Brief Report

Chiari Malformation: *A Potential Cause of Headaches in Brass Players*

Ellis Cerrone [1], **Thomas A. Carroll**[2]

[1]*Faculty of Medicine, The University of Sheffield, Sheffield, England*

[2]*Department of Neurosurgery Sheffield Teaching Hospitals NHS Foundation Trust Royal Hallamshire Hospital Glossop Road Sheffield, England*

Abstract

There has been little attention in the literature to the ailments of horn players and more specifically the etiology of what has been reported by brass players as recurring headaches that may be distinctly related to playing practices. The following report illustrates the case of a 58-year-old male, a keen amateur musician, who presented with progressive Valsalva headaches. He reported that his symptoms became worse when playing the cornet, to the extent that, at presentation, he could no longer play for more than 5 minutes. After imaging, he was diagnosed with Chiari type 1 malformation. This case study looks at the relationship between the patient's music activity and his intracranial pressure related to Valsalva manoeuvres, and furthermore explores the possible contributory link to his Chiari malformation. The occurrence of significant headaches in brass players, in particular when playing in the higher register, should prompt consideration of medical attendance and screening with MR scanning for Chiari malformation.

Keywords: ***Brass, Chiari Malformation, Headache, Valsalva***

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Introduction

The majority of health consequences to playing wind instruments are linked to the effect of Valsalva manoeuvres on the cardiovascular system [1]. One explanation is that the reduced venous return caused by an increased intra-thoracic pressure reduces cardiac output and as a result perfusion may become inadequate. This may explain why trumpeters can experience dizziness and blackouts during their course of playing [1]. A reported case of an intracranial cerebellar haematoma occurring in a professional trumpeter while playing described a particular patient who developed an intracranial lobar haematoma when blowing a horn instrument. The authors hypothesised that the increase in blood pressure caused by Valsalva manoeuvres was responsible, at least in part, for the bleed [2].

Peters et al discuss the link between Valsalva manoeuvres and raised intracranial pressure (ICP). They explain that the reduced venous return from the brain as a result of raised thoracic pressure causes an increase in ICP [3]. The patient case detailed in that report led us to hypothesise whether the regular rises in ICP caused by cornet playing (effectively a Valsalva manoeuvre) could have contributed to the development of his Chiari malformation, or made an erstwhile asymptomatic Chiari malformation symptomatic. A Chiari Malformation is usually considered to be congenital, unless it is associated with an underlying cause such as neck trauma. Most individuals with this condition remain asymptomatic. Surgical intervention is indicated only when symptoms such as headaches, neck pain or motor/sensory deficits develop in association with the malformation.

Description of the Case

The patient, a 58 year old male, presented with an 8 year history of gradual onset, progressively worsening occipital headaches. The pain was aggravated by laughing, coughing and most notably, playing his cornet. In addition, the patient reported variable neurological symptoms including deadness of the left arm and one episode of visual blurring. On examination he was found to have brisk lower limb reflexes and positive cross adductors but no other long tract signs. There was no papilloedema or nystagmus. He subsequently underwent MR imaging, which showed Chiari type one malformation (CM1), i.e., significant cerebellar tonsillar descent through the foramen magnum of the cranium, but with no syrinx (*Figure 1*). *Figure 2* shows a normal scan for comparison.

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Mr. Thomas Carroll Consultant Neurosurgeon Department of Neurosurgery Royal Hallamshire Hospital Glossop Road Sheffield S10 2JF; E-mail: thomas.a.carroll@sth.nhs.uk | COI statement: The authors declared that no financial support was given for the writing of this article. The authors have no conflict of interest to declare.

Figure 1. MRI of the patient, showing the Chiari malformation (arrows), i.e., cerebellar tonsillar descent through foramen magnum of the cranium, acting like a 'cork in a bottle'.

The patient's main concern was his deteriorating ability to play the cornet. He reported that before his symptoms developed, he was able to play for several hours at a time. However, following deterioration over several years, at presentation he was unable to play for more than five minutes without aggravating a painful headache.

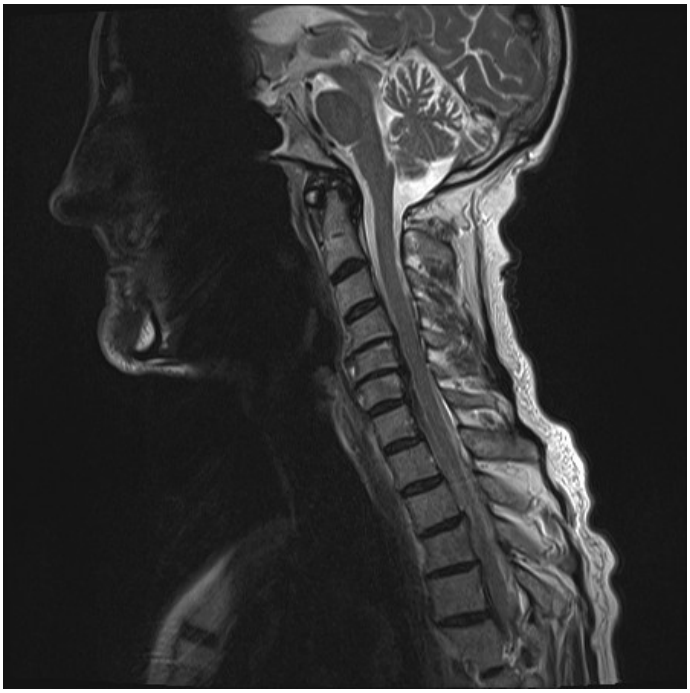

Figure 2. Normal sagittal MRI scan

For this reason, he elected to undergo cranio-cervical decompression. This involves relieving the tension over the cranio-cervical junction by removing a piece of bone (the posterior arch of C1) and incising the dura.

Following the operation, the patient's symptoms resolved almost completely. At six week check up, he denied any Valsalva headaches and was back to playing his cornet for hours at a time. He reported no visual symptoms, and on examination there were no cranial nerve abnormalities or neurological deficits within the upper or lower limbs.

Discussion

The general theory outlining the mechanism linking Valsalva manoeuvres to raised ICP can be explained using the Monro-Kellie hypothesis. According to this, the cranium can be thought of as an enclosed system wherein there lies an equilibrium of three constituents; brain tissue, CSF and blood [4]. Expansion in the volume of any one of these will cause a rise in ICP if it is not met with a reduction in another. Following this line of thought and considering that neck and cerebral veins have no valves [5], it can be deduced that as intra-thoracic pressure rises in a Valsalva manoeuvre and venous blood is prevented from exiting, then another component must be under pressure to leave the cranial cavity. As the equilibrium experiences a change in volume, it shifts to oppose that change and establish a new equilibrium – Le Chatelier's principle [6]. We all experience Valsalva manoeuvres on a daily basis when laughing, coughing, sneezing or straining. The physiological response in these circumstances is to buffer rising ICP using CSF egress. The fluid acts by leaving the cranial cavity and descending into the spinal cord in order to minimise any pressure change [4]. Of course, the brain tissue component of the cranial cavity is also under pressure by the shifting equilibrium. We hypothesise that in individuals with susceptibility (a tight posterior fossa, for example) the cerebellar tonsils are at risk of descending further, and contributing to the progression of CM1.

The transmission of intra-thoracic and intra-abdominal pressure into the head has been shown to produce Valsalva headaches. Bikangaga and Canny note how patients with cystic fibrosis may go on to develop CM1, a fact attributed to consistently raised pressure in the chest [7]. Furthermore, conditions such as obesity are known to have an association with benign intracranial hypertension; the link in this instance being elevated intra-abdominal pressure and interference with cerebral venous drainage [8].

Martínez-Lage and colleagues described two cases of particular relevance to this topic. The first is of a ten year old boy who complained of headaches aggravated by playing the cornet. Imaging showed CM1 with tonsillar descent of more than 5mm. In this instance, a watch and wait approach was taken and advice was given to reduce music playing time. By the six month check up appointment, the patient's headaches had decidedly improved [9]. The link between Valsalva manoeuvres and headaches is not only shown by the trigger

for symptom onset in this case, but also in the cessation of symptoms when musical activity was reduced. The second case is that of a 10- year- old boy admitted with a 2 day history of severe headaches and vomiting. Neurological examination showed only chronic looking papilledema without other abnormalities. In the days leading up to the onset of headache, the patient had been practicing the horn regularly. Of note in the past medical history was that the boy had complained of headaches when playing music or sport over the past two years. MR imaging revealed hydrocephalus in all ventricles with an apparent block of the foramina of Luschka and the foramen of Magendie. The patient subsequently had an endoscopic third ventriculostomy resulting in a complete resolution of symptoms [9].

Headaches on playing a brass instrument are of concern to brass players as per postings on specialist internet forums [10,11]. Some brass players report such 'pressure' headaches, also known as 'slammers' in particular on playing in the higher register: '*every time I play a really high note and hold it for a little bit, I get a massive 10 second headache*'; '*I've been playing lead for 8 years now and in the last year began developing pressure headaches. They started out as slight headaches but they are now getting much worse. It usually only happens when I play the E above the staff and higher.*'; '*Myself and a few other people who I have spoken with have been having what we have come to call "pressure headaches". Which is a headrush or headache that happens after playing a high note, and goes away after a few seconds.*'. Various solutions are suggested such as altering of embouchure, posture, breathing pattern, or even of brass instrument. However, the regular occurrence of such headaches to the point of interfering with playing of the instrument should prompt medical attendance and a search for a Chiari malformation by MR imaging.

Conclusion

This case brought our attention to the possibility that regular, prolonged Valsalva manoeuvres, such as in those who play wind instruments actively and routinely, could be a factor in the development and progression of Chiari malformation. While this role must be taken into consideration, given the joy that musicians gain from their hobby, it would be a difficult decision to put forward a case for recommending the cessation of their treasured activity. However, the development of such headaches in brass players should result in consideration of medical advice and at the very least, a screening for a Chiari malformation.

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Biographical Statements

Ellis Cerrone is a fourth year undergraduate medical student at The University of Sheffield. He has an interest in Neurosurgery.

Mr T Carroll is a consultant neurosurgeon and Deputy Clinical Director of Neuroscience at Sheffield Teaching Hospitals NHS Foundation Trust. His subspecialty practice includes Chiari and craniocervical decompression surgery. He also plays trumpet.