Strategy for EA + TOF Repair in Premature

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Introduction

- Esophageal atresia(EA) with Tracheo-esophageal Fistula (TOF) repair is a complex operation, even in full-term neonates
- Successful operative approach is much more likely in the neonate with
  (1) relative freedom of pulmonary complication,
  (2) sufficient size to permit a comfortable esophageal anastomosis, and
  (3) sufficient vigor to withstand a thoracotomy and its postoperative difficulties.

J. Thoracic and Cardiovas. Surg. Vol. 44,September, 1962

Esophageal atresia

- The major factors leading to death in infants with esophageal atresia and tracheoesophageal fistula are
  (1) pulmonary complications,
  (2) prematurity,
  (3) associated major congenital anomalies, and
  (4) anastomotic leaks with sepsis.

J. Thoracic and Cardiovas. Surg. Vol. 44,September, 1962

Low Birth Weight Neonates

- LBW = 1.5 - 2.5kg
- VLBW = 1.0 - 1.5 kg
- ELBW = < 1.0 kg

- Preterm babies with ELBW/VLBW present with cardio-pulmonary vulnerability, an immature immune system, and the risk of preterm complications such as necrotizing enterocolitis and intracranial hemorrhage (ICH)

In general

- Improvement of survival of EA in LBW babies are due to
  - Improve surgical technique
  - Better understanding of physiology of premature babies
  - Advancement in neonatal intensive care unit
  - Better preoperative preparation, anaesthesia, postoperative care

EA in VLBW neonates

- Management of EA in VLBW neonates remain controversial and continues to be a major surgical challenge
- Specifically those infants with major cardiac anomalies as well as neonates with severe respiratory distress syndrome are less likely to tolerate the surgery and the operative time required for primary repair

Spitz Classification(1994)

Group	Features	Survival (%)
I	>1500 grams , no major cardiac anomally	98.5
II	< 1500 grams or major cardiac anomally	82
III	< 1500 grams and major cardiac anomally	50

Treatment strategies

- Two different treatment strategies for patients with EA and VLBW.
  - The first is primary repair— ligation of the TEF and esophageal anastomosis. The operation time, and anesthesia time are longer. In addition, esophageal tissue is very vulnerable and thin in VLBW, complicating the esophageal anastomosis.
  - The second is staged repair – ligation of the TEF, and gastrostomy is performed to enterally feed the child. Esophageal anastomosis is delayed until the patient stabilizes and gains sufficient weight, usually >1500-2,000 g.

- Some argue that the anastomotic result after primary EA repair is favorable compared with staged repair
- In contrast, others advocate that primary fistula ligation followed by gastrostomy and delayed esophageal anastomosis achieved better outcomes and lowered the rate of anastomotic complications in ELBW infants

TABLE 3 | Literature on esophageal atresia (EA) repair in very low birth weight (VLBW)/extremely low birth weight (ELBW).

Author	Year	Period	n[1]	Weight	Primary	Staged	EA Type	Aim of the study	Conclusion
Schmidt et al. (15)	2017	2002–2016	11	4 ELBW 7 VLBW (24 > 1,500 g)	4 7 24		Gross C	Compare outcome after primary open repair in VLBW/ELBW with BW > 1,500 g	Complications are unrelated to bodyweight
Hannon et al. (16)	2016	1993–2015	9	ELBW (m^2 = 815 g)	2	7	All	Outcome of EA repair in ELBW	56% survival, due to immaturity; Gross A with staged repair, 100% survival
Zani et al. (17)	2016	2000–2014	7	ELBW (m = 930 g)	1	6	All	Outcome of EA repair in ELBW	Complications associated with prematurity
Margain et al. (18)	2014	2012–2013	3	ELBW (m = 690 g)		3	Gross C	Outcome of EA repair in ELBW treated with LEB[3] and delayed repair	LEB enables delayed repair (> 2100g)
Ito et al. (19)	2013		1	ELBW (471 g)		1	Gross C	Case report: Delayed primary repair after EB[4]	Complications associated with prematurity EA repair was performed too late
Petrosyan et al. (20)	2009	1987–2008	25	VLBW (m = 1380 g)	16	9	All	Comparison between primary and staged repair in EA	Significantly more complications after primary repair
Seitz et al. (21)	2006	2002–2004	4	VLBW (m = 920 g)	4		Gross C	Outcome of EA in VLBW	Primary repair is technically feasible, AI and AS in 25%
Chahine and Ricketts (5)	2000	1981–1999	10	VLBW (m = 1160 g)	1	9	all	Outcome of EA in VLBW	10% died after sepsis caused by AI GER and fundo in 62.5%
Driver et al. (22)	1997		1	ELBW (740 g)	1		Gross C	Case report	Good outcome due to improved NICU treatment
Alexander et al. (23)	1993	1966–1986	21	<2,000 g (1590 g)	4	17	all	Comparison between primary and staged repair in EA	Staged repair incurred a lesser morbidity
Schaarschmidt et al. (24)	1992		1	ELBW (445 g)		1		Delayed primary repair without ligation of TEF[5], Case report	No operation-associated complications
Todd et al. (25)	1990		1	ELBW (700g)		1		Outcome of EA (IIIb) and delayed repair after LEB[3], Case report	Mechanical ventilation after LEB[3] dilatates the distal esophagus

Overview of the literature regarding the repair of EA with or without TEF in patients born with exclusively ELBW and VLBW, without the claim of completeness.

1 n, number of patients

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Outcome of Patients With Esophageal Atresia and Very Low Birth Weight (≤ 1,500 g)

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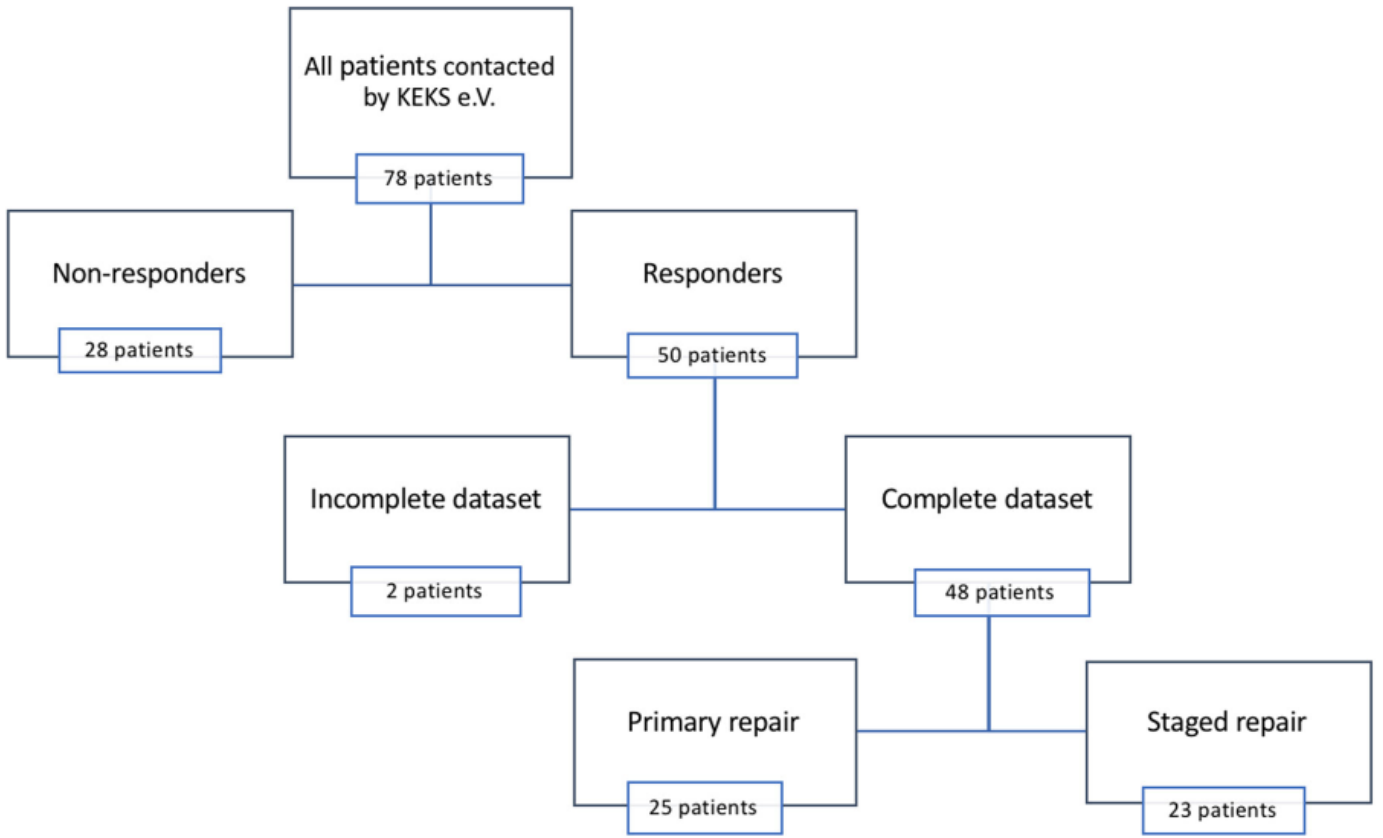

FIGURE 2 | Drop-out analysis.

TABLE 1 | Epidemiological data.

		All	Primary	Staged	*P*-value*
Male	Yes	21	8 (38%)	13 (62%)	0.09
	No	27	17 (63%)	10 (37%)	
ELWB	Yes	10	4 (40%)	6 (60%)	0.4
	No	38	21 (55%)	17 (45%)	
EA type/Gross	A	7	0 (0%)	7 (100%)	***0.01***
	B	1	1 (100%)	0 (0%)	
	C	37	21 (67%)	16 (43%)	
	D	2	2 (100%)	0 (0%)	
	Unknown	1	1 (100%)	0 (0%)	
Congenital heart disease	Yes	16	9 (56%)	7 (44%)	0.7
	No	30	15 (50%)	15 (50%)	
	Unknown	2	1 (50%)	1 (50%)	
Heart function	Normal	41	21 (51%)	20 (49%)	0.9
	Affected	5	3 (60%)	2 (40%)	
	Unknown	2	1 (50%)	1 (50%)	
VACTERL association	Yes	11	6 (55%)	5 (45%)	0.9
	No	35	18 (51%)	17 (49%)	
	Unknown	2	1 (50%)	1 (50%)	
Congenital anomalies	Yes	21	12 (57%)	9 (43%)	0.7
	No	25	11 (44%)	14 (56%)	
	Unknown	2	2 (100%)	0 (0%)	
Intracranial haemorrhage	Yes	11	7 (64%)	4 (36%)	0.4
	No	35	17 (49%)	18 (51%)	
	Unknown	2	2 (100%)	0 (0%)	
Preoperative ventilation	Yes	33	17 (52%)	16 (48%)	0.5
	No	11	7 (64%)	4 (36%)	
	Unknown	4	1 (25%)	3 (75%)	
Time to fistula closure	< 24h	11	7 (64%)	4 (36%)	0.8
	>24 h, <48 h	9	7 (78%)	2 (22%)	
	>48 h, <5 d	8	4 (50%)	4 (50%)	
	>5 d, <7 d	2	1 (50%)	1 (50%)	
	>7d	8	5 (63%)	3 (37%)	
	No fistula	7	0 (0%)	7 (100%)	
	Unknown	3	1 (33%)	2 (67%)	

TABLE 1 | Continued

		All	Primary	Staged	*P*-value*
RF	Yes	8	7 (88%)	1 (12%)	***0.02***
	No	27	12 (44%)	15 (56%)	
	Unknown	13	6 (46%)	7 (54%)	
AS	Yes	24	14 (58%)	10 (42%)	0.5
	No	13	6 (46%)	7 (54%)	
	Unknown	11	5 (45%)	6 (55%)	
Gastrostomy	Yes	28	8 (29%)	20 (71%)	***0.01***
	No	16	14 (88%)	2 (12%)	
	Unknown	4	3 (75%)	1 (25%)	
GER	Yes	31	13 (42%)	18 (58%)	***0.02***
	No	12	10 (83%)	2 (17%)	
	Unknown	5	3 (60%)	2 (40%)	

*This table shows all the information collected. Statistical correlation of primary repair and each category (e.g., EA type: A,B, C, D) was tested. *The p-value relates to the category, not the single parameter in a category, and is calculated without unknown cases performing chi-square test. Statistically significant p-values are underlined and marked in bold.*

EELBW, Extremely low birth weight; EA, Esophageal atresia; VACTERL, Vertebral, intestinal atresia, cardiac, tracheal, renal, limb malformations; No., Number; AI, Anastomotic insufficiency; RF, Recurrent fistula; AS, Anastomotic stenosis; GER, Gastroesophageal reflux.

TABLE 2 | Outcome after primary vs. staged repair in the different subgroups.

Subgroup			AI	RF	AS	GER	1 surg.	2 surg.	3 surg.	> 3 surg.	ICH
All patients	All	48 (100%)	9 (19%)	8 (17%)	24 (50%)	31 (65%)	9 (18%)	11 (23%)	4 (8%)	21 (44%)	11 (23%)
	Primary	25 (100%)	**6 (24%)**	**7 (28%)**	14 (56%)	13 (52%)	**9 (36%)**	5 (20%)	2 (8%)	8 (32%)	**7 (28%)**
	Staged	23 (100%)	3 (13%)	1 (4%)	10 (43%)	**18 (78%)**	/	6 (26%)	2 (9%)	**13 (57%)**	4 (17%)
VLBW + ELBW + Type C	All	37 (100%)	6 (16%)	6 (16%)	18 (48%)	21 (57%)	9 (24%)	9 (24%)	3 (8%)	15 (40%)	**11 (30%)**
	Primary	21 (100%)	**5 (24%)**	**5 (24%)**	**12 (57%)**	5 (48%)	**9 (43%)**	5 (24%)	1 (5%)	5 (24%)	7 (33%)
	Staged	16 (100%)	1 (6%)	1 (6%)	6 (37%)	**11 (69%)**	/	4 (25%)	2 (12%)	**10 (62%)**	4 (25%)
eVLBW	All	38 (100%)	7 (18%)	7 (18%)	17 (45%)	24 (63%)	8 (21%)	8 (21%)	4 (10%)	15 (40%)	5 (13%)
	Primary	21 (100%)	**6 (29%)**	**6 (29%)**	10 (48%)	10 (48%)	**8 (38%)**	4 (19%)	2 (10%)	6 (29%)	**4 (19%)**
	Staged	17 (100%)	1 (6%)	1 (6%)	7 (41%)	**14 (82%)**	/	4 (24%)	2 (12%)	**9 (53%)**	1 (6%)
eVLBW + Type C	All	28 (100%)	5 (18%)	5 (18%)	12 (43%)	15 (54%)	8 (28%)	6 (21%)	3 (11%)	10 (35%)	5 (18%)
	Primary	18 (100%)	**5 (28%)**	**4 (22%)**	9 (50%)	8 (44%)	8 (44%)	4 (22%)	1 (6%)	4 (22%)	**4 (22%)**
	Staged	10 (100%)	0 (0%)	1 (10%)	3 (30%)	**7 (70%)**	/	2 (20%)	2 (20%)	**6 (60%)**	1 (10%)
ELBW	All	10 (100%)	2 (20%)	1 (10%)	7 (70%)	7 (70%)	1 (10%)	3 (30%)	0 (0%)	6 (60%)	6 (60%)
	Primary	4 (100%)	0 (0%)	1 (25%)	4 (100%)	3 (75%)	1 (25%)	1 (25%)	0 (0%)	2 (50%)	3 (75%)
	Staged	6 (100%)	2 (33%)	0 (0%)	3 (50%)	4 (67%)	/	2 (33%)	0 (0%)	4 (67%)	3 (50%)
Type A	All	7 (100%)	1 (14%)	/	**4 (57%)**	**7 (100%)**	/	2 (29%)	0 (0%)	3 (43%)	**0 (0%)**

AI, Anastomotic insufficiency; RF, Recurrent fistula; AS, Anastomotic stenosis; GER, Gastroesophageal reflux; Surg., Surgery; ICH, Intracranial hemorrhage; VLBW, Very low birth weight (≤1,500 g); ELBW: Extremely low birth weight (≤1,000 g); eVLBW, Exclusively VLBW (>1,000 g; ≤1,500 g).

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ORIGINAL ARTICLE

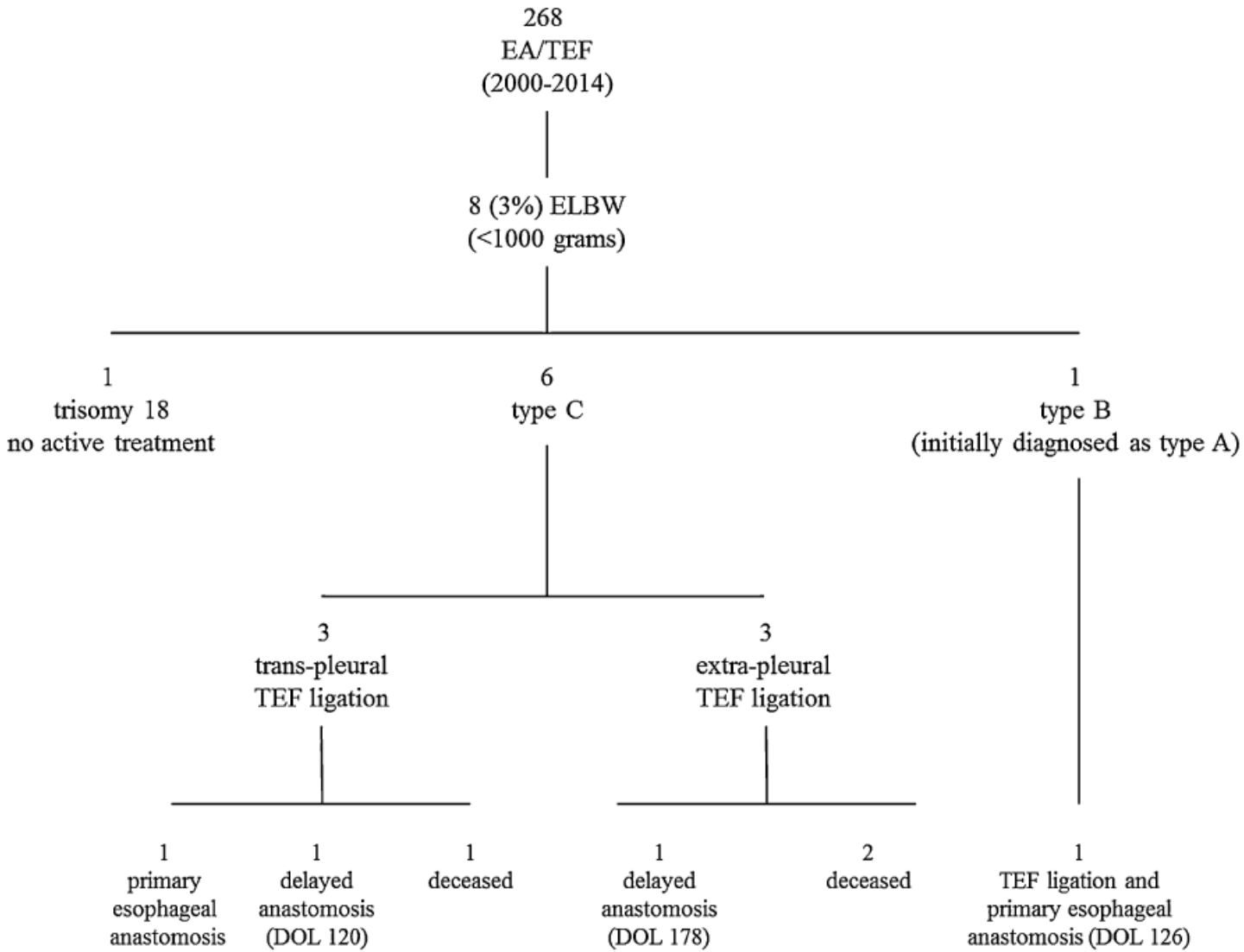
Outcome of esophageal atresia/tracheoesophageal fistula in extremely low birth weight neonates (<1000 grams)

Augusto Zani[1] · Justyna Wolinska[1] · Giovanni Cobellis[1] · Priscilla P. L. Chiu[1] · Agostino Pierro[1]

Table 1 Extreme low birth weight patients with esophageal atresia with/without tracheoesophageal fistula: demographics and description

	Gender	Birth weight (g)	Gestational age (weeks)	Antenatal scans	Associated anomalies
1	M	750	26 + 1	Normal	PDA
2	F	980	31 + 3	Polyhydramnios, severe IUGR, 2 vessel cord	VSD, PDA, duodenal atresia, anorectal malformation, omphalomesenteric duct
3	M	995	28 + 4	Normal	Truncus arteriosus
4	F	990	32 + 6	Severe IUGR, single pelvic kidney, single umbilical artery	VSD, PDA, PFO, butterfly vertebra, anorectal malformation, tethered cord, fused pelvic kidney
5	F	870	27 + 1	Oligohydramnios, left talipes, 2 vessel cord, Mosaic uniparental disomy of chromosome 14 (amniocentesis)	Trisomy 14, PDA, PFO, ASD, fused vertebrae, tethered cord, talipes
6	F	975	29 + 5	Bilateral choroid plexus cysts	Trisomy 18
7	F	884	32 + 4	Polyhydramnios, severe IUGR	ASD, tethered cord
8	M	540	23 + 2	Normal, dichorionic diamniotic pregnancy	PDA

ASD atrial septal defect, *IUGR* = *PDA* = patent ductus arteriosus, *PFO* patent foramen ovale, *VSD* ventricular septal defect


268
EA/TEF
(2000-2014)
8 (3%) ELBW
(<1000 grams)
1
trisomy 18
no active treatment
6
type C
1
type B
(initially diagnosed as type A)
3
trans-pleural
TEF ligation
3
extra-pleural
TEF ligation
1
primary
esophageal
anastomosis
1
delayed
anastomosis
(DOL 120)
1
deceased
1
delayed
anastomosis
(DOL 178)
2
deceased
1
TEF ligation and
primary esophageal
anastomosis (DOL 126)

- Overall mortality was 50 %.
- All four surviving patients experienced postoperative complications.
  - One patient had a thoracic duct injury that was successfully treated conservatively.
  - Two (50 %) patients had anastomotic leak that was successfully managed non-operatively with antibiotic and chest tube drainage.
  - Three patients (75 %) developed esophageal strictures requiring balloon dilatation.
  - One patient had severe tracheomalacia requiring aortopexy after esophageal repair

- the incidence of ELBW infants with EA/ TEF is rare (3 %) but these patients have a mortality rate of 50 %.
- The causes of death are mainly due to complications not associated with EA/TEF.
- Early TEF ligation followed by delayed esophageal repair can achieve a good outcome for ELBW infants.
- ELBW neonates with EA/TEF, associated anomalies represent a major risk factor for mortality

ORIGINAL ARTICLE

Review of Oesophageal Atresia and Tracheoesophageal Fistula in Hospital Sultanah Bahiyah, Alor Star. Malaysia from January 2000 to December 2009

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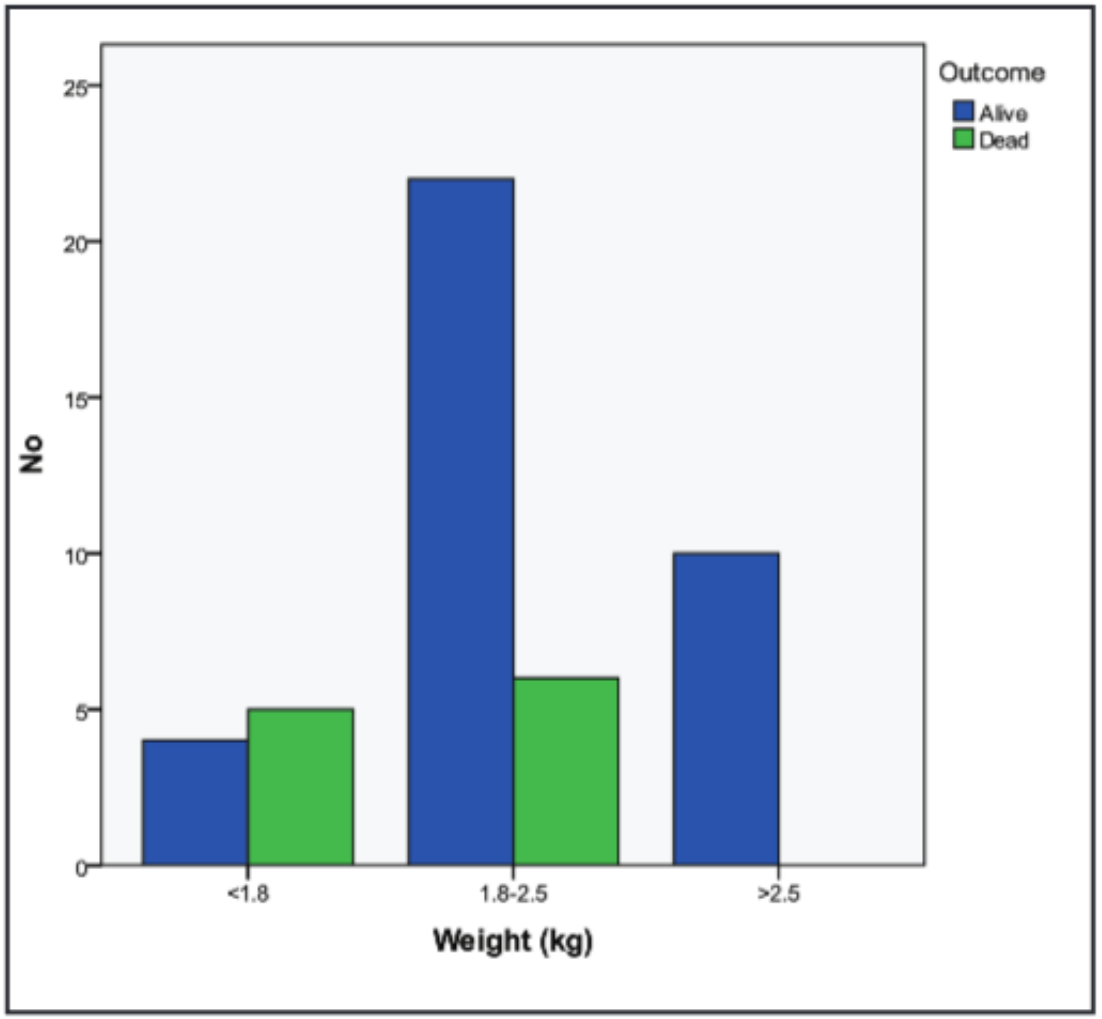

Fig. 2: Comparison of birth weight and outcome of EA/TEF patients in HSB from Jan 2000 to Dec 2009.


INSTITUT PEDIATRIK


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HOSPITAL TUNKU AZIZAH
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KEMENTERIAN KESIHATAN MALAYSIA

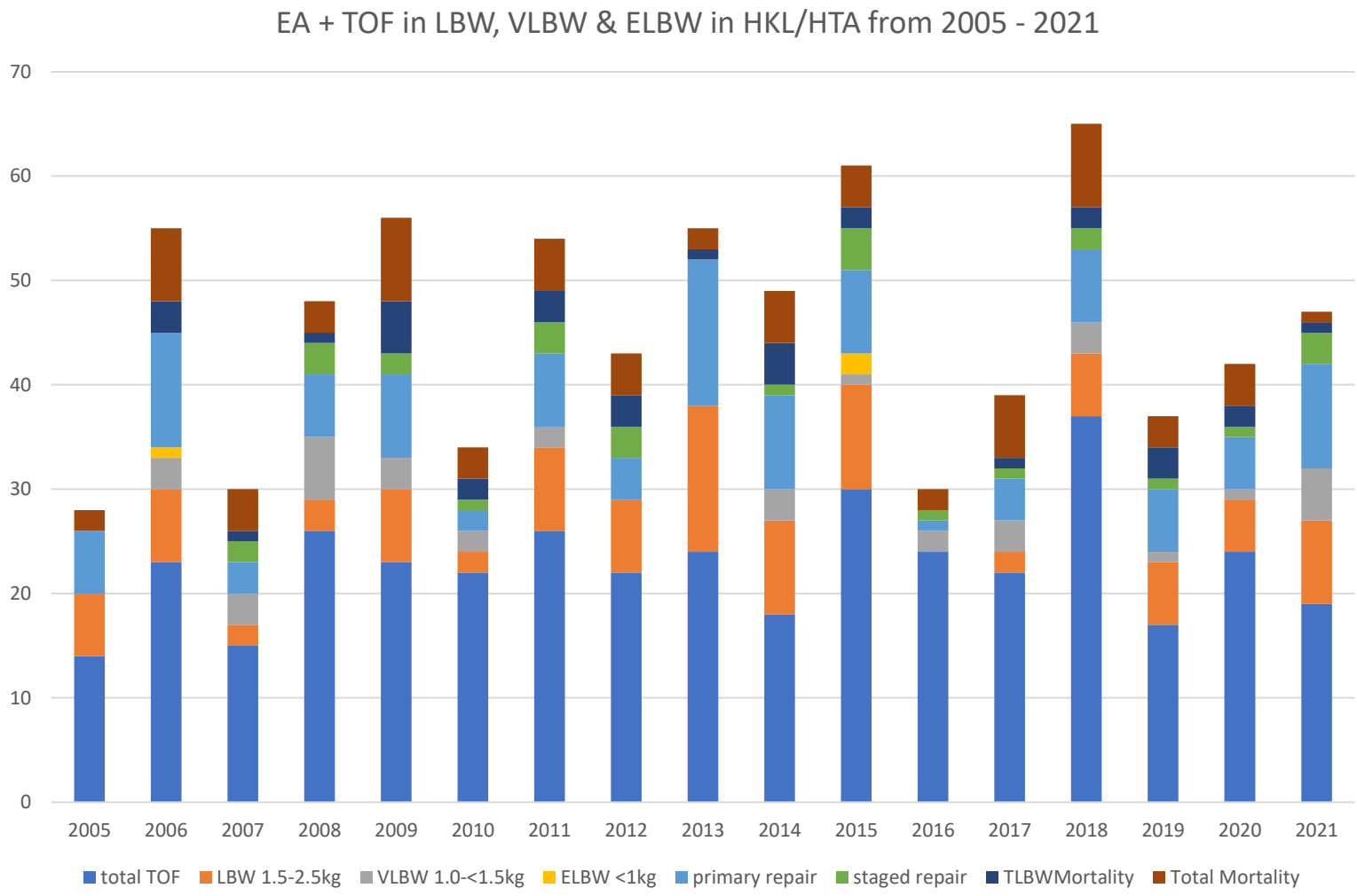
	OA + TOF 2005 - 2010																	
YEAR	total	prem 30 -	prem < 30	wt 2.1 - 2.	wt 1.5 - 2.	wt 1.0 - 1.	wt < 1 kg	primary re	staged repair			mortality	comorbids					
2005	14	34			1.8			primary repair										
		33				1.54		primary repair										
		33			1.75			primary repair										
		35		2.2				primary repair					Single ventricle, PDA					
		term		2.4				primary repair					cardiac tof					
		term		2.45				primary repair					Leak-conservative					
2006	23		26				0.625	primary repair				died - chronic lung, IVH3, ?Leak						
		33				1.38		primary repair										
		36		2.1				primary repair				died - cvl sepsis, coarc aorta						
		33				1.45		primary repair				died - chro	ARM					
		34				1.34		primary repair										
					1.92			primary repair										
		term			1.93			primary repair					ARM					
		37		2.41				primary repair					tracheal stenosis					
		term			2.05			primary repair				Died at ho	Cardiac Tof					
		term		2.2				primary repair										
		38		2.18				primary repair					Leak- redo repair					
2007	15		27			1.05		primary repair				died - chronic lung						
			29			1.22			staged repair										
			29			1			staged repair										
		38		2.15				primary repair										
		term		2.16				primary repair										
2008	26	34				1.2			staged rep	delayed 1	repair pod7							
		32				1.2		primary repair										
		30				1.3			staged rep	delayed 1	repair pod30							
		32				1.3		primary repair										
		31				1.48			staged repair			died - NEC, Down synd, Cardiac TOF						
		30			1.7			primary repair										
		term				1.45		primary repair										
		term		2.1				primary repair										
		term			1.94			primary repair										
2009	23	35				1.26		primary repair										
		36				1.47		primary repair				died - dysmorphic, PRS						
		33			1.6				staged repair			died						
		36		2.19				primary repair				died - Edward						
		36			1.7			primary repair				died - recurrent fistula						
		30				1.46			staged rep	delayed 1		died - aspirated						
		35			1.93			primary repair						cervical myotomy				
		35		2.37				primary repair										
		36			1.85			primary repair										
		term			1.9			primary repair										
2010	22																	
		32				1.45						died - Down, Cardiac TOF, hypercyanotic spell. No op done							
		34				1.29			staged repair					esophagostomy				
		36		2.06				primary repair				died - sepsis, duod atresia, asp pneum						
		term		2.4				primary repair										

			OA + TOF 2011 - 2015								
YEAR	total	prem 30 -3	prem < 30	wt 2.1 - 2.	wt 1.5 - 2.	wt 1.0 - 1.	wt < 1 kg	primary re	staged repair	mortality	
2011	26										
		35		2.1				primary repair			ARM, Duod atresia
		32				1.2		primary repair			
		35		2.35				primary repair			
		34			1.73			primary repair			Leak, converted to pure atresia, gastrostomy
		33			1.5				staged rep	delayed repair pod4	desat intraop, later noted Trisomy18
		34			1.5			primary repair			stricture - dilate
		34			1.7				staged rep	delayed repair pod3	
		32				1.05			staged repair	died - lung problem	
		34			1.9			primary repair		died - sepsis	
		term			1.9			primary repair		died - pphr	redo op pod3
2012	22										
		35			1.92				staged repair	died - mult	DA, ARM, Uret hypop
		35			1.9				staged repair		severe cardiac - single atrium, ventricle
		36			1.56			primary repair			cardiac tof
		33			1.07			primary repair			
		term		2.12				primary repair		died - asp	pneu
		term		2.08				primary repair		died - seps	ARM, DA
		35		2.05					staged repair		Tof type B, esophagostomy
2013	24										
		36		2.23				primary repair			ARM-anoplasty
		36		2				primary repair			
		35			1.91			primary repair			
		36			1.6			primary repair			Leak- conserv
		36			2.09			primary repair			DA, ARM
		34			1.84			primary repair			
		35		2.1				primary repair			stricture-dilate
		32			1.62			primary repair			
		34			1.85			primary repair			Cardiac tof, ARM
		36			1.95			primary repair			DA
		36			1.77			primary repair		died -	complex heart
		term		2.09				primary repair			
		term			1.64			primary repair			Leak-conserv, PDA in failure
		term		2.2				primary repair			leak-conserv
2014	18										
		term		2.42						died in ot	post-bronch desat, cpr 1 hr, no murmur
		term		2.3				primary repair			
		term		1.57				primary repair			tof repair with lap for gastric perf
		36			1.75			primary repair			hypoplastic Lt lung,
		term		2.2				primary repair			
		34			1.75			primary repair			
		34				1.4		primary repair		died - sepsis,	MOF
		36			1.63			primary repair			
		term		2.45				primary repair			
		34				1.45		primary repair		died	1st op in sjmc, leak, PDA in failure
		34			1.8					died - No	op, cardiac tof, bronc stenosis, absent RLL & LLL
		33				1.1			staged repair		
2015	30										
		31					0.9	primary repair			Leak, converted to pure OA
		31			1.9			primary repair			stricture-dilate
		36		2.1				primary repair			dysmotility, tracheomalacia, Aortopexy done
		30				1.15			staged rep	delayed repair after 2	mth
		27					0.94		staged repair	died-resp f	1st fistula ligation done in Kajang, refistula
		term		2.06				primary repair			
		36			1.7			primary repair			VSD in failure
		34			1.5			primary repair			ARM
		term		2.25					staged rep	delayed repair pod3	hypoplastic Lt heart
		36		2.35				primary repair			LPA stenosis
		term			1.94				staged repair		pul atresia, large vsd
		term		2.42				primary repair			DA
		term			1.63					died at home -	discharged home, Edward syndrome

			OA + TOF 2016 - 2021									
YEAR	total	prem 30 -3	prem < 30	wt 2.1 - 2.4	wt 1.5 - 2.0	wt 1.0 - 1.4	wt < 1 kg	primary re	staged repair	mortality		
2016	24											
		34			1.75			primary repair			ARM	
		34			1.63				Staged repair		tracheal tear, esophagostomy, recurrent fistula	
2017	22											
		33				1.48		primary repair				
		32				1.4		primary repair			leak - conservative	
			29			1.4			staged rep delayed repair pod4		stricture - dilatation	
		36			1.9			primary repair				
		35			1.96			primary repair		died - complex heart		
2018	37											
		34			1.64			primary repair				
		33			1.69			primary repair		died		
		33			1.95			primary repair				
		31				1.36			staged repair		TOF type D	
		32				1.38			staged repair	died - com	ARM, Absent pulm artery	
		34			1.84			primary repair			ARM	
		31				1.48		primary repair			stricture, dilatation	
		36		2.15				primary repair			ARM - Anoplasty	
		34			1.92			primary repair			stricture, dilatation	
2019	17											
		36				1.3		primary repair		died - perf	leak, converted to pure OA, Cardiac Tof	
		33			1.6			primary repair			cyanotic heart on prostin	
		36			1.87			primary repair			leak, reanastomosed	
		36			1.9			primary repair			ARM, stricture- dilate	
		34			1.93			primary repair				
					1.92				staged repair	died - bil. l	esophagostomy pod3	
					1.84			primary repair		died - Rt lung hypoplasia		
2020	24											
		34			1.6			primary repair			duod atresia	
		32		2				primary repair		died -MOF		
		32				1.45		primary repair			stricture - dilate, coarc aorta	
				2.03				primary repair				
				2				primary repair -Kuantan			leak, refistula,esophagostomy	
		33			1.77				staged repair	died	aortic injury	
2021	19											
		34				1.4		primary repair			stricture- dilate	
		32				1.42		primary repair			dysmorphic	
		34				1.24		primary repair			ARM, stricture- dilate	
					1.54				staged repair	died- cardiac tof, infundibular spasm		
					1.98			primary repair			severe tracheomalacia	
					1.92			primary repair			ARM	
		33			1.74			primary repair				
						1.17		primary repair				
					1.75				staged repair			
		35		2.1				primary repair			severe tracheomalacia	
		33				1.48		primary repair			stricture - dilate	
		36		2.5					staged repair		RUL agenesis, esophagostomy	
		36		2.42				primary repair			VSD	

YEAR	total TOF	LBW 1.5-2.5kg	VLBW 1.0-<1.5kg	ELBW <1kg	primary repair	staged repair	TLBWMortality	Total Mortality
2005	14	6			6		0	2
2006	23	7	3	1	11		3	7
2007	15	2	3		3	2	1	4
2008	26	3	6		6	3	1	3
2009	23	7	3		8	2	5	8
2010	22	2	2		2	1	2	3
2011	26	8	2		7	3	3	5
2012	22	7			4	3	3	4
2013	24	14			14		1	2
2014	18	9	3		9	1	4	5
2015	30	10	1	2	8	4	2	4
2016	24		2		1	1	0	2
2017	22	2	3		4	1	1	6
2018	37	6	3		7	2	2	8
2019	17	6	1		6	1	3	3
2020	24	5	1		5	1	2	4
2021	19	8	5		10	3	1	1
TOTAL	**386**	**102**	**38**	**3**	**111**	**28**	**34**	**71**

TLBW % = 143/386 = 37%			
Total Mortality = 71/386 = 18%	TLBW=Total Low Birth Weight		
TLBWMortality = 34/71 = 47%			
TLBWMortality Rate = 34/143 = 23%			


EA + TOF in LBW, VLBW & ELBW in HKL/HTA from 2005 - 2021
70
60
50
40
30
20
10
0
2005
2006
2007
2008
2009
2010
2011
2012
2013
2014
2015
2016
2017
2018
2019
2020
2021
total TOF
LBW 1.5-2.5kg
VLBW 1.0-<1.5kg
ELBW <1kg
primary repair
staged repair
TLBWMortality
Total Mortality

Conclusions

- Management of EA + TOF in LBW, VLBW and ELBW neonates are very challenging
- Primary repair for stable neonates
- staged repair for “unstable” neonates and for ELBW neonates
- Esophagostomy for neonates with respiratory compromised

Thank you for your attention