

# Ethical Implications of an Incidentally Discovered Asymptomatic Chiari Malformation in a Competitive Athlete

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## ABSTRACT

The clinical and ethical implications of an asymptomatic 17-year-old competitive football player incidentally found to have a type 1 Chiari malformation without a syrinx on brain imaging are discussed. Considering that patients with Chiari malformations can sustain irreversible neurologic injury or death after a mild head injury, and given the lack of data describing the risk of catastrophic injury after head trauma, the ethics of clearing this athlete to return to play are reviewed.

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## Case

A 17-year-old apparently healthy adolescent boy presented to a neurologist for a mandatory evaluation prior to his high school senior year football season. As a result of recent scientific studies and state laws regarding concussion management, the high school sports program required that all athletes undergo a medical evaluation to obtain clearance prior to playing and after an injury. The athlete had a history of a single concussion 2 years prior with no residual effects. At the evaluation, he had no complaints, a normal neurologic examination, and above-average performance on computerized cognitive testing. On review of his medical record, the neurologist found a head CT scan that had been performed in the emergency department after his concussion. While reviewing the images, the neurologist became concerned that the cerebellar tonsils appeared to be low lying. A follow-up MRI scan was performed that confirmed a type 1 Chiari malformation (pointed cerebellar tonsils displaced 7 mm below the foramen magnum with mild basilar invagination) without evidence of a syrinx.

The patient was seen by two different neurosurgeons (one in community practice and one at an academic center), neither of whom recommended surgical intervention for this athlete's asymptomatic Chiari malformation. However, both physicians outlined the unlikely but potential risk of significant neurologic injury or death with minor head trauma. The athlete attended the follow-up visit with the neurologist without his parents, acknowledged

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the risks associated with competing with this Chiari malformation, and requested clearance to play football. He also disclosed that he had already signed a scholarship agreement to play football for a state university and asked that the information about his Chiari malformation remain confidential.

## DISCUSSION

In this case, the following ethical questions should be considered:

1. Should an athlete with an incidentally found asymptomatic Chiari malformation be cleared to participate in contact sports?
2. Should the physician's ethical duties supersede an athlete's autonomy, desire to play, and request for confidentiality?
3. Do situations exist in which it is appropriate to advocate for prophylactic surgery for an asymptomatic athlete who wishes to continue in competitive contact sports?

Neurologists are increasingly being called upon to provide clearance to play for athletes who have sustained neurologic injuries such as concussion, spinal cord, and peripheral nerve injuries, as well as athletes who harbor neurologic conditions such as brain tumors, epilepsy, and congenital brain or vascular malformations. In each scenario, the neurologist must weigh the risk of further potential neurologic compromise, most often with limited evidence, against the physical, emotional, and sometimes financial benefits of playing a sport. In doing so, the neurologist must also balance the ethical principles of autonomy, beneficence, and nonmaleficence to determine whether an athlete should participate and can compete safely.

Although neuroimaging is not routinely recommended in current concussion management guidelines,<sup>1-3</sup> many athletes undergo head CT scanning in emergency departments or outpatient brain MRI scanning for persistent concussive symptoms. Additionally, concussion-related research protocols involving advanced neuroimaging techniques such as functional MRI (fMRI) and diffusion tensor imaging are increasing in prevalence.<sup>4-6</sup> Incidental findings in both clinical and research neuroimaging are common, and most imaging centers now have protocols for detecting and disclosing them.<sup>7,8</sup> While incidental findings requiring urgent evaluation and management are rare (approximately 1% to 2%), other abnormal findings exist with a rate of about 15% to 20%.<sup>8-10</sup> Findings in this latter category may not generally be of concern or warrant intervention, but may have more substantial implications for athletes, especially those playing contact sports.

## Deconstructing the Ethical Dilemma

In the case presented here, the incidentally discovered Chiari malformation is asymptomatic, and the athlete wishes to continue playing competitively. The decision to provide or deny him medical clearance is challenging. On one hand, most neurosurgeons would not recommend surgery in this situation. On the other hand, numerous case reports exist of patients with Chiari malformations who sustained irreversible neurologic injury or death after a mild head injury.<sup>11-13</sup> Although the probability of a devastating injury occurring during football is low, the risk of playing is not insignificant given that the potential consequences are catastrophic. The onus lies with physicians to balance their fiduciary responsibility

to the current and future best interests and well-being of their patients—a responsibility that stems from their oath to beneficence and the duty to care—with the autonomous wishes of their athlete-patients to continue playing football.<sup>14</sup>

The athlete in this case is legally a minor and has not been granted the legal status of emancipation or been deemed a mature minor by the courts for participation in health decisions.<sup>15</sup> Therefore, while it is appropriate to involve him in decision making about his health care, it is not appropriate to clear him to play football without first discussing the situation with his parents or guardian.<sup>16</sup> If the athlete's parents uphold their son's request after a transparent and unbiased discussion of the available data and potential risks of playing contact sports, the conversation can transition into the conditions under which the physician may feel it is ethically permissible to play.

Given that transient neurologic symptoms could suggest that this athlete has become symptomatic from his Chiari malformation and that these symptoms could be a precursor to a life-threatening event, the coach and team medical personnel should be informed of the Chiari malformation. Clearance to play ought to be predicated on the responsible sharing of this information and the education of team staff about symptoms that should trigger immediate removal from play and subsequent neurologic evaluation. If the athlete and his parents insist on keeping this finding confidential and are unwilling to consent to releasing this information to his school and athletic department, the physician should strongly consider denying his request to play. Permitting an athlete to play without disclosing this finding may unnecessarily expose the athlete to significant risk and preventable injury.

Some athletes may visit several physicians until they receive clearance to play. Physicians can deter this type of “doctor shopping” by requiring athletes to sign waivers allowing the unrestricted communication of relevant evaluation findings with the team management and medical personnel.<sup>17</sup> Physicians who are employed by an athletic team may have contractual obligations to share information with team personnel, and this relationship should be disclosed to the athlete prior to an evaluation.<sup>18</sup> If neuroimaging is performed for any indication, all physicians should consider discussing with athletes and their parents the possibility of discovering an incidental finding that may impact future athletic participation.

### **Risk-Benefit Analysis of Providing Clearance to Play**

Physicians perform risk-benefit analyses when deciding on treatment recommendations or interventions for every patient they encounter. The athlete in this case has biased that analysis by requesting to participate in a sport where head and neck trauma is common. Even if an athlete is fully informed about the risks of his or her participation, some physicians may argue that permitting play in a contact sport with a known Chiari malformation and waiting for symptoms to occur before recommending intervention is unethical and irresponsible because the potential risk of injury is too great. This viewpoint requires that a physician's commitment to beneficence and duty to protect the patient from harm outweigh a patient's autonomous desire and consent to play. While this is a reasonable clinical and ethical perspective, the actual probability of significant neurologic injury from minor head trauma is unknown, making the quantification of this risk challenging. Despite this lack of evidence, 18% to 36% of neurosurgeons recommend avoiding contact sports in individuals with known Chiari malformations, although it is unclear whether these surgeons would sign a form formally restricting athletic participation or leave the decision to play to the discretion of the athlete and parents.<sup>11,19</sup>

Recent conversations in the sports neurology and sports medicine literature have focused on return-to-play decisions after concussion, and many states have enacted concussion laws requiring written clearance from a licensed health care provider prior to returning to play.<sup>20,21</sup> Most physicians agree that it is clinically appropriate and ethically justified to restrict an athlete from participation in activities that have a high likelihood of recurrent head trauma until their concussion symptoms have resolved, even if the athlete requests permission to prematurely return to play. In this situation, the physician is prioritizing the athlete's short- and long-term neurologic health and general well-being above autonomy. It is challenging to use similar ethical reasoning for the athlete with an asymptomatic Chiari malformation since the risk of catastrophic injury from a Chiari malformation after minor head trauma is likely far less than the risk of exacerbating existing concussion-related neurologic deficits through additional head trauma. Thus, if an athlete with an asymptomatic Chiari malformation is fully informed about the risks associated with head and neck trauma, it may be ethically permissible to make an informed decision to play contact sports or participate in other high-risk activities.

Alternatively, if the physician concludes that the risk of competing in a contact sport is too great and denies clearance to play, extenuating situations may exist where the benefits of playing a sport are so overwhelming that the physician may advocate the need for prophylactic surgery. A thorough evaluation by a neurosurgeon is needed for all athletes with incidentally detected Chiari malformations. A majority (more than 90%) of neurosurgeons would recommend conservative management if no additional concerning neuroimaging abnormalities, such as syringomyelia, are present.<sup>11</sup> Some neurosurgeons suggest that certain neuroradiologic properties associated with Chiari malformations, such as obliteration of the subarachnoid space, confer a higher degree of risk of brainstem or cervical spinal cord injury with head trauma.<sup>22,23</sup> For some asymptomatic individuals with Chiari malformations who have concerning neuroanatomic features seen on MRI, surgery has been suggested to reduce the perceived risk of the subsequent development of syringomyelia. However, this approach is controversial. The risk of potential complications from surgical procedures to decompress Chiari malformations ranges from as low as 1% to 2% to up to 20%, depending on the type of procedure and various patient characteristics.<sup>24,25</sup> It is unclear how these known surgical risks compare to the potential risks of severe neurologic injury or death associated with a Chiari malformation and head or neck trauma.

The most conservative approach in the present case would be to deny clearance to play football and recommend adopting a noncollision sport, thereby prioritizing beneficence and nonmaleficence over patient autonomy. However, an asymptomatic athlete with an incidentally discovered Chiari malformation should not necessarily be precluded from athletic participation in high-risk contact sports. It would be ethically permissible to clear the patient to play if he and his parents truly demonstrate understanding of his situation and agree to open communication with school and team personnel.

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