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Case Report

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Cardiac Dysrhythmia Presenting as Possible Seizures Consequent to Concussion- Heart over Head

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Abstract

Objective: This paper reports an instructive case which was thought to represent post-concussive epilepsy but proved to be quite different.

Design: By means of a case report some very important issues in the management of patients with concussion are identified.

Method: A 30-year-old elite professional footballer was diagnosed with post-concussive epilepsy. Following neurological evaluation he was found to have cardiac dysrhythmia, rather than epilepsy, causing cognitive dysfunction. The cardiac abnormality was identified during his electroencephalogram (EEG), which included a modified lead 2 rhythm strip in which he was shown to have marked bradycardia and pulses bigeminy.

Results: The importance of the case is the misdiagnosis of seizures, by a trained observer, highlighting some of the diagnostic problems with epilepsy. Prior to the EEG and, immediately subsequent there to, he had been cardiologically assessed and found to be normal, although subsequent evaluation confirmed aberrant cardiac conduction requiring ablation. History of concussion, as provided by the patient, was at odds with the official records, thereby demonstrating issues that may arise in these circumstances. While he was exposed to concussion the cause of his presentation was unrelated to traumatic brain injury.

Conclusion: Patients with post-concussive altered consciousness need to be fully assessed to ensure that a correct diagnosis is confirmed. Detailed clinical records of all sports people exposed to concussion should be kept as the history provided by patients may be inaccurate. A team approach may enhance diagnosis.

Keywords

Sports medicine, Cardiac dysrhythmia, Concussion, Cognitive seizures, Cardiac electrophysiology

Introduction

Concussion is a prominent topic in sports medicine [1-4], especially in contact sports including rugby league [5,6]. The case, being presented, involves a footballer, with a history of concussive head injury and mild traumatic brain injury (TBI), who presented with episodes thought to be epileptic, acknowledging that seizures are an accepted and anticipated consequence of TBI [7,8].

The case highlights the importance of a detailed medical history and examination and comprehensive investigations. It further demonstrated that even correctly focused investi-

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gations may miss an intermittent pathology that was neither present nor evident, at the time of the studies. More sophisticated analysis and specialised electrophysiological intervention may be required, without which this patient may have surcummed.

Methods

This paper deals with a representative case that is highly instructive and does not deal with a specific research project but reflects very important issues that are relevant to the evaluation of concussion and post-traumatic epilepsy. The patient is aware of the submission and personally chose to undertake television interview to highlight the circumstances of his history. Thus there was no requirement to seek further Ethics Committee approval for this submission.

A 30-year-old professional footballer, was referred by a sport and exercise medicine physician (BM), who witnessed him "…have an absence seizure…" with a past history of at least 2 concussions in 2015, from which he recovered within 7 days "…with standard return-to-play protocols and cogstate testing…" [9-11]. At the time of referral he had: A normal MRI, normal ECG in sinus rhythm; normal full blood count, ESR, biochemical screen and blood sugar.

He attended a neurologist (RGB) the following day, reporting a 3 month history of episodes in which "…his whole body will become warm and then tingle. This will be followed by loss of vision starting in the periphery and closing inwards to the centre…". He denied loss of consciousness but reported loss of balance necessitating sitting down. The episodes lasted approximately 10 seconds without post-ictal features.

They occurred approximately 3-4 times daily, although on one occasion they happened up to 15 times throughout the day; 5-10 times the following day; twice the next day; once the day after; and none the following day. He could not identify precipitating factors.

He was a non-smoker, occasional consumer of alcohol and took no medications. There was nothing else of relevance in his past medical history and his only surgical procedures included appendicectomy, meniscus knee repairs and joint surgery on his thumbs.

Higher centre function testing was low average, devoid of features of focal abnormality, and both cranial nerve and peripheral neurological examination were normal. Blood pressure was 115/80 mmHg, taken in the right arm in the sitting position, with a pulse rate of 60 b/m. Cardiac, carotid, orbital and respiratory auscultation were normal.

Acknowledging that he was a professional footballer, a detailed history of concussion was obtained from the patient. In 2016, he reported 4 significant knocks to the head but denied loss of consciousness. On each occasion he was sent off the field and allowed to return after 15 minutes. On one occasion, in 2015, he cited a 'knee to the head' without retrograde amnesia and while there was reported loss of consciousness, he was still on the field when consciousness was regained. On this occasion he was sent off and did not return to play. He denied head injuries in 2014 and in 2013 he described an episode when he denied loss of consciousness, was sent off the field and not allowed to return. He could not offer a reliable history of head injuries before 2013.

In 2017 he reported 3 episodes of head injury without loss of consciousness but causing incoordination, being sent off the field for 15 minutes and allowed to return to play. He also reported being a heavy snorer, raising concerns regarding obstructive sleep apnoea [12].

His current team physician (BM), since 2013, was able to provide a detailed concussion history. Within the professional competition in which he participates, head injuries since 2014 were recorded and documented by paper and more recently, since 2016, electronically. All records were reviewed, for 2013 and 2014, which confirmed that he was never removed from play, for a head injury assessment, and no concussive episodes were diagnosed. In 2015 he was removed from play on 2 occassions, 24 weeks apart, where he was assessed and diagnosed with concussion and not allowed to return to play. On both occassions his symptoms resolved within 48 hours and he completed a return to play protocol and passed computerised cognitive testing using Cogstate [9-11].

He had no reported concussions in 2016 but in 2017 he was removed from play. On this occasion, head contact with an opponents knee and hip, while tackling and being tackled was noted. With the use of newly introduced video review, there was doubt as to whether he had exhibited possible motor incoordination and he was then removed for further assessment. He was cleared to return to play based on satisfactory SCAT 3 testing and neurological examination. Follow up review and testing, within 48 hours, was undertaken and showed no abnormality.

At the time of the initial neurological consultation, he underwent a standard waking 10:20 placement electroencephalograph (EEG) [13] with modified lead 2 rhythm strip cardiograph (ECG). The EEG was normal and while initially the ECG was also normal, there emerged a pulses bigeminy pattern resulting in apparent bradycardia of 20-30 beats per minute. He also underwent, an in-hospital, polysomnograph, which was essentially normal, together with concurrent prolonged video telemetric EEG, which was likewise normal.

On the basis of these investigations, he was referred for more detailed cardiological evaluation. This included electrocardiogram, echocardiography and stress testing, all of which were normal. Holter monitoring revealed frequent ventricular ectopy but no evidence of sustained dysrhythmia. Cardiac MRI also confirmed a structurally normal heart. The initial plan was to perform further non-invasive evaluation, using a smart-phone based application, to document his heart rhythm during symptoms. The patient developed more frequent episodes of lightheadedness during exercise and so an exercise stress test was repeated. On this occasion, frequent paroxyms of ventricular tachycardia (VT) were observed during exercise, correlating with his symptoms. The ECG appearance of the VT suggested an origin from the right ventricular outflow tract. An electrophysiology study was performed and the ventricular ectopy was confirmed to arise from the right ventricular outflow tract. Ablation was performed at this

site. The patient has remained free of dysrhythmic symptoms since the procedure, and no further VT has been documented by serial exercise testing.

Following ablation treatment, the patient rested for 1 week before undergoing repeat 24-hour holter monitoring and stress testing. Both tests were unremarkable and he was allowed to return to modified and supervised training, avoiding activities causing him to reach greater than 80% maximum heart rate. The patient was reviewed by his cardiologist a month later, with the same testing performed, and was then cleared to return to full training. Since then, he has made a successful return to full training without any repeated episodes.

Results

This case reports a young, healthy, elite, professional sportsman, who experienced numerous concussive TBI's and subsequent episodes of altered consciousness thought to be post-concussive epilepsy. While the history, obtained by the neurologist, raised doubts regarding the nature of the 'epileptic seizures' [13], it warranted an EEG, which included a co-incidental, modified lead 2 rhythm strip ECG which provided the diagnostic clue as to the cause of the symptoms. The history was also suggestive of sleep disordered breathing and sleep apnoea [12], the tests for which proved negative.

Discussion

There are a number of salient features from this case which are instructive. It is imperative to pursue a detailed history and to document same, a feature within this case which raised initial concerns regarding the witnessed cognitive seizures. The history of experience, provided by the patient, was both at odds regarding the concussive head injuries as well as what occurred during the "seizures". It is valuable to note that the history re-concussion was at variance with the offical records, available through the club sports medicine physician. This highlights the need to access official records and to return to source data, whenever possible, if considering a case of potentially multiple concussions and their consequences. There may be many reasons why the history from the patient may be inaccurate, not the least being amnesia for event associated with TBI or alternatviely embellishment for subsequent gain, the latter being irrelevant ib this case.

Despite the concerns regarding the history obtained by the neurologist, with specific reference to the features of the seizures, they were observed by the sports physician whom the patient initially consulted. This fully justified the necessity to properly investigate the patient who had already undergone preliminary carilogical assessment which had been found to be normal. This raises two important considerations, namely that even experieinced and trained clinicians can misinterpret episodes of altered consciousness and that such cases may need to be assessed by a team of doctors, each of whom has his/her own area of expertise. It highlights the need to be thorough when evaluating the patient and to take nothing at face value.

Previous studies have confirmed the additional value of performing concurrent ECG when undertaking EEG [14]. In this case, the concurrent ECG was initially normal, as was the formal 12 lead ECG prior to referral to the neurologist. This demonstrated the intermittent nature of the dysrhythmia, which was first noted towards the end of the EEG but was again absent at the first, and subsequent, detailed cardiological evaluation. It was only with perseverance that the underlying cardiac abnormality was identified and appropriately managed with ablation.

Having undergone repeatedly normal detailed cardiac assessments, it was possible that the patient could have been allowed to return to play, with devasting consequences, had his team physician not been determined to find a root causes for that which he witnessed. This demonstrates the absolute need for diligence and perseverence, when evaluating such cases, even in the presence of obvious discepancies and repeatedly normal results.

Concussion history in this case revealed inconsistency between the patient's self reported history and the detailed, officially documented history. Such detailed documentation was available because the patient participated in an elite professional competition and may not be available when consulting with semi-professional or amaetur athletes. This emphasises the importance of maintianing adequate reporting and documentation of exposure to concussion and potential head injuries in sport, at all level of activity. Player recollection may be inaccurate and can be misleading, as evidenced by this case in which there was no obvious secondary gain as a result of such error.

Regarding return to play criteria following ablative cardiac surgery, the most recent consensus statement comes from the American Heart Assosciation and American College of Cardiology [10]. The recommendation for athletes, without any underlying structural heart disease, is a return to full competitive activities in 3 months. The athlete must remain free of spontaneous and induced ventricular tachycardia. The platient is expected to complete a successful return to competitive activities in this time frame. In this case the patient did return to his sport and has successfully continued without further incident.

Conclusion

The case emphasises the need for a team approach when evaluating not just elite athletes but all sports men and women who report strange episodes that otherwise defy diagnosis. It emphasises the need to take an adequate history and confirm it with supplementary data, accepting that the more times a history is revisited, the more likely it is to build a reflective picture of the true situation. Despite the initial comprehensive cardiological review, failing to identify the underlying pathology, it was the team approach which insisted on further electrophysiological assessment that identified the aetiology and resulted in curative intervention and optimal outcome.

Practical Implications

- Not all post-concussive altered consciousness is post-trau-

matic epilepsy.

- The history provided by someone with concussion is not always reliable and accurate and may require review of more detailed official documentation.
- Even in the absence of comfirmatory evidence it is imperiative to persevere and continue to investigate until a suitable diagnosis is confirmed.
- A team approach to the assessment of patients with post-concussive symptoms may be more helpful especially when intial investigation is fruitless.

Author Contributions

Roy G Beran: Concept of paper writing and editing of paper and neurological evaluation of patient.

Raymond W Sy: Writing and editing of paper and cardiological management of paper.

Bassam Moses: Initial contact with patient, co-ordination of patient care, writing and editing of paper.

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