Pain Management and Rib Fractures - How ***we*** do it…

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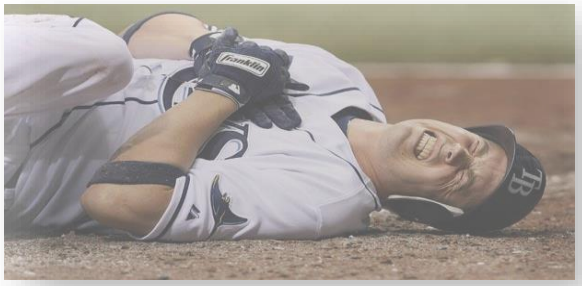
St. George's Hospital



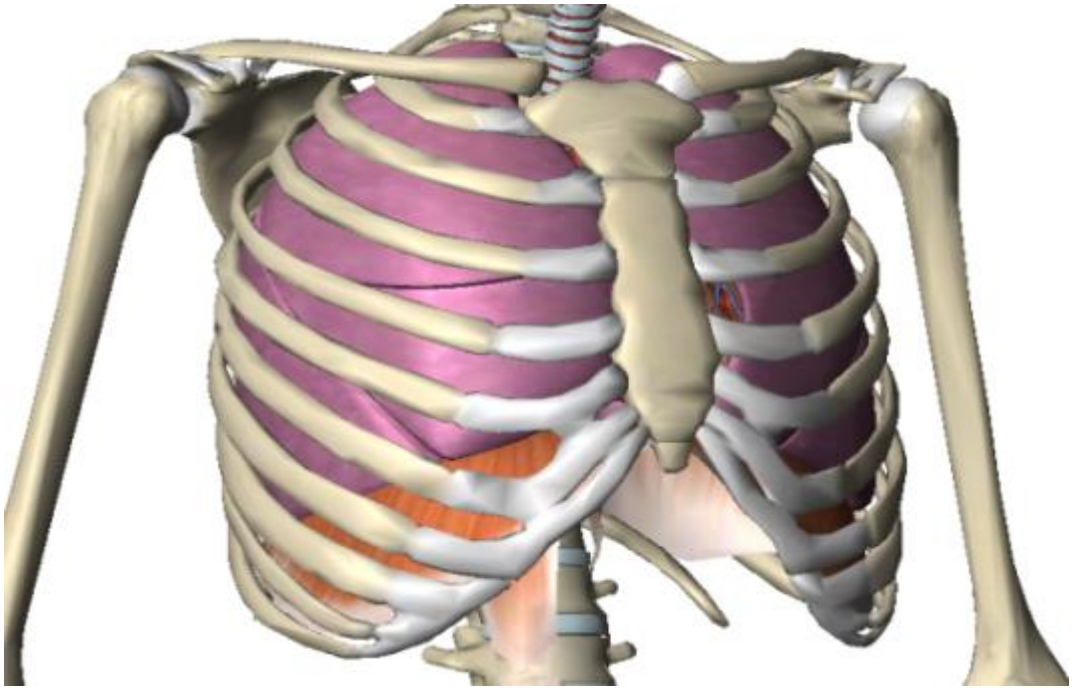
A “special” place to work…

A “special” place to work…

24 HOURS IN A&E

How important are rib fractures?

- Common !!
  - 10% trauma admissions (Ziegler et al 1994)
  - 3,722 admissions with multiple rib fractures (2013-14 TARN data)
- Frequently missed on CXR(50%) (Dubinsky 1997)



How important are rib fractures?

- Associated with high levels of morbidity including:
  - Pneumonia/sepsis
  - ARDS
  - Prolonged hospital & ICU stays
  - Acute pain
  - Chronic pain
    - pain score 3.5/10 at 30 days
  - Poor quality of life
  - Slow return to work
    - (average 70 days of work/school missed = 7.7 years lost productivity per 40 patients)

(Kerr-Valentic J et al J Trauma 2003)

Mortality

- 25% trauma deaths annually have chest trauma
- No. rib #'s directly related to mortality
  - 1-2 rib #'s 5%
  - 3-5 rib #'s 15%
  - >6 rib #'s 34%

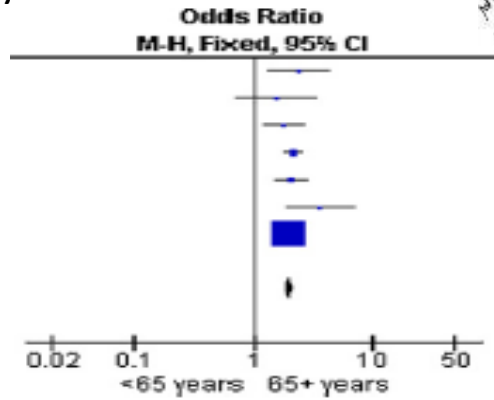
Sharma OP et al Am Surg 2008

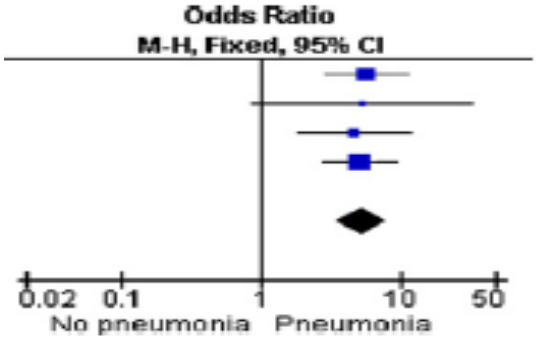
- Taiwanese insurance database (n=18,856) Young-Chang et al ATS 2009

>5 rib fractures	3.16
Haemopneumothorax	3.15
Extremity fractures	1.74
Pelvic fractures	2.92
Head injury	4.29
Spleen	1.83
Liver	4.39
Heart	4.48
Diaphragm	3.16

Risk factors that predict mortality in patients with blunt chest wall trauma:
A systematic review and meta-analysis
Battle CE, Hutchings H, Evans PA ; Injury 43 (2012)8-17

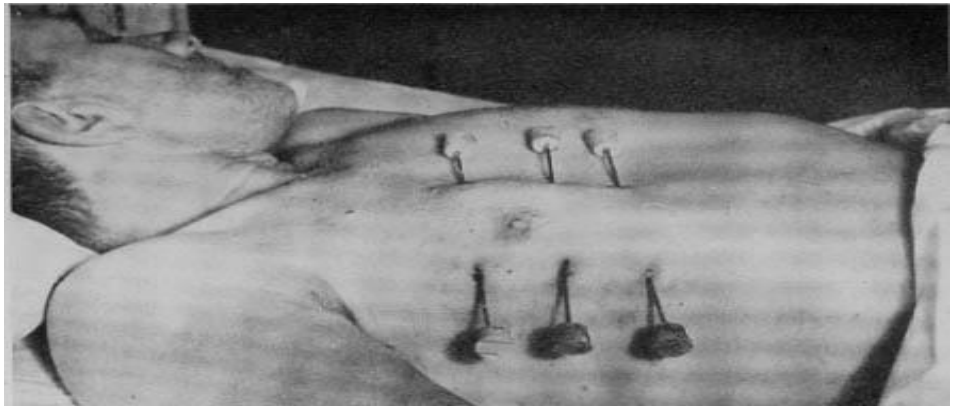
- Odds ratios
  - Age > 65 years 1.98
  - >3 Rib #'s 2.02
  - Pre-existing Conditions 2.43
  - Pneumonia 5.24

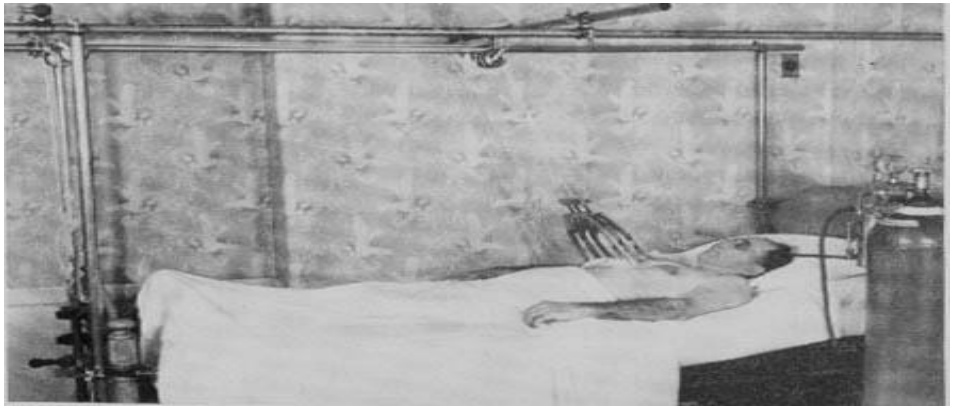




Flail segment

- “2 or more ribs fractured in 2 or more places”
- Incidence 2-6% of rib fractures
- Associated with increased morbidity and mortality
- Underlying pulmonary contusion





Pathophysiology

- Shallow tidal breathing
- Atelectasis / sputum retention
- Hypoxaemia / V/Q mismatching
- Pneumonia / respiratory failure
- ICU
- DEATH

Pathophysiology

Pain

- Shallow tidal breathing
- Atelectasis / sputum retention
- Hypoxaemia / V/Q mismatching
- Pneumonia / respiratory failure
- ICU
- DEATH

EFFECTIVE ANALGESIA / PAIN CONTROL

Analgesic Options available

Drugs

- NSAIDS / Para
  - Fairly safe, but only mild/mod analgesics
- Opiates (IV & oral)
  - Sedation, resp depression..!!
- Lidocaine patches
  - No evidence of significant improvements in pain control over placebo

(Ingalls NK et all J Am Coll Surg 2010)

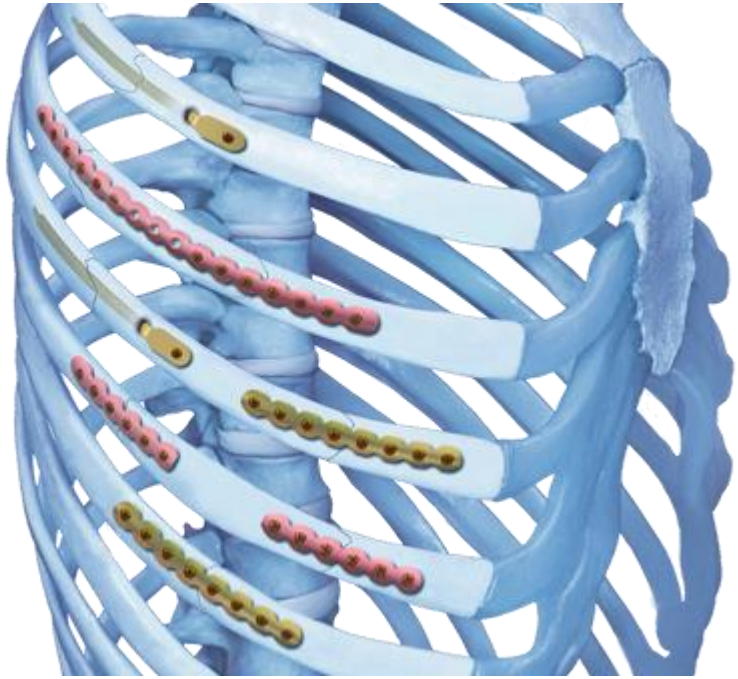
Regional techniques

- **Intercostal blocks**
  - Good initial relief
  - Limited duration of action / need for repeat procedures
- **Thoracic Epidural**
  - No difference in mortality/hospital/ICU LOS, duration of mechanical ventilation compared to IV opiates

    (Carrier FM et al Can J Anaesth 2009).
  - Hypotension/hypovolaemia contraindications
- **Paravertebral**
  - Excellent regional technique
  - Similar efficacy to epidural
  - Less risks around insertion, better pt mobility

    (Mohta M et al J Trauma 2009)
- **Serratus anterior plane block / infusion**
  - Limited information about effectiveness / RCT's few case reports.

What about fixing fractured ribs?



Evidence for rib fixation

- 37 intubated ITU pts with flail chest
- 5 days post-injury, randomised to surgery or continued PPV

	Surgery	PPV
Days ventilated	10.8	18.3
ICU Stay	16.5	26.8
Pneumonia	24%	77%
Return to work at 6 months	61%	5%

Tanaka et al 2002, J Trauma

Evidence for rib fixation

- 20 intubated ITU pts with flail chest
- Randomised to surgery or continued PPV

	Surgery	PPV
Days ventilated	2	12
ICU Stay	9.6	14.6
Pneumonia	10%	50%
Residual chest deformity	5%	45%

Granetzny et al 2005, ICVTS

Evidence for rib fixation

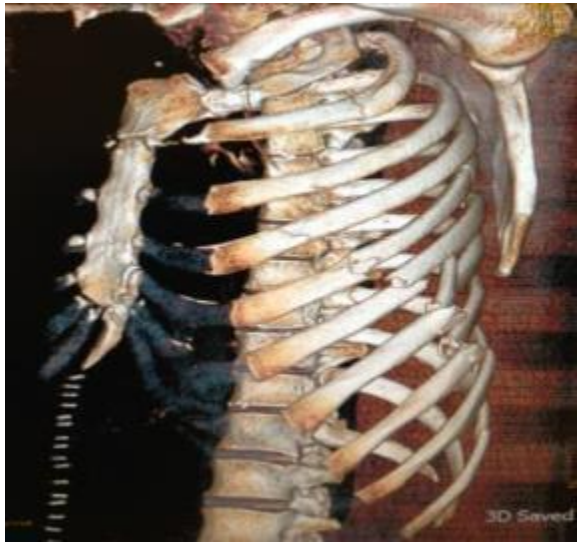
- Fixation has been demonstrated to be safe
- Initial non-randomised trials suggest benefits including:
  - Reduced number of days on ventilator/in ITU/ in hospital (Leinicke et al 2013)
  - Better pain control in the short and long term (Mayberry et al 2009)
  - Quicker rehabilitation (de Jong et al, 2014)
  - Earlier return to work (Majercik et al, 2014)
  - Possible cost savings related to better outcomes (Bhatnagar et al 2012)

Evidence for rib fixation for flail chest

- Best Evidence topic
  - 11 papers reviewed
- Beneficial effects of stabilisation
  - Reduced ventilatory support
  - Shorter ICU stay
  - Shorter hospital stay
  - Reduced incidence of pneumonia / sepsis
  - Decreased risk of chest deformity
  - Reduced mortality

Schulte K et al, ICVTS 23(2)314-9

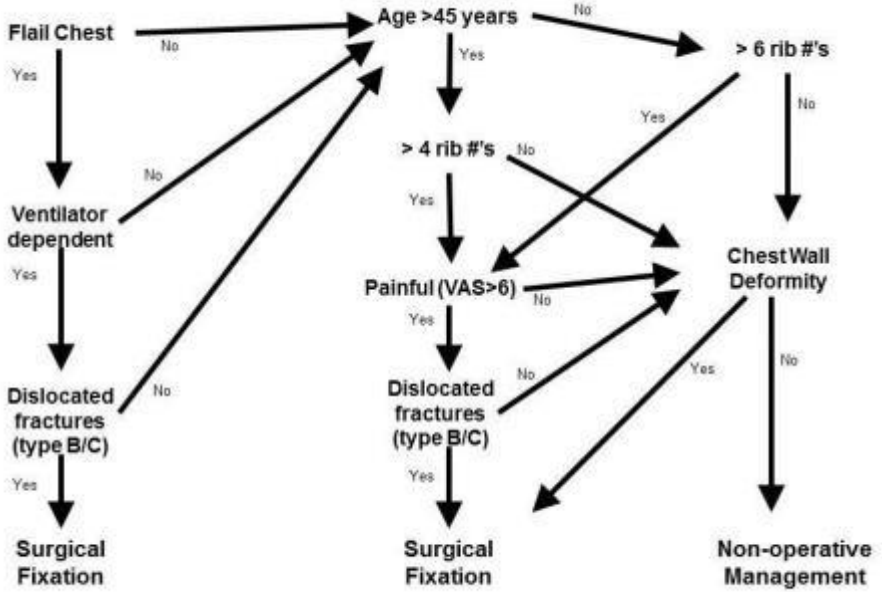
Who do we operate upon?

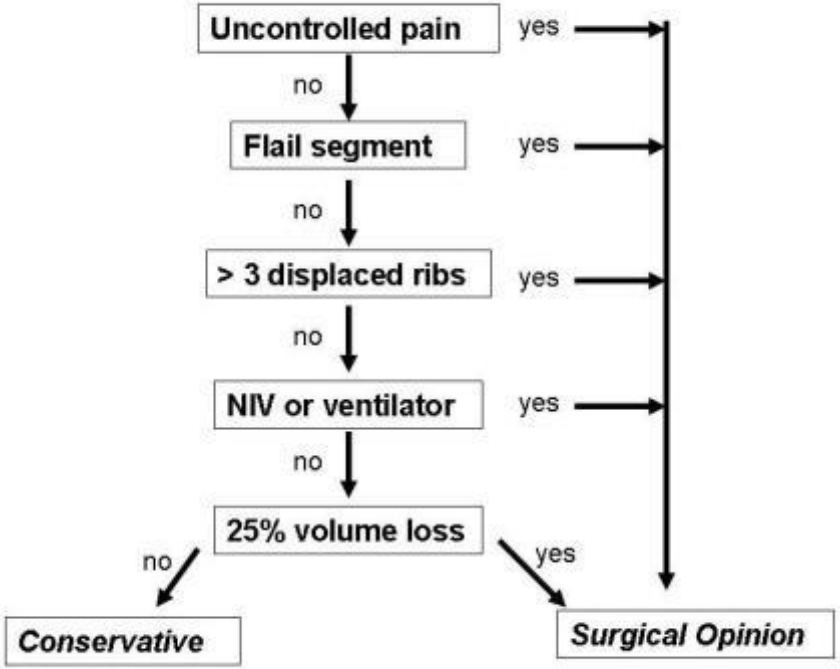


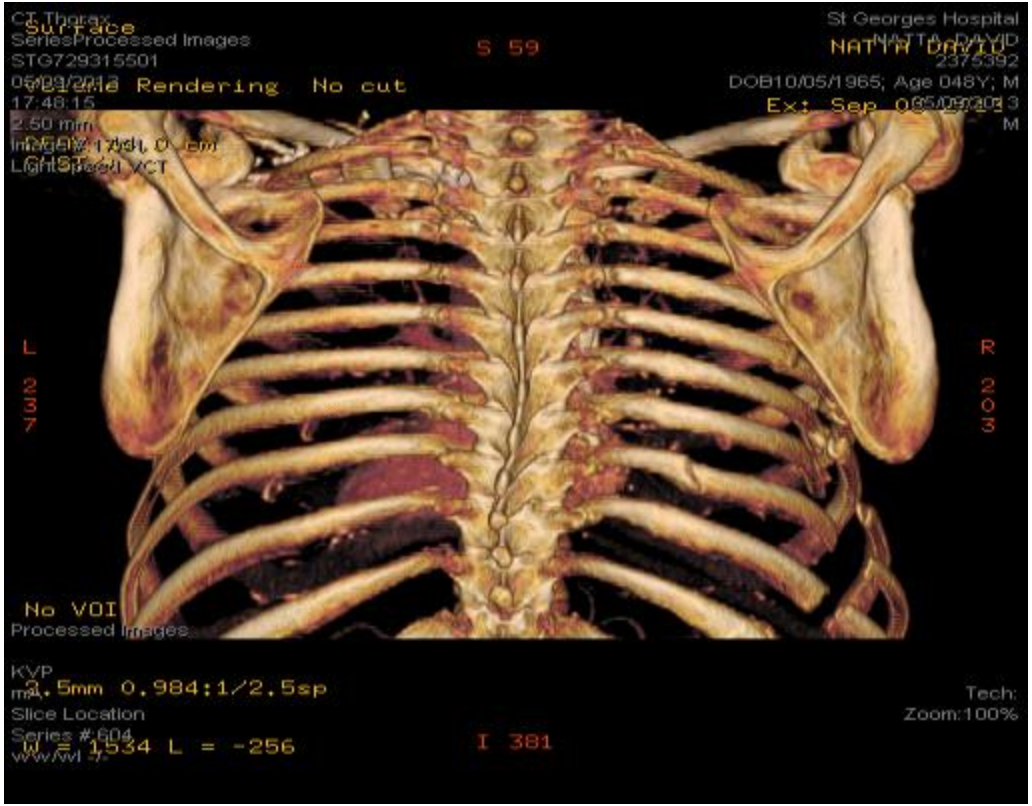
- Multiple Factors….
  - Pain
  - Deformity
  - Respiratory Compromise
  - Position of # (spine)
  - Operability
    - Age
    - Pre-morbid function
    - Co-morbidities

Sheffield Algorithms

Nottingham



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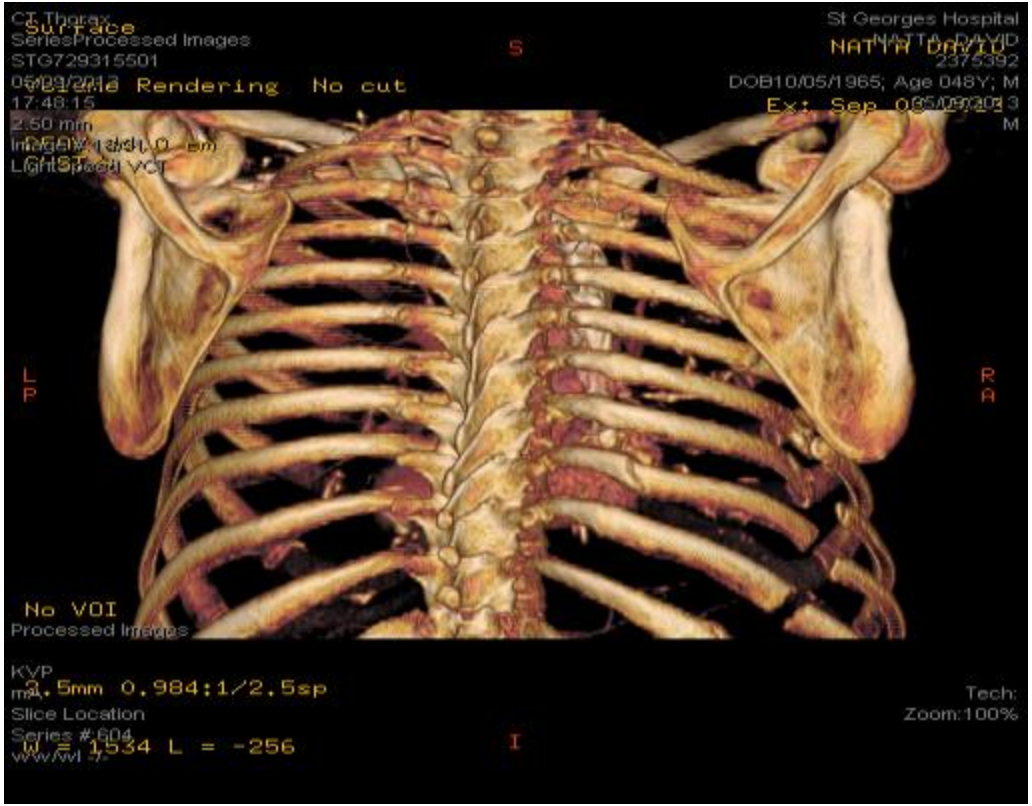
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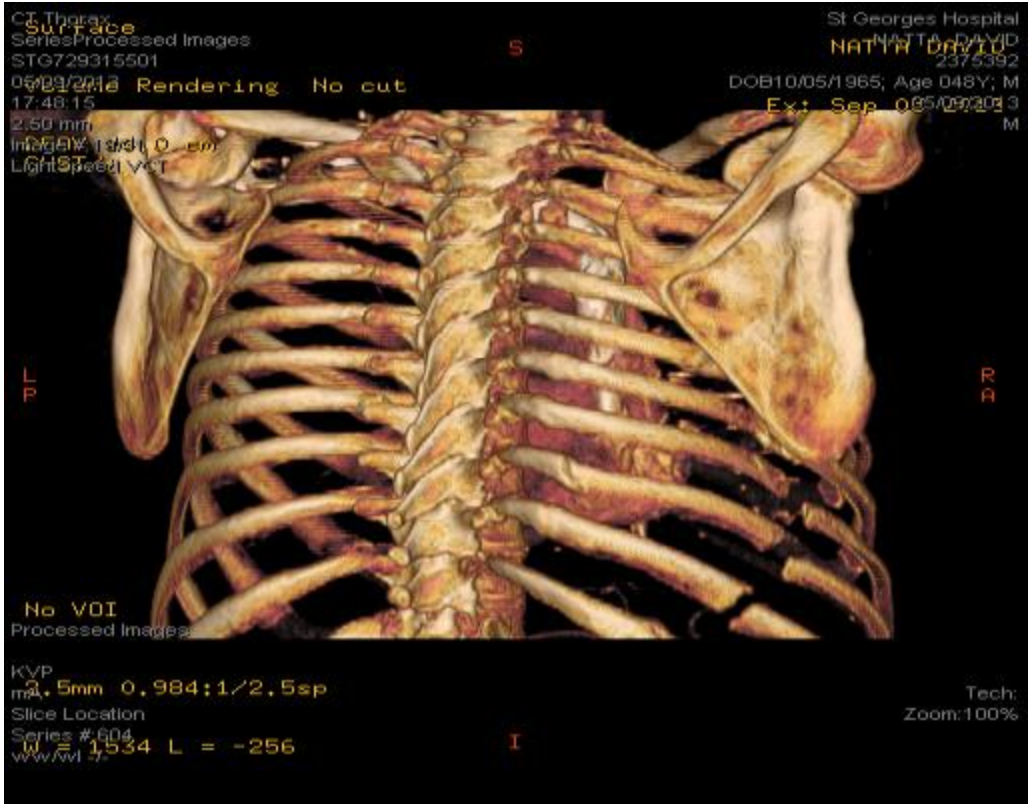
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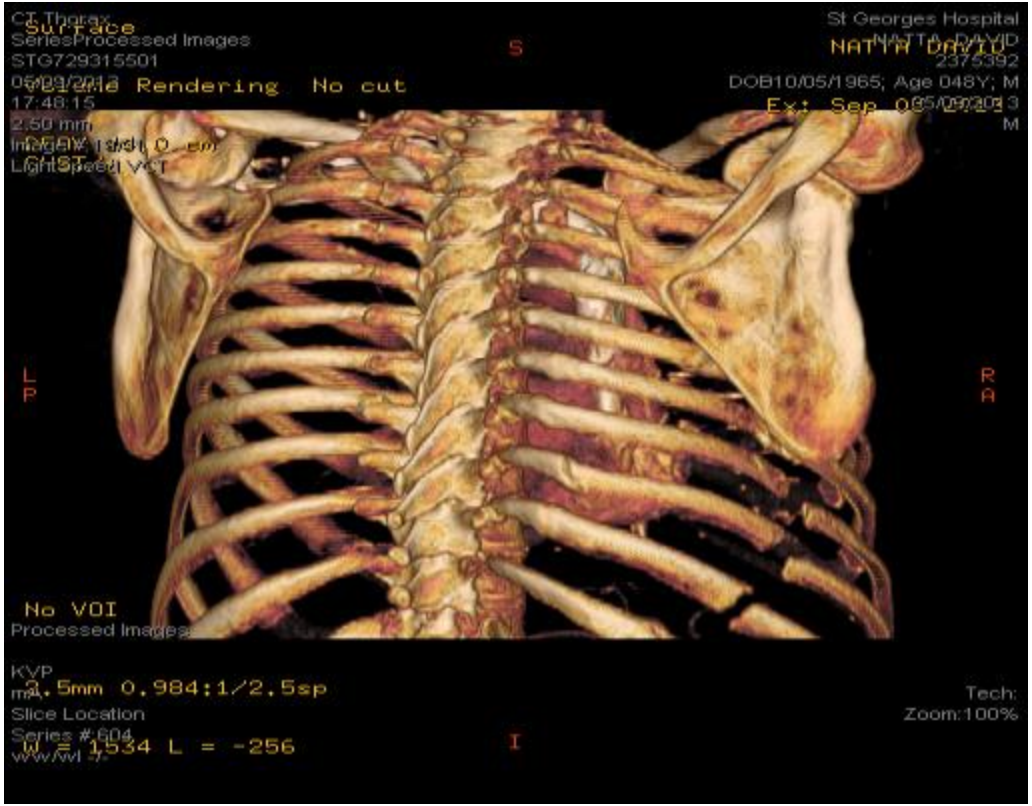
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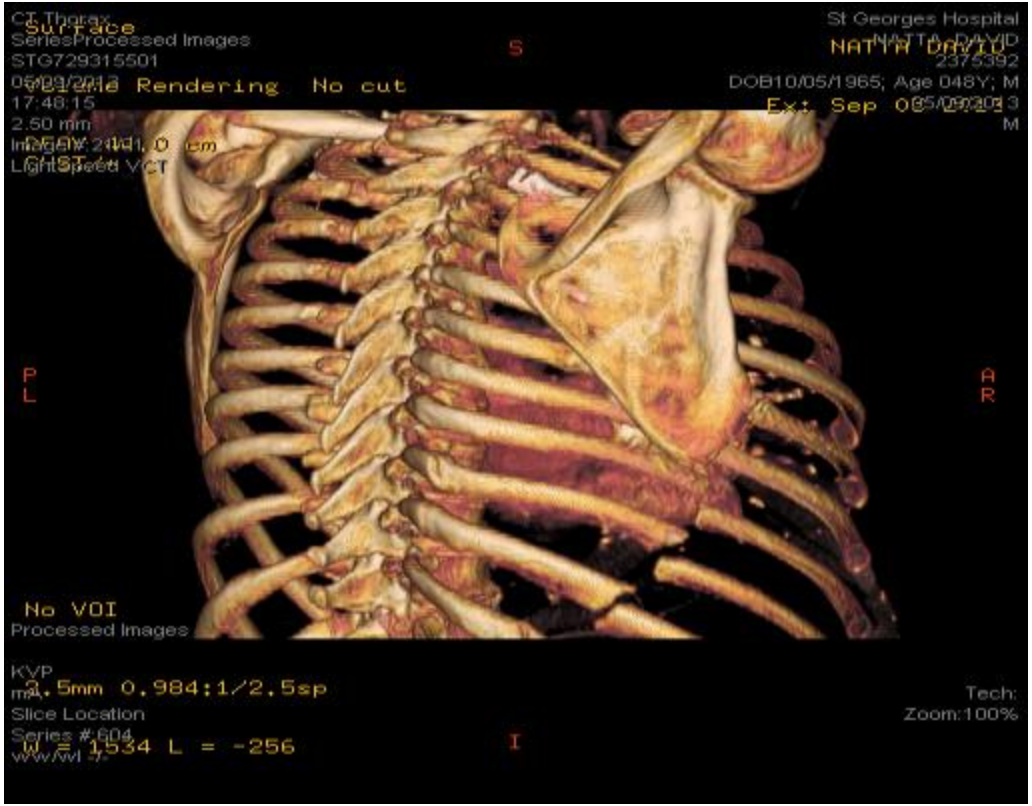
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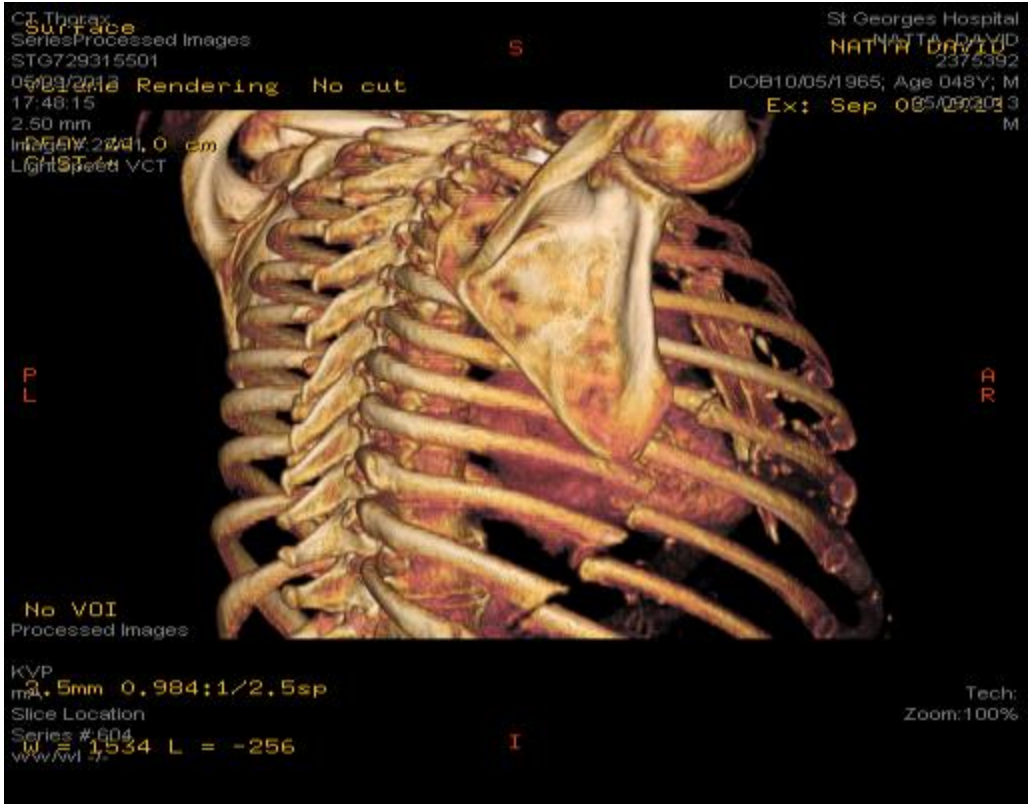
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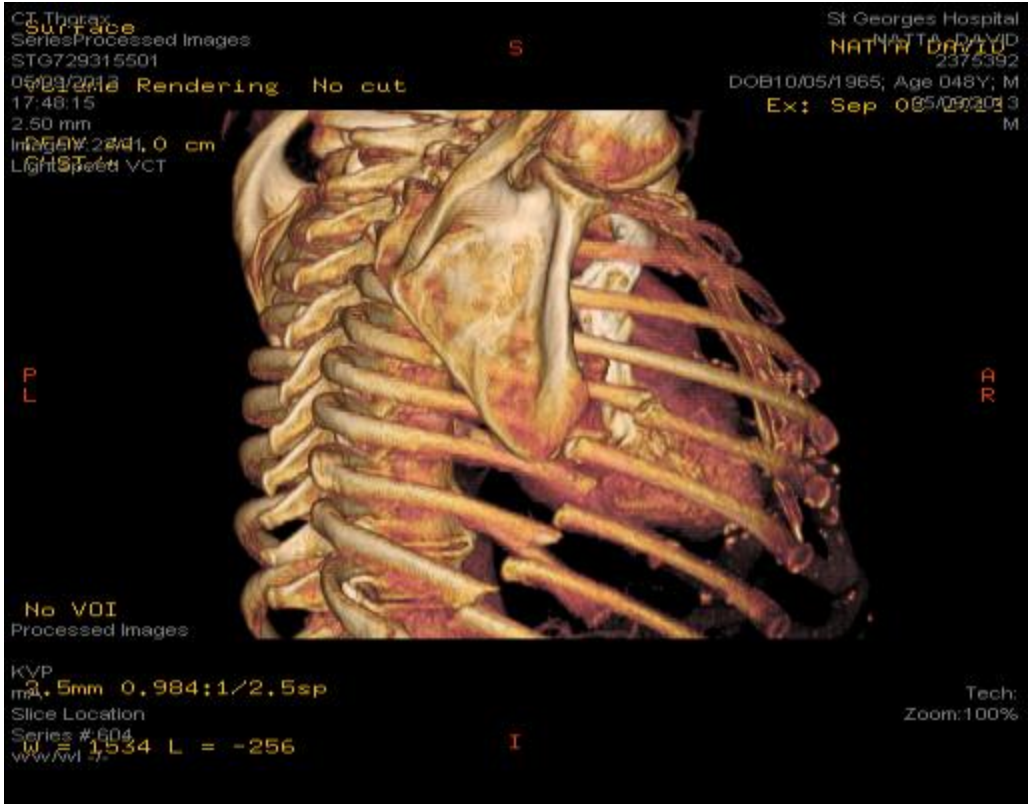
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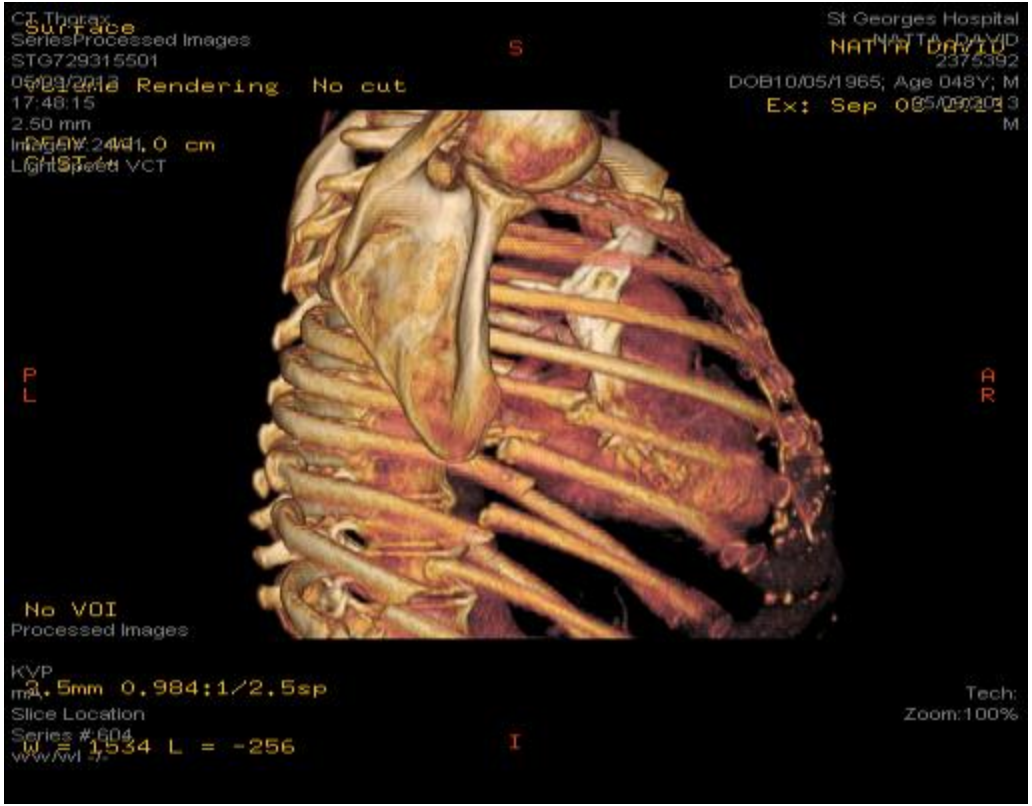
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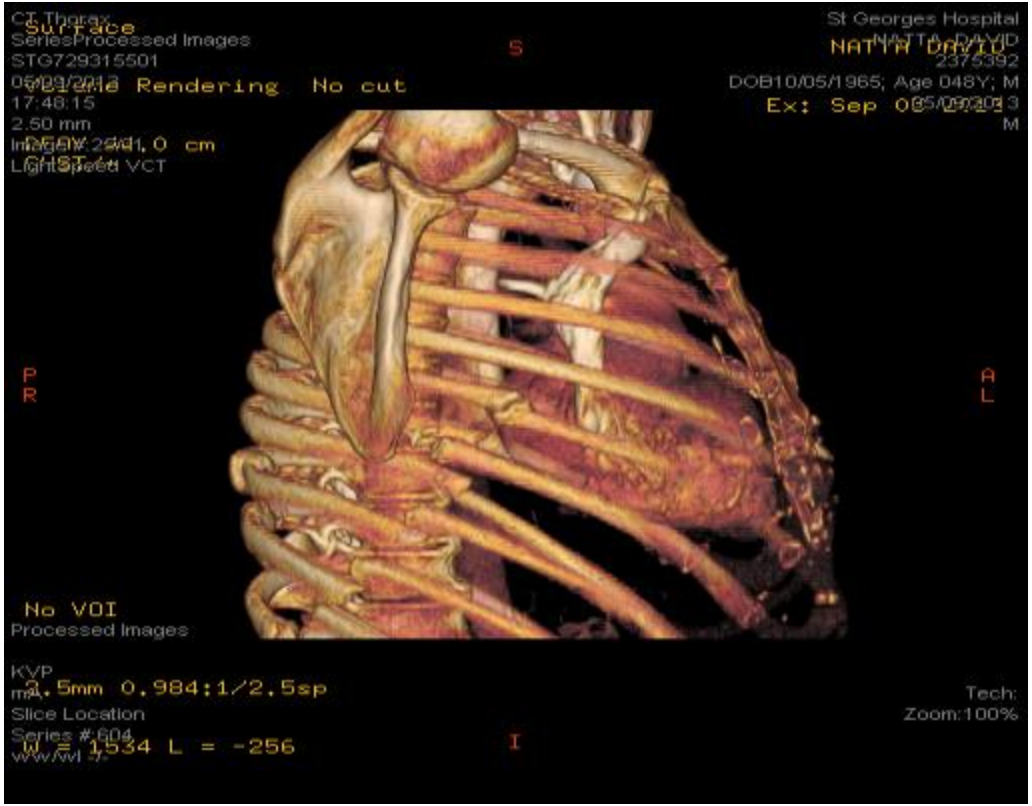
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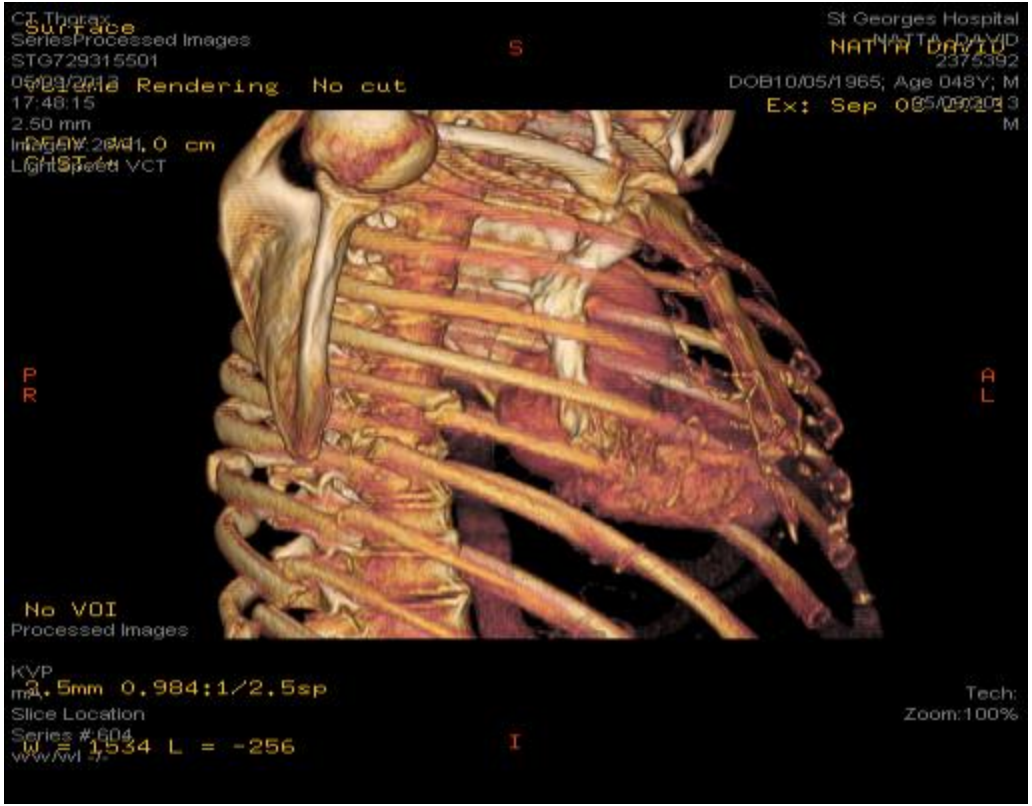
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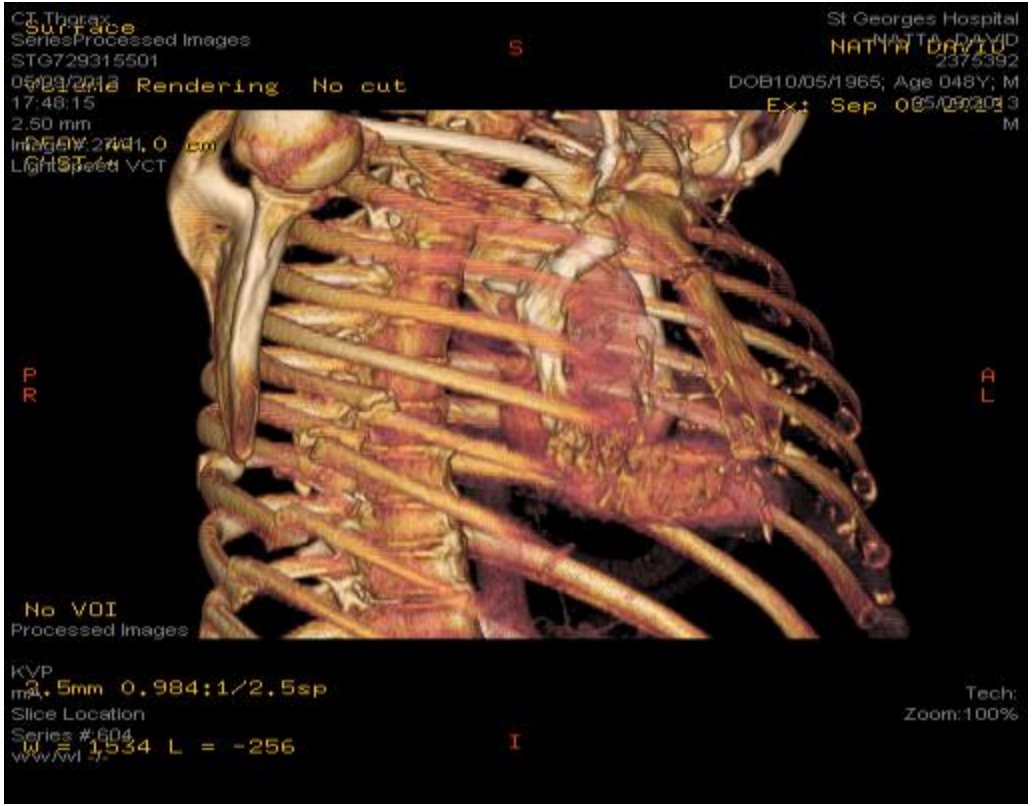
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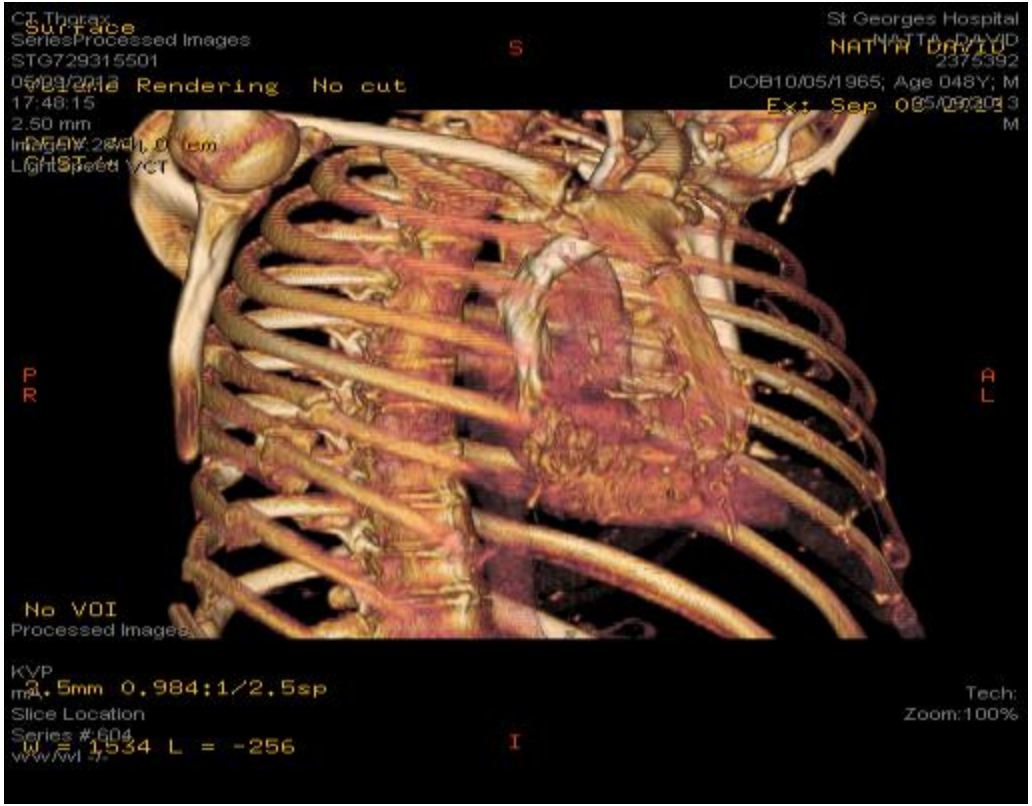
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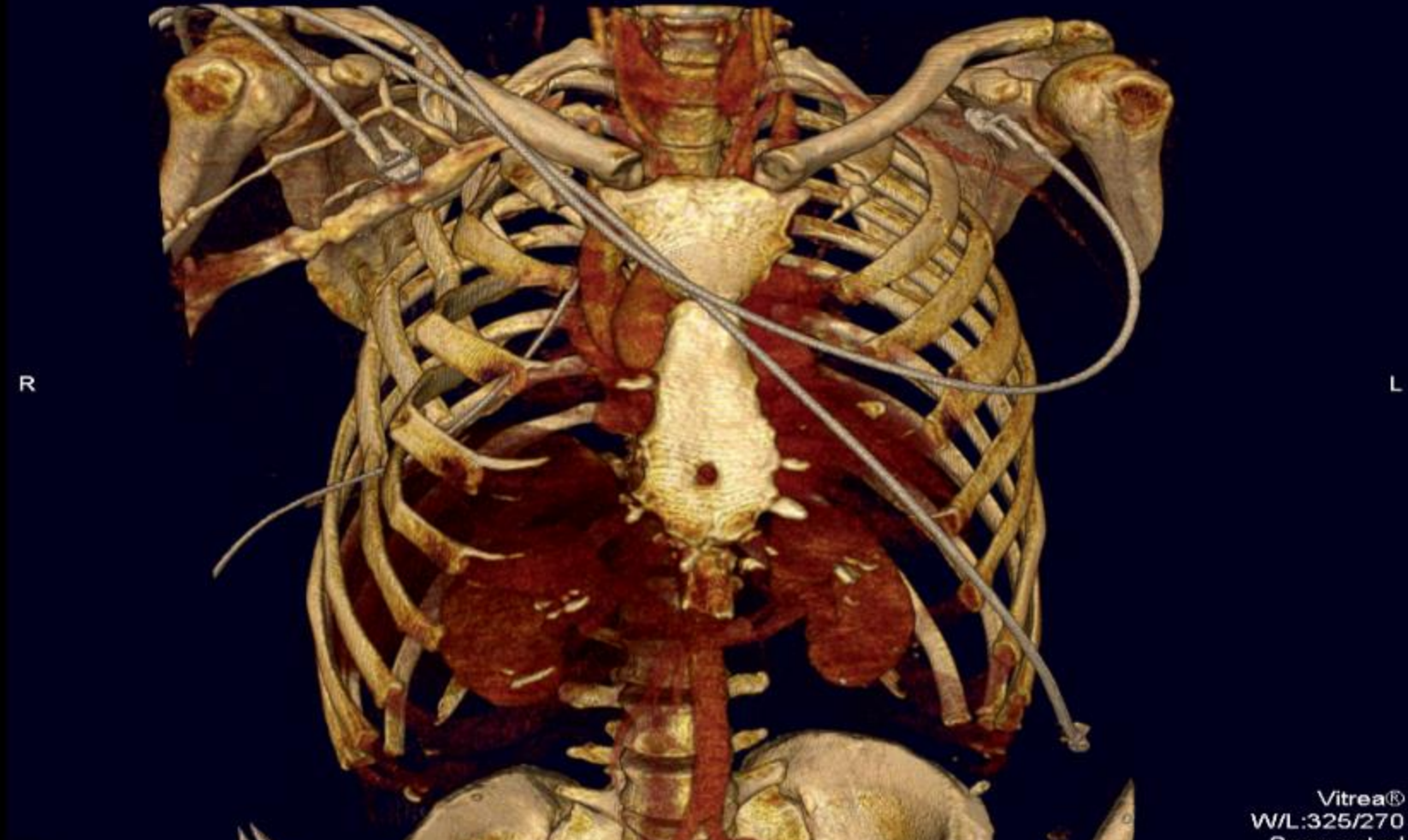
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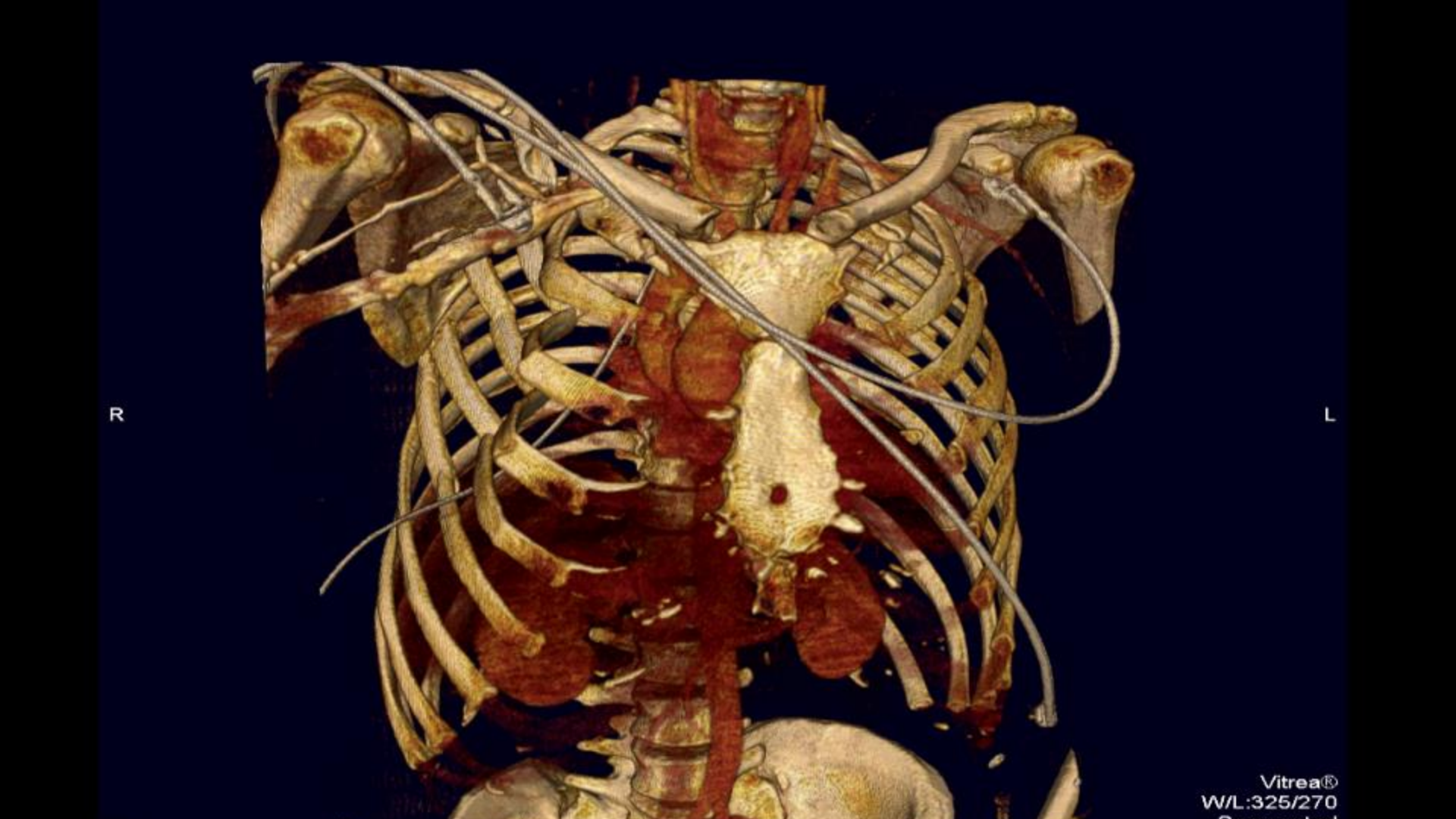
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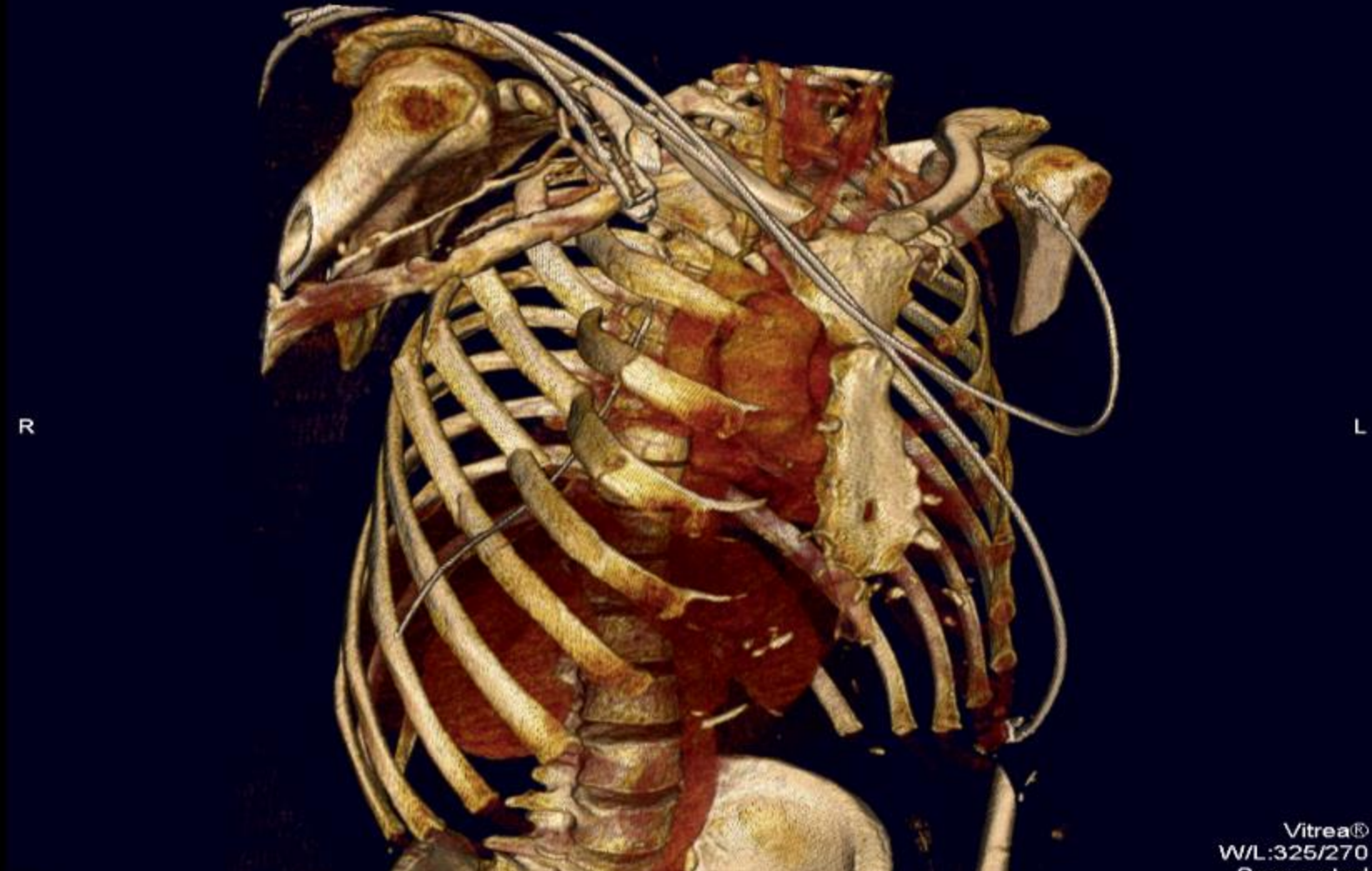
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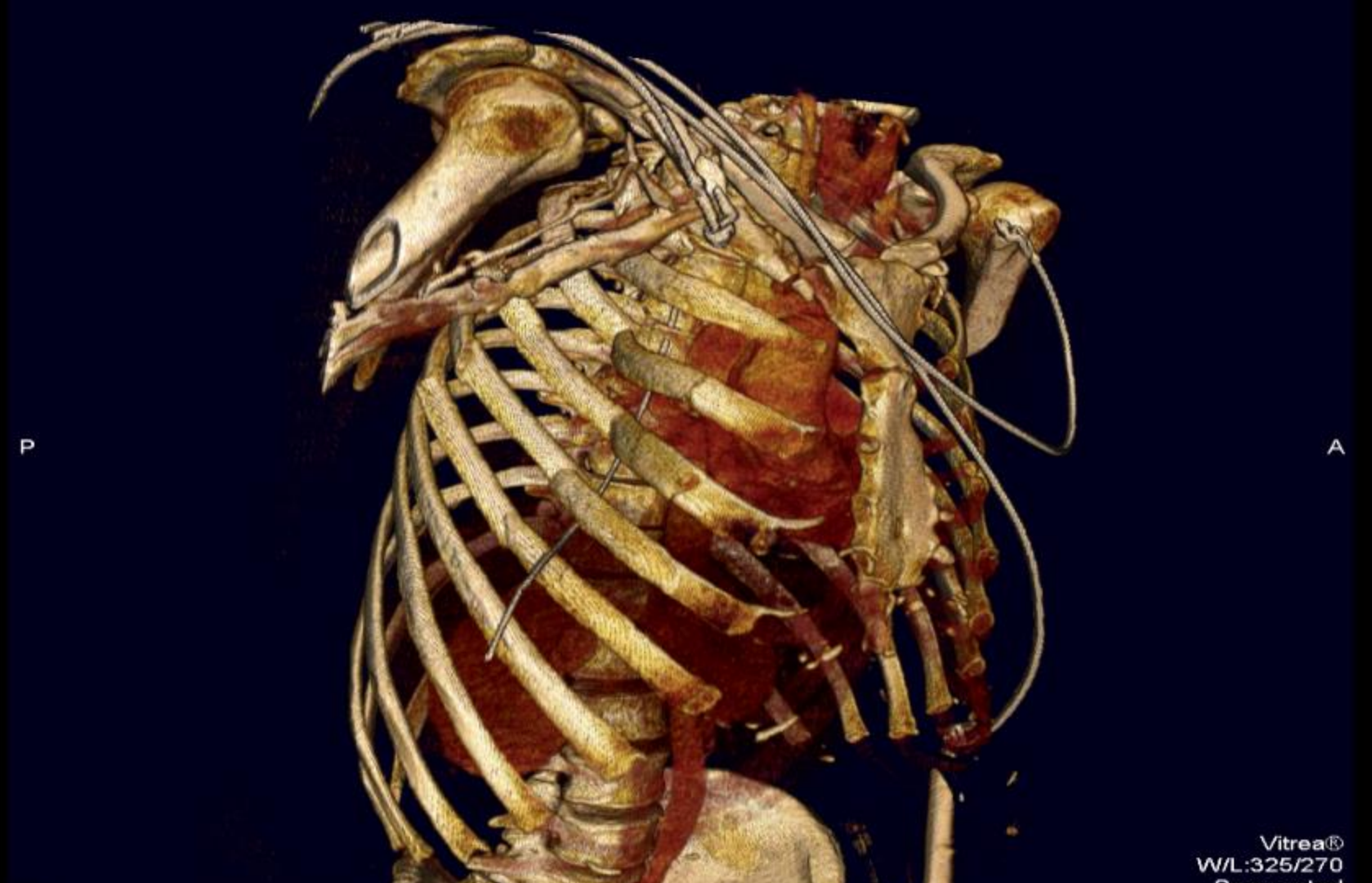
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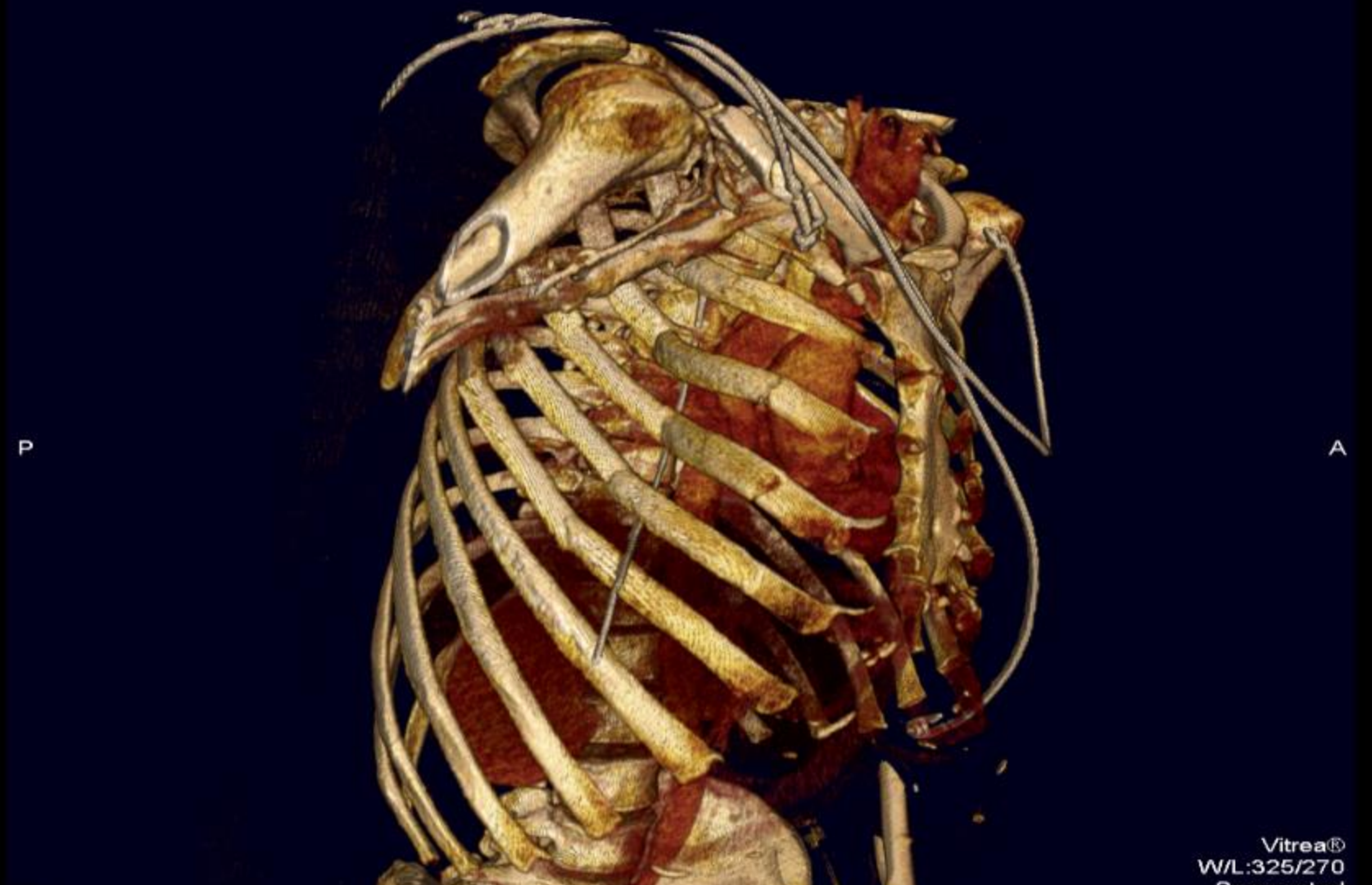
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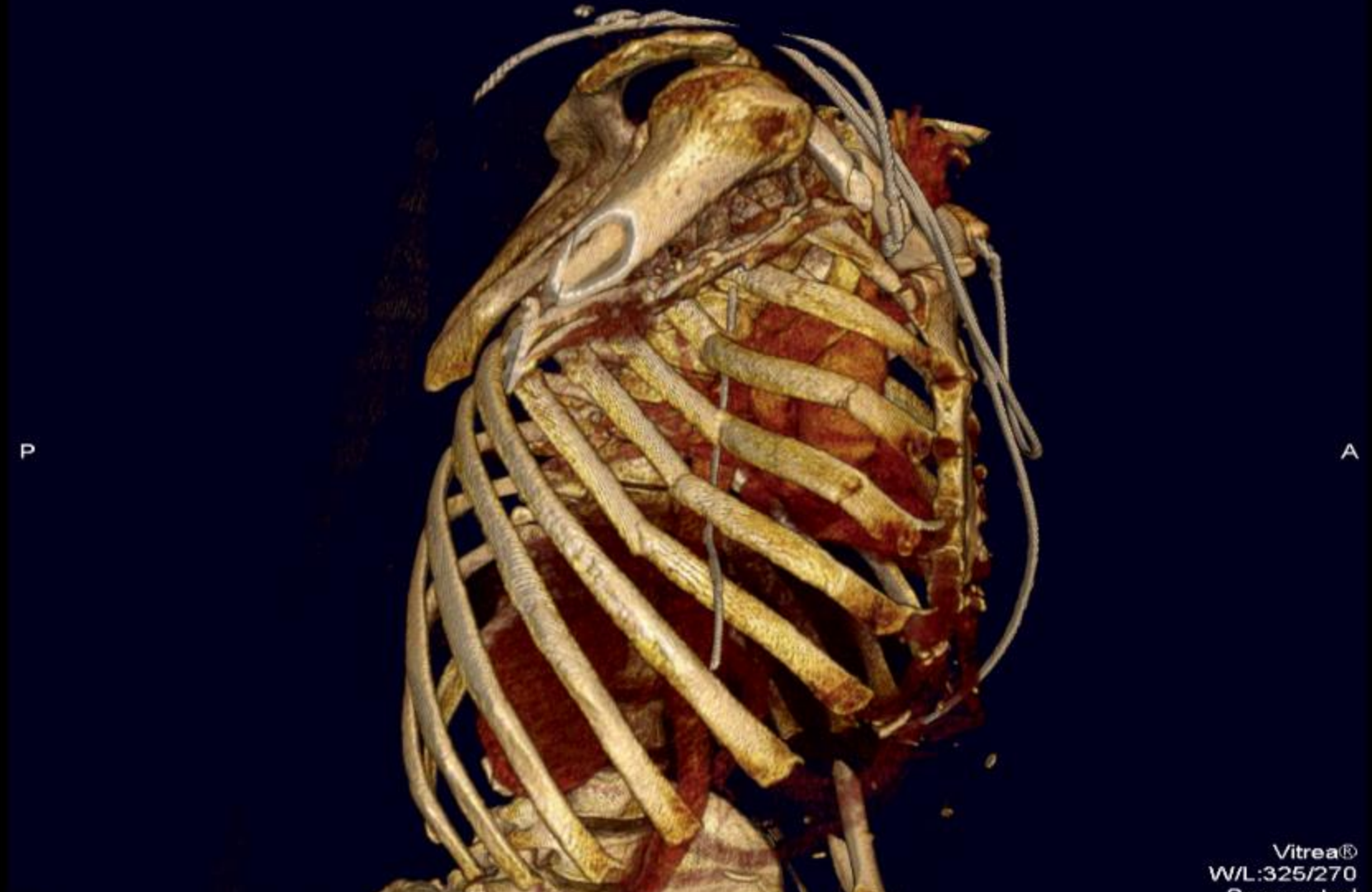
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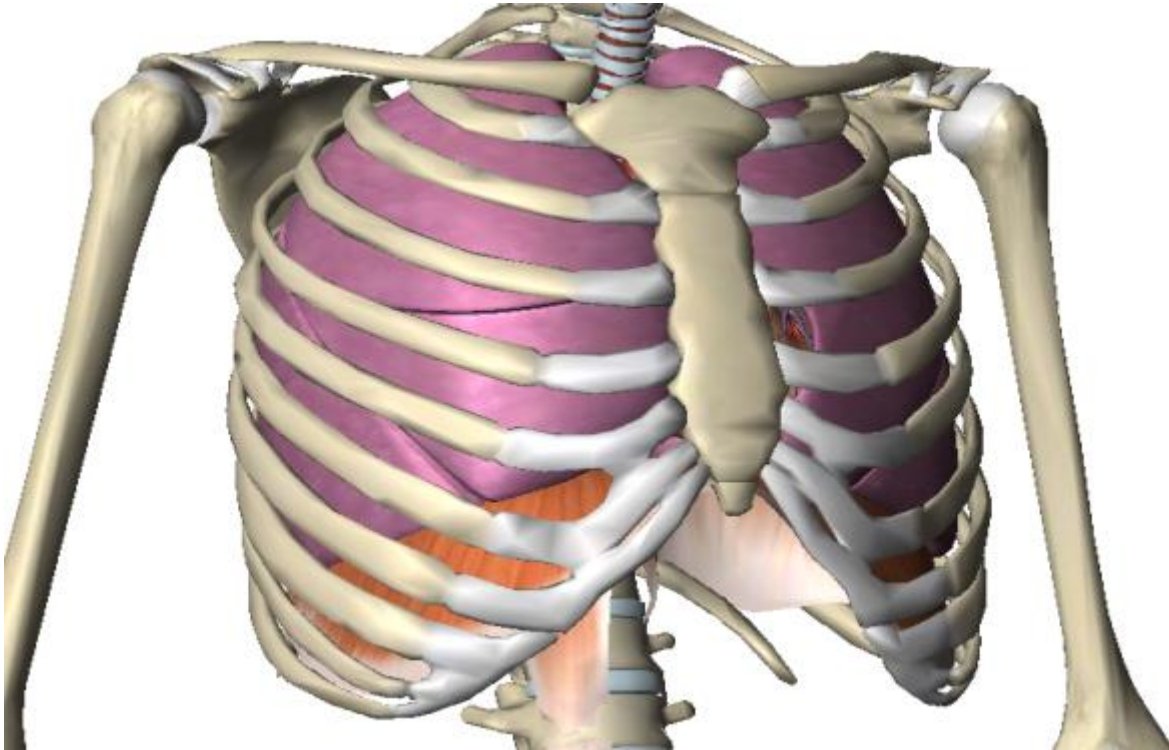
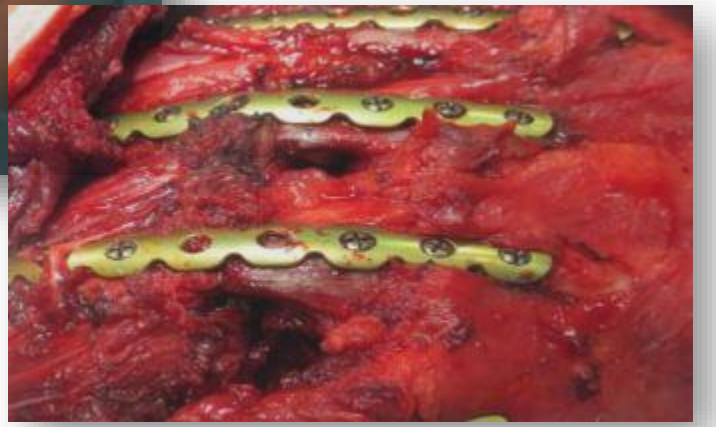


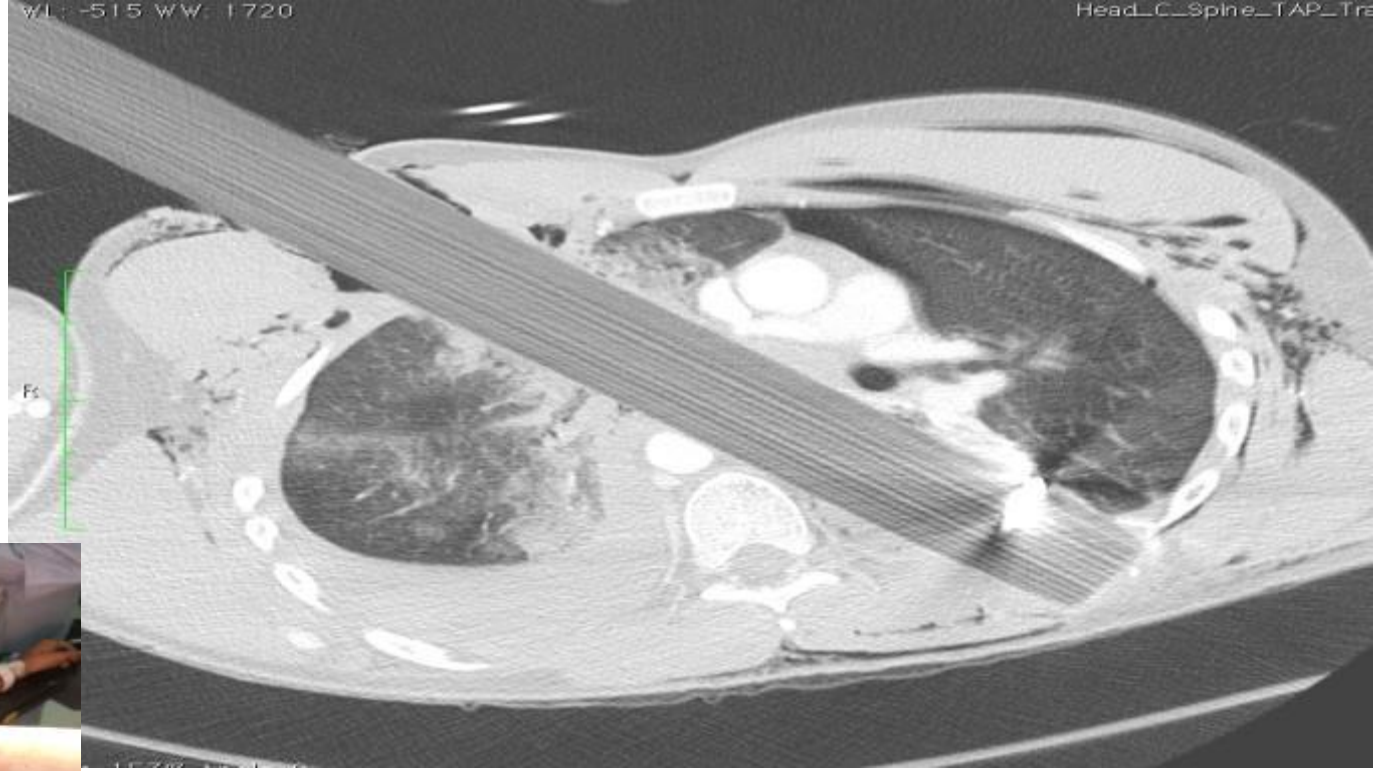


Evolution of the VATS role in trauma

Established in managing certain situations

- Haemodynamically stable
- Blunt & Penetrating chest trauma
- ‘exploration’
  - Evacuation of clot
  - Ligation of minor vascular/lung parenchymal injury
- Assessment of occult injuries
  - Diaphragmatic injuries

- LIMITATIONS!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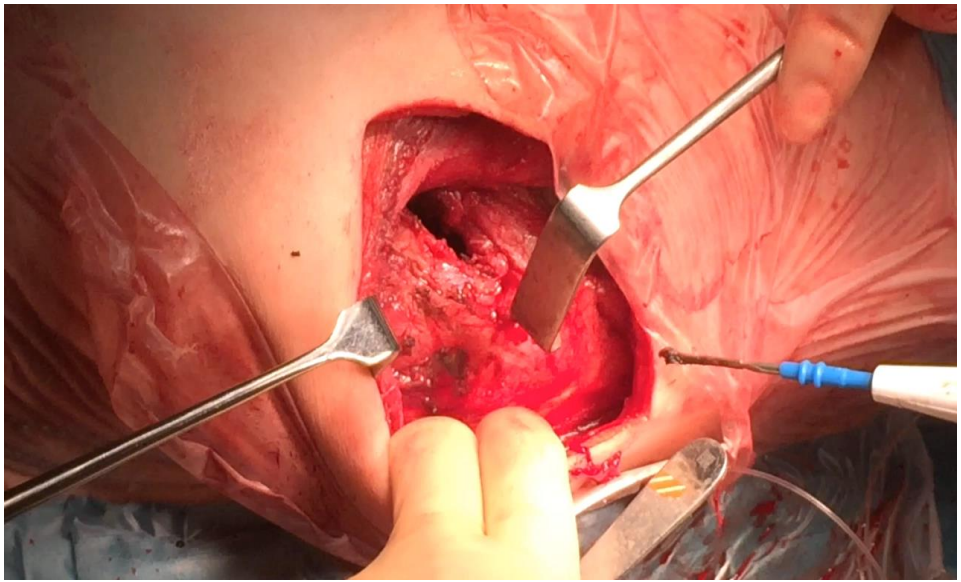
A little flavour of the advantages of VATS (Keyhole)

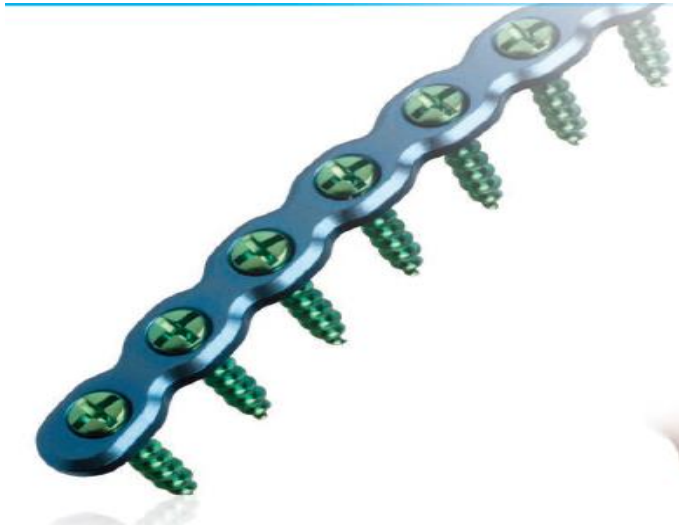
Surgical technique (evolving)

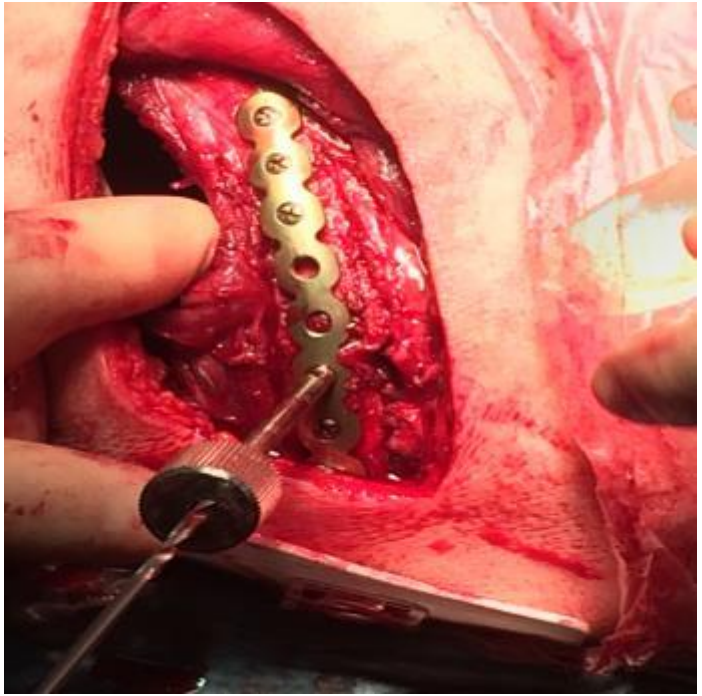
- Place small thoracotomy
- Dissect down onto fracture site
- Reduce the fracture
- Preparation



Surgical technique (evolving)

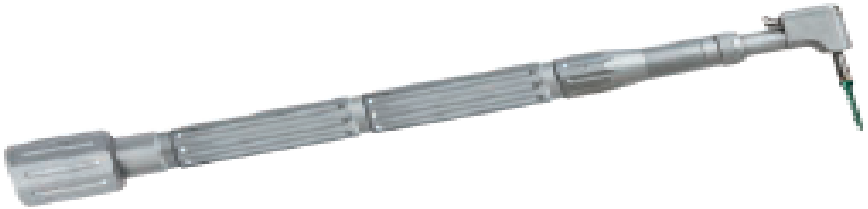
- Stabilisation



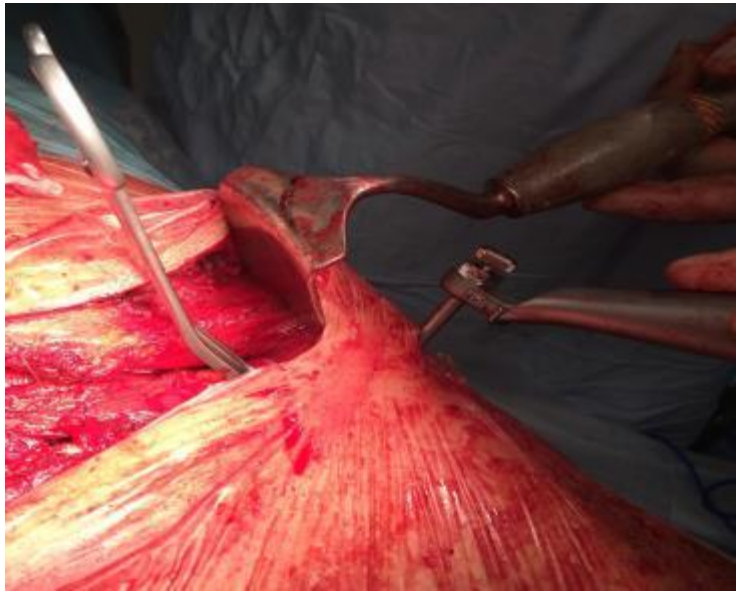


Surgical technique (evolving)

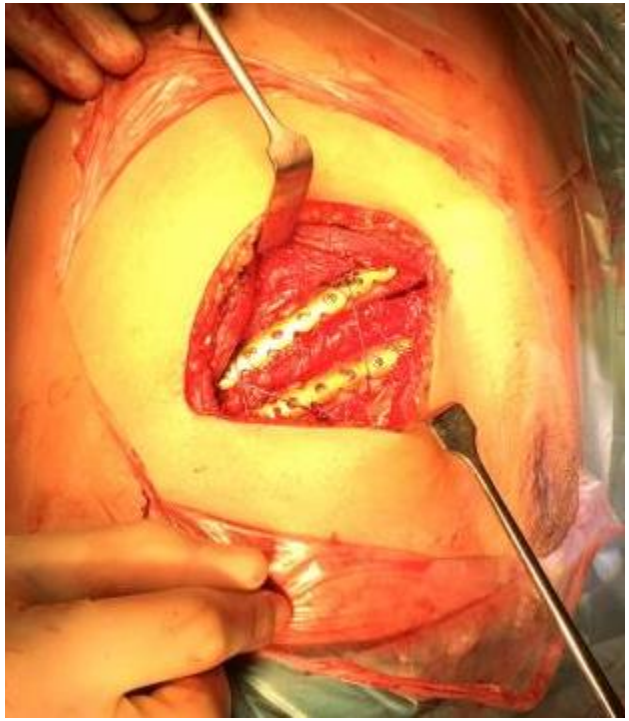
- Extra's…
- (for those difficult to reach areas)



Contra-Angle Screwdriver



Surgical management of complex rib fractures



LEARNING CURVE ASSOCIATED WITH RIB FIXATION: THE ROLE OF VATS

Rib fixation (sternum excluded)

Data:

- Retrospective data
- 2011 -2015
- N=24 (at submission)
- (N=34)

Thoracic Trauma (integrated service)

- 25-30 patients/month/unit
- “Becoming significant part of thoracic surgical practice”

Eur J Trauma Emerg Surg
DOI 10.1007/s00068-015-0598-5

CrossMark

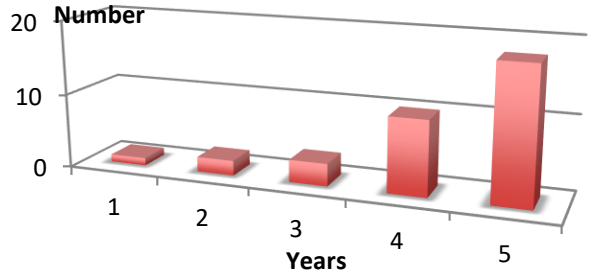
ORIGINAL ARTICLE

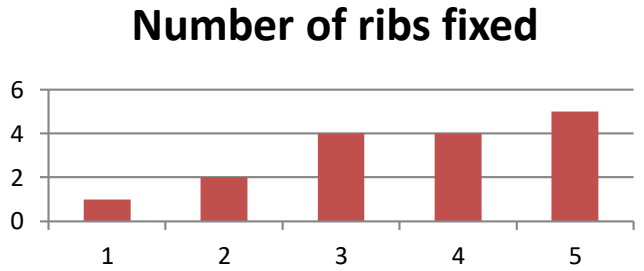
The role of a video-assisted thoracic approach for rib fixation

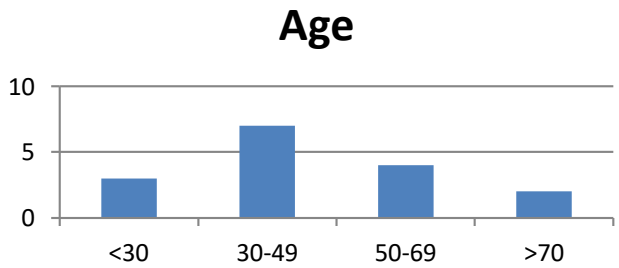
S. F. Fraser[1] · C. Tan[2] · M. K. Kuppusamy[2] · P. Gukop[1] · I. J. Hunt[2]

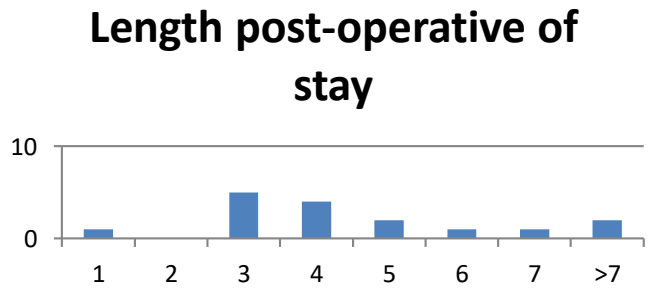
LEARNING CURVE ASSOCIATED WITH RIB FIXATION: THE ROLE OF VATS (IN PRESS, FEB)

Demographic (n=24)
Age: mean 48yrs
M:F (80:20)





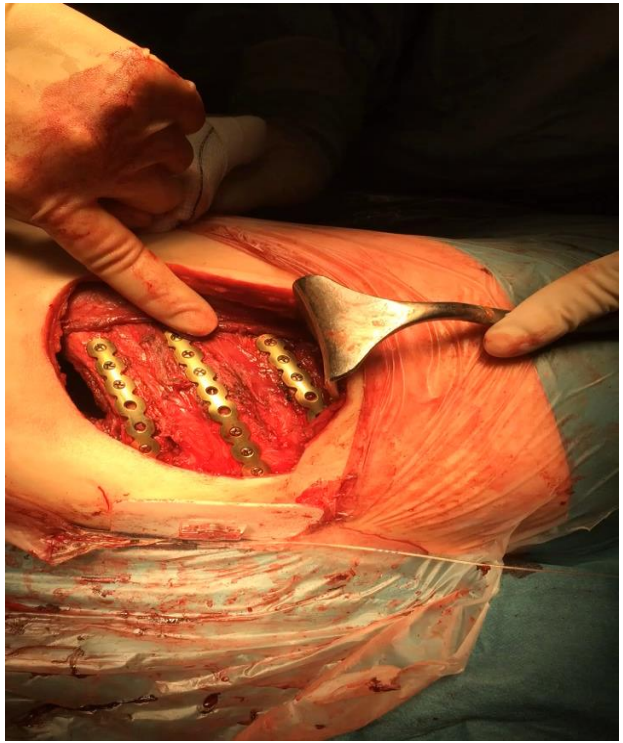




LEARNING CURVE ASSOCIATED WITH RIB FIXATION: THE ROLE OF VATS

Results:

- OR time Mean 81 mins (excluding 2 combined procedures (thoracic spinal fixation)
- Average number of Ribs Fractured 6.6
- Average number of ribs fixed 3.6
- No mortality
- Morbidity – 1 patient required return to theatre (evacuation of clot)
- LOS 5.1 days (including 2 patients returned to ICU)
- Follow-up data? 1 patient developed chronic pain (requiring LT analgesia)



Acknowledgements

Mr Ian Hunt

Ms Carol Tan

Questions?

Flail segment

Initial ATLS management:

- Oxygen
- Re-expand lung
- Intubate as indicated
- Judicious fluids
- Analgesia