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DIAGNOSTIC METHODS FOR STUDYING THE COMMON TRUNCUS ARTERIOSUS IN RADIOLOGY

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Abstract

Introduction. Providing an accurate radiological report is important because the optimal timing and procedure for truncus arteriosus repair is determined based on morphological characteristics. It is necessary to take into account the advantages and disadvantages of each method to help clinicians.

Aim: Review of diagnostic methods used in radiology to study the common truncus arteriosus according to the literature.

Search strategy. To search for literature, we used the PubMed, Scopus and Google Scholar databases, without limiting the depth of the search. This is due to the importance of foundational fundamental works, both of the past and the beginning of the 21st century, revealing basic issues in describing the anatomy and classification of the arterial trunk, understanding the natural history, the results of surgical treatment, the latest research in the field of diagnosis and treatment, reflecting current trends and practice. *Inclusion criteria for the review*: publications with full text, clear conclusions, published in English. *Exclusion criteria:* duplicate articles, incomplete articles, articles with paid access, summary of the reports, abstracts, advertising articles. As a result, 65 articles were accepted for analysis.

Results. Diagnostic methods for studying the common truncus arteriosus in radiology include chest radiography, echocardiography, computed tomography, cardiac magnetic resonance imaging, if necessary, cardiac catheterization and angiography. Each of the listed methods has its own advantages and disadvantages.

Conclusions: Analysis and further diagnosis of conotruncal pathologies based on data from computed and magnetic resonance imaging, cardiac catheterization, and echocardiography are expected to be effective with an integrated approach.

Keywords: *common truncus arteriosus, diagnosis, echocardiography, X-ray, computed tomography, catheterization, Magnetic resonance imaging.*

Резюме

ДИАГНОСТИЧЕСКИЕ МЕТОДЫ ИЗУЧЕНИЯ ОБЩЕГО АРТЕРИАЛЬНОГО СТВОЛА В РАДИОЛОГИИ

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Актуальность. Предоставление точного радиологического заключения является важным, поскольку оптимальные сроки и процедура пластики артериального ствола определяются на основе морфологических характеристик. Необходимо учитывать преимущества и недостатки каждого метода, для помощи клиницистам.

Цель. Обзор диагностических методов, используемых в радиологии для изучения общего артериального ствола по данным литературы.

Стратегия поиска. Для поиска литературы мы использовали базы данных PubMed, Scopus и Google Scholar, без ограничения глубины поиска. Это связано с важностью основополагающих фундаментальных работ, как прошлого, так и начала 21 века, раскрывающих базовые вопросы по описанию анатомии и классификации артериального ствола, пониманию естественной истории, результатов хирургического лечения, последние исследования в области диагностики и лечения, отражающие современные тенденции и практику. *Критерии включения в обзор:* публикации с полным текстом, четкими выводами, опубликованные на английском языке. *Критерии исключения*: повторяющиеся статьи, неполные статьи, статьи с платным доступом, краткое изложение докладов, тезисы, рекламные статьи. В результате для анализа было принято 65 статей.

Результаты поиска. К диагностическим методам изучения общего артериального ствола в радиологии относятся рентгенография грудной клетки, эхокардиография, компьютерная томография, магнитно-резонансная томография сердца, при необходимости катетеризация сердца и ангиография. Каждый из перечисленных методов имеет свои преимущества и недостатки.

Выводы: Анализ и дальнейшая диагностика патологий конотрункуса на основании данных компьютерной и магнитно-резонансной томографии, катетеризации сердца, эхокардиографии предполагаются эффективными при комплексном подходе.

Ключевые слова: *общий артериальный ствол, диагностика, эхокардиография, рентген, компьютерная томография, катетеризация, магнитно-резонансная томография.*

Түйіндеме

РАДИОЛОГИЯДА ЖАЛПЫ ТРУНКУС АРТЕРИОЗЫН ЗЕРТТЕУДІҢ ДИАГНОСТИКАЛЫҚ ӘДІСТЕРІ

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Өзектілігі: Дәл радиологиялық қорытынды беру өте маңызды, өйткені жалпы трункус артериозын пластикалық операция оңтайлы уақыты мен процедурасы морфологиялық сипаттамаларға байланысты анықталады. Дәрігерлерге көмектесу үшін әрбір әдістің артықшылықтары мен кемшіліктерін ескеру қажет.

Мақсаты: Әдебиеттерге сәйкес жалпы трункус артериозын зерттеу үшін рентгенологияда қолданылатын диагностикалық әдістерге шолу.

Іздеу стратегиясы: Әдебиеттерді іздеу үшін біз іздеу тереңдігін шектемей, PubMed, Scopus және Google Scholar дерекқорларын қолдандық. Бұл трункус артериоздын анатомиясы мен жіктелуін сипаттау, табиғи тарихты, хирургиялық емдеу нәтижелерін түсіну, қазіргі тенденциялар мен тәжірибелерді көрсететін диагностика мен емдеудің соңғы зерттеулері бойынша негізгі сұрақтарды ашатын өткен және 21 ғасырдың басындағы іргелі жұмыстардың маңыздылығына байланысты. Рецензияға енгізу критерийлері: толық мәтіні бар басылымдар, тұжырымдары нақты, ағылшын тілінде жарияланған. Шығарылатын критерийлер: қайталанатын мақалалар, толық емес мақалалар, ақылы мақалалар, баяндамалардың қысқаша мазмұны, тезистер, жарнамалық мақалалар. Қорытындысында 65 мақала талдауға қабылданды.

Нәтижелер: Радиологияда трункус артериозын зерттеудің диагностикалық әдістеріне кеуде қуысының рентгенографиясы, эхокардиография, компьютерлік томография, жүрек магнитті-резонансты томографиясы, қажет

болған жағдайда жүрек катетеризациясы және ангиография жатады. Аталған әдістердің әрқайсысының өзіндік артықшылықтары мен кемшіліктері бар.

Қорытындылар: Компьютерлік және магниттік-резонанстық томография, жүрек катетеризациясы, эхокардиография деректері негізінде конотрункус патологияларын талдау және одан әрі диагностикалау кешенді тәсілмен тиімді деп болжанады.

Түйінді сөздер: *туа біткен жалпы трункус артериозы, диагностика, эхокардиография, рентген, компьютерлік томография, катетеризация, магнитті-резонансты томография.*

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Introduction

Truncus arteriosus (CAT) is an infrequent congenital abnormality, among congenital heart defects accounting for approximately 0.21–0.34%. According to a number of authors, there is no gender predisposition [5, 9, 30, 44, 47, 59], but according to *M. Koplay*, there is a slight predisposition in males [28]. It is distinguished by its composition of a solitary arterial trunk emerging from the ventricles, generating the coronary arteries, aorta, and pulmonary arteries (PA). Almost always, this lesion occurs against the background of the usual arrangement of the atria and concordant atrioventricular connections and, most often, against the background of a concomitant ventricular septal defect (VSD). Substantial morphological diversity exists in the branches of the main trunk of large arteries, forming the foundation for all principal subclassification systems. The expressions vary significantly and rely on morphological differences, the extent of regurgitation in the truncal valve, and the relative resistance of the vasculature in the pulmonary and systemic arteries, often presenting less frequently with cyanosis and more often with tachypnea due to pulmonary hypercirculation [5, 9].

The defect is usually fatal without treatment, with an average age of death of 2.5-6 months. Without surgical treatment, 80% of sick children die by 1 year of life, many in early infancy [5, 7, 22, 35].

The timing of recovery of CAT continues to be a subject of debate. Some surgeons recommend elective repair of CAT without major concomitant cardiac anomalies during the first quarter of life, others prefer primary neonatal repair [5].

According to *C. Marcelleti et al.,* 15-30% of patients had survival of up to 5 years. Ideal candidates for surgery are children 5-12 years old [35].

According to a study by *F. Henley et al.,* the intermediate survival rate in children from 1 to 4 years for most forms of truncus arteriosus is close to 100%. The absence of risks associated with young age and low weight, the absence of serious problems with the use of small homografts, the specific benefits associated with the pulmonary vasculature, and the general benefits associated with ensuring a normal cardiovascular system indicate that the truncus arteriosus should be restored in the neonatal period as planned [20, 45, 54]. Preoperative moderate or severe CAT valve insufficiency is one of the most important factors influencing mortality in children with truncus arteriosus [40, 58].

Data from *L. Thompson et al.* suggest that truncal valve repair is effective and durable, and our current recommendation is that it should be the first option in virtually all neonates with large truncal valve regurgitation [53].

An ideal imaging modality should be readily available, rapid, noninvasive, radiation-free, require no sedation or anesthesia, have no contraindications, and provide all necessary diagnostic data [25].

Patients with CAT can be evaluated using echocardiography, contrast-enhanced computed tomography (CTA), Cardiac Magnetic Resonance Imaging (MRI), and cardiac catheterization. Also, reoperations and catheter-based interventions are possible for most patients during childhood [39].

Existing anatomical features and associated physiological consequences influence the timing and technique of surgical treatment. An accurate preoperative diagnosis is very important, since the optimal timing and procedure for truncus arteriosus repair is determined based on morphological characteristics. *S. Gupta et al.* emphasize the importance of detailed knowledge of the origin of the pulmonary and coronary arteries for surgical treatment [19].

Thus, the versatility of this defect, the predominant occurrence in newborns, the morphological orientation in the choice of surgical treatment tactics requires thoughtfulness in the choice of diagnostic method.

Aim: To provide a comprehensive overview of the diagnostic techniques used in radiology to study the common truncus arteriosus, with the goal of supporting the medical community in improving the diagnosis and care of patients with this condition.

Search strategy: In this review a comparative analysis of radiological research methods was carried out: EchoCG, X-ray, CT, MRI, used in the diagnosis and assessment of the common arterial trunk.

We used PubMed, Scopus, and Google Scholar databases to search the literature. In this case, the search

depth covers both articles published in the past (for example, the work of Collett and Edwards in 1949) and more modern publications (for example, the work of Gupte and Aggarwal in 2020). Thus, the search depth includes a period of more than 70 years, from 1949 to the present, which provides a wide coverage of the literature on the topic of the truncus arteriosus. The work of Collett and Edwards, published in 1949, represents one of the earliest studies of the anatomy and classification of the truncus arteriosus that is still used today. Works published in the late 20th century contribute to the understanding of the natural history, classification, and results of surgical treatment in patients with truncus arteriosus. More recent publications, such as those by Gupte and Aggarwal published in 2020, represent the latest research and updates in the diagnosis and treatment of truncus arteriosus, reflecting current trends and practice. Inclusion criteria for the review: studies conducted in patients diagnosed with truncus arteriosus, published in English. *Inclusion criteria for the review:* studies conducted in patients diagnosed with truncus arteriosus, published in English. Key terms: “common arterial trunk”, “morphology of the heart with the common arterial trunk”, “conotruncus”, “cardiac echocardiography”, “magnetic resonance imaging”, “computed tomography”, “cardiac catheterization”. *Exclusion criteria:* studies conducted on patients diagnosed with truncus arteriosus, with clear conclusions, articles published in other languages. Consequently, 65 articles were selected for this review. A limitation of selecting only 65 articles to cover the topic is that many of the available articles may not be directly related to diagnostic techniques for studying the truncus arteriosus in radiology. Some of them may focus on treatment and intensive care techniques, genetic studies, pathophysiology, epidemiology and other aspects of this pathology. This limitation may reduce the representativeness of the study, as some of the available information may not be relevant to the topic.

Search results and discussion

Common arterial trunk (CAT) is an uncommon congenital heart anomaly, accounting for less than 3% of all congenital heart defects. Indications of CAT encompass a solitary large artery emerging from the heart's base, facilitating systemic, coronary, and pulmonary circulation, along with the presence of a ventricular septal defect [3, 21]. The solitary truncus arteriosus originating from the heart is primarily situated above the right ventricle in 42% of instances, above the left ventricle in 16% of instances, and is evenly distributed between the ventricles in 42% of instances. [42].

Classification.

The greatest anatomical variability depends on the branching arrangement of the trunk. Thus, this feature should have played and played a role in the classification [11].

There are two classification options: *Collett and Edwards (C–E), and Van Praagh,* which are still used to describe the anatomical variants of CAT, as well as a modified *Van Praagh* classification (Fig. 1). [56]

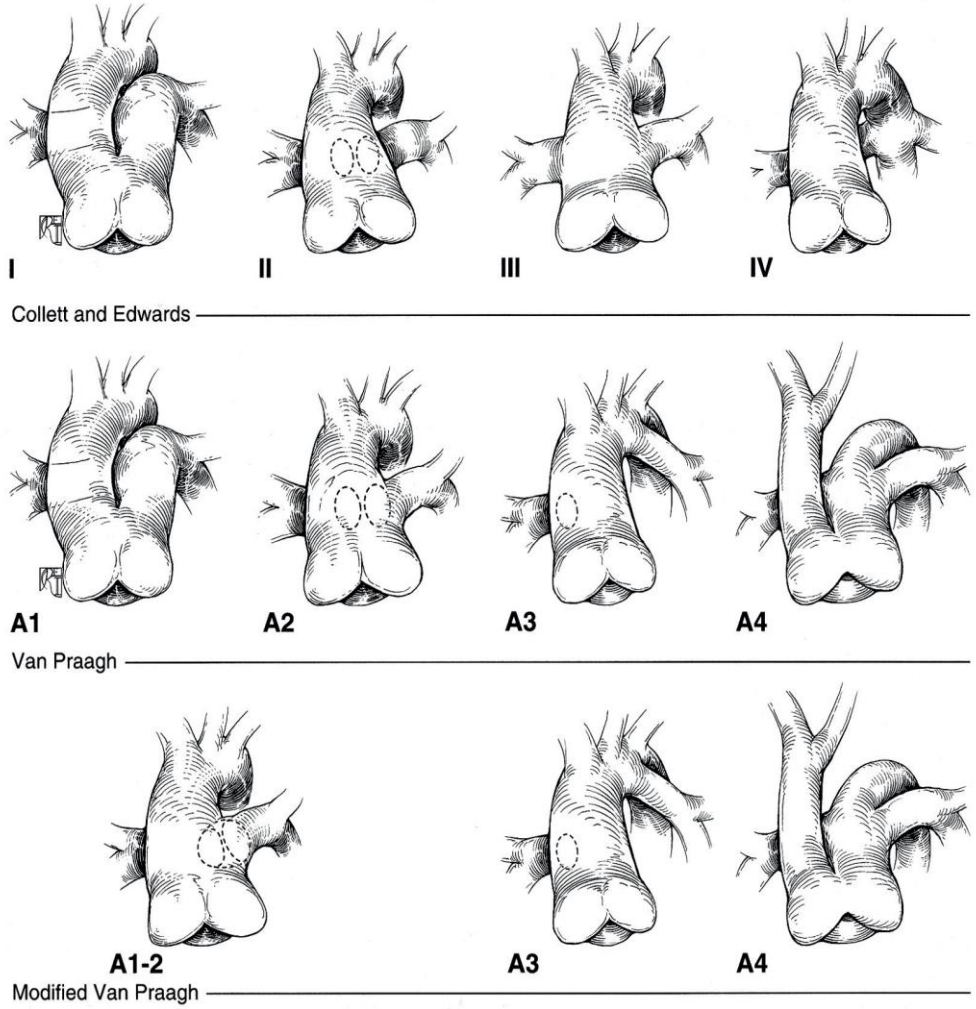

Figure 1. Collett and Edwards, Van Praagh, and modified Van Praagh common arterial trunk classifications [42].

The *R. Collet and J. Edwards* classification (1949) includes 4 types associated with different stages of delayed development of the conotruncus. Type 1 - the pulmonary trunk and ascending aorta arise from the common truncus arteriosus. In type 2, the right and left branches arise close to each other from the posterior wall of the common arterial trunk. Type 3 involves the origin of one or both pulmonary arteries independently from both sides of the common truncus arteriosus. In type 4, there are no pulmonary arteries; in turn, large bronchial arteries are identified, which provide arterial circulation to the lungs [10, 60].

In 1965, *R. Van Praagh* published a new classification, according to which he distinguishes two types: Type A, where a ventricular septal defect is determined; without ventricular septum, type B. Both types are also classified in terms of the main arteries: type 1 - the aortopulmonary septum is partially formed, where the partially separated main pulmonary artery is identified; in type 2 – the main pulmonary artery is absent due to the complete disappearance of the anteroposterior septum, and both branches of the pulmonary artery originate from the CAT; with type 3 - one lung is supplied with blood by a collateral artery, and one branch is present; in type 4, a large PDA is determined, which leads to narrowing of the aorta at the level of the isthmus [63, 64].

In 2000, a new modified *Van Praagh* classification was proposed, according to which SAT is divided into 3 categories: with confluent pulmonary arteries ("large aorta type"); type 2 with one pulmonary artery missing or "large aorta type with one pulmonary artery missing" (Van Praagh type 3); and type 3 with interruption of the aortic arch or severe coarctation is the "large pulmonary artery type" (Van Praagh type A4) [24, 46].

Russell H.M. et al recently suggested an alternative and more pragmatic categorization centered on the aortic or pulmonary dominance of CAT, which also underscores the nature of systemic intrapericardial pathways [46]. This classification harmonizes various existing categorizations of CAT patients, establishing a common terminology for all healthcare practitioners and serving as the foundation for a more suitable surgical approach, as previously highlighted by Jacobs. Essentially, the patterns of pulmonary artery origin in aortic-dominant patients can be characterized by either a proximate origin from the common trunk, a distinct origin from the common trunk, or one branch of the pulmonary artery emerging from the common trunk while the other branch is supplied by a persistently open ductus arteriosus (Fig. 2).

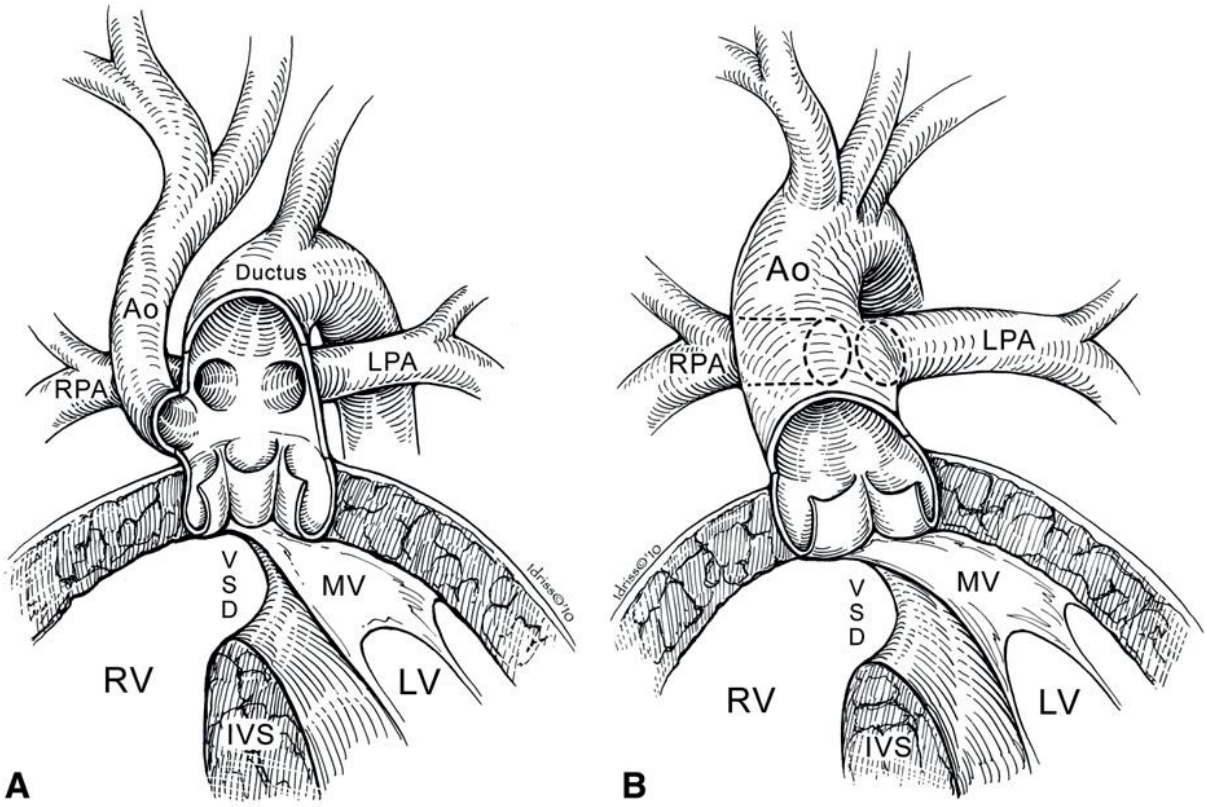

Figure 2. Russell common arterial trunk classification.

(A) *Describes pulmonary trunk dominance as a major pathway with a small aortic component and a truly confluent pulmonary artery component.* ***(B)*** *Describes aortic trunk dominance of adjacent origin from the major pathway of the pulmonary arteries but separate origin. Ao: Aorta; IVS: Interventricular septum; LPA: Left pulmonary artery; LV: Left ventricle; MV: Mitral valve; RPA: Right pulmonary artery; RV: Right ventricle; VSD: Ventricular septal defect. (Paolo de Siena, Mohamed G., Qiang C., Deana Y., Massimo C.Common arterial trunk: review of surgical strategies and future research, Expert Review of Cardiovascular Therapy, 9:12, 1527-1538.)*

Diagnostics

The diagnosis of the common truncus arteriosus can be established prenatally or after the birth of the child using ultrasound diagnostics. Also, as a rule, this defect is suspected when a chest x-ray reveals cardiomegaly and increased pulmonary pattern in children with cyanosis and a cardiac murmur [63].

An accurate preoperative diagnosis is very important since the optimal timing and procedure for truncus arteriosus repair is determined based on morphological characteristics [3, 4, 23, 61].

As the patient ages, optimal imaging modalities will change based on patient characteristics and clinical findings. The advantages and disadvantages of each method should be weighed in each case so that optimal information can be provided to assist clinicians [25].

In diagnosing of CAT, chest **radiography** may be the first simplest method [28]. Based on chest X-ray data, it can be said that the combination of cardiomegaly with an oval configuration, an enhanced pulmonary pattern, a narrow superior mediastinum, a “shoe-shaped” heart and a right-sided aortic arch in a patient with cyanosis convincingly indicates a preliminary diagnosis of the common truncus arteriosus [9, 63]. This modality is often used to monitor and monitor overall cardiorespiratory status and complications [25]. However, X-ray findings are often not diagnostic [44].

Echocardiography is the main, rapid, non-radiation and non-invasive method for diagnosing CAT, both prenatally and during the newborn period [28]. In general, transesophageal echocardiography is rarely performed in children [25, 36, 38, 52, 54, 62].

Prenatal diagnosis of CAT remains challenging and is associated with high rates of elective termination of pregnancy [50].

The accuracy of prenatal diagnosis of congenital heart defects, including CAT, has improved over the past several decades with the standardization of more thorough obstetric ultrasound screening. Fetal echocardiography provides prenatal diagnosis of the fetus, provides a detailed image of the excretory tracts and main arteries, but requires further research [15, 25, 42, 44]. When the pulmonary valve and right ventricular outflow tract cannot be identified on a fetal echocardiogram, differentiation between CAT and other congenital heart defects with semilunar valve atresia may be difficult [1, 50].

The most common indication for prenatal screening is a family history of congenital heart defects, especially in patients with “conotruncal” anomalies, a family history of DiGeorge syndrome, and in fetuses with midline defects. Although prenatal diagnosis of CAT has not been shown to improve survival, it allows for prenatal parental counseling and management team training, and avoids late diagnosis with the risk of progressive coronary steal because pulmonary vascular resistance is reduced, leading to ischemic myocardial dysfunction and sudden death or development of significant pulmonary arterial hypertension. To avoid these complications, the standard of care is complete surgery within the first few weeks of life, for which fetal diagnosis can help better prepare [9].

However, according to *G. Sharland* [10], the frequency of prenatal detection of this type of cardiac anomaly is low. Also, according *to D. Laux et al,* the accuracy of prenatal diagnosis of the anatomical subtype of CAT is insufficient to adapt neonatal management and predict outcome. Truncal valve dysfunction is probably not amenable to reliable prenatal assessment [32].

In the neonatal period, echocardiography remains the primary and, in most cases, the only assessment before surgery, which in turn can guide the cardiologist to select the next best imaging modality [25]. Echocardiography provides an accurate assessment of cardiac anatomy in the truncus arteriosus. This method remains the main preoperative and intraoperative assessment tool, as well as for continuous monitoring of patients with this defect [18, 30, 41].

In turn, c**ontrast-enhanced computed tomography** is a non-invasive method, which makes it possible to view three-dimensional images with high resolution, where the number, type of branching of large collaterals, and other anomalies of the heart and chest organs are determined. [8, 16, 17, 23, 27, 33, 65].

As is known, conotruncal anomalies are often associated with complex and unique geometries. CT has become a reliable diagnostic tool in the preoperative and postoperative evaluation of conotruncal abnormalities. It can provide rapid thin-section images to aid in preoperative planning and postoperative surveillance of conotruncal abnormalities [57]. The greatest clinical use of CT imaging is in critically ill patients or patients with implanted devices. With continued advances in CT technology, including increasingly rapid image acquisition, ever-reducing radiation and contrast agent requirements, and more robust post-processing options, the role of CT is likely to increase in the near future [30, 34, 43, 51, 54, 55].

According *to P. Kumar et al.,* the minimum requirement for obtaining diagnostic images of optimal quality is a multidetector CT with 64 slices [30]. Submillimeter spatial resolution is made possible by the increased speed and resolution available with multidetector CT [25].

Sharma's study, which used 256-slice dual-energy CT, found it to be a useful imaging tool for analyzing persistent truncus arteriosus. Moreover, it helps in treatment planning by simultaneously assessing associated cardiac and extracardiac abnormalities and providing useful airway information [47].

Radiation exposure is a major concern for children, as they are more sensitive to radiation and have a longer life expectancy than adults. Although there is a risk of contrast agent-induced nephropathy, this risk is less compared with catheter angiography [30].

Also, *T. Klink et al.* in studies using low-dose 256-slice CT in 12 patients, cardiovascular computed tomography angiography (CTA) can be performed in neonates and infants with hemodynamic and/or respiratory compromise with very low radiation doses and diagnostic image quality using single-frame axial 256-MSCT without an ECG trigger. Reducing the tube voltage to 80 kV is the key to significantly reducing radiation doses for CTA examinations of the heart and great vessels without compromising image quality or diagnostic performance [27, 64].

Leschka S. et al report the high spatial and temporal resolution provided by multidetector CT, combined with short scanning times, allowing the use of no or only short-term sedation when examining patients with congenital heart defects [33].

Also, according to *Sharma A. et al,* the current dual-energy computed tomography is very valuable for determining the exact anatomy of the common arterial trunk, correctly determining the origin of the pulmonary component and its distance from the origin of the left main coronary artery. This is particularly useful for characterizing associated abnormalities [47].

CT has great potential for demonstrating vascular anatomy, especially the anatomy of the pulmonary arteries and aortopulmonary collateral vessels, which may be difficult to study with echocardiography [27].

Kumar P. et al note the possibility of reproducing three-dimensional printed models of the cardiovascular system using computed tomography methods, demonstrating the exact anatomy of organs, which allows for surgical modeling and simulation of the course of an operation comparable to the real one [30].

Although CT imaging is associated with high radiation exposure, which is a major concern in pediatric patients, technical improvements such as wider detectors, shorter gantry rotation times, tube current modulation, and z-flying focal spot technique, among others, are being used to reduce radiation doses while maintaining the quality of diagnostic images [2, 8]**.**

Cardiac magnetic resonance imaging (MRI) has been used for many years in the evaluation of congenital heart defects. This is a “single window” for cardiovascular anatomy [13, 29], physiology, function and tissue characteristics, making it extremely attractive to health care providers caring for children and adults with cardiovascular disease [14]. An example of its utility is that it is the gold standard in a number of areas, including great vascular anatomy, ventricular volumes [6] and blood flow; In addition, it requires regular internal checks, which makes it very accurate. It provides a comprehensive assessment of conotruncal anatomy, blood flow velocities and does not contain ionizing radiation [28, 30]. The field of view is practically unlimited. Limitations are the presence of metal structures and the presence of arrhythmia [25].

Using the cine mode of cardiac MRI, it is possible to quantify the volumes of the left and right ventricles, ejection fraction and ventricular hypertrophy [14]. In addition, MRI can visualize turbulence in the branches of the pulmonary arteries, identify residual ventricular septal defects, valve regurgitation and stenosis. Although other imaging modalities are used in the initial evaluation of the truncus arteriosus, cardiac magnetic resonance imaging may provide additional and complementary diagnostic information in difficult cases or when diagnosis is delayed [12, 37]. As a preoperative preparation, the purpose of cardiac MRI is to determine the type of common arterial trunk, including the origin of the pulmonary trunk, branches and collaterals; functional truncal valve abnormalities, including regurgitation, stenosis, valve morphology, and number of leaflets; mobility of the TSA valve in relation to the interventricular septum and ventricular septal defect; assessment of the aorta and brachiocephalic vessels, pulmonary veins, associated cardiac anomalies and mediastinal structures [11, 14]. The use of a paramagnetic agent such as gadolinium makes it possible to visualize the common arterial trunk and the branching pattern of the pulmonary arteries from this vessel. It is easy to determine rupture or hypoplasia of the aortic arch, as well as the presence of a common ductus arteriosus. Thanks to this, the displayed heart can be fully defined in the two main classification schemes used - the Collett and Edwards and Van Praagh scheme. Gadolinium, in turn, is safe in children. Prolonged scanning, during which the patient must lie in the same position, may require the use of general anesthesia [25], which is also one of the points for cardiac MRI to become the main method of choice in preoperative preparation.

Cardiac catheterization continues to play an important role in the treatment of patients with the common truncus arteriosus. Although noninvasive imaging techniques have largely eliminated the need for diagnostic catheterization in these patients during the neonatal period, they can still provide valuable information in some cases. Cardiac catheterization, with possible transcatheter intervention during long-term postoperative management, can be used to diagnose and treat a number of problems, including stenosis of the right ventricular outflow tract to the pulmonary artery conduits, stenosis of the branches of the pulmonary arteries, and narrowing of the systemic and pulmonary venous septa. and lesions of the coronary arteries [26].

Although cardiac catheterization and angiography are not usually required in patients with truncus arteriosus, they may be useful to identify aortic arch abnormalities or to assess pulmonary vascular resistance in older children before surgery [11, 25, 49]. Since this is an invasive procedure requiring separate punctures to individually visualize the right and left heart, it is not the main method for diagnosing CAT [30]. This procedure also exposes patients to ionizing radiation [25].

Conclusion

X-rays, although not diagnostically important, can provide guidance for in-depth investigations. Prenatal ultrasound diagnosis can be the first step in identifying heart defects, but is difficult. Echocardiography performed during the newborn period is the main and mandatory method in the diagnosis of CAT. Transesophageal access is usually rarely used and is required to clarify or exclude concomitant pathologies. The physical features of the ultrasound diagnostic method cannot always fully characterize the morphology of the conotruncal region, which is key for planning surgical tactics. In such cases, bolus contrast-enhanced computed tomography can visualize the anatomy in detail and classify the type of CAT accordingly. In addition to this, the method is characterized by speed and demonstrativeness. The Achilles heel, like any x-ray method, is radiation exposure, as well as nephrotoxic and possible allergic effects associated with the administration of a contrast agent. Catheterization is usually an additional diagnostic method. Cardiac catheterization is necessary only for specific indications, preferably for children older than a year. Moreover, for patients older than eight years, for the sake of radiation safety, it is desirable to have MRI without sedation or CTA. MRI of the heart makes it possible to assess the hemodynamics and functional parameters of the heart in this defect, complementing the data from radiation methods. The absence of radiation exposure is a fundamental advantage for use in children. The only limitation can be the presence of ferromagnetic structures.

Increasingly, new technologies are being used in preoperative preparation, such as 3D printing of the heart and blood vessels.

Today, a radiologist has at his disposal a wide range of methods for diagnosing CAT in both the prenatal and postnatal periods. Each method has its positive and negative sides. But none of them can be distinguished by their versatility. The fact of maturation and the patient's condition may redirect the choice of the appropriate modality during diagnosis. However, the contribution of each method to the diagnosis of a defect and the specification of its type cannot be underestimated.

Knowledge of the pathogenesis and clinical picture of the common truncus arteriosus is a key point in diagnosing this defect at an earlier stage, understanding and improving the management of patients with a rare but life-threatening heart defect.

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