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Dementia in football/soccer players: professional resistance to a new cause of neurodegenerative disease

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ABSTRACT

Football is popular world wide, and in the U.S. the sport is known as soccer. This game consists of two teams of eleven players using a spherical ball. Dementia, a tragic progressive neurodegenerative disease has been recognised in boxing for over a century, and this paper explores its emergence in football. Heading the ball is a feature of the game, producing repetitive subconcussive brain injuries.

Dementia in football/soccer only emerged at the end of the 20th century in Scotland. The author had been alerted to the issue in 1981; his observational study, including some neuropathological findings, of 14 players was eventually published in 2017. This was the first study in the world to show a link between football and the development of dementia.

The difficulties of getting the results published, including the vulnerability of the brain to repetitive subconcussive injuries, are described and the resistance to the idea is explored. These include the conservative nature of the medical profession, the rigidity of Evidence Based Medicine and the role of Paul McCrory. These negative attitudes delayed the development of a more enlightened dementia management and prevention strategy in football.

Introduction

Football is popular world wide, and in the U.S. is known as soccer. This game consists of two teams of eleven players using a spherical ball. Unfortunately the sport contains a cruel paradox: playing the game is health-enhancing physical activity but experienced players are at risk of developing dementia. Heading the ball, a much admired feature of the game, is an example of a repetitive subconcussive brain injury.

Dementia in sport has been known to occur for over a hundred years. During this century there has been a gradual acceptance that this type of dementia is caused by repetitive subconcussive injuries occurring over a long playing career, in football it is brought about by heading the ball.[1] For example, a recent study from Boston found evidence of chronic traumatic encephalopathy in >90% of former American Football players[2], and a controlled study of >7,000 soccer players found that the former footballers were 3.5 times more likely to die from dementia or other neuro-degenerative diseases than the controls[3], the increased risk being related to playing position and length of playing career, thus establishing a dose-response relationship.[4] This paper sets out the narrative and the contribution of the author in the evolving picture. It also explores the factors which have hindered the acceptance of prolonged heading of the ball, an instance of repetitive brain microtrauma, as the key aetiological factor in dementia in football/soccer players.

Background

Dementia is a devastating condition perhaps the most tragic of all illnesses as it destroys the integrity of the individual. This neurodegenerative process is relentless, dismantling all aspects of higher mental functioning until in its final stages the person has disappeared and only the body remains. For over a century dementia has been recognised in boxers, becoming known as punch drunk syndrome or *dementia pugilistica*[5] and later as chronic traumatic encephalopathy (CTE).[6] For over eight years it has been generally accepted that in boxing CTE is the result of repetitive subconcussive blows to the head in sparring, and evidence of reduced neuropsychiatric performance is associated with the boxers' sparring history and not with their fight record[7]. The regular pummelling of the head in sparring is similar to heading practice sessions in soccer. During the second half of the last century anecdotal reports occasionally occurred in other sports. The issue of the possibility of dementia occurring in footballers was only placed firmly in the public domain at the very end of the 20th century in Scotland.

Billy McPhail, the celebrated Scottish centre forward and noted header of the ball, developed mental deterioration and in the 1990's was diagnosed with Alzheimer's disease.[8] McPhail, with the support of medical specialists, associated his symptoms with heading leather balls used in the 1950's, explaining how "the ball used to get very heavy when it rained – when you took that full in the forehead it nearly knocked you over". In 1999 he launched a legal case claiming he was entitled to disability payments. However, an industrial tribunal did not accept that a clash of heads during his playing career could have caused the dementia. The tribunal would not consider whether heading the ball might have contributed, as it categorised that as "part of the job (as a footballer)" and not an industrial injury. The decision was upheld by the Social Security Commissioner of Scotland.

The emerging picture

In 2003 McPhail was completely vindicated. Jeff Astle a celebrated English centre forward and powerful header of the ball, died with dementia aged 59. At an inquest the coroner ruled that on the balance of probability, Astle had died from an industrial disease caused by heading the ball over many years.[9] This landmark decision received extensive media coverage. A subsequent neuropathological examination revealed he had chronic traumatic encephalopathy (CTE), the brain disease of boxers.[10]

The author was not surprised by the Astle verdict. In 1981 he was alerted to the issue; a relative of a man with advanced dementia posed the question, can heading the ball over a long period produce dementia? Noting the extreme fragility of the brain,

he thought this was an insightful suggestion. The extreme fragility of brain tissue was evident to the author in two ways. As a teenager brought up on a farm he had handled fresh mammalian brain during breaking down pig carcasses and he still vividly remembers its watery, semi-solid consistency. As a young doctor he had worked in neurosurgery and had seen at first hand the soft delicate consistency of the human brain, similar to soft butter, blancmange or jelly. The relative's suggestion of a link between heading a football and subsequent dementia was certainly a hypothesis worth testing. He decided to look out for footballers with dementia in the dementia service he was running in Swansea, Wales. By 2000 he had eight examples and the clinical series was presented in 2002 at a conference in Jersey. The paper created considerable press interest; several relatives contacted him, including the wife of Jeff Astle who arranged for him to brief the coroner prior to her husband's inquest.

The extensive media interest in the Astle inquest decision was a cue that the Jersey paper should be published. Unfortunately it was rejected by the British Medical Journal (BMJ). Two reviewers, one of whom was Paul McCrory, were dismissive of the piece and emphatic that a more convincing scientific approach was essential. The British Journal of Sports Medicine (BJSM) also rejected the article for similar reasons. These assessments were disappointing, but entirely in-keeping with the evolving editorial standards in medical journals. At an earlier period when clinicians were more influential in editorial policy the Jersey paper might well have been published. In this new emerging culture the detailed study of one patient in a case report was deemed anecdotal and not worthy of consideration. This attitude is clearly demonstrated in the valedictory editorial of the retiring editor of the British Journal of Psychiatry in 2003: "I hastened the demise of the case report, to exclude what I see as psychiatric trivia".[11] Observational case studies were also viewed in much the same way.

The author had no choice but to continue to identify more cases and try to obtain consent for autopsy so that neuropathological examination could be undertaken in due course. This was not easy for two reasons. After patients have had long distressing illnesses relatives are more reluctant to give consent for post mortem, and in the UK, the 2001 report of the Alder Hay Hospital scandal (involving the unauthorised removal, retention, disposal of human tissue and falsification of post-mortem records over a 15-year period)[12] created a negative attitude towards autopsies and their consequences.

Eventually the author collaborated with colleagues at the National Hospital for Neurology and Neurosurgery, London and an observational study of 14 retired footballers who had died with dementia was published in 2017.[13] The brains of six were examined; four had CTE two had Alzheimer's disease. This was the first clinical series in the world showing a link between soccer and the development of dementia, a landmark publication which received worldwide publicity. During the preparation of the paper the authors learnt that there was considerable opposition to its publication, so in order to make it more likely to be accepted the objective was only to place the basic facts in the public domain. This was achieved when the report appeared in *Acta Neuropathologica* in 2017.[13]

The author was aware that the paper did not attempt to set out to explain the human brain's vulnerability to heading a football frequently during a long playing career. There are two crucial factors. The first is the brain's extreme fragility, exemplified by its consistency being similar to blancmange or soft butter. Alan Turing, the mathematical genius, computer pioneer and World War II cryptographer, compared its consistency to tepid porridge. "Tepid" is crucial as it hardens on cooling. The second factor is the intrinsic activity and functioning of the brain, i.e. its colossal memory, creativity and prodigious information processing ability. For many years the brain has been considered to be a computer. Initially this was difficult to comprehend because the early mainframe computers were huge and bulky, but with the recent advances in miniaturisation and the advent of the

smart phone it is easy to understand that the human brain is a superlative supercomputer, the most advanced on the planet.

Writing a sequel to the 2017 paper was fairly straightforward. It's aim was to place the reasons for the brain's vulnerability to prolonged repeated micro trauma in the public domain. Getting the paper accepted for publication was not easy. Several submissions were rejected and this was a cue to discuss the problem with three leading colleagues in the fields of dementia research, neurosurgery and neuropsychology. The explanation soon emerged; it appeared that among neuroscientists there was no easy acceptance that the brain is a very fragile organ. Despite this entrenched opposition the author was still confident of the facts which required to be placed in the public domain and eventually this was achieved in 2023.[1]

Resistance to a new cause of neurodegenerative disease

Medicine has a track record of strong resistance to new innovative ideas about the aetiology of disease. Here are three examples. Joseph Lister (1827-1912) encountered vigorous opposition to the introduction of antisepsis which in due course revolutionised modern surgery. Similarly Semmelweis (1818-65) experienced hostility when he introduced antisepsis into post-partum care. A modern example is from Australia. In 1982 Barry Marshall and Robin Warren began to develop their hypothesis on the bacterial cause of peptic ulcers. The idea was initially ridiculed by established scientists and doctors, however in 2005 Marshall and Warren were awarded the Nobel Prize for the discovery of Helicobacter pylori and its role in gastritis and peptic ulcer disease. It is virtually 25 years since McPhail was unable to convince the authorities in Scotland that his dementia had been caused by heading the ball during a long and distinguished playing career as a centre forward. It is timely to review factors contributing to resistance to accepting the idea.

Heading is an important feature of British soccer, both in attack and defence. The elegant heading of a goal is a spectacular sight, much appreciated by fans. The football authorities have not wanted to curtail this aspect of the game and have insisted on hard scientific evidence being available before any changes can be contemplated.

The medical profession is a conservative body. During the last 50 years the profession has changed and evolved. Academic medicine and medical research with their emphasis on rigorous scientific standards have become much more influential within the profession and on the editorial policies of medical journals. In parallel with these changes Evidence Based Medicine(EBM) became to be accepted as a pillar of professional practice. Nevertheless from time to time individuals have been critical of its rigidity.[14]

Certainly the author has no fundamental problem with EBM, in fact he is a strong supporter of the concept so long as its limitations are clearly recognised and acknowledged. Theoretically everything is capable of being measured. This is what scientific medicine demands but there are areas, such as within human psychology and human behaviour where this is extremely difficult, so difficult that it should be acknowledged to be well-nigh impossible. Modern medicine, particularly psychiatry is heading in the same direction as psychology. One of the great mistakes made by academic psychology was to model itself on Newtonian physics. The discipline, academic psychology, failed to realise that physics is an unsuitable model for the task of understanding human beings.[15] Medicine, by its insistence on only hard scientific facts is running the risk of falling into into the same trap.

Another relevant factor is the role of Paul McCrory, the Australian concussion expert who was editor of the BJSM from 2001 to 2008, editor-at-large until 2019, and for most of this century Chairman of the Concussion in Sport Group which provided definitive advice to most of the sport governing bodies. In 2022 he was exposed for plagiarism in a paper in the BJSM.[16] Since then he has been totally discredited, and his rise and fall was set out in a detailed exposé in a recent issue of the (London) Times newspaper.[17]

The McCrory scandal is mainly about concussion, but he has also played a significant in role in delaying the acceptance and recognition of dementia in football. In January 2003 the Jersey paper, describing eight footballers who had developed dementia, was submitted to the BJSM. During the review process, McCrory published a leading editorial in the BMJ- "Brain injury and heading in soccer. Head to ball contact is unlikely to cause injury but head to head contact might".[18] The Jersey paper was a strong alert that heading could give rise to dementia, and was not published.

There is little doubt that McCrory closed down the emergence of a constructive exploration of how repetitive micro brain trauma/repetitive subconcussive brain injuries could give rise to dementia. A characteristic strategy, exemplified in a 1999 paper in the BJSM[19] on "the mythology of concussion management", was to dismiss guidelines and the prevailing consensus about how concussion in sport was managed, on the basis of their failure to conform to high scientific standards. The tone of the article was derisory and the piece could be described as academic hubris. McCrory had fallen into the same trap as academic psychology in not understanding that the principles of Newtonian physics cannot be used as a model to address conditions of a medical/psychological nature in human beings, conditions and psychological states which are extremely difficult to measure and quantify.

Conclusions

Heading the ball in football is a good example of repetitive micro brain trauma/repetitive subconcussive brain injuries, if prolonged it may lead to cognitive deterioration and in due course dementia. It is a significant problem, particularly as football is the most popular game in the world. Unfortunately the evolution of management guidelines based on experiential evidence came to an end through the dominance of Paul McCrory. Progress has been largely on hold for over 20 years and there is much catching up to do. The way forward should be along two avenues. The first is a public health/public education campaign informing the public that the brain is a very fragile structure. Any unnecessary trauma must be avoided, even minor trauma if repeated regularly can result in significant brain impairment leading to dementia. Second, any player at risk should receive cognitive testing, initially to provide a base line and then testing should be repeated every two or three years. Should cognitive deterioration be detected the player should give serious consideration to retire from the game.

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