

TITLE. A CONTROLLED STUDY ON THE COGNITIVE AND PERFORMANCE IMPACTS OF SLEEP DEPRIVATION IN ANAESTHETIC REGISTRARS.

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Fatigue is frequently cited as an important contributing factor in anesthetic mishaps caused by human error (1). Previous studies which attempted to evaluate the impact of fatigue on performance accepted necessary naps as part of the study design, which may have provided significant performance improvement. The aim of the present study was to determine the impact of 24 hours complete sleep deprivation, occurring as part of the duty cycle of anaesthetic registrars, on attention span, vigilance and problem-solving ability.

Following IRB approval, 17 anaesthetic registrars in the third year of specialty training were each tested for two separate 24 hour periods. One period was during a normal daytime duty cycle when well-rested, with the evening at home and off call (control). The other was a full duty cycle where a continuous non-sleep period of 24 hours occurred (study). The sequence of study period was randomly allocated. Their alert and fatigued performances were then compared, subjects acting as their own controls.

Measurements were made approximately 5 hourly from the commencement to completion of each period and included thermal tracking of diurnal rhythm, subjective grading of fatigue (Wolf Fatigue Scale), mood (Norris Mood Scale), and

sleepiness (Stanford Sleepiness Scale), and paced objective assessment of logical reasoning (Baddeley logical reasoning task) and short term memory (Folkard 2 and 6 letter Memory and Search Task). Workload logs and graphs, and a record of stressful events, were kept for each period. Objective test data were analyzed by ANOVA.

Subjective Fatigue ratings indicated that exhausted and drowsy fatigue followed similar trends during the first day and the early morning (2.00 am) sessions. At the later testing session (24 hour mark) both drowsy and exhausted fatigue ratings were significantly elevated for the no sleep group. Both MAST tests and the logical reasoning test showed a decrease in performance after 18 hours, achieving a statistically significant difference in performance between sleep conditions at the 24 hour mark. There was also a significant decrement in performance after 4 hours sleep during the control period, returning to baseline after a further 4 hours sleep.

These results confirm that cognitive performance for a logical reasoning task is affected by 18-24 hours without sleep. There was a similar trend in performance for the 3 different cognitive tasks although the significance of performance differences was task dependent. This study therefore confirms that the impact of 18 or more hours of continual work, with sleep deprivation, impacts on the tasks of anesthesia, in particular on attention, vigilance and problem-solving ability as well as on short-term memory, information retrieval and reasoning.

REFERENCE

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Title : ASSESSMENT OF COLLATERAL CIRCULATION IN THE HAND IN PATIENTS UNDERGOING MAJOR CARDIOVASCULAR SURGERY: MODIFIED ALLEN TEST (AT) AND USE OF PULSE OXIMETRY (PO) VS DOPPLER ULTRASOUND (DU).

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Ischemic injury of the hand following radial artery cannulation although rarely reported is a severe complication. One mechanism of injury is radial artery thrombosis in the absence of adequate ulnar collateral circulation. Allen test is usually performed before a radial artery cannulation. Recently, some authors have proposed the registration of a finger pulse oximetric signal after compression of the radial artery to assess the collateral circulation in the hand¹. The aim of our study is to compare AT² and PO³ to DU considered as the reference method.

Patients and Methods: After institutional approval and informed consent, 50 consecutive ASA II-IV patients undergoing CABG or major vascular surgery (34 males / 16 females, age ranged from 26 to 76, mean=59.2) were tested preoperatively by three investigators. Each investigator performed always the same test and was not aware of the other investigators findings. The first hand tested (right or left) was randomly assigned. A directional 8 MHz DU flow probe (DUH 800) was used to assess the functionality of the superficial palmar arch; the collateral circulation was classified in: good (DU+), poor or absent (DU-). Results of AT were classified according to the time of full palmar blush (FPB) after release of the ulnar compression: < 7 sec, 7 ≤ FPB < 15 sec, FPB ≥ 15 sec. Finger probe of a pulse oximeter (Nellcor 200) was placed on the thumb and the pulse oximetric signal was registered; after compression of radial artery at the wrist the presence (PO+) or absence (PO-) of signal was recorded.

Results: The superficial palmar arch was functional in 89/100

hands at the DU. When AT was compared to DU (Tab 1), AT showed a sensibility of 0.86 and a specificity of 0.54 (PPV = 0.93, NPV = 0.33) when the time accepted to observe a FPB was limited to < 7 sec. When this time increased to < 15 sec., sensibility of AT became 0.99 and specificity 0.27 (PPV = 0.91, NPV = 0.75); consequently, the risk of considering normal collateral circulation according to AT when it was absent, according to DU, increased from 0.46 to 0.73 when time of PBF was increased. When PO was compared to DU (Tab 2), PO showed a sensibility of 0.89 and a specificity of 0.45 (VPP = 0.93, VPN = 0.38). The probability to have a PO+ with a DU- was 0.55.

Conclusion: AT and PO do not seem to be accurate in assessing collateral circulation in the hand in patients undergoing major cardiovascular surgery.

Tab. 1 - Comparison of modified Allen test vs doppler ultrasound

	FPB<7	Allen 7≤FPB<15	FPB≥15
DU+	77	11	1
DU-	5	3	3

Tab. 2: Comparison of pulse oximetry vs doppler ultrasound

	PO+	PO-
DU+	80	9
DU-	6	5

References:

1. Hovajim AR et al. Pulse oximetry for evaluation of radial and ulnar arterial blood flow. J Cardiothorac Anesth, 111, 1, 27-30, 1989
2. Oh TE et al. Radial artery cannulation. Anesth. Intens. Care, 3:12-18, 1975.
3. Mozersky DJ et al. Ultrasonic evaluation of the palmar circulation. A useful adjunct to radial artery cannulation. Am. J. Surg., 126:810:812, 1973.