Special Section: The Best Interests of a Child: Problematic Neuroethical Decisions

Separation of Craniopagus Twins

A Clinical, Legal, and Ethical Conundrum

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Abstract: Separation of craniopagus twins is fraught by ethical issues. The surgery is high risk and may involve the sacrifice of one twin. We review surgical successes in separation of craniopagus twins and consider ethical and legal concepts affecting the decision to undertake such procedures. Our discussion considers how Gillett's potentiality principle and the concept of moral permissibility may be used to arrive at fair and realistic decisions.

Keywords: craniopagus; neurosurgery; ethics; confidentiality; autonomy; potentiality; sacrifice; morality

Introduction

Craniopagus twins are the most rare form of conjoint twins and occur in approximately one per 2.5 million births.[1,2] Approximately 40% are stillborn and a 33% perinatal mortality means that very few survive to adulthood.[3] A plethora of ethical issues—including issues of confidentiality, autonomy, consent, twin sacrifice, and expert versus experimental surgery—surround the management of craniopagus twins. Much of the literature on twin separation has been precipitated by high-profile legal cases, such as that of the Manchester twins Mary and Jody in the UK, and entwines ethical discussion with legal argument. The objective of the following discussion is to review the success of surgery to separate craniopagus twins and to identify ethical and legal concepts involved in the decision to separate conjoined craniopagus twins, for clinicians and others involved in such rare and challenging cases. Our concern, as clinicians, is to navigate through these dilemmas while remaining focused on arriving at a just and practical solution in each case. Legal considerations for and against surgical separation of conjoined twins are constrained by the necessity to consider each twin as a separate entity. We consider how ethical analysis, including Gillett's potentiality principle and the concept of moral permissibility, may be used in arriving at fair and realistic decisions.

Surgical Separation of Craniopagus Twins

Winston et al. identified several historical landmarks in the surgical separation of craniopagi that are worth reviewing.[4] The first reported attempt at surgical separation was early in the sixteenth century: the twins were joined at the forehead, and one died at the age of ten, prompting an attempted separation that resulted in the death of the surviving twin.[5] The next reported attempt—made by Cameron at Guy's Hospital in London—was not until 1928. However, both twins died—one instantaneously on entering the subdural space and the other within a few hours of surgery.[6] It is interesting to note that Cameron described

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the twins as "the craniopagus monster" and administered anesthetic to only one twin. The first successful separations did not occur until the 1950s; a single twin survived separation in 1953,[7] and both survived in 1957.[8,9] Perhaps two further ethical landmarks should be added: (1) two sets of craniopagus twins reported in 1974 survived into their twenties but refused surgical separation, as they felt they had a satisfactory and meaningful life,[10] and (2) another set, the Bijani twins, requested surgical separation but did not survive surgery.[11]

Todorov et al. reviewed the literature of surgical separation available up until 1974 and reported 14 cases that were sufficiently well documented to permit analysis.[12] They found that 50% of the individual twins died during surgery or shortly after. Of the 11 that survived and were available for follow up, 7 were functioning normally, and 4 had a neurological deficit or intellectual disability (the authors point out that there are likely to be many more attempts at separation not reported in the literature). Another review of the literature in 1987 found 30 reported attempts at separation in the twentieth century and 1 in the sixteenth century; although 70% survived the actual surgery, most survived for only for a few hours, and only 43% of cases involved survival of one (20%) or both (23%) twins beyond the perioperative period.[13]

There have been many advances in surgical techniques and in the investigations available to assess twins prior to surgery, but a 15-year review of craniopagus twin separation attempts reported between 1995 and 2010 revealed persistent mortality rates of 50%.[14] Although various factors have been linked with a better chance of success (lesser extent of the cranial junction, frontal union, vertical union, surgery at a young age, and staged surgery), the only factor that appears strongly associated is the anatomical complexity of the union. The 50% operative mortality in the literature is in keeping with views held by experienced teams involved in separating conjoined twins; these professionals consider that operative mortality should not exceed 50%–60%.[15] Whereas a fundamental consideration is the expertise of the team undertaking the surgery, such cases are so rare that it is difficult for any team to gain a large experience. What is more, availability of expertise needs to be balanced against time-critical factors, as Winston et al. indicate:

> Physicians and surgeons should not be criticized for trying to save these children, but the high risk of a bad result must be recognized when such a complex operative procedure is undertaken under less than optimal conditions. Optimal conditions would include adequate knowledge of the vascular anatomy and a well-conceived anesthetic and operative plan: these are difficult if not impossible when the death of one or both children is imminent.[16]

However, a line should be drawn somewhere, and Annas suggests that if the healthcare team has insufficient experience with a procedure, then it should be deemed experimental, so that the parents have an unquestionable right to refuse.[17] Indeed, in the Mary and Jodie case there was a dispute about which center should undertake the surgery, with one hospital claiming to be a "centre of excellence," having carried out 12 separations compared to the other center's 2 separations.[18] Notwithstanding the importance of expertise, teams attempting separation surgery can benefit from others by liaising with those who have more experience.

Surgical separation of craniopagus twins poses several surgical challenges. The complexity of the shared cranial venous anatomy poses a risk of catastrophic hemorrhage, the most feared complication and, perhaps, the main reason for failed attempts at separation.[19] Separation of the shared venous outflow of the brains also creates a risk of venous infarction and raised intracranial pressure if venous drainage is preserved for one twin and sacrificed for the other, although the risk may be reduced with staged surgery.[20] A shared scalp, dura, and calvaria pose challenges in providing enough skin, dural graft, and bone reconstruction for wound closure following separation, as failure to close adequately increases the risk of fatal central nervous system (CNS) infection. Furthermore, brain tissue can be interdigitated or fused, and there may be connections between the ventricular systems.

Careful assessment of each component of the surgical challenge may reveal disparate risks to each twin, even though each twin has equal potential to benefit from separation; although some reports of surgical separation never mention any overt decision to sacrifice one twin, the surgical decisions made clearly favored one over the other, particularly in terms of major cerebral venous drainage.[21] Swift et al. reported successfully separating a case of vertex craniopagus in two twins from Egypt as part of a multidisciplinary team of pediatric neurosurgeons, craniofacial plastic surgeons, and pediatric anesthesiologists.[22] The twins shared a highly symmetrical venous drainage system, ethical consultation was done locally, and their surgical plan specifically disallowed "sacrifice" of one twin's drainage system for the benefit of the other. Such symmetrical venous drainage is extremely rare. Two Sudanese craniopagus twins, Rital and Ritag, were separated at Great Ormond Street in London in 2011.[23] Ritag took the burden of venous drainage from Rital, and, as a result, her heart was under more stress, and the burden of surgery was greater for her. The surgery was successful, but the risks were not equal for each twin. In some cases, therefore, even if craniopagus twins may have equal potential for a separate life, the risks of achieving this are often not equal for each twin.

Classification of Craniopagus Twins: Clinical Implications

Numerous anatomically based classifications of craniopagus twins have been proposed and modified and have evolved over time.[24,25,26,27,28] From a surgical perspective, the most useful classification scheme is that which gives the best indication of the potential success of surgery. In this regard, the most comprehensive scheme was proposed in 2006,[29] in which craniopagi are graded according to key characteristics affecting the risk of surgical separation, with particular emphasis on the anatomy of the shared venous structures. The scheme grades twins on a scale from 10 to 28, with higher scores indicating greater difficulty of surgical separation. However, irrespective of the surgical difficulties, the decision to separate craniopagus twins in the first place must incorporate ethical justifications for separation. These have been outlined for the separation of conjoined infant twins,[30] and we propose that, in considering the ethical justification for separation of craniopagus twins, there are three separate situations:

Situation 1: Biologically necessary separation in order to preserve the life of one or both children
Situation 2: Separation to optimize the quality of life of one or both children
Situation 3: Autonomously requested separation of adult craniopagus twins

The decision to separate craniopagus twins is particularly challenging because of the difficulty in balancing the competing medical, legal, and ethical rights of the conjoined children without disadvantaging either of them, while remaining humane and pragmatic at the same time. If the surgical procedure is viewed as complex, then the ethical and legal aspects are at least as, if not more, complex.

Biologically Necessary Separation: The Dilemma of Twin Sacrifice

Biologically necessary separation may be required when there is clear evidence that if the children remain joined, it will result in the death of both, usually because of inadequate physiological function of one, leading to physiological failure of the other due to their combined circulation. In this situation there is an understandable instinct to preserve life where possible, although this may be at the cost of hastening the death of the other child. Biologically necessary separation directly opposes the two children's rights to life and well-being and so requires a legal and ethical justification for the sacrifice involved.

This dilemma faced the court in the *Queensland v. Nolan* case, in which the craniopagus twins Alyssa and Bethany had separate brains but shared a draining vein.[31] Bethany did not have a functioning renal tract to remove waste products from her bloodstream and so was completely dependent on Alyssa for survival. Eventually Bethany developed cardiac failure and pulmonary edema to the point that her death was imminent within 24 hours. Evidence suggested that her death would also result in the death of her twin, and the only chance of survival was surgical separation, with an estimated 20%–40% chance of survival for Alyssa but with the inevitable death of Bethany. In this case, therefore, the prognosis for the weaker twin, Bethany, was dire: death within hours without separation and death even sooner with separation. There was, therefore, no benefit of surgery for Bethany, only for Alyssa.

In this case, there was a clear disparity in the survival chances and potential for independent life between the twins (situation 1). In other cases it may be deemed that there is an equal chance for both twins to benefit from successful separation surgery (situation 2). Situation 2 requires careful planning of the surgical techniques so that review of the options at each stage can disclose any operative steps that place one twin at a greater risk than the other during the procedure.

Various ethical principles have been applied in order to justify separation of craniopagus twins: "In planning separation it is unacceptable to sacrifice *a priori* one twin on behalf of the second. The parents must be informed of the risks of an operation and the possibility that one or both twins may die during it. If they consent to the operation, it is then for the neurosurgeon to decide the best possible management." However, Todorov et al. also suggested that certain types of craniopagi may be more tolerable, particularly parietal junction craniopagus, in which the twins could have an acceptable life—thus the impositions of being joined needed to be balanced: "One may ask whether living under these conditions is worse than living a life of profound mental retardation which may be a complication of surgery."[32]

Indeed, the conjoined twins clearly represent a deviation from the anatomical norm, but does this deviation require correction, or is it something that should be accepted as an unusual variation of normal? Certainly, accepting craniopagus twins as they are is a viable option in potentially all cases. This approach is more

attractive in cases that do not involve a biological countdown to physiological failure and death. In cases in which death is imminent, however, Winston et al. challenged whether it is really unacceptable to sacrifice one twin: "Some would change their minds if it were clear that this was the only reasonable hope of one child and the death of the second twin was imminent."[33] O'Connell proposed that twin sacrifice is acceptable and that separation should be attempted if only one twin has an opportunity to live a normal, independent life: "It was therefore decided that the risks of separation should be accepted if investigation suggested that it might enable even one of the pair to enjoy a normal existence."[34] Winston et al. ultimately conclude that there is no one solution: "There is probably no satisfactory general solution to such ethical problems, and each craniopagus must be considered independently."[35]

The issue of twin sacrifice was central to the discussion of the separation of the Manchester ischiopagus twins, Mary and Jody, who were joined at the pelvis with fused spinal cords and four legs. Mary, the weaker twin, was completely dependent on Jody for life and was also deemed to have abnormal brain and cardiorespiratory systems, with a limited life expectancy even in the conjoined state. Separation would certainly result in the death of Mary but would give Jody a chance of survival. The parents refused surgical separation, asking the question, "Everyone has the right to life, so why should we kill one of our daughters to enable the other to survive?"[36] The eventual death of the twins without separation was seen by the parents as the natural course of their lives. In the Mary and Jody case, the lord justices of the court of appeal struggled to resolve the competing principles of preservation of life, welfare of the children, and the necessity to find some justification for the lawful killing of the one twin in order to protect the other.[37] Although all three judges supported the high court decision to separate the twins, they all used different reasoning. Lord Justice Ward used the argument of self-defense: one could consider that Mary was in fact assaulting Jody; because the attachment adversely affected Jody's chances of survival, separation could be justified as assisting Jody to defend herself against Mary—that is, helping the innocent victim. He argued that, being faced with two choices that both had detrimental outcomes for Mary but potential benefit for Jodie, it was necessary for the court to choose the lesser of two evils. Lord Justice Brooke, however, favored necessity as a justification for permitting separation: the lawful killing of Mary had the defense of necessity because it was the only way to save the life of Jodie.

One of the complicating factors in the Mary and Jody case was the prospect that, should Jody survive the surgery, she would be left with significant disabilities and complex ongoing medical needs for which treatment would not be available in the home country of the parents. This led to the prospect that Jody's parents might have to leave Jody behind in the care of the state or a foster family.[38] That poses a question as to whether a court-ordered intervention against the wishes of the parents can oblige parents to take care of the surviving child for what may be many years with potentially significant emotional, medical, financial, practical, and social effects on them, any other family members, and the child itself. Does the court or state have any responsibility to provide ongoing care to the child? Would the parents be justified in saying they would not agree to be involved in the ongoing care of the children, given that their religious, moral, and parental views were ignored in favor of perceived best interests of the surviving child? It might be very difficult to justify authorizing surgical separation on the grounds of welfare if the

only outcome for the child were significant disability and the need for ongoing medical therapy, rejection by his or her parents, and state-sponsored placement in a care facility because a foster family could not be found. In *Re A (Jody and Mary)*, the court of appeal clearly struggled to resolve the competing arguments of preservation of life, welfare of the children, and the necessity to find some justification for the lawful killing of Mary in order to protect Jody.

Twin Autonomy

The issue of conjoint twins as autonomous individuals with separate wills and rights has certain implications. What, for example, should be done if the stronger of two adult twins demanded to be separated from the other in the knowledge that it would lead to the death of the weaker twin? Kenneth Himma[39] considered this possibility in reference to Thomson's violinist argument[40] that a fetus, although possessing a right to life, does not necessarily have the right to use the mother's body. The imagined scenario is that you wake one morning to find that, without your consent, a famous violinist with a terminal kidney disease has been connected to you by a machine and needs you to survive. Thomson argues that it would be morally permissible for you to disconnect yourself from the machine and allow the violinist to die because you did not entitle him to use your body. Himma applies this argument to the case of conjoined twins: in his example, Joe is the stronger twin with all the vital organs, and Tom is the weaker twin and needs Joe's vital organs to survive. Joe demands separation, knowing that Tom will die as a result. Himma argues that although there are similarities with Thomson's violinist in that Joe did nothing to give Tom the right to use his vital organs, there is a fundamental difference: Joe and Tom are autonomous and distinct moral persons, but they are not independent: "Though there is a sense in which we can characterize part of the physical entity constituting Tom and Joe as Tom's body and part as Joe's body, there is no clear moral sense in which part of that entity can be characterized as Joe's to dispose of as he pleases."[41]

So far as we are aware, there has been no report of adult craniopagus twins sharing different views as to whether they wish to be separated. The Iranian twins Ladan and Laleh Bijani requested separation when they were in their twenties. Ladan and Bijani were born in Iran in 1974 and developed separate interests as they matured. They felt they had significantly different personalities, and although they both studied law at a university in Tehran, they still desired to pursue separate careers: Ladan wished to be a lawyer and Laleh a journalist. They were declined separation surgery by a German team but were offered surgery in Singapore under Dr. Goh, who had previously successfully separated a pair of Nepalese twins. Sadly they did not survive the surgery. Ladan and Laleh Bijani were not unwell or at risk of imminent death from craniopagus but sought surgery so as to live separately and have a chance of true individuality.[42] There are reports of craniopagus twins who have developed into adulthood and have not wanted surgery—such as the 24-year-old female twins in the United States who were living happily with their family and did not wish to be separated.[43] Some argue that, in the case of some conjoint twins, it may not be in their best interests to be separated, and society needs to be challenged as to what it considers normal.[44] Certainly, in English law it is accepted that a legally defined adult with mental capacity has legally protected autonomy to make decisions regarding his or her own health, even if those decisions

are perceived as irrational.[45,46] To disregard the principle of consent gives rise to the crime of battery and the tort of trespass. In the case of adult craniopagi, therefore, adult twins have the ability to consent unless there is an issue with mental capacity, but it is unclear how the principle of autonomy would apply to conjoined twins holding different views.

In most cases surgical separation is likely to be considered when the twins are less than one year old, in which case the parents have the power to give proxy consent for treatment.[47] They are the preferred decisionmakers because of the assumption that they care for their children but also because it is assumed that the children are likely to adopt similar values to those of their parents. Nonetheless, there is a limit to parental decisionmaking, and parental decisions that put the child at unnecessary risk may be overruled by the courts. In English law, the authority of the parents to give consent for treatment is set out in the Children's Act 1989, which ensures that the parent(s) have both the right and the duty to give consent to treatment when the treatment is clearly in the best interests of the child. The duty of the parent on behalf of the child means that a scenario of culpable omission could arise if the parent refused treatment and if that refusal had a negative impact on the welfare of the child. It is unlikely that doctors would seek to overturn the parental decision unless they felt their decision was not in the best interests of the child, but the issue of parental refusal did arise in *Re A (Children)*. The judgement in that case helpfully reviewed the legislation (the Children's Act 1989) and its origin and also discussed the caveat that although parental consent on behalf of children was a robust concept, it was not beyond question if the welfare of the child might be disadvantaged by the parents' decision. In such cases, the court is deemed the final determinant of the appropriateness of the parental decision (*Re A Children* 2000). The Children's Act 1989 makes it clear that the court should make the child's welfare the paramount consideration, even though the concept of welfare is debatable and will change depending on the circumstances of the case, but what is clear (at least in the English courts) is that "best interests are not limited to best medical interests"[48] and "[encompass] medical, emotional, and all other welfare issues."[49] In the case of biologically necessary separation of craniopagi, and other conjoined twins, parental consent may imply consent to the killing of one of the twins. It is understandable that parents would not feel able to give such consent, even in cases in which such surgery is likely to result in the survival of one child and in which parents, clinicians, and courts are required to consider the best interests of both of the children whose fates are intertwined. Is there a moral justification for separating the twins? Several solutions have been proposed, including the potentiality principle (Gillett) and the principle of moral permissibility; we consider each of these in turn.

The Potentiality Principle

Gillett has proposed the *potentiality principle* in order to help overcome the quandary of the best interests of the child; he argues that this term aims to capture the duty we owe to every child as a human being in his or her own right.[50] In the case of craniopagus twins requiring separation due to biological necessity, the best interests of the child may be at odds with the sanctity of life. Gillett builds on the concept of wholeness, or "bodily integrity," introduced by Judge Chesterman when he quotes Lord Justice Robert Walker in *Re A (Children)*: "It is not a case of evaluating

the relative worth of two human lives, but of undertaking surgery without which neither life will have the . . . wholeness it is due."[51] Gillett uses the example of anencephalic neonates and argues that we have no obligation to keep alive a child destined to a vegetative or near-vegetative state, and furthermore that avoiding the futile rescue of such children is reinforced by the need to alleviate suffering. He thus proposes the potentiality principle: "The life due to each and every child is a life in which its potential is given the full chance of being actualized."[52]

This principle allows us to consider whether a child has any chance of a meaningful, human form of life and introduces a proportionality according to which interventions can be justified. Of course, ethical arguments to justify twin sacrifice are more malleable than legal arguments, but they are helpful in giving a sense of justice to any legal decision. If we consider the case of Mary and Jody, the potentiality principle allows us to consider that separation does not hamper Mary's potential to actualize a normal life, notwithstanding the fact that surgery will expedite her death—that is, if we consider that Mary has no further potential for meaningful life, then we are justified in separating her from Jody. In this way the justification is comparable to that of not continuing to provide futile support to anencephalic neonates—that is, we countenance the death of the neonate because the alternative, an unmeaningful life with the possibility of ongoing suffering, is unacceptable to us. Gillett acknowledges that the law is required to consider each individual as a separate, inviolable legal entity, but reasoning with the potentiality principle may allow for some resolution of the impasse in such cases.

Moral Permissibility as an Argument for Ethical Separation and Twin Sacrifice

Waisel, in discussing the case of the Manchester twins Mary and Jody, considered a principle of moral permissibility as a guide to decisionmaking in conjoint twins.[53] He considered two opposing positions: the view that one child should never be sacrificed for the other versus a utilitarian position that it is better to save one child at the cost of the other's life rather than let both die. He claims that the twins are "entangled singletons" for the purpose of ethical and legal discussion and are therefore two individuals unnaturally and indeed unwillingly entangled. On the basis of this conceptual framework he argues that separation is morally permissible—even if it will result in the death of the weaker twin (Mary)—through familial altruism, that is, that Mary may willingly forfeit her life to secure the life of her sister, an act often considered morally permissible in a family relationship. They also use the tethered mountaineer analogy, imagining that Jodie insists on separation from Mary in the same way that a mountaineer unable to rescue a dangling companion pulling him over the edge will cut the rope to save his own life, the only other alternative being the death of both.

Discussions regarding twin sacrifice often use such analogies. In a family court in the United States in 1977, Dr. Koop sought judicial protection from homicide charges if he undertook the separation of two twins, which would result in the certain death of the weaker twin.[54] In that case rabbinical scholars used two analogies, one in which an individual is destined for death, and one in which an individual is designated for death.[55] In the first, two men are jumping from a burning plane, each with a parachute. The parachute of one man does not open, and so he grabs the legs of the other, but the single parachute is not strong enough to support them both. The rabbis concluded that the man with the working parachute would

be justified in kicking the other man off to save himself, as the other man was already destined for death. In the second analogy, a caravan is surrounded by bandits who demand the handing over of one named individual to be executed; if the others comply, they will be spared. The rabbis concluded that it is morally justifiable for that individual to be handed over by the caravan, as he has been designated for death. However, the use of analogy in moral justification is fraught with problems, as the analogies are often weak.[56] Here they involve adults voluntarily engaging in risky behavior, a situation quite unlike that of involuntarily conjoined twins.

Irrespective of the weaknesses of the analogies, the argument that the killing of one individual is done out of legitimate necessity may have relevance elsewhere in medicine. The termination of a failing pregnancy that threatens the mother is a case in point, and, in the eyes of the law, aborting an unborn child to save the mother is considered lawful.[57] Waisel also argues that the double-effect doctrine permits separating conjoint twins: in Mary and Jodie's case, the separation of Jodie and Mary is intended to benefit Jodie by saving her life, rendering the unintended detrimental effect of shortening Mary's life morally permissible if the overall good effect outweighs the bad. Waisel's moral permissibility argument legitimizes the separation of the twins but can also be used to support a decision not to separate them.

Can the Twins Be Considered as One Individual?

The craniopagus twin dilemma comes from using the term "twin" and implying that there are two separate individuals joined together. Winston et al. found a case report of one fatal separation against the patient's will in which the twins were considered as a single human being, with the aim of surgery being "to form a more normal human being."[58] If we take the view that the joined bodies are in fact one organism, then the term "separation" does not apply, and removal of one part would merely be an amputation in order to save the whole organism. If the extra part were an extra limb, we would be comfortable with this outcome. But the existence of another head/brain has completely different connotations. This demands an answer to the question, "What is an individual or person?" *Life* magazine ran the headline "One Body Two Souls" when it carried a front-cover photo of the dicephalus twins Abigail and Brittany Hensel in 1996. Campbell and McMahan have discussed the dilemmas created by philosophical animalism regarding various forms of conjoined twins, including craniopagus parasiticus.[59] In craniopagus parasiticus, a completely developed human being with a fully developed head capable of generating consciousness has a secondary head attached to it, which is entirely dependent on its host, the body of the primary head. They discuss the possibility of a secondary head that is capable of independent thought and consciousness and that could be separated and reattached to a cloned body. In this hypothetical case, the secondary head is a person who could be separated with the potential for life independent from the host it was born onto, and thus the separation cannot be seen as an amputation of a part but only as a separation of individuals. The implication is that personhood is to a great extent determined by the brain or mind, and therefore two brains means two minds and two individual persons, thus attracting the legal protection of two individuals. On the whole, surgical teams and bioethicists have considered conjoined twins with one head and parasitic twins

to be one person.[60,61] Bratton and Chetwynd, on the other hand, have argued that being in the conjoined state is part of the twins' individuality.[62] Dreger also shares this view and suggests that what it means to be an individual is a construct projected onto the twins by others: "The paradoxical fact is that being conjoined is part of conjoined twins' individuality. . . . The separation of conjoined twins is invariably at least in part an issue of the predominant culture's ill ease with continuity."[63]

In response to the controversial decision to separate Jody and Mary, the Western ethical and legal tradition, with its emphasis on personal sovereignty and the associated physical assumptions, arguably creates the problems in such cases.[64] The judgments can be critiqued as being predicated on a failure of legal and ethical imagination and an anthropological premise that people are meant to be physically separate. Bratton and Chetwynd argue that conjoined twins may be separate psychological individuals, but only by degrees, with a shared body for which they do not compete but in which they share common interests. In the case of craniopagus twins it is difficult to see how this argument holds, as both twins have separate bodies, and it might not be reasonable to say that they do not compete for the use of their combined body. In the case of Jody and Mary, Mary did require the use of Jody's body to survive. And it is difficult to argue that Jody has a common interest in a body that is joined to Mary if that join will deprive her of her life. A similar unbalanced combined anatomical-physiological state can be seen in the Australian case involving Alyssa and Bethany. In cases in which the weaker twin's imminent demise puts an undue strain on the other, one could argue that, even if there is no absolute competition over bodily resources, one twin may be putting an extra strain and burden on the other, and, given that the law is likely to consider craniopagus twins as separate individuals with separate legal rights, ethical arguments sufficient to justify humane legal decisions must be based on this premise.

Conclusions

In order to justify the surgical separation of craniopagus twins, we need to consider the historical success, and failure, of such surgery. Only by doing so can we learn from the mistakes made and move such surgery from experimental status toward accepted techniques. Most separations are likely to occur in neonates, and the greatest ethical dilemmas arise in cases of biologically necessary separation in which one twin may have to be sacrificed. We argue that the yoke of legal principles can be unburdened with careful ethical consideration of the best interests of the child in terms of the potentiality principle and the concept of moral permissibility.

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