The Use of Mobile Smartphone Technology to Enhance Positioning of a Prone Patient for Thoracic Spine Surgery.

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Citation

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Abstract

Mobile technologies are increasingly utilized by today's healthcare providers both in their personal and professional lives. In modern healthcare, mobile technologies have numerous applications that may revolutionize how doctors practice medicine. We report the use of a commercially available personal consumer electronics device (Apple's IPhone 4th generation (Cupertino, CA)) which aided in the positioning and monitoring of a patient undergoing spine surgery in the prone position.

INTRODUCTION

According to a recent study from Manhattan Research, a health care market research firm, 64 percent of physicians own a smartphone [1]. In addition, 30 percent have an iPad and another 28 percent intend to buy one within six months [2]. Smartphones and other personal mobile technologies are increasingly being utilized by healthcare practitioners at work. According to the same study, one third of physicians use their smartphones to input patient data to an electronic medical record [1]. With a large library of apps available on a wide range of smartphones and tablets, the integration of mobile technology in patient care is likely to increase in coming years. The use of mobile technology has the opportunity to improve patient care in many ways in the future.

Ophthalmic complications including postoperative visual loss are well recognized in patients undergoing surgery in the prone position [3]. Though some ophthalmic complications are preventable by precautions such as proper positioning, the mechanism of injury is not well understood in all cases [4,5]. One well understood mechanism of ophthalmic injury during surgery in the prone position occurs when direct external pressure by a headrest or other support on the eye causes an increase in intraocular pressure [6]. This increased intraocular pressure can lead to retinal ischemia and visual loss [6]. It is essential, therefore, to avoid external pressure on the eye by careful positioning during prone cases and to maintain vigilance through periodic checks of the eyes as well as the face as a whole throughout these cases.

We report the use of a commercially available personal consumer electronics device in the positioning of a patient for spine surgery in the prone position. The use of this device may have potentially prevented positioning injury to the patient's face.

CASE PRESENTATION

A 66-year-old gentleman (height 168 cm, weight 77 kg) with multiple metastatic spinal tumors and spinal cord compression presented for tumor resection including posterior laminectomy, foraminectomy, and decompression of the spinal cord at the T8, T9, and T10 levels as well as pedicle screw fixation extending from T3 to T6 as well as L1 and L2. The patient's past medical history was significant for hypertension, hyperlipidemia, and glaucoma.

General endotracheal anesthesia was induced on transport bed and the patient was subsequently turned to the prone position on an OSI Jackson table using neuro spine positioners. An OSI Gentletouch adult Shea headrest was used to position the patient's head. The left and right arms were flexed and placed on side arm boards and the legs were flexed and padded as per usual routine.

Pressure points including the patient's face were checked by direct visual inspection. In addition, a photograph was taken of the patient's face in the headrest using a mobile smartphone's front facing camera. The image (Image 1) was then examined in detail to assess patient positioning. The image revealed proper positioning of the head with the eyes and face free from external pressure. The device was used for checks of the patient's face approximately every 30

minutes. It was noted that after two hours in the prone position the patient's face had progressively migrated from its initial position (Image 2). At an additional check thirty minutes later, the patient's nose was noted to be in contact with the headrest support (Image 3). The patient's head was repositioned with additional towel bolsters. The repositioning was then confirmed using the mobile smartphone's camera (Image 4). No further change in patient positioning was required during the approximately seven hour surgery. At the conclusion of surgery, the patient met extubation criteria and was taken uneventfully to the PACU. At a postoperative visit on postoperative day one, no positioning injury was noted.

Figure 1

Image 1. Prior to incision, the head is demonstrated in proper position in headrest with no direct external pressure on eyes or nose.

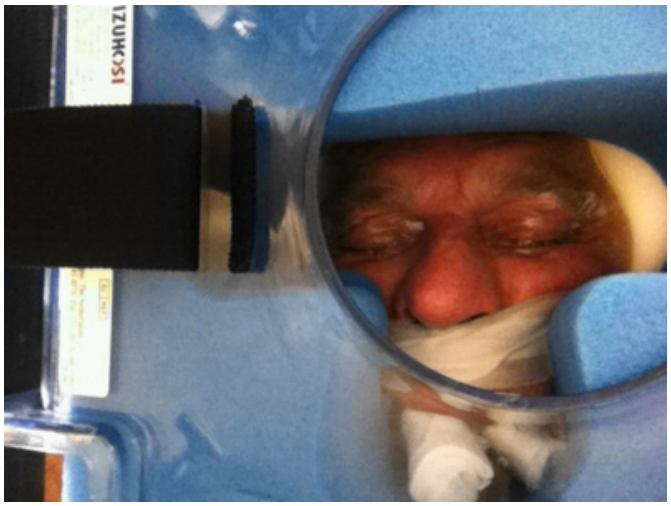

Figure 2

Image 2. Patient's face had migrated after approximately two hours in prone position.

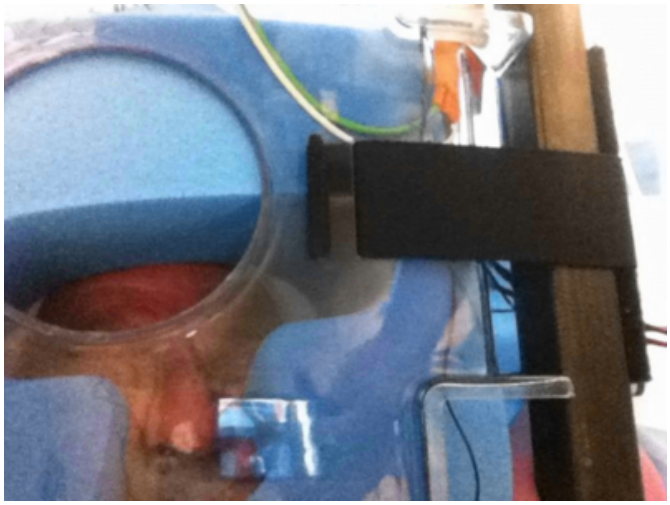

Figure 3

Image 3. Patient's nose in contact with the headrest support (arrow) after 2.5 hours in the prone position.

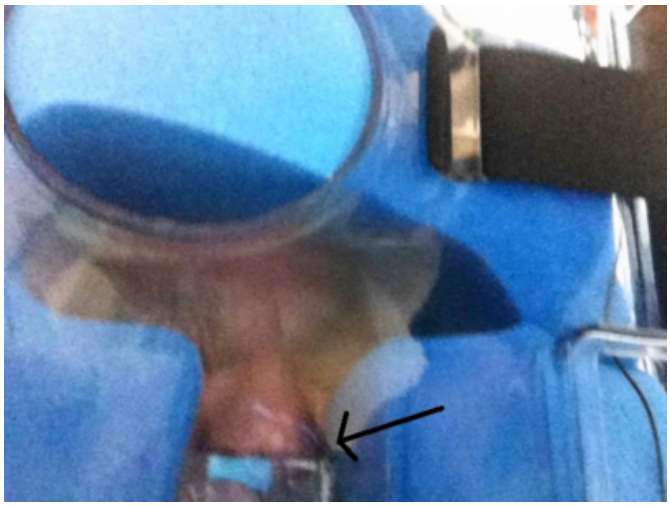

Figure 4

Image 4. Patient was repositioned to allow eyes and nose to be free from external pressure after 2.5 hours in the prone position.

DISCUSSION

When positioning a patient in the prone position for posterior spinal surgery, extreme vigilance is required. Pressure points such as the eyes, nose, ears, and the rest of the face should be assessed at initial pronation and periodically thereafter to prevent pressure injuries. The traditional method to inspect pressure points is direct visualization by ducking under the spine table. However, this may be difficult for some practitioners with decreased mobility. Also, this maneuver necessitates being directly under the patient's mouth and nose where often secretions can be found. Another option is the ProneView® (Dupaco, Inc., Oceanside, CA) which uses a mirror to reflect an image of the patients face for easier visualization. We describe a new third option in which a smartphone camera is used to periodically record the condition of the patients face. In recent years, smartphones have become extremely commonplace and are much more accessible than devices like the ProneView®. An additional advantage to the smartphone option is it allows digital images to be stored. Hence, an image from initial positioning can be compared with an intraoperative image to assess change. In addition to assessing for patient positioning, this comparison could have the additional benefit of assessing intraoperative facial edema and might allow early recognition of the need for post-op mechanical ventilation for airway protection.

In conclusion, we would like to emphasize the need for vigilance when positioning a patient in the prone position. We report the use of a smartphone as a safe, widely available enhancement in assessing and subsequently reassessing prone patient positioning.

References

1. Manhattan Research. (2011). Taking the Pulse® U.S. v11.0
2. Manhattan Research. (2011). 75 Percent of U.S. Physicians Own Some Form of Apple Device According to New Manhattan Research Study [Press Release]. Retrieved August 11, 2011, from http://manhattanresearch.com/News-and-Events/Press-Releases/physician-iphone-ipad-adoption
3. Lee LA, et al. The American Society of Anesthesiologists Postoperative Visual Loss Registry Analysis of 93 Spine Surgery Cases with Postoperative Visual Loss. Anesthesiology 2006; 105:652-9.
4. Lee LA. ASA Postoperative Visual Loss Registry: Preliminary Analysis of Factors Associated with Spine Operations. ASA Newsletter 2003; 67: 7–8
5. Warner ME, et al. The frequency of perioperative vision loss. Anesth Analg 2001; 93: 1417–21
6. Roth S, Tung A, Ksiazek S. Visual loss in a prone-positioned spine surgery patient with the head on a foam headrest and goggles covering the eyes: an old complication with a new mechanism. Anesth Analg 2007; 104: 1185–7

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