Dental treatment for an adult patient with reflex anoxic seizures

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Introduction

Reflex anoxic seizures (R.A.S), otherwise known as reflex asystolic seizures is a rare condition limited mainly to infants and preschool children. On occasion, however, it can develop through to adulthood (Port and Sultan, 2012, Whitehouse, 2013, Stephenson and Whitehouse, 2012, Iyer and Appleton, 2013). The true prevalence of R.A.S is unknown with the condition often being misdiagnosed as epilepsy (Whitehouse, 2010, Iyer and Appleton, 2013, Garg and Paul, 2013, Stephenson and Whitehouse, 2012).

R.A.S is caused by a trigger stimulating excitation of the vagus nerve, leading to bradycardia and then asystole (Whitehouse, 2010, Iyer and Appleton, 2013, Stephenson and Whitehouse, 2012, Garg and Paul, 2013). Consciousness is lost, with normal sinus rhythm returning in between 15 seconds and 2 minutes, when the person may then regain consciousness. Some patients, however, can appear unconscious for up to one hour (Whitehouse, 2010, Stephenson and Whitehouse, 2012, Iyer and Appleton, 2013). The seizure is self-limiting with recovery occurring in all recorded cases however the person may continue to feel tired or subdued for a period of time (Stephenson and Whitehouse, 2012, Garg and Paul, 2013).

Multiple triggers for R.A.S have been discussed within the literature including painful stimuli (banging the head, trapping a finger in the door), changes in temperature (hot baths, eating ice lollies), venepuncture, immunisations, anaesthesia and being told off by a parent or adult (Port and Sultan, 2012, Garg and Paul, 2013, Iyer and Appleton, 2013).

The presentation of R.A.S can be distressing for family members and health care professionals alike and management of the condition is often prevention and avoidance of the trigger stimulus (Stephenson and Whitehouse, 2012, de Almeida et al., 2013). In some patients pharmacological management is required with anticholinergic drugs, β-blockers or selective serotonin reuptake inhibitors or the use of cardiac pacing where seizures are frequent (Stephenson and Whitehouse, 2012, Garg and Paul, 2013, Iyer and Appleton, 2013, de Almeida et al., 2013).

The Syncope Trust and Reflex anoxic Seizure organisation (S.T.A.R.S - http://www.heartrhythmalliance.org/stars/uk/) work with families and patients who experience R.A.S., providing information leaflets and advice for both patients and health care professionals, along with general information about other causes of syncope (Stephenson and Whitehouse, 2012).

Although this condition mainly affects children with literature quoting 75% of cases resolving by the age of 5 years, the condition can progress into adulthood (Whitehouse, 2010). Literature discussing adults with R.A.S is limited, perhaps due to the changes in nomenclature and diagnosis (Whitehouse, 2010, Whitehouse, 2013).

There is only one case reported in the literature of a patient with R. A. S. requiring general anaesthesia for the extraction of a molar tooth in a 20 year old female patient (Port and Sultan, 2012). The patient's seizures had reduced since childhood but remained infrequent with an atypical presentation; she was otherwise fit and well. This case discussed the careful anaesthetic planning using propofol for induction, maintenance was with sevoflurane and nitrous oxide and fentanyl. Paracetamol and local anaesthesia was used for pain relief. Atropine, in the instance of vagal stimulation, and suxamethonium, for emergency airway management, were also made available. The tooth was removed and the patient recovered without concern (Port and Sultan, 2012).

We present the case of an adult patient requiring the provision of dental treatment. This patient continued to suffer with R.A.S, and we discuss the impact that R.A.S. had on facilitating his care.

Patient case

A 28 year old male patient was referred to the Oral Surgery Department at Liverpool University Dental Hospital by his General Dental Practitioner with regards to his UL8. The UL8 was grossly carious and potentially a complex extraction.

Medical history

The patient reported an allergy to dairy products, hayfever and reflex anoxic seizures. He was not under consultant care, and was taking no medication. He was a non-smoker and drank around 25 units of alcohol per week. The patient's ASA was recorded as III.

Reflex anoxic seizure history

The patient was diagnosed with R.A.S as a child and had been fully investigated for epilepsy and cardiac arrhythmias; his last seizure was in January 2015. He reported that his seizures last between 10 seconds to 2 minutes; and he had always regained consciousness following a seizure but they resulted in him feeling unwell afterwards.

The patient stated that the main trigger for his seizures was the use of needles and therefore he had actively avoided medical and dental interventions in the past; he had even had his dislocated shoulder reduced without sedation. He found the prospect of having dental treatment difficult particularly due to his severe needle phobia that had developed as a consequence of his diagnosis of R.A.S.

Dental assessment

At initial assessment, a full medical and dental history were taken. Clinical and radiographic examination **(Figure 1)** confirmed a grossly carious UL8 and following discussion with the patient he was listed for surgical removal of the tooth under IV midazolam sedation and local anaesthesia.

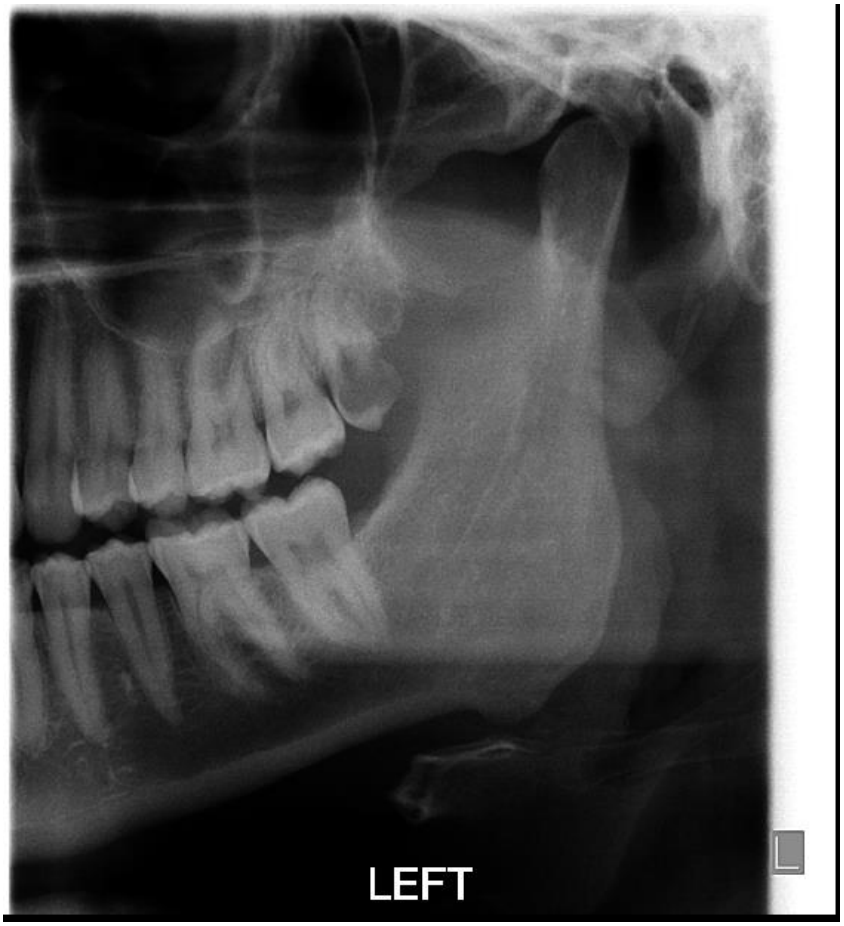

Figure 1: Left half OPG showing the grossly carious UL8.

Treatment planning

The patient attended for the IV sedation appointment. Due to his medical history and the trigger for his R.A.S being needles, the clinician and the patient agreed to rebook the appointment for when an anaesthetist was present

At the patient's second sedation appointment, he attended with the S.T.A.R.S – Reflex Anoxic Seizures (R.A.S) patient information leaflet (Stephenson and Whitehouse, 2012). The patient explained he was unhappy with the plan for IV sedation as he felt that cannulation would likely precipitate a seizure.

Therefore a further dental assessment including bitewing radiographs (to confirm no other carious lesions) was completed **(Figure 2)**. The patient was prescribed high fluoride toothpaste to aid in the prevention of future episodes of dental intervention.

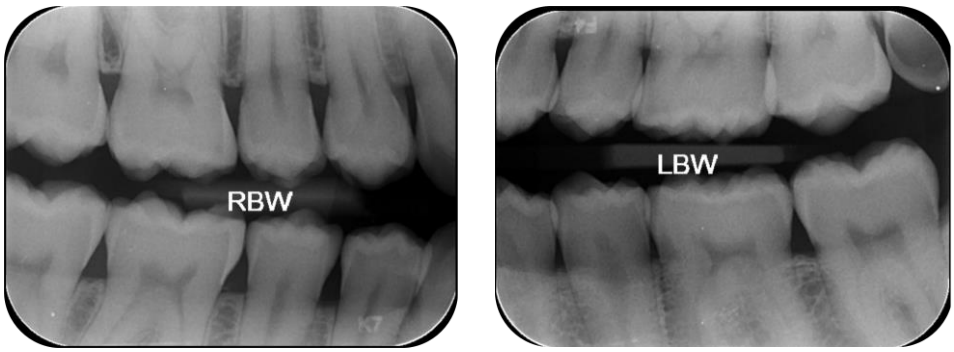

Figure 2: Right and Left Bitewing radiographs confirming no further carious lesions other than UL8

In addition the patient received an anaesthetic review with the consultant anaesthetist and the following plan was agreed:

1. Pre-operative electrocardiogram (ECG) to confirm no underlying arrhythmias
2. Treatment to be completed in a theatre setting
3. Nitrous oxide sedation to allow cannulation
4. IV propofol sedation with Bispectral Index (BIS) monitoring
5. Local anaesthesia for extraction UL8

The patient was happy with the plan and a date was provided following the results of the ECG, which confirmed no underlying arrhythmias.

Treatment

The patient was admitted to dental theatre at Liverpool University Dental Hospital, in May 2017.

Anaesthetic considerations

Pre sedation

Having completed the "team briefing" on management of the patient and WHO pre-operative check list, the patient was transferred to the operating theatre. Patient ID and operating details were confirmed as per standard WHO checklist.

Monitoring.

- NIBP (153/80 mmHg)
- 3 lead ECG monitoring lead II (heart rate 82 beats per minute)
- Saturation (97%)
- BIS electrode to forehead (pre induction BIS 97)

Sedation

Administration of oxygen/nitrous oxide (O_2/N_2O) via circle system and facemask in the ratio 40/60% was commenced allowing the patient to indicate when he was ready for IV cannulation. A 20-gauge IV cannula was inserted, using the aseptic technique, into the dorsum of left hand and O_2 /N_2O was discontinued. The patient requested that the cannula be covered with a bandage to prevent him seeing it on recovery.

Prior to administration of propofol, glycopyrrolate 100mcg was administered IV. Propofol TCI (diprifusor® was started at 2 mcg/ml) providing a moderate-deep level of sedation with no airway support being required. The targeted propofol range throughout treatment was between 2 to 1.6 microgram/ml. At a BIS reading of 71, infiltration local anaesthesia was administered by the surgeon, and dental surgery was completed with BIS reading of 70/80/81 **(Figure 3)**. TCI propofol was stopped as soon as extraction was completed and patient was moved to recovery at a BIS reading of 94.

Figure 3: Changes in the BIS monitoring throughout

The patient's blood pressure ranged from 100/70 to 120/60 mmHg, heart rate between 100 – 90 beats per minute and oxygen saturation was from 96-100% with lowest reading being 96% throughout treatment.

Dental treatment

Figure 4: Administration of 2.2ml 2% lignocaine 1:80,000 adrenaline local anaesthetic

Once adequately sedated the UL8 was anaesthetised with a combination of 2.2ml 2% lignocaine 1:80,000 adrenaline and 2.2.ml 4% articaine 1:100,000 adrenaline **(Figure 4)** placed as buccal and lingual infiltrations. The UL8 was removed intact **(Figure 5)** and the socket was packed with haemostatic gauze and sutures to prevent any issues with bleeding post operatively.

There were no issues with recovery following the treatment and the patient was discharged home.

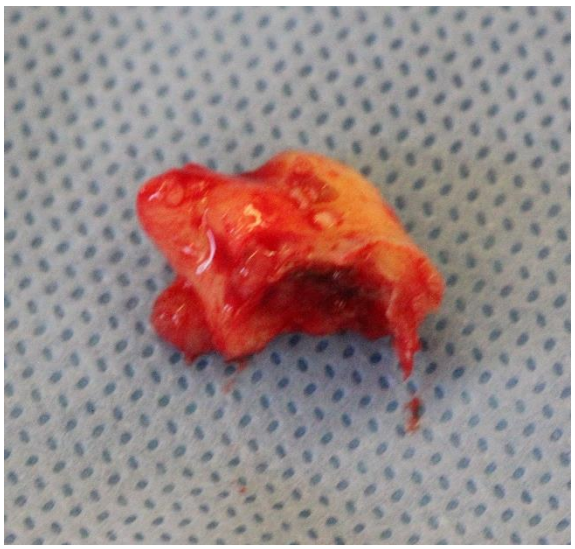

Figure 5: Grossly carious UL8

Discussion- Sedation

Sedation has been defined by ASA society as a continuum ranging from mild to general anaesthesia (American Society of Anesthesiologists®, 2014). Here a moderate to deep level of sedation was achieved with monitoring using BIS. BIS monitoring allows an objective measurement of a drug's sedative and hypnotic effect on the brain (Sandler and Sparks, 2000, Yeganeh et al., 2010). A BIS value of 90-100 suggests an awake state; 71-90, light to moderate sedation; 61-70, moderate sedation and values of 45-60 indicate a level of hypnosis suitable for surgery (Sandler and Sparks, 2000, Yeganeh et al., 2010, Munoz Garcia et al., 2012).

Propofol is a short acting hypnotic agent and has many uses both in sedation and general anaesthesia. In sub-anaesthetic doses it has useful sedative and anxiolytic properties (Oei-Lim et al., 1998). It may be administered by continuous infusion or by Target Controlled Infusion (TCI) systems. The TCI infusion pump incorporates a pharmacokinetic/dynamic model to calculate and deliver propofol at a variable rate which maintains a stable effect site concentration and maintains an optimum level of sedation (Oei-Lim et al., 1998). There are several TCI pharmacokinetic/pharmacodynamics models which have been shown to be clinically effective (Coetzee et al., 1995, Barakat et al., 2007).

Conclusion

Although R.A.S progresses infrequently into adulthood, the diagnosis can continue to cause anxiety for patients, family members and health care professionals. A thorough medical and social history is required for patients presenting with R.A.S to document if the patient is receiving any medical management, to ensure patients have been investigated for cardiac arrhythmias and epilepsy, and to establish the possible triggers for each individual patient.

From a dental perspective, establishing the level of patient anxiety around dental treatment and having a thorough history of the possible triggers, pattern of the seizures and time taken to

recover, is useful for successful treatment planning. Thorough discussion with the anaesthetic team allows for careful planning and management of this patient cohort to allow dental intervention to occur uneventfully.

For this patient sedation occurred in operating theatre allowing for all the necessary equipment, in the event of loss of consciousness or possible haemodynamic disturbances. Clearly the preparation leading to sedation for this patient helped to have a desired outcome. The careful titration of O_2/N_2O allowed the patient to be adequately sedated to allow cannulation and therefore propofol sedation to allow administration of the local anaesthetic. As the patient was unaware of any injections occurring there was no apparent excitatory stimulation of the vagus nerve and so a reflex anoxic seizure did not occur.

The patient discussed in the case will likely require future dental intervention and therefore continued review with prevention advice is necessary.

References

AMERICAN SOCIETY OF ANESTHESIOLOGISTS®. 2014. Continnum of depth of sedation: Definition of general anaesthesia and levels of sedation/analgesia*. Available: http://etherweb.bwh.harvard.edu/education/resources/ambulatory_anesthesia/Continuum_of_Depth_of_Sedation.pdf [Accessed September 2017].

BARAKAT, A. R., SUTCLIFFE, N. & SCHWAB, M. 2007. Effect site concentration during propofol TCI sedation: a comparison of sedation score with two pharmacokinetic models. *Anaesthesia,* 62**,** 661-666.

COETZEE, B. J. F., MBCHB, D. P. M., GLEN, B. P. D. V. A. W. C. A. M. J. B. & BOSHOFF, M. M. F. F. A. L. 1995. Pharmacokinetic Model Selection for Target Controlled Infusions of PropofolAssessment of Three Parameter Sets. *Anesthesiology,* 82**,** 1328-1345.

DE ALMEIDA, T., PENNOCK, V. & SKINNER, J. R. 2013. Medical image. Reflex anoxic seizures in a toddler. *The New Zealand medical journal,* 126**,** 83-85.

GARG, A. K. & PAUL, S. P. 2013. Reflex anoxic seizures are not epileptic fits: A management dilemma. *Indian Journal of Pediatrics,* 80**,** 531-533.

IYER, A. & APPLETON, R. 2013. Management of reflex anoxic seizures in children. *Archives of Disease in Childhood,* 98**,** 714-717.

MUNOZ GARCIA, J., VIDAL MARCOS, A., RESTOY LOZANO, A. & GASCO GARCIA, C. 2012. Utility of Bispectral Index Monitoring During Intravenous Sedation in the Dental Office. *International Journal of Oral & Maxillofacial Implants,* 27**,** 375-382.

OEI-LIM, V. L., WHITE, M., KALKMAN, C. J., ENGBERS, F. H., MAKKES, P. C. & OOMS, W. G. 1998. Pharmacokinetics of propofol during conscious sedation using target-controlled infusion in anxious patients undergoing dental treatment. *Br J Anaesth,* 80**,** 324-31.

PORT, N. & SULTAN, A. 2012. Case presentation: Reflex anoxic seizures and anaesthesia. *British Journal of Medical Practitioners,* 5.

SANDLER, N. A. & SPARKS, B. S. 2000. The use of bispectral analysis in patients undergoing intravenous sedation for third molar extractions. *Journal of Oral and Maxillofacial Surgery,* 58**,** 364-368.

STEPHENSON, J. & WHITEHOUSE, W. P. 2012. Syncope Trust and Reflex anoxic Seizures - Reflex Anoxic Seizures (RAS). *In:* SYNCOPE TRUST AND REFLEX ANOXIC SEIZURES (S.T.A.R.S) (ed.). http://www.heartrhythmalliance.org/stars/uk/.

WHITEHOUSE, W. P. 2010. Reflex anoxic seizures. *Journal of Pediatric Neurology,* 8**,** 51-53.

WHITEHOUSE, W. P. 2013. Reflex asytolic syncope. *Paediatrics and Child Health (United Kingdom),* 23**,** 263-268.

YEGANEH, N., ROSHANI, B., ALMASI, A. & JAMSHIDI, N. 2010. Correlation between bispectoral index and predicted effect-site concentration of propofol in different levels of target-controlled, propofol induced sedation in healthy volunteers. *Arch Iran Med,* 13**,** 126-34.