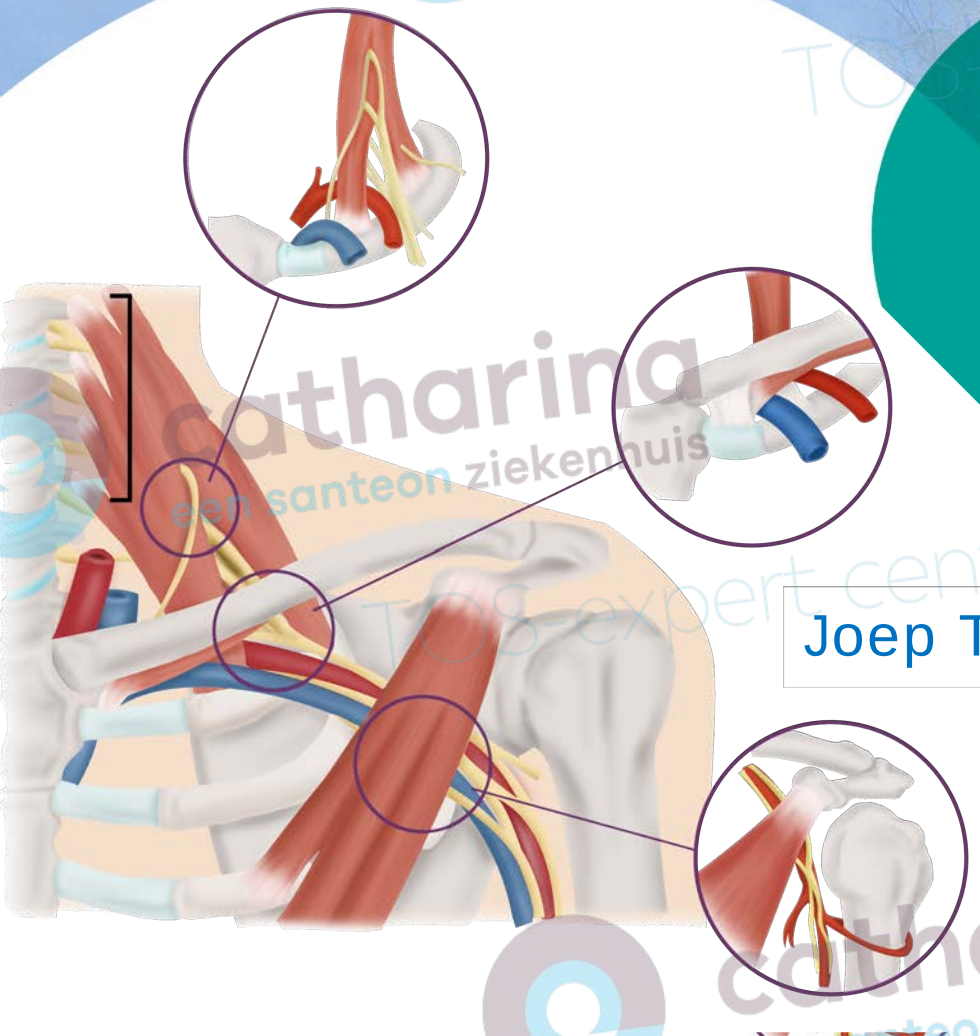
catharina
een santeon ziekenhuis

TOS expert center



Joep Teijink, vaat-/TOS-chirurg

‘Eerste rib resectie’ controversieel

- Diagnose
  - Heterogene klinische presentatie
  - Lage sens./spec. (PPV/NPV) ‘tests’
  - Overlap met andere aandoeningen
- Behandeling
  - Diverse technieken en benaderingen
  - Tegenstrijdige resultaten, ernstige complicaties
  - Geen duidelijke, uniforme uitkomst parameters
- Evidence
  - Geen level 1 bewijs (kleine, retrospectieve, single center studies)
  - Geen duidelijke, uniforme uitkomst parameters

One of the most controversial clinical entities in medicine.

Cochrane

2010; 2014

‘Eerste rib resectie’ controversieel

- Dale WA 1982
  - TOD associated Brachial Plexus injury of up to 30%
  - Recurrence rates of up to 26%
  - Mortality

“the lack of familiarity with the complex anomalies lead to a definite incidence of poor surgical results”

Arch Surg. 1982 Nov;117(11):1437-45.

Thoracic outlet compression syndrome. Critique in 1982.

Dale WA.

Abstract

Experienced surgeons recommend different approaches and operations for thoracic outlet compression syndrome. I reviewed my recent 76-patients series (55% had excellent results; 35%, good; and 9%, failure), series reported by others, and the results of a national survey of complications of the transaxillary first-rib resection reporting 273 partial or complete postoperatively brachial plexus injuries, 52 of which failed to recover completely. The difficulties with diagnosis, variability of results, and the potential of serious neurologic sequelae suggest reevaluation of indications and techniques of surgical therapy. Operation should be reserved as a last resort. Modern results with scalenectomy (not simple division of the muscle) suggest its use with reservation of first-rib resection for failures.

TOS expert center

‘Eerste rib resectie’ controversieel

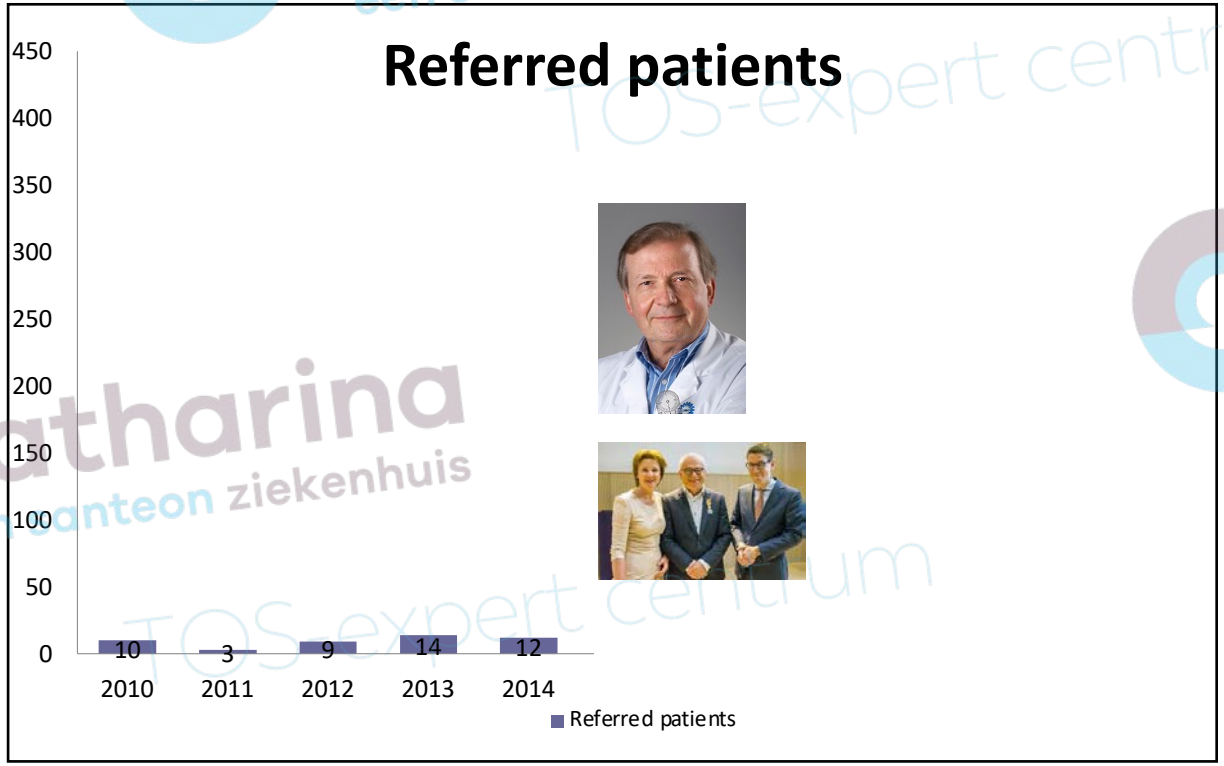
‘Vroeger’

- “Bijna iedereen deed dat wel eens”
- “Hoe was het ook alweer?”
- “S###, de tweede rib eruit gehaald!”

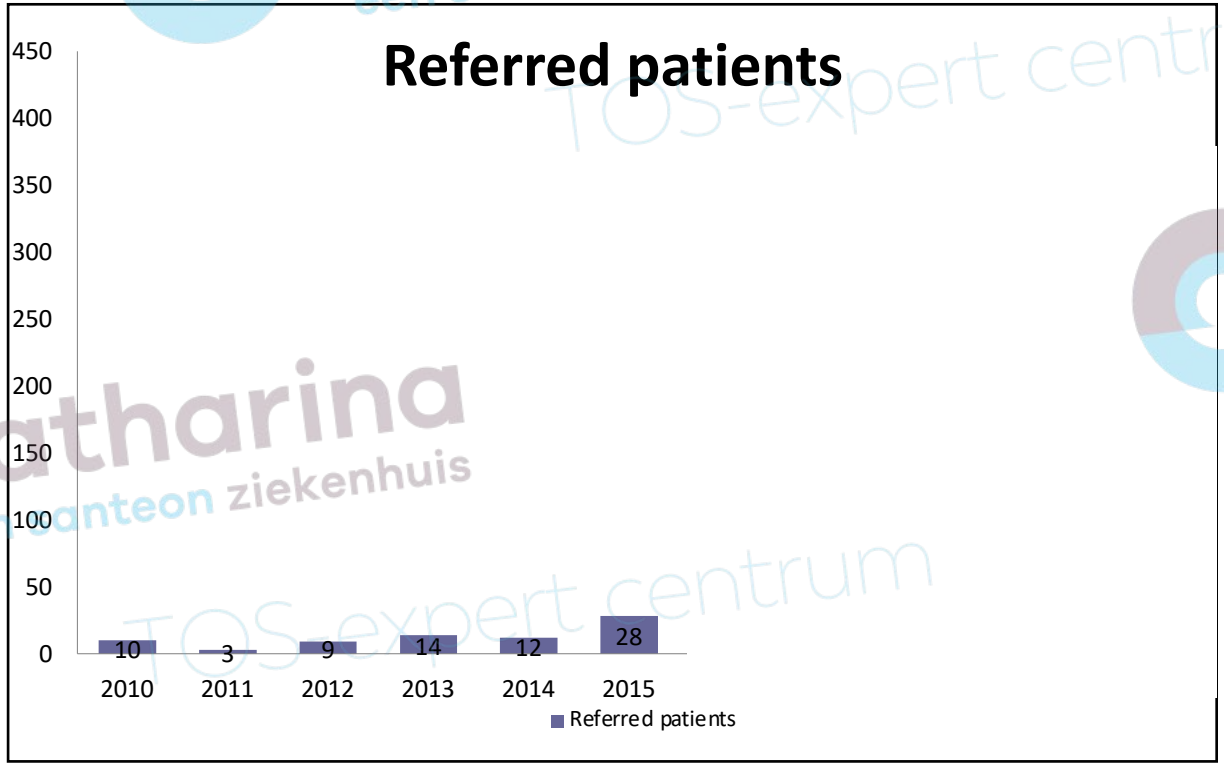
Ook in 2022

- Volume laag (<10 per chirurg)
- Extreem veel variatie in anatomie
  - verdwalen, durven niet meer verder, “zo is het goed, kijk, de zenuw ligt vrij”, “eerst de 2e rib verwijderen, meer zicht”.
- Lastig aan te leren / superviseren (key hole surgery) / leercurve
- Nog steeds: thoracotomieën, weken IC opname, plexusletsels….
- Maar vooral, incomplete resecties

Ontstaan – groei TOS centrum CZE

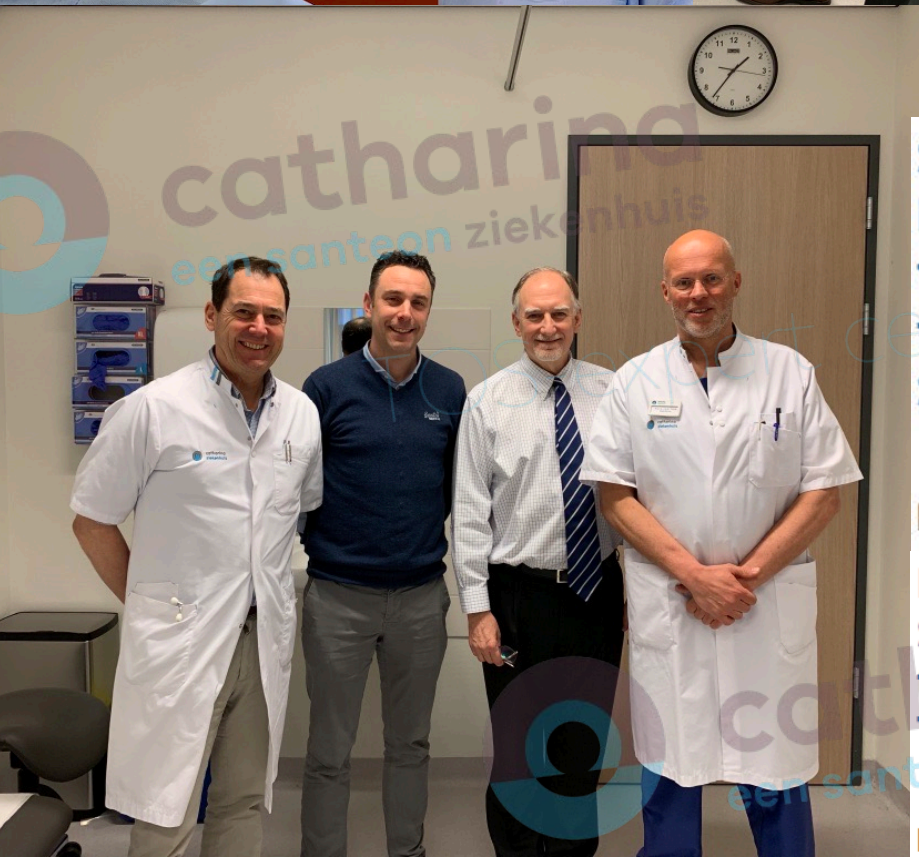


Ontstaan – groei TOS centrum CZE



Ontstaan – groei TOS centrum CZE

oefenen Anatomie-Erasmus MC

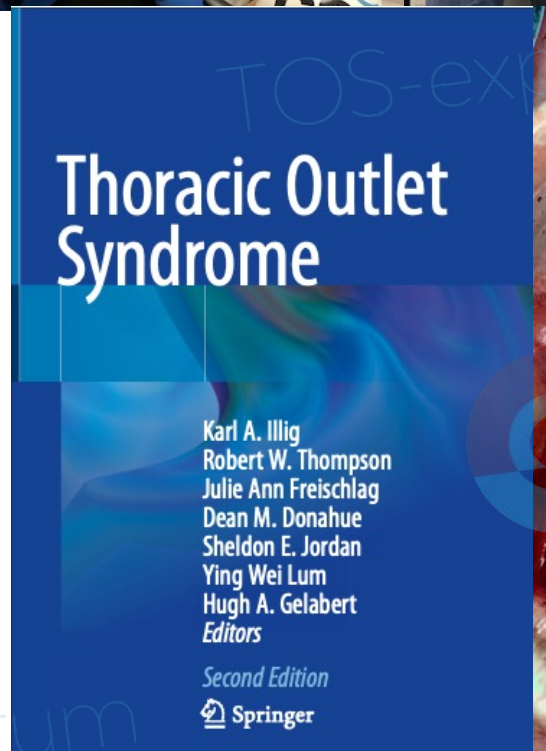


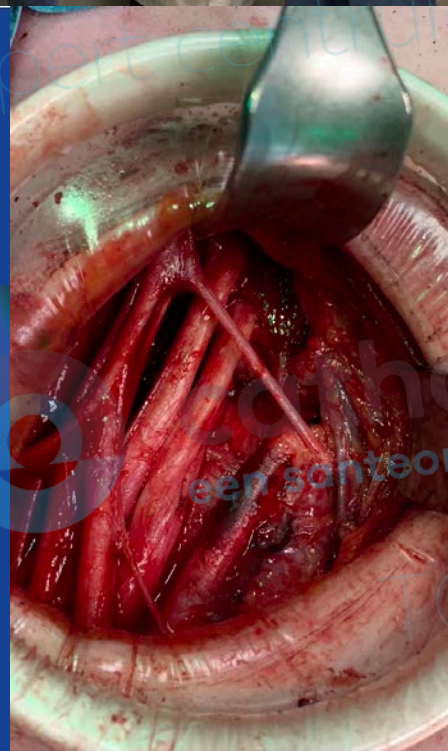
Surgical Techniques: Operative Decompression Using the Supraclavicular Approach for Neurogenic Thoracic Outlet Syndrome

Robert W. Thompson and J. Westley Ohman

Point/Counterpoint: Supraclavicular Decompression Is the Best Approach for Neurogenic Thoracic Outlet Syndrome

Francis J. Caputo and Robert W. Thompson



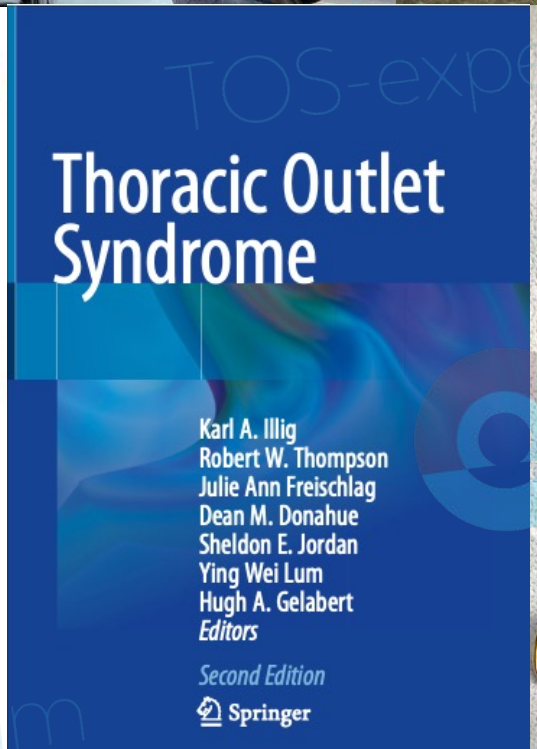


JOHNS HOPKINS
UNIVERSITY

Harbor-UCLA
MEDICAL CENTER

Surgical Techniques: Operative Decompression Using the Transaxillary Approach for NTOS

Controversies in NTOS: Transaxillary or Supraclavicular First Rib Resection in NTOS? Arguments Pro and Con the Transaxillary Approach in Favor of Transaxillary First Rib Resection

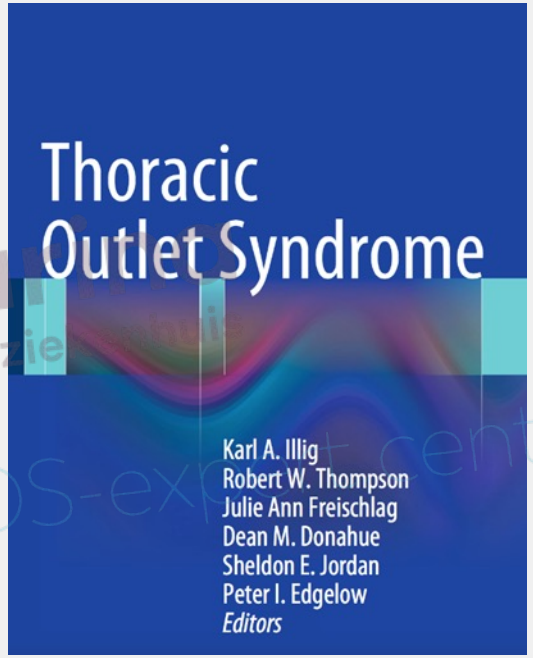


2016

Reporting standards of the Society for Vascular Surgery for thoracic outlet syndrome

Karl A. Illig, MD,[a] Dean Donahue, MD,[b] Audra Duncan, MD,[c] Julie Freischlag, MD,[d] Hugh Gelabert, MD,[e] Kaj Johansen, MD,[f] Sheldon Jordan, MD,[g] Richard Sanders, MD,[h] and Robert Thompson, MD,[i] *Tampa, Fla; Boston, Mass; London, Ontario, Canada; Sacramento and Los Angeles, Calif; Seattle, Wash; Aurora, Colo; and St. Louis, Mo*

" to produce consistency in diagnosis, description of treatment and assesment of results to allow for more valuable data to be reported "



2013

Reporting standards of the Society for Vascular Surgery for thoracic outlet syndrome.Illig KA, Donahue D, Duncan A, Freischlag J, Gelabert H, Johansen K, Jordan S, Sanders R, Thompson R.J Vasc Surg. 2016 Sep;64(3):e23-35. doi: 10.1016/j.jvs.2016.04.039.PMID: 27565607 **Free article.** Review.

PubMed.gov

Multidisciplinair probleem

Intake, coördinatie zorgpad: VS / PA

- 2x Neuroloog
- 3x Fysiotherapeut
- 2x Vaat/TOS-chirurg

Aanvullende diagnostiek

- Proefblokkade: 5 anesthesisten pijnpoli
- Orthopeed
- Radiologen
- Vaatlab.
- KNF

- 2,5 dagdelen poli per week
- 1x per week MDO

Miscellaneous

Eur J Vasc Endovasc Surg (2021) 61, 1017–1024

Feasibility and Outcomes of a Multidisciplinary Care Pathway for Neurogenic Thoracic Outlet Syndrome: A Prospective Observational Cohort Study

Niels Presser [a,f], Jens Goeteyn [a,f], Lieke van der Sanden [a], Saskia Houterman [b], Nens van Alfen [c], Marc R.H.M. van Sambeek [a,d], Bart F.L. van Nuenen [e], Joep A.W. Teijink [a,f,*]

[a] Department of Vascular Surgery, Catharina Hospital, Eindhoven, the Netherlands
[b] Department of Education and Research, Catharina Hospital, the Netherlands
[c] Department of Neurology, Donders Institute for Brain, Cognition and Behaviour, Radboudumc, Nijmegen, the Netherlands
[d] Department of Biomedical Technology, University of Technology Eindhoven, Eindhoven, the Netherlands
[e] Department of Neurology, Catharina Hospital, Eindhoven, the Netherlands
[f] CAPHRI School for Public Health and Primary Care, Faculty of Health, Medicine and Life Sciences, Maastricht University, the Netherlands

WHAT THIS PAPER ADDS

This is the first single centre prospective cohort study to describe the implementation of a multidisciplinary diagnostic care pathway for patients with neurogenic thoracic outlet syndrome (NTOS), and evaluates diagnostic and treatment outcomes of patients with NTOS within the scope of the North American Society for Vascular Surgery reporting standards for NTOS. The results suggest a prominent role for multidisciplinary care pathways in NTOS diagnostics, underline the role of dedicated physiotherapy as the primary treatment, and show good to excellent short term treatment outcomes in the majority of the surgically treated NTOS patients following previous unsuccessful physiotherapy. The objective outcome measures of surgically treated patients allow for reliable comparison with future cohort studies.

Eur J Vasc Endovasc Surg (2021) 61, 1025

EJVES Open Access

INVITED COMMENTARY

A Multidisciplinary Approach to Neurogenic Thoracic Outlet Syndrome: Sinking Deeper or Stepping Out of a Chaotic Quagmire Onto Terra Firma?

Prem C. Gupta *, Gnaneswar Atturu

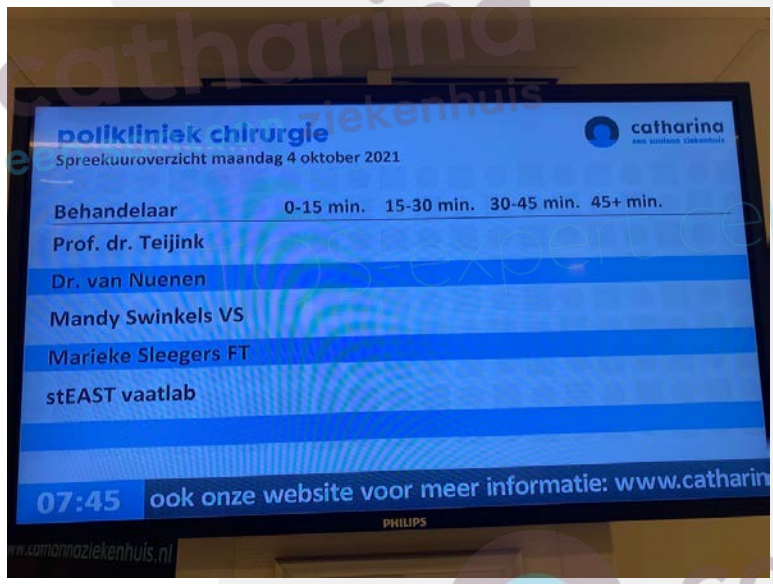
Department of Vascular & Endovascular Surgery, Care Hospitals, Hyderabad, India

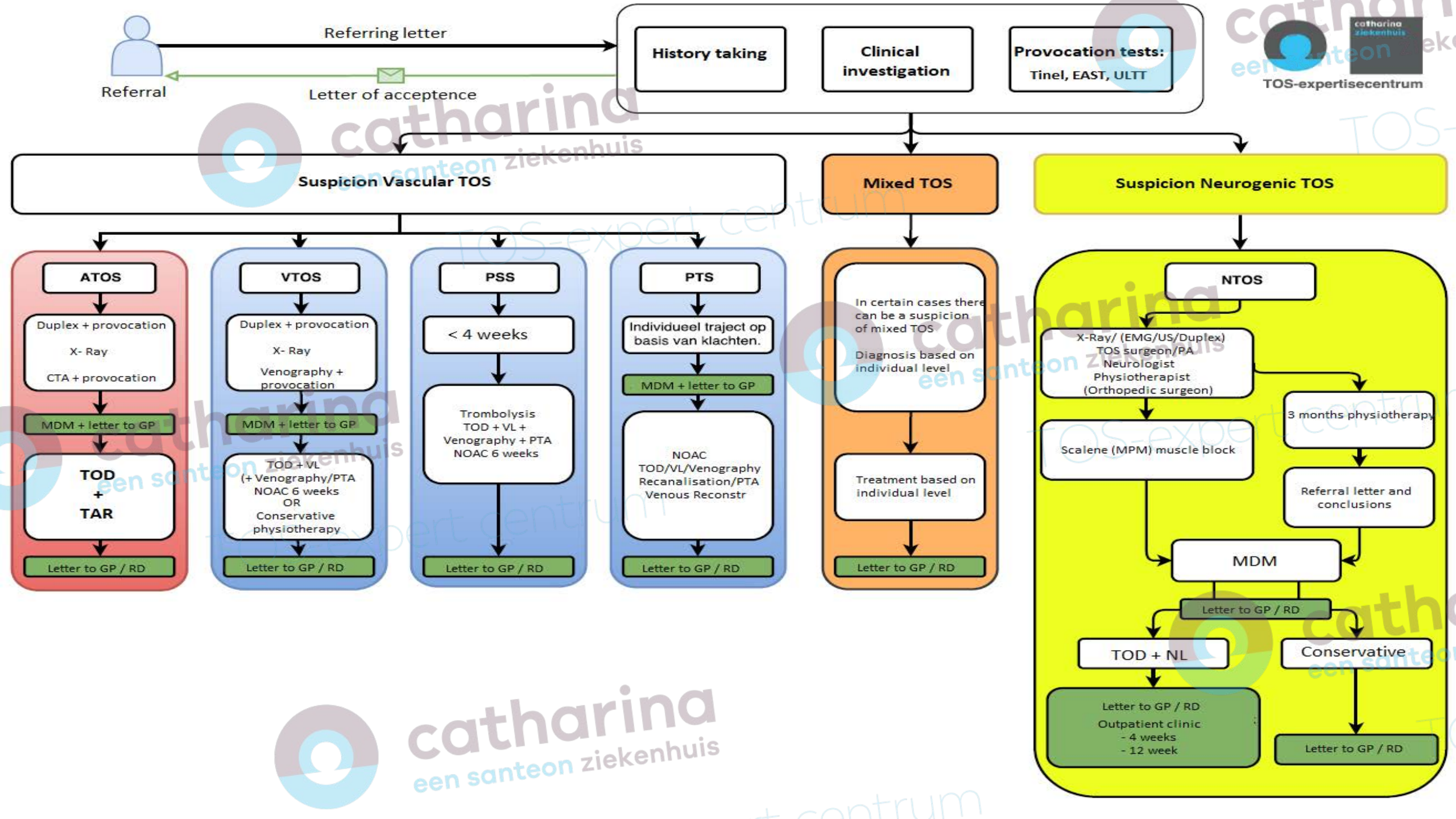
Niels Presser *et al.*[1] must be complimented for analysing outcomes of neurogenic thoracic outlet syndrome (NTOS) using a multidisciplinary approach for diagnosis and offering the appropriate therapy to patients. One of the challenges

the present series had a satisfactory result from supervised physiotherapy alone and this could have been a larger number had the study not been at a tertiary referral centre. While the authors have rightly focused on standardised

Multidisciplinair leren van elkaar

Multidisciplinair probleem




Referring letter
Referral
Letter of acceptence
History taking
Clinical investigation
Provocation tests:
Tinel, EAST, ULTT
TOS-expertisecentrum
Suspicion Vascular TOS
Mixed TOS
Suspicion Neurogenic TOS
ATOS
Duplex + provocation
X- Ray
CTA + provocation
MDM + letter to GP
TOD + TAR
Letter to GP / RD
VTOS
Duplex + provocation
X- Ray
Venography + provocation
MDM + letter to GP
TOD + VL (+ Venography/PTA NOAC 6 weeks OR Conservative physiotherapy
Letter to GP / RD
PSS
< 4 weeks
Trombolysis TOD + VL + Venography + PTA NOAC 6 weeks
Letter to GP / RD
PTS
Individueel traject op basis van klachten.
MDM + letter to GP
NOAC TOD/VL/Venography Recanalisation/PTA Venous Reconstr
Letter to GP / RD
In certain cases there can be a suspicion of mixed TOS
Diagnosis based on individual level
Treatment based on individual level
Letter to GP / RD
NTOS
X-Ray/ (EMG/US/Duplex)
TOS surgeon/PA
Neurologist
Physiotherapist
(Orthopedic surgeon)
Scalene (MPM) muscle block
3 months physiotherapy
Referral letter and conclusions
MDM
Letter to GP / RD
TOD + NL
Conservative
Letter to GP / RD
Outpatient clinic
- 4 weeks
- 12 week
Letter to GP / RD

Ontstaan – groei TOS centrum CZE

Patiënten voorlichtingsmateriaal

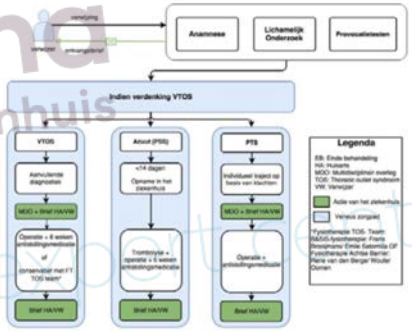
Chirurgie

Thoracic Outlet Syndroom (TOS)

catharina ziekenhuis

Zorgpad Veneus Thoracic Outlet Syndroom

Overzicht van zorgpad TOS dat u doorloopt indien de verdenking VTOS bestaat.



Arterieel Thoracic Outlet Syndroom (ATOS)

Wat is Arterieel Thoracic Outlet Syndroom (ATOS)?

Het Arterieel Thoracic Outlet Syndroom (ATOS) is de arteriële variant van TOS. Hierbij is de slagader (arterie) in de thoracale outlet beklemd of beschadigd geraakt.

Klachten bij ATOS

Klachten die veel voorkomen bij ATOS zijn:

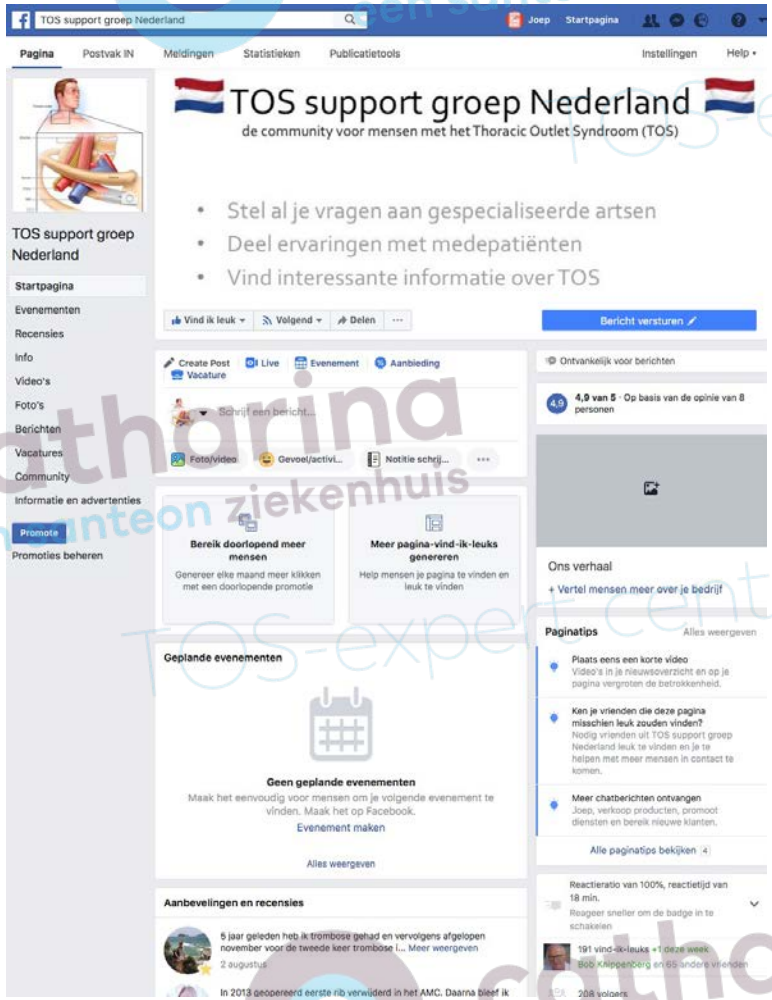
- Een vermoeid en zwaar gevoel in de arm;
- Een koud gevoel in de arm, bleke of gevlekte vingers en/of spierkrampen;
- Verkleuring van de vingertoppen;
- Pijn in de arm en/of hand.

Inhoud

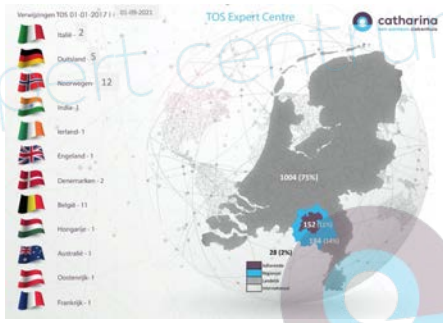
Patiëntenvoorlichting, patienten.voorlichting@catharinaziekenhuis.nl
CH1064 / Thoracic Outlet Syndroom (TOS) / 27-10-2017

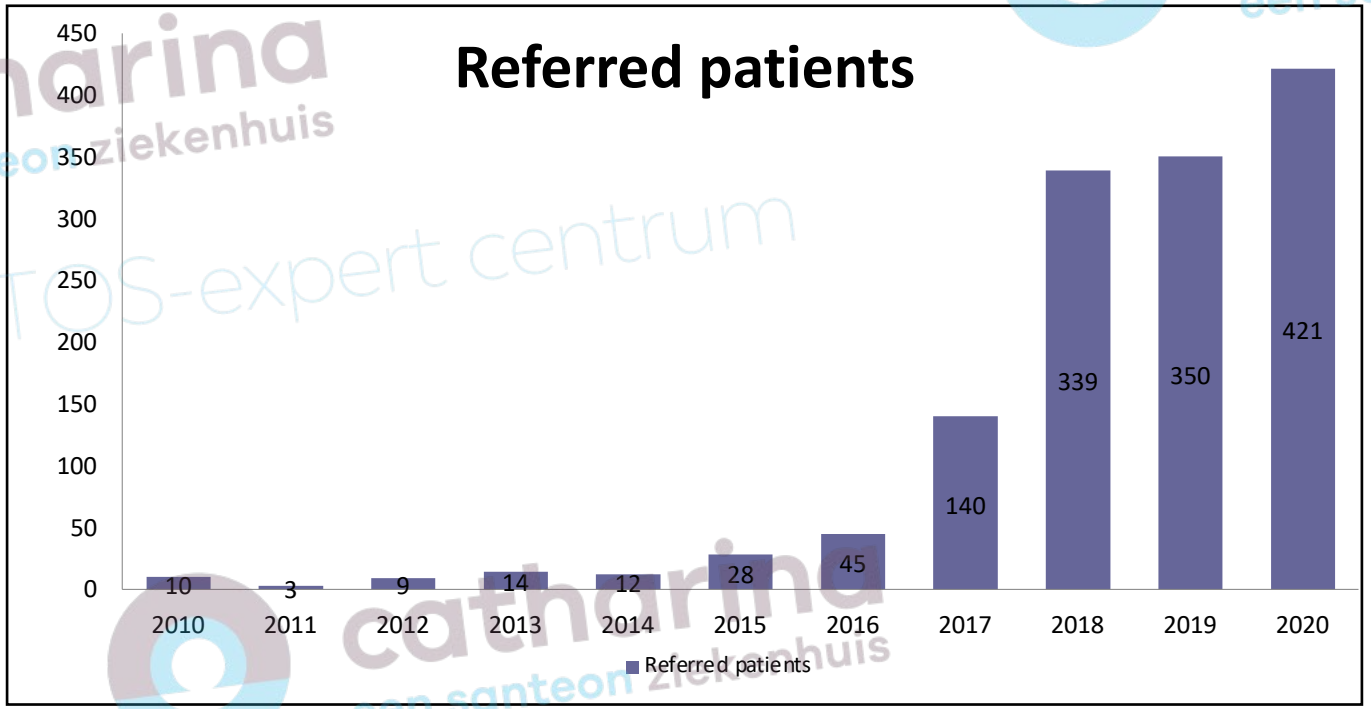
TOS expert center

Ontstaan – groei TOS centrum CZE



Verwijzingen TOS centrum CZE





OP ZOEK NAAR:

3-4 centra Nederland

Opzet cf. CZE TOS centrum

Primaire en redo TODs

Gemeenschappelijke database

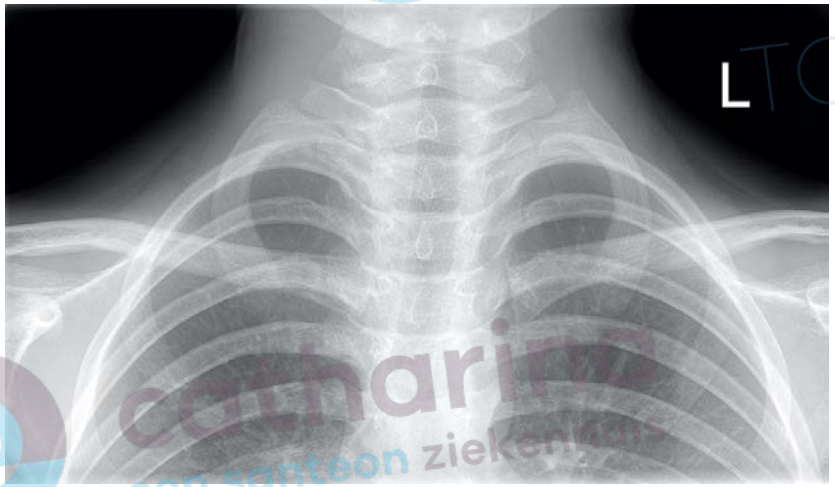
TOS expert center

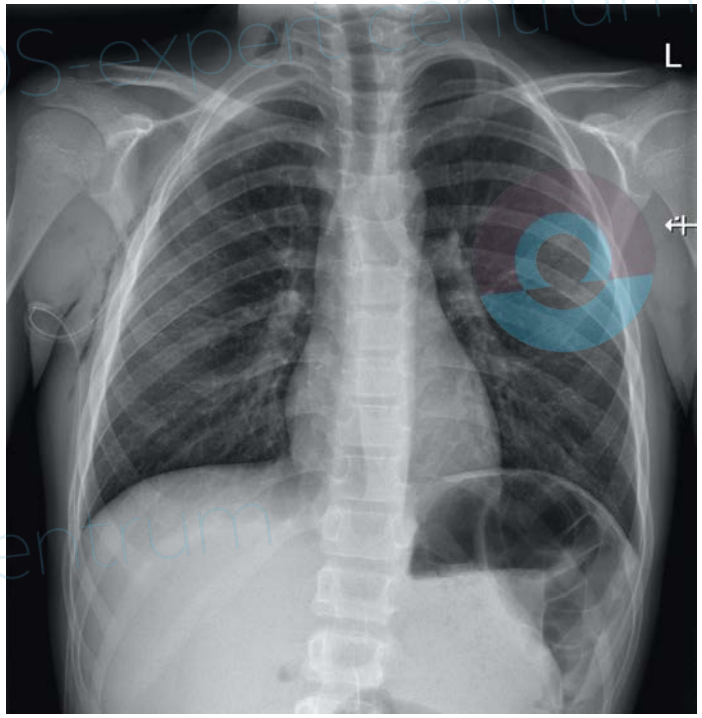
F 16 yrs NTOS R, cervical rib – TOD 2017
18 yrs NTOS L – TOD 2020

July 8 2021

Afgebeeld met toestemming
Jady en moeder

M 11 yrs NTOS R – TOD 2017

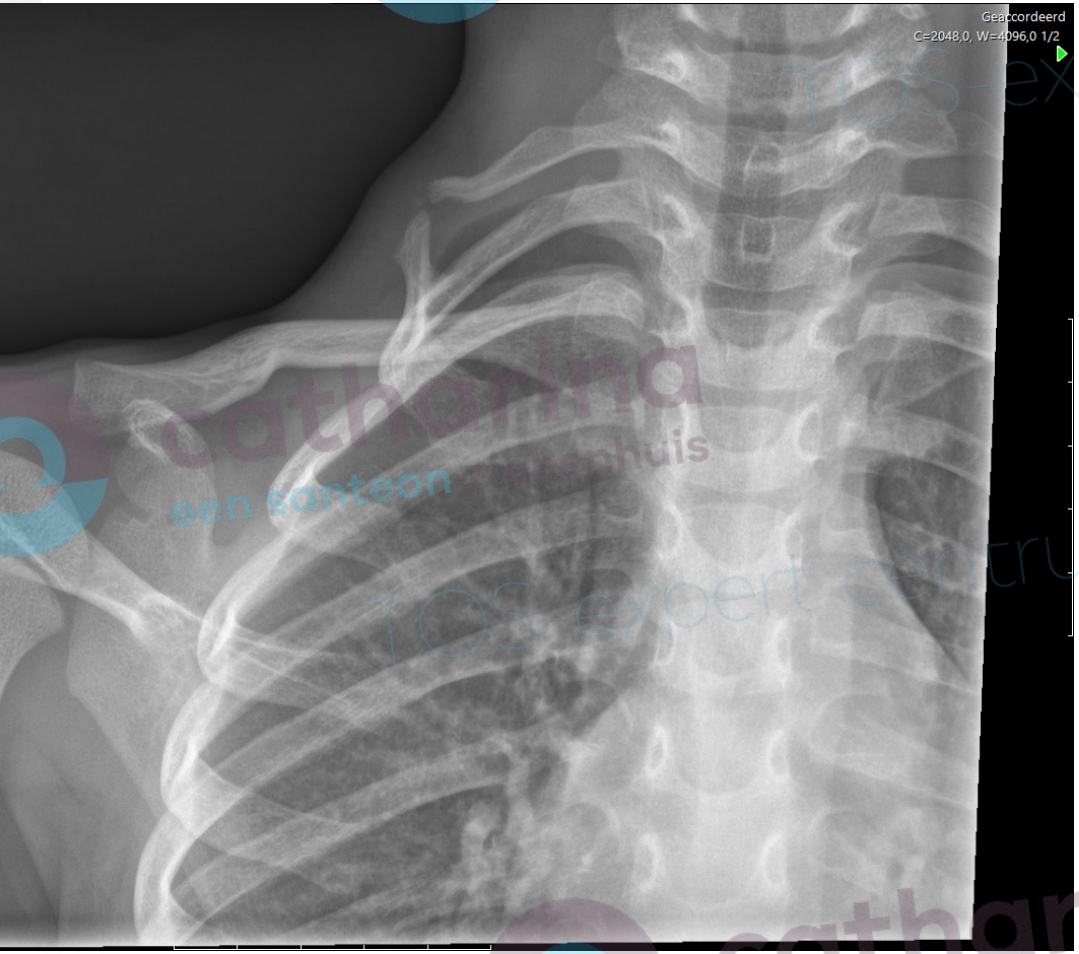


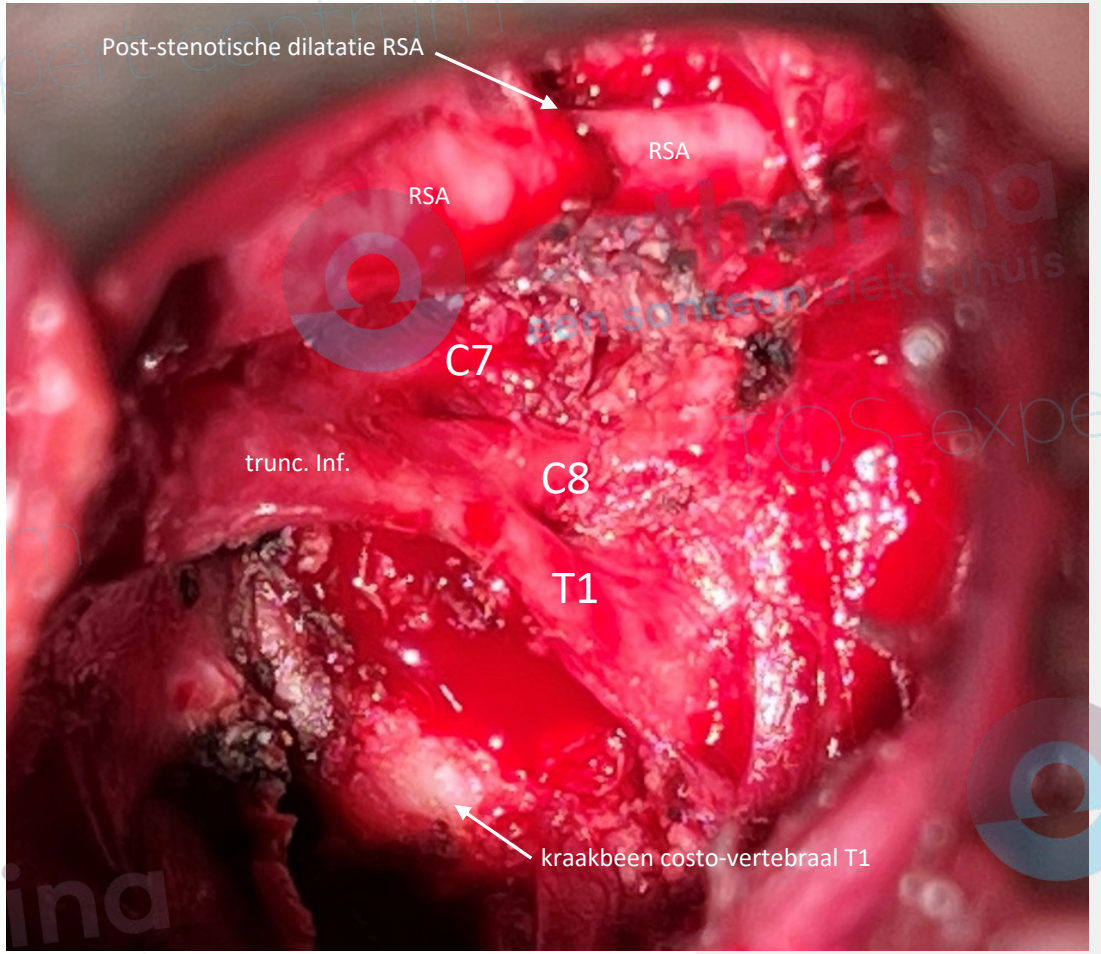


M 15 yrs Free runner

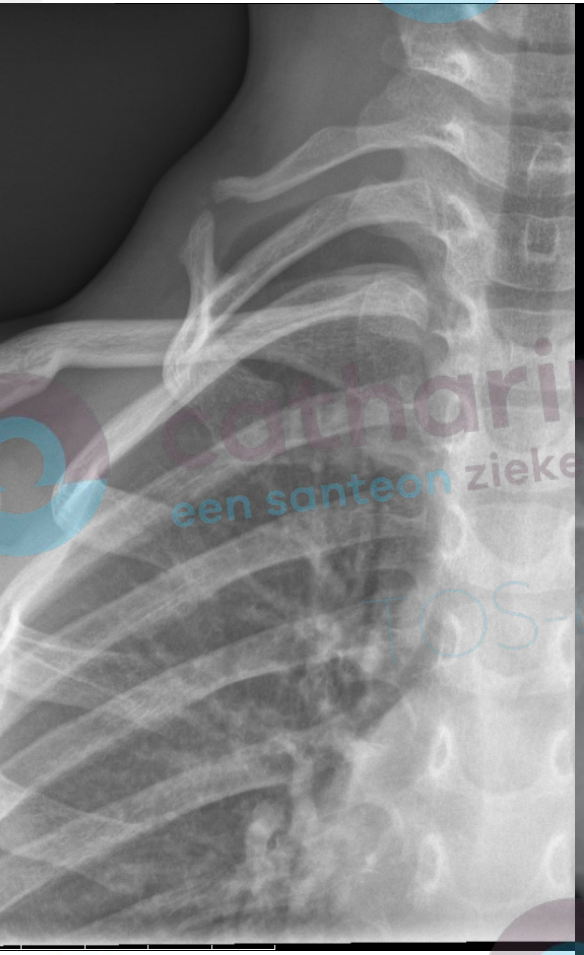
Afgebeeld met toestemming
Lucas en ouders

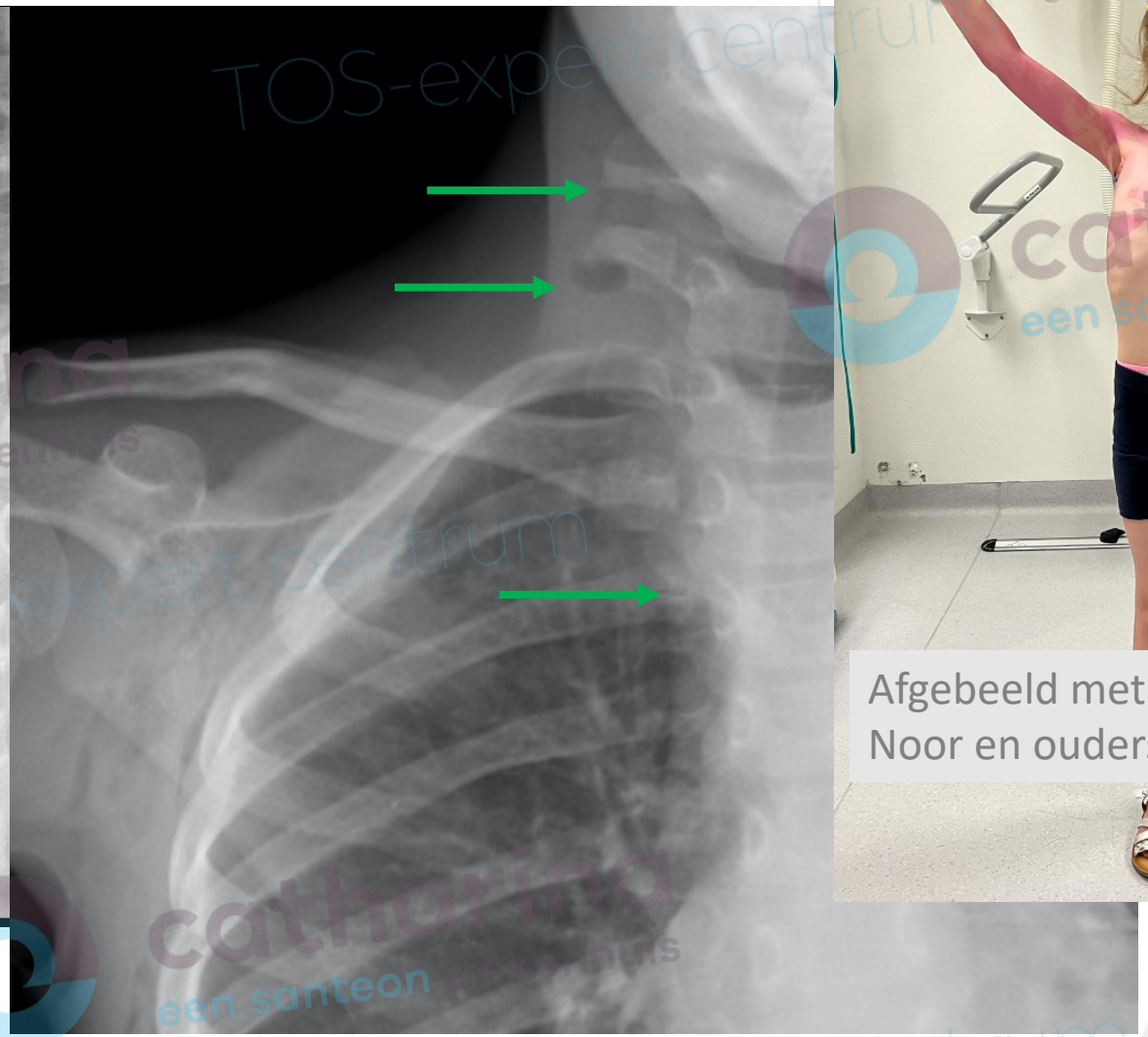
F 5 yrs NTOS R complete cervical rib – TOD 2021





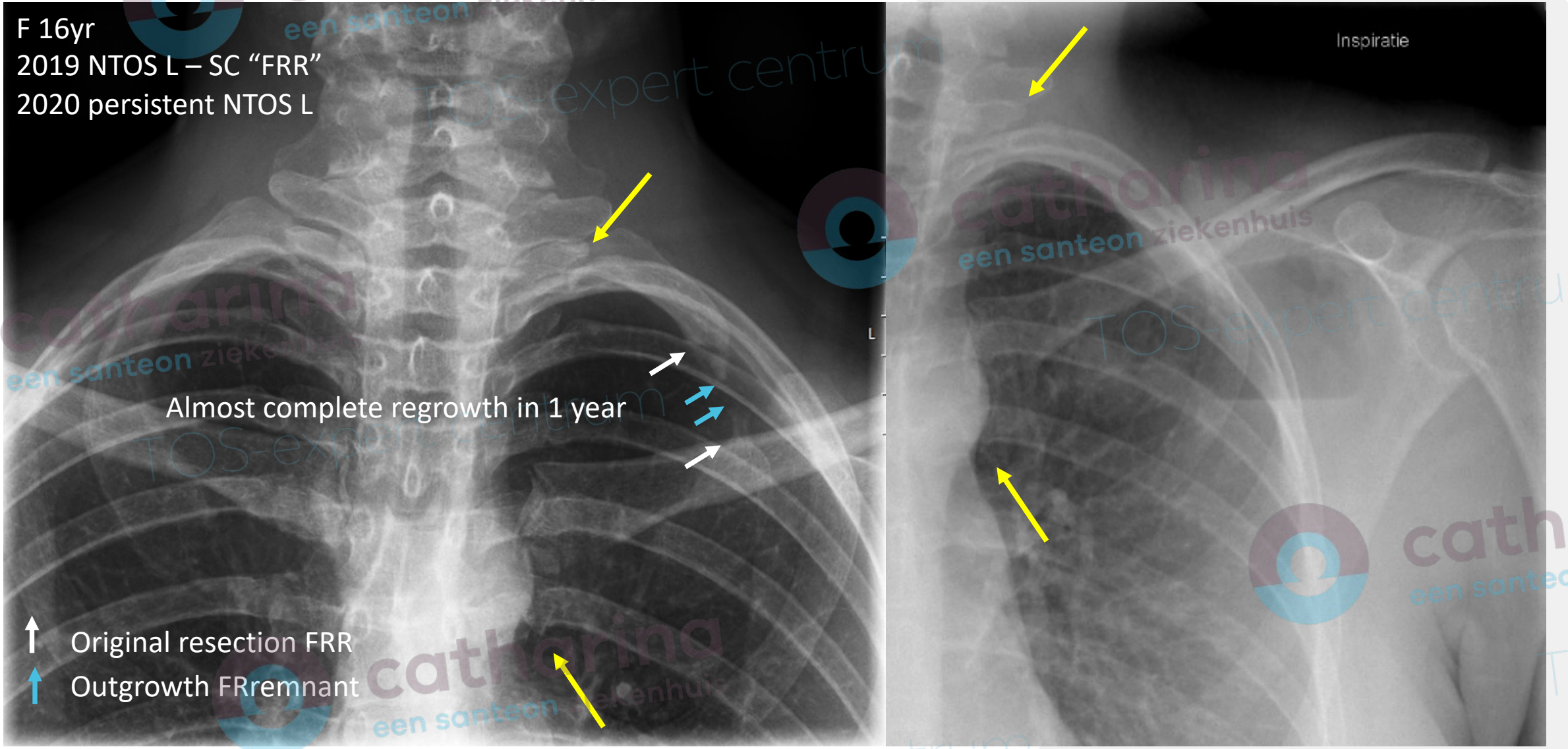
F 5 yrs NTOS R complete cervical rib – TOD 2021



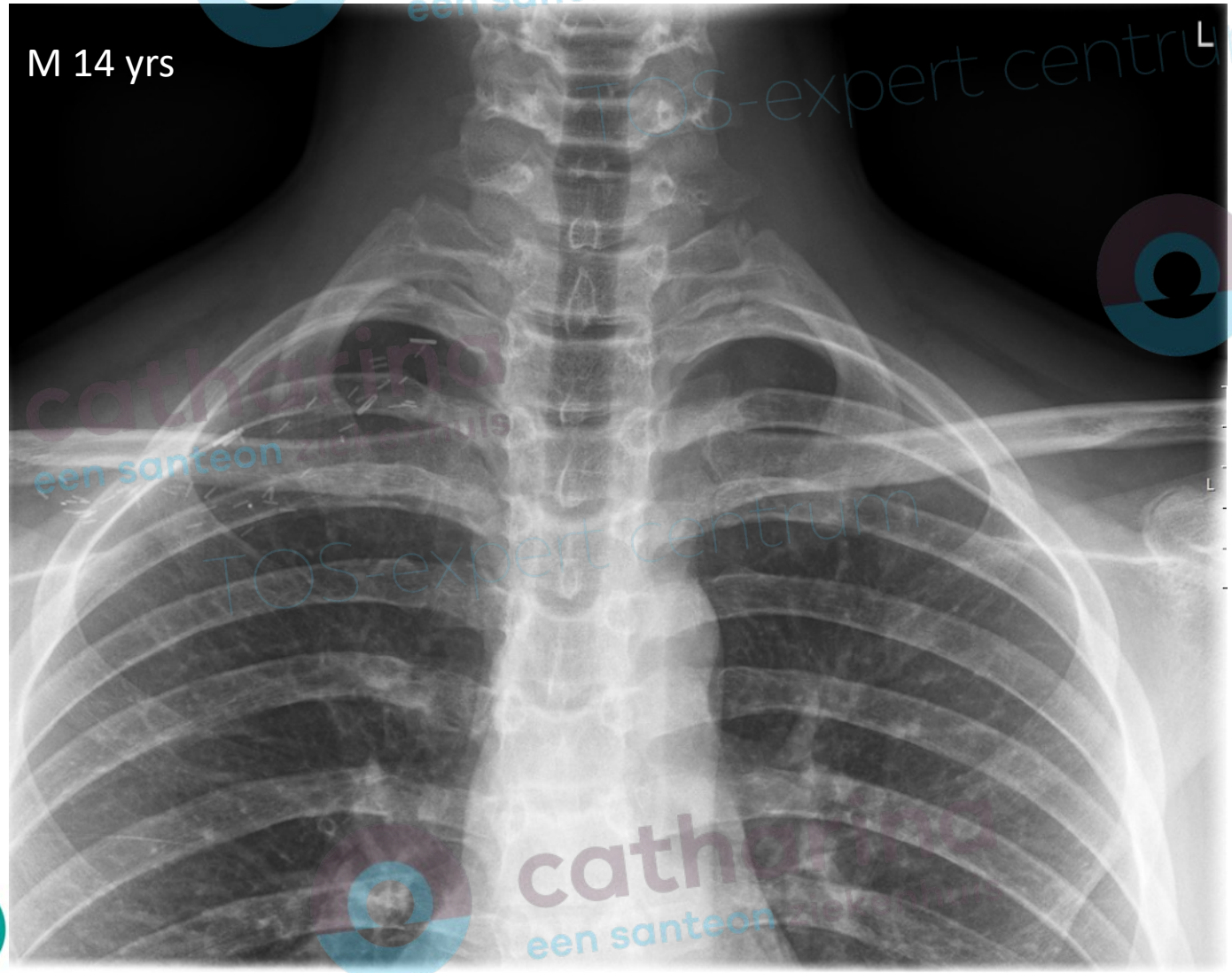


Afgebeeld met toestemming
Noor en ouders

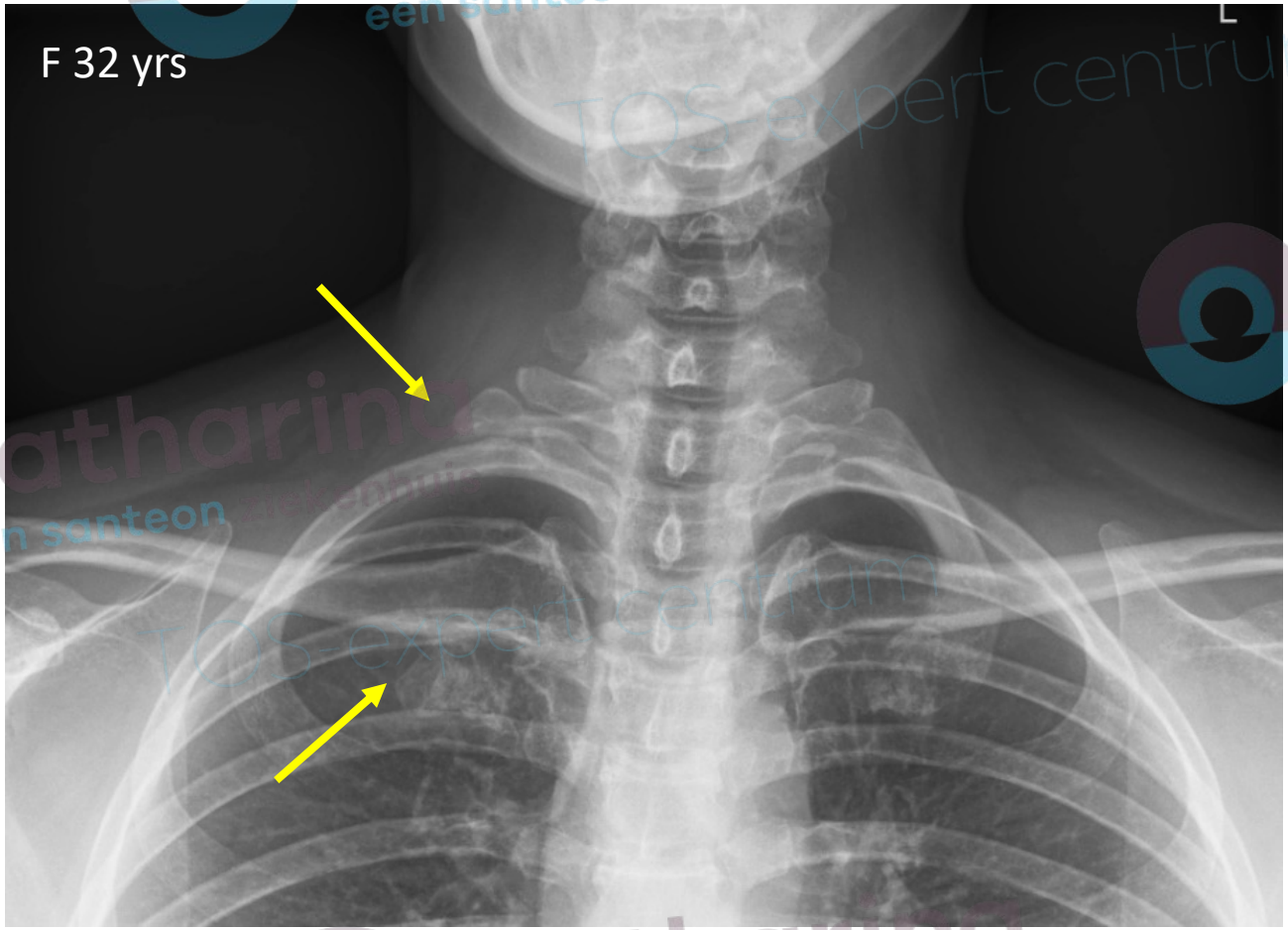
‘Eerste rib resectie’ ?



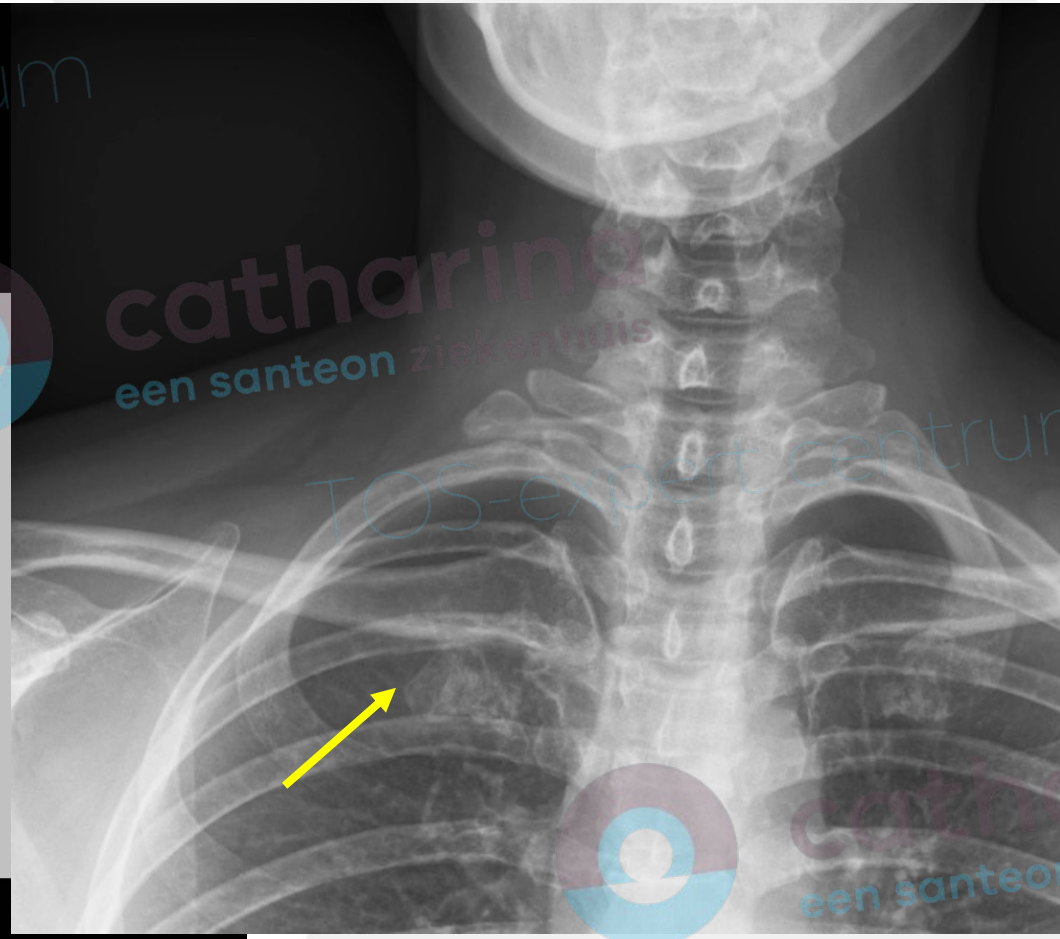
‘ATOS? 6mm interponaat bij 14 jarige jongen



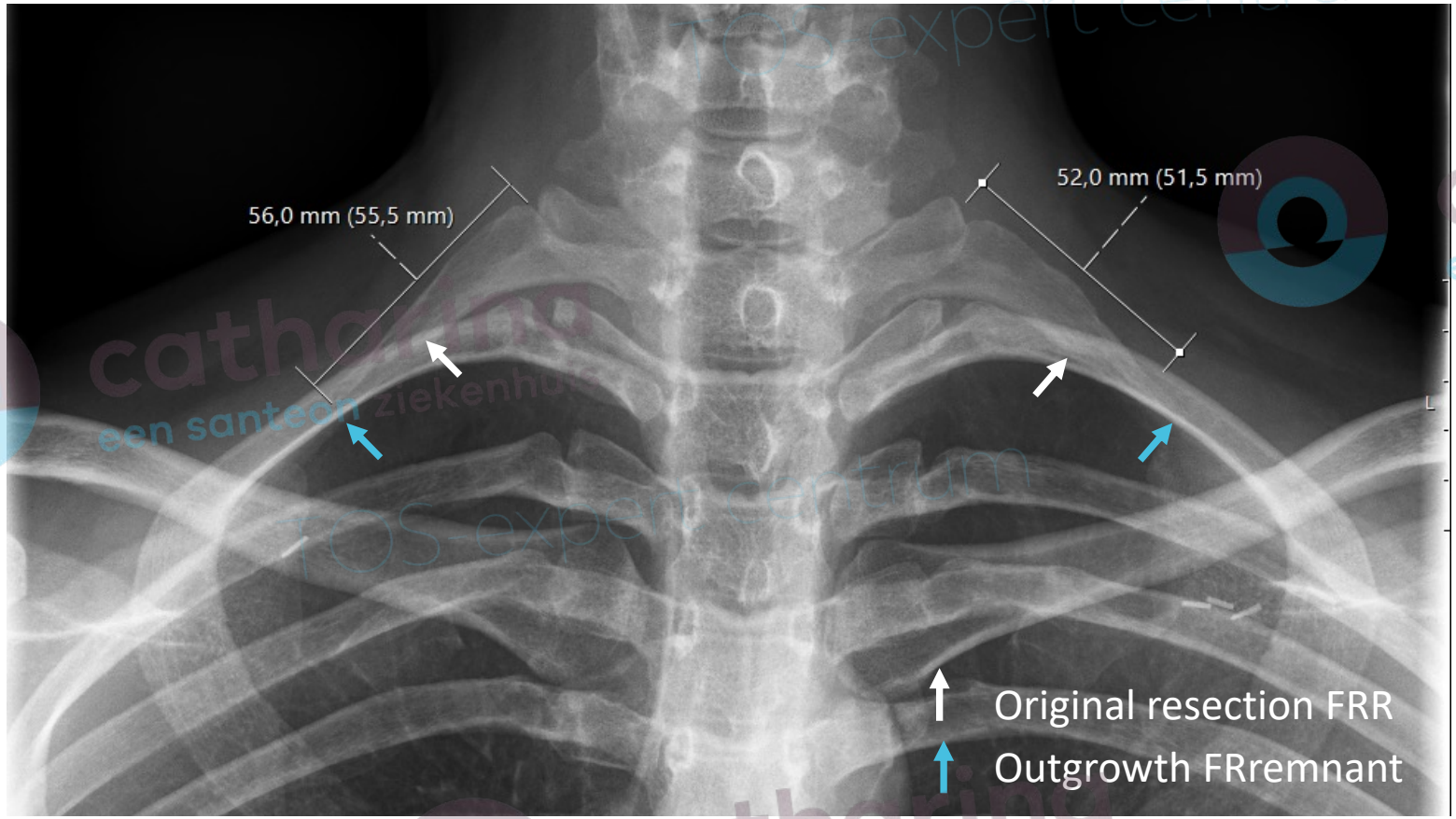
‘Eerste rib resectie voor VTOS’ ? – NTOS gemist



‘Eerste rib resectie voor VTOS’ ? – NTOS gemist



‘Eerste rib resectie’ rol restrib?

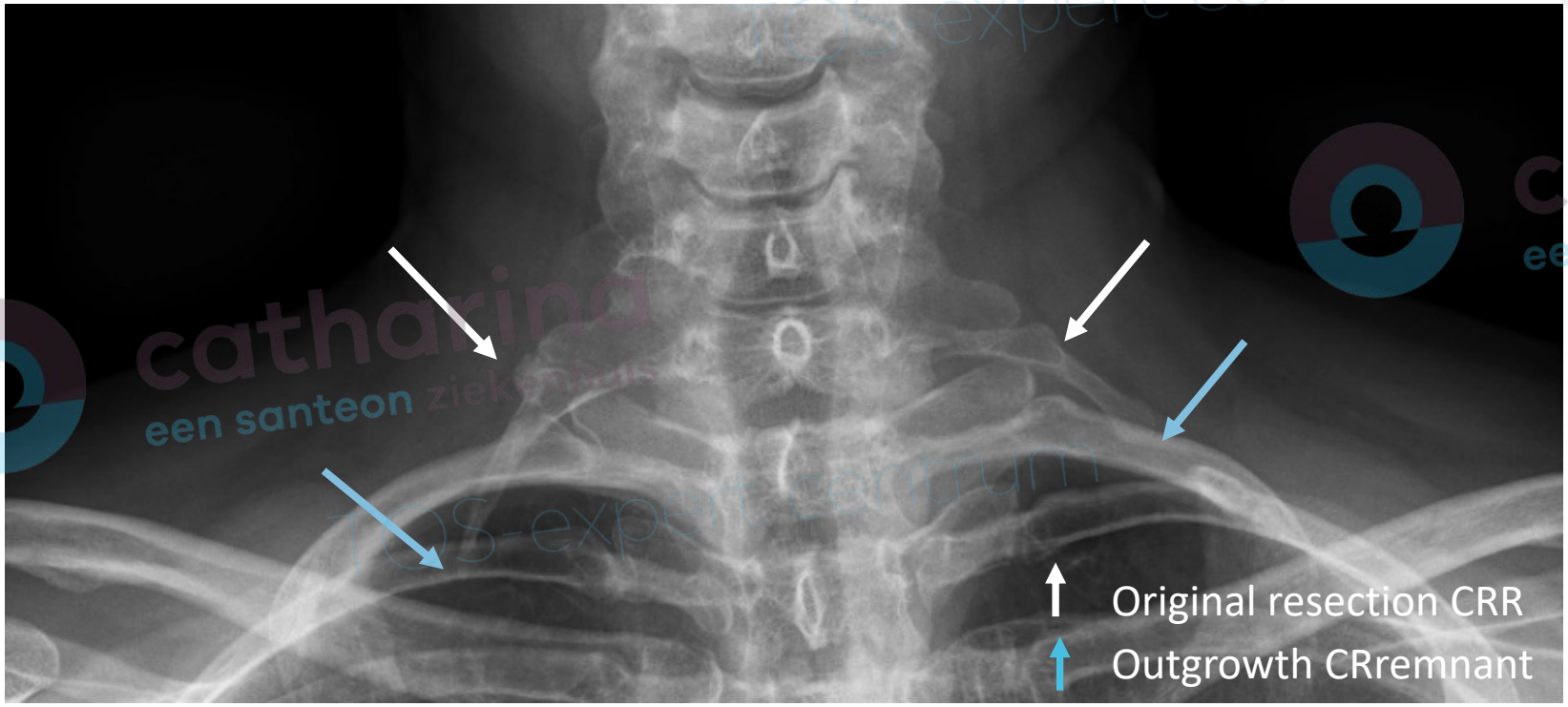


Bilaterale incomplete eerste rib resectie.

Persisterende NTOS R, Li klachtenvrij

‘Halsrib resectie’?

M 46 yrs halsribresectie bdz.(1987) recidief NTOS Li



Laat geen eerste (hals) rib rest achter!

- Complete cervical + FRR (cartilage-cartilage)

True recurrence is usually caused by scar tissue surrounding the brachial plexus or caused by a residual first rib stump (>1 cm) causing further impingement. [92]

Journal of Vascular Surgery

Volume 65, Number 6S

Causes and Treatment of Recurrent Symptoms After First Rib Resection for Thoracic Outlet Syndrome

Kathryn A. Wagstaff, Ralph Davis, Misty D. Humphries, Julie Ann Freischlag. University of California Davis, Davis, Calif

Conclusions: Care must be taken with first rib resection for vTOS cases to ensure complete posterior rib resection to prevent new onset neurogenic symptoms.

of TOS recurrence. Conversely, in our experience on 118 patients who had transaxillary first-rib resection for TOS, a long first-rib posterior stump—shown by routine follow-up chest x-ray films—was responsible for TOS recurrence in 20 of 25 cases (80%) [[2]]. Moreover, in the series reported by Urschel and Razzuk [[3]], a long posterior stump of the first rib was responsible of 1060 of 1221 (87%) TOS recurrences.

LETTER TO THE EDITOR | VOLUME 190, ISSUE 1, P156, JULY 01, 2005

Role of first rib stump length in recurrent neurogenic thoracic outlet syndrome

Andrea Mingoli, M.D. • Paolo Sapienza, M.D. • Luca di Marzo, M.D

DOI: https://doi.org/10.1016/j.amjsurg.2004.11.006

We read with great interest the article by Ambrad-Chalela et al [[1]] in which the investigators reported their experience with recurrent neurogenic thoracic outlet syndrome (TOS). They identified just 1 case (6%) in which an incomplete first-rib resection was responsible for the symptom recurrence and stated that incomplete excision of first rib is an occasional cause of TOS recurrence. Conversely, in our experience on 118 patients who had transaxillary first-rib resection for TOS, a long first-rib posterior stump—shown by routine follow-up chest x-ray films—was responsible for TOS recurrence in 20 of 25 cases (80%) [[2]]. Moreover, in the series reported by Urschel and Razzuk [[3]], a long posterior stump of the first rib was responsible of 1060 of 1221 (87%) TOS recurrences.

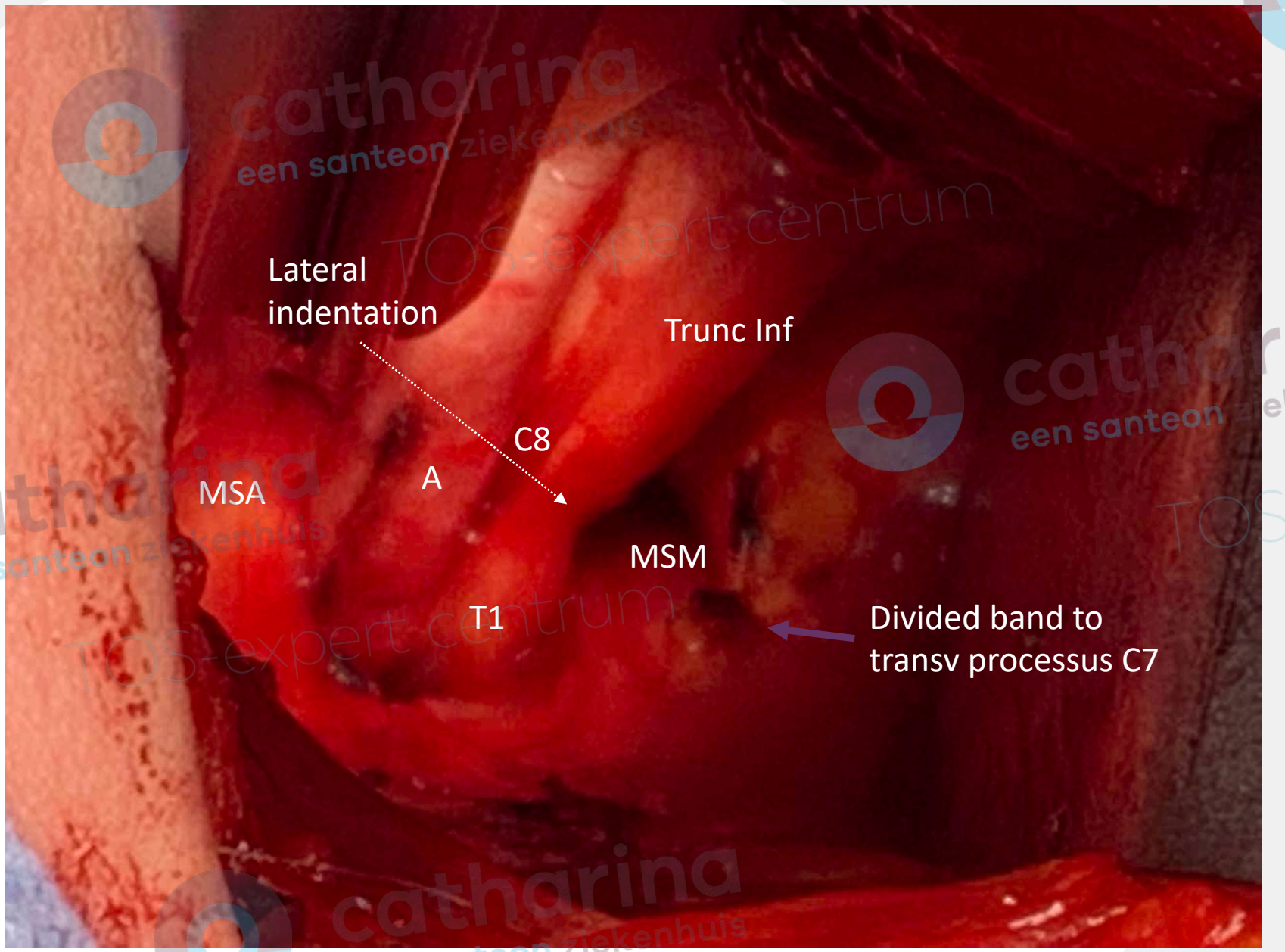
2. Mingoli A. • Feldhaus R.J. • Farina C. • et al.
Long-term outcome after transaxillary approach for thoracic outlet sindrome.
Surgery. 1995; **118**: 840-844

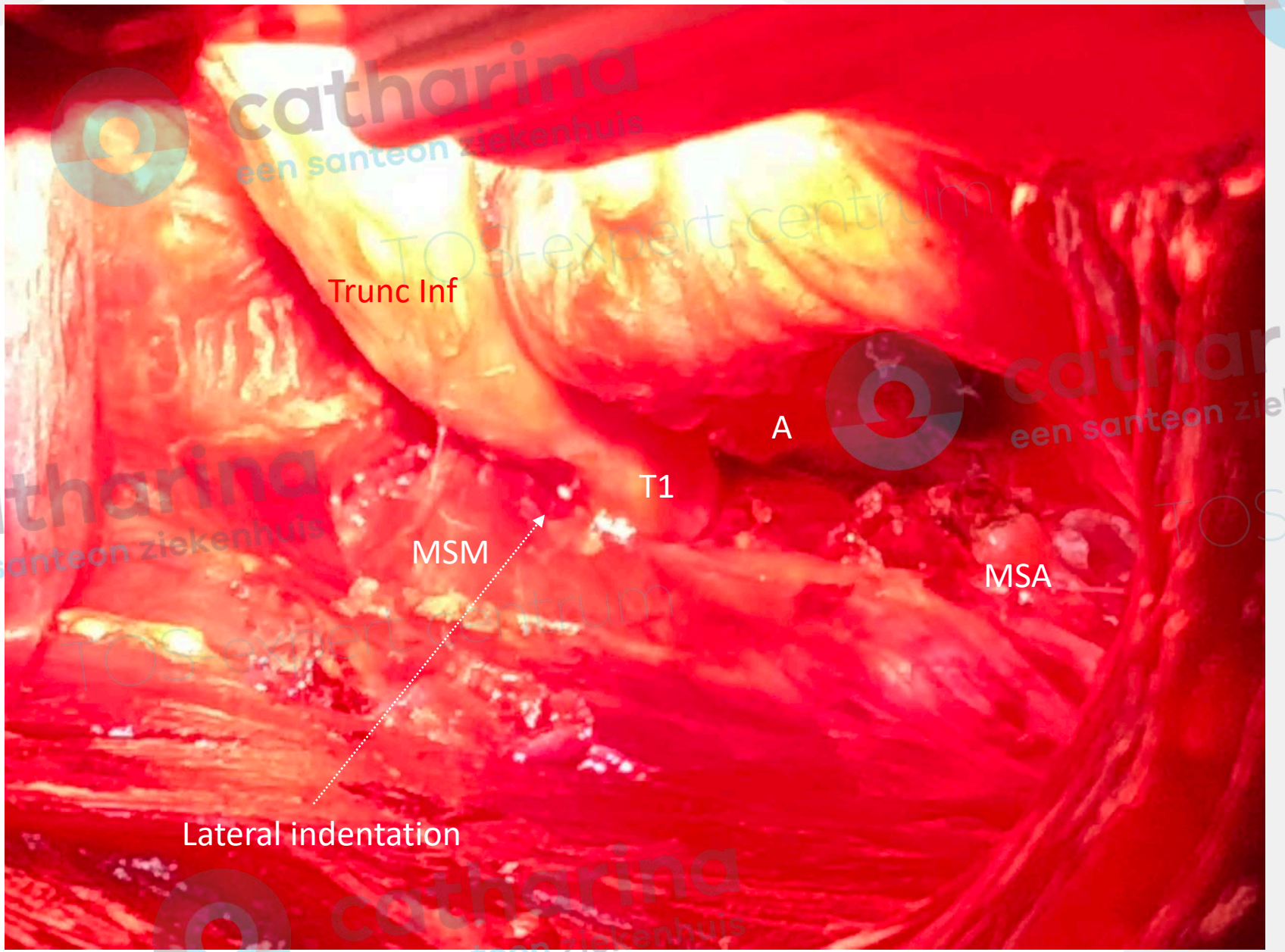
3. Urschel Jr, H.C. • Razzuk M.A.
Neurovascular compression in the thoracic outlet.
Ann Surg. 1998; **228**: 609-617

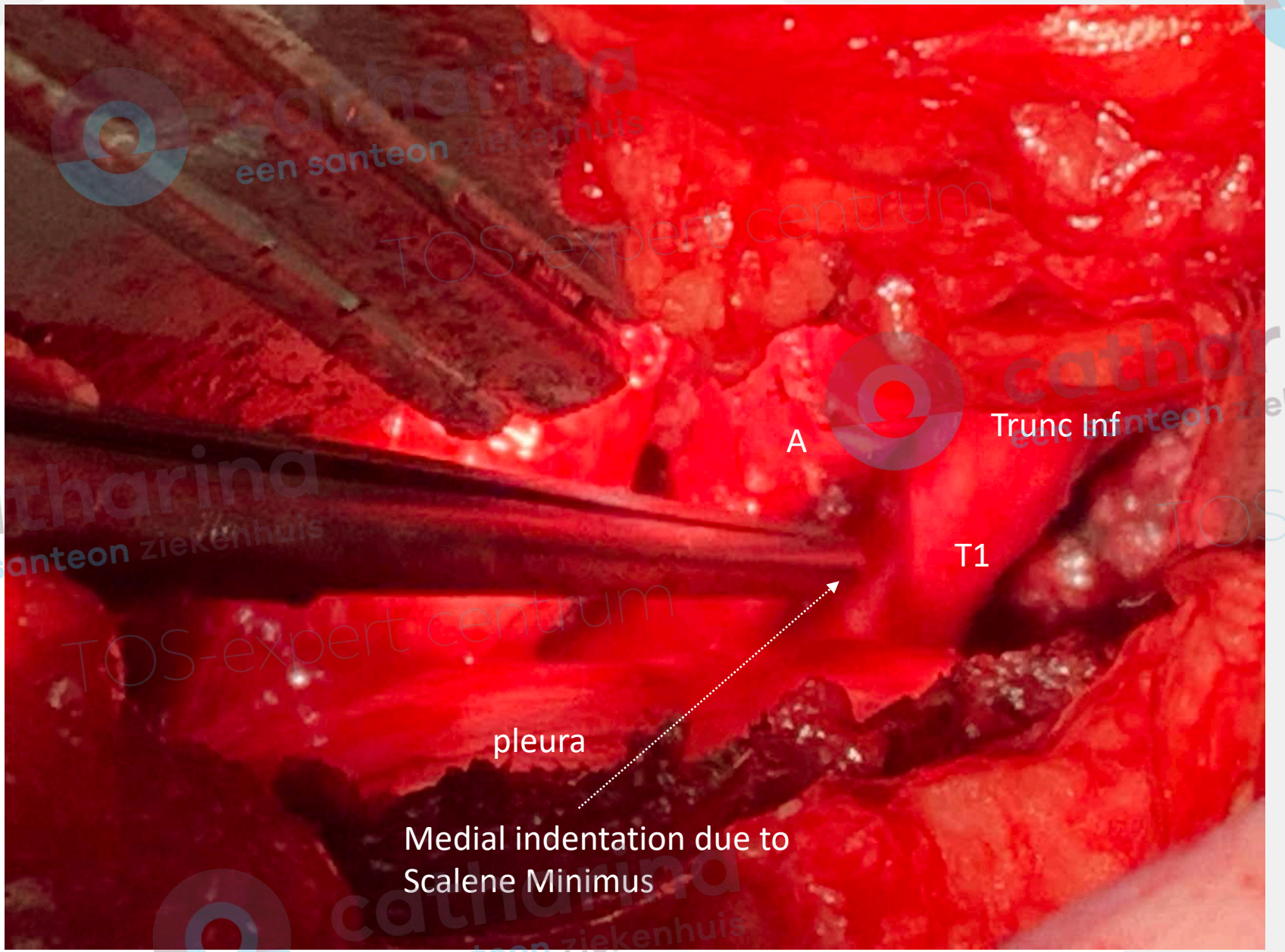
› Ann Vasc Surg. 2014 May;28(4):939-45. doi: 10.1016/j.avsg.2013.12.010. Epub 2014 Jan 21.

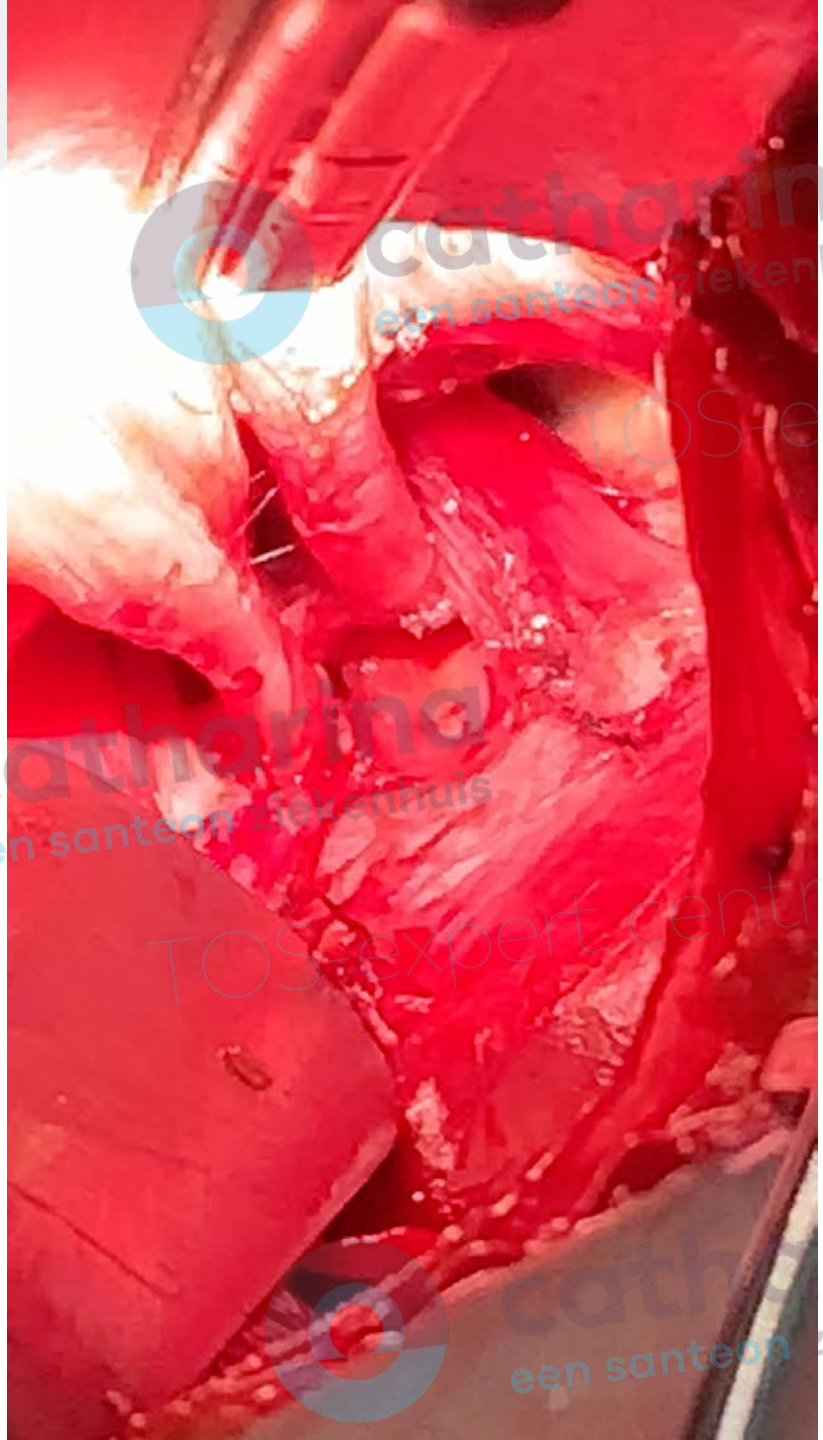
Remaining or residual first ribs are the cause of recurrent thoracic outlet syndrome

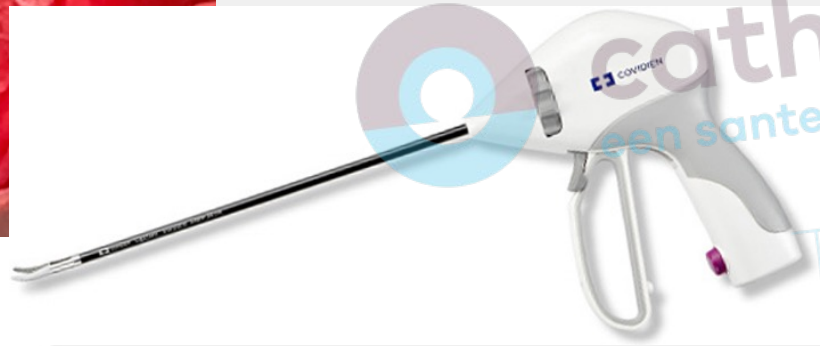
Kendall Likes [1], Thadeus Dapash [2], Danielle H Rochlin [2], Julie A Freischlag [2]


Lateral
indentation
Trunc Inf
C8
A
MSA
MSM
T1
Divided band to
transv processus C7

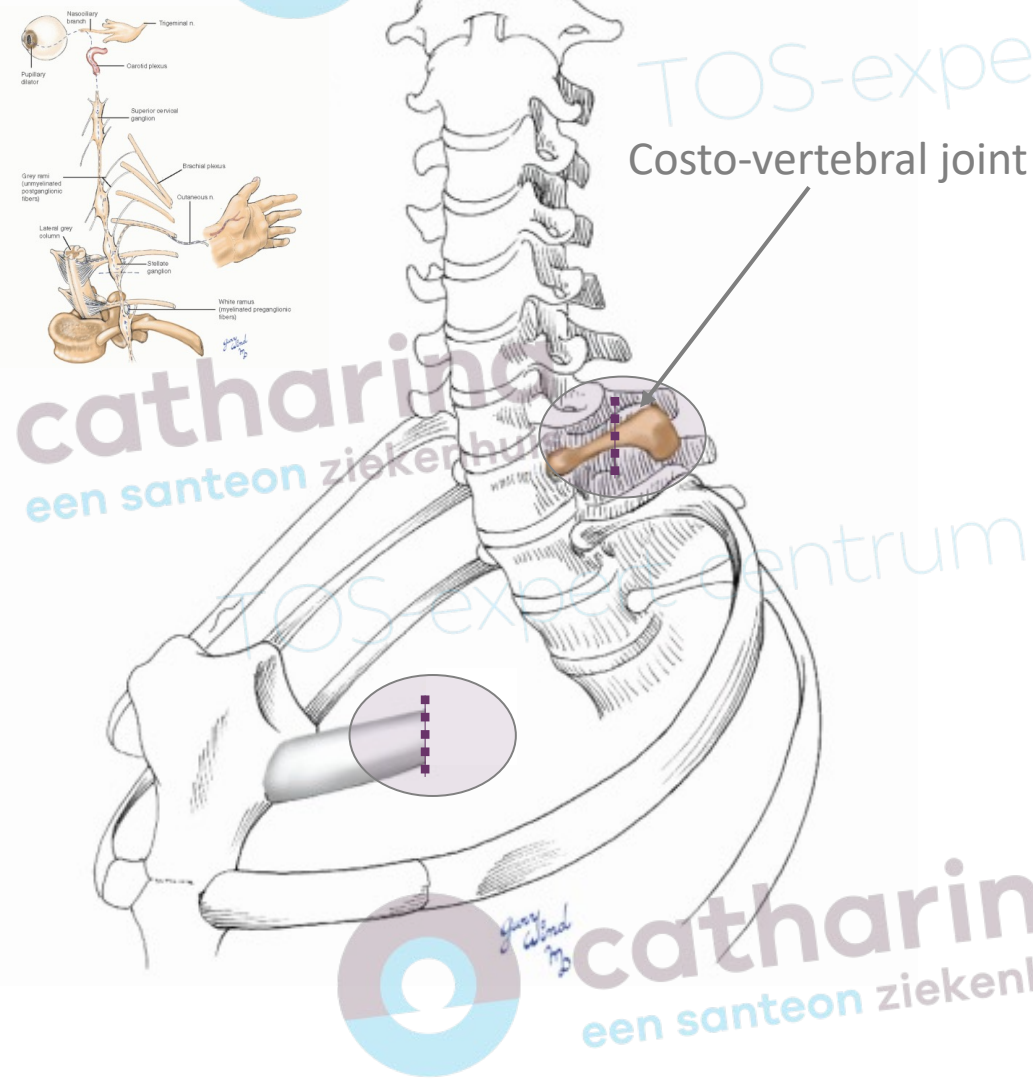

Trunc Inf
A
T1
MSM
MSA
Lateral indentation

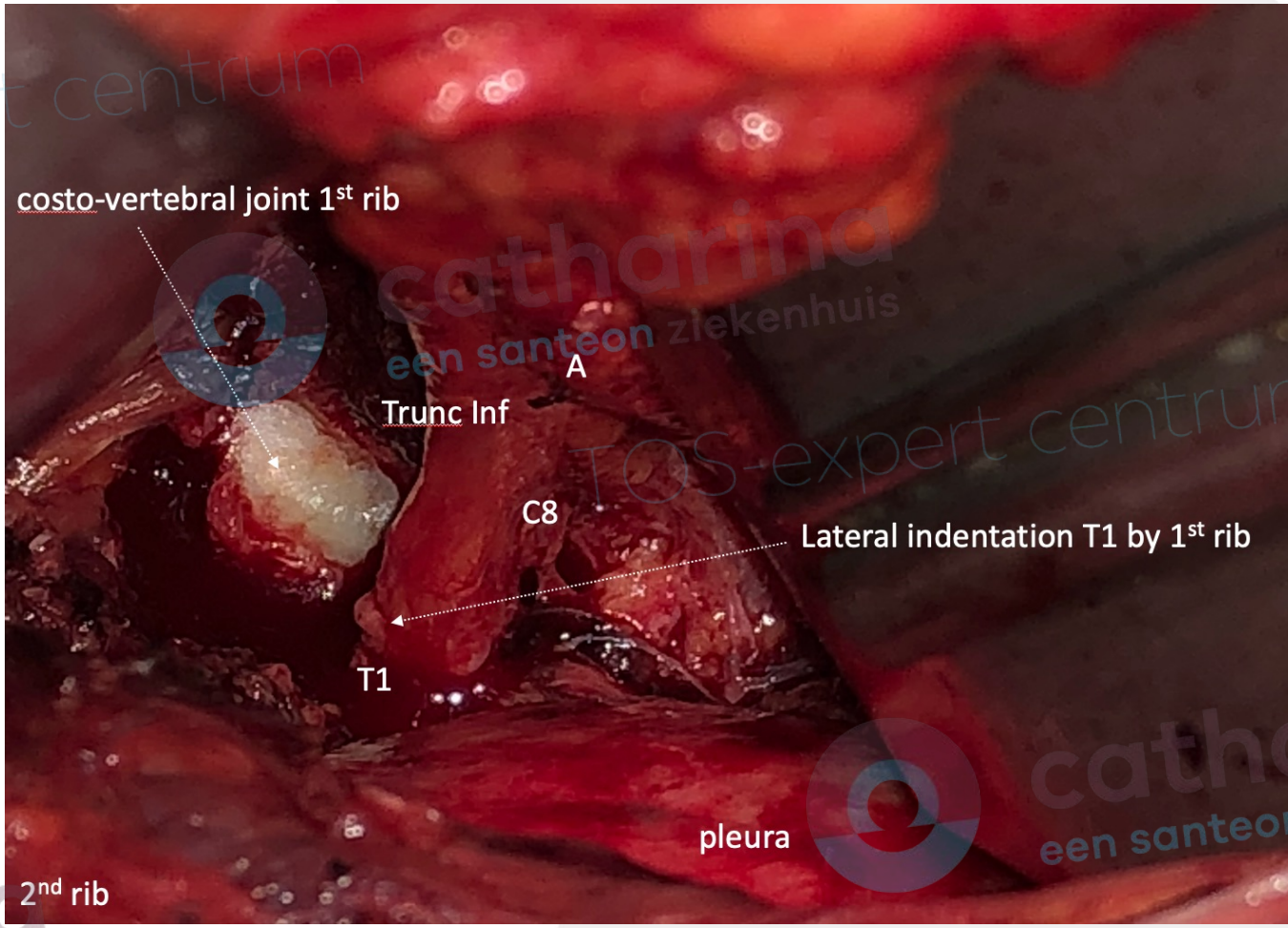

A
Trunc Inf
T1
pleura
Medial indentation due to
Scalene Minimus



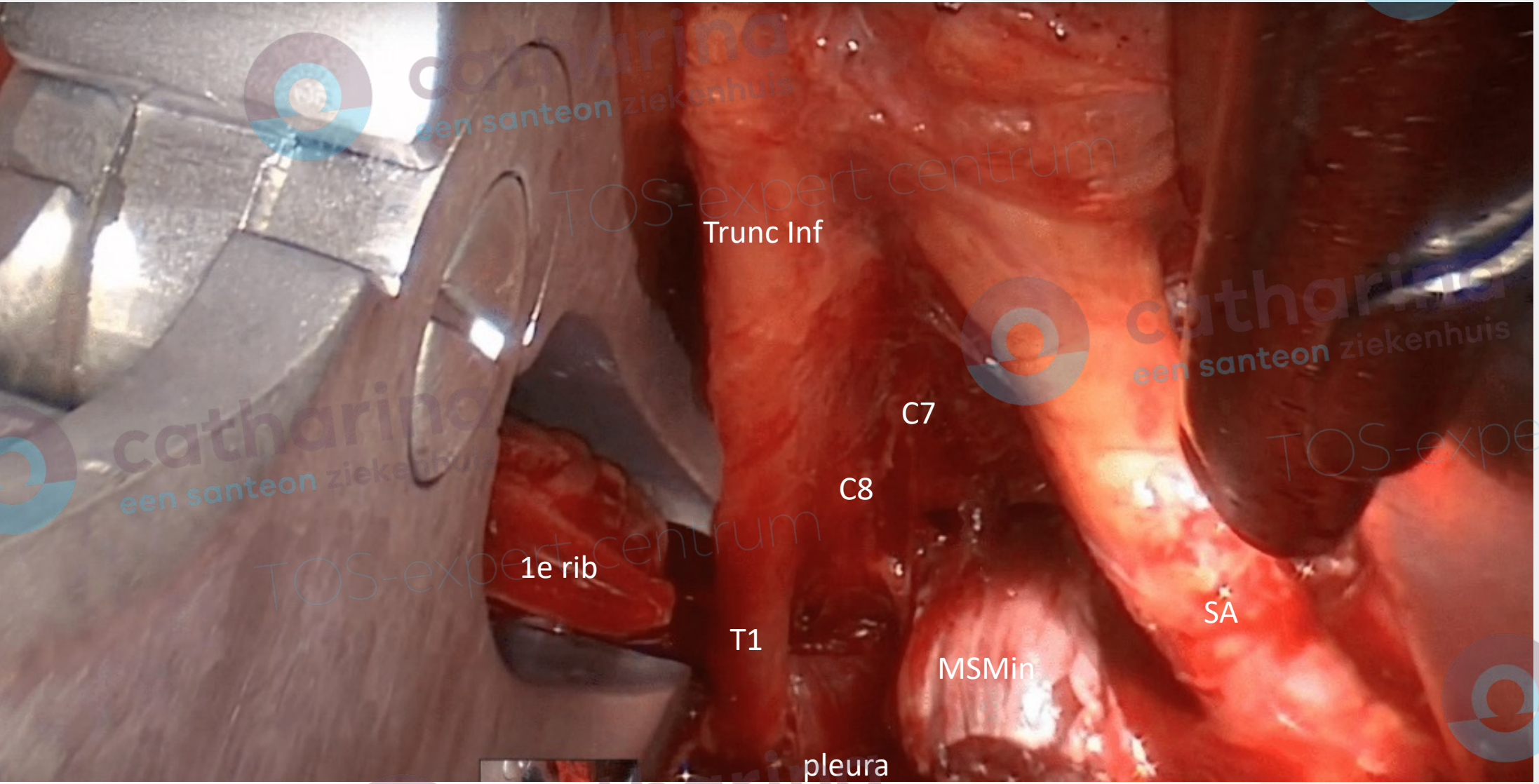


Laat geen eerste rib rest achter!

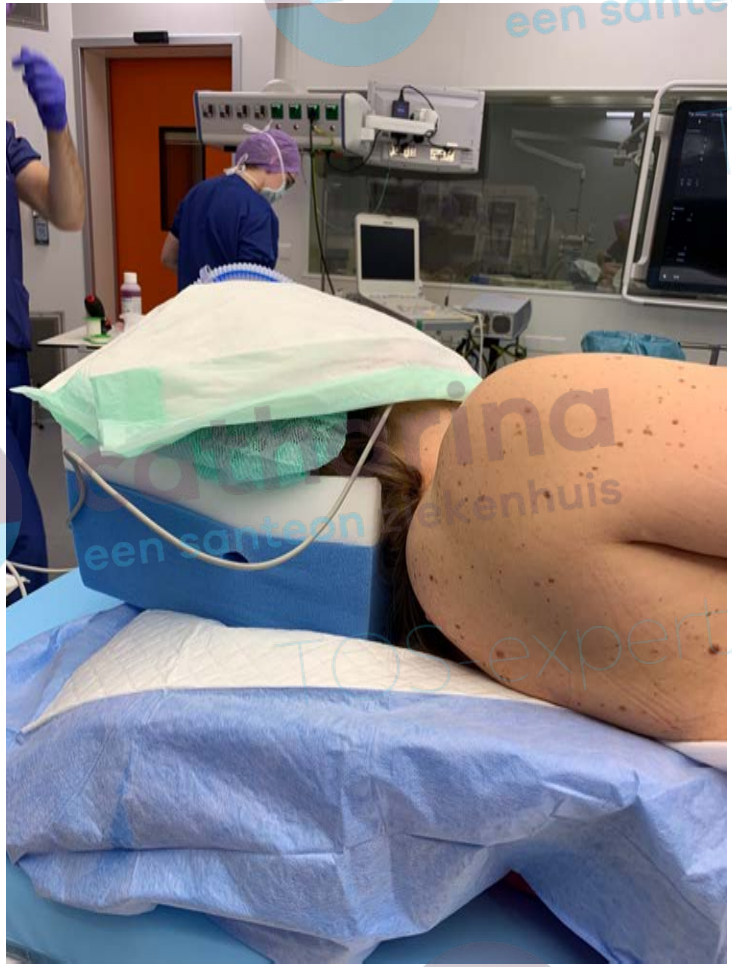


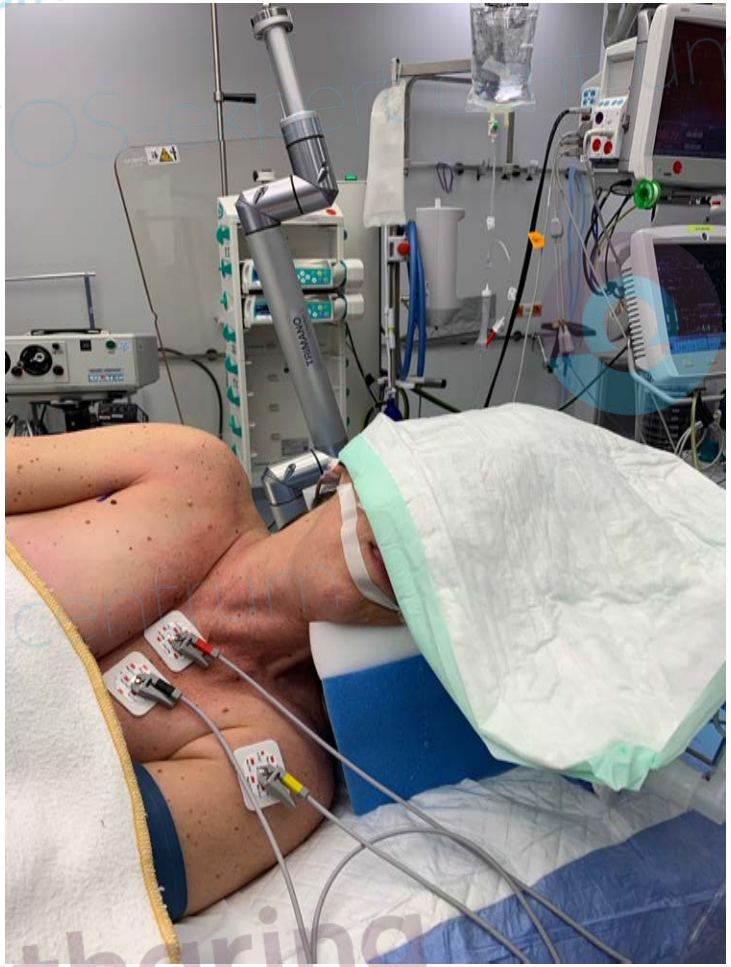


Why NOT???


Trunc Inf
C7
C8
1e rib
T1
SA
MSMin
pleura

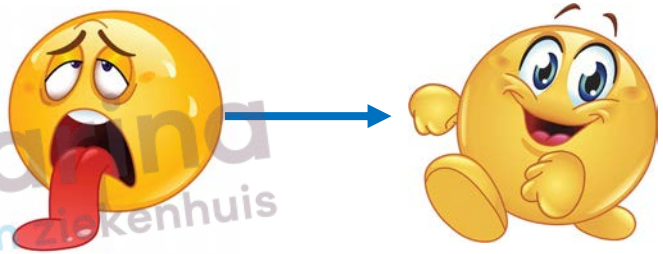
Tips&Trics for a transaxillary TOD



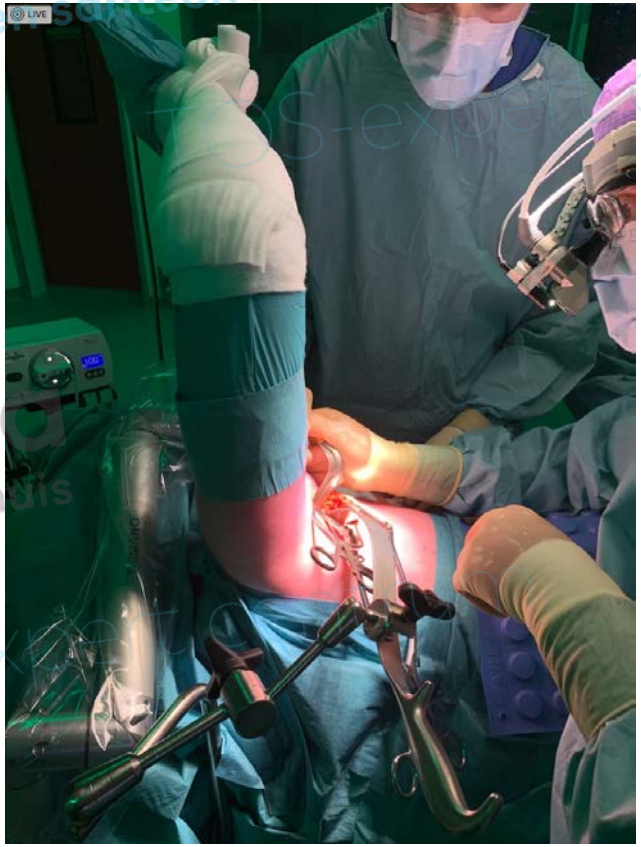


Tips&Trics for a transaxillary TOD

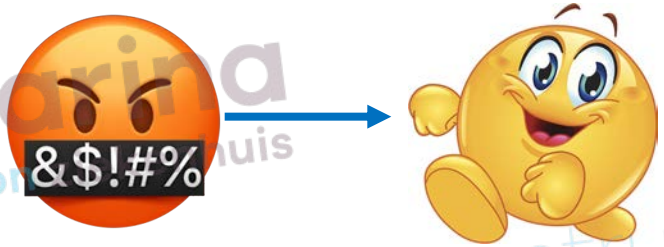
Trimano



Tips&Trics for a transaxillary TOD



Martin’s arm with Pilling/Deaver

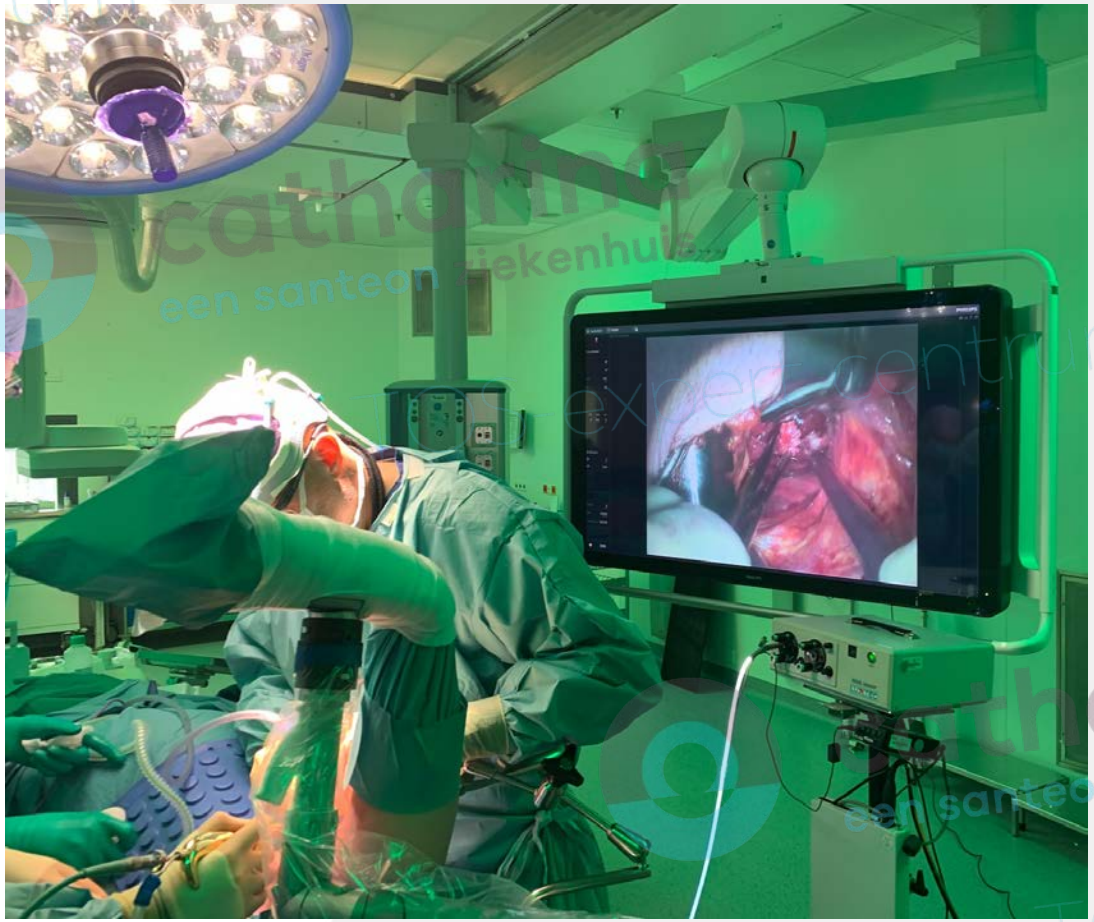


Tips&Trics for a transaxillary TOD

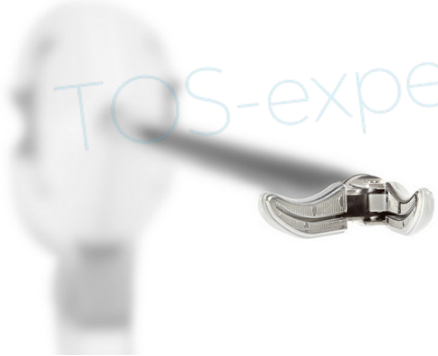
TV screen

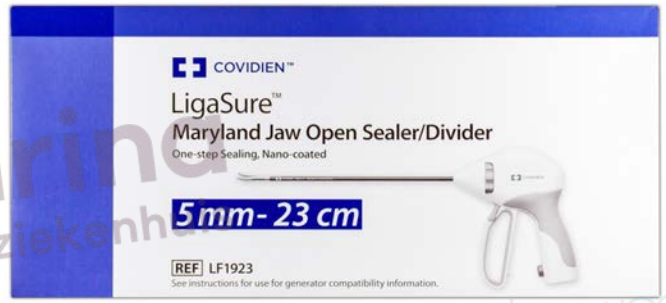
surgeon

Camera/Headlight/flatscreens

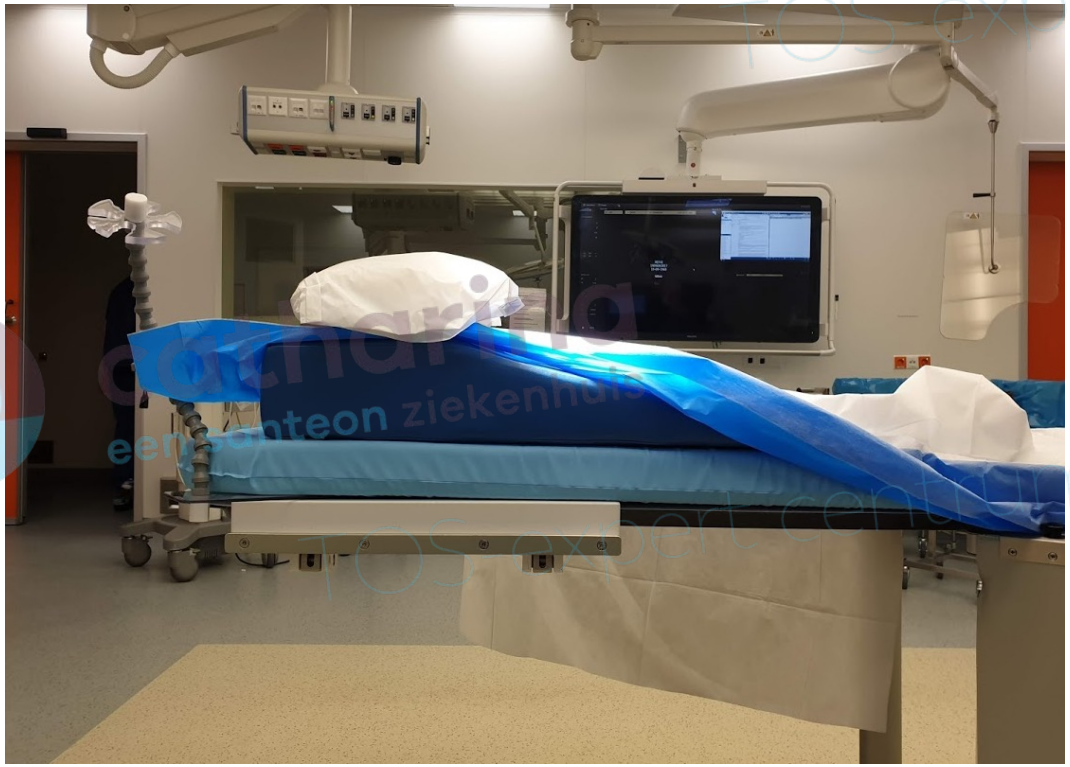


Tips&Trics for a transaxillary TOD

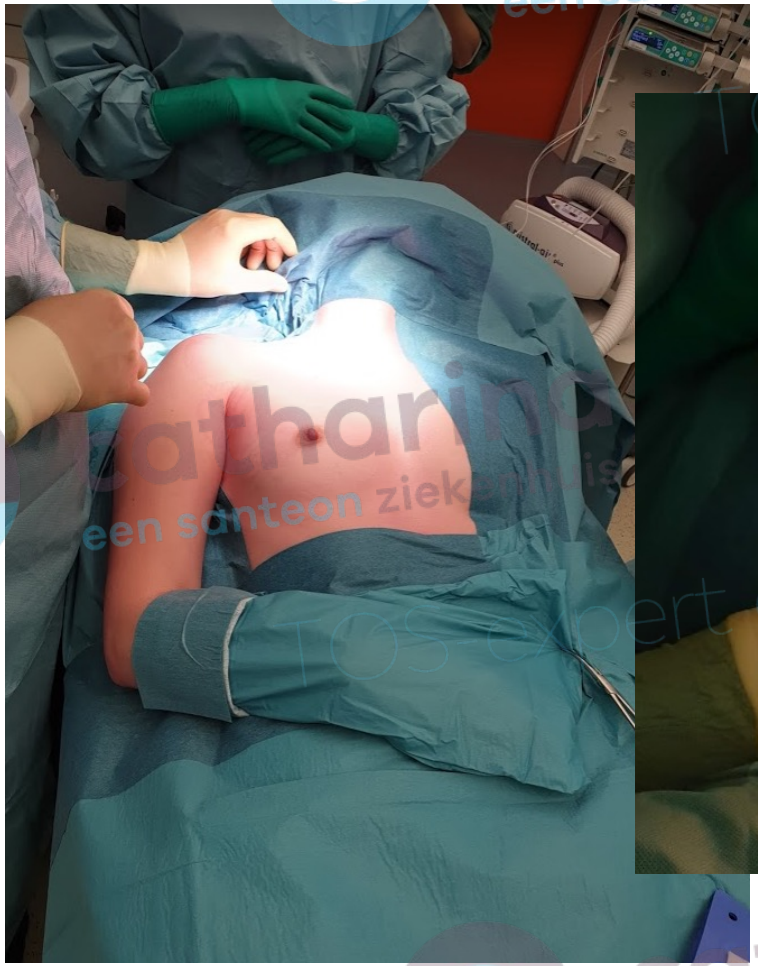


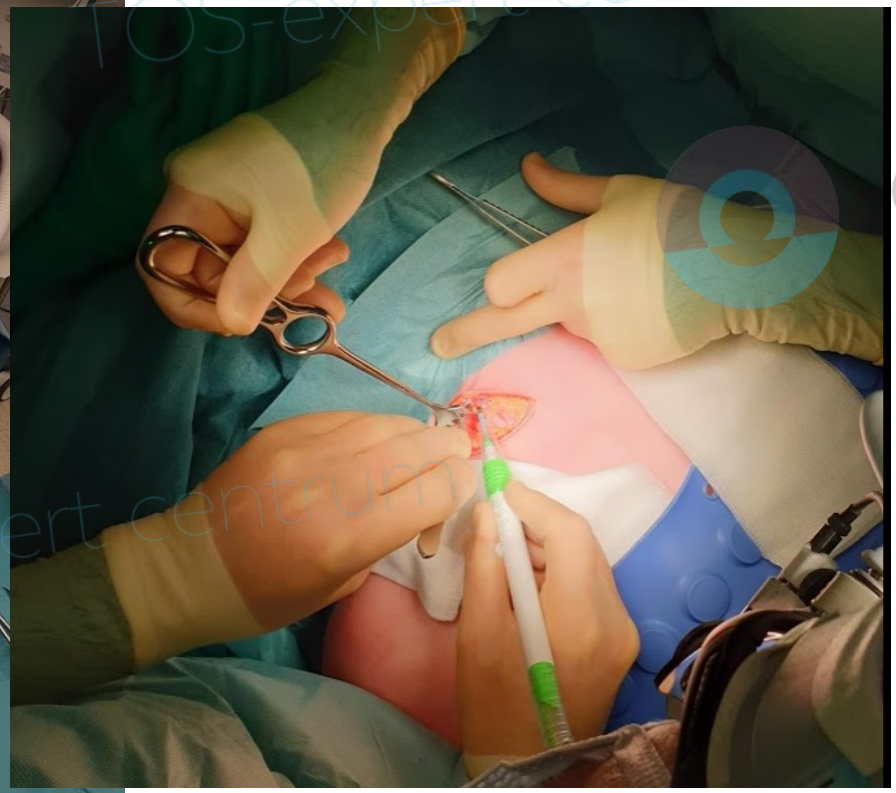


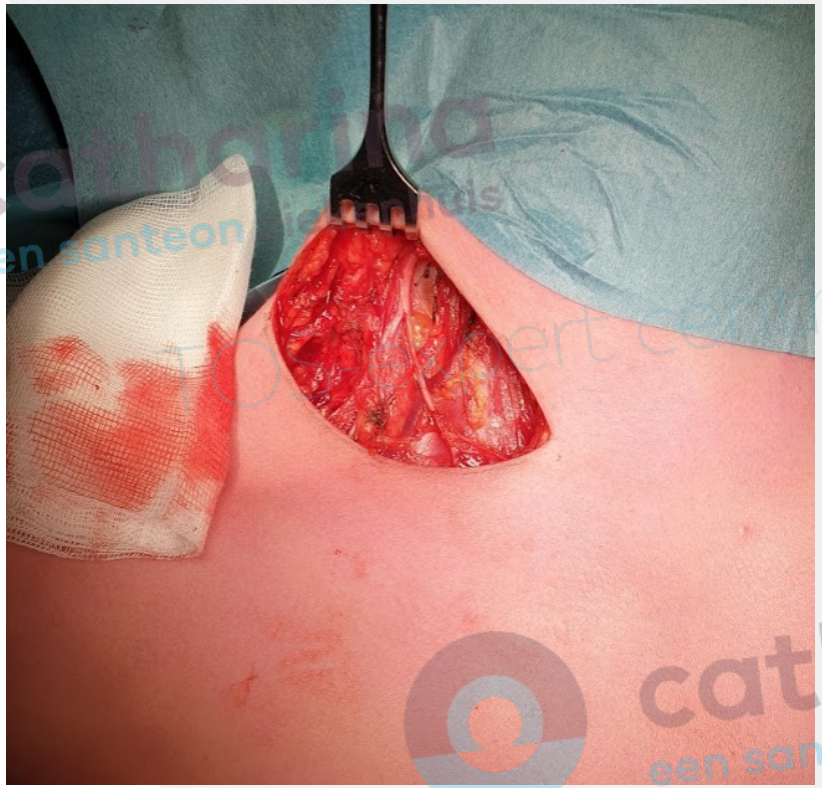
Recidief SC TOD voor NTOS



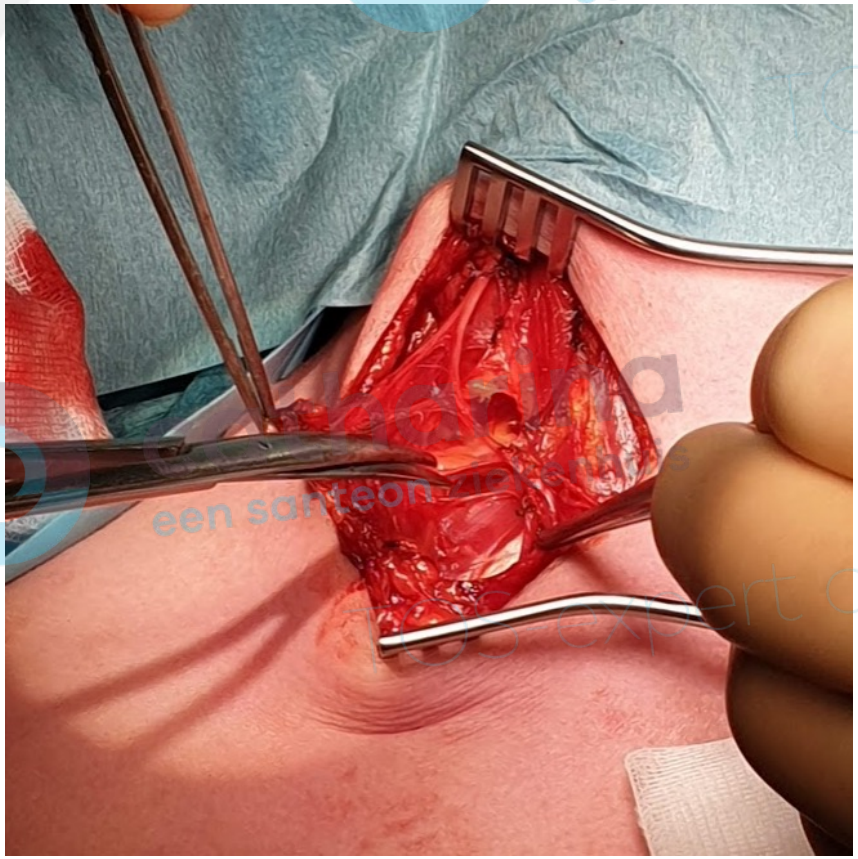
Recidief SC TOD voor NTOS

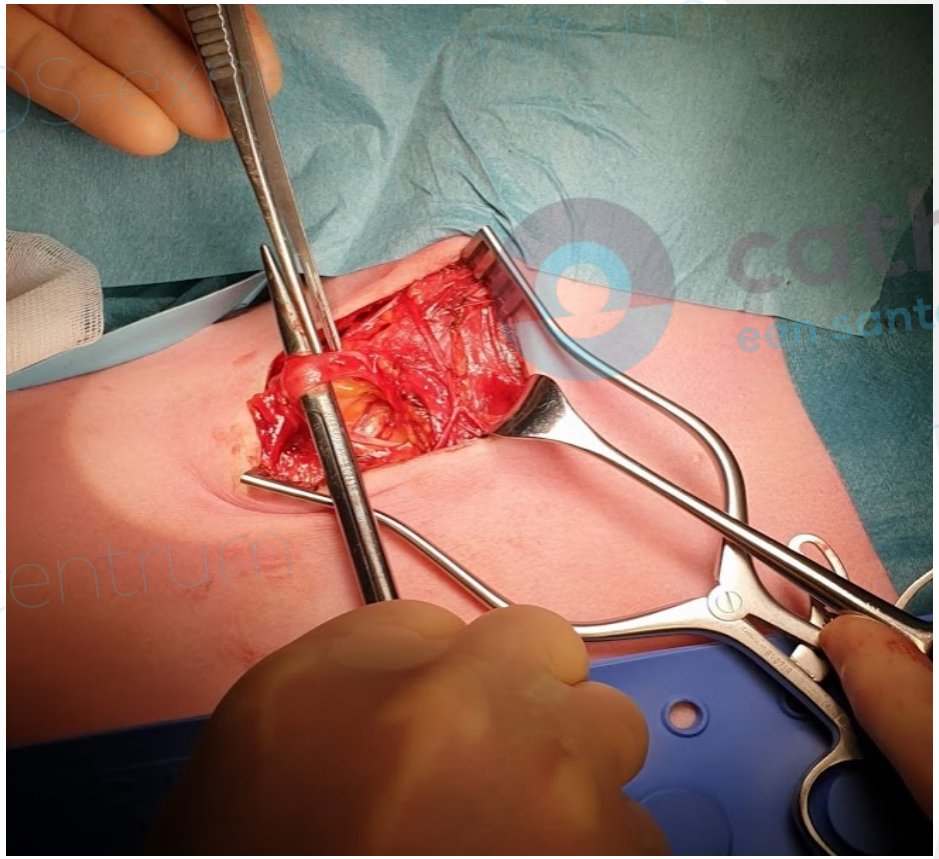






Recidief SC TOD voor NTOS





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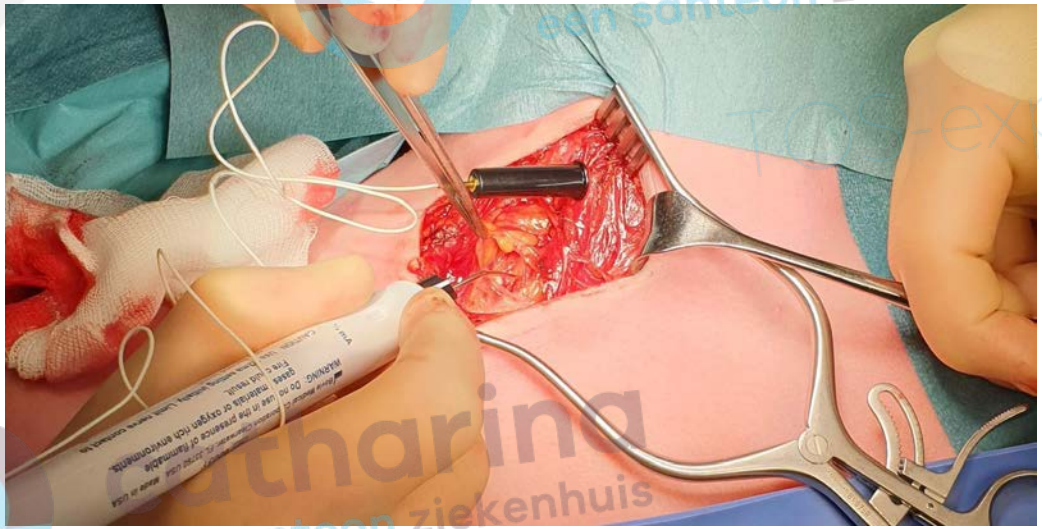

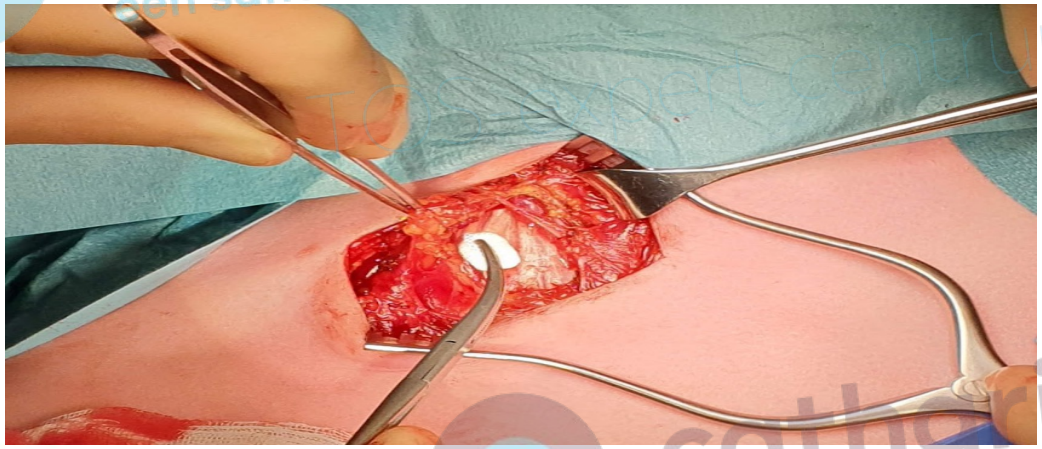

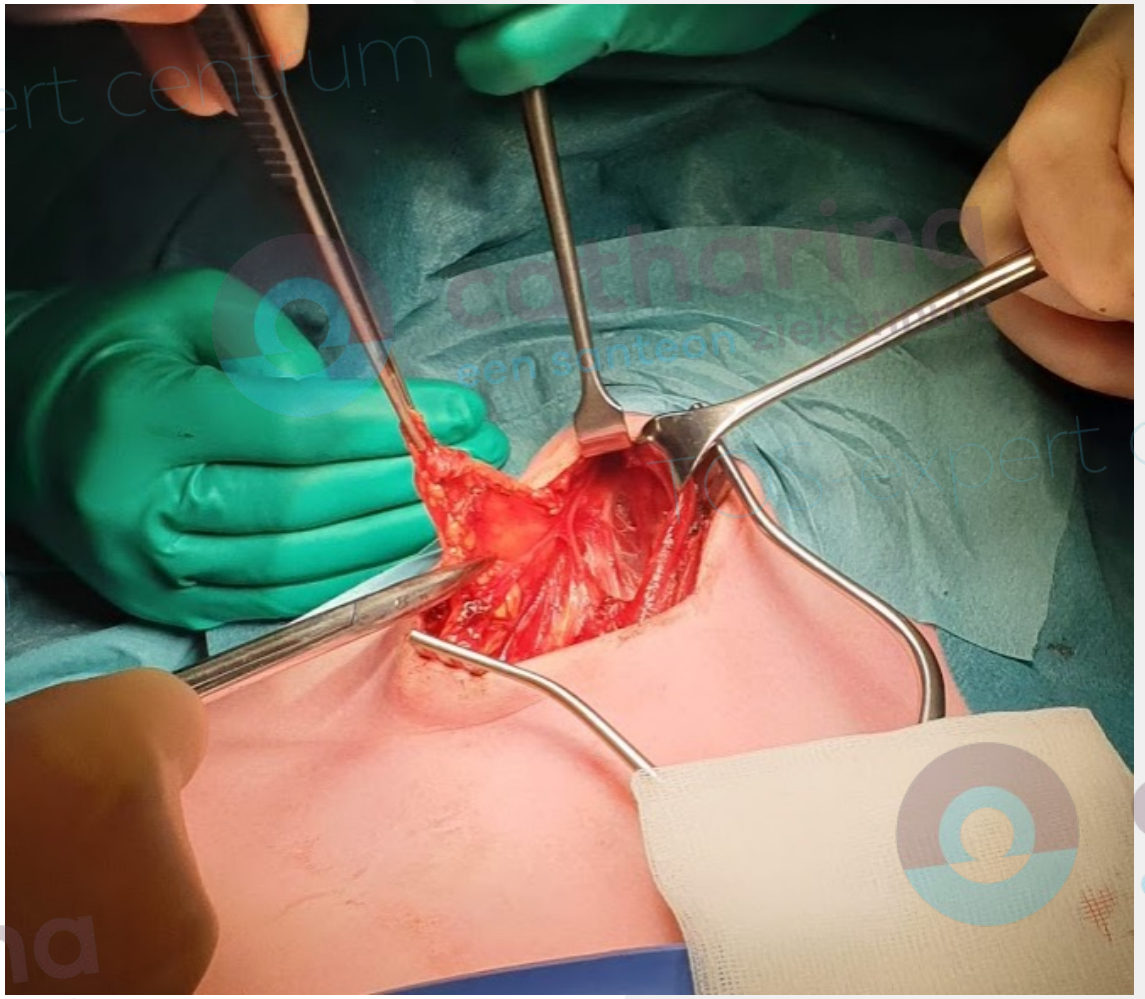

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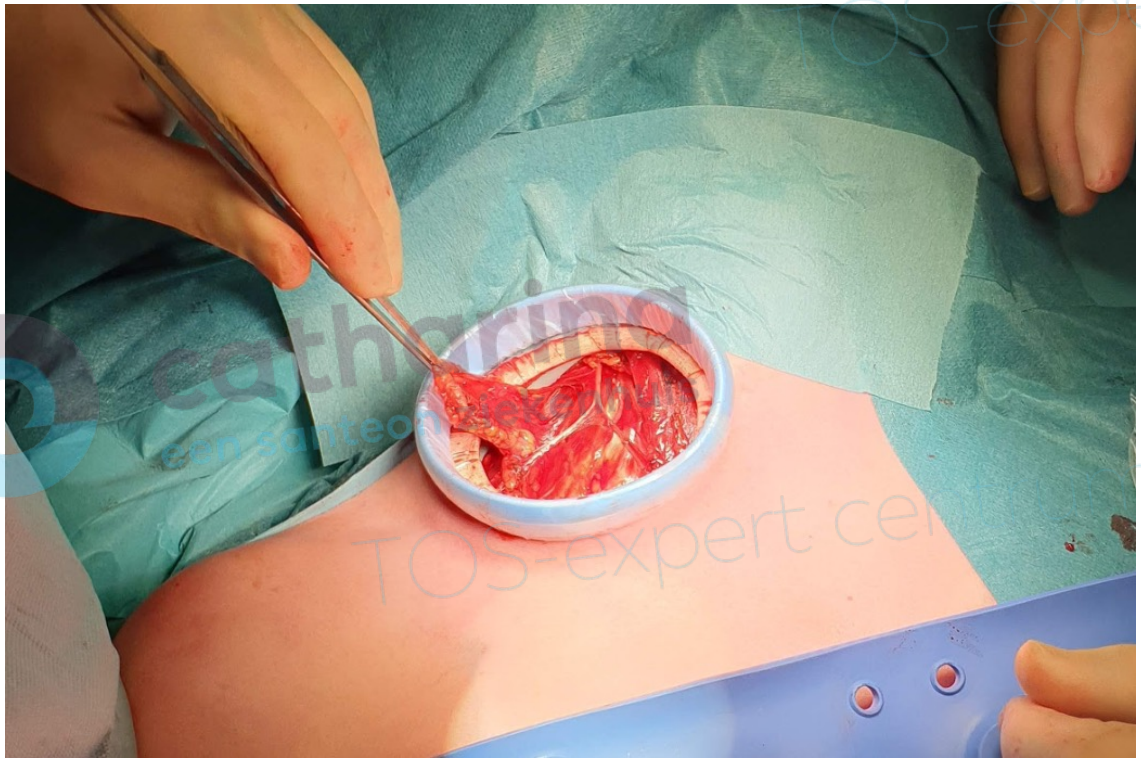

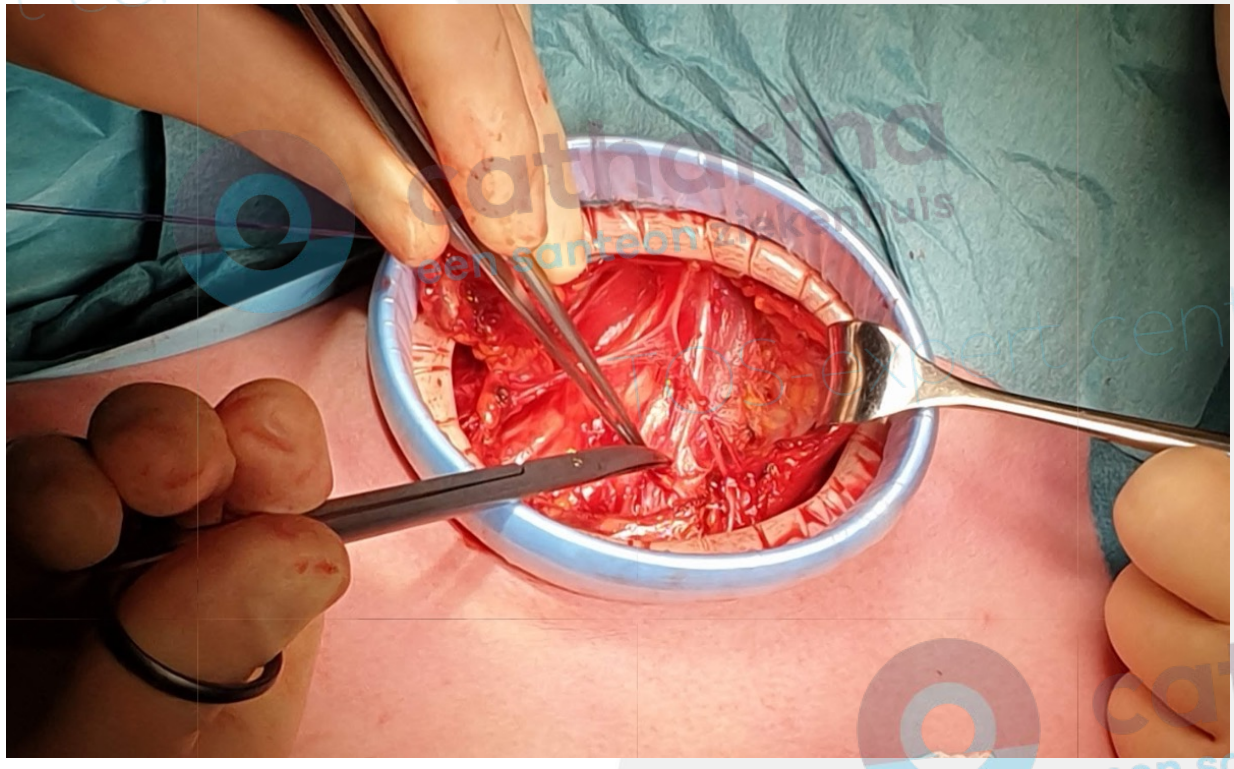

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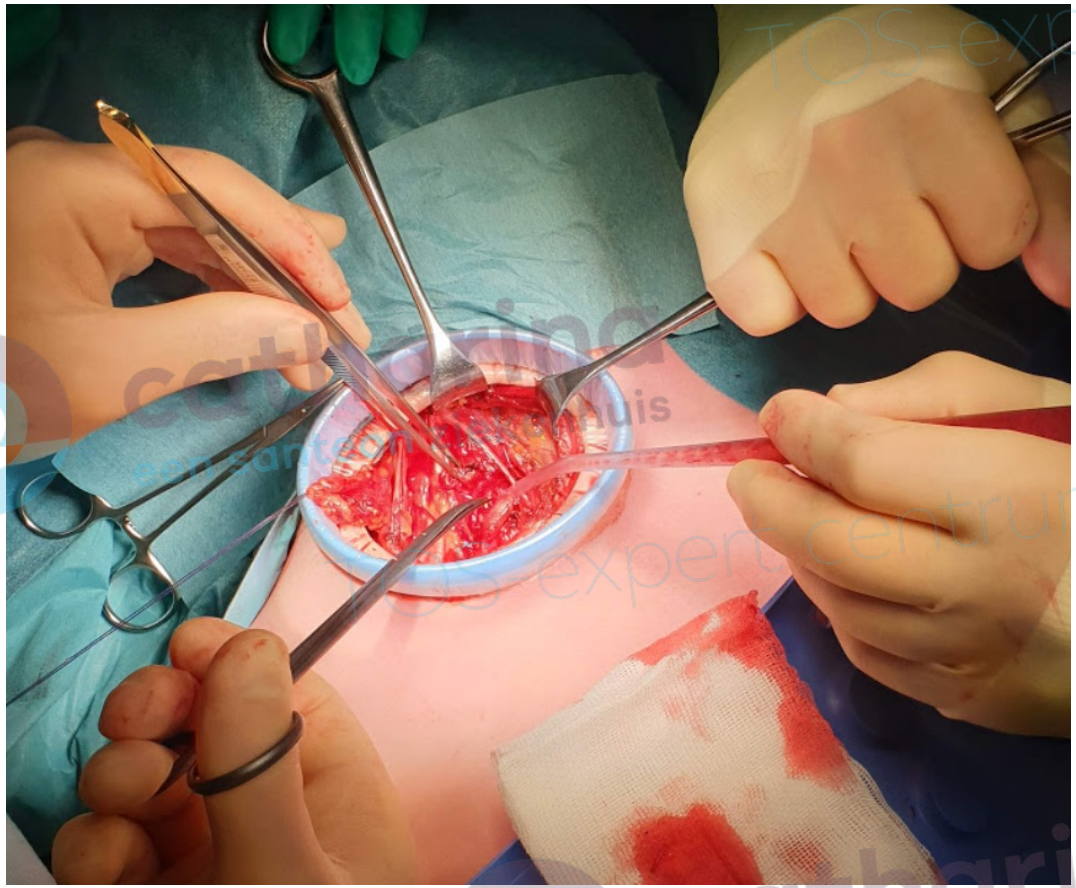

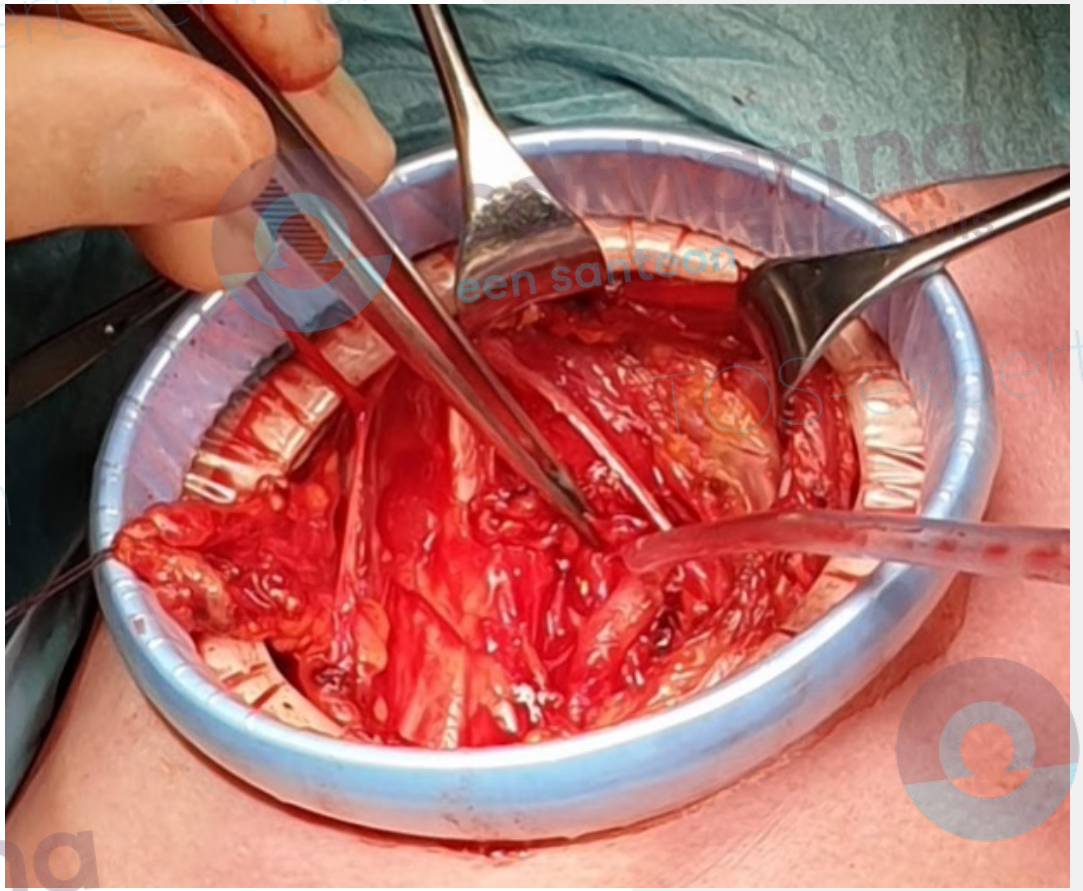

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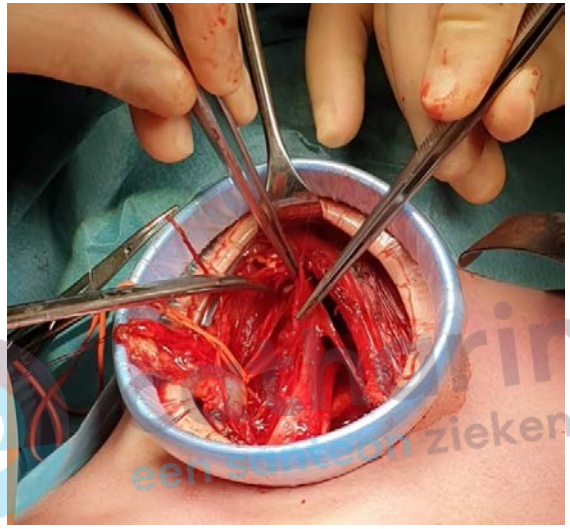

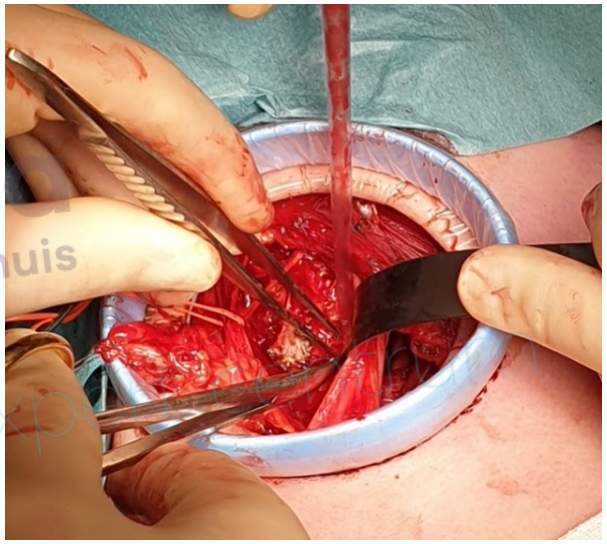

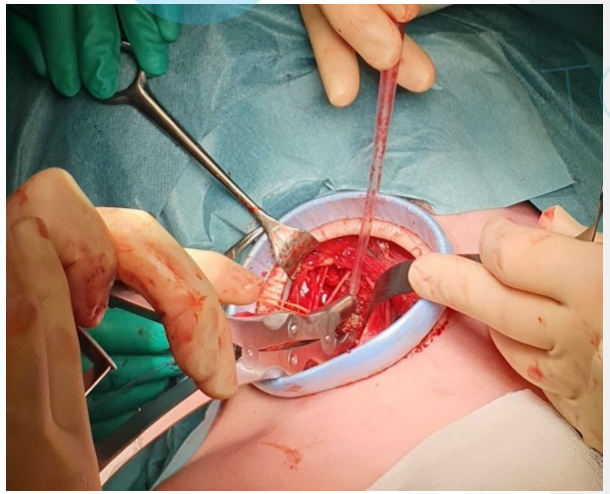

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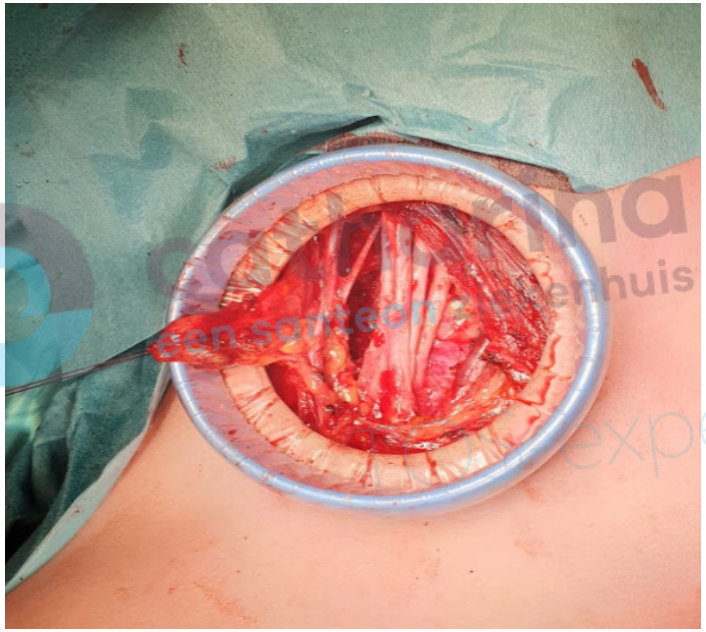

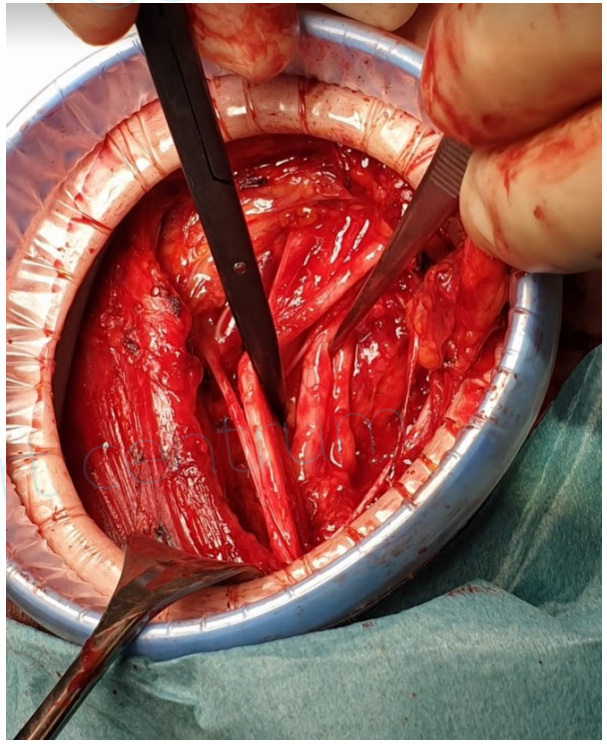

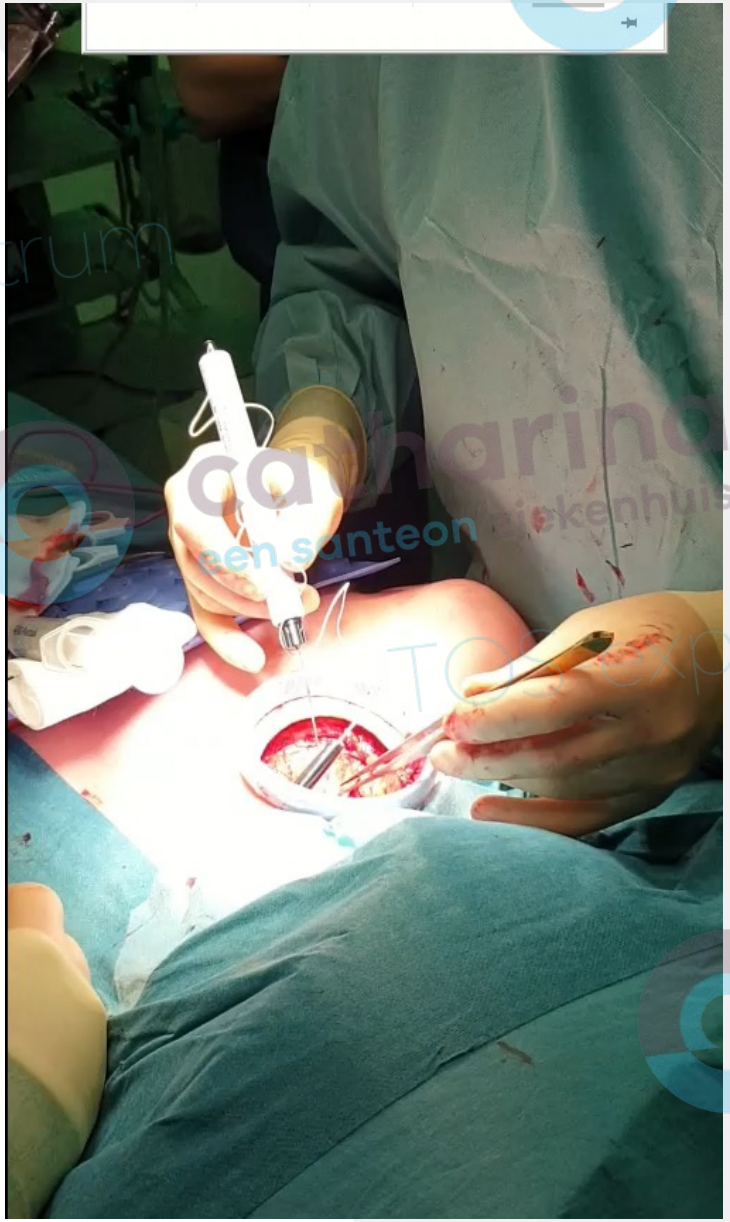

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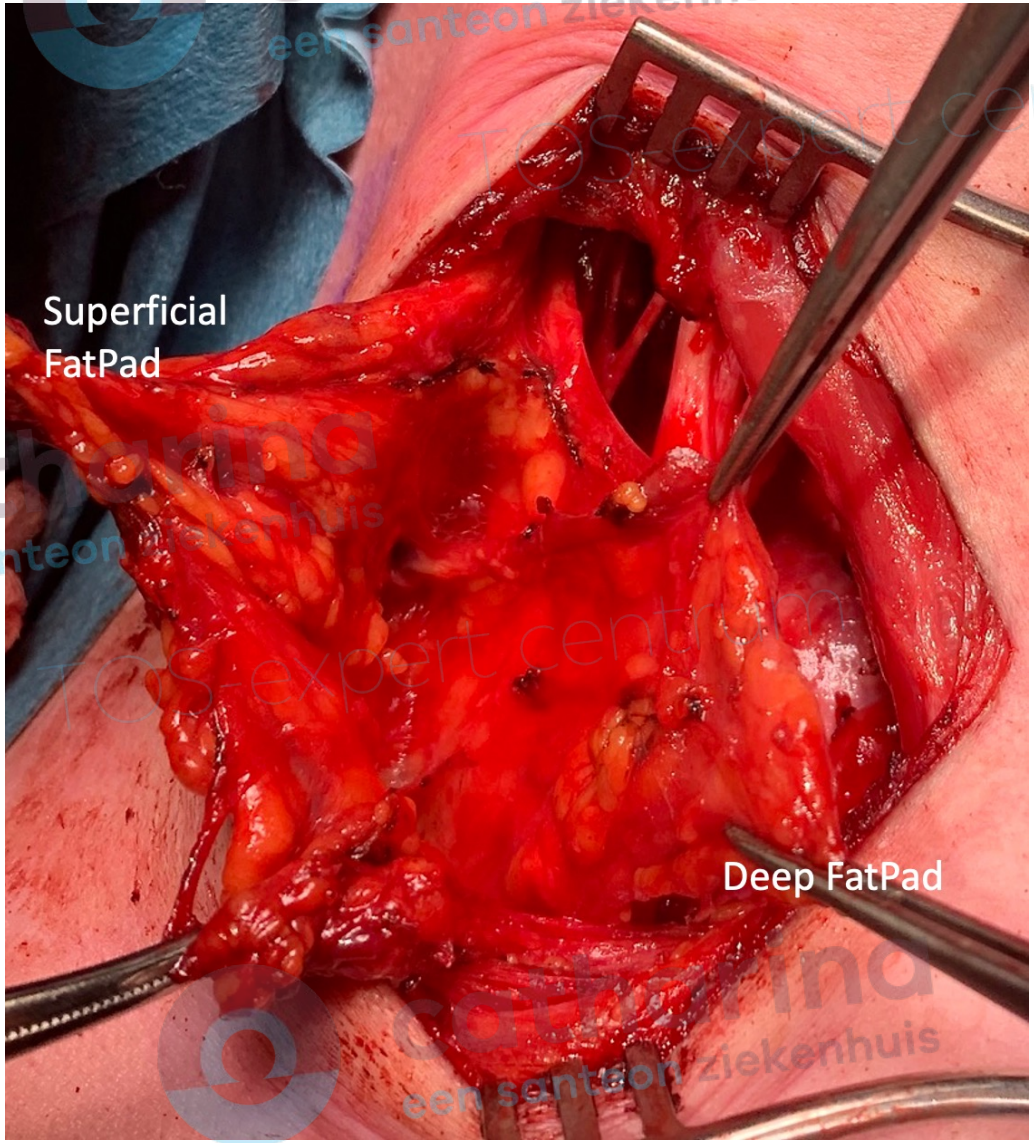
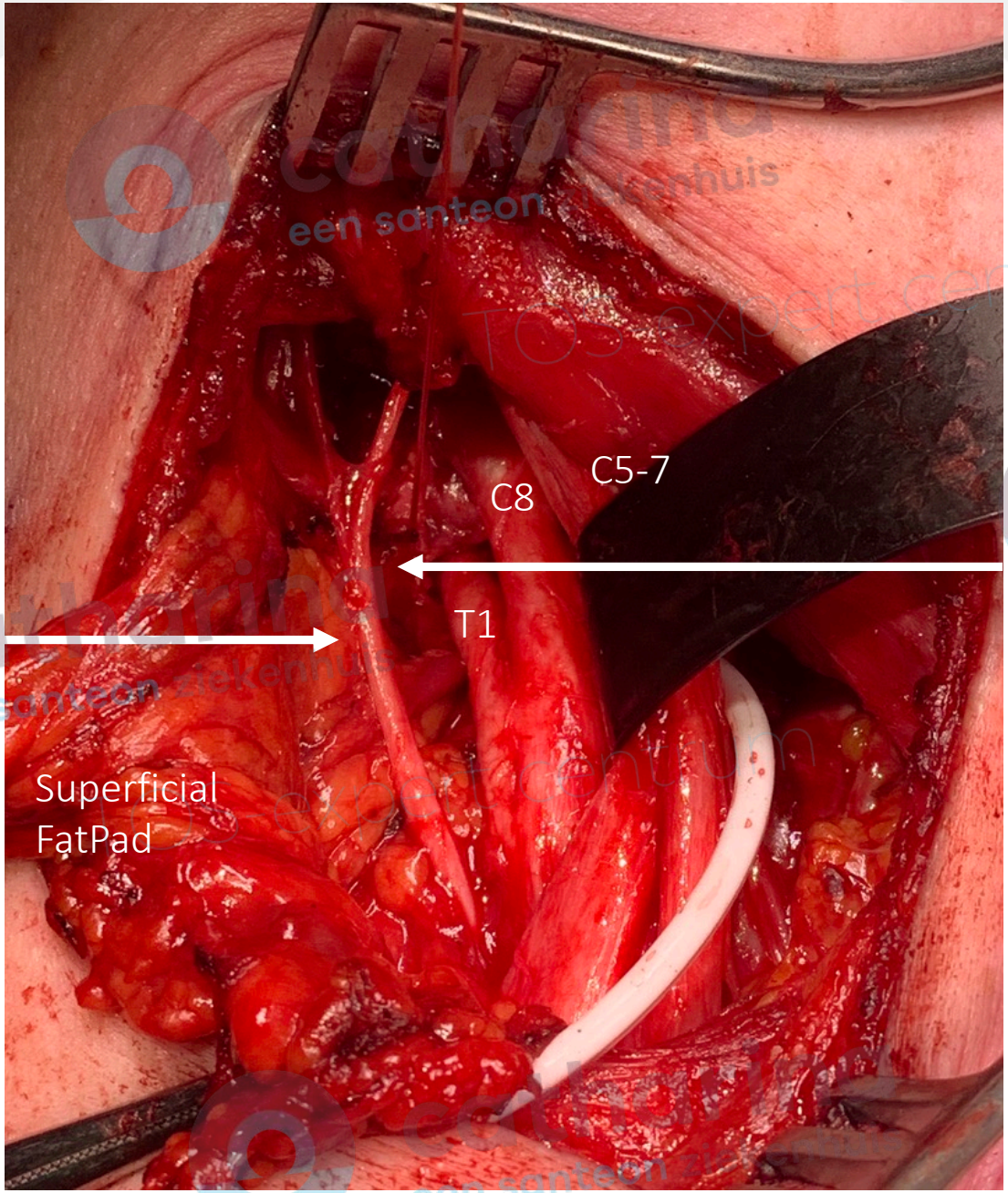


SC redo TOD

Division of fatpad at level of omohyoid muscle

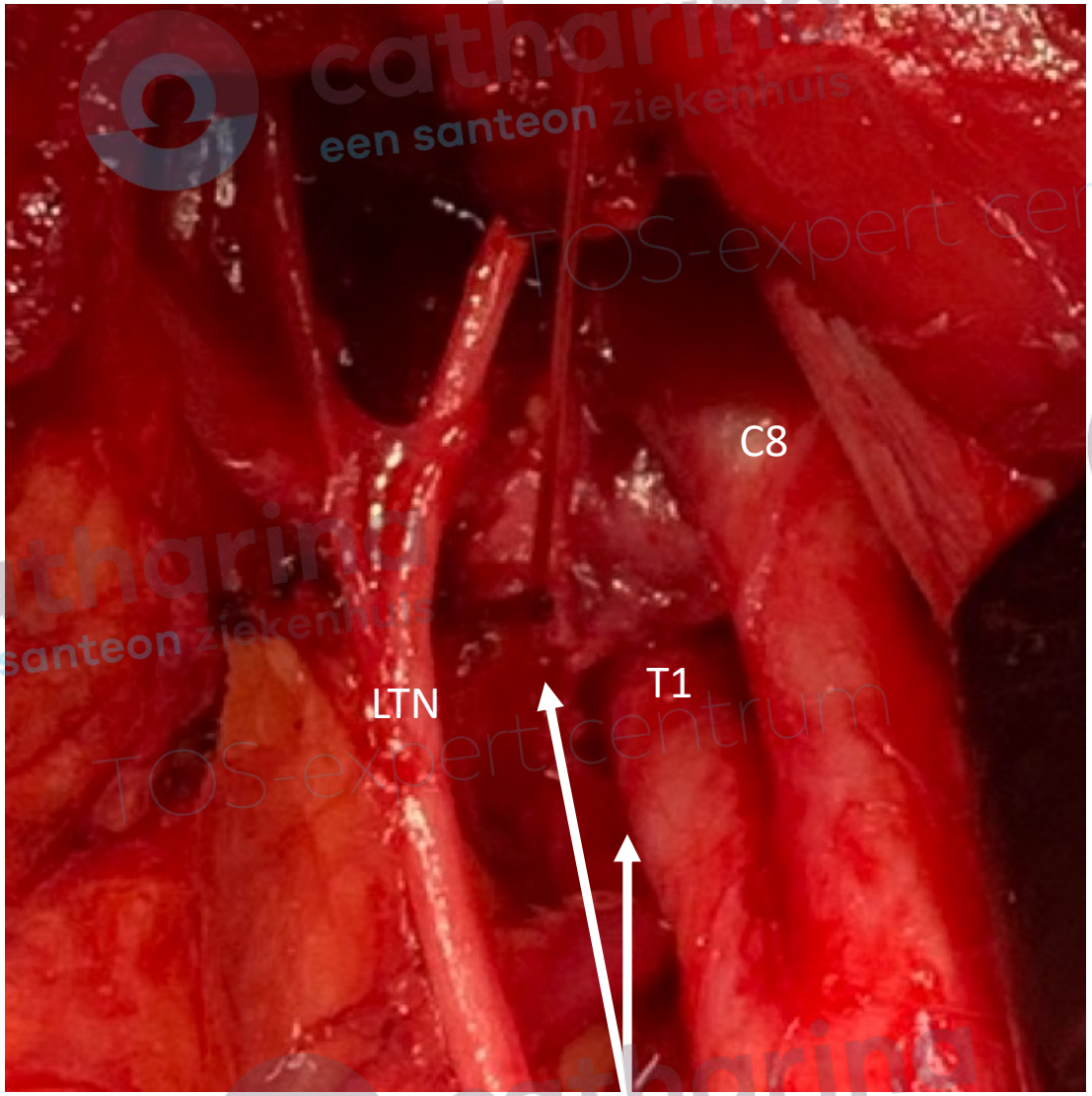
SC redo TOD

Securing deep fatpad below level T1



SC redo TOD

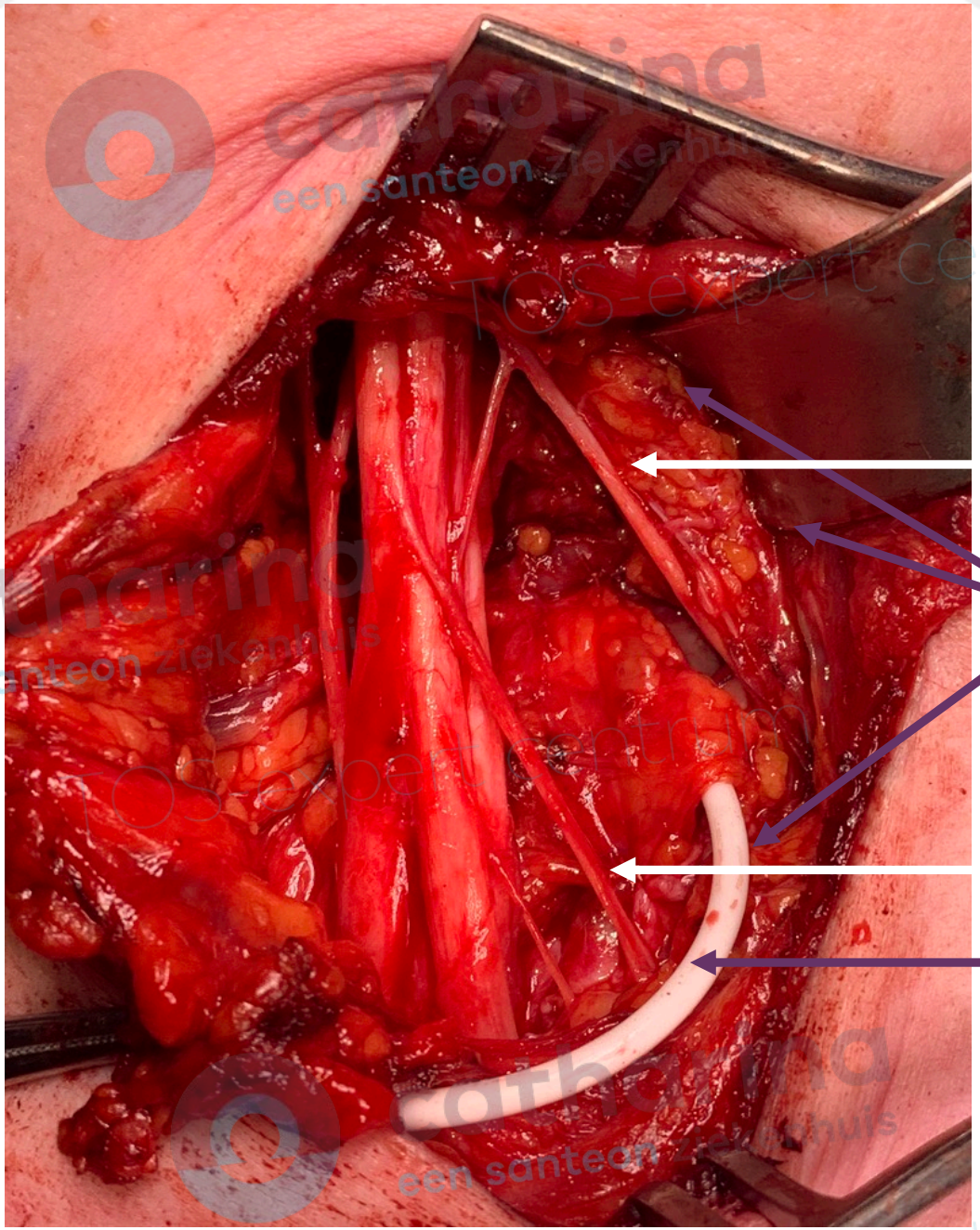
Securing deep fatpad below level T1



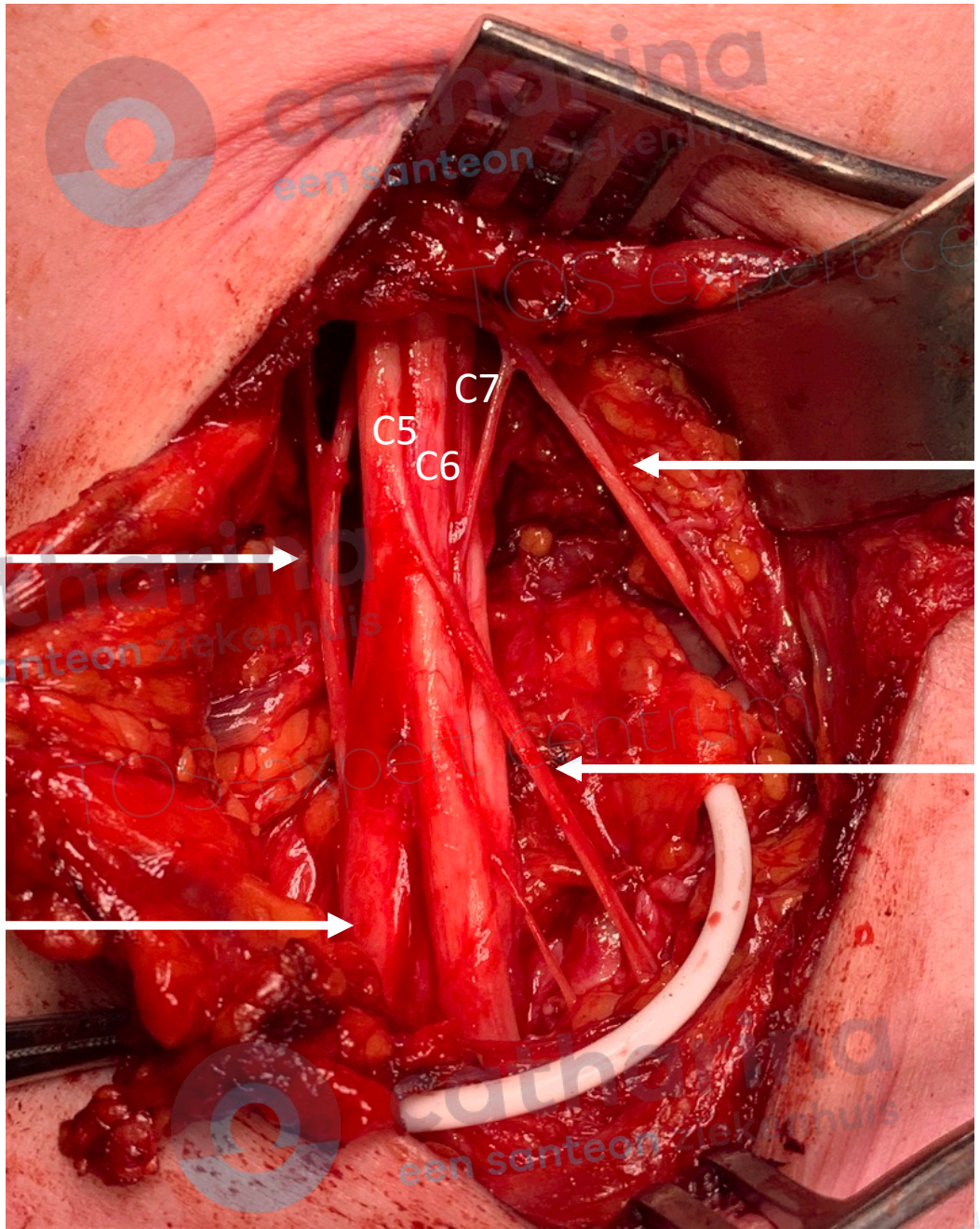
Secured Deep FatPad
below and around T1

SC redo TOD

Securing medial border deep fatpad



SC redo TOD



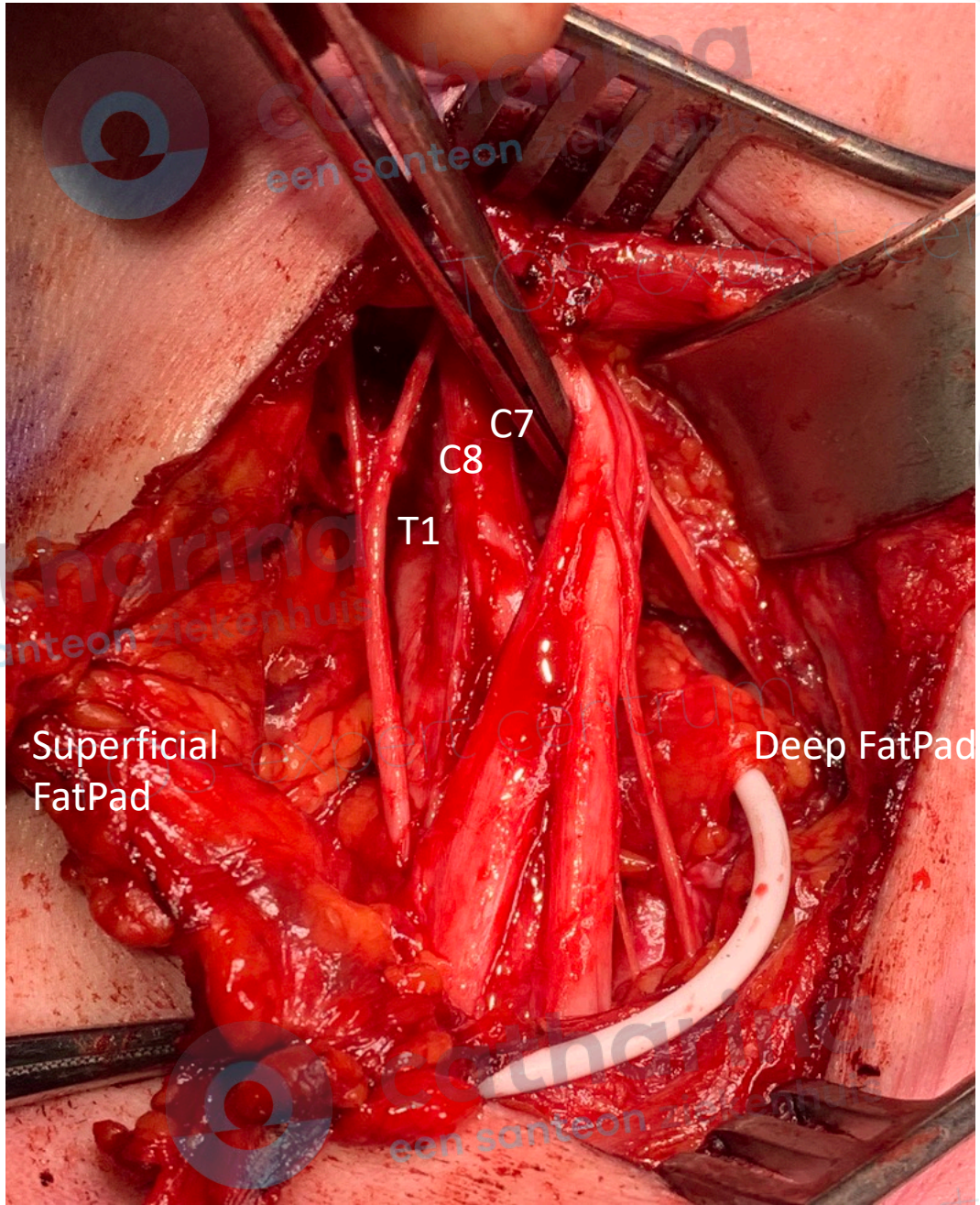
phrenic nerve

long thoracic nerve

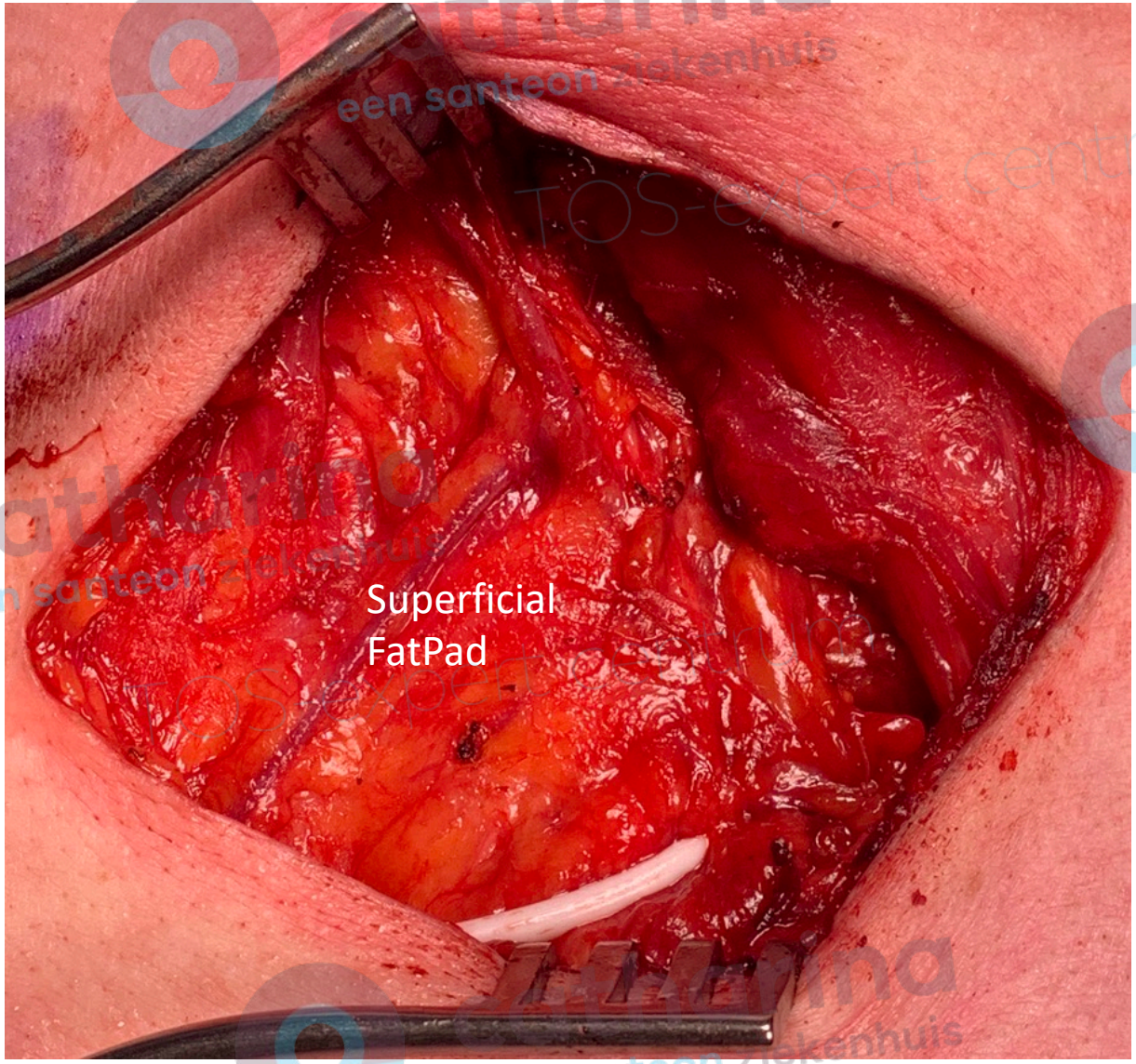
acc. phrenic nerve

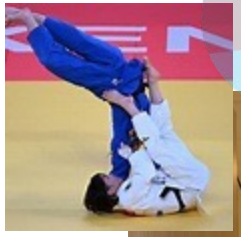
suprascapular nerve

SC redo TOD



SC redo TOD





Met dank aan:

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Ruud Vorstenbosch – Krijnen Medical / Sunoptic

CZE
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