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H-fistula

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Patient

- Patient X
- 5 m / boy
- Weight 4.33 kg

- EMLSCS due maternal pre-eclampsia
- Born at 34w 5days, birth weight 1.95 kg

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What’s in the literature?

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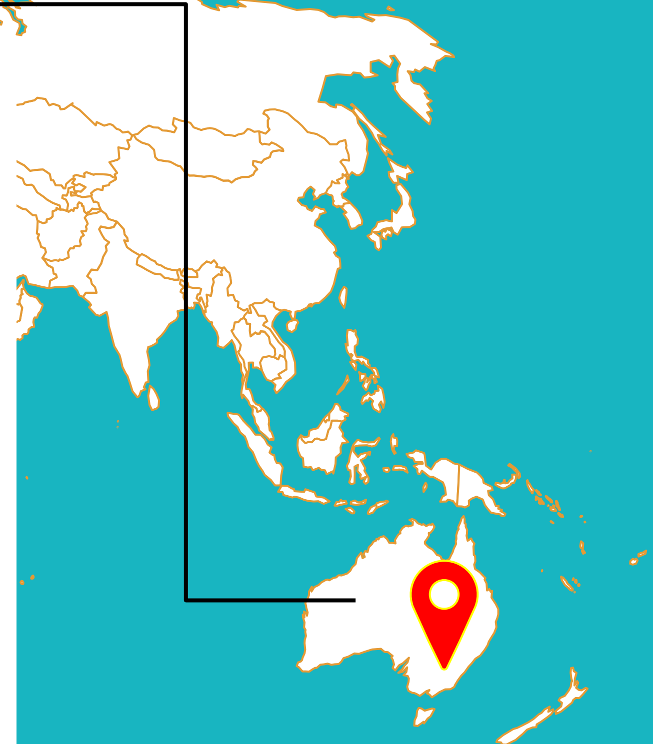
Australia



70 years experience (1948-2017)
Royal Children's Hospital Melbourne

1088 TOF
56 (5.1%) H-fistula
82% symptomatic in first week of life

46% Associated congenital anomalies

22% vocal cord palsy
5.6% leak, 9.3% recurrence, 1.9% stricture,
1.9% diverticulum

Taghavi et al JPS 2021

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Saudi Arabia

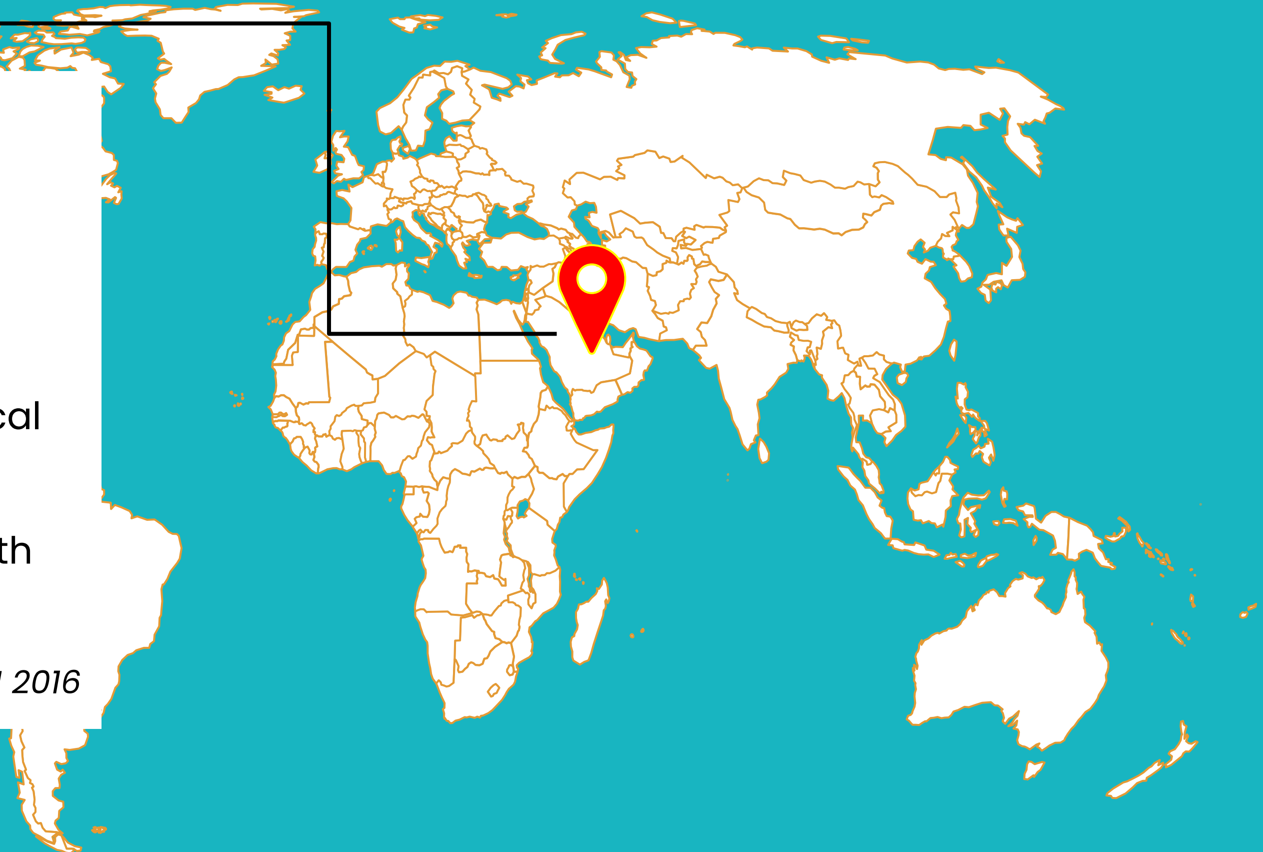
National multicentre
Jan 1998 – Dec 2013

435 OA/TOF
23 (5.3%) H fistula

1 thoracoscopic repair
The rest via right cervical incision

2 patients RLN palsy with complete recovery

Al-Salem AH et al, PESI 2016



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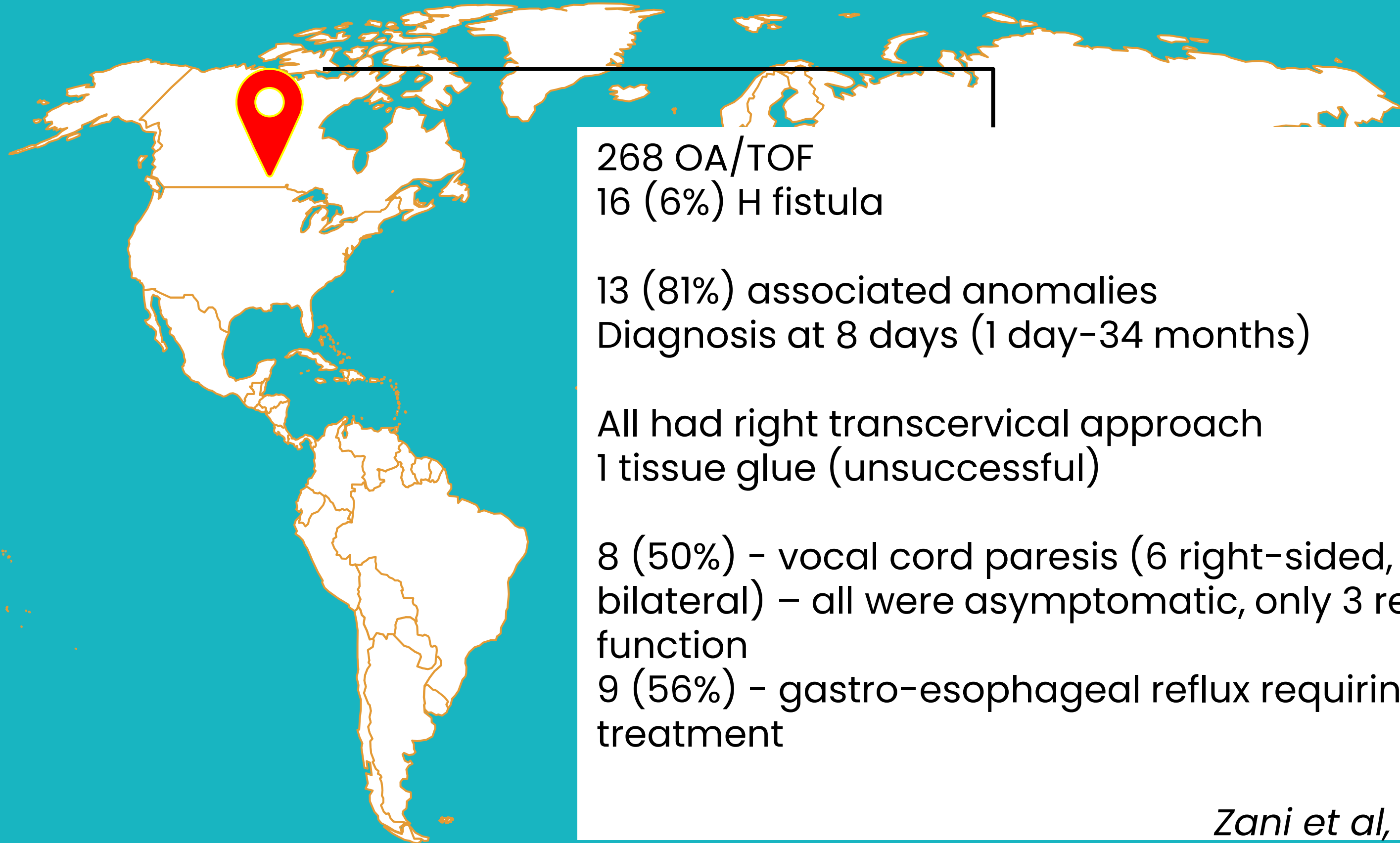
Canada – Sick Kids Toronto



268 OA/TOF
16 (6%) H fistula

13 (81%) associated anomalies
Diagnosis at 8 days (1 day-34 months)

All had right transcervical approach
1 tissue glue (unsuccessful)

8 (50%) - vocal cord paresis (6 right-sided, 2 bilateral) – all were asymptomatic, only 3 regained function
9 (56%) - gastro-esophageal reflux requiring treatment

Zani et al, PESI 2017

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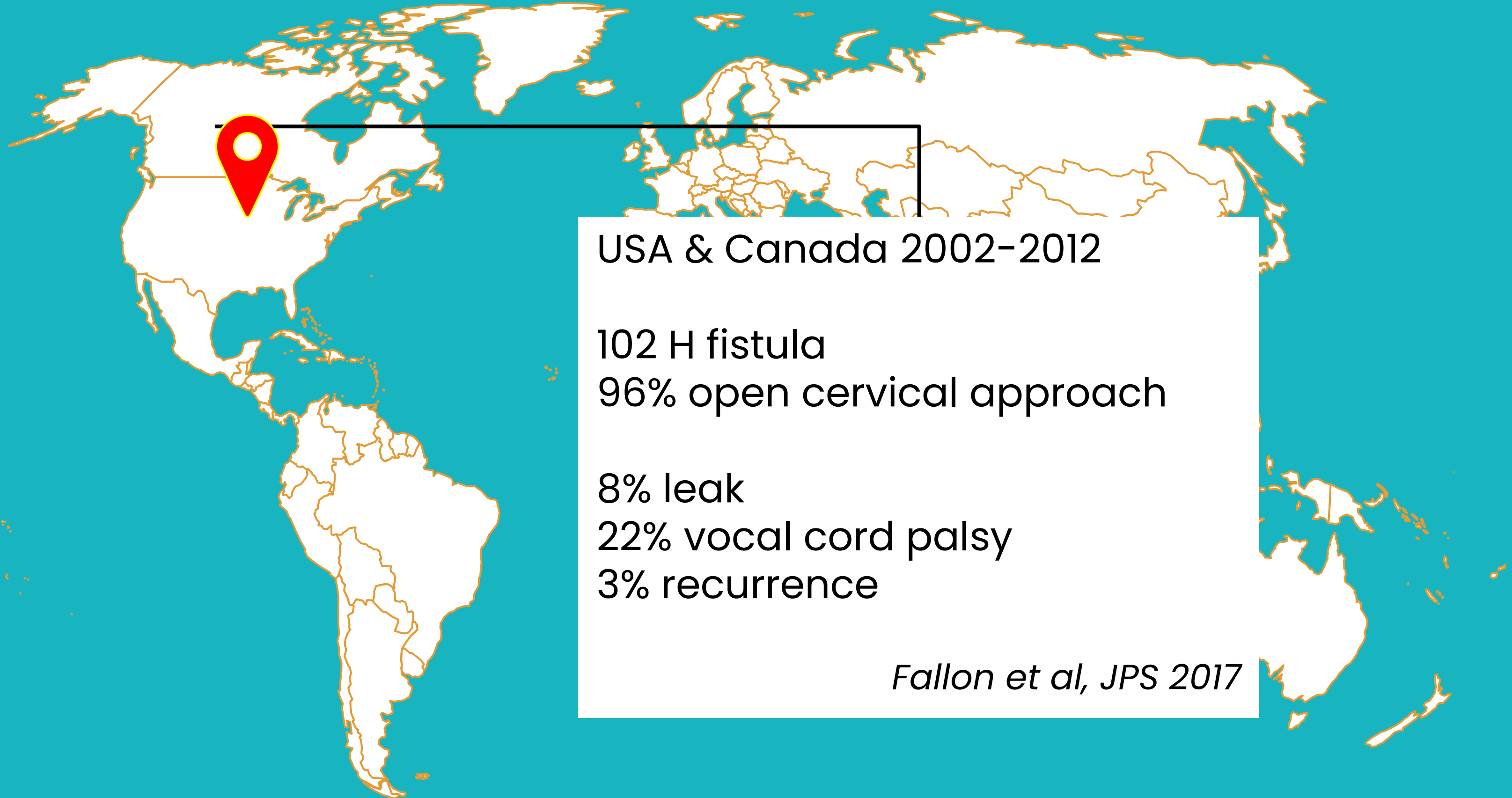
14 hospitals: USA & Canada



USA & Canada 2002-2012

102 H fistula
96% open cervical approach

8% leak
22% vocal cord palsy
3% recurrence

Fallon et al, JPS 2017

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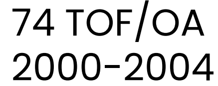
Paediatric Institute HKL



74 TOF/OA
2000-2004

90% distal TOF
8% OA without TOF

H-fistula – zero
(likely due to selection bias as cases were obtained from the surgical NICU only)

Nah et al (unpublished)

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Clinical presentation

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Patient X: History

- Recurrent penumonia requiring intubation x 3 episodes
- Persistent right upper lobe collapse
- CPAP dependent since day 24 of life
- Multiple investigations
  - CECT
  - Bronchoscopy x 2 – severe tracheomalacia
  - ECHO – no vascular ring
- Contrast swallow
  - confirmed H type TOF

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Literature: Clinical symptoms

- First months of life

- Choking during feeds
- Cyanotic spells
- Recurrent pneumonia

- Non-specific symptoms – delayed diagnosis
- Delays in surgery are due to delayed diagnosis, not delayed presentation

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Diagnosis

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Fluoroscopy

- Tube oesophagogram
  - Prone
  - Slow withdrawal of gastric tube into oesophagus
- Water soluble contrast recommended
- Sensitivity 50-73%

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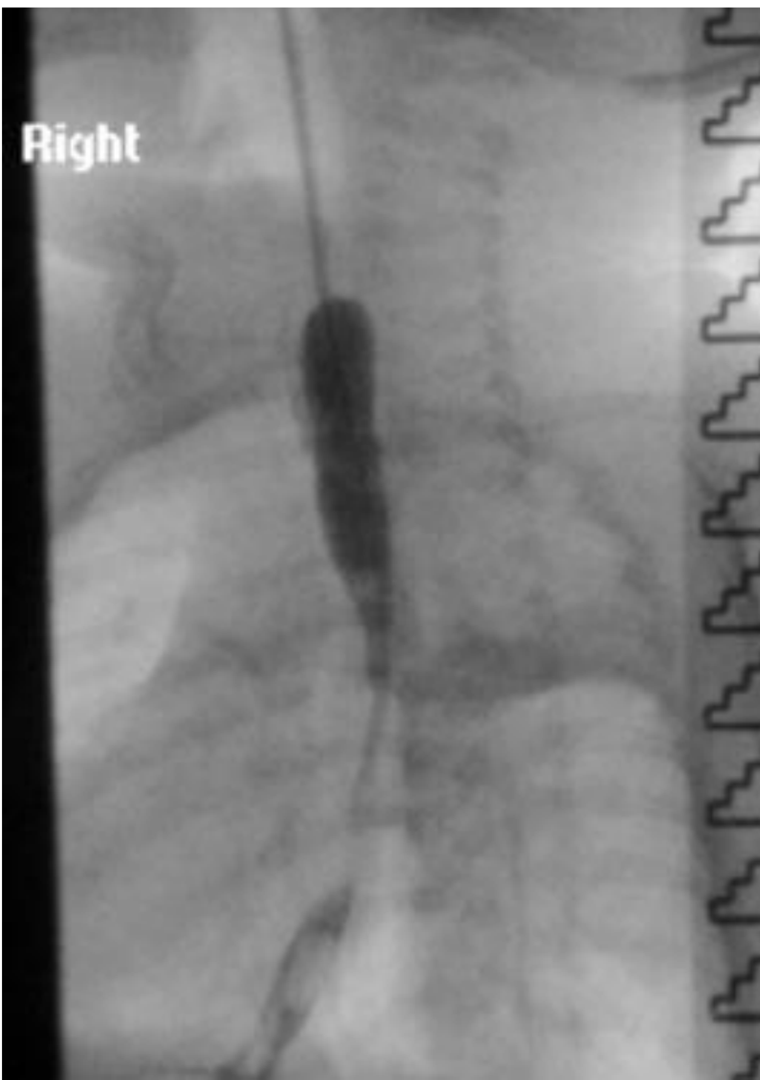
Patient X



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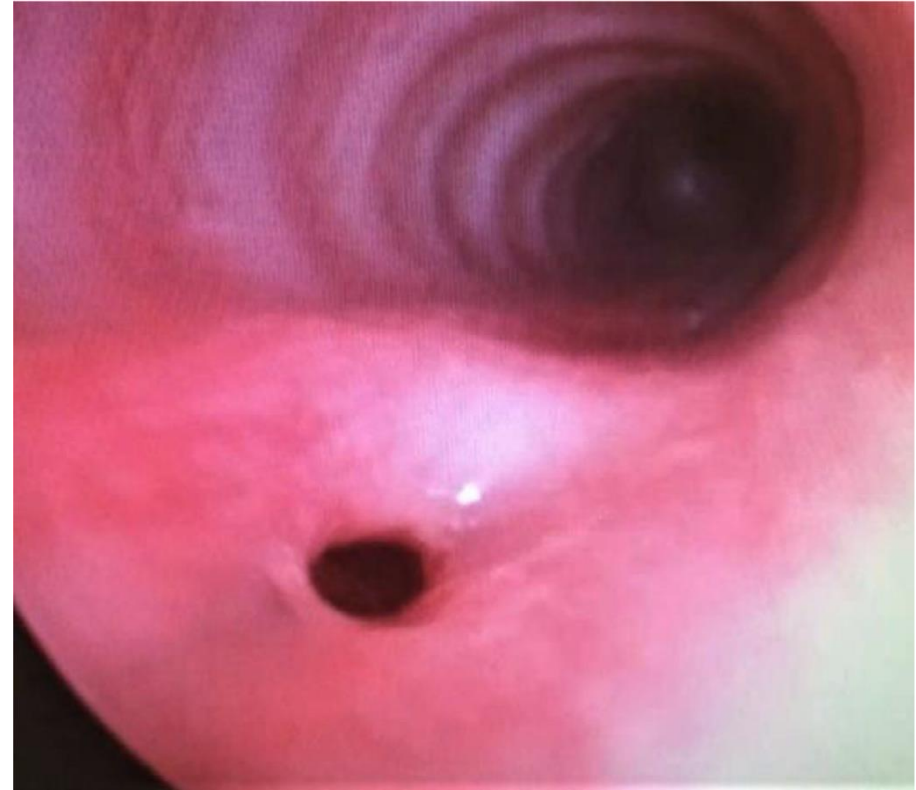
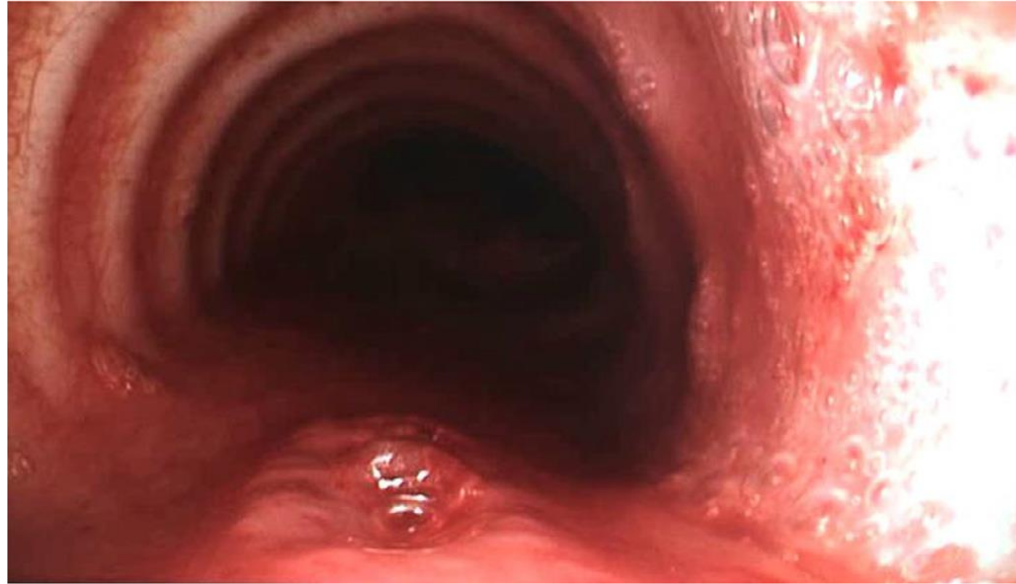
Right

Bronchoscopy

- Rigid bronchoscopy
  - Better visualization
  - Distension of posterior tracheal wall
- Associated airway anomalies
  - tracheomalacia, laryngeal cleft, stenosis, vocal cord paralysis, second fistula



Air injection



- Air or saline injection
  - Into the endotracheal tube
  - Confirmed by presence of bubbles/saline
  - Methylene blue can also be used

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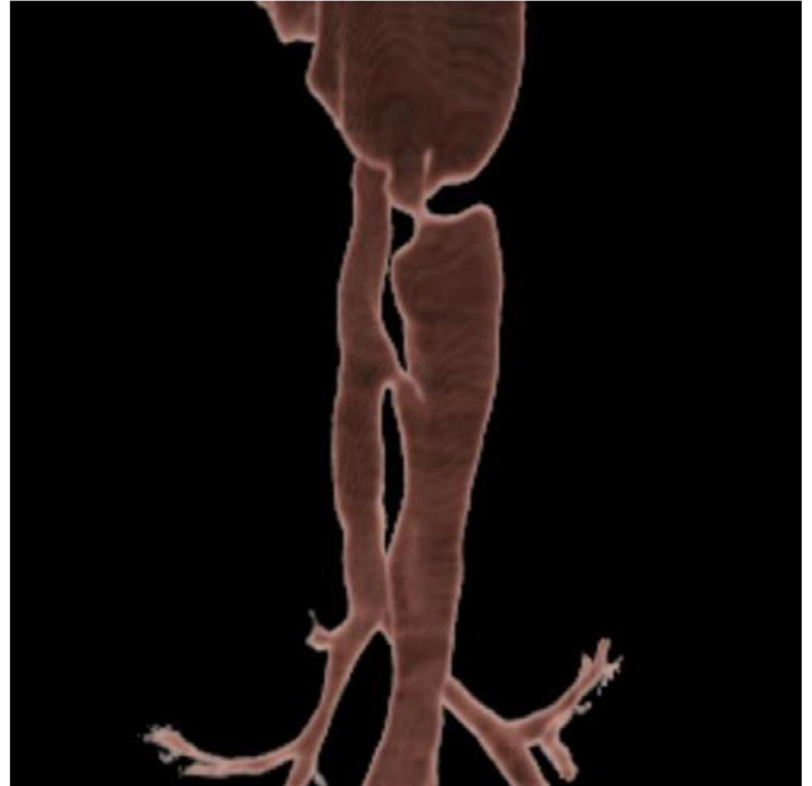
Other methods

- CT or MRI imaging
- Usually for sick patients

Gutierrez et al, Sem Ped Surg 2021



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Surgery

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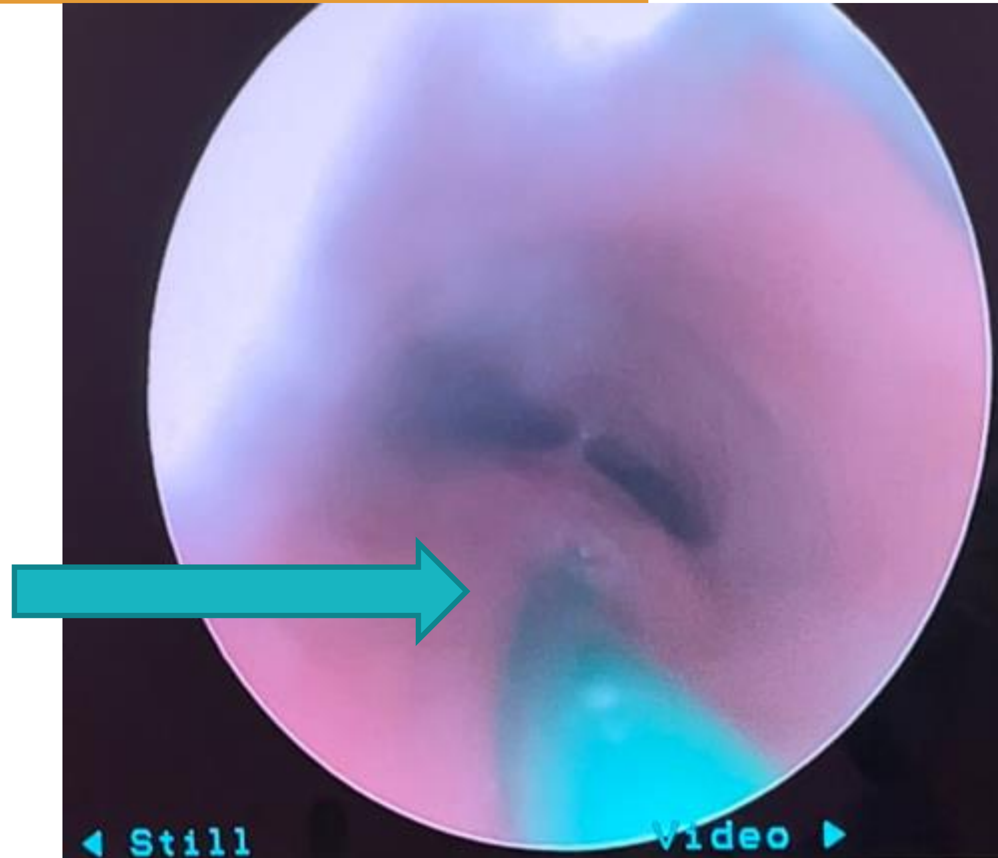
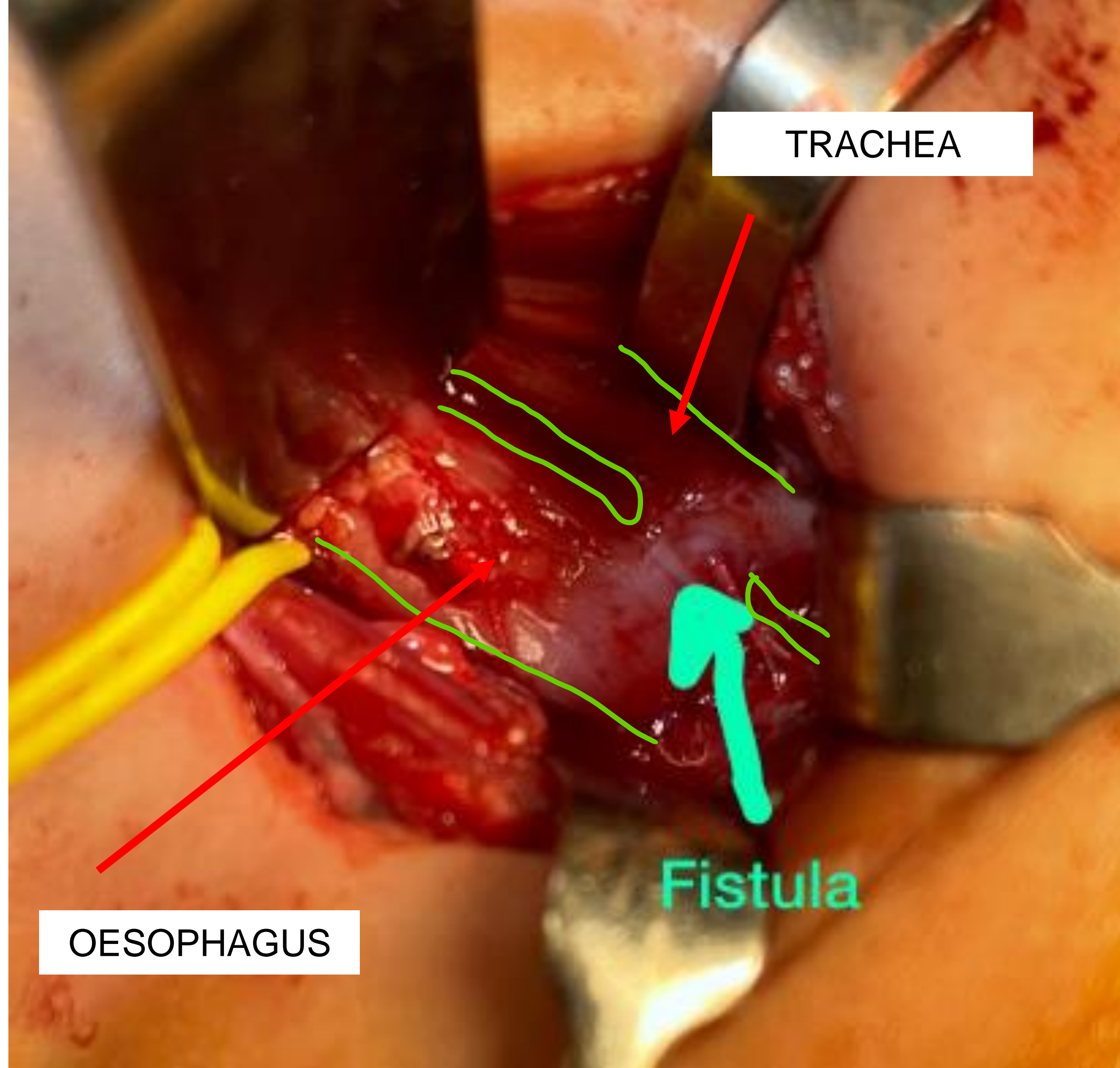
Patient X: Operative repair

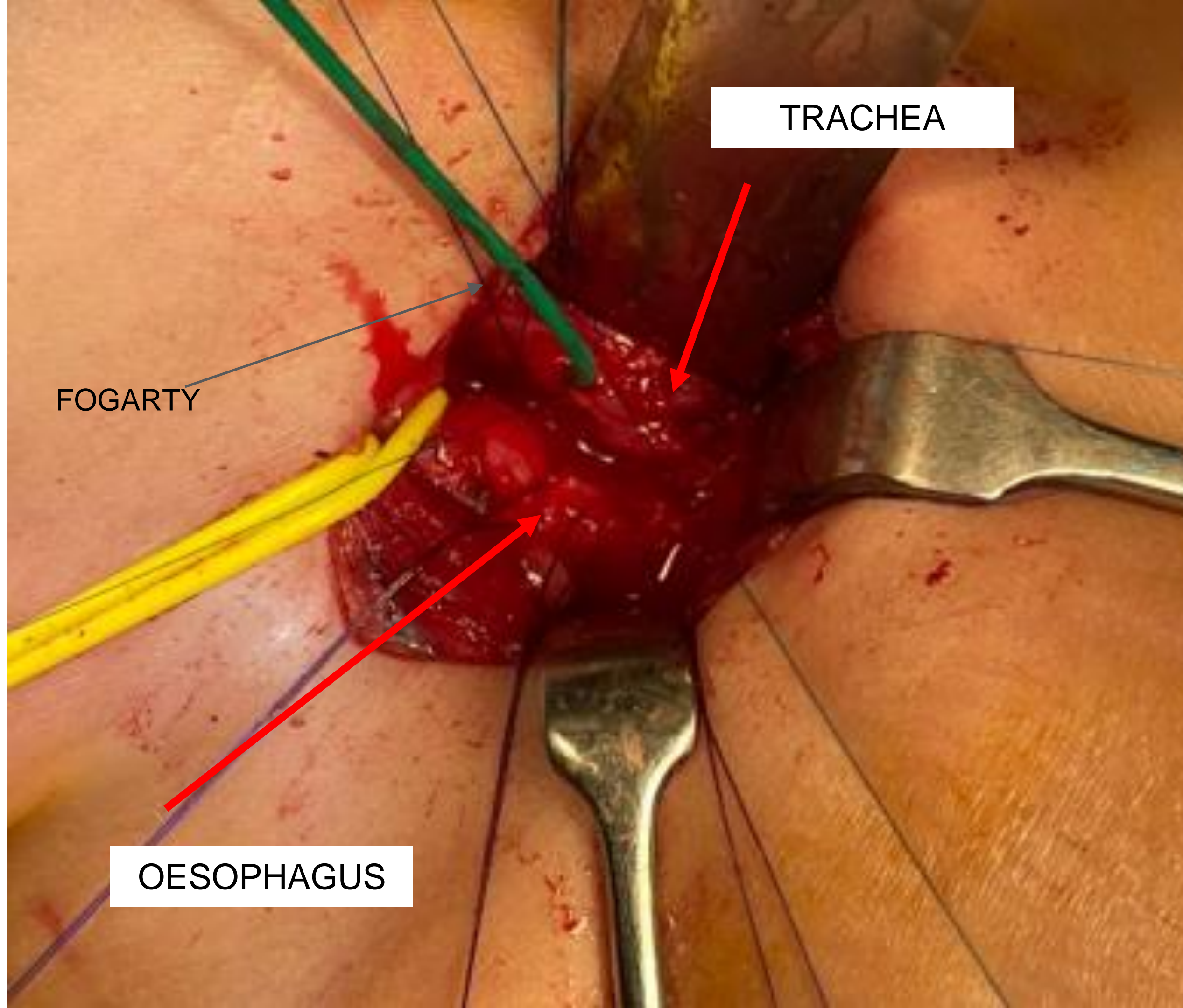
- Bronchoscopy, right cervical approach TOF fistula ligation and repair

- Intraoperative finding:
- Bronchoscopy:
  - Fistula at posterior wall



- Right cervical approach
- Presence of H type fistula at cervical esophagus (above the thoracic inlet)





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Open approach

- Right cervical incision
  - Dissection in root of neck
  - (Majority H-fistulae – T2)
- Thoracotomy
  - If lower than T2

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Operative considerations

- Fistula tract cannulation
  - Guidewire, Fogarty, ureteric stent/catheter
- Ligation & non-tension closure of both oesophageal & tracheal sides
- Tissue interposition
  - Strap muscles, parietal pleura, fat
- Drain?

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Ablation methods

- Glue – most successful
- Silver nitrate - poor
- Electrocautery - poor

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Thoracoscopic repair

- Restricted visualization
- Variable scope placements, size of scopes, optical angle
- Rothenberg – better visualization of recurrent laryngeal nerve

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Follow-up

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Patient UW: Early post-operative progress

POD5
Planned direct laryngoscopy, tracheobronchoscopy under GA by ENT

- Severe tracheomalacia
- Sutures intact

POD9 Upper contrast study done

- no evidence of leak

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Patient UW: Progress

Hoarseness of voice – nearly resolved
No further bouts of pneumonia

Persistent right upper lobe collapse
Swallowing incoordination (but wants to eat)
CPAP – weaned to 4 hours a day

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Literature: Complications

- Leak – 2-5 %
- Recurrence – 2-3%
- Tracheomalacia – 3%
- Perioperative mortality – 1.7%

- Right vocal cord palsy
  - up to 50%
  - value of pre-operative vocal cord assessment
- Gastro-esophageal reflux (some perform fundoplication)

- Achalasia like dysmotility (adults)
- Megaoesophagus (adults)

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My observations
n=1

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Different approach to the carotid triangle

Surprisingly substantial oesophagus

N orientation, not H

Closely adherent oesophageal & tracheal wall

Post op care adjusted to team experience and resources

- upper contrast
- repeat bronchoscopy pre-extubation

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Thank you

Dr Gomalaa – assistance with patient's clinical records

UMMC/UM – academic staff & MOs

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