

Utilization of Intra-Operative Visual Evoked Potential in Long Spine Surgery: Case Report

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Introduction

Perioperative visual loss (POVL) is a terrifying complication that can rarely follow non-ocular surgery. The incidence of POVL following complex spine and cardiac surgery is higher than other surgical procedures and can be as high as 0.2% [1-3]. The etiology behind POVL can involve any part of the visual pathway starting from the cornea to the occipital lobe, with optic nerve ischemia being the most common pathophysiology [2,3]. Different risk factors identified in the literature include prolonged duration of surgery, prone position, significant blood loss, hypoxia, hypotension, anemia and the presence of comorbidity [2,3]

Visual Evoked Potential is a non-invasive test used to test the function of the visual pathway from the retina to the occipital lobe by using a high contrast visual stimulation and occipital electrodes [4]. The use of Intraoperative visual evoked potential is a technique which has been tried in some surgical procedures to monitor the optic nerve in case direct injury occurs, such procedure include transsphenoidal surgery, occipital lobe surgery and paraorbital surgery [5,6].

We are exploring the use of Intra operative visual evoked potentials in long spine cases (high risk) in an attempt to prevent perioperative visual loss by detecting early changes in the visual evoked potential. The use of intraoperative flash visual evoked potential (FVEP) is not associate with serious side effects and is convenient in the setting of an available neurophysiology monitoring. In our article we include a case where intra operative VE monitoring was utilized.

Case Presentation

56 years old male referred to our service with three years history of progressive paraparesis and left leg numbness. The patient has no visual symptoms. On examination the patient has weakness in both lower limbs with a power of 4 out of 5 using the medical research council scale, T6 sensory level with decreased proprioception in lower limbs, normal tone, no clonus and normal upper extremity. Optic nerve examination including acuity and visual field are normal. MRI of the spine (Figure 1 and 2) showed syrinx at T8-9, old compression fracture at T6-9 with kyphosis and normal craniocervical junction.

The patient underwent two stages of surgery. First stage anterior T7-8 corpectomy with cage insertion and correction of kyphosis followed by a second stage posterior T4-10 instrumental fusion and correction of kyphosis. FVEP was monitored during the second stage surgery.

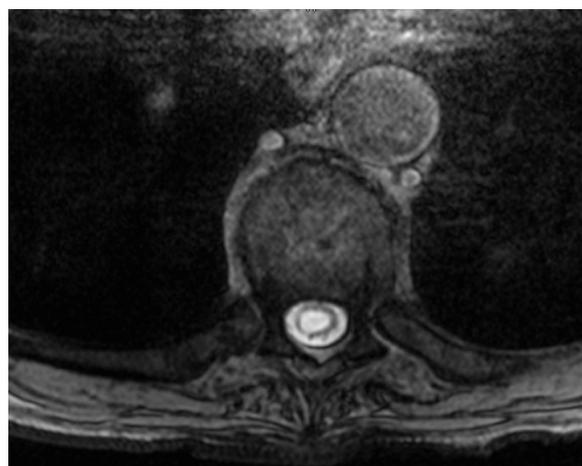


Figure 1: T8-9 syrinx

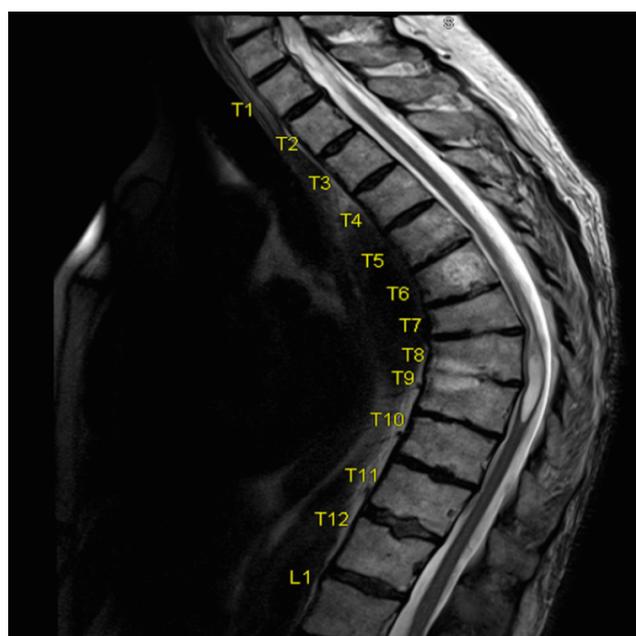


Figure 2: T8-9 syrinx and Kyphosis

Description of surgery and surgical setup

The patient underwent two stages of surgery aiming to correct the kyphosis and decompress the spinal cord. The first stage was through an anterior thoracic approach in which a corpectomy and discectomy of T7-8 was done with correction of kyphosis and instrumental fusion.

The Second stage was done a week later. The patient was positioned prone on a Jackson Table with endotracheal intubation and general anesthesia. Our neurophysiologist connected the intra-operative neuro-monitoring including the goggles used for Intra-operative visual evoked potentials. T4-10 decompression and instrumental fusion with correction of kyphosis was done guided by x-ray and neuronavigation. The surgery lasted eight hours with no complications.

Anesthesia during second stage

For the second stage an arterial line and a central line were placed. The patient had anesthesia induced with Desflurane gas inhalation, propofol 200 mg intravenous bolus, Ketamine 10 mg intravenous bolus, lidocaine 80 mg intravenous bolus and fentanyl 100 mcg intravenous bolus. He was intubated using a standard endotracheal tube. The amount of blood loss was 600 cc and the patient was given 300 cc of blood and 1100 cc of fluids during the surgery. No hypotensive attacks occurred.

Flash visual evoked potential

Our method for recording FVEP has been described previously [7]. Briefly, left then right eyes were stimulated with commercially available goggle stimulators (Cadwell Instruments, Kennewick, WA) at a rate of 1.41 times per second. FVEPs were obtained from corkscrew electrodes (Xian Friendship Medical Electronics, Shaanxi, China) Oz-linked mastoid (International 10-20 system) that were connected to a Cadwell Cascade Elite machine. The total sweep time was 300 msec. The amplifier gain was 20 μ V but the display gain was adjusted for optimal presentation of the FVEP waveform. The recording bandpass was 10-100 Hz for all channels. The reject window limit was 20 μ V peak-to-peaks. The FVEP waveform was the averaged result of 100 stimulus presentations. The FVEP peak-to-peak amplitude was measured from the first negative peak after 60 milliseconds (N1) to the following positive peak (P1). A significant change in FVEP was when N1-P1 amplitude decreased more than 50% from baseline for two or more consecutive trials.

Results

At the beginning of the case the patient was anaesthetized with inhalation agents so FVEP monitoring was not performed. After the patient was on TIVA, the FVEP was obtained along with SSEPs in an interleaving fashion. There were no significant changes in FVEP waveforms after left then right eye stimulation (Figure 3 and 4).

Discussion

We report for the first time the use of Intraoperative FVEP in prone position long spine surgery case in an attempt to detect any intraoperative changes that could indicate compromise of the visual pathway. In our case no concerning changes occurred and we were able to monitor FVEP which was reassuring. We hypothesize that FVEP will help detecting intraoperative compromise of the visual pathway and so will help the surgical and anaesthesia team identify and try to prevent visual loss.

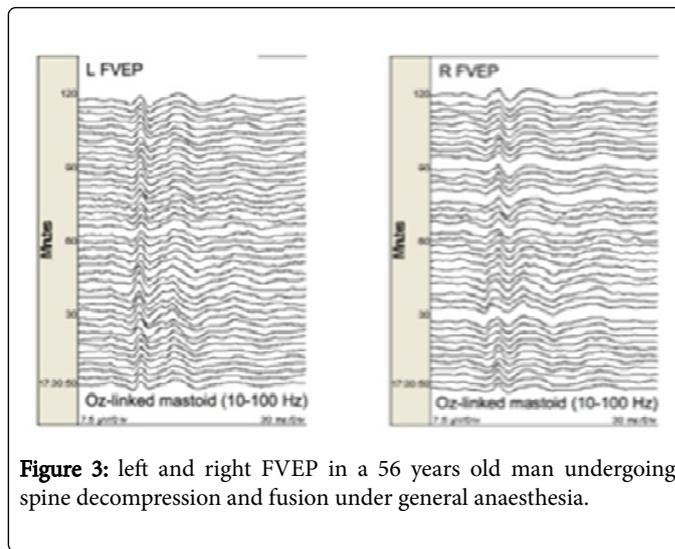


Figure 3: left and right FVEP in a 56 years old man undergoing spine decompression and fusion under general anaesthesia.

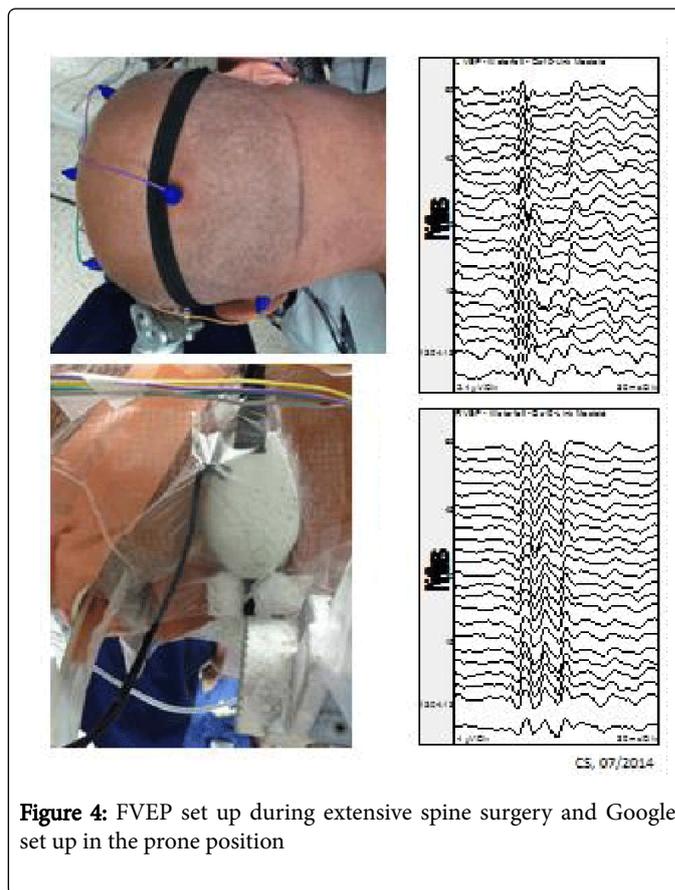


Figure 4: FVEP set up during extensive spine surgery and Google set up in the prone position

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