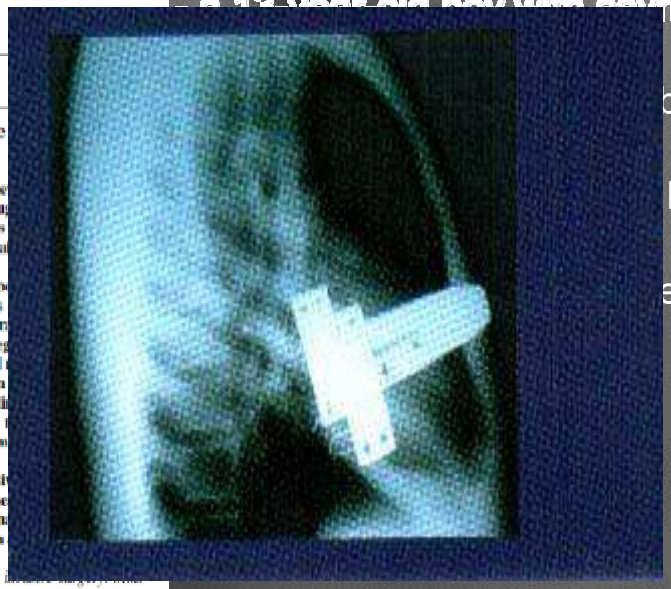
Localizador web
Artículo 79.720

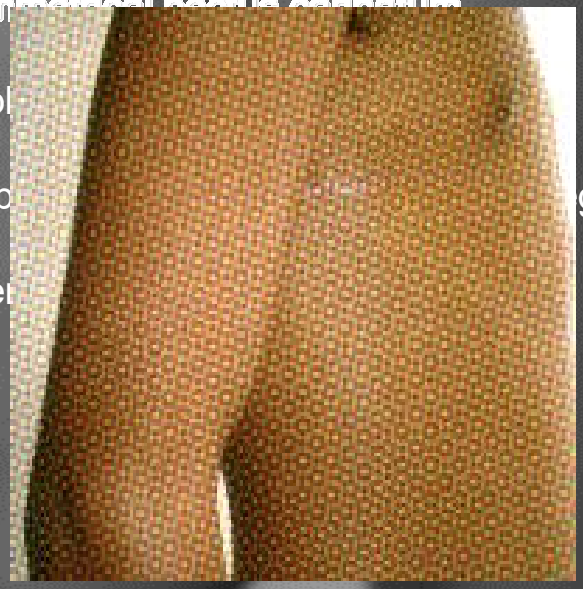
Método miniinvasivo para la corrección del *pectus carinatum*. Comunicación preliminar

H. Abramson

Hospital del







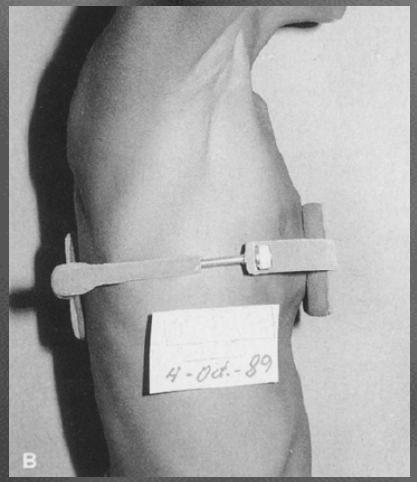
Chest Wall Deformity - Pectus Carinatum

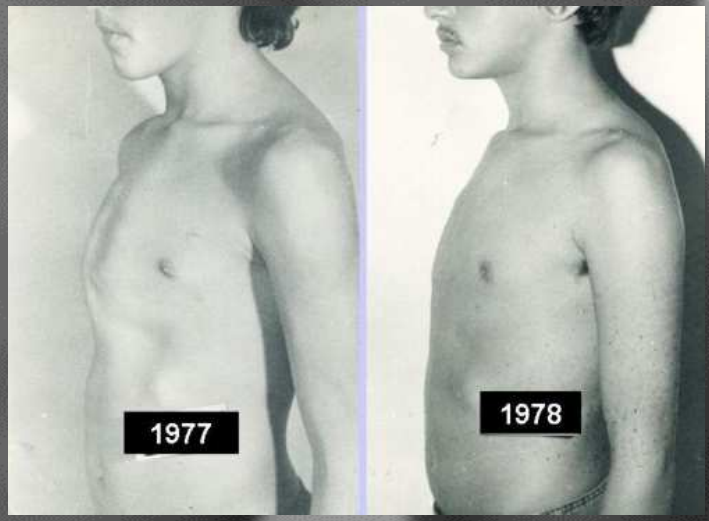
Dynamic Chest Compressor

Haje SA, Raymundo JLP.

Chest wall deformities: conservative treatment of the anterior protrusion forms.

Brazilian J Orthop 1979;14:167–178.

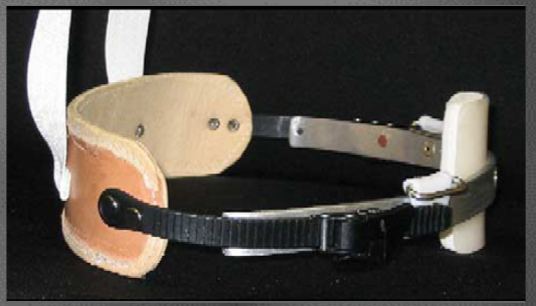


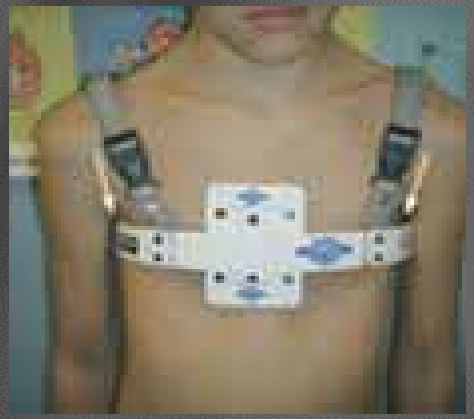


Chest Wall Deformity - Pectus Carinatum

Various Braces






Chest Wall Deformity - Pectus Carinatum

Long-Term Results of Compressive Brace Therapy for Pectus Carinatum

Duk Hwan Moon[1] Min Kyun Kang[1] Hye Sun Lee[2] Sungsoo Lee[1]

[1] Department of Thoracic and Cardiovascular Surgery, Gangnam Severance Hospital, Seoul, the Republic of Korea
[2] Biostatistics Collaboration Unit, Gangnam Severance Hospital, Seoul, the Republic of Korea

Address for correspondence Sungsoo Lee, Department of Thoracic and Cardiovascular Surgery, Gangnam Severance Hospital, 211 Eonju-ro, Gangnam-Gu, Seoul 06273, the Republic of Korea (e-mail: CHESTLEE@yuhs.ac).

Thorac Cardiovasc Surg 2019;67:67–72.

Abstract

Background Pectus carinatum (PC) is one of the most common types of congenital chest wall deformity. Recently, noninvasive compressive brace therapy has been more frequently used than invasive surgical correction to treat PC. Hence, the purpose of this study was to determine the long-term outcome of compressive brace therapy.

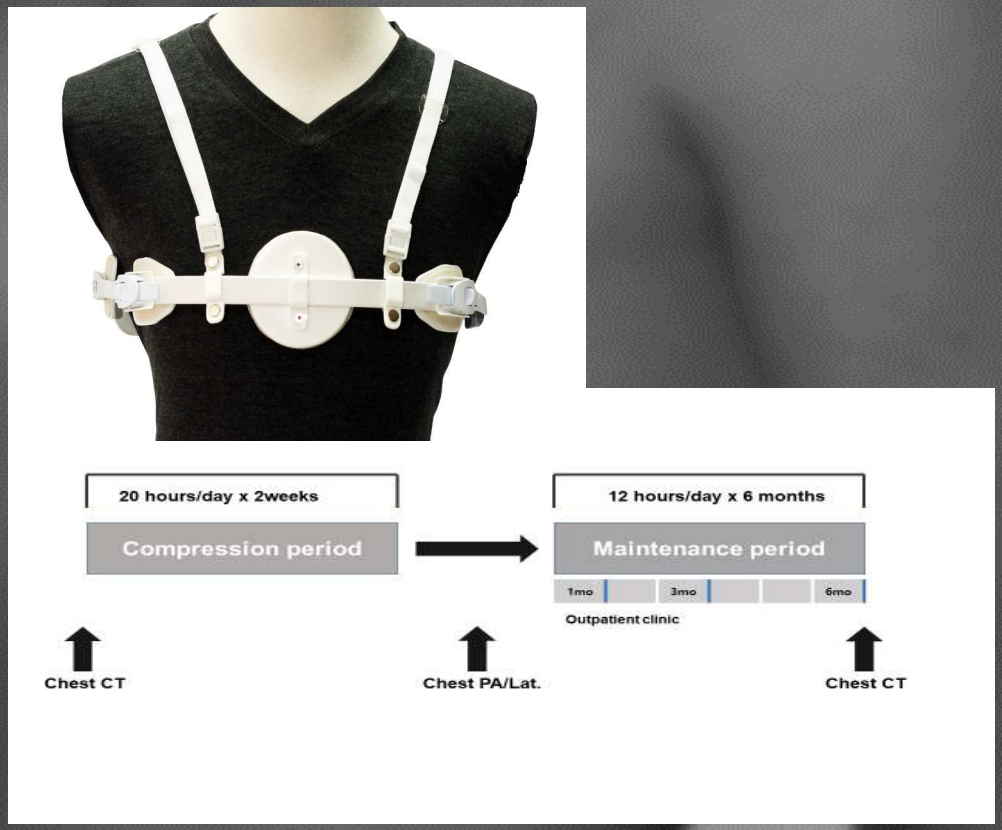
Methods We retrospectively reviewed patients with PC who underwent compressive brace therapy between January 2014 and December 2016. All patients underwent a 2-week compression period, in which braces were worn for 20 hours per day, followed by a 6-month maintenance period, in which braces were worn for 12 hours per day. Patient satisfaction was investigated via telephone survey.

Results A total of 320 patients were included in this study. The average age was 13 years, and 280 were males (87.5%). The median follow-up period was 42 months (13–68). Good compliance was observed in 286 patients (89.4%; compliance group). In this group, the initial Haller index significantly increased from 2.20 ± 0.31 to 2.59 ± 0.38 after the 6-month therapy period ($p = 0.001$). After the 6-month period, 255 patients (89.1%) and 31 patients (12.1%) in the compliance group were very satisfied and satisfied, respectively. Satisfaction at the last follow-up via telephone survey was very satisfied in 250 patients (87.4%) and satisfied in 36 (12.6%). In the compliance group, no patient needed compressive braces again after the therapy period.

Conclusion Given the findings presented in this study, compressive brace therapy appears to be a relatively simple and safe method with good long-term outcome in treating patients with PC.

Keywords

- chest wall deformity
- pectus carinatum
- compressive brace



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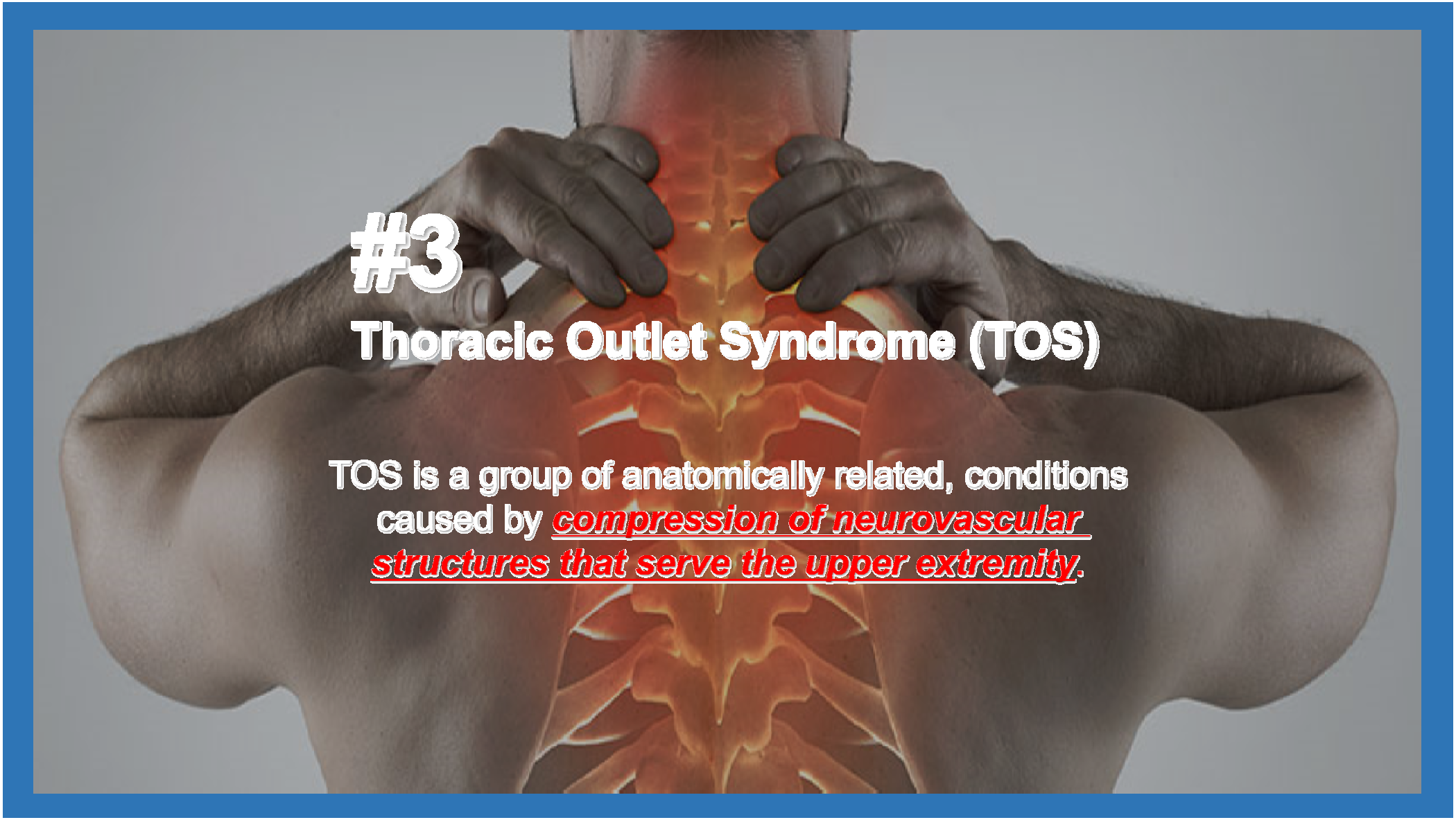
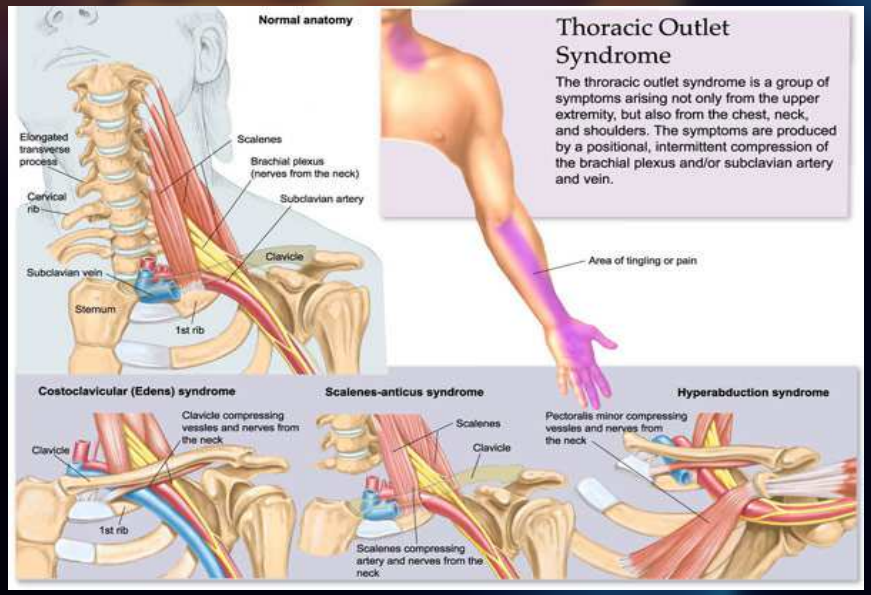

#3
Thoracic Outlet Syndrome (TOS)
TOS is a group of anatomically related, conditions caused by compression of neurovascular structures that serve the upper extremity.

Thoracic Outlet Syndrome (TOS)

TOS is a group of anatomically related, conditions caused by **compression of neurovascular structures that serve the upper extremity.**

- ✓ Scalene triangle
- ✓ Costoclavicular space
- ✓ Pectoralis minor space



Thoracic Outlet Syndrome (TOS) - Type

Type	Characteristics
Neurogenic TOS	Caused from **brachial plexus compression** Symptoms include **pain**, **dysesthesia**, **numbness**, **weakness** – **not localized** in specific peripheral nerve distribution
Venous TOS	Caused from **subclavian vein compression** Symptoms include **swelling**, **paresthesias** in the fingers
Arterial TOS	Caused from **subclavian artery compression** Almost always associated with a **cervical rib** or **anomalous rib** Symptoms include **hand ischemia** with **pain**, **pallor**, **paresthesia**, **coldness**

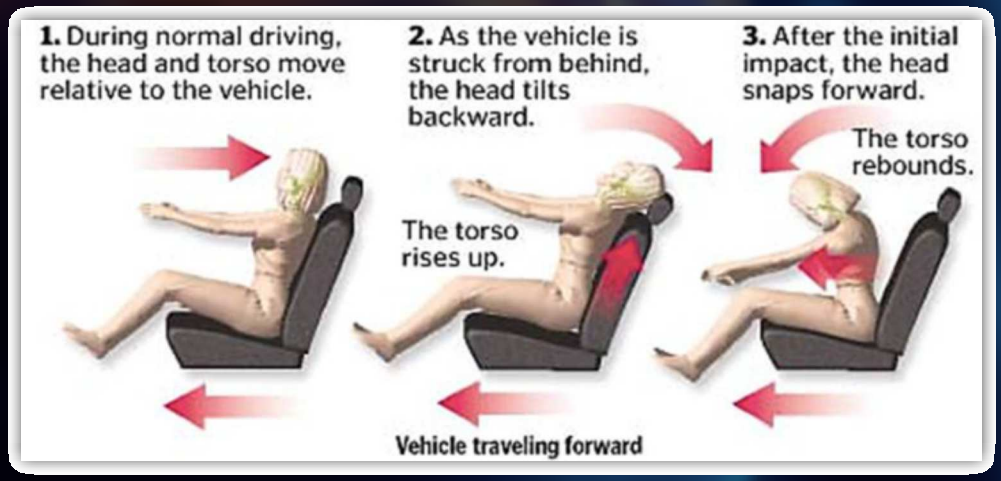
Thoracic Outlet Syndrome (TOS) - Cause

Congenital abnormality
- **Cervical rib**
- Prolonged transverse process
- Muscular abnormality(ant. scalene m., sickle-shaped scalene m.)
- Fibrous connective tissue anomalies.

Trauma
- **Whiplash injury**

Repetitive strain

Etc.
- Tumor
- Hyperostosis
- Osteomyelitis



Thoracic Outlet Syndrome (TOS) - Surgery

Common Surgical Approaches for Thoracic Outlet Syndrome

Surgical Approach	Characteristics/Proposed Advantages	Disadvantages
Transaxillary	Most commonly used approach	Risk of iatrogenic brachial plexus injury[32]
	Allows more complete exposure of first rib	
	More cosmetic scar	
	No retraction of neurovascular structures necessary for first rib removal[31]	
Supraclavicular	Allows better exposure of the middle and upper trunks, neck of the first rib, and anterior and middle scalene muscles[32]	Retraction of brachial plexus and vascular structure necessary for complete first rib removal[31]
	May also allow effective first rib resection[32]	
	Allows vascular reconstruction[33,35]	
Posterior	Favored for recurrent TOS and in cases of prior anterior neck surgery	Requires extensive muscle dissection that can lead to postoperative shoulder dysfunction
	May allow better exposure of proximal elements of the brachial plexus[34]	Risk of injury to the long thoracic, dorsal scapular, and accessory nerves[34]


2022 흉부외과 전공의 연수교육
Thanks for your attention:)