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Conjoined twins: embryology, diagnosis, management, and ethical challenges

Abstract

Conjoined twins are an exceptionally rare and severe complication of monochorionic twin pregnancy, associated with substantial perinatal morbidity and mortality, as well as complex ethical and surgical challenges. Their embryological origin remains incompletely understood, with partial fission and secondary fusion as the principal proposed mechanisms. Advances in prenatal imaging have improved early diagnosis and characterization, but management remains highly individualized. We conducted a narrative review of literature identified through PubMed/MEDLINE, Scopus, and Google Scholar (search date: August 15, 2026), supplemented by manual screening of reference lists. Priority was given to original studies, systematic reviews, guidelines, and relevant case reports, with a focus on ethical decision-making frameworks.

Prenatal diagnosis is primarily achieved by first-trimester ultrasound, with fetal magnetic resonance imaging and fetal echocardiography providing complementary assessment of shared organs and vascular anatomy. Prognosis depends on the site and extent of fusion, shared organs, and associated anomalies, particularly cardiovascular abnormalities. Elective separation achieves survival rates of up to 50% for at least one twin in selected cases, while emergency separation carries a ~30% mortality rate per twin pair. Management requires multidisciplinary planning and may include termination, expectant management with planned delivery, or postnatal separation.

Ethical dilemmas, such as termination decisions, surgical timing, and informed consent, are analyzed within a proposed framework that considers fetal viability, parental autonomy, resource allocation, and long-term quality of life. Conjoined twins pose a major diagnostic, therapeutic, and ethical challenge. Early accurate imaging, individualized multidisciplinary management, and further research into embryogenesis and ethical frameworks are essential to optimize outcomes and support affected families.

Keywords: conjoined twins, monochorionic pregnancy, prenatal diagnosis, fetal ultrasound, fetal MRI, surgical separation, embryology, ethical dilemmas, multidisciplinary management

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Emilija Jasovic-Siveska,[1] Katerina Kubelka-Sabit,[2] Elena Krstevska-Kelepurovska[3]

[1]PHO Medihelp Bitola, North Macedonia; University St. Clement of Ohrid, Higher Medical School, Bitola, North Macedonia
[2]Clinical Hospital Acibadem Sistina, Department of Histopathology and Cytology, Skopje, North Macedonia; Faculty of Medical Sciences, Goce Delcev University, Stip, North Macedonia
[3]Center for Public Health Bitola, Department of Microbiology, Republic of North Macedonia; Higher Medical School, Bitola, North Macedonia

Correspondence: Emilija Jasovic-Siveska, MD, PhD, Specialist of Gynecology and Obstetrics, Professor of Gynecology and Obstetrics, PHO Medihelp, Bitola, Solunska Str.218 a Bitola, North Macedonia, University St. Clement of Ohrid, Higher Medical School, Bitola, North Macedonia, Tel +389 70 782 100

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Abbreviations: CT/CTs, conjoined twin/twins; DCDA, dichorionic diamniotic; GI, gastrointestinal; MA, monoamniotic; MC, monochorionic; MCMA, monochorionic monoamniotic; MZ, monozygotic; MRI, magnetic resonance imaging

Introduction

In the last thirty years, the frequency of multiple pregnancies has increased significantly, primarily because of the wider adoption of assisted reproductive technologies. These pregnancies present considerable clinical challenges, as they are linked to a substantially higher risk of perinatal complications and mortality, as well as long-term neurodevelopmental issues, compared to singleton pregnancies. Additionally, they are associated with greater rates of preterm delivery and restricted fetal growth, both of which play a major role in negative birth outcomes.[1–3]

Determining the exact incidence of multiple pregnancies is challenging, as many such pregnancies end in early miscarriage. The vanishing twin phenomenon occurs when one embryo is resorbed, leading to a singleton pregnancy or, if initially a higher-order multiple, a reduced-number twin pregnancy. Research shows that approximately one in 89 conceptions results in a twin pregnancy. Furthermore, the use of assisted reproductive techniques has significantly raised the global occurrence of multiple pregnancies.[2,3–5]

Monochorionic (MC) twin pregnancies are linked to elevated perinatal morbidity and mortality due to shared placental vascular connections. Typical complications include twin-to-twin transfusion syndrome, twin anemia–polycythemia sequence, twin reversed arterial perfusion sequence, monoamniotic gestation, and conjoined twinning (CT).[2,3–5]

Among MC complications, conjoined twinning represents one of the rarest and most severe, introducing unique ethical and palliative care dilemmas. The overall incidence stands at 1.5 per 100,000 births, with roughly half of cases resulting in live births. However, prevalence figures vary significantly depending on the specific type of conjoined twins and shifting socio-economic or geographical factors. Detailed prevalence data for different conjoined twin types remain largely unavailable, rendering many cases that do not conform to standard morphological classifications as distinct yet perplexing entities. Clinicians widely recognize that CTs are categorized into asymmetrical and symmetrical phenotypes.[6,7] The survival rate for conjoined twins is low, and the overall prognosis remains poor.[8,9] By clinical definition, conjoined twins are monoamniotic (MA), and female cases outnumber male cases by a ratio of approximately 3 to 1.[4]

CTs have extremely low survival rates in early infancy. Fetal demise occurs in up to 60% of cases, with ~35% surviving beyond the first day. [7] Historically, conjoined twins have been viewed through diverse

cultural lenses, ranging from awe and reverence to fear and stigma, leading to varied societal responses. Academic interest reached its height in 18th to early 20th century Europe, although early investigators lacked understanding of molecular embryology. Monochorionic monoamniotic (MCMA) pregnancies are often associated with congenital anomalies, including severe cardiovascular or cerebral conditions in conjoined twins. Also, these pregnancies include gastrointestinal abnormalities (Meckel's diverticulum, bowel atresia, and anomalous hepatic venous drainage), genitourinary anomalies (duplex kidney, renal dysplasia, pelvic-ureteric junction obstruction, and vesicoureteric junction obstruction), and musculoskeletal anomalies (congenital hip dislocation and talipes).[7,9,10]

Currently, two primary theories exist: partial fission and secondary fusion. However, both have limitations, including overlapping terminology that creates semantic ambiguity. Problematically, their hypothetical deductions have been uncritically accepted as fact, requiring critical re-evaluation.[10]

This article aims to provide a comprehensive overview of the various aspects involved in the enigmatic development of symmetrical conjoined twins, including their diagnosis and management.

Methods

We performed a narrative literature review to compile and summarize existing evidence on the embryology, epidemiology, pathophysiology, diagnosis, classification, management, and ethical considerations of conjoined twins in monochorionic pregnancies.

A thorough search was conducted across PubMed/MEDLINE, Scopus, and Google Scholar on August 15, 2026, for articles published from January 1, 2000, to August 15, 2026. The search strategy incorporated the following keywords and Medical Subject Headings (MeSH) terms, used both individually and in combination: "conjoined twins," "monochorionic twins," "monochorionic pregnancy," "embryology," "epidemiology," "diagnosis," "management," "postnatal outcome," "ethical dilemmas," and "multidisciplinary care." Example search string: (conjoined twins[MeSH]) AND (monochorionic[MeSH] OR monoamniotic[MeSH] OR ethics[MeSH]).

For ethical decision-making literature, we additionally searched bioethics databases (e.g., PhilPapers, Bioethics Literature Database) and clinical ethics guidelines to identify frameworks relevant to conjoined twin management.

The reference lists of relevant articles, review papers, clinical guidelines, and consensus statements were manually reviewed to identify further eligible publications.

Study selection

We prioritized original research articles, systematic reviews, meta-analyses, consensus statements, international practice guidelines, and case reports and small case series (given the rarity of conjoined twins). Ethics-focused publications (e.g., case analyses, framework proposals) were included if they addressed prenatal counseling, surgical decision-making, or resource allocation.

Only publications written in English were included. Formal quality assessment was not performed due to heterogeneity in study designs, but methodological limitations were noted where relevant.

Embryology, etiology, and pathogenesis of conjoined twins

During later developmental stages, incomplete division of the primitive node and streak can lead to the formation of conjoined twins. The classification of these twins is based on the nature and extent of their union.[11,12]

The exact embryological origin of conjoined twins remains unclear. Monoamniotic (MA) pregnancies typically arise from a single fertilized egg. Monozygotic (MZ) twins develop from the division of a single fertilized egg, with conjoined twinning arising from either incomplete fission or secondary fusion of the embryonic disc. Two competing theories attempt to explain conjoined twinning:

a) **Fission theory:** Proposes incomplete splitting of the embryonic axis (e.g., at Carnegie stage 6, days 12–15 post-conception). Proponents such as Kaufman highlight the symmetry of conjoined twins and the consistency of union sites as supporting evidence. Kaufman argues that the higher incidence of mirror-imaging in conjoined twins (compared to separate monoamniotic twins) weakens the fusion hypothesis, as fusion would not predictably increase mirror-imaging.[13,14]

b) **Fusion theory:** Proposes secondary fusion of two initially distinct embryonic discs. Spencer (2003), a prominent supporter of this theory, argues that fusion can explain specific patterns of union, particularly in cases where asymmetrical conjoining (e.g., parasitic twins) is observed.[15] Critics of fusion theory, such as Kaufman, contend that it fails to account for the symmetry and consistent union sites seen in most conjoined twins.

c) **Current consensus:** Neither theory fully explains all cases, and both mechanisms may contribute to the phenotypic diversity of conjoined twins. Further molecular research is needed to clarify the underlying pathways.

Dizygotic Conjoined Twins: Dizygotic (DZ) conjoined twins are extremely rare. While fusion is the proposed mechanism for DZ conjoined twins, this remains theoretical, and no definitive evidence confirms this pathway. This claim requires further investigation, and current data are insufficient to draw firm conclusions.

Regardless of the true pathogenic mechanism behind conjoined twinning, it is reasonable to hypothesize that a specific "conjoined twinning event" occurs during early embryonic development. This event results in aberrant hypoblast configurations, leading to the duplication of the earliest visible signs of gastrulation—the primitive streak, node, and/or pit—within a single cell mass or bilaminar embryonic disk. Theoretically, the duplication and subsequent outgrowth of these morphogenetic primordia may occur in a directly opposing manner, producing ventrally or caudally conjoined types, or in an angulated and somewhat parallel arrangement, resulting in laterally conjoined phenotypes.[10,15]

While the fission theory is currently favored by some researchers, neither hypothesis fully explains the phenotypic diversity of conjoined twins, and further molecular research is needed.

Classification and types of conjoined twins

Conjoined twins can be classified through various systems. One approach categorizes them as either symmetric or asymmetric. Asymmetric twins are defined by significant underdevelopment of one

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twin, often called "parasites" or "heteropagi." Conversely, symmetric conjoined twins can be further divided into four groups according to the fusion site: ventral, lateral, caudal, and dorsal. However, many fusion patterns overlap including latero-ventral, latero-caudal, and intermediate unions resulting in a diverse and heterogeneous phenotypic spectrum. This suggests a continuum among the different types of conjoined twins.[15,16]

However, in clinical practice, classification based on the fusion site is most widely used. Conjoined fetuses are categorized into distinct types based on the specific site of fusion with the co-twin.[17–19] Table 1 summarizes the classification of conjoined twins by fusion site, with incidence percentages derived from published case series and reviews. [12,17-19]

Table 1 Classification of conjoined twins by fusion site and incidence12, 17-19

Type	Description	Incidence (%)
Cephalopagus	The vertex and umbilicus are fused together. They have a single conjoined cranium that has either one composite face or two faces on the opposite side of the head. The upper digestive tract, heart, liver, and thorax are united together until the Meckel diverticulum, where they separate. Typically, there are four limbs and legs. Usually, nonviable due to shared brain and cardiac structures	5.5
Thoracopagus	Joined at the chest and umbilicus; most common type but with low survival rate. Prognosis varies based on the extent of cardiac sharing, and some cases have undergone successful separation	42
Omphalopagus	Joined twins that share a portion of the abdominal wall and GI tract. If effectively separated, these kinds of twins have the best prospects of survival	5.5
Ischiopagus	Ischiopagus twins have varying degrees of severity in the spine, central nervous system, gastrointestinal, and genitourinary tracts. It is a surgical difficulty to separate them	1.8
Parapagus	Conjoined twins known as parapagus twins are fused ventrolaterally and are found side by side. Typically, the umbilicus, abdomen, and pelvis of this kind of conjoined twins are shared. There may be one symphysis pubis and one or two sacra in the conjoined pelvis. The genitourinary tract, gallbladder, liver, and pancreas are other organs that are frequently shared. The lower gastrointestinal tract (single colon and rectum) is also frequently shared	11.6
Craniopagus	There are two types of craniopagus: partial and complete. In the partial version, the union has a limited scope, especially in terms of its depth, and it is assumed that both offsprings would survive and go on to lead everyday lives after separation. The two brains can be thought of as existing within a single cranium in the complete form, which has three identified types, and several gross intracranial abnormalities start to appear. These include a massive vascular anomaly, a deformation of the base of the skull, and a deformity and displacement of the cerebrum	3.4
Pygopagus	They share the spinal cord, genitourinary system, gastrointestinal system, and sacrum to varying degrees and are linked in the sacral region. They represent a set of conjoined in which the embryonic axis' caudal separation was imperfect	1
Rachipagus	Conjoined twins of the rachipagus variety are incredibly rare. They are separated from one another and linked in the dorsal aspect. The spinal cords may be shared as a result of the occiput fusing with various vertebral column segments. Above the sacrum, the fusion comes to an end. Legs and faces seem to be separate	1
Unspecified	The unspecified classification reflects complex or mixed fusion patterns that do not fit standard categories, highlighting the phenotypic diversity of conjoined twins.	21.4

Notes: Incidence percentages are derived from published case series and reviews and do not represent population-based data. Because these series differ in denominators and source populations, the percentages are not directly comparable and do not sum to 100%; the remaining 6.8% corresponds to cases not classified in the source series. Prognosis varies widely based on specific anatomy and associated anomalies; generalizations (e.g., "usually nonviable") should be interpreted cautiously. The data presented in Table 1 are taken from reference 19 (Sorrenti S, Mascio D: Conjoined Twins, Visual Encyclopedia of Ultrasound in Obstetrics and Gynecology, www.isuog.org, October 2024).

Diagnosis of conjoined twins

Accurate determination of chorionicity is fundamental in the assessment of twin pregnancies because ultrasound examination performed between 11+0 and 13+6 weeks of gestation provides the highest diagnostic accuracy for determining chorionicity and amnionicity. Key first-trimester ultrasound parameters include measurement of crown–rump length (CRL), identification of placental number and location, and characterization of the intertwin amniotic membranes. When gestation exceeds 14 weeks, fetal age is more reliably estimated using head circumference. Establishing chorionicity and amnionicity in twin pregnancies is essential; when ultrasound is performed before 13+6 weeks, chorionicity can be determined with approximately 95% accuracy. The presence of two placentas, together with the characteristic "lambda" or "delta" sign (triangular thickening at the site of membrane insertion), supports dichorionicity. An additional supportive finding is the visualization of two distinct placental masses. Discordant fetal sex is indicative of a dizygotic (and therefore dichorionic) pregnancy. Amnionicity is assessed by evaluating the intertwin membrane: a 'T-sign' (membrane departing the placental surface at approximately 90°) is suggestive of a monochorionic pregnancy, whereas dichorionic pregnancies typically show a lambda sign. Absence of a dividing membrane raises suspicion of monoamnionicity and, in conjoined twins, no intertwin membrane is present at all.[2,3,20–22]

Improvements in ultrasound technology have led to the earlier detection of conjoined twins, most often in the first trimester. Although first-trimester ultrasound (11–13+6 weeks) is optimal, conjoined twins may also be identified later in pregnancy; reports of reduced second-trimester diagnostic accuracy reflect single-center experience rather than controlled comparisons, and this claim should be interpreted cautiously. [4] Given the substantial risks of morbidity and mortality associated with continuing such pregnancies, many parents elect for

termination. Among families who choose to continue, approximately 25% of fetuses are expected to survive to hospital discharge, and nearly all survivors experience significant morbidity.[23]

Conjoined twins are suspected when two separate fetuses cannot be visualized within a single gestational sac. A meticulous evaluation of the shared anatomical structures is crucial in such cases to enable precise classification of the type of conjunction. In this setting, color Doppler imaging can be particularly informative for delineating shared organs: for example, applying color Doppler to the cranial structures in suspected craniopagus twins may reveal common vascular channels, often corresponding to the sagittal sinuses. Additional sonographic indicators that support the diagnosis include a bifid appearance of the first-trimester fetal pole, the presence of an apparently single umbilical cord containing more than three vessels, persistent alignment of the heads at the same level and within the same body plane, and an inability of the fetuses to alter their relative positions over time. Three-dimensional sonography may provide greater diagnostic accuracy than two-dimensional imaging alone, but its superiority lacks robust comparative evidence and should be interpreted cautiously.[16,19,22–25]

Fetal magnetic resonance imaging (MRI) is particularly valuable in assessing shared cardiac structures (e.g., single atrium/ventricle in thoracopagus twins), neural fusion (craniopagus), and complex vascular anomalies. However, MRI should not be used in isolation to determine cardiac separability or whether pregnancy continuation is advisable; findings must be correlated with echocardiography and clinical context.[4,16,25]

While genetic anomalies are rare in conjoined twins, prenatal genetic testing (e.g., amniocentesis or chorionic villus sampling) may be considered if associated structural abnormalities are detected. Non-invasive prenatal testing (NIPT) is a screening tool (not diagnostic) and may be offered to assess for common aneuploidies, but diagnostic testing (e.g., amniocentesis) is required for confirmation. Genetic counseling is strongly recommended when abnormalities are identified.

Prognosis is ultimately dictated by the extent and location of the union between the twins; consequently, comprehensive ultrasound evaluation is required to fully characterize the nature and complexity of the connecting structures. The most frequent site of conjunction is the thorax, with the twins typically oriented face-to-face, and potential sharing of bowel, liver, and cardiac structures. Detailed mapping of vascular anatomy and shared organs is essential for planning postnatal surgical management. When delivery is anticipated, it should be performed by cesarean section in a tertiary center equipped to address the complex surgical needs of the neonates.[19,23]

Conjoined twins must be differentiated from uncomplicated monochorionic monoamniotic pregnancies, in which fetal positioning or cord entanglement that restricts relative fetal movement may mimic the sonographic appearance of conjoined twins.[19]

Perinatal management and outcomes

Conjoined twins are associated with a markedly elevated risk of morbidity and mortality, with fetal demise occurring in up to 60% of cases. A review encompassing 379 cases documented a live birth rate of 45%, while 27% resulted in stillbirths and 27% in pregnancy terminations.[26]

Surgical separation of conjoined twins represents a highly complex undertaking that necessitates a coordinated, multidisciplinary team approach.

Termination of pregnancy may be offered in the second trimester for non-viable cases (e.g., shared heart with no possibility of reconstruction) to minimize maternal risks. However, decisions must be individualized based on fetal anatomy, gestational age, and parental values. Termination in the second trimester is not universally preferable; maternal risks, ethical considerations, and local laws must be considered. Vaginal delivery may be possible for non-viable cases, while cesarean section is preferred for viable conjoined twins to prevent dystocia and birth trauma.[4,27]

Multidisciplinary counseling (obstetrician, neonatologist, ethicist, psychologist) is essential to support parental decision-making. Such decisions should be supported by thorough, fully informed parental counseling. Cesarean delivery is preferred for conjoined twins to prevent dystocia and birth trauma, though vaginal delivery may be considered in preterm or non-viable cases where fetal survival is unlikely.[27]

The prognosis for liveborn infants is primarily determined by the site of fusion, the specific organs that are shared, and the presence of associated anomalies—particularly cardiovascular malformations—which critically influence the feasibility of surgical separation.

The most favorable survival outcomes are observed in omphalopagus twins, owing to the relatively high technical feasibility of surgical intervention.[28] In contrast, cephalopagus and thoracopagus conjoinments are often nonviable, but exceptions exist (e.g., cases with partial cardiac sharing). All other forms of conjoined twins require comprehensive preoperative assessment to evaluate operability.[12]

Even when surgical separation is technically achievable, postoperative mortality remains substantial, predominantly due to infectious complications or sequelae arising from associated anomalies.[12]

Ethical challenges in conjoined twin management: a decision-making framework

Conjoined twins present ethical dilemmas that cannot be resolved through clinical judgment alone but demand a structured, multidisciplinary approach. We propose a decision-making framework built on four core principles. This framework is an adaptation of principles described in prior analyses of conjoined-twin separation, notably Thomas et al.,[29] synthesized here for prenatal counselling rather than proposed as an entirely novel scheme.

Fetal viability and surgical feasibility: Ethical deliberation begins with a rigorous assessment of whether separation is achievable and what survival can realistically be expected, based on detailed prenatal imaging (ultrasound, MRI, echocardiography) and postnatal surgical evaluation. Anatomy may itself foreclose the operative pathway: in thoracopagus twins sharing a single heart, separation may be contraindicated when cardiac reconstruction is impossible, necessitating a shift toward structured non-operative care.[29]

Parental autonomy and informed consent: In the prenatal setting, the pregnant patient (together with her partner and family, as she chooses) may decide according to her values, cultural beliefs, and religious perspectives. This autonomy is not absolute, however; state intervention has historically overridden parental refusal when a salvageable twin's life was at risk.[30] Informed consent must communicate prognostic uncertainty, survival rates and long-term outcomes alongside the risks of separation (mortality, morbidity, lifelong care) and alternatives including termination, expectant management, and palliation.[29,31] Because the clinical picture evolves, counseling should be repeated throughout pregnancy to incorporate

new information, alleviate parental distress, and sustain an accurate understanding of the prognosis.[30]

Resource allocation and equity: Separation surgery consumes hundreds of clinical hours, multidisciplinary delivery-room networks, and prolonged intensive postoperative care.[32,33] Healthcare systems must balance individual cases against broader public health needs, accounting for specialized surgical centers, three-dimensional modeling equipment, and multi-day anesthetic coordination.[33] Case selection must remain transparent to ensure fairness and avoid implicit societal bias.[29]

Long-term quality of life (QoL): Providers must resist assuming that physical disability or bodily dependence equates to poor QoL, as such expectations are often clouded by ableist societal biases.[29] Deliberation should instead center on concrete metrics: neurological outcomes (cognitive function, motor skills), functional independence, and psychosocial well-being (family support, societal integration).[29] Throughout, the twins' psychological individuality must be weighed against the physical reality of their biological conjoinment.[34]

Special considerations: Several situations resist resolution within these principles alone. When one twin's survival depends on the other's sacrifice—as with a shared heart and a single dominant twin—frameworks must reconcile beneficence, non-maleficence, and justice, and ethics committees must navigate the tension between the imperative to do no harm and the necessity of preserving at least one life.[34] Prognostication itself is volatile; parents should be counseled on the full range of possible outcomes rather than a single predicted trajectory.[29] Finally, non-operative care is not synonymous with palliation: some twins, such as omphalopagus pairs with minimal organ sharing, may survive long-term without separation, and this path should be framed as a viable, specialized option supported by sustained institutional and familial collaboration rather than as imminent death.[35]

The role of ethics consultation: Formal ethics consultation, typically through clinical ethics committees, is particularly valuable when parental and medical opinions conflict, when resource limitations constrain options, or when cultural or religious beliefs substantially shape decisions concerning life, death, and physical individualization.[35]

Discussion

Conjoined twins are almost always monozygotic, arising from a single fertilized egg and leading to MCMA placentation. Dizygotic conjoined twins are exceedingly rare, and fusion has been proposed, but not confirmed as the underlying mechanism.[28,36] The underlying embryogenic defect is thought to result either from incomplete separation of the embryonic discs at 15–17 days post-fertilization or from secondary fusion of two initially distinct embryonic discs.[36] To date, no definitive genetic or environmental risk factors have been conclusively associated with their occurrence. Classification is based on the site of bodily fusion, with the Greek suffix *pagus* (meaning "fixed") appended to denote the specific type.[13]

Surgical separation of conjoined twins constitutes a highly complex procedure that demands a coordinated, multidisciplinary team approach. The reported success rate of ~50% refers to survival of at least one twin after elective separation in selected cases. Emergency separations carry substantially higher mortality (~30%), but the two groups are not directly comparable: emergency cases arise from acute deterioration in sicker, often unselected twin pairs, whereas elective cases are carefully selected after complete preoperative assessment.[29]

Non-operative management is pursued when complex cardiac anomalies render separation impossible and preclude even the reconstruction of a single functional heart. Emergency separation is indicated for twins who develop life-threatening complications, such as rupture of an exomphalos, cardiac instability, hepatic injury with significant hemorrhage, intestinal volvulus with necrosis, or the demise of one twin.[17] Elective separation is undertaken when the infants have achieved an optimal physiological condition.[28]

Prenatal diagnosis of CTs may arise in twin gestations complicated by polyhydramnios, the presence of a single placenta, and the absence of distinct amniotic membranes. Ultrasonographic diagnosis relies on the identification of several characteristic signs. When investigations reveal a shared heart or other complex anomalies that preclude safe separation, termination of pregnancy may be offered as one option among several; such decisions must be individualized and supported by comprehensive, fully informed parental counselling.[17] If termination is chosen, second-trimester termination may reduce maternal morbidity by permitting vaginal delivery and avoiding cesarean section, but optimal timing of delivery remains uncertain and should be individualized according to fetal anatomy, viability, maternal factors, and multidisciplinary specialist assessment.

limitations of the evidence: This review article has certain limitations, and they are: small sample sizes (most data come from case reports and small series), heterogeneity in anatomy (conjoined twins vary widely in fusion site and organ sharing), referral bias (tertiary centers may report better outcomes due to selection of viable cases), and publication bias (successful separations are more likely to be published).

Regarding ethical implications, this review highlights the need for a structured ethical framework to guide prenatal counseling, surgical decision-making, and resource allocation. Further development of this framework through clinical ethics consultation and multidisciplinary collaboration, is essential to standardize care and support families facing these complex decisions.[30]

Conclusion

Conjoined twins are a rare but profound challenge in obstetrics and neonatology. Advances in prenatal imaging, multidisciplinary care, and ethical discourse are critical to improving outcomes and supporting affected families.

Future research priorities include: unraveling the molecular basis of conjoined twinning, standardizing management protocols to guide clinical decision-making, and developing robust ethical frameworks to address prenatal counseling and surgical dilemmas.

In summary, conjoined twins require individualized, evidence-based, and ethically sound management to optimize survival and quality of life for both infants and families.

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Conflicts of interest

The authors declare no potential conflicts of interest.

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