

Title: ASSESSMENT OF RECOVERY FROM ANAESTHESIA: WHAT TESTS SHOULD WE USE?

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INTRODUCTION: Surgery is being increasingly performed on a day-stay basis. It is important that adequate criteria for assessing a return to "street fitness" prior to patient discharge be formulated. Towards this end a variety of tests of psychomotor function have been used. Psychomotor performance results from the co-ordination of sensory and motor systems through central neural integrative and organisational pathways. The processing of sensory information is influenced by personality, memory and individual motivation, while the overall function of the integrative mechanism is governed by the state of arousal of the CNS. It is possible to isolate the major variables of psychomotor performance which go to make up the psychological and motor response to the administration of a psychoactive substance and to devise tests for the assessment of the effects of such drugs on these variables. The essential components of psychomotor behaviour are: the sensory processing aspect - which can be assessed using a letter cancellation test (LC); the central integration and processing mechanisms - which can be assessed using the critical flicker-fusion test (CFF); the overall sensorimotor co-ordination - which can be assessed using the simple reaction time test (SRT). In addition, short term memory can be assessed using a picture recall test (PR). This study evaluates critically the usefulness of these commonly used psychomotor tests in the context of assessing adequacy of recovery from anaesthesia for minor out-patient surgery. In order to assess the discriminating power of the four standard tests, patients were either premedicated with an inert placebo or with a low (5 mg) or high (20 mg) dose of a sedative/hypnotic imidazo-pyridine derivative with a very short duration of action (Zolpidem - half life 2.4 hours).

METHODS: Twenty-six consenting female patients scheduled to undergo minor gynecological surgery as out-patients participated in this ethics committee approved study. All patients were ASA I/II and aged 20-65 years. In order to assess recovery from anaesthesia the tests of psychomotor performance outlined above were employed. Letter cancellation was subdivided into speed and accuracy components. Baseline levels of performance were recorded pre-operatively and at the same time the patients' level of sedation was assessed using a linear analogue scale. A standard barbiturate induction was followed by maintenance of anaesthesia with nitrous oxide 66% in oxygen 33% and halothane 0.5-3.0%, with the patient breathing spontaneously. Only patients in whom the duration of anaesthesia was 15 minutes or less were studied. The time from cessation of anaesthesia to the first response to command ("wake-up" time) was recorded. Repeat psychomotor testing was carried out at 30, 90 and 180 minutes following wake-up. Patients served as their own controls. Results are reported as a percentage of baseline value and expressed as Mean±SEM. All psychomotor performance measures were subjected to logarithmic transformation before statistical analysis. Only values of $p < 0.05$ were considered as demonstrating a statistically significant difference.

RESULTS: The 3 groups were comparable for age and weight. Sedation was increased pre-operatively in those patients who received either dose of zolpidem. Similarly there was a dose-related increase in mean wake up time in these patients.

Picture recall was impaired in all groups postoperatively and had not returned to baseline in any group by 180 minutes. Impairment was greatest in the high dose group and least in the placebo group. However, there was a significant difference between the high dose and placebo only at the 30 minute assessment time. Simple reaction time was prolonged in all groups after operation, being greatest at all assessment times in the high dose group. The high dose group was significantly impaired compared with both placebo and low dose again only at the 30 minute assessment time. Simple reaction time had returned towards normal by 180 minutes in the placebo group. Letter cancellation - speed was reduced in all groups postoperatively returning to normal by 180 minutes in the placebo and 5 mg groups and being most impaired in the 20 mg group. Letter cancellation - accuracy in contrast showed little impairment except in the 20 mg group only, whose performance remained impaired throughout. An increase in accuracy was seen with placebo and the lower dose, the so called "speed-accuracy trade off". The Critical flicker fusion test was difficult to apply in environments which ranged from the ward to recovery room and we were unable to obtain consistent results due to extreme variability in response; its use was therefore abandoned early on in the study.

Results of Psychomotor tests (mean±sem), expressed as percentage of baseline value

| | Placebo (n=5) | Zolpidem 5 mg (n=10) | Zolpidem 20mg (n=11) |
|--------------------|------------------|-------------------------|-------------------------|
| PR | | | |
| 30 minutes | 39±17.0 | 20± 6.6 | 8± 4.2* |
| 90 minutes | 48± 5.4 | 56±12.6 | 27± 8.1 |
| 180 minutes | 83±21.9 | 72±10.1 | 48±13.0 |
| SRT | | | |
| 30 minutes | 118± 6.7 | 118± 6.6 | 160±13.3# |
| 90 minutes | 117± 6.3 | 114± 6.3 | 140± 9.3 |
| 180 minutes | 104± 5.8 | 111± 6.6 | 131± 7.0 |
| LC-speed | | | |
| 30 minutes | 82± 5.4 | 89± 6.2 | 75± 9.9 |
| 90 minutes | 91± 4.0 | 90± 6.0 | 84± 8.9 |
| 180 minutes | 99± 5.8 | 100± 7.0 | 94±10.7 |
| LC-accuracy | | | |
| 30 minutes | 104± 9.1 | 108± 8.1 | 83±10.6 |
| 90 minutes | 102± 5.2 | 108±11.4 | 89± 7.7 |
| 180 minutes | 100± 7.3 | 103± 9.7 | 90± 8.7 |

* $p < 0.05$ vs placebo

$p < 0.05$ vs placebo and 5 mg

DISCUSSION: Of these commonly used tests only picture recall was able to begin to differentiate between placebo, 5 and 20 mg in terms of the subtle differences in recovery. Simple reaction time was able to differentiate between the high dose and the low dose dose and placebo. Critical flicker fusion was too impractical a test to be of use in clinical decision making. We would suggest therefore that tests of memory and sensorimotor coordination appear to be the most useful indices of recovery.