

Supplementary table 1: Search string and results

Database	Search Terms	Number of Records
Scopus	("Transposition of Great Vessels" OR "transposition of great arteries" OR D-TGA OR TGA) AND ("Balloon Atrial Septostomy" OR "Rashkind procedure" OR BAS OR "atrial septostomy") AND ("Arterial Switch Operation" OR ASO OR Jatene OR outcome OR mortality OR survival OR morbidity) AND ("infant, newborn" OR neonate OR neonatal OR newborn OR infant)	163
Medline (PubMed)	("Transposition of Great Vessels"[Mesh] OR "transposition of great arteries"[all] OR D-TGA[all] OR TGA[tiab]) AND ("Balloon Atrial Septostomy"[all] OR "Rashkind procedure"[all] OR BAS[tiab] OR "atrial septostomy"[all]) AND ("Arterial Switch Operation"[all] OR ASO[tiab] OR Jatene[all] OR outcome[all] OR mortality[all] OR survival[all] OR morbidity[all]) AND ("infant, newborn"[Mesh] OR neonate[all] OR neonatal[all] OR newborn[all] OR infant[all])	143
Web of Science	("Transposition of Great Vessels" OR "transposition of great arteries" OR D-TGA OR TGA) AND ("Balloon Atrial Septostomy" OR "Rashkind procedure" OR BAS OR "atrial septostomy") AND ("Arterial Switch Operation" OR ASO OR Jatene OR outcome OR mortality OR survival OR morbidity) AND ("infant, newborn" OR neonate OR neonatal OR newborn OR infant)	55
EBSCO	((MH "Transposition of Great Vessels+") OR "transposition of great arteries" OR D-TGA OR (TI TGA OR AB TGA)) AND ("Balloon Atrial Septostomy" OR "Rashkind procedure" OR (TI BAS OR AB BAS) OR "atrial septostomy") AND ("Arterial Switch Operation" OR (TI ASO OR AB ASO) OR Jatene OR outcome OR mortality OR survival OR morbidity) AND ((MH "infant, newborn+") OR neonate OR neonatal OR newborn OR infant)	134

Embase (Ovid)	(exp “Transposition of Great Vessels”/ OR “transposition of great arteries”.af. OR D-TGA.af. OR TGA.tw.) AND (“Balloon Atrial Septostomy”.af. OR “Rashkind procedure”.af. OR BAS.tw. OR “atrial septostomy”.af.) AND (“Arterial Switch Operation”.af. OR ASO.tw. OR Jatene.af. OR outcome.af. OR mortality.af. OR survival.af. OR morbidity.af.) AND (exp “infant, newborn”/ OR neonate.af. OR neonatal.af. OR newborn.af. OR infant.af.)	128
Cochrane Library	“Transposition of the great arteries” AND (“Balloon Atrial Septostomy” OR “Arterial switch operation”)	32
ClinicalTrials.gov	“Transposition of the great arteries” AND (“Balloon Atrial Septostomy” OR “Arterial switch operation”) <i>(Filter: completed)</i>	9
EU Clinical Trials Register	“Transposition of the great arteries”, “Balloon Atrial Septostomy”, and “Arterial switch operation” searched independently	8
WHO ICTRP Search Portal	“Transposition of the great arteries”, “Balloon Atrial Septostomy”, and “Arterial switch operation” searched independently	4

Supplementary table 2. Studies excluded from the meta-analysis with reasons for exclusion

Title	Year	Decision	Reason for exclusion
"Bendy" stents help negotiate hairpin intracardiac curves	2015	Exclude	Review
[Atrio-septostomy using a Rashkind catheter in complete transposition of the great arteries. Immediate and late results]	1985	Exclude	No Arterial switch operation performed
[Balloon (Rashkind) atrio-septostomy in transposition of great vessels in the neonatal period]	1993	Exclude	No Arterial switch operation performed
[Heart catheterization in newborn and young infants. Description of the method]	1983	Exclude	Different medical condition
[Indications to the surgical treatment of patients with "simple" transposition of the great arteries. Analysis of 302 cases surgically treated according to mustard's technique (author's transl)]	1981	Exclude	No Arterial switch operation performed
[Transposition of great arteries. Results of treatment 1967-1973]	1975	Exclude	No Arterial switch operation performed
[Transposition of the great arteries: natural history and indications for surgery after balloon-atrioseptostomy (author's transl)]	1977	Exclude	No Arterial switch operation performed
[Transposition of the great arteries: results of treatment in the years 1967--1980 (author's transl)]	1981	Exclude	No Arterial switch operation performed
[Transposition of the great vessels in western Africa. Apropos of 17 cases observed at the Institute of Cardiology in Abidjan]	1990	Exclude	Older than age requirement
3D patient-specific modeling for surgical planning of a complex Nikaidoh procedure	2025	Exclude	Older than age requirement
A case of congenitally protected d-transposition of the great arteries in a very low-birth-weight infant	2003	Exclude	Case report
A randomized, double-blind, placebo-controlled, dose-ranging study of oral sildenafil citrate in treatment-naïve children with pulmonary arterial hypertension	2012	Exclude	Different medical condition
A rare lethal combination of premature closure of the foramen ovale and d-transposition of the great arteries with intact ventricular septum	2008	Exclude	No Arterial switch operation performed
A Retrospective Observational Study in Neonates with Transposition of Great Arteries Undergoing Balloon Atrial Septostomy in a Tertiary Care Hospital	2024	Exclude	No Arterial switch operation performed
A unique indication for the senning procedure: Atrioventricular discordance with ventriculoarterial concordance	2020	Exclude	No Arterial switch operation performed
Adolescents With d-Transposition of the Great Arteries Corrected With the Arterial Switch Procedure	2011	Exclude	Older than age requirement
Aldosterone Antagonists in Systemic Right Ventricle: a Randomized Clinical Trial	2008	Exclude	No Arterial switch operation performed
Amrinone versus dopamine and nitroglycerin in neonates after arterial switch operation for transposition of the great arteries	1999	Exclude	Different medical condition
An analysis of prognostic factors in the outcome of balloon atrial septostomy for transposition of the great arteries	1974	Exclude	Review
Analysis of 8681 neonates with transposition of the great arteries: Outcomes with and without Rashkind balloon atrial septostomy	2010	Exclude	No Arterial switch operation performed
Anatomic repair of transposition of the great arteries or arterial switch operation	2004	Include	Older than age requirement
Antenatal diagnosis, neonatal brain volumes, and neurodevelopment in transposition of the great arteries	2024	Exclude	No Arterial switch operation performed
Appraisal of the Mustard procedure for the physiological correction of "simple" transposition of the great arteries. Eighty consecutive cases, 1970-1980	1981	Exclude	Older than age requirement
Arrival and survival of a 3-week-old boy from Pakistan with an arterial oxygen saturation of 17%	2009	Exclude	Case report
Assessment of measurement properties of peak VO(2) in children with pulmonary arterial hypertension	2012	Exclude	Different medical condition
Atrial septostomy with a balloon catheter under echocardiographic control. Our experience	1993	Exclude	No Arterial switch operation performed
Atrial switch (Senning procedure) in the era of the arterial switch operation: Current indications and results	1996	Exclude	No Arterial switch operation performed
Attenuation of Myocardial Dysfunction by N-Acetylcysteine in Infants Undergoing Arterial Switch Procedure	2006	Exclude	No Arterial switch operation performed
Balloon Atrial Septostomy	2024	Exclude	Review

Balloon atrial septostomy and preoperative brain injury in neonates with transposition of great arteries: A systematic review and a meta-analysis	2011	Exclude	Review
Balloon Atrial Septostomy at Queen Sirikit National Institute of Child Health in the Year 2001	2003	Exclude	No Arterial switch operation performed
Balloon atrial septostomy at the bedside versus the catheterisation laboratory	2019	Exclude	No Arterial switch operation performed
Balloon atrial septostomy for transposition of the great arteries: Safety and experience with the Z-5 balloon catheter	2024	Exclude	No Arterial switch operation performed
Balloon atrial septostomy guided by echocardiography in a neonatal intensive care unit	2010	Exclude	No Arterial switch operation performed
Balloon atrial septostomy in complete transposition of great arteries in infancy	1970	Exclude	No Arterial switch operation performed
Balloon atrial septostomy in complete transposition of the great arteries	1985	Exclude	No Arterial switch operation performed
Balloon atrial septostomy in congenital heart disease in infancy	1973	Exclude	No Arterial switch operation performed
Balloon atrial septostomy in the era of vanishing Rashkind balloon	2022	Exclude	Case report
Balloon atrial septostomy is associated with preoperative stroke in neonates with transposition of the great arteries	2006	Exclude	No Arterial switch operation performed
Balloon atrial septostomy performed out-of-hours: Effects on the outcome	2013	Exclude	No Arterial switch operation performed
Balloon atrial septostomy under echocardiographic guidance: Case report	1998	Exclude	No Arterial switch operation performed
Balloon atrial septostomy under echocardiographic guide: Case series	2012	Exclude	Case report
Balloon atrial septostomy under two-dimensional echocardiographic control in the intensive care unit	1995	Exclude	No Arterial switch operation performed
Balloon atrial septostomy under two-dimensional echocardiographic control: a new outlook	1997	Exclude	No Arterial switch operation performed
Balloon Atrial Septostomy. Let's Take a Closer Look	2009	Exclude	Review
Balloon atrial septostomy: Six years experience at cardiology unit, children hospital, Lahore	2013	Exclude	Different medical condition
Balloon atrioseptostomy for transposition of the great arteries in Europe: characteristics and outcomes	2025	Exclude	No Arterial switch operation performed
Bedside balloon atrial septostomy is safe, efficacious, and cost-effective compared with septostomy performed in the cardiac catheterization laboratory	2002	Exclude	No Arterial switch operation performed
Bilateral pulmonary arterial banding for complex transposition of the great arteries	2013	Exclude	Different medical condition
Biventricular repair in an infant with transposition of the great arteries and straddling of the tricuspid valve	2023	Exclude	No Arterial switch operation performed
Broadening Indications for Neonatal Balloon Atrial Septostomy in Dextro-Transposition of the Great Arteries Reduce Predictive Value of Fetal Echocardiography	2023	Exclude	No Arterial switch operation performed
Can We Safely Decrease Early-Term Delivery and Cesarean Section Rate in Pregnancies Complicated by Fetal Transposition of Great Arteries?	2023	Exclude	Different medical condition
Cardiac catheterization in infants <2500 grams	2018	Exclude	Case report
CASE REPORT CHALLENGING CMV INFECTION DIAGNOSIS COMPLICATED BY CONGENITAL HEART DISEASE	2019	Exclude	Case report
Causes of death in transposition of the great arteries. A clinical and autopsy study of 140 cases	1975	Exclude	Different medical condition
Changes in the chest roentgenogram following balloon septostomy for transposition of the great vessels	1975	Exclude	Review
Characteristics of the atrial septum in foetuses with D-transposition of the great arteries	2013	Exclude	Different medical condition
Clinical presentation of isolated transposition of the great arteries in a complete population based cohort. Implications for pre-and postnatal screening routines	2014	Exclude	No Arterial switch operation performed
Clinical profile of cyanotic congenital heart disease in neonatal intensive care unit at Sohag University Hospital, Upper Egypt	2017	Exclude	No Arterial switch operation performed

Clinical, evolutive and therapeutic notes on 15 cases of complete transposition of the great vessels	1973	Exclude	No Arterial switch operation performed
Complete D-transposition of the great vessels diagnosed late in a 10-month infant. Rashkind manoeuvre	1997	Exclude	Case report
CT Coronary Angiography for the Detection of Reimplanted Coronary Lesions in Patients Who Had Undergone Arterial Switch Operation for Transposition of the Great Arteries	2010	Exclude	Review
Dapagliflozin in adults with a systemic right ventricle:initial results from the DAPA-SERVE trial	2023	Exclude	Older than age requirement
Delayed cortical gray matter development in neonates with severe congenital heart disease	2016	Exclude	Different medical condition
Dextro-transposition of the great arteries in one twin: case reports and literature review	2022	Exclude	Case report
Different outcomes of balloon atrial septostomy and the association of C677T polymorphism in MTHFR gene on TGA children	2022	Exclude	No Arterial switch operation performed
Do infants with transposition of the great arteries born outside a specialist centre have different outcomes?	2019	Exclude	No Arterial switch operation performed
Does a balloon atrial septostomy performed before arterial switch surgery increase adverse neurological outcomes?	2012	Exclude	Review
Double Outlet Right Ventricle With Intact Ventricular Septum: Avulsion or Exclusion	2016	Exclude	Different medical condition
Early and late results of a protocol for simple transposition leading to an atrial switch (Mustard) repair	1988	Exclude	No Arterial switch operation performed
Echocardiographic monitoring of atrial septostomy in the transposition of the great arteries	1984	Exclude	No Arterial switch operation performed
Echocardiography guided bed side balloon atrial septostomy in dextro transposed great arteries (dTGA) with intact ventricular septum (IVS): A resource limited country experience	2018	Exclude	Case report
Effect of angiotensin receptor blockade on systemic right ventricular function and size: a small, randomized, placebo-controlled study	2008	Exclude	Different medical condition
Effect of balloon atrial septostomy on cerebral oxygenation in neonates with transposition of the great arteries	2013	Exclude	No Arterial switch operation performed
Effect of Rashkind procedure on oxygen saturation level and short term outcomes in neonates with transposition of the great arteries	2019	Exclude	No Arterial switch operation performed
Emergency heart surgery in neonates	1988	Exclude	No Arterial switch operation performed
Extracorporeal Membrane Oxygenation as a Rescue Therapy for Postoperative Diastolic Dysfunction and Refractory Chylothorax	2021	Exclude	Case report
Factors influencing survival after balloon atrial septostomy for complete transposition of great arteries	1981	Exclude	No Arterial switch operation performed
Family Socioeconomic Status and Neurodevelopment Among Patients With Dextro-Transposition of the Great Arteries	2024	Include	No Arterial switch operation performed
Fate of infants with transposition of the great arteries in relation to balloon atrial septostomy	1984	Exclude	No Arterial switch operation performed
Fetal cardiac and neonatal cerebral hemodynamics and oxygen metabolism in transposition of the great arteries	2023	Exclude	No Arterial switch operation performed
FETAL PREDICTORS OF NEONATAL HYPOXIA IN D-TRANSPOSITION OF THE GREAT ARTERIES: A PROSPECTIVE, MULTI-CENTER STUDY BY THE FETAL HEART SOCIETY RESEARCH COLLABORATIVE	2025	Exclude	No Arterial switch operation performed
Fetal predictors of urgent balloon atrial septostomy in neonates with complete transposition	2011	Exclude	No Arterial switch operation performed
Functional assessment of atrial M-mode in 3rd trimester in the context of postnatal balloon atrial septostomy in fetuses with simple dextro-transposition of the great arteries	2022	Exclude	No Arterial switch operation performed
General health status of children with D-transposition of the great arteries after the arterial switch operation	2001	Exclude	Older than age requirement
Haemodynamic effects of balloon atrial septostomy in infants with transposition of the great arteries	1972	Exclude	Review
Hemodynamic consequences of a restrictive ductus arteriosus and foramen ovale in fetal transposition of the great arteries	2016	Exclude	Case report
High-Throughput Genomics Identify Novel FBN1/2 Variants in Severe Neonatal Marfan Syndrome and Congenital Heart Defects	2024	Exclude	Case report

How reliably does prenatal echocardiography predict urgent balloon atrial septostomy in fetuses with D-TGA?	2024	Exclude	No Arterial switch operation performed
Hybrid strategies for high-risk non-hypoplastic left heart syndrome patients	2018	Exclude	Review
Hypoxia in the delivery room: Do not forget the heart!	2018	Exclude	Case report
Immediate and Intermediate-Term Outcomes of Infants With Transposition of Great Arteries Who Underwent Balloon Atrial Septostomy in Sudan	2025	Include	No Arterial switch operation performed
Immediate results of balloon atrial septostomy (Rashkind procedure) in the newborns with the transposition of the great arteries (TGA)	1984	Exclude	No Arterial switch operation performed
Immediate results of balloon atrial septostomy (Rashkind procedure) in the newborns with the transposition of the great arteries (TGA)	1984	Exclude	No Arterial switch operation performed
Immediate results of balloon atrial septostomy (Rashkind procedure) in the newborns with the transposition of the great arteries (TGA)	1984	Exclude	No Arterial switch operation performed
Immediate results of balloon atrial septostomy (Rashkind procedure) in the newborns with the transposition of the great arteries (TGA)	1984	Exclude	No Arterial switch operation performed
Impact of balloon atrial septostomy in neonates with transposition of great arteries	2011	Exclude	No Arterial switch operation performed
Impact of novel balloon catheter on static balloon atrial septostomy with double balloon technique in infants with congenital heart disease	2015	Exclude	No Arterial switch operation performed
Impact of prenatal diagnosis of transposition of the great arteries on postnatal outcome	2017	Exclude	Different medical condition
Improved results with single-stage total correction of Taussig-Bing anomaly	2008	Exclude	Different medical condition
Improving transport time for babies with antenatally diagnosed transposition of the great arteries reduces the need for ECMO	2020	Exclude	No Arterial switch operation performed
Incidence of stroke in patients with d-transposition of the great arteries that undergo balloon atrial septostomy in the University Healthsystem Consortium Clinical Data Base/Resource Manager	2010	Exclude	No Arterial switch operation performed
Inducing labour does not reduce preoperative morbi-mortality in infant with prenatal diagnosis of transposition of great arteries	2022	Exclude	Different medical condition
Influence of Physical Training on Cardiopulmonary Exercise Capacity and Right Ventricular Function in Patients With D-TGA and Atrial Switch Operation	2009	Exclude	Review
Inhaled iloprost as a rescue therapy for transposition of the great arteries with persistent pulmonary hypertension of the newborn	2013	Exclude	Case report
Intensive care management of neonates with d-transposition of the great arteries and common arterial trunk	2012	Exclude	Review
Interventional cardiac catheterization in neonates and premature infants with congenital heart disease: a single center experience	2023	Exclude	No Arterial switch operation performed
Interventional therapy for neonates with critical congenital heart disease	2008	Exclude	Review
Late complications and pathological findings of the arterial switch operation	2014	Exclude	Different medical condition
Left ventricular regression after balloon atrial septostomy in d-transposition of the great arteries	2016	Exclude	No Arterial switch operation performed
Lessons from prenatal diagnosis and in utero transfer of fetuses with transposition of the great arteries	2019	Exclude	No Arterial switch operation performed
Long-distance transport of neonates with transposition of the great arteries for the arterial switch operation: A 26-year Western Australian experience	2015	Exclude	Review
Long-term results after the resection of the left atrial appendage procedure for transposition of the great arteries and double-outlet right ventricle with pulmonary stenosis	2023	Exclude	No Arterial switch operation performed
Long-term results after the REV (reparation of the left atrial appendage) procedure for malposition of the great arteries	2022	Exclude	Older than age requirement
Major aorto-pulmonary arteries in transposition of the great arteries: Impact and management	2021	Include	No Full text available
Management of Hypertrophic Cardiomyopathy in a Newborn with Dextro-Transposition of the Great Arteries	2022	Exclude	Different medical condition

Management of preoperative ECMO support for hemodynamic instability prior to arterial switch operation	2011	Exclude	Case report
Maternal infant bonding enhanced after atrial septostomy in cyanotic neonates in a general hospital	2003	Exclude	No Arterial switch operation performed
MINIMALLY INVASIVE MANAGEMENT OF TRANSPOSITION OF THE GREAT-ARTERIES IN THE NEWBORN PERIOD	1992	Exclude	No Arterial switch operation performed
Modified Septostomy in d-Transposition of Great Arteries With Aneurysmal and Intact Atrial Septum	2019	Exclude	Case report
Mortality and impact of prenatal diagnosis of severe complex congenital heart disease in a country with limited surgical resources	2016	Exclude	Different medical condition
Mortality in potential arterial switch candidates with transposition of the great arteries	1998	Exclude	No Arterial switch operation performed
MUSTARD'S OPERATION FOR TRANSPOSITION OF THE GREAT ARTERIES. Review of 200 Cases	1972	Exclude	No Arterial switch operation performed
Neonatal arteria switch operation for transposition of the great arteries: In a patient with mirror image dextrocardia and situs inversus totalis	2000	Exclude	Review
Neonatal arterial switch operation for transposition of the great arteries in a patient with mirror image dextrocardia and situs inversus totalis	2000	Exclude	Case report
Neonatal arterial switch operation: The sooner the better!	2016	Include	No Full text available
Neonatal Brain Injury and Timing of Neurodevelopmental Assessment in Patients With Congenital Heart Disease	2018	Exclude	Different medical condition
Neuroimaging findings in newborns with congenital heart disease prior to surgery: An observational study	2019	Exclude	No Arterial switch operation performed
New transcatheter techniques for creation or enlargement of atrial septal defects in infants with complex congenital heart disease	2007	Include	Different medical condition
Nitric oxide in neonatal transposition of the great arteries	2005	Exclude	No Arterial switch operation performed
Nitric oxide in neonatal transposition of the great arteries	2005	Exclude	No Arterial switch operation performed
Nitric oxide in neonatal transposition of the great arteries	2005	Exclude	No Arterial switch operation performed
Nitric oxide in neonatal transposition of the great arteries	2005	Exclude	No Arterial switch operation performed
No difference found in safety or efficacy of balloon atrial septostomy performed at the bedside versus the catheterisation laboratory	2018	Exclude	No Arterial switch operation performed
Non-occlusive mesenteric ischaemia (NOMI) in neonates: A devastating disease	2021	Exclude	Case report
Our surgical experience and mid-term results with the Senning procedure	2011	Exclude	No Arterial switch operation performed
Outcome of emergency interventions in sick neonates	2017	Exclude	No Arterial switch operation performed
Outcomes of transposition of great arteries in a country without possibility of surgical correction	2015	Exclude	No Arterial switch operation performed
Out-of-hours versus in-hours delivery of antenatally diagnosed transposition of the great arteries: outcomes from a United Kingdom Tertiary Centre	2023	Exclude	No Arterial switch operation performed
Pathogenesis and Surgical Treatment of Dextro-Transposition of the Great Arteries (D-TGA): Part II	2024	Exclude	Review
PDA stenting: our experience over the past decade	2018	Exclude	Different medical condition
Percutaneous Fetal Atrial Balloon Septoplasty for Simple Transposition of the Great Arteries With an Intact Atrial Septum	2018	Exclude	No Arterial switch operation performed
Performing an urgent neonatal cardiac intervention safely during the COVID-19 pandemic	2021	Exclude	Review
Perioperative Monitoring of Thromboelastograph on Blood Protection and Recovery for Severely Cyanotic Patients Undergoing Complex Cardiac Surgery	2010	Exclude	Different medical condition
Persistence of the fetal pattern of circulation in transposition of the great arteries	1974	Exclude	Case report

Persistent Pulmonary Hypertension in a Neonate With Transposition of Great Arteries and Intact Ventricular Septum: A Case Report and Review of the Literature	2015	Exclude	Review
Phentolamine as a treatment for poor mixing in transposition of the great arteries with adequate intraatrial communication	2005	Exclude	Different medical condition
Prediction of IQ and Achievement at Age 8 Years From Neurodevelopmental Status at Age 1 Year in Children With D-Transposition of the Great Arteries	2004	Exclude	Older than age requirement
Prenatal closure of the foramen ovale in complete transposition of great vessels. Observations in a case with intact ventricular septum and normally developed left heart chambers	1979	Exclude	Case report
Prenatal Detection of D-TGA and Novel Interventional Program Decrease Time to Balloon Septostomy	2024	Exclude	No Arterial switch operation performed
Prenatal diagnosis is associated with a lower rate of pre-operative brain injury in newborns with transposition of the great arteries	2014	Exclude	Different medical condition
Prenatal Diagnosis of Transposition of the Great Arteries Reduces Postnatal Mortality: A Population-Based Study	2020	Exclude	Different medical condition
Prenatal Echocardiographic Assessment of Foramen Ovale Appearance in Fetuses with D-Transposition of the Great Arteries and Impact on Neonatal Outcome	2017	Exclude	No Arterial switch operation performed
Prenatal risk factors for urgent atrial septostomy at birth in fetuses with transposition of the great arteries: a systematic review and meta-analysis	2022	Exclude	Review
Pre-operative brain injury in newborn infants with transposition of the great arteries occurs at rates similar to other complex congenital heart disease and is not related to balloon atrial septostomy	2009	Exclude	Different medical condition
Preoperative brain injury in transposition of the great arteries is associated with oxygenation and time to surgery, not balloon atrial septostomy	2009	Exclude	No Arterial switch operation performed
Preoperative ECMO in transposition of the great arteries with persistent pulmonary hypertension	2005	Exclude	Case report
Preoperative Venovenous Extracorporeal Membrane Oxygenation for Transposition of Great Arteries With Severe Pulmonary Hypertension in a Newborn	2020	Exclude	Case report
Prevalence and Outcomes of Balloon Atrial Septostomy in Neonates With Transposition of Great Arteries	2020	Exclude	No Arterial switch operation performed
Prevalence, Risk Factors, and Impact of Preoperative Seizures in Neonates With Congenital Heart Disease	2022	Exclude	Different medical condition
Prognosis following balloon atrial septostomy and subsequent management of transposition of the great arteries	1971	Exclude	No Arterial switch operation performed
Prognosis for the newborn with transposition of the great arteries	1979	Exclude	Review
Prognosis of children with transposition of the great arteries, treated in a regional heart centre between 1967 and 1979	1982	Exclude	No Arterial switch operation performed
Prognosis of newborns with transposition of the great arteries after balloon-atrioseptostomy and after surgical atrial inversion	1981	Exclude	No Arterial switch operation performed
Pronostic factors after arterial switch operation for transposition of the great arteries in children	2019	Include	No Full text available
Pulmonary atresia with intact ventricular septum associated with congenitally corrected transposition	2006	Exclude	Case report
Pulmonary vascular disease in neonates with transposition of the great arteries and intact ventricular septum	1993	Exclude	No Arterial switch operation performed
Radiofrequency Catheter Ablation of Intractable Ventricular Tachycardia in an Infant Following Arterial Switch Operation	2014	Exclude	Review
Rashkind's atrial septostomy in newborn infants. Evaluation of 47 operations	1970	Exclude	No Arterial switch operation performed
Rashkind's balloon atrial septostomy in transposition of the great arteries during the neonatal period	1993	Exclude	No Arterial switch operation performed
Rastelli Operation for D-Transposition of the Great Arteries, Ventricular Septal Defect, and Pulmonary Stenosis	2019	Exclude	No Arterial switch operation performed
Recanalisation of the closed ductus arteriosus in a critically ill infant with transposition of the great arteries	2015	Exclude	Case report
Reliability of Fetal Echocardiography in Predicting Postnatal Critical Hypoxia in Patients with Transposition of Great Arteries and Intact Ventricular Septum	2021	Exclude	No Arterial switch operation performed

Results of Senning operation for transposition of great arteries	1992	Exclude	No Arterial switch operation performed
Results of the Senning operation for transposition of the great arteries with intact ventricular septum in neonates	1984	Exclude	No Arterial switch operation performed
Results of the Senning operation for transposition of the great arteries with intact ventricular septum in neonates	1984	Exclude	No Arterial switch operation performed
Results of the Senning operation for transposition of the great arteries with intact ventricular septum in neonates	1984	Exclude	No Arterial switch operation performed
Results of the Senning operation for transposition of the great arteries with intact ventricular septum in neonates	1984	Exclude	No Arterial switch operation performed
Right ventricular dissection after arterial switch operation	2023	Exclude	Different medical condition
Right ventricular global longitudinal strain by cardiac magnetic resonance feature tracking is associated with outcome in patients with a systemic right ventricle	2024	Exclude	No Arterial switch operation performed
Right Ventricular Hypertrophy After Atrial Switch Operation and Its Role in a Systemic RV: Normal Adaptation Process or Risk Factor? A Cardiovascular Magnetic Resonance Study	2011	Exclude	No Arterial switch operation performed
Risk Factors for Perioperative Brain Lesions in Infants With Congenital Heart Disease: A European Collaboration	2022	Exclude	Different medical condition
ROLE OF MATERNAL HYPEROXYGENATION TESTING TO PREDICT NEED FOR BALLOON ATRIAL SEPTOSTOMY IN FETAL D-TRANSPOSITION OF THE GREAT ARTERIES	2023	Exclude	No Arterial switch operation performed
Selexipag for the Treatment of Pulmonary Arterial Hypertension	2015	Exclude	No Arterial switch operation performed
Senning operation for very low birth weight infant with transposition of the great arteries: one of the smallest cases in the world	2016	Exclude	Older than age requirement
Senning repair for transposition of the great arteries without patch augmentation of the septum	1988	Exclude	No Arterial switch operation performed
Successful Balloon Atrioseptostomy and Arterial Switch Operation in a 6-Month-Old Infant with D-Transposition of the Great Arteries	2023	Exclude	Case report
Successful emergent aspiration of thrombus for postoperative superior vena cava obstruction presenting life-threatening SVC syndrome in early infancy	2014	Exclude	Case report
Successful Management of a COVID-19 Positive Infant With Transposition of the Great Arteries	2021	Exclude	Case report
Successful staged surgical repair using rapid pulmonary artery banding in a very-low-birth-weight premature infant who had d-transposition of the great arteries with an intact ventricular septum	2013	Exclude	Case report
Surgery in newborns and infants with cyanotic cardiac malformations: indication and technique of emergency operations and urgent early surgical interventions (author's transl)	1978	Exclude	No Arterial switch operation performed
Surgical correction in infancy to reduce mortality in transposition of the great arteries	1977	Exclude	No Arterial switch operation performed
Surgical repair of transposition of the great arteries (Hebrew)	1975	Exclude	No Arterial switch operation performed
Surgical timing for arterial switch operation: Does post-natal maturation matter?	2013	Exclude	Review
Surgical treatment of complex congenital heart defect in children and infants	1991	Exclude	Different medical condition
SURGICAL-CORRECTION IN INFANCY TO REDUCE MORTALITY IN TRANSPOSITION OF GREAT ARTERIES	1977	Exclude	No Arterial switch operation performed
Survival after balloon atrial septostomy for complete transposition of great arteries	1987	Exclude	No Arterial switch operation performed
SURVIVAL OF INFANTS WITH TRANSPOSITION OF GREAT ARTERIES AFTER BALLOON ATRIAL SEPTOSTOMY	1971	Exclude	Review
Systemic ventricle function assessment in a difficult case	2019	Exclude	Case report
The association of hospital transfer on outcomes of newborns with transposition of great arteries: Analysis of national inpatient sample database years of 2008-2016	2019	Exclude	No Arterial switch operation performed
The Blalock Hanlon operation: An anachronism?	1987	Exclude	Different medical condition

The Blalock-Hanlon procedure. A new look at an old operation	1975	Exclude	No Arterial switch operation performed
The clinical anatomy of transposition	2005	Exclude	Review
The early results of treatment of simple transposition in the current era	1988	Exclude	No Arterial switch operation performed
The Effectiveness of Balloon Atrial Septostomy in Neonates with Great Artery Transposition in Duhok, Iraq	2022	Exclude	Review
The histological findings in transposition of the great artery with severe persistent pulmonary hypertension of the newborn	2018	Exclude	No Arterial switch operation performed
The immediate effect of Rashkind's atrioseptostomy on systemic saturation in transposition of the great arteries	2004	Exclude	No Arterial switch operation performed
The infant with transposition of the great arteries II. Results of balloon atrial septostomy	1972	Exclude	No Arterial switch operation performed
The Mustard procedure for correction of simple transposition of the great arteries before 1 month of age	1992	Exclude	No Arterial switch operation performed
The Neonatal Arterial Switch Operation: Technical Pearls	2017	Exclude	Review
The Task Force on Transposition of the Great Arteries of the European Association for Cardio-Thoracic Surgery (EACTS) and the Association for European Paediatric and Congenital Cardiology (AEPC)	2017	Exclude	Review
Timing of balloon atrial septostomy in patients with D-TGA and association with birth location and patient outcomes	2021	Exclude	No Arterial switch operation performed
Total Correction of Transposition of the Great Arteries in Infancy as Initial Surgical Management	1972	Exclude	Older than age requirement
Transcatheter Cardiac Interventions in Neonates with Congenital Heart Disease: A Single Centre Experience	2024	Exclude	No Arterial switch operation performed
Transposition of great arteries in developing world: Early mortality and predictive factors	2024	Exclude	No Arterial switch operation performed
Transposition of great arteries. Early results of Mustard's operation in paediatric patients	1976	Exclude	No Arterial switch operation performed
Transposition of the great arteries	2004	Exclude	Review
Transposition of the great arteries	2004	Exclude	Review
Transposition of the Great Arteries	2020	Exclude	Review
Transposition of the Great Arteries	2020	Exclude	Review
Transposition of the Great Arteries	2024	Exclude	Review
Transposition of the Great Arteries	2024	Exclude	Review
Transposition of the great arteries	2008	Exclude	Review
Transposition of the great arteries	2008	Exclude	Review
Transposition of the Great Arteries and Common Variants	2016	Exclude	Review
Transposition of the great arteries and the arterial switch operation	2018	Exclude	Review
Transposition of the great arteries in the neonate: failed balloon atrial septostomy	1985	Exclude	Review
Transposition of the great arteries in the newborn: A three year survey	1978	Exclude	Review
Transposition of the great arteries in the newborn: A three year survey	1978	Exclude	Review
Transposition of the great arteries in the newborn: A three year survey	1978	Exclude	No Arterial switch operation performed
Transposition of the great arteries in the newborn: A three year survey	1978	Exclude	No Arterial switch operation performed
Transposition of the great arteries. Correction in paediatric patients (Norwegian)	1975	Exclude	No Arterial switch operation performed
Transposition of the great arteries. Results of treatment with early palliation and late intracardiac repair	1975	Exclude	No Arterial switch operation performed
Transposition of the great arteries: From fetus to adult	2008	Include	Review
Transposition of the great arteries: natural history and indications for surgery after balloon atrioseptostomy	1977	Exclude	No Arterial switch operation performed
Transposition of the great arteries: Rationale for tailored preoperative management	2017	Exclude	Review
Transposition of the great arteries: Results of treatment in the years 1967-1980	1981	Exclude	No Arterial switch operation performed
Transposition of the great arteries: Results of treatment in the years 1967-1980	1981	Exclude	No Arterial switch operation performed
Transposition of the great arteries: Results of treatment in the years 1967-1980	1981	Exclude	No Arterial switch operation performed

Transposition of the great vessels	1975	Exclude	No Arterial switch operation performed
Transposition of the great vessels and intact ventricular septum: Is there an age limit for the arterial switch? Personal experience and review of the literature	2020	Include	Review
Transverse testicular ectopia in a newborn with transposition of the great arteries: A unique case report	2024	Exclude	Case report
Treatment of d-transposition of the great arteries: management of hypoxemia after balloon atrial septostomy	1981	Exclude	No Arterial switch operation performed
ULTRASOUND PROBE - AN EMERGENCY PRESCRIPTION PEN IN LIFE-THREATENING NEONATAL EMERGENCIES	2024	Exclude	Case report
Urgent neonatal balloon atrial septostomy in simple transposition of the great arteries: predictive value of fetal cardiac parameters	2021	Exclude	No Arterial switch operation performed
Usefulness of the Prenatal Echocardiogram in Fetuses With Isolated Transposition of the Great Arteries to Predict the Need for Balloon Atrial Septostomy	2017	Exclude	No Arterial switch operation performed
Value of balloon atrial septostomy in hybrid procedure for patients with complex congenital heart disease	2009	Include	No English translation after numerous attempts to translate
Ventriculo-arterial coupling parameters by cardiac magnetic imaging are associated with outcome in patients with a systemic right ventricle	2024	Exclude	No Arterial switch operation performed
Visual-Spatial Skills in Children After Open-Heart Surgery	2003	Exclude	Different medical condition
[Medium and long-term results of anatomical correction of transposition of the great arteries in Marseille]	2006	Excluded	No full text available
Brain MRI based choice of best time for transition of the great arteries surgery: Inside brain protection	2011	Excluded	No full text available
18-YEAR EXPERIENCE IN MANAGEMENT OF COMPLETE TRANSPOSITION OF THE GREAT ARTERIES IN NEWBORN: A SINGLE-CENTRE'S EXPERIENCE	2017	Excluded	No full text available
Anesthesia for arterial switch operation in simple transposition of the great arteries: experience at Siriraj Hospital Cochrane Library		Excluded	No full text available
Celite based viscometer sonoclot analysis in infants with D-transposition of great arteries undergoing arterial switch operation Cochrane Library		Excluded	No full text available
Characterization of the Cardiac Reinnervation of Patients With Transposition of the Great Arteries Long After Repair With the Arterial Switch Operation. Correlation With Electrocardiographic and Exercise Test Parameters	2018	Excluded	No full text available
Clinical profile and pre-operative critical care needs of children with transposition of great arteries: A retrospective study	2023	Excluded	No full text available
Anatomic correction of transposition of great vessels with entire interventricular septum. Initial results	1995	Excluded	No full text available
Anatomical correction of transposition of great vessels. Considerations on the first 50 patients operated on and analysis of the surgical choice	1990	Excluded	No full text available
Arterial repair for simple and complex forms of transposition of the great arteries	1987	Excluded	No full text available
Arterial switch operation in older infants with severe pulmonary hypertension	2003	Excluded	No full text available
Follow-up of Patients Who Underwent Arterial Switch Repair for Transposition of the Great Arteries	1991	Excluded	No full text available
Leveraging the First Statewide Congenital Cardiac Consortium to Reduce Variation in Modifiable Preoperative Management Among Neonates Undergoing Arterial Switch Operation	2016	Excluded	No full text available
Management of transposition of the great arteries in southern France: Impact of antenatally diagnosis	2010	Excluded	No full text available
Medium and long-term results of anatomical correction of transposition of the great arteries at Marseille	2006	Excluded	No full text available
MRI Study After Arterial Switch Operation in Patients With Transposition of the Great Arteries	2013	Excluded	No full text available
Neuropsychological and structural brain abnormalities in adults with D-transposition of the great arteries: the boston circulatory arrest study Cochrane Library		Excluded	No full text available

Outcomes of Transposition of the Great Arteries After Arterial Switch Operation: a Dual-center Study	2021	Excluded	No full text available
Patterns of Developmental Dysfunction After Surgery During Infancy to Correct Transposition of the Great Arteries	1997	Excluded	No full text available
Predictors of early postoperative complications after arterial switch operation of newborns with transposition of the great arteries	2014	Excluded	No full text available
Pre-treatment with dexamethasone provides antiinflammatory and myocardial protection in neonatal arterial switch operation: a prospective randomized double-blind controlled study Cochrane Library		Excluded	No full text available
Pronostic factors after arterial switch operation for transposition of the great arteries in children	2019	Excluded	No full text available
Transposition of the Great Arteries - Are We Doing Better? Correlating Outcome to Change in Renal Function Over 2 Decades of Arterial Switch Operation	2020	Excluded	No full text available
Transposition of the great arteries in neonates: Incidence and outcome	2017	Excluded	No full text available
Transposition of the Great Arteries with Intact Ventricular Septum: 12-Year Experience and Perinatal Outcomes of Early Surgical Correction Using Autologous Umbilical Cord Blood	2023	Excluded	No full text available
Transposition of the great arteries: Results of treatment in the years 1967-1980	1981	Excluded	No full text available
Use of antifibrinolytics for children with transposition of the great arteries undergoing arterial switch operations Cochrane Library		Excluded	No full text available
[Anatomic repair of transposition of the great arteries or arterial switch operation. Report of 62 cases]	2004	Excluded	No full text available
[Therapeutic value and critical analysis of atrial septostomy in the transposition of the great arteries]	1978	Excluded	No full text available
A 13-year single center experience of arterial switch operation in the first hours of life using autologous umbilical cord blood	2024	Excluded	No full text available
A randomised controlled trial of nitric oxide administration during cardiopulmonary bypass in neonates undergoing Arterial Switch Operation for repair of transposition of the great arteries Cochrane Library		Excluded	No full text available
BALLOON ATRIAL SEPTOSTOMY UNDER 2-DIMENSIONAL ECHOCARDIOGRAPHIC CONTROL IN THE INTENSIVE-CARE UNIT	1995	Excluded	No Arterial switch operation performed
Cardiac Catheterization Interventions in the Right Ventricular Outflow Tract and Branch Pulmonary Arteries Following the Arterial Switch Operation	2025	Excluded	No Arterial switch operation performed
Comparison of three dose regimens of aprotinin in infants undergoing the arterial switch operation	2010	Excluded	Different medical condition
Detection of coronary complications after the arterial switch operation for transposition of the great arteries: first experience with multislice computed tomography in children	2006	Excluded	Different medical condition
Developmental and Neurologic Status of Children after Heart Surgery with Hypothermic Circulatory Arrest or Low-Flow Cardiopulmonary Bypass	1995	Excluded	Different medical condition
Developmental and Neurological Status of Children at 4 Years of Age After Heart Surgery With Hypothermic Circulatory Arrest or Low-Flow Cardiopulmonary Bypass	1999	Excluded	Older than age requirement
Dexamethasone Pretreatment Provides Antiinflammatory and Myocardial Protection in Neonatal Arterial Switch Operation	2012	Excluded	Different medical condition
D-Transposition of the great arteries with restrictive foramen ovale in the fetus: the dilemma of predicting the need for postnatal urgent balloon atrial septostomy	2024	Excluded	No Arterial switch operation performed
Effect of C1-esterase-inhibitor on capillary leak and inflammatory response syndrome during arterial switch operations in neonates	2001	Excluded	Outside the scope
Effects of N-acetylcysteine on renal dysfunction in neonates undergoing the arterial switch operation	2010	Excluded	Outside the scope
Fetal-to-Neonatal Transition of an Infant with Transposition of the Great Arteries and Intact Ventricular Septum: A Case Report	2024	Excluded	Case report

Long-term results of left ventricular reconditioning and anatomic correction for systemic right ventricular dysfunction after atrial switch procedures	2004	Excluded	No Arterial switch operation performed
Myocardial viability assessed by positron emission tomography in infants and children after the arterial switch operation and suspected infarction	2000	Excluded	Out of scope
Neurodevelopmental status at eight years in children with dextro-transposition of the great arteries: The Boston Circulatory Arrest Trial	2003	Excluded	Older than age requirement
Postoperative course and hemodynamic profile after the arterial switch operation in neonates and infants: a comparison of low-flow cardiopulmonary bypass and circulatory arrest	1995	Excluded	Out of scope
Pulse oximetry screening and prenatal diagnosis play complementary roles in reducing risks in simple transposition of the great arteries	2015	Excluded	Out of scope
Randomized comparison between mild and moderate hypothermic cardiopulmonary bypass for neonatal arterial switch operation	2012	Excluded	No full text available
Relation of Seizures After Cardiac Surgery in Early Infancy to Neurodevelopmental Outcome	1998	Excluded	Out of scope
Successful coronary transfer for transposition of the great arteries with bilateral intramural coronary arteries from a single aortic sinus	2018	Excluded	Out of scope
Thallium-201 myocardial imaging in cases involving transposition of the great arteries after arterial switch operation	1992	Excluded	Out of scope
The effect of duration of deep hypothermic circulatory arrest in infant heart surgery on late neurodevelopment: The Boston Circulatory Arrest Trial	2003	Excluded	No full text available
The Need for Preoperative Prostaglandin E1 for d-Transposition After Balloon Atrial Septostomy	2024	Excluded	No Arterial switch operation performed
Three-dimensional geometry of coronary arteries after arterial switch operation for transposition of the great arteries and late coronary events	2021	Excluded	Out of scope

Supplementary Table 3: Studies Included in the meta -analysis

First author	Title	Year of data collection	Year of publication	Country	Study design	Population	Intervention	Comparator	Outcome measured	Sample Size	Characteristics of groups	D-TGA Type (IVS/VSD)	Total ASO Patients	BAS Before ASO (n)	No BAS Before ASO (n)	Pre-op characteristics Reported (Notes)	Intra interventions (Notes)	Post-op maagement Reported (Notes)	Overall Mortality	Mortality by BAS (n)	Mortality No BAS (n)	Other outcomes	Long-term Neuro Outcomes(Notes)	Limitations
Anderson et al.	Earlier arterial switch operation improves outcomes and reduces costs for neonates with transposition of the great arteries	2003 - 2012	2014	USA	Retrospective cohort study	Infants diagnosed with dextro-transposition of the great arteries (d-TGA) at 36 weeks' gestation or later, admitted to NewYork – Presbyterian/ Morgan Stanley Children's Hospital at five days of age or younger between January 1, 2003, and October 1, 2012. Infants were excluded if they had additional	Arterial Switch operation in the first month of life		Primary outcome: Major morbidity and inpatient hospital costs. Major morbidity included cardiac arrest, extracorporeal membrane oxygenation, delayed sternal closure, systemic infection, necrotizing enterocolitis, seizure, stroke with clinical sequelae, diaphragmatic paralysis or paresis, reoperation before discharge and 30-	128	There was a slight male predominance, with 64% of the cohort being boys. The mean birth weight was 3.30 ± 0.52 kg. Fifty-one percent of infants (n = 72) were transferred from outside hospitals, with transfer rates varying significantly over time, higher in 2003 (85%) and lower in 2012 (9%), likely due to increased surgical expertise and prenatal diagnoses. The	VSD	128	100	28	Echocardiographic assessment, surgical confirmation of VSD and coronary anatomy, classification of coronary anatomy, and evaluation for left ventricular outflow tract or arch obstruction.	All surgeries were performed by one of four surgeons at NewYork–Presbyterian/ Morgan Stanley Children's Hospital. The procedure involved a median sternotomy, cardiopulmonary bypass, aortic cross-clamping, moderate hypothermia	Administration of prostaglandin E1, monitoring for complications, and, after 2008, performing brain MRI for all infants who had undergone BAS	n = 2			The overall in-hospital and 30-day mortality was (n=2), and (n=28) experienced major morbidity. Common complications included delayed sternal closure (7.1%), major infections (5%), and reoperations before discharge (4.3%). Median hospital cost was \$60,500, with a median	Seizures occurred in 4 infants and stroke with clinical findings on MRI was reported in 2 infants	The paper does not stratify mortality by BAS status
Baylen et al.,	Role of Balloon Atrial Septostomy Early Arterial Switch Repair Of Transposition of the Great Arteries	1986 - 1991	1992	USA	Retrospective cohort	newborns with uncomplicated cyanotic dextro-transposition of the great arteries (d-TGA) referred to the institution. All had IVS (intact ventricular septum), with only 2 patients having a hemodynamically insignificant VSD.	Balloon Atrial Septostomy (BAS) performed preoperatively in 8 infants (Group II)	No BAS group (Group I) included 15 infants who did not undergo septostomy	Primary outcomes: Arterial PO ₂ response, need for ventilator/inotropic support, operative mortality, and age at discharge. Secondary outcomes: Echocardiographic indices of foramen ovale restriction, post-op complications, and long-term neurologic status.	23	Birth Weight: Group I: 3.4 ± 0.5 kg, Group II: 3.2 ± 0.7 kg Age at admission: Group I: 18 ± 15 hours, Group II: 42 ± 90 hours Pre-op support: Ventilator support: Group I: 8/15, Group II: 8/8 (p=0.02) Diuretic use: Group I: 6/15, Group II: 6/8 Bicarbonate: Group I: 7/15, Group II: 6/8	IVS Only 2 patients had a small VSD, deemed hemodynamically insignificant	23	8	15	Group II (BAS) had lower arterial PO ₂ before and after prostaglandin and smaller foramen ovale diameters (2.7 ± 0.4 mm), Septal bowing was moderate to severe in BAS group, suggesting left atrial hypertension, and all patients had patent ductus arteriosus on	No inter-group variation in surgical technique: All underwent ASO with LeCompte maneuver, only one infant (Group I) required suture closure of a small restrictive VSD during ASO, and no major coronary artery	No statistically significant differences between groups in: Duration of inotropic support, Ventilator support duration, and Time to hospital discharge Age at discharge: Group I: 14 ± 5 days, Group II: 23 ± 19 days (NS)	1 (4.4%) A group I infant who died 42 hours post-op due to pulmonary hypertension	0	1	2 infants required late reoperation for supraventricular aortic stenosis (1 from each group). These cases included a preterm infant and another with a neurologic insult. No significant differences in hospital stay, morbidity, or follow-up echocardiography between groups.	Among 17 survivors assessed long-term (3–55 months): 12 had normal neurologic outcomes, 5 had abnormalities, including: Delayed milestones, Fine motor dysfunction and Language delay. One of the 5 with poor outcomes had documented neurologic insult post-op.	Retrospective design—susceptible to selection bias, small sample size, especially for long-term follow-up, decision to perform BAS was based on clinical judgment, not standardized criteria, and others note the need for controlled prospective studies to determine
Beattie et al.,	Prostaglandin E2 After Septostomy for Simple Transposition	2000 - 2005	2008	United Kingdom	Retrospective observational study	Infants diagnosed with simple transposition of the great arteries (sTGA) All diagnosed postnatally Excluded: Infants with naturally wide	Balloon Atrial Septostomy (BAS) followed by Prostaglandin E2 (PGE2) administration Groups defined based on whether and when PGE2 was given	Infants with BAS who did not receive PGE2 after septostomy vs. those who did receive PGE2 after septostomy	Primary: Postoperative outcomes including oxygen saturation, ICU stay, total postoperative stay, and mortality Secondary: Use and timing of PGE2, ductal patency, atrial gap	24	Four groups: Group 1 (n=4): No PGE2 before or after BAS Group 2 (n=8): PGE2 before but not after BAS Group 3 (n=11): PGE2 before and after BAS	IVS	24	24	0	The mean gestational age was 40.2 ± 1.1 weeks in Group 2 (those who received PGE2 before but not after BAS) and 40 ± 0.8 weeks in Group 3 (those who	The mean CPB time in Group 2 (PGE2 before but not after BAS) was 173 ± 101.4 minutes, while in Group 3 (PGE2 before and	The mean ICU stay was significantly longer in Group 3 (PGE2 after BAS), averaging 8.5 ± 10.3 days, compared to 5 ± 0.93 days in Group 2 (p < 0.05). Similarly, the total postoperative inpatient stay was also significantly	1 death (Group 3): Died 15 days post-ASO due to coronary artery	1	N/A all patients included underwent BAS	Oxygen saturation significantly improved after balloon atrial septostomy (BAS) in both groups: in Group 2, saturation increased from 61 ± 11% to 82 ± 8.6%, and in		No formal control group without BAS

Beca et al.,	Pre-Operative Brain Injury in Newborn Infants With Transposition of the Great Arteries Occurs at Rates Similar to Other Complex Congenital Heart Disease and Is Not Related to Balloon Atrial Septostomy	Likely 2005 - 2008 (Not specified)	2009	New Zealand	Prospective observational cohort study	Newborns (≥36 weeks gestation) with congenital heart disease (CHD), including 44 with dextro-transposition of the great arteries (d-TGA). Infants with genetic or malformation syndromes were excluded. The study focused on pre-operative MRI assessment of brain injury.	BAS performed in 33/44 (75%) of TGA infants. The decision to perform BAS was based on echocardiographic features (restrictive atrial septum) and clinical signs of hypoxemia/acidosis. Most procedures occurred within the first 1–2 days of life.	Infants with TGA who did not undergo BAS (n = 11). These infants presumably had adequate interatrial mixing and stable oxygenation without the need for septostomy	Pre-operative brain injury, specifically: White matter injury (WMI) – the most common finding and Stroke (focal infarction). All were assessed by MRI before arterial switch operation (ASO) in all infants.	64	44 had TGA, 13 - hypoplastic left heart syndrome (HLHS), and 7 with pulmonary atresia (PA). Comparative analysis focused on the TGA subgroup. Among TGA infants, there was no significant difference in sex, birth weight (mean ~3.3–3.4 kg), gestational age (~39 weeks), Apgar scores, lactate, pH, MAP, or SpO ₂ between those with and without brain	32 infants had an intact ventricular septum (IVS) and 12 infants had a ventricular septal defect (VSD)	0	33	11							19/64 infants (30%) had brain injury on MRI, 17/64 (27%) had WMI, usually mild, 3/64 (5%) had small strokes (1 with BAS, 1 without BAS, 1 with HLHS)., No difference in brain injury rates between TGA and other CHD groups, No procedural complications from BAS were reported. There was a trend toward more		this was a pre-operative observational study
Butts et al.	Effect of Prostaglandin Duration on Outcomes in Transposition of the Great Arteries with Intact Ventricular Septum	1995 - 2008	2012	USA	Retrospective surgical cohort	Patients with TGA-IVS who underwent arterial switch operation (ASO) by a single surgeon at a tertiary referral center between 1995 and 2008, excluding those with incomplete records, intraoperative death, or postoperative ECMO use.	Preoperative prostaglandin E1 (PGE) and Arterial Switch Operation (ASO)		Inotropic score was calculated for all patients in the first 5 postoperative days and maximum inotropic score was recorded. Length of postoperative mechanical ventilation, fluid balance, mechanical ventilation time, as well as ICU and hospital stay were recorded for all patients.	59	The median age at arterial switch was 6 days (range 3–31), with a median birth weight of 3.3 kg (range 2.2–4.3 kg), including 5 infants under 2.5 kg. Preoperative prostaglandin (PGE) exposure occurred in 88% of patients, with a median duration of 59 hours (range 0–272). Balloon atrial septostomy was performed in 69% of cases. Postoperatively, the median hospital stay was	IVS	59	41	18	Prostaglandin E exposure duration was recorded in hours. Dosage was 0.03 to 0.05 µg/kg/min. Preoperative variables included gestational age, birth weight, sex, balloon atrial septostomy status, maximum preoperative inotrope score, mechanical ventilation	Intraoperative variables: total cardiopulmonary bypass time, cross-clamp time, and age at surgery.	Postoperative variables: maximum inotrope score, net fluid balance over the first 120 postoperative hours, ventilator hours, and the duration of both intensive care unit and total hospital stay.	0	0	0	Median PGE exposure was 51 hours in the BAS group and 61 hours in the no BAS group, with no significant difference between them (p = 0.18). The maximum inotrope score showed a significant difference (p = 0.02), with the upper quartile median being 10 and the 1st-3rd quartiles		

Chasovskyi et al	Arterial Switch Operation in the First Hours of Life Using Autologous Umbilical Cord Blood	2009 - 2011	2012	Ukraine		The autologous umbilical cord blood transfusion (AUCBT) group, included 21 patients with prenatally diagnosed d-TGA in whom autologous UCB was used during ASO performed in the first hours of life. The second group, the HBT group, included 40 patients who underwent corrective surgery for d-TGA in the	performing the arterial switch operation in the first hours of life using autologous umbilical cord blood transfusion (AUCBT)	40 Patients in whom corrective surgery for d-TGA in the conventional way was performed using homologous blood components for perioperative management	surgery with the use of homologous blood transfusion.	61	Prenatal diagnosis of d-TGA was made between the 22nd and 28th week of gestation by fetal echocardiography	IVS	61	0	61	Prenatal diagnosis of d-TGA was made between the 22nd and 28th weeks of gestation and confirmed at 36 weeks using fetal echocardiography. Contraindications for autologous umbilical cord blood (UCB) collection included ABO or Rh	Anesthesia was induced with fentanyl (10 µg/kg) and vecuronium (0.1 mg/kg), maintained with sevoflurane or isoflurane, and supplemented by a morphine sulfate infusion (40 µg/kg/hr). A miniaturized cardiopulmo	Postoperative management included continuous morphine sulfate infusion at 40 µg/kg/h during the first night, with 100 µg/kg boluses every 6 hours as needed. Monitoring involved ECG, pulse oximetry, and invasive arterial and central venous or left atrial pressure measurements. Fluid was administered based on body surface area: 500 mL/m² on day one, 750 mL/m² on day two, and 1,000 mL/m² on day		0	0	The groups were similar in diagnoses, birth weight, cardiopulmonary bypass protocol, and surgical technique, excepting timing of surgery and blood management strategy. The AUCBT group had a mean birth weight of 3.4 kg, with 76% (16 out of 21) diagnosed with D-TGA, IVS. The mean	None reported	its observational, non-randomized nature and relatively small number of patients studied
Cirstoveanu et al	Impact of Bedside Balloon Atrial Septostomy in Neonates with Transposition of the Great Arteries in a Neonatal Intensive Care Unit in Romania	2008 - 2022	2023	Romania	Observational, retrospective, single-center study	patients had either simple (TGA/IVS) or complex TGA (with VSD, PDA, or other anomalies) and were evaluated for balloon atrial septostomy (BAS) and arterial switch operation (ASO). One neonate with hypoplastic left heart syndrome was excluded. Most patients were admitted postnatally for stabilization due	Balloon Atrial Septostomy (BAS) performed bedside under echocardiographic guidance	Patients who underwent BAS vs. those who did not. Stratification was also done by oxygen saturation and timing of arterial switch operation (ASO)	Primary: Clinical safety and effectiveness of BAS (improved oxygenation, hemodynamic status). Secondary: Mortality (pre- and post-op), complications, neurological outcomes, hospital stay	92	BAS Group: Median age at presentation: 3 days, Median SpO₂: 78%, 88% required invasive ventilation at admission, and 64% required inotropic/vasopressor support. Non-BAS Group: Median age: 8 days, Median SpO₂: 84%, and 52.2% required invasive ventilation	Simple TGA (IVS): 38% of total cohort, Complex TGA with VSD: 45.6%. Among BAS group: 19 had TGA/IVS, 6 had TGA/VSD.	20	7	13	At admission, the median oxygen saturation was 83%, lower in the BAS group (78%) compared to the non-BAS group (84%). Invasive respiratory support was needed in 88% of BAS patients versus 52.2% of non-BAS patients. Inotropic or vasopressor support was	All patients received PGE1 infusion before surgery, with a median dose of 0.05–0.1 µg/kg/min. Balloon atrial septostomy was performed bedside using femoral access in 56.2% of cases (88.8% success) and	Post-ASO, all patients received ICU care with mechanical ventilation and vasoactive support. One patient required ECMO but died on postoperative day two due to late surgery and sepsis. Following BAS, 76% of patients had improved oxygenation (mean SpO₂ increase of 9%) and 72% showed reduced respiratory support needs. Lactate levels declined in 79.1% of cases post-	26% among the 20 patients who underwent ASO (n= 5)			BAS improved pre-op survival in neonates with SpO₂ >75% (0% pre-op mortality vs. 16% in non-BAS). In neonates with SpO₂ <75%, BAS was associated with 36.3% pre-op mortality. Complications of BAS: transient hypotension, metabolic acidosis, SVT, deep vein thrombosis and BAS success	9.7% of patients had neurological lesions (IVH, hydrocephalus, seizures). Higher neurological complication rate in BAS group (12%) vs. non-BAS (8.9%). Brain injury was likely multifactorial hypoxia and surgical delay was more important than BAS.	Mortality among ASO patients not stratified by prior BAS status

Dibardino et al	Current Expectations for Newborns Undergoing the Arterial Switch Operation	1995 - 2003	2004	USA	Retrospective single-center cohort study	Neonates and infants with transposition of the Great Arteries (TGA/IVS, TGA/VSD), Taussig-Bing Anomaly (TBA)	arterial Switch Operation (ASO), performed by two surgeons	Outcomes observed across diagnostic subtypes (TGA/IVS, TGA/VSD, TBA) and anatomical variants	30-day and overall survival, Need for reoperation, ICU/hospital stay, ventilation/inotropic days, long-term functional status	125	TGA/IVS: 79 (63%) TGA/VSD: 37 (30%) TBA: 9 (7%) Median age at ASO: 8 days Median weight: 3.5 kg 7.2% had extracardiac anomalies, 22.4% had associated cardiac anomalies	IVS and VSD	125	109	16	Most received prostaglandin E1, Pre-op intubation associated with longer ICU/hospital stay, Pre-op BAS generally safe (1 serious complication reported)	Standard median sternotomy, full-flow CPB, DHCA used sparingly (67% cases), Routine coronary transfer regardless of anatomy, Mean CPB time: 229 min, aortic cross-clamp: 122 min	Median ventilation: 3 days, Median ICU stay: 5 days, No ECMO used post-op, Monitoring with LA catheter, and cerebral perfusion techniques	2	1	1	Reoperation: 7 patients (5.8%), Mostly for pulmonary artery stenosis, Freedom from reoperation: 90% at 7 year	2 patients had perioperative seizures	
Dorobantu et al	Arterial Switch for Transposition of the Great Arteries: Treatment Timing, Late Outcomes, and Risk Factors	2000-2017	2023	United Kingdom	Retrospective cohort study	Neonates with simple D-TGA and intact ventricular septum (TGA-IVS), treated in England & Wales	Balloon Atrial Septostomy (BAS) followed by Arterial Switch Operation (ASO)	Primary ASO without prior BAS	Mortality (30-day, 1-year, 10-year), cardiac reintervention, hospital resource utilization	1772	Matched pairs on age, weight-for-age Z score, and procedure year	IVS	1772	174	174	Prenatal diagnosis (48.3%), 4.3% preterm birth, 24.8% had markers of severity (shock/acidosis)	Median cardiopulmonary bypass time 145 min; ECMO use 3.5%, renal support 14%	ICU stay median 7 days; longer in patients with complications		4	5	Thirty-day mortality was 2.3% in the BAS group versus 2.9% in the primary ASO group (p=0.74), and in-hospital mortality was similarly low (2.9% vs. 3.4%, p=0.76). Total hospital stay during the ASO spell was slightly longer for BAS+ASO (median 22.4 vs. 20.0 days), but not significantly so (p=0.30).	Not assessed	

Durandy et al.,	Pre- and Postoperative Magnetic Resonance Imaging in Neonatal Arterial Switch Operation Using Warm Perfusion	2010 - 2011	2011	France	prospective observational study	Neonates diagnosed with dextro-transposition of the great arteries (D-TGA). Included both simple D-TGA (IVS) and complex cases (with VSD, aortic coarctation). Neonates with genetic syndromes, prematurity <35 weeks were excluded	Normothermic cardiopulmonary bypass (34–35°C):	Patients with BAS vs without BAS, and Preoperative vs postoperative MRI findings	Incidence and pattern of brain lesions via MRI (white matter injury, infarct, hemorrhage), Short-term neurological outcomes, Mortality, and 18-month neurodevelopmental outcomes using Bayley III Scales.	27	Clinical characteristics were comparable between groups: Median gestational age: 40 weeks (range: 35–41), Weight: 3.4 kg (range: 2.9–4.6), 57% had antenatal diagnosis, 80% received PGE1 infusion, 38% required pre-op intubation	25/27 had intact ventricular septum (IVS) 2/27 had ventricular septal defect (VSD)	27	12	15	The median gestational age of the neonates was 40 weeks, ranging from 35 to 41 weeks, and the median birth weight was 3.4 kg (range: 2.9–4.6 kg). Of the 27 patients, 15 experienced oxygen saturations below 60% sustained for more than 10 minutes. Preoperative	All arterial switch operations were performed using a warm perfusion strategy with normothermic cardiopulmonary bypass maintained at 34–35°C, and no temperature correction was applied to blood gas measurements. The median	Postoperative brain MRI was conducted within the first week after surgery in all patients. These MRIs were evaluated by a single, blinded senior pediatric neuroradiologist to ensure consistency. The median time to extubation following surgery was 16 hours, with a wide range from 7 to 312 hours. The median length of stay in the intensive care unit was 2 days, ranging from 2 to 14 days.	1	1	0	Pre-op MRI: 9/21 had lesions (42%) Post-op MRI: 6/21 had new lesions (28%) Types of lesions: white matter injury (WMI), infarcts, hemorrhages No clinical neurologic deficits noted except one seizure	Using Bayley Scales of Infant Development III at 18 months, No significant neurodevelopmental delays found	No control group (e.g., hypothermic bypass patients) and only included double-ventricle physiology, which is not generalizable to single-ventricle cases
ESCO BAR-DIAZ et al.,	Prenatal diagnosis of transposition of the great arteries over a 20-year period: improved but imperfect	1992 - 2011	2015	USA	Retrospective, single-center cohort study	340 patients with d-looped TGA/IVS presenting within the first month of life, excluding those with additional complex cardiac anomalies, ventricular septal defects (VSD), or other genetic/non-cardiac anomalies	Arterial switch operation (ASO) performed at a median of 4 days post-delivery in prenatally diagnosed and 5 days in postnatally diagnosed patients.	Patients diagnosed prenatally versus those diagnosed postnatally .	Timing of ASO and BAS, Preoperative status (acid-base balance, ventilation requirements), Overall mortality rate, longer-term neurodevelopmental outcomes (not detailed in the provided pages)	340 (Prenatally diagnosed: 81 (23.8%) , Postnatally diagnosed: 259 (76.2%))	The percentage of males was similar in both groups (69.1% vs. 70.3%, P=0.89). The median gestational age (GA) at diagnosis for the prenatal group was 22.5 weeks, whereas GA at delivery was comparable between groups, with 38.3 weeks in the prenatal group and 38.8 weeks in the postnatal group (P<0.001). Birth weights were similar (~3.3 kg vs. ~3.4 kg).	IVS	81	81	0	Fewer prenatally diagnosed infants required mechanical ventilation (55.6% vs 68.0%, P=0.03). Acidotic preoperative blood gases (pH < 7.1) were less frequent in prenatal group (16% vs 25.5%), but not significantly different	ASO performed at median of 4 days (prenatal) and 5 days (postnatal). BAS was performed earlier in prenatal group	Postoperative morbidity: no significant differences in ICU stay duration or need for ECMO between groups.	11/340 But for those that had ASO, it was 1 death occurring in the BAS group Preoperative deaths			Prenatal diagnosis was significantly associated with earlier surgical intervention; the median age at surgery was 4 days in the prenatal group versus 5 days in the postnatal group (P=0.14). Additionally, prenatally diagnosed patients required mechanical ventilation less frequently (55.6%)		

Faateh et al.,	When to do the Arterial Switch Operation to Optimize Outcomes and Resource Utilization: A National Database Analysis	2004 - 2024	2024	USA	Retrospective national database analysis	d-Transposition of Great Arteries (d-TGA) with Intact Ventricular Septum (IVS). Exclusions: VSD, arch reconstructions, other defects, ASO after day 30	Arterial Switch Operation (ASO)	ASO performed at different time intervals (e.g., early vs late)	Primary: In-hospital mortality Secondary: Post-op ECMO use, Delayed sternal closure, ICU Length of Stay, Discharge disposition (home vs non-home), Total adjusted hospital cost, Composite: mortality + non-home discharge + ECMO + delayed sternal closure	3556	Very Early: 773 (21.7%) Early: 1,815 (51.0%) Late: 752 (21.1%) Very Late: 216 (6.1%) Median age at ASO: 6 days (IQR 4–8)	IVS				Higher pre-op stroke, BAS use, iNO, ECMO, prematurity, low birth weight in late/very late groups Government insurance more common in late groups		Post-op ECMO, delayed sternum closure, ICU LOS analyzed Longer ICU stays and more interventions in late groups	51			Composite adverse outcome increased with later ASO timing: Very Early: 8% Early: 9.6% Late: 16.2% Very Late: 25.0% Multivariate aOR (late vs early): 1.97 (95% CI: 1.57–2.43, p<0.001)		
H. Kamalı et al.	Clinical effects of major aortopulmonary collateral arteries in term neonates diagnosed with transposition of the great arteries	2020 - 2023	2023	Turkey		neonates diagnosed with simple transposition of the great arteries who underwent arterial switch surgery between May 2020 and January 2023 at two high-volume pediatric cardiac centers in Turkey. Patients with complex transposition anomalies, those diagnosed later than one month of age, premature infants, or those	Arterial switch operation	Those with major aortopulmonary collateral arteries (MAPCAs) and those without MAPCAs. Patients were matched 1:1 based on post-operative characteristics using propensity score matching, allowing for a direct	Echocardiographic evaluations (presence of collateral arteries, valve regurgitation, structural features), clinical parameters (ventilator time, ICU stay, inotropic support duration), hemodynamic and perfusion measurements (near-infrared spectroscopy for cerebral and renal oxygenation, vasoactive inotropic scores, troponin levels)	200	The median age at the time of surgery was 5 days (interquartile range: 3–7 days), with a median body weight of 3,100 grams (interquartile range: 2,900–3,400 grams). Slightly more than half of the patients were male (55%).	Both	200	32	168			Transfer to the pediatric cardiac intensive care unit while intubated and on mechanical ventilation. Typical inotropic support included milrinone and low-dose norepinephrine, with epinephrine used only if clinically necessary. Sedation was maintained with fentanyl and midazolam, and prophylactic antibiotics such as cefazolin were administered. Parenteral nutrition was initiated on	7% (n=14)			Patients with major aortopulmonary collateral arteries (MAPCAs) experienced longer intensive care stays, with a median of 10.2 days compared to 8.1 days in those without MAPCAs (p < 0.005). They also required longer durations of mechanical ventilation (median 4.5 days vs. 2.0	None reported	The specific number of deaths bases on whether BAS was done or not prior to ASO was not reported

Idriss	Transposition of the great arteries with intact ventricular septum	1983 - 1986	19988	USA		infants diagnosed with simple transposition of the great arteries and an intact ventricular septum who underwent surgery between October 1983 and October 1986.	A modified arterial switch operation was performed, involving early intracardiac repair, coronary artery transfer with a cuff technique, and the Lecompte maneuver. Cold blood cardioplegia and hypothermia (20°C) were used during bypass. The neopulmonary artery was reconstructed using either		Successful coronary transfer, pulmonary artery reconstruction, and recovery. Postoperative indicators were rewarming, discontinuation of bypass, and overnight ventilation	23	The age at operation ranged from 2 to 35 days, with a mean of 9.82 ± 6.86 days; 22 of the infants were operated on within the first 21 days of life, while one infant, aged 35 days, had dynamic left ventricular outflow obstruction that maintained left ventricular pressure equal to the systemic right ventricular pressure. All infants underwent cardiac	VSD	23	22	1		A modified arterial switch operation was performed, involving early intracardiac repair before coronary transfer, use of a cuff technique for coronary artery reimplantation, and the Lecompte maneuver. Cardiopulmonary bypass with	Postoperative care included overnight mechanical ventilation, with most infants discharged within a week. Follow-up involved echocardiography and Doppler studies in 15 patients and catheterization in 7 patients around one year post-op. Most patients had normal left ventricular function, no outflow tract obstruction, and only mild valve abnormalities. One patient had nonsustained ventricular	2			all 15 patients who underwent echocardiography showing normal left ventricular function and no outflow tract obstruction. The left semilunar valve was normal in 11 patients, thickened in 1, and not visualized in 3; the right semilunar valve was normal in 8 and not visualized in 7. Doppler studies showed normal	Not studied	Technique refined during study (learning curve effect)
Jung-Won Kim	Preoperative Factors as a Predictor for Early Postoperative Outcomes After Repair of Congenital Transposition of the Great Arteries	2005 - 2012	2014	Republic of Korea	Retrospective cohort study	infants with TGA who underwent ASO at Asan Medical Center, Seoul, Korea, between March 2005 and May 2012. Inclusion: Dextro-type TGA, diagnosed prenatally and confirmed postnatally via echocardiography or CT. Exclusion: Presence of other congenital heart defects (e.g., right	Arterial switch operation	Patients with preoperative balloon atrial septostomy (BAS) vs. those without BAS.	Primary: Duration of mechanical ventilation, length of ICU and hospital stay, early mortality (within 30 days or before discharge). Secondary: Postoperative serum lactate, inotropic score, ventilation duration, and other early recovery markers	115	Age: Median 6 days (range 1-90). Weight: Median 3.2 kg. Preoperative variables included arterial oxygen saturation (~89%), VIS (median 6), BNP (median 2025 pg/ml), serum lactate (median 1.9 mmol/l). Intraoperative: Mean CPB time ~130 min.	70.4% had intact ventricular septum (IVS). 29.6% had ventricular septal defect (VSD)	115	37	78	patient age, weight, and anatomical features such as VSD and ASD. Clinical data encompassed the need for balloon atrial septostomy, mechanical ventilator support, arterial oxygen saturation, blood pressure, and heart rate. Laboratory measures analyzed	Cardiopulmonary bypass (CPB) time (~130 min). Fluids administered (~45 mL). Postoperative interventions: ECMO, pacing, dialysis in some patients.	Serum lactate levels immediately post-surgery (~2.5 mmol/l), VIS during first 48 hours, duration of mechanical ventilation (~65 hours median). Length of ICU stay (~5 days median).	6			higher preoperative VIS showed a strong correlation with increased duration of mechanical ventilation (β = 0.385, p < 0.001) and was an independent predictor for early mortality (p = 0.057, OR = 1.154, 95% CI 1.024–1.300). Lower body weight was also associated with early mortality (R = 0.457, p =	Outcomes not stratified by BAS /No BAS status	

Lim et al.,	Associations Between Age at Arterial Switch Operation, Brain Growth, and Development in Infants With Transposition of the Great Arteries	1998 - 2014	2019	USA	Retrospective cohort study	neonates (≤28 days old) with a diagnosis of transposition of the great arteries (TGA) across 47 U.S. states.	Arterial Switch	Early repair (≤13 days, n=32) vs late repair (>13 days, n=13); TGA/IVS vs TGA/VSD	Brain injury (MRI), brain growth (z score), Bayley-III neurodevelopmental scores at 18 months	45	TGA/IVS: 34 (76%) TGA/VSD: 11 (24%) (7 patch closure, 4 direct suture)	IVS and VSD	45	42	3	median age at ASO 7 days (early) vs 17 days (late); 24% had VSDs; 4 required ECMO, 2 had NEC; most prenatally diagnosed; saturation ~84% after BAS	CPB time median 140 min; cross-clamp 86 min; circulatory arrest rarely used (2 patients); VSD closure added bypass/cross-clamp time; 2 needed reoperation for coronary issues	ICU stay: 15–26 days total LOS; chest closure: 0–8 days; mechanical ventilation: 2 days median; ECMO post-op in 1 case; seizures in 3 (1 clinical, 2 subclinical). Nine percent of patients (4/45) in our study had a small stroke on preoperative imaging	0	0	0	Brain weight z-score declined perioperatively in 35/45; worse growth in VSD and late repair groups; longer stay linked to lower cognitive scores	Bayley-III at 18 months: normal range, but language score lower with older age at ASO and more days with open chest; cognitive score lower with longer hospital stay	
Modestini et al.,	Impact of Persistent Pulmonary Hypertension of the Newborn in Neonates with Dextro-transposition of the Great Arteries	2005 - 2018	2024	Netherlands	Retrospective observational	The study population was divided into two groups: those with persistent pulmonary hypertension of the newborn (PPHN) and those without, based on clinical and echocardiographic findings. PPHN was diagnosed in patients showing a pre- to post-ductal oxygen saturation difference (DSO ₂) greater			preoperative mortality, 30-day postoperative mortality, late mortality (from 30 days to 5 years postoperatively), overall mortality (sum of preoperative, 30-day postoperative, and late mortality), and postoperative morbidity. Morbidity factors assessed were the length of ventilatory support, ICU and hospital stay, delayed sternal closure, need for	99 [Of 147 neonates diagnosed with d-TGA between January 2005 and December 2018, 104 had simple d-TGA (with or without VSD), of whom 5	Five patients, three from the non-PPHN cohort and two from the PPHN cohort, with associated hypoplastic aortic arch or aortic coarctation, were excluded from the study. A ventricular septal defect (VSD) was present in 28 patients (23 in the non-PPHN cohort and 5 in the PPHN cohort). Of the 104 neonates, 31% (31 patients) were diagnosed with PPHN. Among them, 22	VSD	95			Preoperative anesthetic assessment for newborns with d-TGA involved a thorough review of the echocardiogram, hemodynamic status, inotropic support, ECG and arrhythmias, arterial and venous access, laboratory values, chest radiography, ventilator	For patients undergoing arterial switch operation (ASO), general anesthesia was induced either by inhalation with sevoflurane or intravenously with propofol or etomidate. Anesthesia maintenance was achieved using	Postoperative management included a median duration of ventilatory support of 3 days (IQR 2–6), with all patients who received preoperative inhaled nitric oxide (iNO) continuing iNO therapy until extubation, typically for 3–6 days. The median ICU stay was 5 days (IQR 3–8), and the median post-ICU hospital stay was 7 days (IQR 4–11). Delayed sternal closure was	8.1% (8/99)			Mortality: The overall mortality was 8.1%, with no significant difference between PPHN and non-PPHN groups (9.7% vs. 7.4%, p = 0.70). Preoperative mortality occurred in 4 patients (3 non-PPHN, 1 PPHN) and was associated with lower birth weight (p = 0.02). Three patients died within 30 days	From monitoring intraoperative cerebral oxygen saturation (ScO ₂) using near-infrared spectroscopy as a marker of brain oxygenation, cerebral oxygen desaturation did not significantly affect postoperative mortality or morbidity, including ventilatory	Mortality was not categorised based on BAS or no prior BAS

Mukherjee et al		1988 - 2005	2010	USA	Retrospective cohort	Neonates (<60 days old) with a diagnosis of transposition of the great arteries (TGA) identified from 18 years of U.S. national inpatient databases (Nationwide Inpatient Sample and Kids' Inpatient Database).	Rashkind Balloon Atrial Septostomy (BAS),	Neonates with TGA who did not undergo BAS.	In-hospital mortality, Stroke, Necrotising enterocolitis (NEC), Length of stay, and Hospital charges	8681	BAS group had more males (71% vs. 64%) and more co-morbidities (median 7 vs. 6), Higher frequency of patent ductus arteriosus and atrial septal defects, Lower frequency of VSD and double outlet right ventricle	VSD was present in 36.9% overall, BAS group: lower VSD rate (34.8%), Non-BAS group: higher VSD rate (37.4%)	2205	841	1364	BAS patients had more respiratory, infectious, and neurologic issues, including higher rates of acidosis, jaundice, and seizures	Use of cardiopulmonary bypass (reported as “extracorporeal circulation”) in 31.2% of all patients		Overall in-hospital mortality: BAS group: 9.7% (169/1,742) No BAS group: 11.7% (810/6,939) . However, the study does			Stroke: Higher in BAS group (0.69%) vs. non-BAS (0.35%), p = 0.046, NEC: No difference (1% in both groups), Length of stay: Median 14 days (BAS) vs. 8 days (non-BAS), p < 0.001, Hospital charges: Significantly higher for BAS group	mortality among patients who specifically underwent the Arterial Switch Operation (ASO) is not stratified by BAS status	
Nevvazhay et al.,		2007 - 2010	2011	Russia	Retrospective cohort	Critically ill neonates with D-transposition of the great arteries (D-TGA), intact ventricular septum (IVS), restrictive patent foramen ovale (PFO), and severe metabolic acidosis.	Arterial switch operation (ASO) performed within 24 hours of birth, without prior balloon atrial septostomy (BAS).		Survival, Lactate clearance, Neurologic outcomes, Intra/postoperative complications, ICU and ventilation duration	87	7 males and 1 female, All prenatally diagnosed (except 1), received PGE1 preoperatively, 3 required mechanical ventilation, and all had oxygen saturation of 60–85% and severe acidosis	IVS	87	0	87	All patients had severe metabolic acidosis (pH 6.96–7.2), elevated lactate levels (5.5–17.0 mmol/L), a small patent foramen ovale (PFO) measuring 1–3 mm, with prenatal diagnosis and early admission	Normothermic cardiopulmonary bypass (CPB) with the LeCompte maneuver was performed, coronary artery transfer utilized the trapdoor technique, transesophageal echocardiography (TEE) was used intraoperatively in 5	The median ICU stay was 9 days, with a median ventilation duration of 5 days, serial lactate monitoring was conducted, levosimendan was used in 2 cases with left ventricular dysfunction, and delayed sternal closure was required in 2 patients				No significant aortic regurgitation was observed, with only trivial cases in 5 patients. No neurologic injury was detected on follow-up, and postoperative lactate clearance was effective.	No neurologic injury reported on follow-up (median 14.5 months)	The study had a small sample size (n=8), lacked a control group, was a single-center observational study without randomization. Its conclusions were hypothesis-generating rather than being definitive

Niccu m et al.,	Intubation and Lower Saturation in the Delivery Room are Associated with Balloon Atrial Septostomy in Neonates with Transposition of the Great Arteries	2013 - 2023	2024	USA	Retrospective cohort study	Neonates with prenatally diagnosed D- transposition of the great arteries (D-TGA) delivered at a tertiary care center between 2013 and 2023, all of whom underwent arterial switch operation (ASO) during the newborn admission.	Balloon Atrial Septostomy (BAS) performed preoperatively to improve systemic oxygenation in cases with inadequate intracardiac mixing	Neonates with TGA who did not undergo BAS before ASO.	Identification of delivery room (DR) clinical factors associated with undergoing BAS. Key outcomes included: Intubation in the DR Maximum systemic oxygen saturation (SpO ₂) in the DR (especially values <86%) Receiver operating characteristic analysis of DR	168	The cohort was evenly divided into two groups: the BAS group (n = 84, 50%) and the No BAS group (n = 84, 50%). Baseline characteristics: median gestational age of 39.5 weeks, with 64% of the participants being male. 33% had a ventricular septal defect (VSD), while 8% had either aortic arch hypoplasia or coarctation. Both groups demonstrated	VSD	168	84	84	SpO ₂ in DR: Lower in BAS group (median max 79% vs 87%, P < .001), Higher rate of intubation in BAS group (87% vs 33%, P < .001), FiO ₂ requirements, blood gases, and Apgar scores (5- minute score lower in BAS group). From Logistic regression:	All patients received a Prostaglandi n E1 infusion, with intubation administered as needed based on delivery room (DR) SpO ₂ thresholds. Indications for BAS included the presence of a restrictive atrial septal defect (ASD) and persistently	Hospital length of stay (median: 14 days for both groups)	5			Receiver operating characteristic (ROC) analysis showed that an SpO ₂ level below 86% in the delivery room effectively discriminated the need for BAS, with an area under the curve (AUC) of 0.82. The sensitivity and specificity were 70% and 88%, respectively. Additionally, extracorporeal membrane	Single-center study at a high- resource tertiary care hospital and no long-term followups	
O’Byrne et al	Association between variation in preoperative care before arterial switch operation and outcomes in patients with transposition of the great arteries	2010 - 2015	2018	USA	Retrospective cohort study	The study population included neonates (<30 days old) with transposition of the great arteries who underwent an arterial switch operation (ICD-9: 35.84) during their initial hospitalization between January 1, 2010, and September 13, 2015, excluding those who had Rastelli-type or atrial switch procedures, underwent	Arterial switch operation in the first 2 weeks of life, BAS, PGE infusion, mechanical ventilation, and inotrope infusion(s).	Age at ASO	Death prior to hospital discharge, 2) LOS, and 3) total cost	2159 at 40 Hospitals	The majority were white (63%) and male (68%). About 8% were born prematurely	IVS	2159	1131	1028	Median age at admission of 0 days (IQR: 0–1), median age at arterial switch operation (ASO) being 6 days (IQR: 4–9). Most patients were insured through Medicaid (43%) or private insurance (47%). Preoperative interventions were common			2.8% (2.1–3.6%, n=60)	Balloon atrial septostomy was significantly associated with reduced in- hospital mortality (OR: 0.32, 95% CI: 0.17–0.59), shorter hospital stay (ratio: 0.84, 95% CI:	Among neonates undergoing arterial switch operations, 2.8% (95% CI: 2.1–3.6%, n=60) required ECMO, 2.1% (95% CI: 1.5–2.8%, n=45) initiated new dialysis, the median total hospital stay was 18 days (IQR: 14–26), postoperative stay was 12 days (IQR: 9–19), and the median total hospitalization	None reported	The specific number of deaths bases on whether BAS was done or not prior to ASO was not reported, not even in the supplementary files. Reported as Odds ration comparing with those that never has BAS, while adjusting for other factors	

Ozcan oğlu et al	The Effect of Variations in the Neutrophil/Lymphocyte Ratio on The Length of Post-Operative ICU Stay in Cases Diagnosed with Transposition of the Great Arteries	Jan 2021 - Dec 2021	2022	Türkiye	Retrospective observational study	neonates with a median age of 3 days (IQR 2–7 days), comprising 51% males and 49% females. Exclusion criteria included prematurity, complex congenital heart diseases with additional defects such as VSD or pulmonary stenosis, steroid use, and positive blood cultures. All patients had isolated TGA	Arterial switch operation (ASO)	Groups: Patients with prolonged ICU stay (>8 days) vs. those with shorter stays Variables: NLR values before and after surgery in both groups analyzed; specific subgroup comparison	Primary: Length of post-operative ICU stay (with prolongation defined as >8 days or within the 25th percentile of the longest stays) Secondary: NLR predictive value (cutoff >1.5 pre-op; >2 days 2 and 3 post-op) Overall mortality	45	No significant differences noted in age, weight, or gender distribution between groups (implied, not explicitly stated)	No classification provided	45	10	35	Elevated NLR before surgery (>1.5), median age 3 days, median weight ~3 kg, prostaglandin E1 usage in 82%, inotropes in 15%, ventilation in 9%, PDA (88%), ASD (44%), coronary anomalies (45%)	The median cardiopulmonary bypass (CPB) time was 110 minutes, with ultrafiltration used during surgery. cardioplegia was administered approximately every 60 minutes using Del Nido solution.	Mechanical ventilation: median 48 hours, ICU management monitored with saturation, CVP, invasive BP, end-tidal CO2, ECG, NIRS, Inotropic support with milrinone and low-dose noradrenaline; epinephrine was used as needed	4			ICU length of stay: median 6 days; longer stays associated with higher NLR, Mechanical ventilation duration: median 48 hours, Hospital length of stay: median 12 days	Deaths not stratified by BAS or No Bas status The study period restricted to one year (2021)	
Planché et al.,	Switch operation for transposition of the great arteries in neonates	1984 - 1987	1988	France	Retrospective observational study	120 neonates with transposition of the great arteries (TGA) who underwent an arterial switch operation at Marie-Lannelongue Hospital in Paris between April 1984 and January 1987	Balloon atrial septostomy. Prostaglandin E1 infusion.	Primary Outcomes: Overall hospital mortality rate, Mortality stratified by coronary artery pattern types. Secondary Outcomes: Postoperative complications such as pulmonary stenosis, valve regurgitation, and coronary artery issues. Follow-up morbidity and long-term	120	110 patients had isolated TGA (simple TGA), with a mean age at operation of 7.8 days (ranging from 1 to 23 days) and most operated on within the first two weeks of life, and 10 patients had TGA associated with a large ventricular septal defect (VSD), with a mean age of 17.9 days (ranging from 6 to 30 days). The average weight in the simple TGA group was 3.3 kg	110 IVS 10 VSD	120	Performed in approximately 96% (~115 patients)	Implied (5)	Patients mostly referred from pediatric cardiology teams. Preoperative catheterization done in all. Prostaglandin infusion administered in ~90% of patients. Mean age at operation within 2 weeks for simple TGA.	Coronary artery pattern identification, Coronary transfer, Reconstruction of pulmonary arteries	Postoperative care involved hypothermic cardiopulmonary bypass, prevention of pulmonary hypertension and follow-up echocardiography to evaluate coronary patency and valve function.	The perioperative mortality rates were 8.3% for the entire series and 5.4% for the last 110 patients, with no			Valve regurgitation was noted as trivial or mild in some cases, with two patients exhibiting trivial aortic regurgitation. Coronary artery compromise was a specific concern, with six perioperative deaths attributed to coronary artery kinking, particularly in patients with type C coronary	Deaths not stratified by BAS or No BAS prior to ASO		

Rito et al.,	Primary Arterial Switch Operation for Late Presentation of Transposition of the Great Arteries With Intact Ventricular Septum	2015 - 2018	2020	Italy	Single-center retrospective cohort study	45 patients with Transposition of the Great Arteries with Intact Ventricular Septum (TGA-IVS) presenting after 21 days of age.	Primary arterial switch operation (ASO) performed despite left ventricular (LV) deconditioning. All surgeries involved: Moderate hypothermic cardiopulmonary bypass, Custodiol cardioplegia, Standard Lecompte maneuver, and Coronary artery translocation	Unfavorable TGA (unf-TGA): Severely deconditioned LV (banana-shape, indexed LV mass <35 g/m², unfavorable geometry), and Favorable TGA (f-TGA): Less severe LV deconditioning	Primary: In-hospital mortality, ECMO use, LV mass recovery at discharge. Secondary: Neurological complications, ICU/hospital stay, and other post-op morbidities.	45 Unfavorable TGA: 16, Favorable TGA: 29	The unfavorable group (unf-TGA) was defined by the simultaneous presence of all three high-risk indicators: indexed left ventricular (LV) mass <35 g/m², banana-shaped LV, and unfavorable LV geometry. The favorable group (f-TGA) had fewer or none of these features. A significantly larger proportion of f-TGA patients had a patent ductus arteriosus.	IVS	45	38	7	Indexed LV mass, geometry, and presence of banana-shaped LV. PDA status was classified as absent, small (<2.5 mm), or significant (>2.5 mm). Median oxygen saturation at admission was 70% (IQR 66–77%).	Uniform surgical technique across all patients, Inotropic support used for all, Chest left open in 56% for delayed sternal closure, Median CPB time: 150 min; cross-clamp: 73 min	5 patients (11.1%) required ECMO support, Median ICU stay: 7 days; hospital stay: 23 days, Inotropic support and ECMO initiated early when needed, and no patients with large PDA (>2.5 mm) required ECMO.	1 (2.2%) Due to coronary ischemia and mediastinitis.	1	0	Neurological injuries occurred in 8 patients (17.8%), with 80% (4/5) of ECMO-supported patients affected. There was no statistically significant difference in complications between favorable and unfavorable TGA groups (P > 0.05). All patients showed significant LV mass recovery from a	Only one patient had persistent neurological deficit at discharge	Selection bias possible (only survivors referred late and Inability to evaluate long-term LV function post-discharge)
Serraf A et al	Anatomic correction of transposition of the great arteries in neonates	1984 - 1992	1993	France	Retrospective cohort study	Three hundred sixty-two patients had simple transposition, 47 had transposition and a large ventricular septal defect, 6 had transposition with intact ventricular septum and coarctation of the aorta and 17 had transposition with ventricular septal defect and coarctation.	Arterial switch operation in the first 2 weeks of life	Patients with IVS + CoA and Patients with VSD+CoA	Overall hospital mortality and risk factors	432	Patients with transposition and intact ventricular septum, the mean age was 8.5 ± 4 days, for those with transposition and ventricular septal defect, it was 18.5 ± 12 days. The mean weight for the entire series was 3.3 ± 0.5 kg. Ninety-two percent of all patients were operated on within the first 2 weeks of life	IVS and VSD	432	375	57	At the start of the study, all patients underwent cardiac catheterization; Preoperative left ventricular function was evaluated by two-dimensional echocardiography. Left ventricular geometry was assessed by a subxiphoid transverse view by measuring in end-systole	Electrocardiograms (ECG), chest X-ray films, two-dimensional echocardiography and Doppler studies were performed every 6 months during the first postoperative year and annually thereafter. When these studies revealed any abnormalities, either 24-h Holter ambulatory ECG recording for rhythm disturbances or cardiac catheterization on the right and left sides was				Early (operative) mortality was 7.8% overall, with rates of 7.6% in TGA-IVS, 8.5% in TGA-VSD, and 13.3% in TGA-VSD with coarctation of the aorta (TGA-VSD-CoA). Type II coronary artery pattern was the only statistically significant risk factor for early mortality (p < 0.01), while	None reported	Despite 375 patients having undergone BAS, there was no stratified analysis of mortality outcomes based on BAS vs. no BAS prior to ASO	

Subramanian et al.,	Revisiting the Role of Balloon Atrial Septostomy Prior to the Arterial Switch Operation	2005 - 2020	2024	USA	Retrospective cohort study	Neonates diagnosed with dextro-transposition of the great arteries (d-TGA) who underwent an arterial switch operation (ASO) at Dell Children's Medical Center in Austin, Texas. neonates had to have a confirmed postnatal diagnosis of d-TGA, either with an intact ventricular septum (IVS) or a ventricular	Balloon Atrial Septostomy (BAS) before ASO	Group 1: Patients who underwent BAS before ASO Group 2: Patients who did not undergo BAS before ASO	Primary: Mortality between BAS and No BAS group before ASO Secondary: low cardiac output syndrome (LCOS) within the first 48 hours postoperatively, need for extracorporeal membrane oxygenation (ECMO), duration of mechanical ventilation, length of stay in the intensive care unit (ICU), overall hospital stay, postoperative	411	In the BAS group, patients had a median birth weight of 3.3 kg (interquartile range [IQR] 3.0–3.8 kg; range 2.7–4.2 kg). They also had lower preoperative arterial oxygen saturations, with a median pre-BAS SpO ₂ of 83% (IQR 75%–88%; range 54%–92%), which improved significantly after BAS to a median of 87% (IQR 85%–90%; range 72%–95%) (P = .007). The group	IVS and VSD	411	218	223	Oxygen saturation levels were significantly lower in the BAS group prior to the procedure, with a median pre-BAS SpO ₂ of 83% (interquartile range [IQR] 75%–88%; range 54%–92%), which improved to 87% (IQR 85%–90%; range 72%–95%)	The median cardiopulmonary bypass time was 78 minutes (IQR 71–87), and the median aortic cross-clamp time was 52 minutes (IQR 47–60), with no significant difference between BAS and no-BAS groups. Circulatory arrest was	No patients required ECMO, and low cardiac output syndrome (LCOS) occurred in 2 patients (9%) in the BAS group and none in the no-BAS group. Median hospital stay was 13 days for BAS vs. 10 days for no-BAS (P = .108). Duration of mechanical ventilation and ICU stay were not reported with specific values but were part of routine care. Neurologic complications such as seizures were not observed. MRI	16	8	8	The median age at surgery was significantly higher in the BAS group at 8 days (IQR 7–13; range 3–32) compared to 4 days (IQR 3–7; range 2–10) in the No BAS group (p = 0.016). Length of hospital stay post-ASO did not differ significantly, with a median of 13 days (IQR 12–21; range 7–43) in the BAS group	No comprehensive long-term neurodevelopmental follow-up included but the authors acknowledge need for further evaluation	Lack of standardized neurodevelopmental follow-up Missing long-term outcome data for majority Heterogeneity in MRI acquisition and interpretation
Vida et al.,	Arterial switch operation for transposition of the great arteries: A single-centre 32-year experience	1987–2018	2019	Italy	Retrospective single-centre cohort study	neonates with D-TGA undergoing ASO at the University of Padua	Arterial Switch Operation (ASO).	Groups compared: D-TGA/IVS vs complex D-TGA; BAS vs no BAS before ASO.	Early and late mortality, reoperation/reintervention, CPET results, coronary status, and complications.	267		IVS and VSD	267	162	105	Median age at ASO: 8 days (IVS: 7; complex: 11) Weight: ~3.3 kg Higher rate of prenatal diagnosis in recent years 31% had coronary artery anomalies	DHCA used in 55% (especially before 2005) CA reimplantation using trap-door technique Additional CA maneuvers in 5.2% CPB and cross-clamp time significantly longer in complex D-TGA	ICU stay: median 4 days Complications in 26% (more in complex group) Routine coronary imaging during follow-up (CT, MRI, angiography)	17/267 (6.4%) Early mortality: 15 (5.6%) Late mortality: 2 (0.8%)	6	9	Reoperation/reintervention in 35 (14%), mostly for RVOT obstruction Freedom from reintervention at 10 and 20 years: 87% and 78%	Indirectly assessed using CPET. 44 patients (17%) tested VO ₂ peak ~92.6% of predicted. All CPET patients were asymptomatic and NYHA I	

Zaleski et al.	Elective non-urgent balloon-atrial septostomy in infants with d-transposition of the great arteries does not eliminate the need for pge1 therapy at the time of arterial switch operation	2012 - 2018	2021	USA	Retrospective cohort study	neonates diagnosed with d-TGA who underwent an arterial switch operation (ASO) during their initial admission to Boston Children’s Hospital (BCH), with or without a preceding balloon atrial septostomy (BAS). Neonates were excluded if they had undergone BAS or ECMO before transfer to BCH, died before ASO, or	BAS or no BAS followed by Arterial switch operation		The primary outcome was the incidence of BAS. Secondary outcomes included BAS technical success, freedom from PGE1 at surgery, incidence of post-ASO low cardiac output state (LCOS), and complication rates (related to BAS, PGE, ECMO use, or death).	147	Among neonates with d-TGA and an intact ventricular septum (IVS), those who underwent BAS had a lower rate of prenatal diagnosis (55.9% vs 78.8%, p = 0.041), a higher need for delivery room resuscitation (59.3% vs 36.4%, p = 0.035), and were more likely to require intubation (54.2% vs 18.2%, p = 0.001). Additionally, atrial septal defect (ASD) was	IVS and VSD	147	73	74		27.4% of BAS procedures were performed in the cardiac catheterization lab, while the majority (72.6%) took place in the ICU. The femoral vein was the most common access site (84.9%), and the procedure had a high						In the overall cohort, patients with d-TGA and IVS who underwent BAS had lower rates of prenatal diagnosis and were more likely to require delivery room resuscitation, particularly intubation (54.2% vs 18.2%, p = 0.001). In the VSD group, BAS patients had significantly lower birth weights (2805g		
----------------	---	-------------	------	-----	----------------------------	--	---	--	---	-----	---	-------------	-----	----	----	--	---	--	--	--	--	--	--	--	--

Supplementary table 4: Risk of Bias Assessment using Robins-I Tool

Author	Title	1. Confounding	2. Selection of Participants	3. Classification of Interventions	4. Deviations from Intended Interventions	5. Missing Data	6. Measurement of Outcomes	7. Selection of Reported Result	Overall Risk	Key Justification Notes
Anderson et al.	Earlier arterial switch operation improves outcomes and reduces costs for neonates with transposition of the great arteries	Moderate	Moderate	Low	Low	Low	Low	Moderate	Moderate	Selection bias from excluding patients with delayed surgery due to clinical instability, confounding from unmeasured clinical factors influencing surgical timing decisions
Baylen et al.,	Role of Balloon Atria) Septostolnly petore Early Arterial Switch Repair Of Transposition of the Great Arteries	Serious	Moderate	Low	Moderate	Moderate	Low	Moderate	Serious	Confounding by indication was the major limitation. The decision to perform BAS was based on clinical severity, creating systematic differences between groups that fundamentally compromise the ability to draw causal inferences about the intervention's effects
Beattie et al.,	Prostaglandin E2 After Septostomy for Simple Transposition	Low	Low	Low	Low	Low	Low	Low	Low	
Beca et al.,	Pre-Operative Brain Injury in Newborn Infants With Transposition of the Great Arteries Occurs at Rates Similar to Other Complex Congenital Heart Disease and Is Not Related to Balloon Atrial Septostomy	Moderate	Low	Low	Moderate	Moderate	Low	Low	Moderate	The clinical decision for BAS was based on patient characteristics that could independently affect brain injury risk, and no multivariable adjustment was performed to control for this.
Butts et al.,	Effect of Prostaglandin Duration on Outcomes in Transposition of the Great Arteries with Intact Ventricular Septum	Moderate	Low	Low	Serious	Low	Moderate	Moderate	Moderate	The lack of standardized protocols for PGE management and long study period introduce significant risk of systematic differences in care beyond PGE duration
Cirstoveanu et al	Impact of Bedside Balloon Atrial Septostomy in Neonates with Transposition of the Great Arteries in a Neonatal Intensive Care Unit in Romania	Low	Serious	Low	Moderate	Low	Low	Low	Moderate	The selection of participants depended on clinical presentation and transfer availability
Dorobantu et al	Arterial Switch for Transposition of the Great Arteries: Treatment Timing, Late Outcomes, and Risk Factors	Low	Low	Low	Low	Low	Low	Low	Low	
Durandy et al.,	Pre- and Postoperative Magnetic Resonance Imaging in Neonatal Arterial Switch Operation Using Warm Perfusion	Serious	Moderate	Low	Moderate	Low	Moderate	Moderate	Serious	The absence of a control group makes it impossible to attribute outcomes to the warm perfusion intervention rather than other factors.

Escobar-diaz et al.,	Prenatal diagnosis of transposition of the great arteries over a 20-year period: improved but imperfect	Moderate	Serious	Low	Moderate	Moderate	Moderate	Low	Serious	Study excluded patients who died before reaching the cardiac center. This creates severe survival bias that likely overestimates outcomes for both groups but particularly affects the postnatal diagnosis group. The difference in birth location (95% vs 5% at cardiac center) represents unmeasured confounding that could explain most observed differences between groups
H. Kamali et al.	Clinical effects of major aortopulmonary collateral arteries in term neonates diagnosed with transposition of the great arteries	Low	Low	Low	Moderate	Low	Low	Moderate	Low	
Jung-Won Kim	Preoperative Factors as a Predictor for Early Postoperative Outcomes After Repair of Congenital Transposition of the Great Arteries	Low	Moderate	Low	Low	Low	Low	Moderate	Low	
Lim et al.,	Associations Between Age at Arterial Switch Operation, Brain Growth, and Development in Infants With Transposition of the Great Arteries	Low	Low	Low	moderate	Moderate	Moderate	Low	Low	
Mukherjee et al.,	Analysis of 8681 neonates with transposition of the great arteries: outcomes with and without Rashkind balloon atrial septostomy	Moderate	Low	Low	Low	Moderate	Low	Moderate	Moderate	
Nevvazhay et al.,	Arterial switch in the first hours of life: no need for Rashkind septostomy?	Serious	Serious	Low	Moderate	Moderate	Moderate	Moderate	Serious	Lack of a comparison group and significant selection bias for neonates with severe metabolic disorder
Niccum et al.,	Intubation and Lower Saturation in the Delivery Room are Associated with Balloon Atrial Septostomy in Neonates with Transposition of the Great Arteries	Moderate	Moderate	Low	Low	Low	Low	Low	Moderate	The moderate overall risk of bias is primarily driven by confounding and selection issues. The study excluded patients with prenatal evidence of severely restricted atrial communication who had planned immediate BAS
Özcanoglu et al	The Effect of Variations in the Neutrophil/Lymphocyte Ratio on The Length of Post-Operative ICU Stay in Cases Diagnosed with Transposition of the Great Arteries	Serious	Moderate	Low	Moderate	Serious	Moderate	Moderate	Serious	No control for important confounders that could affect both NLR values and ICU length of stay, plus the lack of multivariable adjustment
Planche et al.,	Switch operation for transposition of the great arteries in neonates	Serious	Moderate	Low	Moderate	Low	Moderate	Low	Moderate	The temporal confounding from learning curve impacts on early mortality rates. Also, the absence of comparison group - Limits ability to assess intervention effectiveness
Rito et al.,	Primary Arterial Switch Operation for Late Presentation of Transposition of the Great Arteries With Intact Ventricular Septum	Serious	Low	Low	Low	Low	Low	Low		Lacks multivariable adjustment or matching for key confounders such as severity of hypoxemia, ventricular hypoplasia, prenatal diagnosis status, associated anomalies, or surgical era changes

Serraf A et al	Anatomic correction of transposition of the great arteries in neonates	Serious	Moderate	Low	Moderate	Low	Low	Moderate	Serious	It's a single-arm case series without a comparison group, making confounding assessment difficult. The study also includes mixed populations (simple TGA-IVS, TGA-VSD, with/without coarctation) without clear stratification for many analyses
Subramanian et al.,	Revisiting the Role of Balloon Atrial Septostomy Prior to the Arterial Switch Operation	Serious	Moderate	Low	Moderate	Low	Moderate	Moderate	Serious	BAS selection was based on clinical severity, creating systematic differences between groups that are not adequately controlled for. Patients selected for no-BAS were "stably maintained on prostaglandin," suggesting they were less critically ill.
Vida et al.,	Arterial switch operation for transposition of the great arteries: A single-centre 32-year experience	Serious	Moderate	Low	Moderate	Moderate	Moderate	Moderate	Serious	The study spans 32 years (1987-2018), representing significant era effects in surgical techniques and patient management for which no adjustment was made. BAS also use varied significantly between D-TGA/IVS (83%) vs complex D-TGA (13%) groups without adequate statistical adjustment
Zaleski et al.,	Elective non-urgent balloon-atrial septostomy in infants with d-transposition of the great arteries does not eliminate the need for pge1 therapy at the time of arterial switch operation	Serious	Moderate	Low	Moderate	Moderate	Moderate	Low	Serious	Confounding by indication, where patients who received BAS were systematically different from those who did not . They were sicker at baseline (higher resuscitation rates, more intubations, different anatomical variants)
Chasovskiy et al	Arterial Switch Operation in the First Hours of Life Using Autologous Umbilical Cord Blood	Serious	Moderate	Low	Moderate	Low	Moderate	Moderate	Serious	The significant differences between groups (timing of surgery, clinical presentation, prenatal vs postnatal diagnosis) represent serious confounding that could explain observed differences independent of the blood transfusion strategy
Idriss	Transposition of the great arteries with intact ventricular septum	Low	Moderate	Low	Moderate	Moderate	Low	Moderate	Moderate	Substantial loss to follow-up for intermediate outcomes (35% missing echo data, 70% missing catheterization data)
Modestini et al.,	Impact of Persistent Pulmonary Hypertension of the Newborn in Neonates with Dextro-transposition of the Great Arteries	Moderate	Low	Low	Moderate	Moderate	Low	Low	Moderate	Confounding by treatment intensity as PPHN patients received more aggressive interventions
O'Byrne et al	Association between variation in preoperative care before arterial switch operation and outcomes in patients with transposition of the great arteries	Low	Low	Low	Moderate	Low	Low	Low	Low	
Faateh et al.,	When to do the Arterial Switch Operation to Optimize Outcomes and Resource Utilization: A National Database Analysis	Low	Low	Low	Moderate	Low	Low	Low	Low	
Dibardino et al	Current Expectations for Newborns Undergoing the Arterial Switch Operation	Serious	Moderate	Low	Moderate	Low	Low	Moderate	Serious	There's no systematic comparison of outcomes between BAS and no-BAS groups important confounders like severity of hypoxemia, clinical instability, and timing of presentation are not controlled for when comparing these subgroups

Supplementary table 5: Certainty of measurement for three outcomes; Mortality, length of stay and intubation rate

Certainty assessment							№ of patients		Effect		Certainty	Importance
№ of studies	Study design	Risk of bias	Inconsistency	Indirectness	Imprecision	Other considerations	[intervention]	[comparison]	Relative (95% CI)	Absolute (95% CI)		
Mortality Follow-up: in-hospital or 30-day												
9	non-randomised studies	serious ^a	not serious	not serious	not serious	none	13/715 (1.8%)	23/500 (4.6%)	OR 0.45 (0.24 to 0.87)	25 fewer per 1,000 (from 35 fewer to 6 fewer)	⊕⊕⊕○ Moderate ^a	CRITICAL
Length of hospital stay Follow-up: postoperative period												
4	non-randomised studies	serious ^b	not serious	not serious	not serious	none	1045	1561	-	SMD 0.4 SD higher (1.51 lower to 0.71 higher)	⊕⊕⊕○ Moderate ^b	IMPORTANT
Intubation rate Follow-up: perioperative period												
2	non-randomised studies	very serious ^c	not serious	not serious	serious ^d	none	91/92 (98.9%)	36/99 (36.4%)	OR 13.37 (6.29 to 28.45)	521 more per 1,000 (from 419 more to 578 more)	⊕○○○ Very low ^{c,d}	NOT IMPORTANT

CI: confidence interval; OR: odds ratio; SMD: standardised mean difference

Explanations

- a. Four of nine studies had serious risk of bias due to confounding by indication. Sensitivity analysis excluding these studies lost statistical significance.
- b. Two of four studies had serious risk of bias. Initial analysis showed high heterogeneity ($I^2 = 86.5\%$) which was resolved after excluding biased studies.
- c. The decision to perform BAS was based on clinical severity, creating systematic differences between groups that fundamentally compromise the ability to draw causal inferences about the intervention's effects
- d. Small sample size (n=191) from only two studies limits the precision of the estimate

PRISMA 2020 Main Checklist

TITLE

Title	1	Identify the report as a systematic review.	line 1 page 1
-------	---	---	---------------

ABSTRACT

Abstract	2	See the PRISMA 2020 for Abstracts checklist	
----------	---	---	--

INTRODUCTION

Rationale	3	Describe the rationale for the review in the context of existing knowledge.	Line 65 - 74, page 3
-----------	---	---	----------------------

Objectives	4	Provide an explicit statement of the objective(s) or question(s) the review addresses.	Line 75 - 84 Page 3 - 4
------------	---	--	-------------------------

METHODS

Eligibility criteria	5	Specify the inclusion and exclusion criteria for the review and how studies were grouped for the syntheses.	Line 93 - 110, Page 4 - 5
----------------------	---	---	---------------------------

Information sources	6	Specify all databases, registers, websites, organisations, reference lists and other sources searched or consulted to identify studies. Specify the date when each source was last searched or consulted.	Line 113 - 116 Page 5
---------------------	---	---	-----------------------

Search strategy	7	Present the full search strategies for all databases, registers and websites, including any filters and limits used.	Line 118 - 127, Page 5 - 6
-----------------	---	--	----------------------------

Selection process	8	Specify the methods used to decide whether a study met the inclusion criteria of the review, including how many reviewers screened each record and each report retrieved, whether they worked independently, and if applicable, details of automation tools used in the process.	Line 128 - 132 Page 6
-------------------	---	--	-----------------------

(continued)

Data collection process	9	Specify the methods used to collect data from reports, including how many reviewers collected data from each report, whether they worked independently, any processes for obtaining or confirming data from study investigators, and if applicable, details of automation tools used in the process.	Line 135 - 149 Page 6 - 7
Data items	10a	List and define all outcomes for which data were sought. Specify whether all results that were compatible with each outcome domain in each study were sought (e.g. for all measures, time points, analyses), and if not, the methods used to decide which results to collect.	Line 135 - 149 Page 6 - 7
	10b	List and define all other variables for which data were sought (e.g. participant and intervention characteristics, funding sources). Describe any assumptions made about any missing or unclear information.	Line 135 - 149 Page 6 - 7
Study risk of bias assessment	11	Specify the methods used to assess risk of bias in the included studies, including details of the tool(s) used, how many reviewers assessed each study and whether they worked independently, and if applicable, details of automation tools used in the process.	Line 150 - 158 Page 7
Effect measures	12	Specify for each outcome the effect measure(s) (e.g. risk ratio, mean difference) used in the synthesis or presentation of results.	Line 166 173, Page 7 - 8
Synthesis methods	13a	Describe the processes used to decide which studies were eligible for each synthesis (e.g. tabulating the study intervention characteristics and comparing against the planned groups for each synthesis (item 5)).	Line 160 -164

(continued)

	13b	Describe any methods required to prepare the data for presentation or synthesis, such as handling of missing summary statistics, or data conversions.	Line 169 -173
	13c	Describe any methods used to tabulate or visually display results of individual studies and syntheses.	Line 160 -164
	13d	Describe any methods used to synthesize results and provide a rationale for the choice(s). If meta-analysis was performed, describe the model(s), method(s) to identify the presence and extent of statistical heterogeneity, and software package(s) used.	Line 160 -164
	13e	Describe any methods used to explore possible causes of heterogeneity among study results (e.g. subgroup analysis, meta-regression).	Line 174 - 178, Page 8
	13f	Describe any sensitivity analyses conducted to assess robustness of the synthesized results.	Line 181 - 185, Page 8
Reporting bias assessment	14	Describe any methods used to assess risk of bias due to missing results in a synthesis (arising from reporting biases).	Line 179 - 180, Page 8
Certainty assessment	15	Describe any methods used to assess certainty (or confidence) in the body of evidence for an outcome.	Line 186 - 189, Page 8
RESULTS			
Study selection	16a	Describe the results of the search and selection process, from the number of records identified in the search to the number of studies included in the review, ideally using a flow diagram.	Line 191 - 198 Page 9
	16b	Cite studies that might appear to meet the inclusion criteria, but which were excluded, and explain why they were excluded.	Line 196 - 198 Page 9
Study characteristics	17	Cite each included study and present its characteristics.	Line 207 - 208 Page 10 -12

(continued)

Risk of bias in studies	18	Present assessments of risk of bias for each included study.	Line 218 - 225 Page 13
Results of individual studies	19	For all outcomes, present, for each study: (a) summary statistics for each group (where appropriate) and (b) an effect estimate and its precision (e.g. confidence/credible interval), ideally using structured tables or plots.	Line 209 - 247
Results of syntheses	20a	For each synthesis, briefly summarise the characteristics and risk of bias among contributing studies.	Line 209 - 247
	20b	Present results of all statistical syntheses conducted. If meta-analysis was done, present for each the summary estimate and its precision (e.g. confidence/credible interval) and measures of statistical heterogeneity. If comparing groups, describe the direction of the effect.	Line 209 - 247
	20c	Present results of all investigations of possible causes of heterogeneity among study results.	Line 209 - 247
	20d	Present results of all sensitivity analyses conducted to assess the robustness of the synthesized results.	Line 209 - 247
Reporting biases	21	Present assessments of risk of bias due to missing results (arising from reporting biases) for each synthesis assessed.	Not applicable
Certainty of evidence	22	Present assessments of certainty (or confidence) in the body of evidence for each outcome assessed.	Line 251 - 255 Page 14
DISCUSSION			
Discussion	23a	Provide a general interpretation of the results in the context of other evidence.	Line 264 - 271 Page 15
	23b	Discuss any limitations of the evidence included in the review.	Line 289 - 296 Page 15
	23c	Discuss any limitations of the review processes used.	Line 289 - 296 Page 15

(continued)

	23d	Discuss implications of the results for practice, policy, and future research.	Line 298 - 305 Page 16 - 17
OTHER INFORMATION			
Registration and protocol	24a	Provide registration information for the review, including register name and registration number, or state that the review was not registered.	Line 87 - 91 Page 4
	24b	Indicate where the review protocol can be accessed, or state that a protocol was not prepared.	Line 87 - 91 Page 4
	24c	Describe and explain any amendments to information provided at registration or in the protocol.	None
Support	25	Describe sources of financial or non-financial support for the review, and the role of the funders or sponsors in the review.	Line 326 - 327 Page 17
Competing interests	26	Declare any competing interests of review authors.	Line 328 - 330 Page 17
Availability of data, code and other materials	27	Report which of the following are publicly available and where they can be found: template data collection forms; data extracted from included studies; data used for all analyses; analytic code; any other materials used in the review.	Line 331 - 333 Page 17 - 18

PRISMA Abstract Checklist

TITLE

Title	1	Identify the report as a systematic review.	Yes
-------	---	---	-----

BACKGROUND

Objectives	2	Provide an explicit statement of the main objective(s) or question(s) the review addresses.	Yes
------------	---	---	-----

METHODS

Eligibility criteria	3	Specify the inclusion and exclusion criteria for the review.	Yes
----------------------	---	--	-----

Information sources	4	Specify the information sources (e.g. databases, registers) used to identify studies and the date when each was last searched.	Yes
---------------------	---	--	-----

Risk of bias	5	Specify the methods used to assess risk of bias in the included studies.	Yes
--------------	---	--	-----

Synthesis of results	6	Specify the methods used to present and synthesize results.	Yes
----------------------	---	---	-----

RESULTS

Included studies	7	Give the total number of included studies and participants and summarise relevant characteristics of studies.	Yes
------------------	---	---	-----

Synthesis of results	8	Present results for main outcomes, preferably indicating the number of included studies and participants for each. If meta-analysis was done, report the summary estimate and confidence/credible interval. If comparing groups, indicate the direction of the effect (i.e. which group is favoured).	Yes
----------------------	---	---	-----

DISCUSSION

Limitations of evidence	9	Provide a brief summary of the limitations of the evidence included in the review (e.g. study risk of bias, inconsistency and imprecision).	Yes
-------------------------	---	---	-----

Interpretation	10	Provide a general interpretation of the results and important implications.	Yes
----------------	----	---	-----

OTHER

Funding	11	Specify the primary source of funding for the review.	No
---------	----	---	----

Registration	12	Provide the register name and registration number.	No
--------------	----	--	----

From: Page MJ, McKenzie JE, Bossuyt PM, Boutron I, Hoffmann TC, Mulrow CD, et al. The PRISMA 2020 statement: an updated guideline for reporting systematic reviews. MetaArXiv. 2020, September 14. DOI: 10.31222/osf.io/v7gm2. For more information, visit: www.prisma-statement.org