Statistics

Conjoined twins occur in roughly 1 in every 200 identical twin pregnancies and are always identical. Actual numbers for conjoined births vary from 1 in 20,000 to 1 in 100,000 pregnancies, and 40-60% are stillborn, with many others dying within the first few days after birth. About 70% of conjoined twins are female, the reason for which is unknown.

Separation has been attempted on almost all conjoined twins born since the 1950s with varying results, although the first successful separation was performed in Basle, Switzerland in 1689 on twin girls born joined by a ligament at the sternum (xiphopagus). In 1900, Brazilian sisters Maria and Rosalina were separated at the age of 9 with both surviving. The first conjoined twins to be successfully separated in "modern" times are generally believed to be Catherine and Caroline Mouton of Louisiana, born joined at the lower back (pygopagus)and separated in 1953 at 8 days of age. Both survived the operation, but Catherine committed suicide in 1985.

Formation There are two theories of how conjoined twins are formed. More widely accepted is the "fission theory" which states that conjoined twins occur when a fertilized ovum (egg) begins to split into identical twins, but is somehow interrupted during the process and develops into two partially formed individuals who are stuck together.

The "fusion theory" has been around much longer, but only with modern breakthroughs in understanding embryology has it begun to look more probable. According to this model, twins become conjoined *after* the fertilized ovum intially splits into identical twins. While lying side-by-side in the uterine wall, the two embryos become fused together. A human embryo, in its earliest stages, consists of three layers of cells. These cells "seek out" cells of the same type and thus bond together to form individual organs. When two newly-separated identical twin embryos are lying in close proximity to one another, sometimes signals get mixed and cells will attach to other cells of the same type, but that belong to the other twin.

The easiest example of the fusion theory to understand is the formation of craniopagus twins. One of the three "sheets" of tissue that comprises the embryo will ultimately

"roll up" to become the neural tube - the spinal chord and brain. Like rolling a piece of paper into a tube and taping the edges, the edges of this newly-formed tube will adhere together. Spina bifida, a type of paralysis, is caused when these edges fail to join properly. For this to happen, the cells at the edges of the neural tube must be able to find one another in order to bond. However, when two neural tubes are present, the cells at either end of the tubes might accidentally "find" each other, and become stuck.

This "fusion theory" of conjoined twinning has been espoused in recent years by such experts as Dr. Rowena Spencer, who has studied over 1,300 sets of conjoined twins in her 50-year career, and Armand Marie LeRoi, author of the book *Mutants* which discusses the embryological causes behind many of history's so-called "freaks".

Not surprisingly, the media tries to dumb down the science of conjoined twinning with such inaccurate phrases as "fused since birth" or "joined at birth" - making it seem as though conjoined twins are sort of forced into one body during the birthing process. Perhaps a more scientifically accurate description would be "joined since shortly after conception."

Types of conjoined twins

Conjoined twins are categorized by a set of adjectives ending with the suffix "-pagus" from the Greek word for "fixed". Early teratologists such as Ambroise Pare and Geoffrey St. Hillaire were among the first to identify and name the various types of conjoined twins. Many actual sets of twins do not fit perfectly into any of these classifications, and the terms are often combined to describe these twins.

Thoracopagus (left). Joined at the upper chest, from the clavicle to the sternum, each with their own separate heads, arms and legs. The heart is always involved in the conjoinment; some thoracopagus twins have two separate hearts in a single pericardium (heart sac), while others share a single, malformed heart. Thus separation is extremely risky and both twins often die, despite doctors' efforts. In a very few cases, twins sharing a heart have survived for several years. Ruthie and Verena Cady of Rhode Island lived to the age of 7 and were healthy, active girls who rode a tricycle, swam, did gymnastics and went to school. Their shared heart had only 3 chambers. Thoracopagus twins are the most common type, accounting for around 35% of all cases.

Omphalopagus (right). Joined at the abdomen, from the sternum to the groin and often sharing a liver and portions of the digestive system. These twins have separate hearts, heads, arms and legs. Separation is usually successful. Ronnie and Donnie Galyon, born in 1951, are the only non-separated omphalopagus twins in the world today. About 30% of cases.

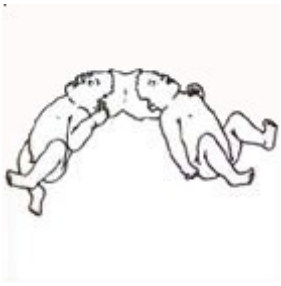
Xiphopagus (left). Joined at the xiphoid process (part of the sternum) and usually linked only by cartilage and soft tissue. These twins share no vital organs but often have conjoined livers. They are by far the easiest to separate. Chang and Eng Bunker (1811-1874) were xiphopagus twins with conjoined livers. Also called sternopagus. About 3% of cases.

Ischiopagus (right). Joined at the ischium (front pelvis) and lower spine (sacrum), with spines at 180-degree angles to one another. These twins can have three legs (tripus) or four legs (tetrapus). About 70% of ischiopagus twins have four complete legs. In tripus cases, the third leg is a fusion of two legs that is not controlled by either twin and is therefore useless. Masha and Dasha Krivoshlyopova of Russia (1950-2003?) were ischiopagus tripus twins, their third leg having been removed when they were 16 years old. About 14% of cases.

Ischio-omphalopagus. Combination of ischiopagus and omphalopagus, with spines joined in a "Y"-shape. These twins usually have three legs and a single set of genitalia.

Parapagus. Joined side-by-side at the torso, having separate heads and arms and usually 3 legs. This is not a totally accurate term, since many of these twins are technically "xipho-thoraco-ischiopagus" or "xipho-omphalo-ischiopagus" or other long, cumbersome appellations.

Dicephalus (right). A subset of parapagus. Twins share a body from the neck or upper chest downward, having only two legs and one set of reproductive organs. They can have two, three or four arms. If separate hearts are present, these twins have a good prognosis for long, healthy lives if not separated. Abigail and Brittany Hensel (1990-) are healthy young girls who are dicephalus twins with two hearts. They love to play sports and are not at all limited by their conjoinment.



Craniopagus (left). Joined by a portion of the skull, with distinctly separate necks and bodies. Separation is very risky since these twins can share parts of the brain, as well as blood circulation. Craniopagus twins are further classified by the portion of the skull which is shared: vertical craniopagus - joined at the top of the head with bodies at a 180-degree angle to one another; occipital craniopagus - joined at the back of the head; frontal craniopagus - joined at the forehead; parietal craniopagus - joined at the side of the head.

Cephalopagus (right). Twins with conjoined necks and heads but separate bodies. Due to malformations in the brain, these twins are never viable. Those that are not stillborn die within a few hours. Also called syncephalus or janiceps.

Cephalothoracopagus (left). A combination of cephalopagus and thoracopagus. Twins with conjoined heads, necks and chests, with separate arms and legs. These usually share a heart as well as a brain and are also non-viable. Also called epholothoracopagus, prosopothoracopagus or craniothoracopagus.

Diprosopus. Another subset of parapagus, describing a single organism with two faces on a single head. It is questionable whether some cases of diprosopus are even caused by twinning (see parasitic twins); however, if diprosopic babies are a form of conjoined twins, it would support a fission theory of conjoined twinning. This condition is rare in humans but relatively common in other animals such as sheep, cattle and cats. Gould & Pyle refer to this as "disprosopus" but I believe this to be a spelling error.

Pygopagus (right). Joined back-to-back at the pelvis and lower spine, each with separate hearts, heads and limbs. Almost all pygopagus twins are female; most male twins of this type are stillborn. Historically, many pairs of conjoined twins who live to adulthood have been pygopagus. Separation is usually successful, although separating a conjoined spinal cord can lead to paralysis below the point of junction. Also called illeopagus.

Rachipagus (left). Joined back-to-back from the pelvis to the shoulders. I have never come across a case of rachipagus and believe they exist only in theory.

Parasitic twins. Any of the above types can result in a case of parasitic twins if one twin dies or receives inadequate nutrition while in utero. See my Parasitic Twins Info Page for more.

Can conjoined triplets (or other higher multiples) exist? In theory it

would be possible for identical triplets to be conjoined, however there has never been a substantiated case of such. In identical triplets, a fertilized egg splits in half, then one of the halves splits a second time. Because conjoined twinning happens when the egg splits later in the pregnancy than usual, it would be very unlikely, if not impossible, for this incompletely-divided egg to split a second time. However, of the approximately 200 sets of conjoined twins born each year, about 3 or 4 sets have a non-conjoined triplet, and this sibling can be either identical or fraternal.

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