Evidence & Guidelines Committee

- **Analysis based on the highest quality data**

- **Report** at EUPSA Congress (dissemination and discussion)

Esophageal atresia and TEF

1. Diagnostic and operative technique

1.	Routine preoperative bronchoscopy	Huang Yingying, Haitao Zhu
2.	Open vs thoracoscopic repair	Chen Young and Stella Sabbatini
3.	Magnetic anastomosis	Lisandro Luques, Stella Sabbatini and Naho Fujiwara

2. Postoperative strategy

1.	Trans-anastomotic tube	Elke Ruttenstock
2.	Ventilation, muscle paralysis and neck flex	Naho Fujiwara and Mashriq Alganabi
3.	Antiacid treatment	Nigel Hall

3. Management of long gap

1.	Growth by traction (open or thoracoscopic)	Tomas Wester, Carmen Mesas Burgos + Simon Eaton
2.	Delayed anastomosis	Fabian Doktor and Augusto Zani
3.	Kimura procedure	Naho Fujiwara

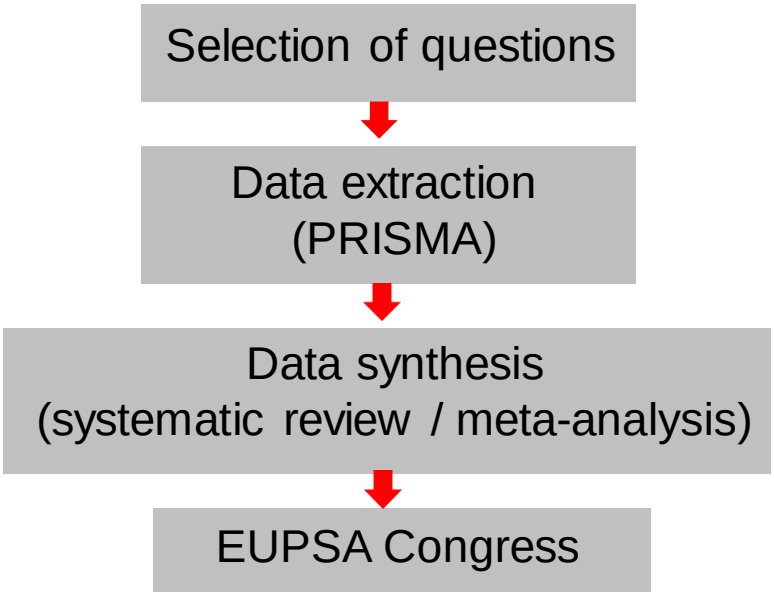
4. Esophageal replacement

1.	Gastric transposition	Giuseppe Lauriti, Maria Enrica Miscia, and Francesco Morini
2.	Gastric tube	Francesco Morini, Maria Enrica Miscia and Giuseppe Lauriti
3.	Colonic interposition	Reto Baertschiger and Lisandro Luques - Annika Mutanen
4.	Jejunum interposition	Annika Mutanen

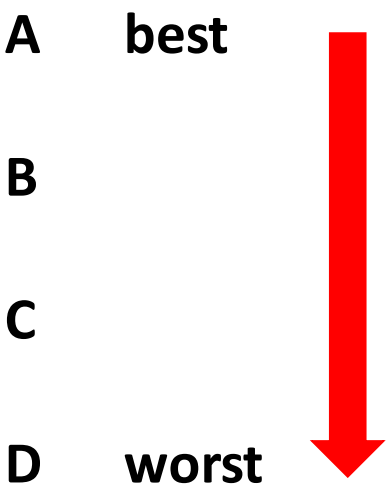
5. Tracheomalacia

1.	Aortopexy or posterior tracheopexy	Ramon Gorter, Paul van Amstel and Stefaan Tytgat

Methodology



Grades of Recommendation



Adrian Baker et al. Clin Med 2010;10:358-363

Royal College of Physicians

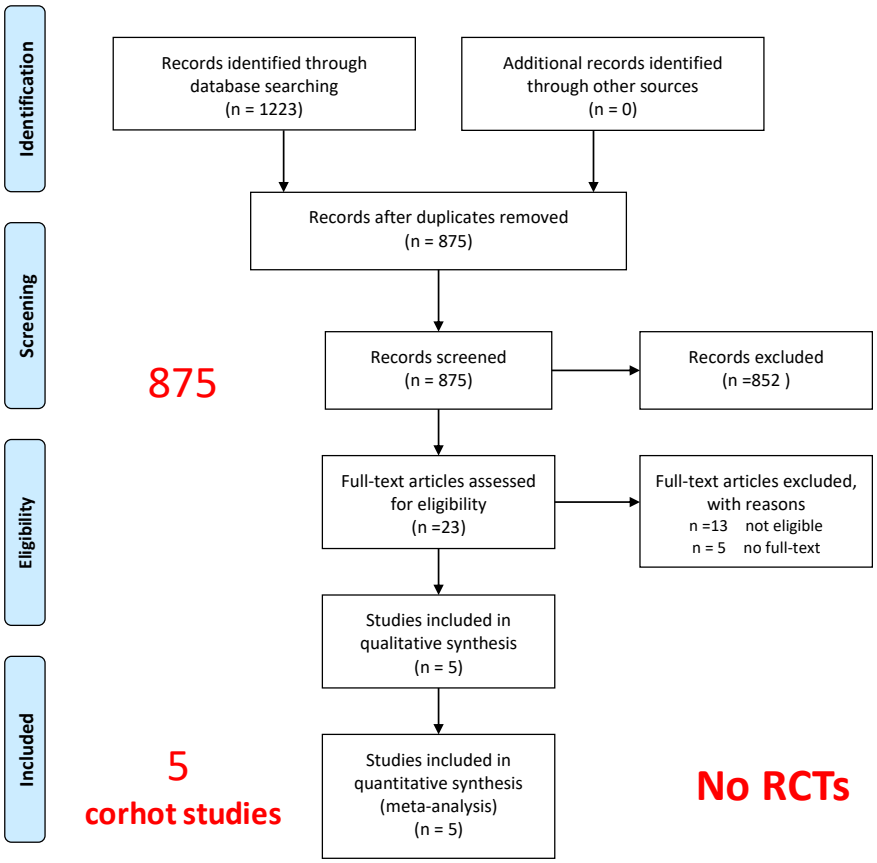
Is a routine pre-operative bronchoscopy beneficial to children with esophageal atresia(EA) and/or tracheoesophageal fistula (TEF)?

Yingying Huang & Haitao Zhu

PICO strategy

- **P**opulation: Children clinically diagnosed with EA and/or TEF
- **I**ntervention: Bronchoscopy before primary EA and/or TEF repair
- **C**omparison: No bronchoscopy
- **O**utcome:
  - **Primary:**
    - Fistula identification
  - **Secondary**
    - Surgical management variations
    - Additional findings of associated anomalies
    - Procedure-related complications

PRSIMA Flowchart



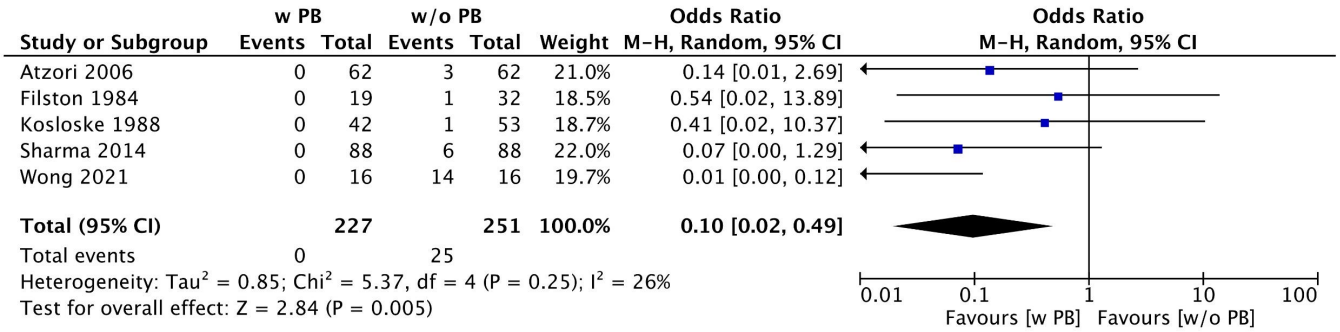
875

5

corhot studies

No RCTs

Primary Outcome----Misdiagnosis Rate of EA Types



Study or Subgroup	w PB Events	Total	w/o PB Events	Total	Weight	Odds Ratio M-H, Random, 95% CI
Atzori 2006	0	62	3	62	21.0%	0.14 [0.01, 2.69]
Filston 1984	0	19	1	32	18.5%	0.54 [0.02, 13.89]
Kosloske 1988	0	42	1	53	18.7%	0.41 [0.02, 10.37]
Sharma 2014	0	88	6	88	22.0%	0.07 [0.00, 1.29]
Wong 2021	0	16	14	16	19.7%	0.01 [0.00, 0.12]
Total (95% CI)		**227**		**251**	**100.0%**	**0.10 [0.02, 0.49]**
Total events	0		25			

Heterogeneity: $Tau^2 = 0.85$; $Chi^2 = 5.37$, df = 4 (P = 0.25); $I^2 = 26\%$
Test for overall effect: Z = 2.84 (P = 0.005)

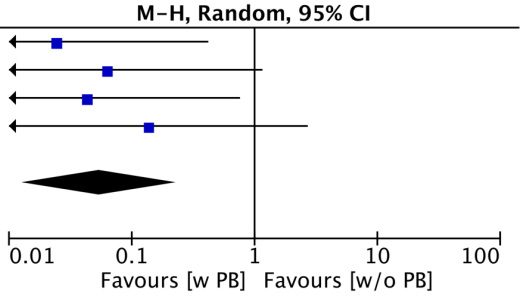
Reduced misdiagnosis rate of EA types in routine pre-op bronchoscopy vs no pre-op bronchoscopy
(OR 0.1, P=0.005)

Especially diagnosis of upper pouch fistula and H type EA

Secondary Outcome----Surgical Management Variation

Study or Subgroup	w PB Events	Total	w/o PB Events	Total	Weight	Odds Ratio M-H, Random, 95% CI
Atzori 2006	0	62	15	62	26.0%	0.02 [0.00, 0.42]
Filston 1984	0	19	9	32	24.8%	0.06 [0.00, 1.16]
Kosloske 1988	0	42	11	53	25.6%	0.04 [0.00, 0.76]
Sharma 2014	0	88	3	88	23.6%	0.14 [0.01, 2.71]
Total (95% CI)		**211**		**235**	**100.0%**	**0.05 [0.01, 0.23]**
Total events	0		38			

Heterogeneity: $Tau^2 = 0.00$; $Chi^2 = 0.73$, df = 3 (P = 0.87); $I^2 = 0\%$
Test for overall effect: Z = 3.95 (P < 0.0001)

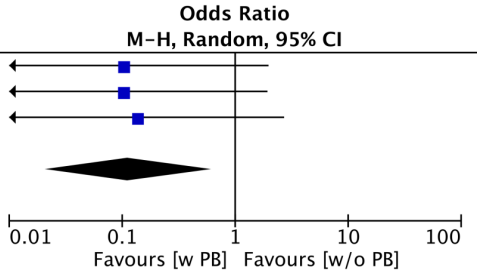


Reduced surgical managment variation in routine pre-op bronchoscopy vs no pre-op bronchoscopy
(OR 0.05, P<0.00001)

Secondary Outcome----Misdiagnosis Rate of Associated Anomalies

Study or Subgroup	w PB Events	Total	w/o PB Events	Total	Weight	Odds Ratio M-H, Random, 95% CI
Atzori 2006	0	62	4	62	33.4%	0.10 [0.01, 1.97]
Kosloske 1988	0	42	5	53	33.9%	0.10 [0.01, 1.93]
Sharma 2014	0	88	3	88	32.7%	0.14 [0.01, 2.71]
Total (95% CI)		**192**		**203**	**100.0%**	**0.11 [0.02, 0.63]**
Total events	0		12			

Heterogeneity: $Tau^2 = 0.00$; $Chi^2 = 0.02$, df = 2 (P = 0.99); $I^2 = 0\%$
Test for overall effect: Z = 2.50 (P = 0.01)



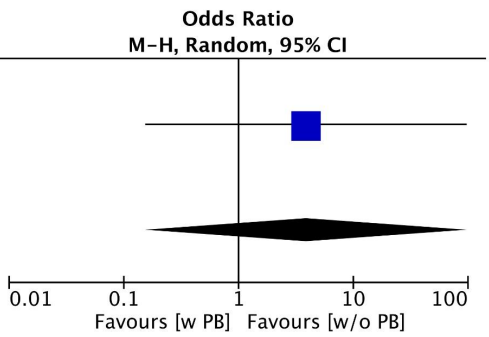
Reduced misdiagnosis rate of associated anomalies in routine pre-op bronchoscopy vs no pre-op bronchoscopy (OR 0.11, P=0.01)

Especially co-existing airway anomalies

Secondary Outcome----Procedure-related complications

Study or Subgroup	w PB Events	Total	w/o PB Events	Total	Weight	Odds Ratio M-H, Random, 95% CI
Atzori 2006	0	62	0	62		Not estimable
Filston 1984	0	19	0	32		Not estimable
Kosloske 1988	1	42	0	53	100.0%	3.87 [0.15, 97.40]
Sharma 2014	0	88	0	88		Not estimable
Wong 2021	0	16	0	16		Not estimable
Total (95% CI)		**227**		**251**	**100.0%**	**3.87 [0.15, 97.40]**
Total events	1		0			

Heterogeneity: Not applicable
Test for overall effect: Z = 0.82 (P = 0.41)



No statistically difference between groups
(OR 3.87, P=0.41)

Conclusions and Recommendation

Conclusions

- A routine pre-operative bronchoscopy may be beneficial to children with EA/TEF
- Reduced misdiagnosis rate of EA types and/or associated anomaly before primary EA repair
- Reduced surgical management variation before definite repair
- Without additional intra-op/post-op complications
- Lack of high quality studies

Recommendation GRADE B

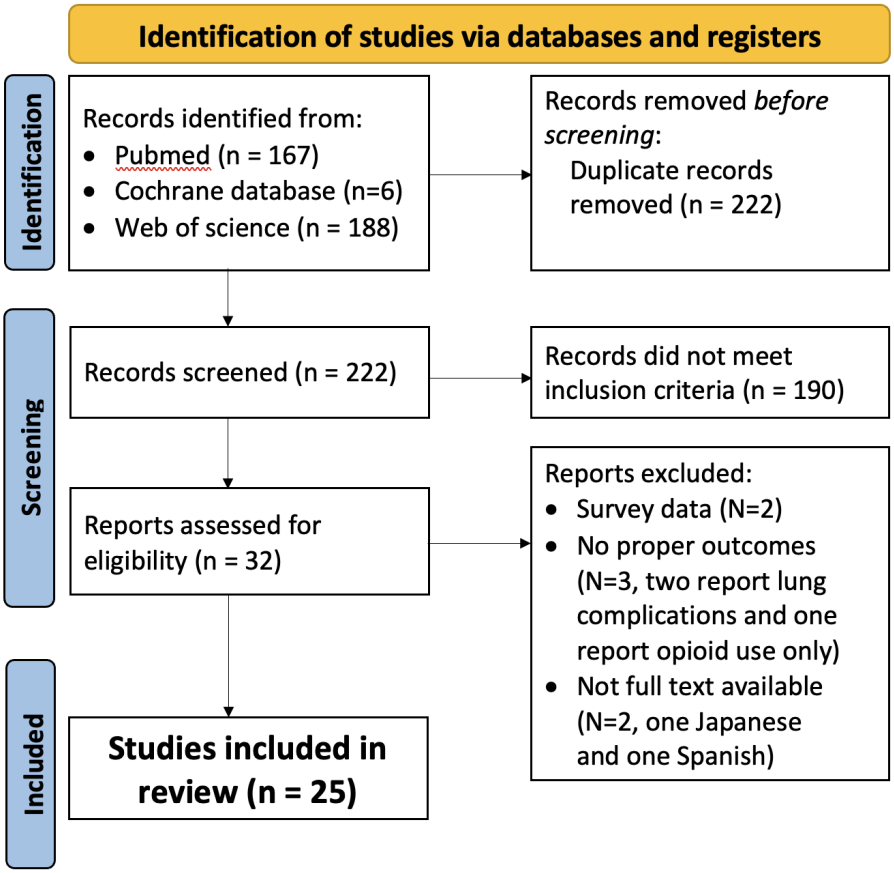
- A routine pre-operative bronchoscopy is recommended in children with EA/TEF

Thoracoscopic versus open repair for esophageal atresia

Chen Yong, Stella Sabbatini, Pierro Agostino

What are the advantages and risks of thoracoscopic versus open repair for esophageal atresia?

PRISMA Flowchart



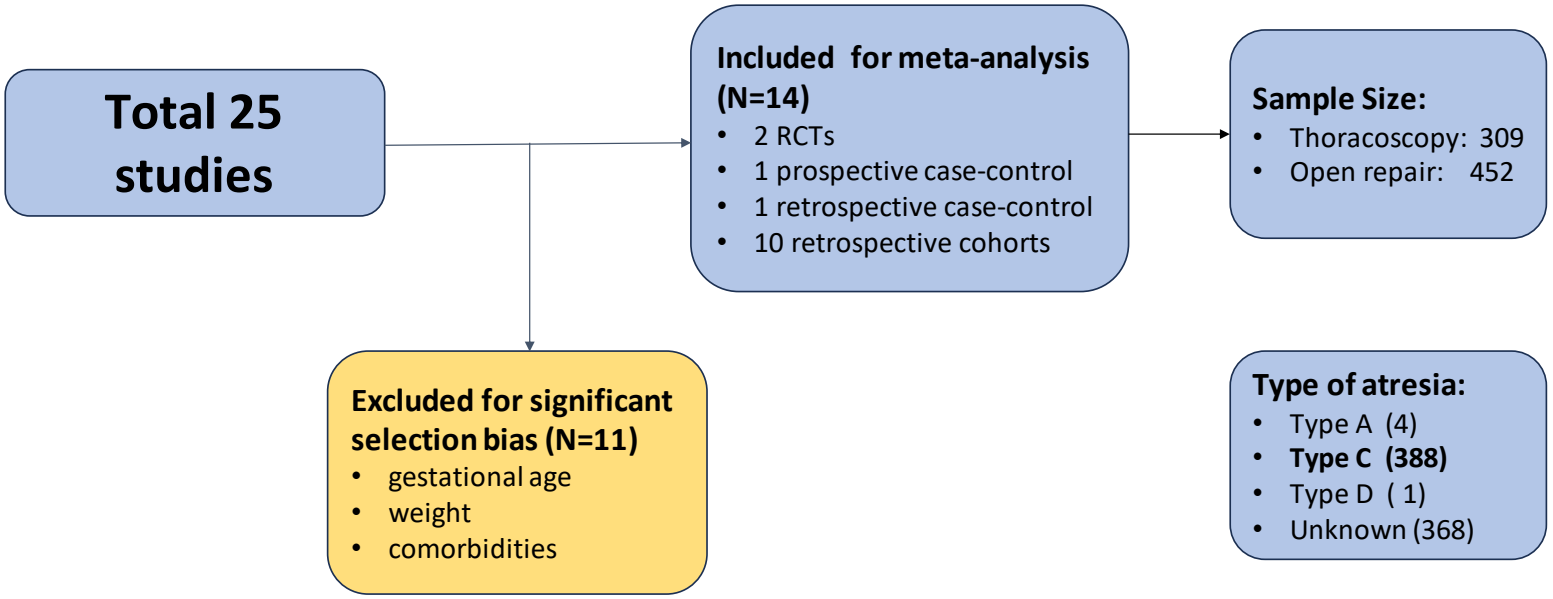
Included studies (N=25)

- 2 RCT
- 2 case control
- 21 cohort studies

Sample size:

- Thoracoscopic: 755 cases (20 in RCTs)
- Open repair: 2215 cases (20 in RCTs)

Studies selected for analysis after excluding selection bias

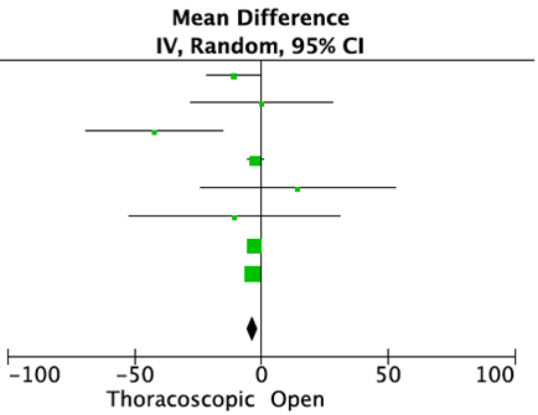


Thoracoscopy vs Open – Length of Stay

Study or Subgroup	Thoracoscopic Mean	SD	Total	Open Mean	SD	Total	Weight	Mean Difference IV, Random, 95% CI
Burford 2011	18.1	28.5	104	29.1	38.5	72	3.6%	−11.00 [−21.44, −0.56]
Lin 2018	35	15.5	9	35	46	12	0.5%	0.00 [−27.93, 27.93]
Lugo 2008	21.8	6.8	8	64.3	68	25	0.6%	−42.50 [−69.57, −15.43]
Rozeik 2020	9.2	3	15	11.7	5.7	15	21.6%	−2.50 [−5.76, 0.76]
Wall 2018	53.4	49.8	8	39	21.9	6	0.3%	14.40 [−24.30, 53.10]
Yamoto 2014	56.9	46.5	11	67.7	62	15	0.2%	−10.80 [−52.51, 30.91]
Zhang 2018	12	4	22	15	3	75	34.7%	−3.00 [−4.80, −1.20]
Zhang 2020	13.1	2.2	49	16.8	4.3	43	38.5%	−3.70 [−5.13, −2.27]
Total (95% CI)			**226**			**263**	**100.0%**	**−3.63 [−5.68, −1.57]**

Heterogeneity: $Tau^2 = 2.32$; $Chi^2 = 11.68$, df = 7 (P = 0.11); $I^2 = 40\%$

Test for overall effect: Z = 3.46 (P = 0.0005)

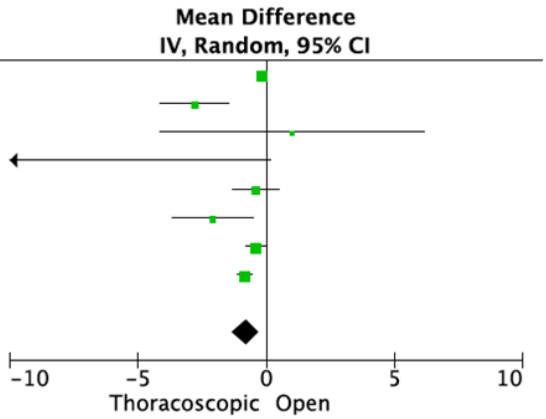


Length of stay shorter in thoracoscopic vs open repair
(MD - 3.63 days , P=0.0005)

Thoracoscopy vs Open – Post-op ventilation

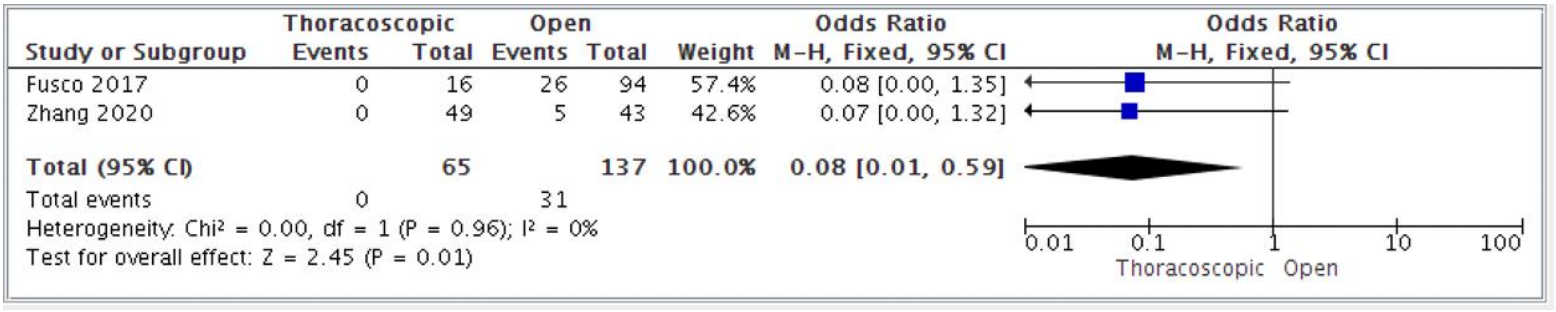
Study or Subgroup	Thoracoscopic Mean	SD	Total	Open Mean	SD	Total	Weight	Mean Difference IV, Random, 95% CI
Ceelie 2011	0.82	0.27	14	1	0.3	28	24.4%	−0.18 [−0.36, −0.00]
Koga 2014	2.8	1.3	25	5.6	4	40	9.0%	−2.80 [−4.14, −1.46]
Lin 2018	3	7.8	9	2	1.3	12	0.9%	1.00 [−4.15, 6.15]
Lugo 2008	4.6	2.8	8	19	36.8	25	0.1%	−14.40 [−28.96, 0.16]
Rozeik 2020	1.5	0.8	15	1.9	1.6	15	13.8%	−0.40 [−1.31, 0.51]
Yamoto 2014	3.5	0.8	11	5.6	3	15	7.1%	−2.10 [−3.69, −0.51]
Zhang 2018	2.3	0.9	22	2.7	0.8	75	21.4%	−0.40 [−0.82, 0.02]
Zhang 2020	2.3	0.5	49	3.15	0.8	43	23.4%	−0.85 [−1.13, −0.57]
Total (95% CI)			**153**			**253**	**100.0%**	**−0.79 [−1.29, −0.29]**

Heterogeneity: $Tau^2 = 0.26$; $Chi^2 = 36.34$, df = 7 ($P < 0.00001$); $I^2 = 81\%$
Test for overall effect: $Z = 3.10$ ($P = 0.002$)



Ventilation time shorter in thoracoscopic vs open repair
(MD -0.79 days, P=0.002)

Thoracoscopy vs Open – Musculoskeletal sequelae



Less musculoskeletal sequelae in thoracoscopic (0%) vs open (22.6%) (P=0.01)

Thoracoscopy vs open – Other outcomes

Outcomes	Included studies	Thoracoscopy	Open repair	P value
Operative time	11	176 min	156 min	0.06
Time to start feeding	6	10 days	14 days	0.37
Anastomotic leakage	9	12%	12%	0.99
Anastomotic stricture	10	13%	23%	0.31
Recurrent TEF	4	2%	4%	0.66
Fundoplication	4	21%	13%	0.24
Mortality	5	2%	3%	0.56

Thoracoscopy vs open repair – Summary

- Thoracoscopy appears superior to open repair for esophageal atresia with fewer musculoskeletal sequelae, shorter ventilation time and length of hospital stay.

- Mortality, time to first feeding, operative time, recurrent TEF, fundoplication rate, anastomotic leak, and stricture are comparable between two approaches.

Recommendation: **Grade B**

European Paediatric Surgeons' Association

Evidence Based Guidelines – EA/TEF

Magnetic Anastomosis

Luques L., Sabbatini S.

The Hospital for Sick Children (SickKids), Toronto, ON, Canada

European Paediatric Surgeons' Association

Background

- First reported for treatment of EA in humans in 2009 (Zaritzky *et al.*)
- Few publications: single cases or short series.
- Possible publication bias towards successful treatment.
- Variable indications – salvage procedure, unsuitable patients for surgery or primary repair
- Variable dispositive design and procedural preparation

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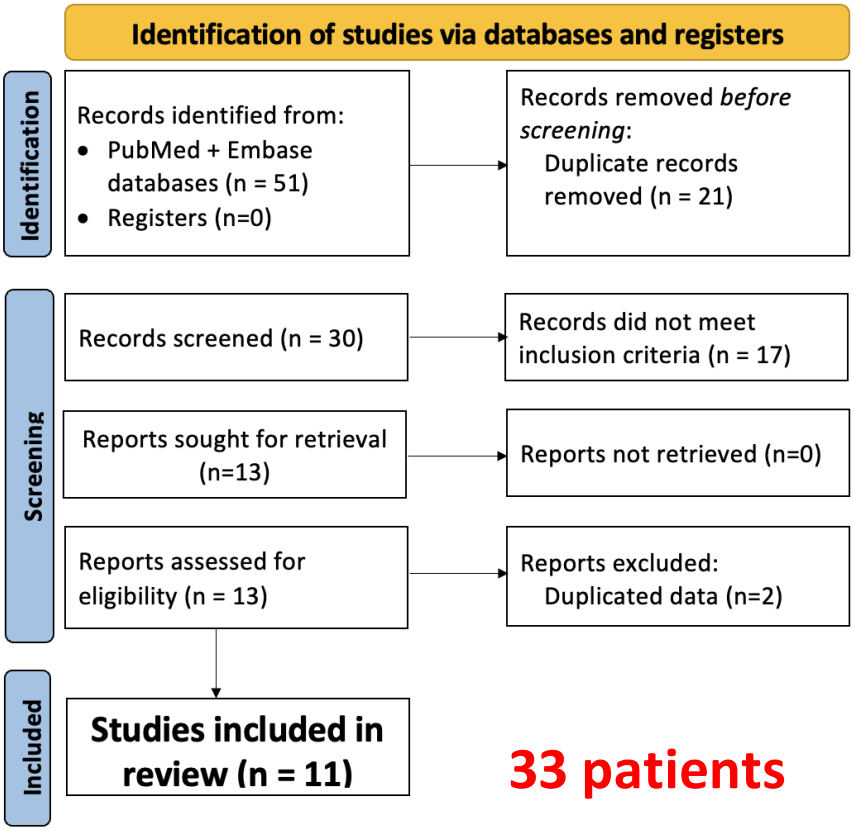
PRISMA Flowchart

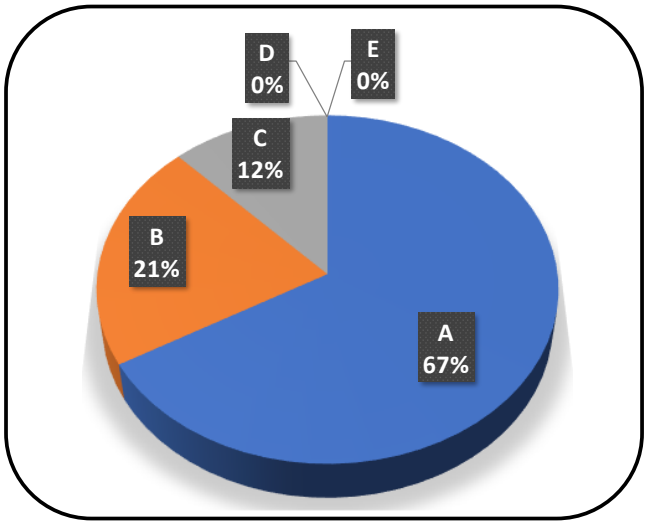


33 patients

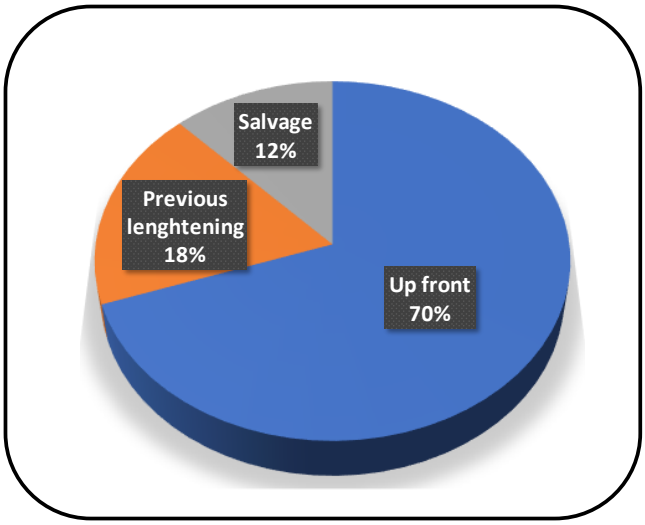
European Paediatric Surgeons' Association

Results – Indications

Type of EA/TEF (Gross Classification)



Surgical history



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Results – Outcomes

- Follow up: 25 months (7-112)
- Success rate: 73% (24/33 patients)
- Re-operation rate: 12% (4/33 patients)
- Mortality rate: 0%
- Complications:
  - Leak 12% (4/33)
  - Stricture 91% (30/33)
  - Others 12% (4/33)

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Summary and Recommendations

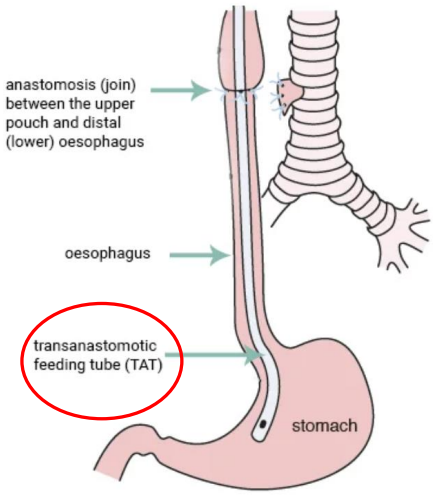
- Promising non-invasive solution.
- Patient selection.
- Success bias should be addressed with prospective studies.
- **No evidence-based recommendations** can be done regarding indications and technic with the available evidence.
- Magnetic anastomosis should be reserved for patients participating in prospective studies (Strength of recommendation: weak)

Esophageal Atresia and Tracheoesophageal Fistula

Evidence for treatment and recommendations

Post-operative trans-anastomotic tube:

Does positioning of a trans-anastomotic tube increase postoperative complications?



Wang et al. BMC Pediatrics (2018) 18:385
https://doi.org/10.1186/s12887-018-1359-5

BMC Pediatrics

RESEARCH ARTICLE Open Access

What is the impact of the use of transanastomotic feeding tube on patients with esophageal atresia: a systematic review and meta-analysis

Chuan Wang[1†], Liwei Feng[2†], Yanan Li[3] and Yi Ji[4*]

Table 1 Characteristics of included studies

Study	Study type	Sample size	Age at surgery (day)	Gestational age (week)	Birth weight (kg)	weight (kg)	NOS
Alabbad SI 2009	OCS (retrospective)	TAFT+:9	NA	39.00 ± 2.1	3.13 ± 0.55	NA	7
		TAFT-:11	NA	37.64 ± 2.5	2.82 ± 0.69	NA	
Fusco JC 2017	OCS (retrospective)	TAFT+:81	2.4	NA	NA	2.69	7
		TAFT-:29	2.3	NA	NA	2.71	
Narayanan SK 2017	OCS (retrospective)	TAFT+:14	NA	35.64 ± 2.60	2.30 ± 0.23	NA	7
		TAFT-:19	NA	36.52 ± 2.20	2.50 ± 0.32	NA	
Lal DR 2018	OCS (retrospective)	TAFT+:231	NA	NA	NA	NA	6
		TAFT-:61	NA	NA	NA	NA	

TAFT ransanastomotic feeding tube, *OCS* observational clinical study, *NOS* Newcastle-Ottawa scale, *NA* not available

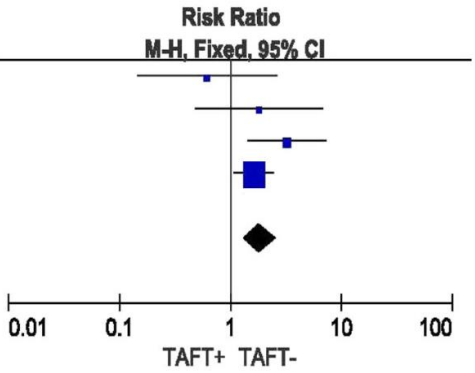
Total of 455 patients

Anastomotic stricture

Study or Subgroup	TAFT+ Events	TAFT+ Total	TAFT- Events	TAFT- Total	Weight	Risk Ratio M-H, Fixed, 95% CI	Year
Alabbad SI 2009	2	9	4	11	8.6%	0.61 [0.14, 2.61]	2009
Narayanan SK 2017	4	14	3	19	6.1%	1.81 [0.48, 6.83]	2017
Fusco JC 2017	45	81	5	29	17.5%	3.22 [1.42, 7.32]	2017
Lal DR 2018	111	231	18	61	67.8%	1.63 [1.08, 2.45]	2018
Total (95% CI)		**335**		**120**	**100.0%**	**1.83 [1.30, 2.58]**	
Total events	162		30				

Heterogeneity: Chi² = 4.33, df = 3 (P = 0.23); I² = 31%

Test for overall effect: Z = 3.47 (P = 0.0005)



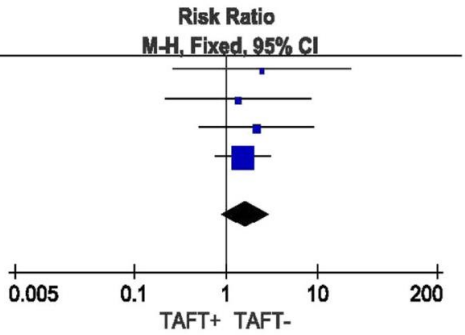
Use of TAT tube significantly increases esophageal stricture rate

Anastomotic leakage

Study or Subgroup	TAFT+ Events	Total	TAFT- Events	Total	Weight	Risk Ratio M-H, Fixed, 95% CI	Year
Alabbad SI 2009	2	9	1	11	4.9%	2.44 [0.26, 22.80]	2009
Narayanan SK 2017	2	14	2	19	9.3%	1.36 [0.22, 8.50]	2017
Fusco JC 2017	12	81	2	29	16.2%	2.15 [0.51, 9.03]	2017
Lal DR 2018	46	231	8	61	69.5%	1.52 [0.76, 3.04]	2018
Total (95% CI)		**335**		**120**	**100.0%**	**1.65 [0.93, 2.93]**	
Total events	62		13				

Heterogeneity: Chi² = 0.35, df = 3 (P = 0.95); I² = 0%

Test for overall effect: Z = 1.72 (P = 0.09)



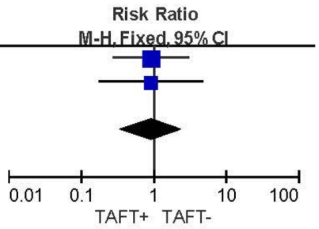
Use of TAT tube is not associated with an increase in anastomotic leakage rate

Sepsis & Tracheomalacia

3.1 Sepsis

Study or Subgroup	TAFT+ Events	TAFT+ Total	TAFT- Events	TAFT- Total	Weight	Risk Ratio M-H, Fixed, 95% CI
Alabbad SI 2009	3	9	4	11	58.6%	0.92 [0.27, 3.07]
Narayanan SK 2017	2	14	3	19	41.4%	0.90 [0.17, 4.71]
Total (95% CI)		**23**		**30**	**100.0%**	**0.91 [0.34, 2.44]**
Total events	5		7			

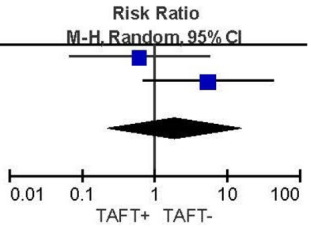
Heterogeneity: Chi² = 0.00, df = 1 (P = 0.99); I² = 0%
Test for overall effect: Z = 0.18 (P = 0.85)



4.1 Tracheomalacia

Study or Subgroup	TAFT+ Events	TAFT+ Total	TAFT- Events	TAFT- Total	Weight	Risk Ratio M-H, Random, 95% CI
Alabbad SI 2009	1	9	2	11	48.2%	0.61 [0.07, 5.70]
Narayanan SK 2017	4	14	1	19	51.8%	5.43 [0.68, 43.44]
Total (95% CI)		**23**		**30**	**100.0%**	**1.89 [0.22, 16.20]**
Total events	5		3			

Heterogeneity: Tau² = 1.19; Chi² = 1.98, df = 1 (P = 0.16); I² = 50%
Test for overall effect: Z = 0.58 (P = 0.56)



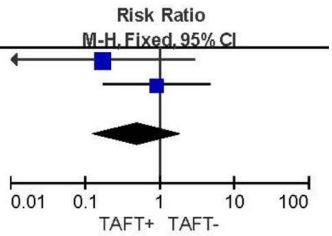
No association between TAT tube use and sepsis or tracheomalacia

GERD & Wound Infection

5.1 Gastroesophageal reflux.

Study or Subgroup	TAFT+ Events	TAFT+ Total	TAFT- Events	TAFT- Total	Weight	Risk Ratio M-H, Fixed, 95% CI
Alabbad SI 2009	0	9	3	11	55.6%	0.17 [0.01, 2.94]
Narayanan SK 2017	2	14	3	19	44.4%	0.90 [0.17, 4.71]
Total (95% CI)		**23**		**30**	**100.0%**	**0.50 [0.13, 1.93]**
Total events	2		6			

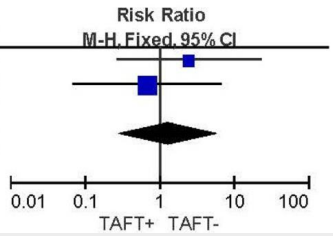
Heterogeneity: Chi² = 1.04, df = 1 (P = 0.31); I² = 4%
Test for overall effect: Z = 1.01 (P = 0.31)



6.1 Wound infection

Study or Subgroup	TAFT+ Events	TAFT+ Total	TAFT- Events	TAFT- Total	Weight	Risk Ratio M-H, Fixed, 95% CI
Alabbad SI 2009	2	9	1	11	34.7%	2.44 [0.26, 22.80]
Narayanan SK 2017	1	14	2	19	65.3%	0.68 [0.07, 6.76]
Total (95% CI)		**23**		**30**	**100.0%**	**1.29 [0.28, 5.92]**
Total events	3		3			

Heterogeneity: Chi² = 0.61, df = 1 (P = 0.43); I² = 0%
Test for overall effect: Z = 0.33 (P = 0.74)



No association between TAT tube use and GERD or wound infection

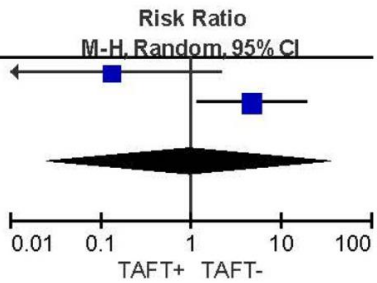
Pneumonia

7.1 Pneumonia

Study or Subgroup	TAFT+ Events	Total	TAFT- Events	Total	Weight	Risk Ratio M-H, Random, 95% CI
Alabbad SI 2009	0	9	4	11	44.6%	0.13 [0.01, 2.19]
Narayanan SK 2017	7	14	2	19	55.4%	4.75 [1.16, 19.49]
Total (95% CI)		**23**		**30**	**100.0%**	**0.97 [0.03, 36.75]**
Total events	7		6			

Heterogeneity: Tau² = 5.69; Chi² = 5.45, df = 1 (P = 0.02); I² = 82%

Test for overall effect: Z = 0.02 (P = 0.99)



No association between TAT tube and pneumonia

ERNICA (2018)

European Reference Networks | ERNICA

Original Article

ERNICA Consensus Conference on the Management of Patients with Esophageal Atresia and Tracheoesophageal Fistula: Diagnostics, Preoperative, Operative, and Postoperative Management

Carmen Dingemann[1] Simon Eaton[2] Gunnar Aksnes[3] Pietro Bagolan[4] Kate M. Cross[5] Paolo De Coppi[2,5] JoAnne Fruithof[6] Piergiorgio Gamba[7] Steffen Husby[8] Antti Koivusalo[9] Lars Rasmussen[10] Rony Sfeir[11] Graham Slater[12] Jan F. Svensson[13] David C. Van der Zee[14] Lucas M. Wessel[15] Anke Widenmann-Grolig[16] Rene Wijnen[17] Benno M. Ure[1]

Eur J Pediatr Surg 2020;30:326–336.

ERNICA Consensus Conference on the Management of Patients with Esophageal Atresia and Tracheoesophageal Fistula: Diagnostics, Preoperative, Operative, and Postoperative Management

	24	In cases with suspected right descending aorta, a right-sided thoracic approach is the first option	+	76.9	10/13	8 (1–9)
	25	The azygos vein should be preserved whenever possible	–	71.4	10/14	6.5 (2–9)
	26	The tracheoesophageal fistula should preferably be closed by transfixing suture	+	100	14/14	9 (6–9)
	27	The esophageal anastomosis should be preferably performed with absorbable sutures	+	85.7	12/14	8 (1–9)
	28	The esophageal anastomosis should be preferably performed with interrupted sutures	+	100	14/14	9 (6–9)
	29	A transanastomotic tube should be routinely inserted	+	80	12/15	8 (1–9)
	30	A chest drain should be routinely placed	–	21.4	3/14	1 (1–9)
	31	The thoracoscopic approach is a viable option	+	87.5	14/16	9 (5–9)

Midwest Pediatric Surgery Consortium

2018

Contents lists available at ScienceDirect

Journal of Pediatric Surgery

journal homepage: www.elsevier.com/locate/jpedsurg

Featured Article

Challenging surgical dogma in the management of proximal esophageal atresia with distal tracheoesophageal fistula: Outcomes from the Midwest Pediatric Surgery Consortium

Dave R. Lal [a,*], Samir K. Gadepalli [b], Cynthia D. Downard [c], Daniel J. Ostlie [d], Peter C. Minneci [e], Ruth M. Swedler [a], Thomas H. Chelius [f], Laura Cassidy [a,f], Cooper T. Rapp [a], Deborah Billmire [g], Steven Bruch [b], R. Carland Burns [g], Katherine J. Deans [a], Mary E. Fallat [c], Jason D. Fraser [h], Julia Grabowski [i], Ferdynand Hebel [i], Michael A. Helmrath [j], Ronald B. Hirschl [h], Rashmi Kabre [i], Jonathan Kohler [d], Matthew P. Landman [g], Charles M. Leys [a], Grace Z. Mak [b], Jessica Raque [c], Beth Rymeski [d], Jacqueline M. Saito [i], Shawn D. St. Peter [b], Daniel von Allmen [j], Brad W. Warner [i], Thomas T. Sato [a], on behalf of the Midwest Pediatric Surgery Consortium

- Multi-centre, retrospective study
- 2009-2014
- 292 patients

- Stricture rate 48%
- TAT tube is associated with increased risk for anastomotic stricture

2021

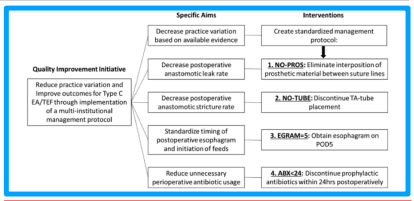
Contents lists available at ScienceDirect

Journal of Pediatric Surgery

journal homepage: www.elsevier.com/locate/jpedsurg

Clinical outcomes following implementation of a management bundle for esophageal atresia with distal tracheoesophageal fistula☆

Christina M. Bence [a], Beth Rymeski [b], Samir Gadepalli [c], Thomas T. Sato [a], Peter C. Minneci [d], Cynthia Downard [e], Ronald B. Hirschl [c], Ruchi A. Amin [a], R. Cartland Burns [f], Linda Cherney-Stafford [g], Cathleen M. Courtney [b], Katherine J. Deans [d], Mary E. Fallat [e], Jason D. Fraser [c], Julia E. Grabowski [c], Michael A. Helmrath [h], Rashmi D. Kabre [c], Jonathan E. Kohler [f], Matthew P. Landman [c], Amy E. Lawrence [d], Charles M. Leys [g], Grace Z. Mak [b], Elissa Port [c], Jacqueline M. Saito [b], Jared Silverberg [c], Mark B. Slidell [b], Shawn D. St. Peter [c], Misty Troutt [b], Sarah Walker [b], Tiffany Wright [e], Dave R. Lal [a,*], on behalf of the Midwest Pediatric Surgery Consortium



- Bundle implementation including no TAT tube use
- Significant reductions in postoperative strictures when TA-tubes are not used

2022

Contents lists available at ScienceDirect

Journal of Pediatric Surgery

journal homepage: www.elsevier.com/locate/jpedsurg.org

Acid suppression duration does not alter anastomotic stricture rates after esophageal atresia with distal tracheoesophageal fistula repair: A prospective multi-institutional cohort study

Alexis N Bowder [a,*], Christina M. Bence [a], Beth A Rymeski [b], Samir K. Gadepalli [c], Thomas T. Sato [a], Aniko Szabo [c], Kyle Van Arendonk [a], Peter C. Minneci [d], Cynthia D. Downard [e], Ronald B. Hirschl [c], Troy Markel [f], Cathleen M. Courtney [b], Katherine J. Deans [d], Mary E. Fallat [e], Jason D. Fraser [a], Julia E. Grabowski [c], Michael A. Helmrath [b], Rashmi D. Kabre [c], Jonathan E. Kohler [c], Matthew P. Landman [g], Amy E. Lawrence [d], Charles M. Leys [c], Grace Mak [b], Elissa Port [c], Jacqueline Saito [b], Jared Silverberg [c], Mark B. Slidell [b], Shawn D. St Peter [c], Misty Troutt [b], Tiffany N. Wright [e], Dave R. Lal [a], on behalf of the Midwest Pediatric Consortium

- Prospective, multi-centre study (156 pts)
- Acid suppression

- Acid suppression did not decrease stricture rate, but no TAT tube does!

Findings do not support routine use of TAT tube

Conclusions and Recommendation

- Based on the evidence currently available in the literature (low, no RCT's), positioning of a trans-anastomotic tube post TEF repair seems to increase the risk for anastomotic stricture.

- Routine placement of a trans-anastomotic tube is therefore NOT recommended.

- Grade of recommendation: Grade B

Postoperative strategy - Ventilation, muscle paralysis and neck flexion

Naho Fujiwara and Mashriq Alganabi

The Hospital for Sick Children (SickKids),

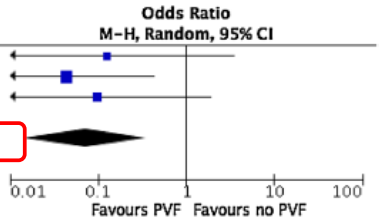
Toronto, Canada

Previous Systematic Review Data

A Association of PVF with the occurrence of "anastomotic leak"

Study or Subgroup	PVF Events	Total	without PVF Events	Total	Weight	Odds Ratio M-H, Random, 95% CI
MacKinlay 1987	0	5	2	5	22.9%	0.13 [0.00, 3.52]
Spitz 1996	7	39	5	6	47.8%	0.04 [0.00, 0.44]
Uchida 2006	0	14	7	28	29.2%	0.10 [0.01, 1.87]
Total (95% CI)		**58**		**39**	**100.0%**	**0.07 [0.01, 0.35]**
Total events	7		14			

Heterogeneity: $Tau^2 = 0.00$; $Chi^2 = 0.35$, df = 2 (P = 0.84); $I^2 = 0\%$
Test for overall effect: Z = 3.26 (P = 0.001)

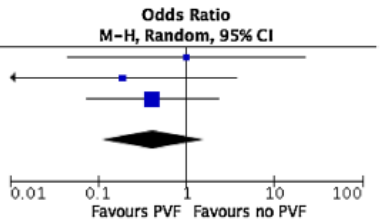


Abbreviations: PVF = elective post-operative muscle paralysis, positive-pressure ventilation, and head flexion.

B Association of PVF with the occurrence of "anastomotic stricture"

Study or Subgroup	PVF Events	Total	without PVF Events	Total	Weight	Odds Ratio M-H, Random, 95% CI
MacKinlay 1987	1	5	1	5	18.5%	1.00 [0.05, 22.18]
Spitz 1996	28	39	6	6	20.4%	0.19 [0.01, 3.67]
Uchida 2006	2	14	8	28	61.1%	0.42 [0.08, 2.30]
Total (95% CI)		**58**		**39**	**100.0%**	**0.42 [0.11, 1.59]**
Total events	31		15			

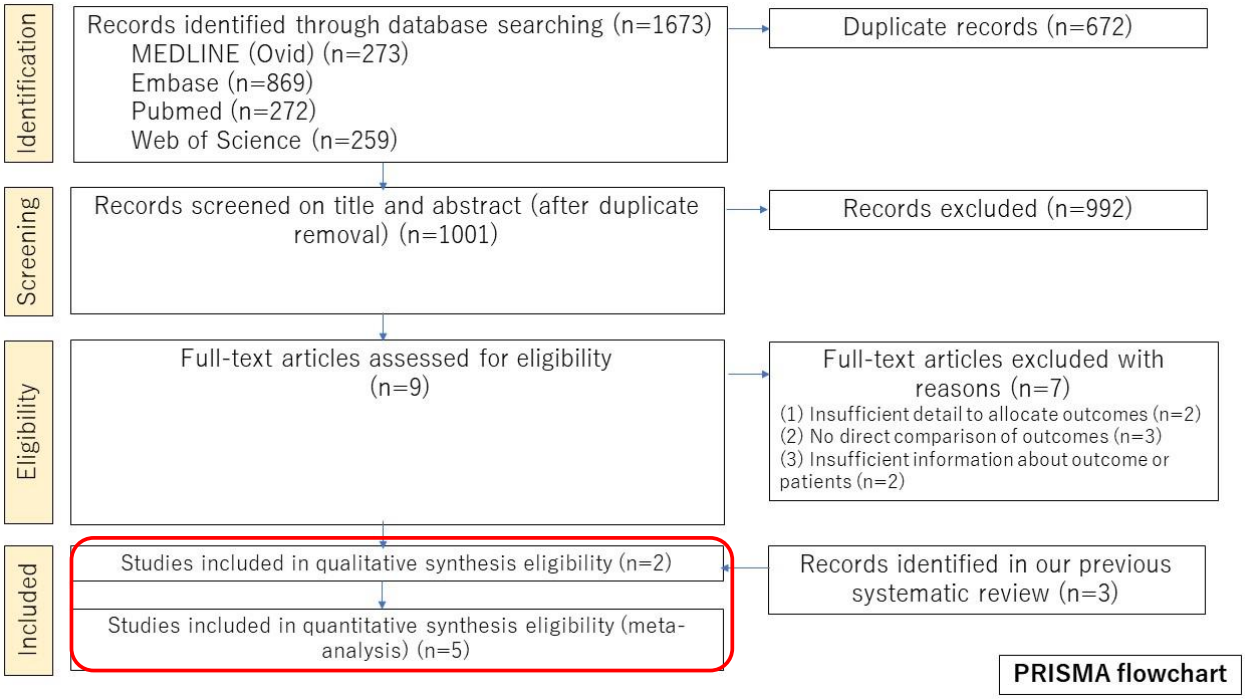
Heterogeneity: $Tau^2 = 0.00$; $Chi^2 = 0.59$, df = 2 (P = 0.75); $I^2 = 0\%$
Test for overall effect: Z = 1.28 (P = 0.20)



Abbreviations: PVF = elective post-operative muscle paralysis, positive-pressure ventilation, and head flexion.

O`Connell JS, et al. 2018

Now we are updating this data



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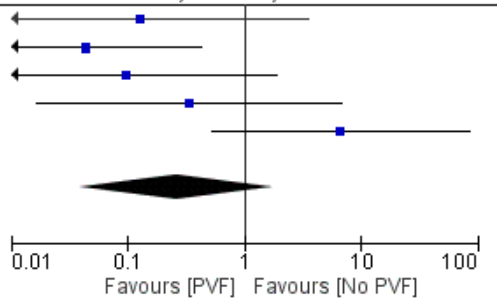
Results

Anastomotic Leaks

Study or Subgroup	PVF Events	PVF Total	No PVF Events	No PVF Total	Weight	Odds Ratio M-H, Random, 95% CI	Year
MacKinlay 1987	0	5	2	5	17.0%	0.13 [0.00, 3.52]	1987
Spitz 1996	7	39	5	6	23.3%	0.04 [0.00, 0.44]	1996
Uchida 2006	0	14	7	28	19.2%	0.10 [0.01, 1.87]	2006
Besendorfer 2021	0	7	5	32	18.8%	0.33 [0.02, 6.73]	2021
De Rose 2022	1	4	3	63	21.7%	6.67 [0.52, 84.78]	2022
Total (95% CI)		**69**		**134**	**100.0%**	**0.27 [0.04, 1.79]**	
Total events	8		22				

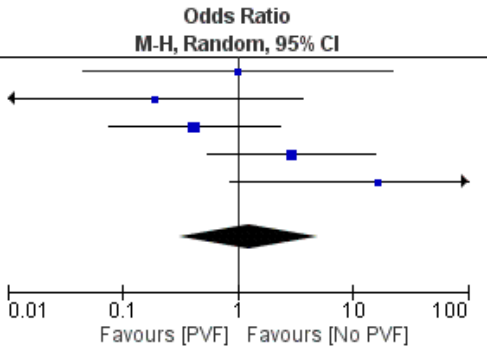
Heterogeneity: Tau² = 2.66; Chi² = 9.30, df = 4 (P = 0.05); I² = 57%
Test for overall effect: Z = 1.36 (P = 0.17)



Anastomotic Strictures

Study or Subgroup	PVF Events	PVF Total	No PVF Events	No PVF Total	Weight	Odds Ratio M-H, Random, 95% CI	Year
MacKinlay 1987	1	5	1	5	14.1%	1.00 [0.05, 22.18]	1987
Spitz 1996	28	39	6	6	15.1%	0.19 [0.01, 3.67]	1996
Uchida 2006	2	14	8	28	27.7%	0.42 [0.08, 2.30]	2006
Besendorfer 2021	4	7	10	32	28.1%	2.93 [0.55, 15.63]	2021
De Rose 2022	4	4	22	63	15.0%	16.60 [0.85, 322.42]	2022
Total (95% CI)		**69**		**134**	**100.0%**	**1.26 [0.31, 5.06]**	
Total events	39		47				

Heterogeneity: Tau² = 1.06; Chi² = 7.09, df = 4 (P = 0.13); I² = 44%
Test for overall effect: Z = 0.33 (P = 0.74)



Risk of Bias Assessment (ROBINS-I)

Author/Year	Bias due to confounding	Bias in the selection of participants into the study	Bias in classification of interventions	Bias due to deviations from intended interventions	Bias due to missing data	Bias in measurement of outcome	Bias in selection of the reported results	Overall Bias
MacKinlay 1987	?	?	+	+	+	+	?	?
Spitz 1996	?	?	+	+	+	+	?	?
Uchida 2006	?	?	+	+	+	+	+	?
Besendorfer 2021	?	?	?	+	+	+	+	?
De Rose 2022	?	?	?	+	+	x	+	?

+ low risk of bias ? moderate risk of bias x serious risk of bias ! critical risk of bias

Conclusions

- On the basis of the existing evidence and our analysis, elective post-operative PVF did **not significantly change** the incidence of anastomotic leaks or strictures.

- **The level of evidence is low**, also the level of risk was assessed to be of moderate risk due to the groups compared being retrospective without necessarily matched baseline characteristics.

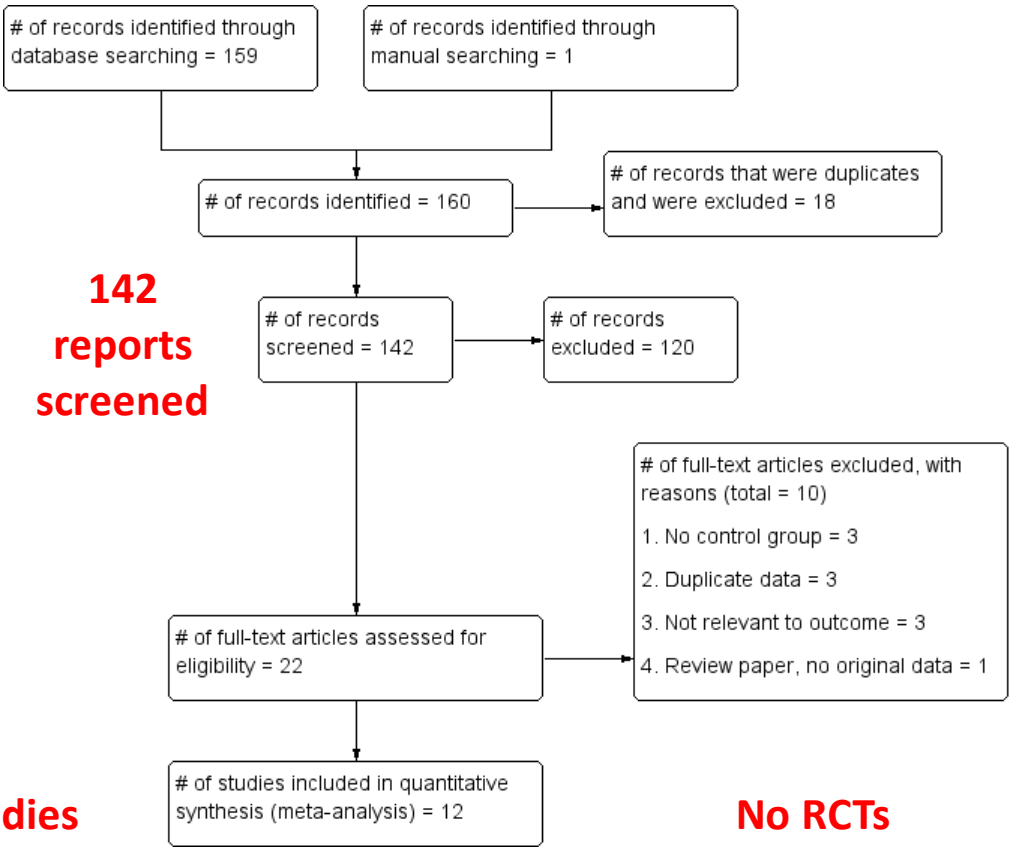
Does routine use of antacid medication reduce incidence of anastomotic stricture follow EA/TEF repair?

Nigel Hall

PICO strategy

- **P**opulation: Children undergoing repair of EA +/- TEF
- **I**ntervention: Routine antacid medication
- **C**omparison: None or symptomatic treatment only
- **O**utcome:
  - **Primary:**
    - Anastomotic stricture
  - **Secondary**
    - GERD
    - Anastomotic leak
    - Esophagitis

PRSIMA Flowchart



142 reports screened

12 observational studies

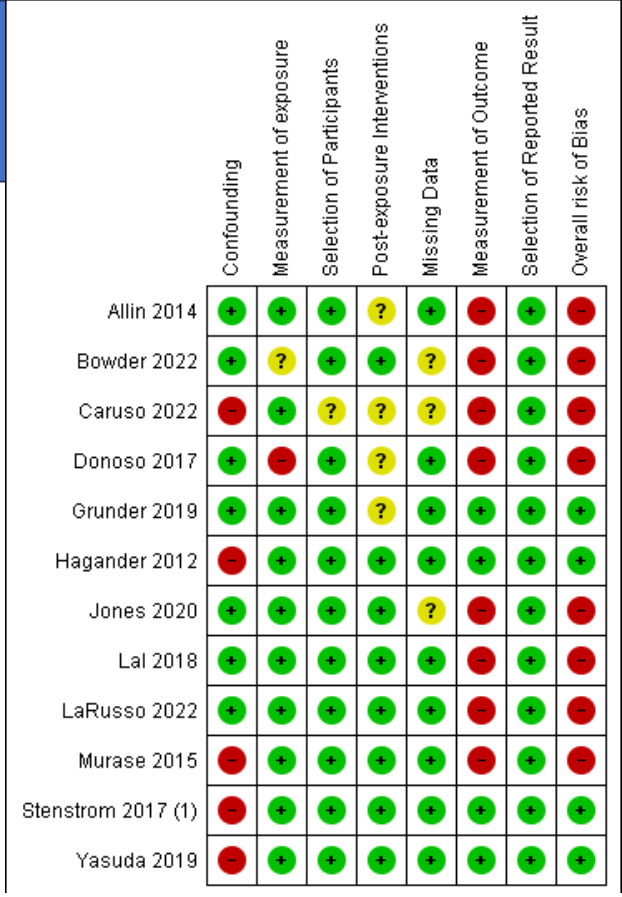
No RCTs

Risk of bias

High risk of bias in majority

Retrospective
Poorly defined primary outcome

Overall grade of recommendations

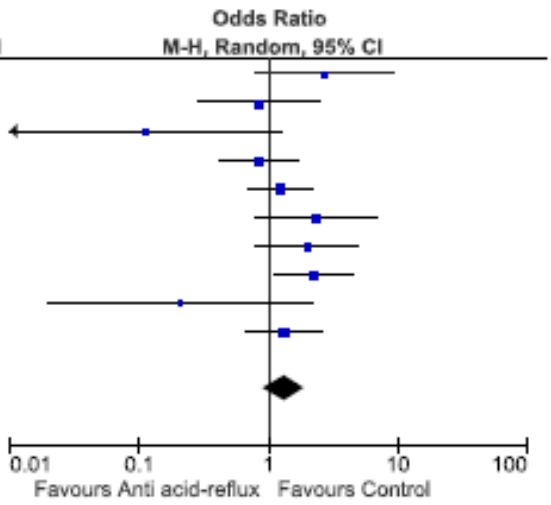


Primary Outcome----Anastomotic stricture

Study or Subgroup	Anti acid-reflux drugs Events	Total	Control Events	Total	Weight	Odds Ratio M-H, Random, 95% CI
Allin 2014	24	57	4	19	7.0%	2.73 [0.80, 9.25]
Bowder 2022	7	15	72	141	8.6%	0.84 [0.29, 2.44]
Caruso 2022	5	10	9	10	2.2%	0.11 [0.01, 1.24]
Donoso 2017	29	57	39	71	14.5%	0.85 [0.42, 1.71]
Grunder 2019	32	73	52	134	17.4%	1.23 [0.69, 2.19]
Jones 2020	10	16	41	98	8.3%	2.32 [0.78, 6.88]
Lal 2018	121	268	7	24	10.6%	2.00 [0.80, 4.98]
LaRusso 2022	60	179	12	65	14.5%	2.23 [1.11, 4.48]
Murase 2015	1	13	4	14	2.3%	0.21 [0.02, 2.18]
Stenstrom 2017 (1)	32	65	28	66	14.7%	1.32 [0.66, 2.62]
Total (95% CI)		**753**		**642**	**100.0%**	**1.33 [0.92, 1.92]**
Total events	321		268			

Heterogeneity: Tau² = 0.12; Chi² = 14.02, df = 9 (P = 0.12); I² = 36%

Test for overall effect: Z = 1.51 (P = 0.13)



No difference in incidence of stricture
(OR 1.33 (95%CI 0.92-1.92), P=0.13)

Secondary outcomes

Outcome	Studies	Participants	Effect Estimate
GORD	3	395	0.52 [0.24, 1.13]
Anastomotic leak	4	674	0.84 [0.46, 1.55]
Oesophagitis/Oesophageal erosion	1	573	1.16 [0.40, 3.38]

No statistically significant association between routine use of antacids and GERD, Anastomotic leak or Esophagitis

Conclusions and Recommendation

Conclusions

- No evidence to support or refute the routine use of antacid medication following EA repair to reduce incidence of anastomotic stricture
- Some evidence of potential side effects of antacid medication
- Lack of high quality studies

Recommendation GRADE B

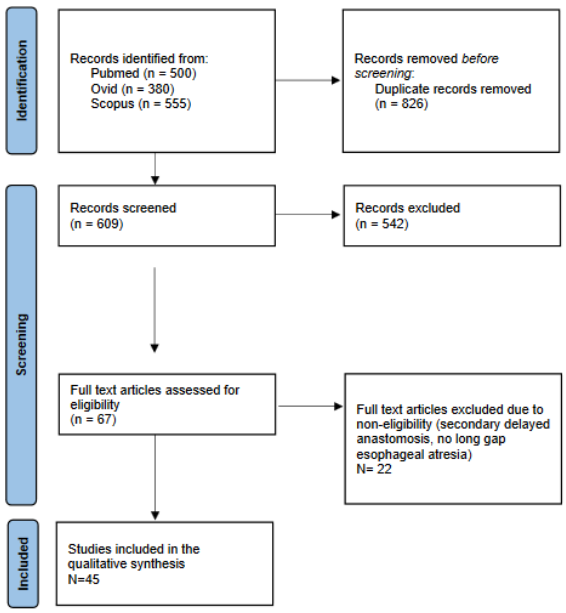
- **Routine use of antacid medication not recommended based on existing data**

Question 3: Management of long gap EA – delayed primary anastomosis (DPA)

Fabian Doktor and Augusto Zani

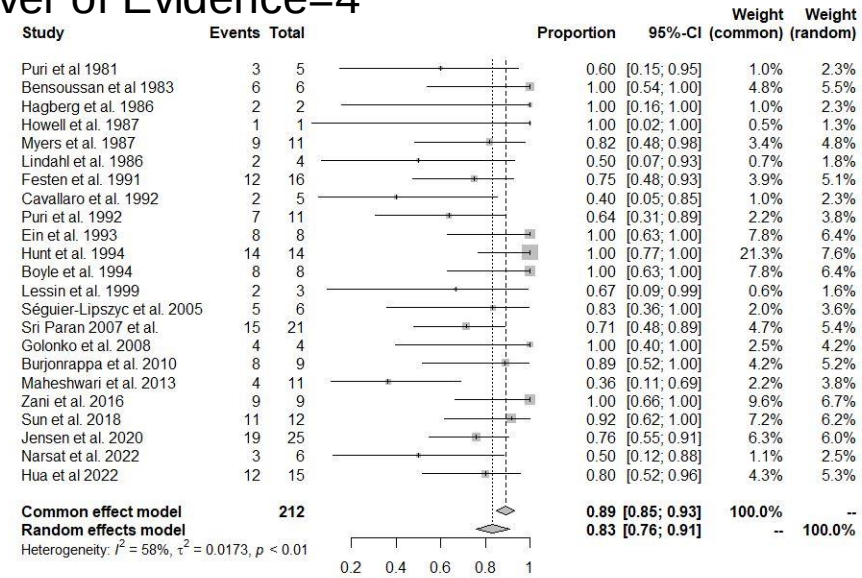
PRISMA 2020 flow diagram for new systematic reviews which included searches of databases and registers only

PRISMA 2009 Flow Diagram



Question 3: What is the success rate of delayed primary anastomosis (patients on full enteral feeds)?

- 22 articles, Level of Evidence=4



Study	Events	Total	Proportion	95%-CI	Weight (common)	Weight (random)
Puri et al 1981	3	5	0.60	[0.15; 0.95]	1.0%	2.3%
Bensoussan et al 1983	6	6	1.00	[0.54; 1.00]	4.8%	5.5%
Hagberg et al. 1986	2	2	1.00	[0.16; 1.00]	1.0%	2.3%
Howell et al. 1987	1	1	1.00	[0.02; 1.00]	0.5%	1.3%
Myers et al. 1987	9	11	0.82	[0.48; 0.98]	3.4%	4.8%
Lindahl et al. 1986	2	4	0.50	[0.07; 0.93]	0.7%	1.8%
Festen et al. 1991	12	16	0.75	[0.48; 0.93]	3.9%	5.1%
Cavallaro et al. 1992	2	5	0.40	[0.05; 0.85]	1.0%	2.3%
Puri et al. 1992	7	11	0.64	[0.31; 0.89]	2.2%	3.8%
Ein et al. 1993	8	8	1.00	[0.63; 1.00]	7.8%	6.4%
Hunt et al. 1994	14	14	1.00	[0.77; 1.00]	21.3%	7.6%
Boyle et al. 1994	8	8	1.00	[0.63; 1.00]	7.8%	6.4%
Lessin et al. 1999	2	3	0.67	[0.09; 0.99]	0.6%	1.6%
Séguier-Lipszyc et al. 2005	5	6	0.83	[0.36; 1.00]	2.0%	3.6%
Sri Paran 2007 et al.	15	21	0.71	[0.48; 0.89]	4.7%	5.4%
Golonko et al. 2008	4	4	1.00	[0.40; 1.00]	2.5%	4.2%
Burjonrappa et al. 2010	8	9	0.89	[0.52; 1.00]	4.2%	5.2%
Maheshwari et al. 2013	4	11	0.36	[0.11; 0.69]	2.2%	3.8%
Zani et al. 2016	9	9	1.00	[0.66; 1.00]	9.6%	6.7%
Sun et al. 2018	11	12	0.92	[0.62; 1.00]	7.2%	6.2%
Jensen et al. 2020	19	25	0.76	[0.55; 0.91]	6.3%	6.0%
Narsat et al. 2022	3	6	0.50	[0.12; 0.88]	1.1%	2.5%
Hua et al 2022	12	15	0.80	[0.52; 0.96]	4.3%	5.3%
Common effect model		**212**	**0.89**	**[0.85; 0.93]**	**100.0%**	--
Random effects model			**0.83**	**[0.76; 0.91]**	--	**100.0%**

Heterogeneity: I^2 = 58%, τ^2 = 0.0173, p < 0.01

0.2 0.4 0.6 0.8 1

Overall, 83% of patients were on full enteral feeds
(95%CI: 76-91%, I^2=58%; p<0.01)

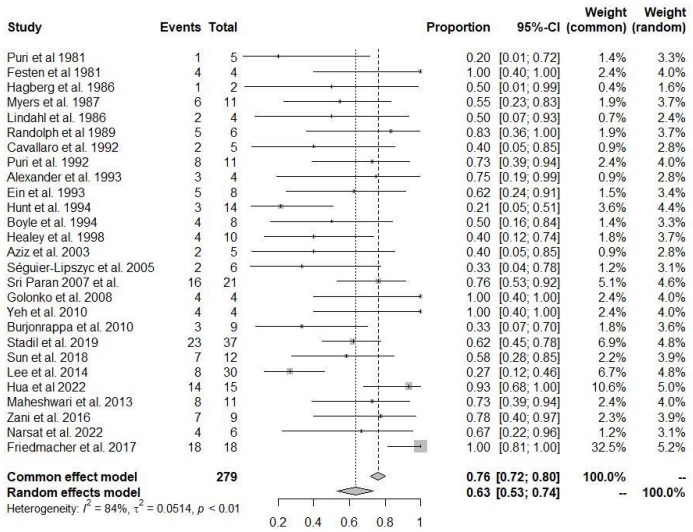
Question 3: How long should the surgery be postponed?

- 26 articles
- Range: several days up to 34 weeks
- Median time until repair:
  - 11.6 weeks

An evaluation of the maximum duration or the period of time surgeons should wait before esophageal replacement is taken into consideration, has not been conducted

Question 3: What are the complications of delayed primary anastomosis?

Overall: **523 complications** in **468 patients**



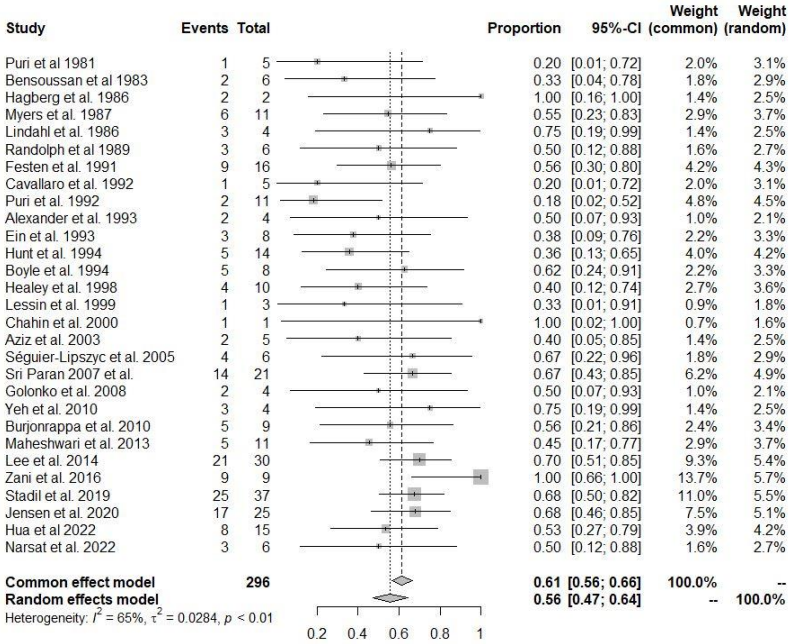
Study	Events	Total	Proportion	95%-CI	Weight (common)	Weight (random)
Puri et al 1981	1	5	0.20	[0.01; 0.72]	1.4%	3.3%
Festen et al 1981	4	4	1.00	[0.40; 1.00]	2.4%	4.0%
Hagberg et al. 1986	1	2	0.50	[0.01; 0.99]	0.4%	1.6%
Myers et al. 1987	6	11	0.55	[0.23; 0.83]	1.9%	3.7%
Lindahl et al. 1986	2	4	0.50	[0.07; 0.93]	0.7%	2.4%
Randolph et al 1989	5	6	0.83	[0.36; 1.00]	1.9%	3.7%
Cavallaro et al. 1992	2	5	0.40	[0.05; 0.85]	0.9%	2.8%
Puri et al. 1992	8	11	0.73	[0.39; 0.94]	2.4%	4.0%
Alexander et al. 1993	3	4	0.75	[0.19; 0.99]	0.9%	2.8%
Ein et al. 1993	5	8	0.62	[0.24; 0.91]	1.5%	3.4%
Hunt et al. 1994	3	14	0.21	[0.05; 0.51]	3.6%	4.4%
Boyle et al. 1994	4	8	0.50	[0.16; 0.84]	1.4%	3.3%
Healey et al. 1998	4	10	0.40	[0.12; 0.74]	1.8%	3.7%
Aziz et al. 2003	2	5	0.40	[0.05; 0.85]	0.9%	2.8%
Séguier-Lipszyc et al. 2005	2	6	0.33	[0.04; 0.78]	1.2%	3.1%
Sri Paran 2007 et al.	16	21	0.76	[0.53; 0.92]	5.1%	4.6%
Golonko et al. 2008	4	4	1.00	[0.40; 1.00]	2.4%	4.0%
Yeh et al. 2010	4	4	1.00	[0.40; 1.00]	2.4%	4.0%
Burjonrappa et al. 2010	3	9	0.33	[0.07; 0.70]	1.8%	3.6%
Stadil et al. 2019	23	37	0.62	[0.45; 0.78]	6.9%	4.8%
Sun et al. 2018	7	12	0.58	[0.28; 0.85]	2.2%	3.9%
Lee et al. 2014	8	30	0.27	[0.12; 0.46]	6.7%	4.8%
Hua et al 2022	14	15	0.93	[0.68; 1.00]	10.6%	5.0%
Maheshwari et al. 2013	8	11	0.73	[0.39; 0.94]	2.4%	4.0%
Zani et al. 2016	7	9	0.78	[0.40; 0.97]	2.3%	3.9%
Narsat et al. 2022	4	6	0.67	[0.22; 0.96]	1.2%	3.1%
Friedmacher et al. 2017	18	18	1.00	[0.81; 1.00]	32.5%	5.2%
Common effect model		**279**	**0.76**	**[0.72; 0.80]**	**100.0%**	--
Random effects model			**0.63**	**[0.53; 0.74]**	--	**100.0%**

Heterogeneity: $I^2 = 84\%$, $\tau^2 = 0.0514$, $p < 0.01$

0.2 0.4 0.6 0.8 1

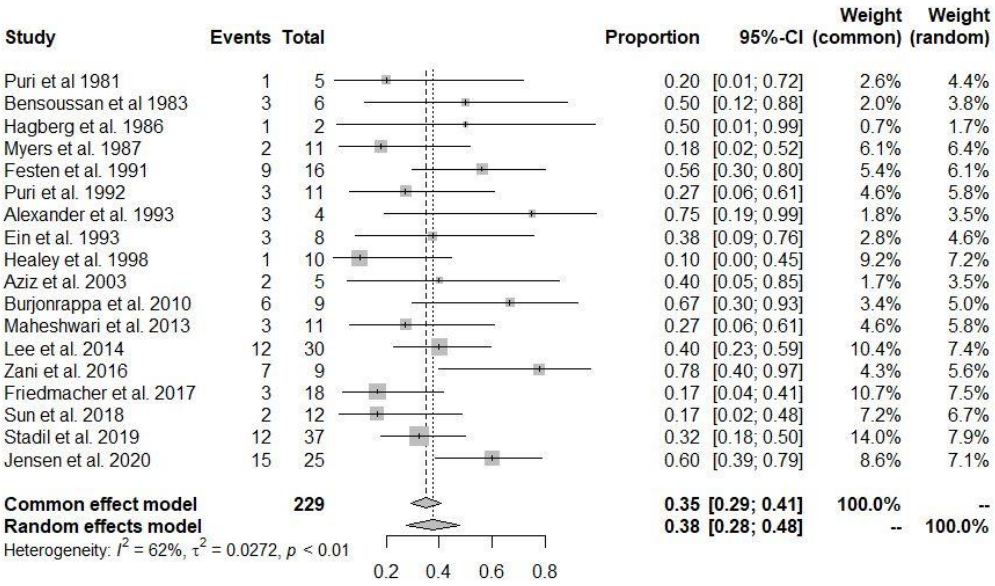
Strictures are to be expected in 63% (95%CI: 53-74%; I^2=84%; p<0.01)

Question 3: What are the complications of delayed primary anastomosis?



GERD is to be expected in 56% (95%CI: 47-64%; I^2=65%; p<0.01)

Question 3: What are the complications of delayed primary anastomosis?



Postoperative anastomotic leakage in 38%

(95%CI: 28-48%; I^2=62%; p<0.01)

Question 3: Management of long gap EA – delayed primary anastomosis (DPA)

Recommendations:

- DPA may be offered as an option for long-gap esophageal atresia
- No recommendation can be drawn for the time until DPA can/should be performed
- **Short- and long term complications are common** demonstrating the necessity of long-term follow-up in this patient population

Grade D

Topic: Management of long gap c. Kimura procedure

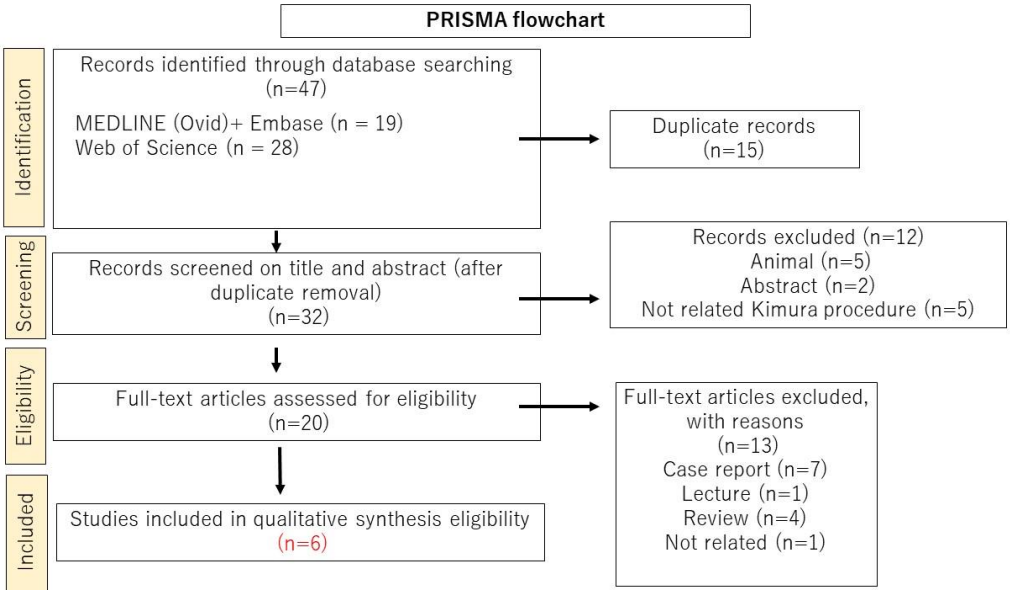
Naho Fujiwara

The Hospital for Sick Children (SickKids),

Toronto, Canada

Topic: Management of long gap　c.　Kimura procedure

Q
1. What is the success rate of “Kimura procedure”?
2. Which are the complications of “Kimura procedure”?



6

Literature on Kimura procedure

	N of pts	Complications	
		Leaks	Stenosis
Kimura, 2001	12	3	12
Takamizawa, 2005	7	2	7
Tamburri, 2009	12	3	6
Miyano, 2013	4	2	4
Sroka, 2013	6	6	5
Oliver, 2021	3	0	2

Kimura Procedure

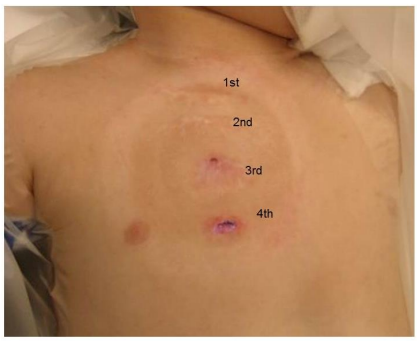
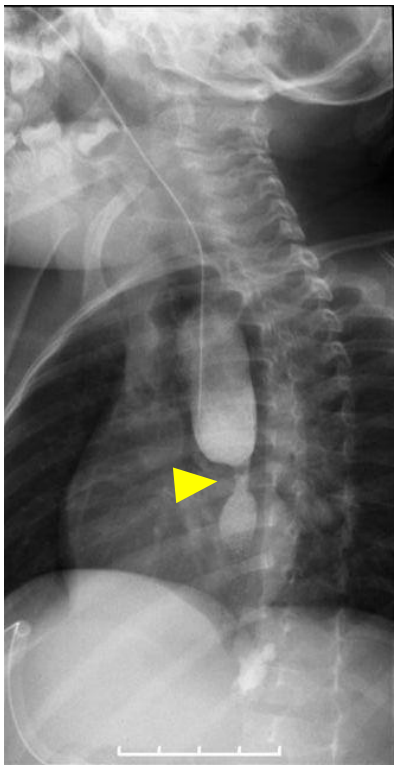


Photo kindly provided by Prof. Yamataka

Outcome

Patient	Age (mths)	BW (kg)	Gap (vert)	Op time (hours)	Open	Complications Post-Op	Dilations	Stenting (days)	Extubation (days)	Feeding (days)
1	27	13	2	9	(-)	stenosis	> 10 times	8	2	7
2	25	9	1.5	8	(-)	stenosis	5	3	2	9
3	27	10	2	10	(+)	leakage/stenosis	2	56	5	31
4	10	7.2	0	10	(-)	leakage/stenosis	3	24	5	24

Open: conversion to open, Stenting: postoperative duration until stent tube removal, Extubation: extubation, Feeding: eating was recommenced



Postoperative Barium Meal

Prof. Yamataka's comment

- Recently we are not using Kimura procedure
- All patients require multiple dilation
- The tip of proximal esophagus is severely fibrotic and full thickness. So it is the cause of postoperative stenosis.

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Evidence Based Guidelines – EA/TEF

Esophageal Replacement

Luques L.[1,2] , Baertschiger R.M.[1], Lauriti G.[3], Miscia M.E.[3], Morini F.[4], Mutanen A.[5], Pierro A.[1]

[1] *The Hospital for Sick Children (SickKids), Toronto, ON, Canada;* [2] *Hadassah Medical Center, Jerusalem, Israel;*

[3] *University of Chieti-Pescara, Pescara, Italy;* [4] *Azienda Ospedaliero-Universitaria Meyer, Firenze, Italy;*

[5] *Helsinki University Central Hospital, Helsinki, Finland.*

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Background

- Conservation of the native esophagus is always the best choice.
- When not possible, different techniques for esophageal replacement have been proposed.
- Four main techniques are currently available: **gastric transposition**, **gastric tube**, **jejunal interposition** and **colonic interposition**.
- Each technique has its own pros and cons.
- Reports are variable and well conducted comparative studies are lacking.

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Outcomes analyzed

1. First outcomes for analysis
    a. **Success rate** defined as full oral feeding within 6 months from surgery.
    b. **Overall complication rate** during three different periods (early, within 30d from surgery; late, between 31d and 1 year and; long-term, after 1 year)
    c. **Overall mortality** within the follow-up period
2. Secondary outcomes
    a. Rate of **specific complications** at the three analyzed periods.
3. Data collection included demographics and mean follow up.

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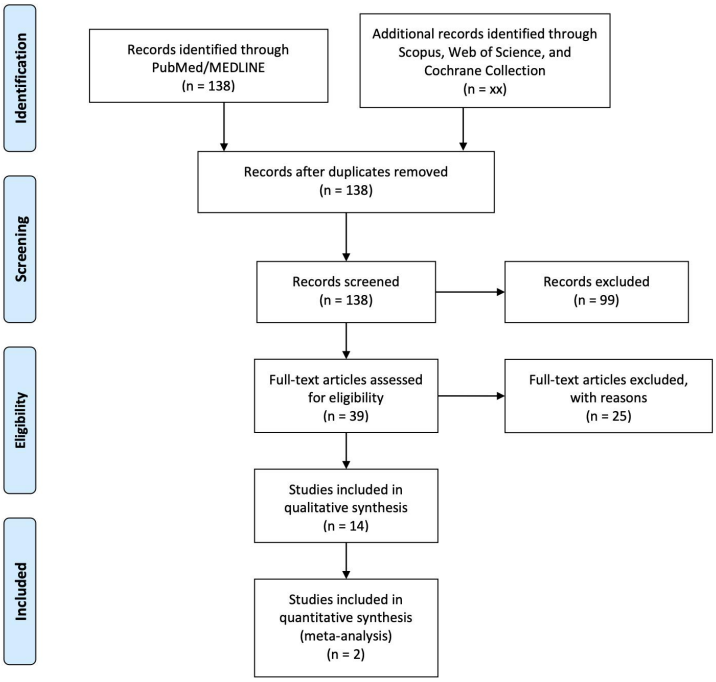
Evidence Based Guidelines – EA/TEF

Esophageal Replacement – Gastric transposition

Lauriti G. , Miscia M.E. , Morini F.

Gastric transposition - PRISMA

- 17 articles identified (422 patients)
- **14 meet inclusion/exclusion criteria (375 patients)**
- 1 excluded because pooled data with cases of caustic strictures
- 2 excluded because EA undergoing gastric pull-up were <10 patients
- **2 comparative study (1 colon; 1 gastric tube)**



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Patients and Follow-up

- 375 patients included for analysis
  - 97 EA Gross Type A - 26%
  - 116 EA Gross Type C - 31%
  - 162 N/A - 43%

- Length follow up: 9.3 ± 2.1 years (5/14 studies)

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Gastric transposition - Outcomes

Success Rate	Overall mortality	Complications		
		Early	Late	Long term
72.9% ±19.0% (157/216 patients, 9/14 studies)	**7.6%** ±6.6% (16/209 patients, 9/14 studies)	Leakage 17±20.9% (54/304 patients)	Strictures 15.7±19.4% (46/292 patients)	N/A
		Pleural effusion 20±11.9% (12/60 patients)	Respiratory 35.1±19.3% (52/148 patients)	N/A
		Re-fistula 12.2±11.2% (7/57 patients)	Dysphagia 28.8±24.7% (21/73 patients)	N/A
			DGR 24.1±25.9% (14/58 patients)	N/A
		Overall 65.6±38.2% (124/189 patients)		

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Gastric transposition - Others

- **Graft failure** was addressed in 2/14 studies and reported in **0/59 patients (0%)**

- Need for **endoscopic dilatation** was addressed in 8/14 studies and reported in **47/200 patients (23.5±30.4%)**

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Evidence Based Guidelines – EA/TEF

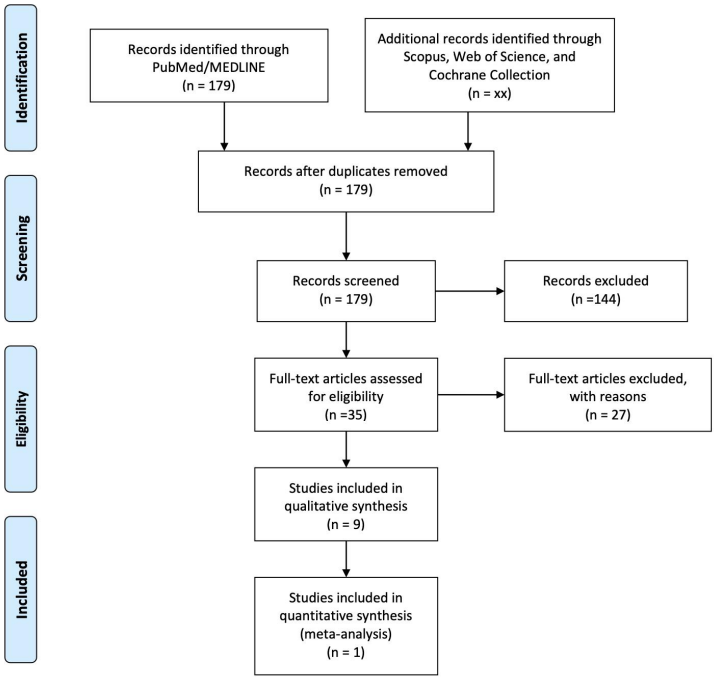
Esophageal Replacement – Gastric Tube

Miscia M.E. , Morini F., Lauriti G.

Gastric Tube - PRISMA

- 9 articles identified (143 patients)
- **9 meet inclusion/exclusion criteria**
- **1 comparative study**

- Only **1/9 papers** published in **current decade**



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Patients and Follow-up

- 143 patients included for analysis
  - 53 EA Gross Type A - 37%
  - 26 EA Gross Type C - 18%
  - 64 N/A - 45%

- Length follow up: 5.5 ± 2.2 years (4/9 studies)

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Gastric Tube - Outcomes

Success Rate	Overall mortality	Complications		
		Early	Late	Long term
100% (56/56 patients, 3/9 studies)	**10%** ±10.6% (6/60 patients, 4/9 studies)	Leakage 42.5±21.6% (34/80 patients)	Strictures 33.9±19.0% (35/103 patients)	N/A
		Respiratory 35.7% (5/14 patients)	Respiratory 27.5±27.6% (11/40 patients)	N/A
		Re-fistula 40.7±30.6% (11/27 patients)	Dysphagia 24.4±15.4% (11/45 patients)	N/A
		SSI 10.7±5.0% (3/28 patients)	DGR 42.4±36.3% (28/66 patients)	N/A
		Overall N/A		

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Gastric Tube - Others

- **Graft failure** was addressed in 2/9 studies and reported in **3/26 patients (11.5±8.1%)**

- Need for **endoscopic dilatation** was addressed in 7/9 studies and reported in **32/110 patients (29.5±26.0%)**

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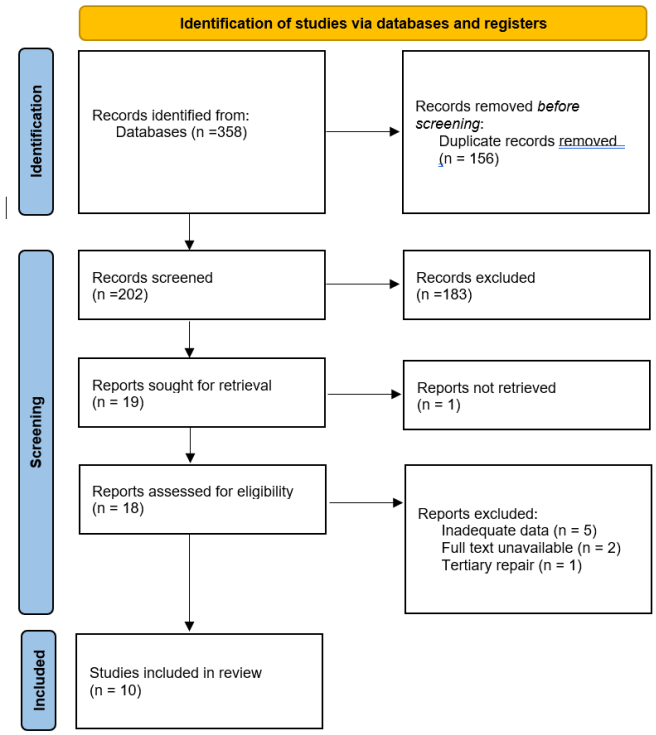
Evidence Based Guidelines – EA/TEF

Esophageal Replacement – Colonic Interposition

Luques L., Mutanen A.,Baertschiger R.M.[1]

Colonic Interposition - PRISMA

- 19 articles identified, 18 retrieved for review
- 8 articles excluded
  - 5 inadequate data
  - 2 full text unavailable
  - 1 Tertiary repair
- **10 meet inclusion/exclusion criteria (318 patients)**



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Patients and Follow-up

- 318 patients included for analysis
  - 125 EA Gross Type A - 39%
  - 2 EA Gross Type B - 0.5%
  - 9 EA Gross Type C - 3%
  - 25 EA Gross Type D - 8%
  - 157 EA N/A - 49.5%
- Length follow up: 5.9 ± 2.6 years (7/10 studies)

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Colonic Interposition - Outcomes

Success Rate	Overall mortality	Complications		
		Early	Late	Long term
97% (75-100%) (191/197 patients)	**4%** (0-10%) (14/318 patients)	Leakage 19% (46/238 patients)	Strictures 14% (34/238 patients)	Strictures 5% (11/229 patients)
		Respiratory 6% (14/238 patients)	Re-operation 2% (5/238 patients)	Redundancy 5% (11/229 patients)
		Sepsis 2.5% (6/238 patients)	Others 18% (43/238 patients)	Bowel obstruction 9% (21/229 patients)
		Others 11.34% (27/238 patients)		Others 16% (37/229 patients)
		Overall 37% (19-70%) (118/318 patients)	Overall 26% (3-63%) (83/318 patients)	Overall 27% (4-61%) (83/310 patients)

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Colonic Interposition- Others

- **Graft failure** was addressed in 10/10 studies and reported in **13/318 patients (4% - range 0-20%)**

- Need for **endoscopic dilatation** was addressed in 8/10 studies and reported in **30/232 patients (13% - range 0-60%)**

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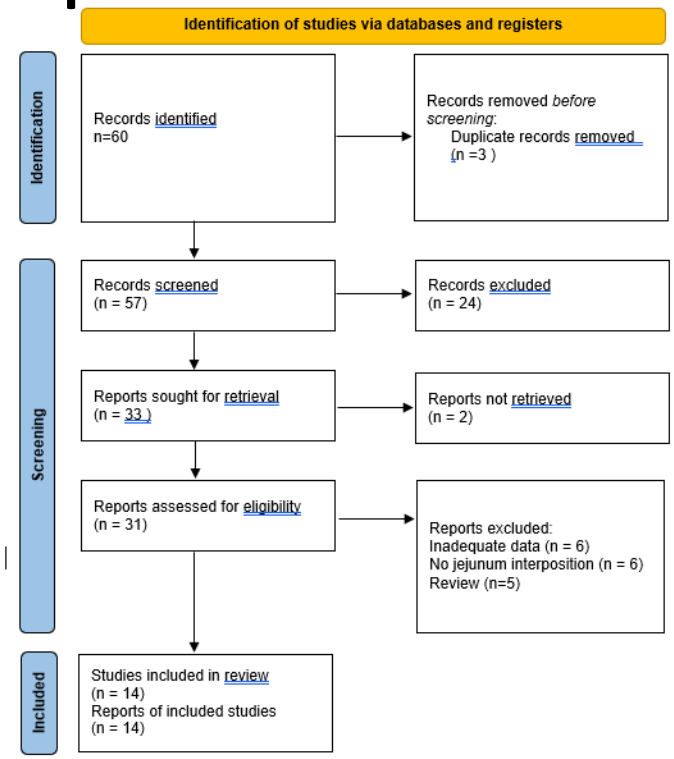
Evidence Based Guidelines – EA/TEF

Esophageal Replacement – Jejunum Interposition

Mutanen A.

Jejunum Interposition - PRISMA

- 33 articles identified, 31 retrieved for review
- 17 articles excluded
  - 6 inadequate data
  - 6 no jejunum interposition
  - 5 review articles
- **14 articles included (176 patients)**



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Jejunum Interposition

- Patients and Follow-up

- 176 patients included for analysis
  - 46 EA Gross Type A - 26%
  - 33 EA Gross Type B - 19%
  - 39 EA Gross Type C - 22%
  - 58 N/A - 33%
- With microvascular anastomosis in 51/176 (29%), 4/14 studies
- Length follow up: median 2.7 years (9/14 studies)

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Jejunum Interposition - Outcomes

Success Rate	Overall mortality	Complications		
		Early	Late	Long term
58% (33-100%) (12/14 studies)	**8%** (33-100%) (11/14 studies)	Leakage 18% (0-60%) (33/188 patients, 11/14 studies)	Strictures 24% (9-50%) (34/142 patients, 8/14 studies)	Strictures 34% (11-53%) (20/59 patients, 4/14 studies)
		Respiratory 12% (0-17%) (12/104 patients, 5/14 studies)	Re-op 22% (10-29%) (28/125 patients, 5/14 studies)	Redundancy 7% (5-10%) (4/58 patients, 3/14 studies)
		Sepsis 12% (3/25 patients, 2/14 studies)		GI symptoms 39% (5-87%) (17/44 patients, 3/14 studies)
		Overall 45% (5-93%) (73/161 patients, 9/14 studies)	Overall 50% (15-60%) (45/90 patients, 3/14 studies)	N/A

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Jejunum Interposition - Others

- **Graft failure** was addressed in 10/14 studies and reported in the **range of 0-33%**

- Need for **endoscopic dilatation** was addressed in 6/14 studies and reported in **26/78 patients (33%)**

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Summary and Recommendation

- Well conducted comparative studies are lacking
- The type and rate of complications variate widely between the different techniques and the analyzed periods of time
- Despite that some medium and long-term studies are available, the comparation is difficult due to high heterogenicity of the analyzed outcomes
- Grade of recommendation: **Grade C/D**

Esophageal Atresia: Tracheomalacia

Evidence for treatment and recommendations

Ramon Gorter, Paul van Amstel and Stefaan Tytgat

Esophageal Atresia

Questions → Evidence Based Guidelines

1. What is the preferred surgical procedure for tracheomalacia in children born with esophageal atresia?

   Aortopexy vs tracheopexy

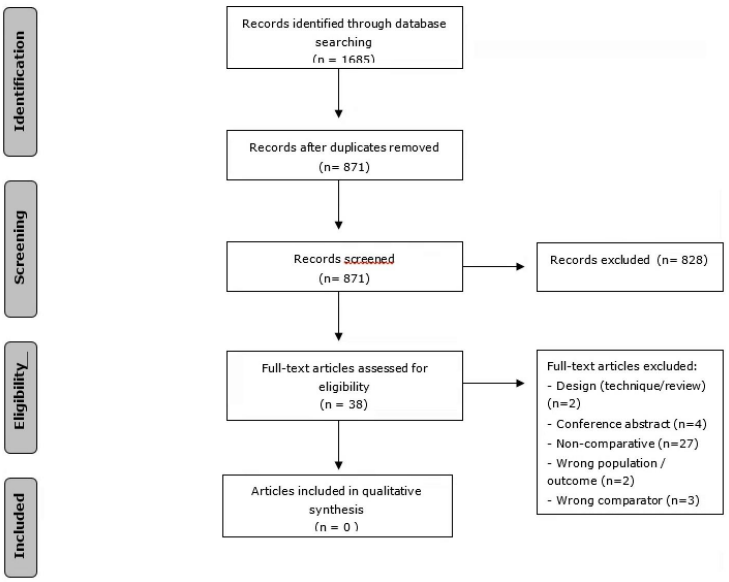
2. Is primary tracheopexy during esophageal repair beneficial?

   Primary tracheopexy vs no primary tracheopexy

Question 1

Gorter / van Amstel / Tytgat

Figure 1. Flowchart of the search and selection procedure of studies.



Conclusion:

No studies are identified comparing aortopexy with (posterior) tracheopexy in children with EA.

Recommendation:

No recommendation can be made regarding the preferred surgical procedure for tracheomalacia in children with EA.

Further studies should focus on this omittance in current literature

Level of evidence: -
Level of recommendation: Grade D

Question 2

Gorter / van Amstel / Tytgat

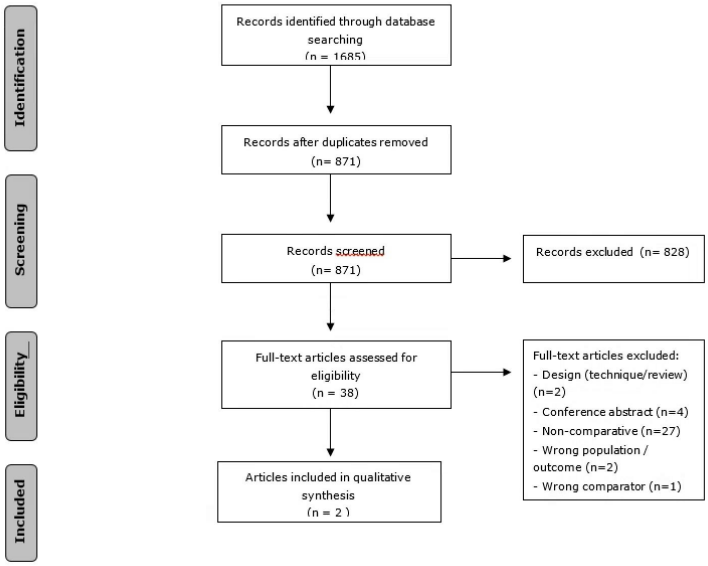
Is primary tracheopexy during esophageal repair beneficial?

Primary tracheopexy vs no primary tracheopexy

Question 2

Gorter / van Amstel / Tytgat

Figure 1. Flowchart of the search and selection procedure of studies.



One excluded study

Retrospective comparative cohort studies

Shieh (2018)

Reason: Compared primary versus secondary PT

Two included studies

Retrospective comparative cohort studies

- Hinoki (2022)
- Van Tuyll Serooskerken (2021)

Question 2

Gorter / van Amstel / Tytgat

- Risk of Bias (cohort studies, ROBINS-I)

Author	Bias due to confounding	Bias in selection of participants into the study	Bias in classification of interventions	Bias due to deviation from intended interventions	Bias due to missing data	Bias in measurement of outcomes	Bias in selection of the reported result	Overall Risk of Bias
Hinoki (2022)	Serious	Serious	Serious	Low	Low	Serious	No information	Serious
van Tuyll van Serooskerken (2021)	Moderate	Moderate	Low	Low	Moderate	Serious	Moderate	Serious

Hinoki et al (2022)

Mortality and complications

- Anastomotic leakage 0/8 PPT vs 1/14 no PPT (p=1.0)
- Chylothorax 1/8 PPT vs 0/14 no PPT (p=0.36)
- Anastomotic stricture 1/8 PPT vs 3/14 no PPT (p=0.53)

Additional surgical interventions within 60 days

- PPT: 1/8 (1 tracheostomy) vs no PPT: 8/14 (5 tracheostomy and 3 aortopexy) (p=0.07)

Improvement of TM symptoms

- Respiratory dependence rate at 30 days postoperative 2/8 PPT vs 11/14 no PPT (p=0.03)
- Intubation 0/8 PPT vs 1/14 no PPT (p=1.0)
- CPAP 2/8 PPT vs 10/14 no PPT (p=0.07)

Van Tuijll van Serooskerken et al (2021)

Mortality

Group 1 vs Group 2: 1/28 vs 0/36

Cause of death: Accidental decannulation tracheostomy

Complications

- Group 1 vs Group 2 anastomotic leakage: 3/28 vs 6/36 (p=0.72)
- PPT vs no PPT (only group 2) anastomotic leakage: 3/22 vs 3/14 (p=0.66)

Improvement of TM symptoms

- *Brief Resolved Unexplained Events*
  - Group 1 vs Group 2: 11/28 vs 7/36 (p=0.09)
  - PPT vs non PPT in group 2: 1/14 vs 6/22 (p=0.21)

- Respiratory tract infection

Group 1 vs Group 2: 17/28 vs 9/36 (p=0.004)

PPT vs non PPT (group 2): 3/14 vs 6/22 (p=1.0)

Conclusion:

Very limited data suggest that primary tracheopexy is safe and feasible (no increase in mortality and complications) and might improve respiratory outcomes although hard evidence is not available.

Recommendation:

A formal recommendation regarding whether or not primary tracheopexy should be done can't be made based upon the available evidence.

We recommend that an international study will be initiated with clear definitions and outcomes to answer this question.

Level of evidence: Very low
Level of recommendation: Grade D