Med. J. Cairo Univ., Vol. 90, No. 4, June: 1163-1177, 2022
www.medicaljournalofcairouniversity.net

Outcome of Surgical Repair of Coarctation in the Neonate: Meta-Analysis

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Abstract

Background: Coarctation of aorta (CoA) can be simply defined as cardiac abnormality resulting in obstruction to the blood flow in the aorta. Coarctation of the aorta is the fifths most common congenital heart defect, accounting for 5 to 9%, In neonates who are stabilized within 24h of presentation, surgical repair can be carried outurgently.

Aim of Study: Aim of study to analyze outcome of surgical repair of coarctation in neonate.

Patients and Methods: The meta-analysis included retrospective, prospective, randomized, or non-randomized controlled trials that study the of outcome of coarctation surgical repair in neonate. Outcome measure include Mortality, need of other surgical intervention (recoarctation or repair of aortic aneurysm or dissection), morbidity include (chylothorax, spinal cord injury, hypertension, and bleeding), and pressure gradient after surgical repair.

Results: The results of the meta-analysis for incidence of aneurysm formation was in conclusive due to fluctuating results in the sensitivity analysis. Also our analysis revealed that extendedarchaor to plasty in association with ductal and coarctation excision provides excellent coarctation repair with a low incidence of recoarctation. According to the regression modeling of mortality and the regression modeling of re-intervention demonstrated different significant predictors. Among these predictors, the associated anomalies (hypoplastic aortic arch) demonstrated the greatest impact on both mortality and reintervention in surgical repair of coarctation in neonate.

Conclusion: In conclusion, surgical repair of coarctation was significantly associated with a lower incidence of re-CoA, fewer repeat interventions due to re-CoA and lower residual transcoarctation gradient in the mid to long term follow-up.

Key Words: *Surgical repair – Coarctation in neonate.*

Introduction

COARCTATION of the aorta is defined as a congenital narrowing of the upper descending aorta, opposite the duct usarteriosus. This accounts for 5-8% of all congenital heart defects. It may be isolated, but is associated with bicuspid aortic valve and VSD. It is the most common cardiac defect in Turner syndrome. (15-20%) [1].

The hemodynamic consequences are high afterload on the LV, increasing LV wall stress and causing LV hypertrophy. Systemic perfusion depends on ductal flow [1].

Depends on the existence of coexisting abnormalities, as well as the location and severity of the location in Neonates presentation inclued collapse, acidosis, hypotension, heart failure; absent femoral pulses on routine review, in Infancy presentation inclued upper extremity hypertension with absent/ reduced femoral pulses; congestive heart failure causing dyspnea and failure to thrive [1].

In the shocked neonate, all pulses may be weak; however, absent femoral pulses should not be disregarded. There may be differential cyanosis, with the duct supplying the lower body, and the aorta supplying the upper body, demonstrated with preductal and postductal oxygen saturation readings. Systolic murmur in the left in fraclavicular or in frascapular area [2].

Uncorrected coarctation leads to a curtailed life expectancy of 30-40 years, with causes of death including aortic rupture, intracranial hemorrhage, cardiac failure, bacterial endocarditis. Beyond infancy, even after correction there is a lifetime risk of hypertension and its sequelae. After correction, freedom from death or complication or hypertension is only 20% at 25 years. Patients can die from cardiac failure, aortic rupture, infective endocarditis, or intracranial hemorrhage. Untreated isolated coarctation has a 1-month mortality of 10%, 1-year mortality around 30% [2].

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In the shocked neonate, the initial management is supportive, improving peripheral perfusion by reopening the duct if possible, correcting the acid and electrolyte disturbances, and supporting the circulation and ventilation as necessary prior to under taking corrective surgery. In neonates who are stabilized within 24h of presentation, surgical repair can be carried out urgently [3].

There are several surgical ways of repairing the coarctation include end-to-end anastomosis, Subclavian flap repair, and Prosthetic patch aortoplasty Fig. (1) [4].

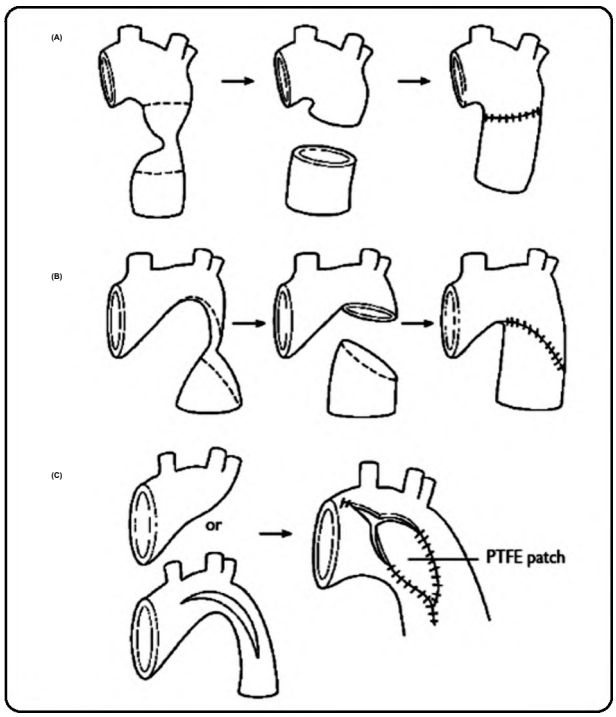


Fig. (1): Coarctation of the aorta repair. (A) End to end anastomosis. (B) Bevelled end-to-end anastomosis. (C) Prosthetic patch aortoplasty.

Patients and Methods

Search strategy for identification of studies: Published observational studies on outcome of coarctation surgical repair in neonate.

We conducted a systematic search of the PubMed, google scholar, Embase, Egyptian knowledge bank (EKB), MEDLINE and Cochrane Central Register databases for randomized controlled trials (RCTs). Abstracts from recent major cardiovascular conferences e.g. American Heart Association, screened for any additional trials addressing the same topic of interest. The search used the following keywords: "coarctation", "hypoplastic syndrom", "surgical repair", "surgical correction", "recoarctation","total correction".

When two or more papers are based on an identical study, the paper that principally investigated the outcome of coarctation surgical repair in neonate.

No restrictions on the language of publications were employed.

Methods of the review:

Locating and selecting studies: Abstracts of articles identified using the search strategy were viewed, and articles that appear to fulfill the inclusion criteria were retrieved in full. Data on at least one of the outcome measures were included in the study. Each article identified were reviewed and categorized into one of the following groups:

Included: RCT or CCT that meets the described inclusion criteria and those where it is impossible to tell from the abstract, title or MESH headings; Excluded: Non RCT or CCT When was there a doubt, the second reviewer assess the article and a consensus were reached.

Statistical considerations:

Data will be abstracted from every study in the form of a risk estimate and its 95% confidence interval (CI). Pooled risk estimate will be obtained by weighing each study by the inverse variance of the effect measure on a logarithmic scale.

When a risk estimate and its 95% confidence interval were not available from the article, we calculated unadjusted values from the published data of the article, using the Epi Info 6 computer program version 6.04d.

This approach to pooling the results assumes that the study populations being compared are similar and hence corresponds to a fixed effect analysis. The validity of pooling the risk estimates will be tested (test of homogeneity) using a chi-square test. A violation of this test implies that the studies being grouped differ from one another. In the presence of significant heterogeneity of the effect measure among studies being compared, we will perform a random effect analysis that is based on the method described by Der Simonian and Laird. The random effect analysis accounts for the inter study variation. Because the test of homogeneity has low power, we will report the figures of the random effect analysis even with the absence of significant heterogeneity.

Evidence of publication bias will be sought using the funnel plot method.

Results

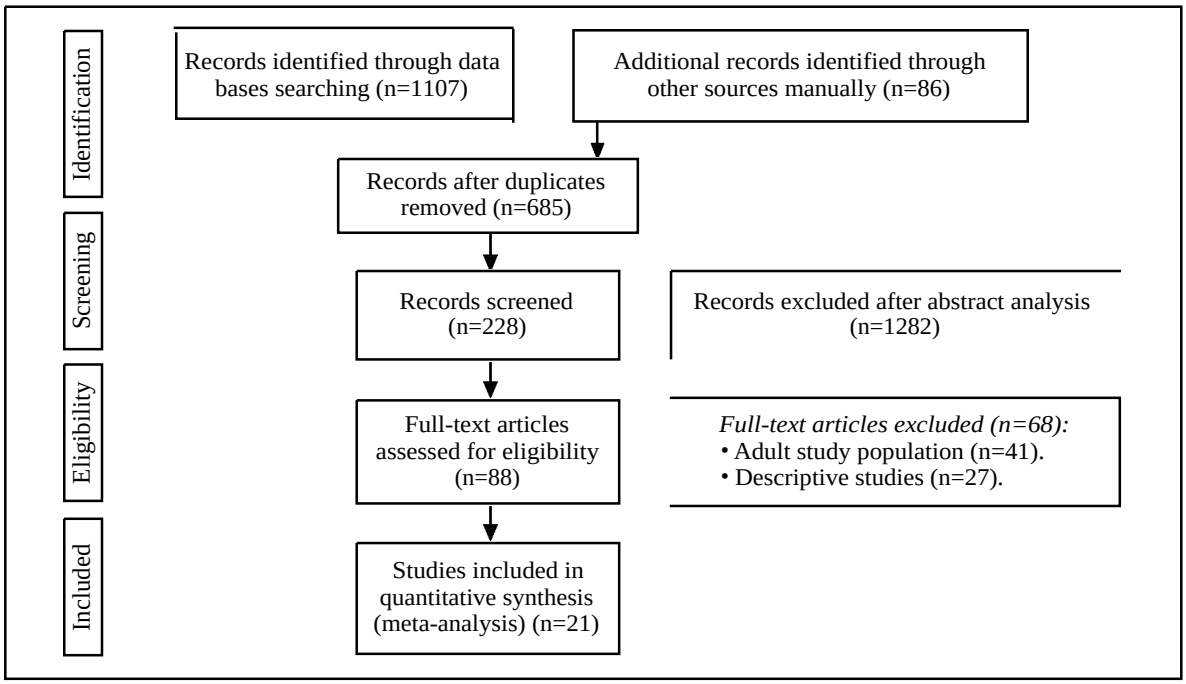


Fig. (2): Study flow chart.

Table (1): Characteristics of the included studies (n=20).

Study	Country	Study design	Coaction correction	Sample size	Surgical approach		Follow-up † (months)
					Thoracotomy	Sternotomy	
Alaei 2011 **[5]**	Iran	Retrospective cohort	SR VS BA	112 SA+55 BA	NR	NR	12 (6-24)
Burch 2009 **[6]**	USA	Retrospective cohort	SA only	167	100%	–	57.6 (0-141.6)
Chiu 2015 **[7]**	Taiwan	Retrospective cohort	SR VS BA	128 SA+41 BA	NR	NR	120±63.6
Cowly 2005 **[8]**	USA	RCT	SR VS BA	16 SA+20 BA	NR	NR	11.3±3.7
Dijkema 2017 **[9]**	Netherland	Retrospective cohort	SR VS BA	29 SA+19 BA	NR	NR	28±9.7
Fiore 2004 **[10]**	USA	Retrospective cohort	SR VS BA	34 SA+23 BA	100%	–	38
Gonzalez 2003 **[11]**	Mexico	Retrospective cohort	SR VS BA	28 SA+30 BA	NR	NR	7.4††
Gorbatykh 2017 **[12]**	Russia	Retrospective cohort	SA only	114	100%	–	37±13
Hager 2009 **[13]**	Germany	Retrospective cohort	SA only	191	NR	NR	156 (0-360)
Lehnert 2019 **[14]**	France	Retrospective cohort	SA only	530	87%	13%	90.8 (3-191.8)
Ramachandran 2018 **[15]**	USA	Retrospective cohort	SA only	102	100%	–	72††
Lin 2008 **[16]**	Taiwan	Retrospective cohort	SR VS BA	12 SA+9 BA	–	100%	53.4 (1.9-52)
McElhinney 2001 **[17]**	USA	Retrospective cohort	SA only	103	100%		24 (5-111.6)
Rao 1994 **[18]**	USA	Retrospective cohort	SR VS BA	14 SA+15 BA		100%	24 (5-111.6)
Soynov 2017 **[19]**	Russia	RCT	SA only	54	100%		25 (21-30)
Truong 2014 **[20]**	USA	Retrospective cohort	SA only	84	100%		12.3 (0.5-71.9)
Walhout 2004 **[21]**	Netherland	Retrospective cohort	SA only	18 SA+28 BA	NR	NR	86.4±28.8
Wood 2004 **[22]**	Ireland	Retrospective cohort	SA only	181		100%	90 (6-192)
Wright 2005 **[23]**	USA	Retrospective cohort	SA only	83	87%	13%	54±37.2
Zhang 2016 **[24]**	China	Retrospective cohort	SA +BA	53 SA+39 BA	NR	NR	33 (6-63)

† Data reported as mean ± SD or median (range) based on the original reporting in the study. †† The median follow-up.
BA: Balloon angioplasty. NR: Not reported. RCT: Randomized controlled trial. SR: Surgical repair.

Table (2): Baseline clinical and demographic characteristics of the included studies.

Study	Age †	Population	Weight† (Kg)	Gender (%male)	Cardiac anomalies			
					%AAH	%V SD	%BAV	%PDA
Alaei 2011 **[5]**	132±89.4 days	Neonates and infants younger than 1 year	4.7±1.3	67.1	NR	27.3	9	73.1
Burch 2009 **[6]**	16 (1-85) days	Neonates and infants younger than 90 days	3.4 (0.8-6)	48	NR	37.1	NR	NR
Chiu 2015 **[7]**	3.3±7.2 years	Pediatric	NR	NR	39.6	53.2	7.7	63.3
Cowly 2005 **[8]**	5.7±2.1 years	Pediatric	19.9±5.2	NR	NR	NR	NR	NR
Dijkema 2017 **[9]**	4.9±5.2 years	Pediatric	NR	65	NR	10.4	64.6	NR
Fiore 2004 **[10]**	7.7 days (mean)	Pediatric	3.4 (mean)	61.3	NR	50.9	NR	NR
Gonzalez 2003 **[11]**	7.0±4.1 years	Pediatric (1 to 16 years)	26.6±15.1	72.4	37.9	NR	NR	NR
Gorbatykh 2017 **[12]**	6.1±3.8 days	Pediatric	6.4±3.5	6.1	14.9	NR	NR	NR
Hager 2009 **[13]**	41 (3-352) days	Neonates and infants younger than 1 year	NR	63.4	28.8	0	49.7	37.2
Lehnert 2019 **[14]**	13±1.6 days	Neonates and infants younger than 3 months	3.2±0.75	58.7	30.4	41.9	NR	NR
Ramachandran 2018 **[15]**	12 days (2-375)	Pediatric younger than 2 years	3.3 (1.1-9.8)	NR	NR	NR	NR	NR
Lin 2008 **[16]**	26 (9-94) days	Neonates and infants younger than 1 year	3.4 (2-5.5)	65	NR	6.7	38.3	3.7
McElhinney 2001 **[17]**	18 (1-90) days	Neonates and infants younger than 3 months	3.3 (1-6.4)	61	NR	18	81	0
Rao 1994 **[18]**	27±35 days	Neonates and infants younger than 1 year	3.5±0.9	58.6	NR	3	NR	NR
Soynov 2017 **[19]**	56±27 days	Neonates and infants younger than 1 year	NR	NR	100	0	0	0
Truong 2014 **[20]**	12 (1-85) days	Neonates and infants younger than 3 months	3.4 (1.18-5.9)	NR	NR	21.4	75	NR
Walhout 2004 **[21]**	0.6 (0.4-14) years	Pediatrics from 2.5 to 11 years	NR	NR	NR	17.4	28.3	28.3
Wood 2004 **[22]**	13.5 (1-300) days	Neonates and infants younger than 1 year	3.7 (0.85-10.5)	NR	NR	1.6	NR	NR
Wright 2005 **[23]**	21 (2-365) days	Neonates and infants younger than 1 year	3.7 (1.7-9.3)	63	NR	NR	NR	NR
Zhang 2016 **[24]**	59.6 (15-190) days	Neonates and infants younger than 1 year	4.0 (2.1-6)	72.8	0	100	0	0

† Data reported as mean ± SD or median (range) based on the original reporting in the study.
AAH: Aortic arch hypoplasia. NR : Not reported. SD : Standard deviation.
BAV: Bilateral aortic valve stenosis. PDA: Patent ductusarteriosus. VSD: Ventricular septal defect.

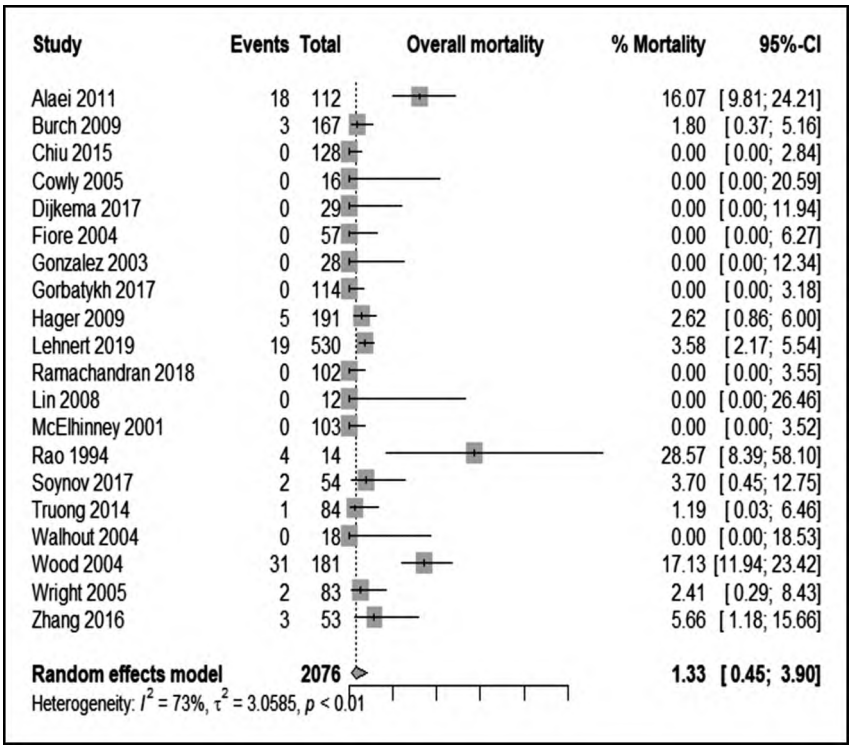


Fig. (3): Forest plot of pooled mortality rate in infant candidates of surgical repair. Vertical line represents the pooled estimate of mortality rate. Horizontal line corresponding to each underlying study represents 95% confidence interval for the proportion of deaths as per study level. A diamond at the bottom of the figure indicates the overall pooled estimate of mortality derived from the included studies at once. From the above plot, it is evident that the mortality rate was 1.33% (95% confidence interval 0.45-3.9) using random effect model.

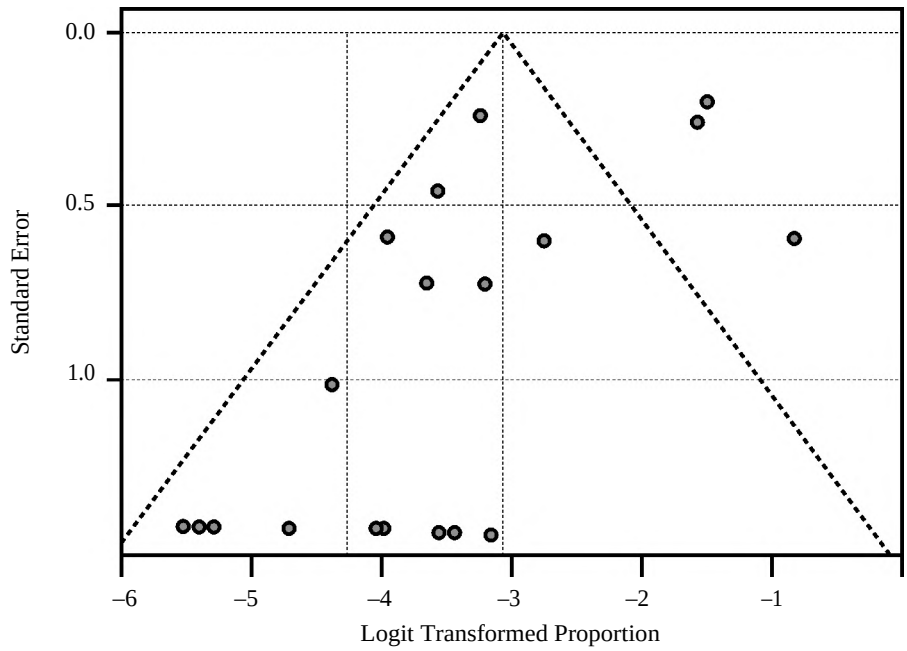


Fig. (4): Funnel plot of the studies assessing the overall rate of mortality following the surgical repair.

Table (3): Analysis of the publication bias reporting the overall mortality.

	Intercept	SE (Intercept)	*t*	*p*
Egger's test	–1.6980	0.3144	–3.29	0.004

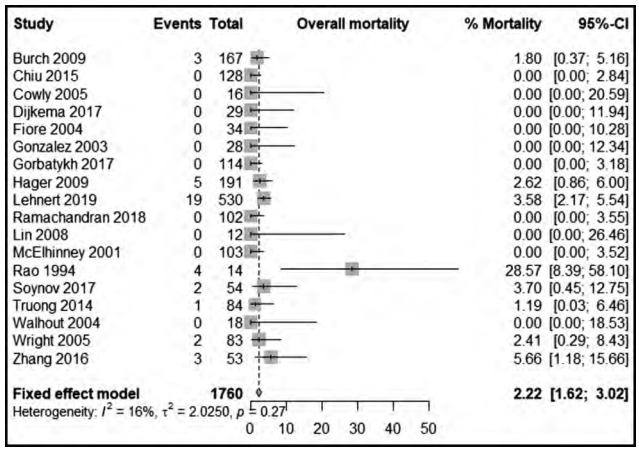


Fig. (5): Forest plot of pooled mortality rate in infant candidates of surgical repair after adjustment of publication bias. Vertical line represents the pooled estimate of mortality rate. Horizontal line corresponding to each underlying study represents 95% confidence interval for the proportion of deaths as per study level. A diamond at the bottom of the figure indicates the overall pooled estimate of mortality derived from the included studies at once. From the above plot, it is evident that the mortality rate was 2.22% (95% confidence interval 1.62-3.02) using random effect model.

Table (4): Analysis of the publication bias reporting the overall mortality.

	Intercept	SE (Intercept)	*t*	*p*
Egger's test	–1.73	0.34	–1.73	0.102

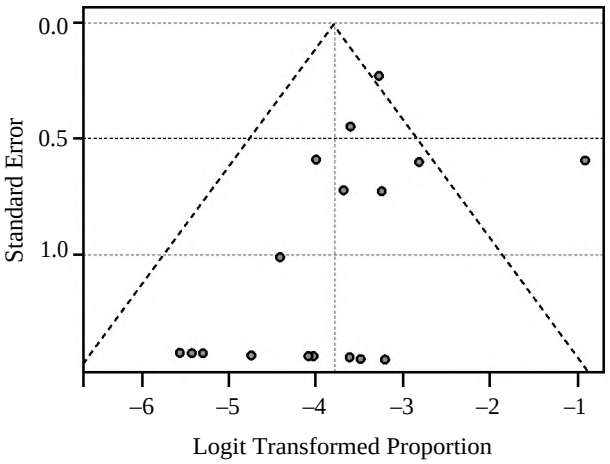


Fig. (6): Funnel plot of the publication bias-adjusted studies assessing the overall rate of mortality following the surgical repair.

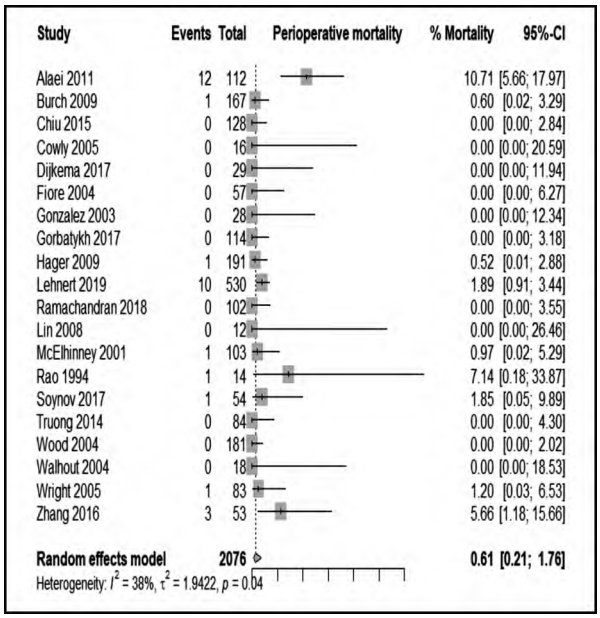


Fig. (7): Forest plot of pooled perioperative mortality rate in infant candidates of surgical repair. Vertical line represents the pooled estimate of perioperative mortality rate. Horizontal line corresponding to each underlying study represents 95% confidence interval for the proportion of perioperative deaths as per study level. A diamond at the bottom of the figure indicates the overall pooled estimate of perioperative mortality derived from the included studies at once. From the above plot, it is evident that the perioperative mortality rate was 0.61% (95% confidence interval 0.21-1.76) using random effect model.

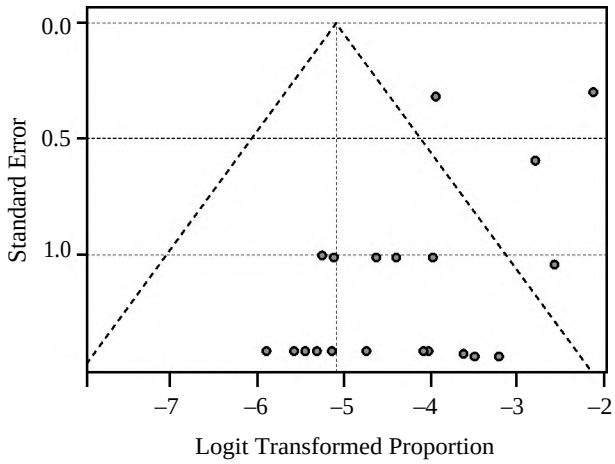


Fig. (8): Funnel plot of the studies assessing the perioperative mortality rate following the surgical repair.

Table (5): Analysis of the publication bias reporting the perioperative mortality.

	Intercept	SE (Intercept)	*t*	*p*
Egger's aawtest	–1.58	0.37	–3.22	0.005

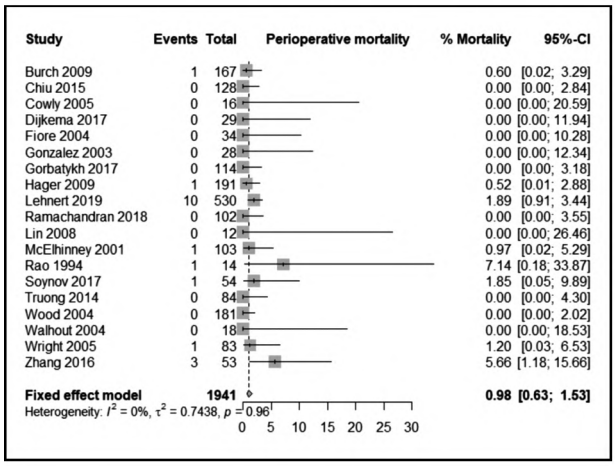


Fig. (9): Forest plot of publication bias-adjusted pooled perioperative mortality rate in infant candidates of surgical repair after adjustment of publication bias. Vertical line represents the pooled estimate of perioperative mortality rate. Horizontal line corresponding to each underlying study represents 95% confidence interval for the proportion of perioperative deaths as per study level. A diamond at the bottom of the figure indicates the overall pooled estimate of perioperative mortality derived from the included studies at once. From the above plot, it is evident that the perioperative mortality rate was 0.98% (95% confidence interval 0.63-1.53) using random effect model.

Table (6): Analysis of the publication bias reporting the perioperative mortality.

	Intercept	SE (Intercept)	*t*	*p*
Egger's test	–3.52	0.36	–1.74	0.1

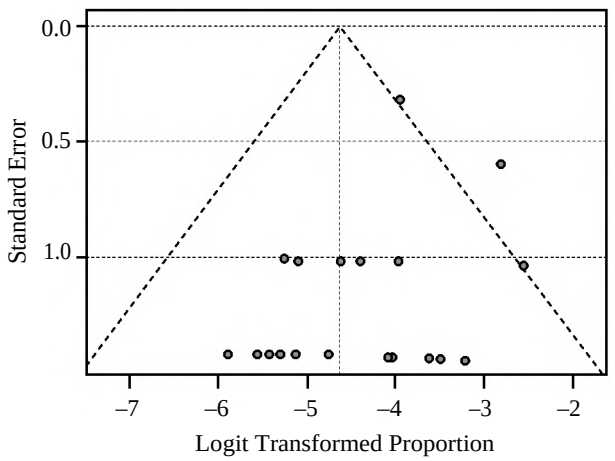


Fig. (10): Funnel plot of the publication bias-adjusted studies assessing the rate of perioperative mortality following the surgical repair.

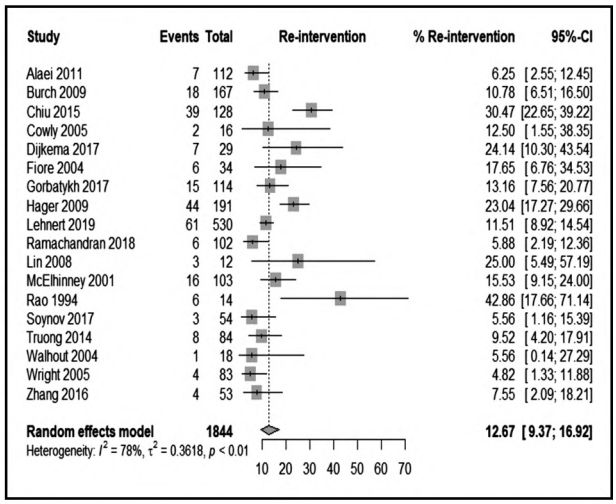


Fig. (11): Forest plot of pooled re-intervention rate in infant candidates of surgical repair. Vertical line represents the pooled estimate of re-intervention rate. Horizontal line corresponding to each underlying study represents 95% confidence interval for the proportion of re-interventions as per study level. A diamond at the bottom of the figure indicates the overall pooled estimate of re-intervention derived from the included studies at once. From the above plot, it is evident that the re-intervention rate was 12.67% (95% confidence interval 9.37-16.92) using random effect model.

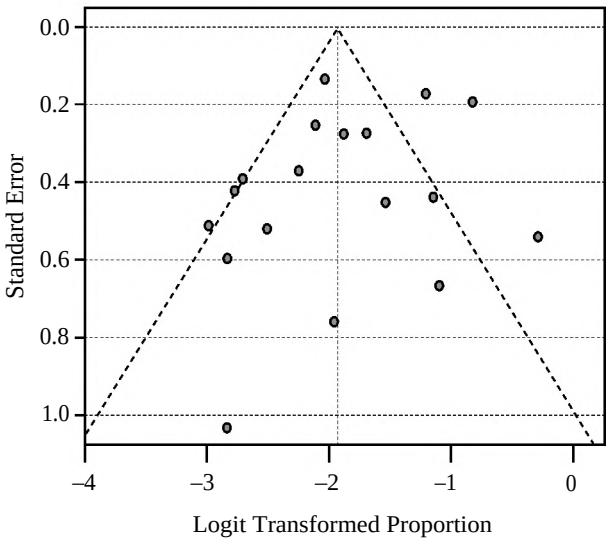


Fig. (12): Funnel plot of the studies assessing the rate of re-intervention rate following the surgical repair.

Table (7): Analysis of the publication bias reporting the re-intervention.

	Intercept	SE (Intercept)	*t*	*p*
Egger's test	–1.46	0.3	–1.05	0.31

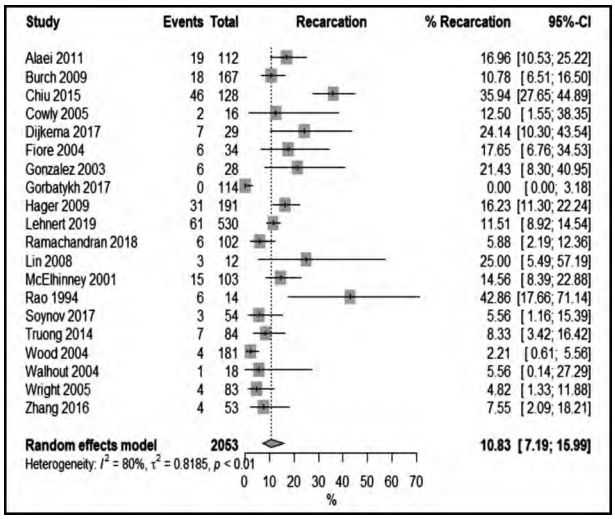


Fig. (13): Forest plot of pooled recoarcationrate in infant candidates of surgical repair. Vertical line represents the pooled estimate of recoarcationrate. Horizontal line corresponding to each underlying study represents 95% confidence interval for the proportion of recoarcationas per study level. A diamond at the bottom of the figure indicates the overall pooled estimate of recoarcationderived from the included studies at once. From the above plot, it is evident that the recoarcationrate was 10.83% (95% confidence interval 7.19-15.99) using random effect model.

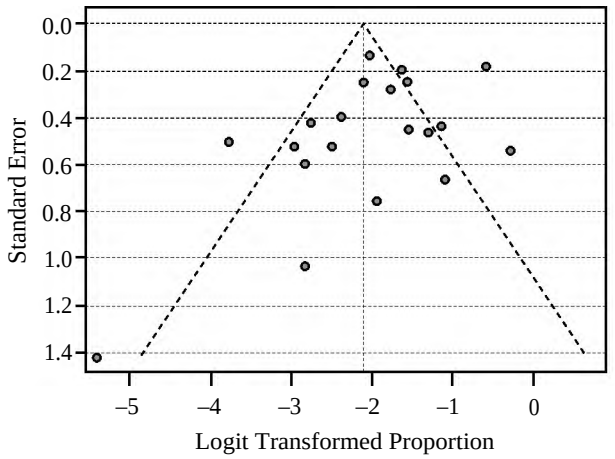


Fig. (14): Funnel plot of the studies assessing the rate of recoarcation rate following the surgical repair.

Table (8): Analysis of the publication bias reporting the recoarcation.

	Intercept	SE (Intercept)	*t*	*p*
Egger's test	–1.39	0.31	–1.36	0.19

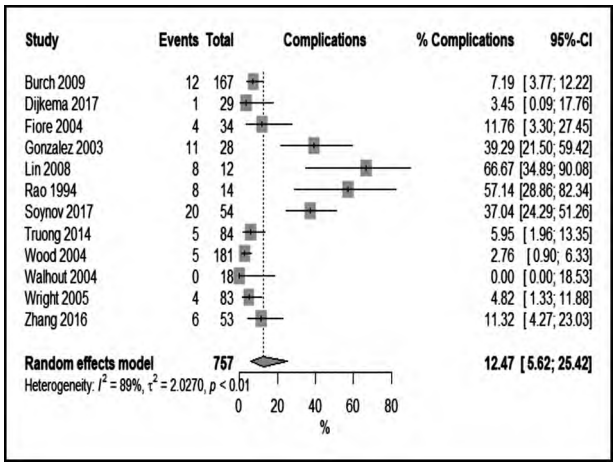


Fig. (15): Forest plot of pooled complication rate in infant candidates of surgical repair. Vertical line represents the pooled estimate of complication rate. Horizontal line corresponding to each underlying study represents 95% confidence interval for the proportion of complication as per study level. A diamond at the bottom of the figure indicates the overall pooled estimate of complication derived from the included studies at once. From the above plot, it is evident that the complication rate was 12.47% (95% confidence interval 5.62-25.42) using random effect model.

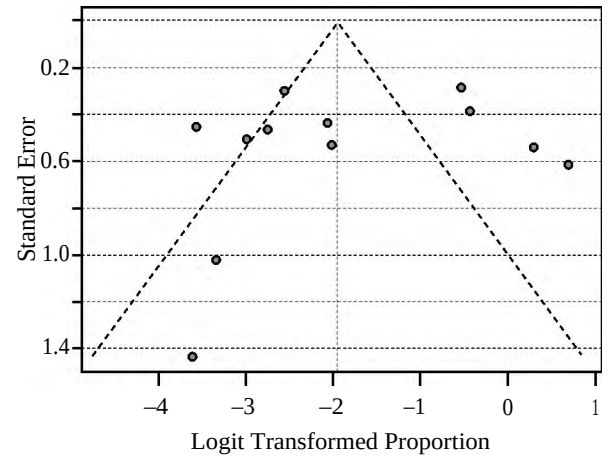


Fig. (16): Funnel plot of the studies assessing the complication rate following the surgical repair.

Table (9): Analysis of the publication bias reporting the complication.

	Intercept	SE (Intercept)	*t*	*p*
Egger's test	–1.1	1.31	–0.56	0.59

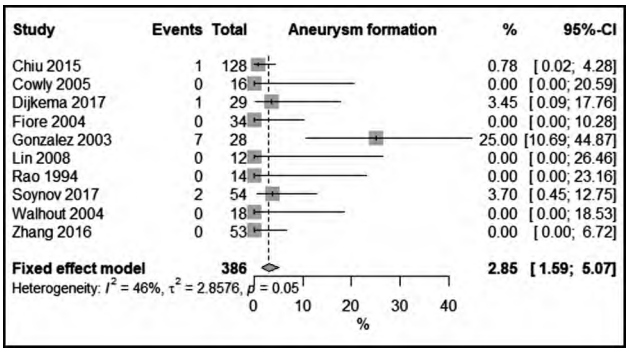


Fig. (17): Forest plot of pooled aneurysm formation rate in infant candidates of surgical repair. Vertical line represents the pooled estimate of aneurysm formation rate. Horizontal line corresponding to each underlying study represents 95% confidence interval for the proportion of aneurysm formation as per study level. A diamond at the bottom of the figure indicates the overall pooled estimate of aneurysm formation derived from the included studies at once. From the above plot, it is evident that the aneurysm formation rate was 2.85% (95% confidence interval 1.59-5.07) using fixed effect model.

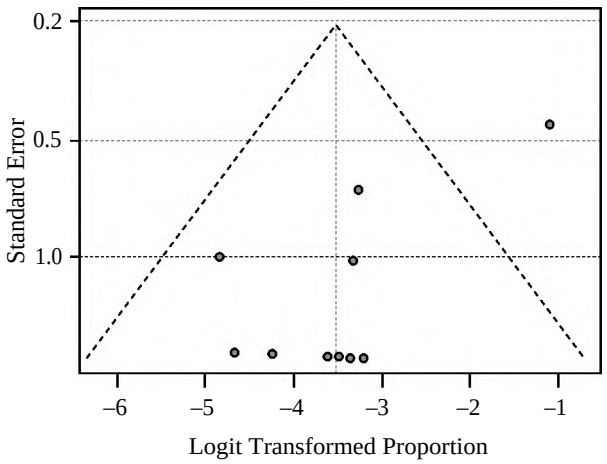


Fig. (18): Funnel plot of the studies assessing the aneurysm formation rate following the surgical repair.

Table (10): Analysis of the publication bias reporting the aneurysm formation.

	Intercept	SE (Intercept)	*t*	*p*
Egger's test	–0.27	0.62	–4.12	0.003

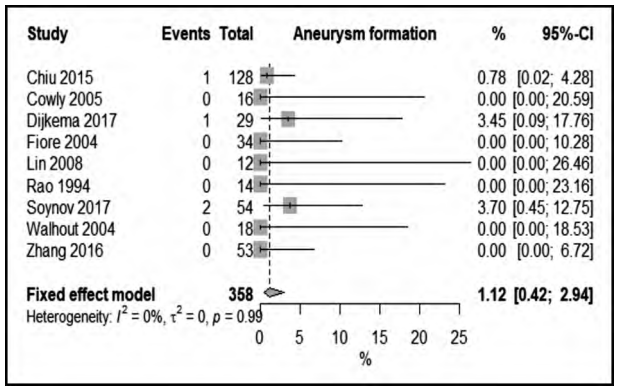


Fig. (19): Forest plot of the publication bias-adjusted pooled aneurysm formation rate in infant candidates of surgical repair. Vertical line represents the pooled estimate of aneurysm formation rate. Horizontal line corresponding to each underlying study represents 95% confidence interval for the proportion of aneurysm formation as per study level. A diamond at the bottom of the figure indicates the overall pooled estimate of aneurysm formation derived from the included studies at once. From the above plot, it is evident that the aneurysm formation rate was 1.12% (95% confidence interval 0.42-2.94) using fixed effect model.

Table (11): Analysis of the publication bias reporting the aneurysm formation.

	Intercept	SE (Intercept)	*t*	*p*
Egger's test	–3.18	0.87	–0.65	0.54

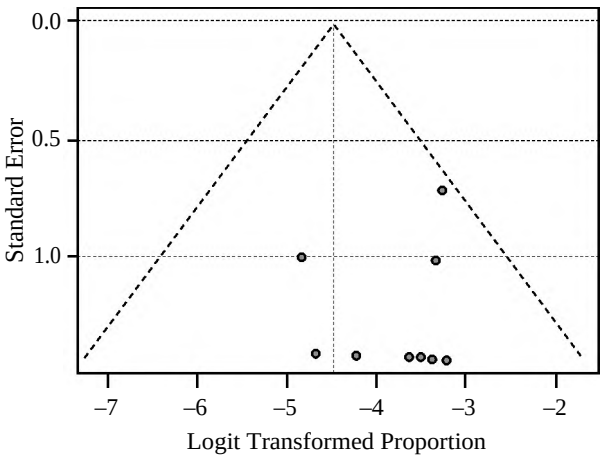


Fig. (20): Funnel plot of the publication bias-adjusted studies assessing the rate of aneurysm formation following the surgical repair.

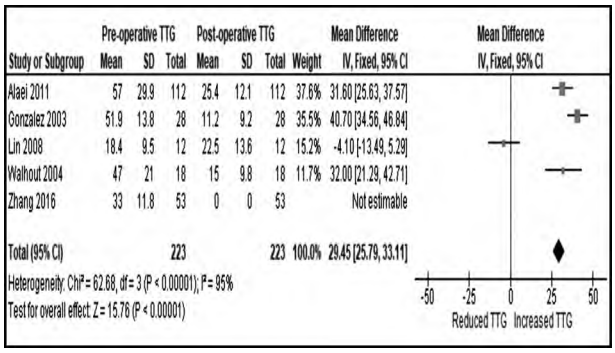


Fig . (21): Forest plot of the pooled transthoracic gradient (TTG) difference in infant candidates of surgical repair. Vertical line represents the pooled estimate of TTG difference. Horizontal line corresponding to each underlying study represents 95% confidence interval for the TTG difference as per study level. A diamond at the bottom of the figure indicates the overall pooled estimate of TTG difference derived from the included studies at once. From the above plot, it is evident that the TTG differencewas 29.45 mmHg (95% confidence interval 25.79-33.11) using random effect model.

Table (12): Analysis of the publication bias reporting the transthoracic gradient (TTG) difference.

	Intercept	SE (Intercept)	*t*	*p*
Egger's test	–2.28	1.04	–0.97	0.41

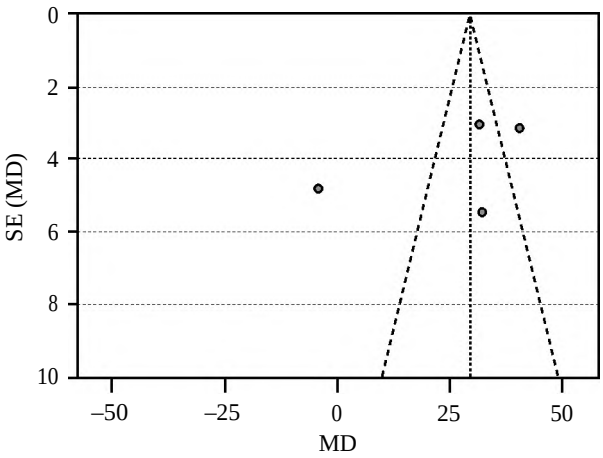


Fig. (22): Funnel plot of the transthoracic gradient (TTG) difference following the surgical repair.

Fig. (23): Forest plot of the effect size of different predictors of mortality following the surgical repair.

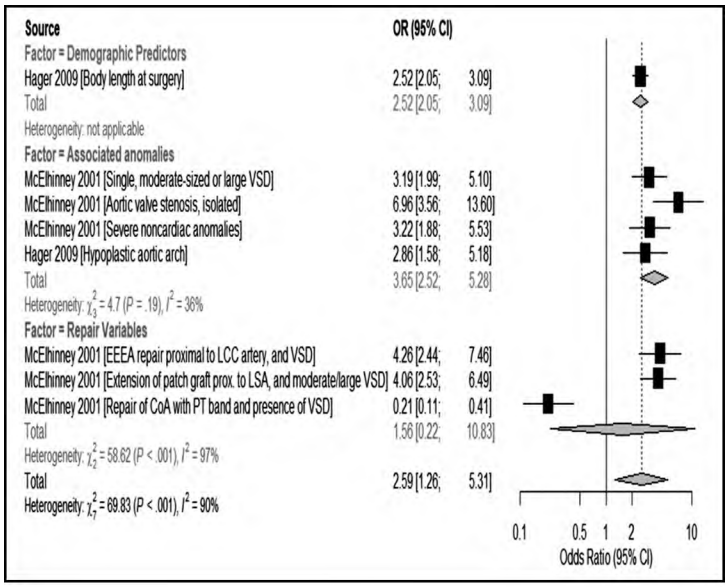
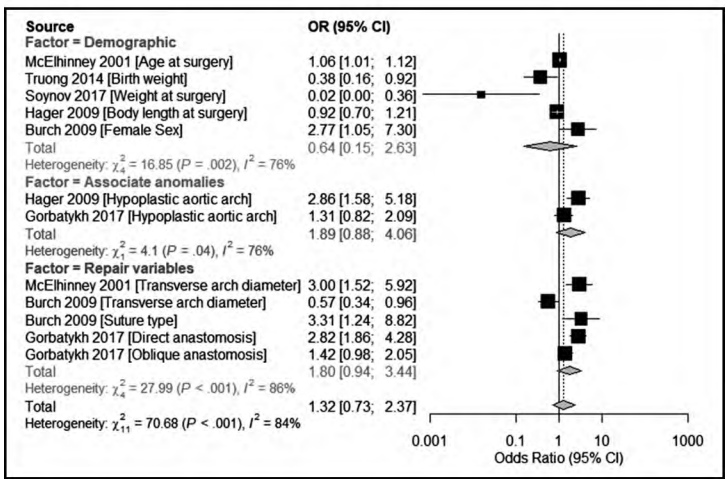


Fig. (24): Forest plot of the effect size of different predictors of mortality following the surgical repair.



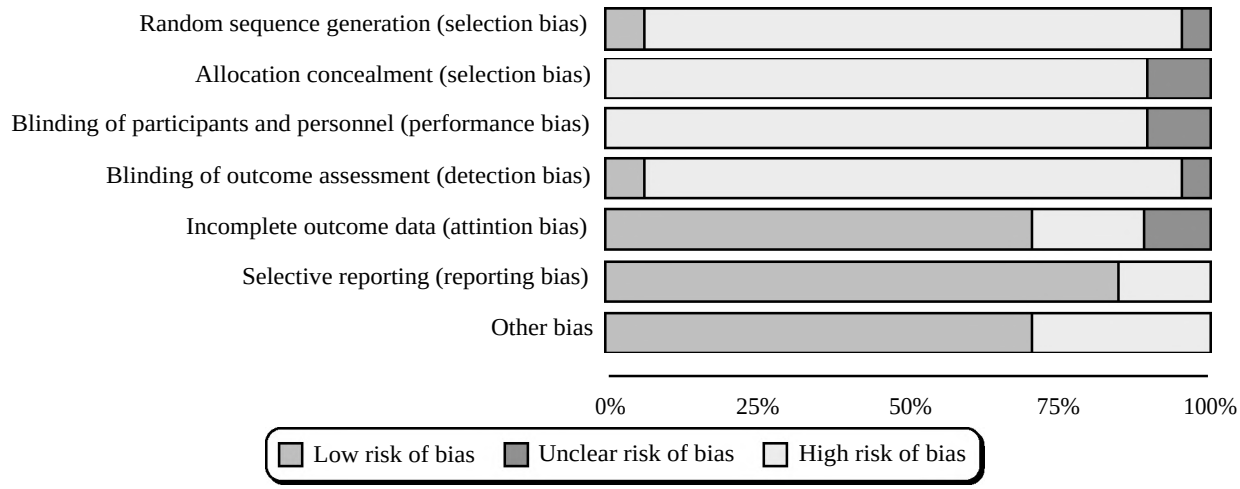


Fig. (25): Risk of bias graph with each risk of bias item presented as percentages across all included studies.

	Random sequence generation (selection bias)	Allocation concealment (selection bias)	Blind of participants and personnel (performance bias)	Blinding of outcome assessment (detection bias)	Incomplete outcome data (attrition bias)	Selective reporting (reporting bias)	Other bias
Alaei 2011	–	–	–	–	–	–	+
Burch 2009	–	–	–	–	+	+	+
Chiu 2015	–	–	–	–	+	+	+
Cowly 2005	+			+	–	+	–
Dijkema 2017	–	–	–	–		+	+
Fiore 2004	–	–	–	–	+	+	–
Gonzalez 2003	–	–	–	–	–	–	–
Gorbatykh 2017	–	–	–	–	+	+	+
Hager 2009	–	–	–	–	+	+	+
Lehnert 2019	–	–	–	–	+	+	+
Lin 2008	–	–	–	–	+	+	+
McElhinney 2001	–	–	–	–	+	+	+
Ramachandran 2018	–	–	–	–	+	+	+
Rao 1994	–	–	–	–	+	+	–
Soynov 2017					+	+	+
Truong 2014	–	–	–	–	–	+	+
Walhout 2004	–	–	–	–	+	+	–
Wood 2004	–	–	–	–	+	–	+
Wright 2005	–	–	–	–		+	+
Zhang 2016	–	–	–	–	+	+	–

Fig. (26): Risk of bias summary of the included studies.

Discussion

Our search resulted in 685 publications after removal of duplicates. A total of 457 studies were removed following abstract analysis for reasons related to irrelevance to our topic or non-availability of the full text. After applying inclusion and exclusion criteria, additional 68 studies were removed for reasons related to adult population inclusion (n=41) or being a descriptive (non-controlled) study (n=27). The final analysis included, therefore, a total of 20 publications encompassing a total of 2076 patients.

In our analysis the postoperative mortaliy rate among the neonateunderwent surgical repair estimated is 2.22% (CI 1.6-3.02) however some studies showed higher mortality rate Rao et al., [25] showedmortality rate 28.57% (CI 8.39-58.10), Wood et al., [26] showed mortality rate 17.13% (CI 11.94-24.42) and Alaei et al., [27] showed mortality rate 16.07% (CI 9.81-24.21). On the other hand Truong et al., [28] showed lower rate of mortality rate estimated 1.19% (CI 0.03-6.46).

In Rao et al., [25], Wood et al., [26], and Alaei et al., [27] the higher mortality rate is due to different patient characteristics and associated cardiac anomalies. According to Patient characteristics in Rao et al., [25] there are 14 patients between 2 and 90 days old (mean age [±SD] 27±35 days; 3.5±0.9kg, range 2.3 to 5.7). Significant associated defects were present in 7 (50%) of 14 patients and included large ventricular septal defects (three infants), severe aortic or sub-aortic stenosis (two infants), double-inlet left ventricle (one infant) and transposition of the great arteries with ventricular septal defect (one infant) [25]. However in Wood et al., [26] patients had associated complex intra-cardiac anomalies particularly univentricular heart [22] Also, in Alaei et al., [5] congenital anomalies was different between the study groups (p-values <0.05) and this maybe the cause of high maortality rate among the neonate underwent surgical repair of coarctation in this study [5].

But in Truong et al., [20] the lower rate of mortality 1.19% (CI 0.03-6.46) is due to short duration of follow-up and it was retrospective design [20]. According to recoarctation rate in neonate candidates for surgical repair estimated is 10.83% (CI 7.19-15.99) however some studies showed higher incidence of recoarctation as in Rao et al., [25] the rate of recoarctation estimated 42.86% (CI 17.66-71.41), In Chiu et al., [7] the rate of recoarctation estimated 35.94% (CI 27.65-39.22), In Lin et al., [16] the rate of recoarctation estimated 25% CI (5.49-57.19), In Dijkema et al., [9] the rate of recoarctation estimated 24.14% (CI 10.30-43.54), and In Hager et al., [13] the rate of recoarctation-estimated 16.32% (CI 11.30-22.24), on the other hand Wood et al., [22] showed lower rate of recoarctation estimated 2.21% CI (0.61-5.56). Rao et al., [25], Chiu et al., [7], and Lin et al., [16] allthese studies had higher rate of recoarctation due to small sample size. But In Rao et al., [25] the a relatively higher rate ofrecoarctation noted after surgical repairdueto different surgical techniques; Ten infant underwent resection and end to end anastomosis, two had subclavian flap and the final two had Gore Tex interposition graft [25]. However In Chiu et al., [7] a relatively higher rate of recoarctation was noted after surgical aortoplasty. They tried to seek the possible risk factors including surgical methods and baseline clinical characteristics by using multivariate logistic regression. However, no significant factor was identified [7]. Dijkema et al., [9] and In Lin et al., [16] both of them had higher rate of recoarctation because they are retrospective, and nonrandomized studies. However In Dijkema et al., [9] relatively higher rate of recoarctation was noted after surgical repair due to, the higher age in the surgery group at the time of this study may have resulted in an overestimation of recoarctation [9]. As regards the higherrate of recoarctation In Hager et al., [13]. It was statistically related to a hypoplastic aortic arch and a low body Weight. Both factors can be summarized to a very small aortic arch [13].

On the other hand In Wood et al., [22] the lowerrate of recoarctation isattributed to extended arch aortoplasty in association with ductal and coarctation excisionprovide excellent coarctation repair with low incident of recoarctation [22].

The pooled analysis of complications including (chylothorax, spinal cord injury, bleeding, and hypertension) demonstated an complication rate of 12.47% (CI 5.62-25.42) however some studiesshowed higher rate of complication as in Lin et al., [16] the rate ofcomplication after surgical repairestimated 66.67% (CI 34.89-90.08), In Rao et al., [25] the rate of complication after surgical repairestimated 57.14% (CI 28.86-82.34), In Soynov et al., [33] the rate ofcomplication after surgical repair estimated 37.04% (CI 24.29-51.26) and In Gonzalez et al., [11] the rate of complication after surgical repair estimated 39.29% (CI 21.50-59.42). On the other hand Wood et al., [22] had lower rate of complication estimated 2.21% CI (0.61-5.56). All studies that showed higher rate of complications including (chylothorax, spinal cord injury, bleeding, and hypertension) after surgical repairas in Lin et

al., [16], Rao et al., [25], and Gonzalez et al., [11] the higher rate of complications on these studies attributed basically to small sample size of these study which over estimate the complications after surgical repair.

However in Soynov et al., [19] the higher rate of complication attributed to surgical modalities In their study, patients who underwent extended end to end anastomosishad a higher rate of residual arterial hypertension. The predictors of arterial hypertension in their study were rigidity of the precoarctation area and fibroelastosis. Their patients have concentric hypertrophy due to the high resistance of the left ventricle, which often correlates with arterial hypertension [19]. On the other hand in Wood et al., [22] the lowerrate of complication attributed to surgical technique (Extended archaortoplasty in association with ductal and coarctation excision) which provides excellent coarctation repair with a low incidence of complication [22].

According to aneurysm formation following surgical repair the pooled analysis of aneurysm formation rate demonstrated an overall aneurysm formation rate 1.12% (CI 0.42 -2.94) and Gonzalez et al., [11] showed higher rate of aneurysm formation estimated 25% CI (10.69-44.87) on the other hand in Chiu et al., [7] showed lower rate of aneurysm formation estimated 0.78% CI (0.02-4.28). In Gonzalez et al., [11] a relatively higher rate of aneurysm formation due to publication bias demonstrated by funnel plot (p=0.003) [11]. Unlike Chiu et al., [7] a relatively lower rate of aneurysm formation due to The present study was limited to a retrospective analysis with relatively small sample size. Additionally, surgical repair was often selected for patients with an associated patent ductusarteriosus. Thus, the potential selection bias might have relatively optimized the results [7]. According to transcoarctation pressure gradient change following surgical repair the pooled analysis of transcoarctation pressure gradient change demonstrated an overall mean difference of 29.45mm hg (CI25.79-33.1). However Gonzalez et al., [11] showed higher mean difference in transcoarctation pressure gradient after surgical repair estimated 40.7mm hgCI (34.56-46.84). Unlike Lin et al., [16] which showed alower mean difference in transcoarctation pressuregradient after surgical repair estimated 4.10 mm hg (CI-13.49-5.29).

In Gonzalez et al., [11] the higher mean difference in transcoarctation pressure gradient after surgical repair is attributed to surgical technique (End to end anasyomosis) and this study exclude patients with arch hypoplasia [11]. However in Lin et al., [16] the mean difference in transcoarctation pressure gradient after surgical repair 4.10% (CI –13.49-5.29) perhaps due to its retrospective, nonrandomized nature, and smaller case numbers 30.Our meta analysis showed Pooling of the effect sizes of different demographic predictors as body surface area at surgery, associated anomalies, and repair variables from the different studies reporting the regression modeling of mortality data demonstrated different significant predictors. Among these predictors, the associated anomalies demonstrated the greatest impact (OR=3.65; 95% CI: 2.52-5.28). The least impact was demonstrated by the repair variables (OR=1.56; 95% CI: 0.22-10.83) and Pooling of the effect sizes of different demographic predictors, associated anomalies, and repair variables from the different studies reporting the regression modeling of re-intervention data demonstrated different significant predictors. Among these predictors, the associated anomalies (hypoplastic aortic arch) demonstrated the greatest impact (OR=1.89; 95% CI: 0.88-4.06). The least impact was demonstrated by the repair variables (OR=1.8; 95% CI: 0.94-3.44).

Conclusion:

In conclusion, Surgical repair of coarctation was significantly associated with a lower incidence of re-CoA, fewer repeat interventions due to re-CoA and lower residual transcoarctation gradient in the mid to long term follow-up. However, the results of the meta-analysis for incidence of aneurysm formation was inconclusive due to fluctuating results in the sensitivity analysis. Also our analysis revealed that extended archaor to plasty in association with ductal and coarctation excision provides excellent coarctation repair with a low incidence of recoarctation. According to the regression modeling of mortality and the regression modeling of re-intervention demonstrated different significant predictors. Among these predictors, the associated anomalies (hypoplastic aortic arch) demonstrated the greatest impact on both mortality and reintervention in surgical repair of coarctation in neonate.

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نتائج الإصلاح الجراحى
لضيق الشريان الأورطى فى الأطفال

يمكن تعريف تضيق الأبهر (CoA) ببساطة على أنه شذوذ فى القلب يؤدى إلى إعاقة تدفق الدم فى الشريان الأورطى. يمكن أن يحدث CoA أى منطقة فى الشريان الأورطى الصدرى والبطن. المو قع الأ كثر شيو عاً لـ CoA هو مجرد بعيد عن الشريان تحت الترقوة الأيسر عند النقطة التى تتصل فيها القناة الشريانية بالأبهر. عادة ما يكون هناك سماكة وسطية مع نسيج شبيه بالجرف بارز فى تجويف الشريان الأورطى من جدار الأبهر الخلفى.

هدف الدراسة : لتقييم نتيجة الإصلاح الجراحى للتضيق عند الأطفال حديثى الولادة. تضمنت المراجعة تجارب بأثر رجعى أو مستقبلية أو عشوائية أو غير معشاة ذات شواهد تدرس نتيجة الإصلاح الجراحى للتضيق عند الأطفال حديثى الولادة.

أنواع المشاركين : حديثى الولادة مع الإصلاح الجراحى للتضيق.

أنواع التدخلات : إصلاح التضيق الجراحى.

فى تحليلنا، ارتبط الإصلاح الجراحى للتضيق ارتباطاً وثيقاً بإنخفاض معدل حدوق إعادة CoA، وعدد أقل من التدخلات المتكررة بسبب إعادة CoA على المدى المتوسط إلى الطويل.

ومع ذلك، فإن نتائج المراجعة المنهجية لحدوث تمدد الأوعية الدموية كانت غير حاسمة بسبب نتائج التذبذب فى تحليل الحساسية.

لذلك، نعتقد أن نتائج المراجعة المنهجية الخاص بنا جدير بالثقة، على الرغم من أن تحيز الاختيار فى التجارب غير معشاة ذات شواهد NRCTs المتضمنة افتقر إلى الأزواج المتضابقة ومطابقة درجات الميل. أخيراً، خططنا فى المستقبل لتضمين الدراسات التى تقارن الجراحة مقابل زرع الدعامة التى كانت تعتبر نهجاً أكثر حداثة، فقد تم الإبلاغ عن أن زرع الدعامة يقلل من خطر تكوين تمدد الأوعية الدموية المحتمل.