

Lack of Premorbid Cognitive Estimates Invalidates Conclusions Regarding Cognitive Decline After CABG

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ABSTRACT and BACKGROUND

Numerous studies have demonstrated that many patients experience cognitive decline following coronary artery bypass grafting (CABG).^{1,2} Not surprisingly, postoperative decline is most apparent in the first weeks post-CABG with up to 75% of patients exhibiting cognitive decline.¹ There is less agreement regarding the persistence of these deficits. Newman et al³ reported cognitive decline post-CABG in 42% of patients at five years; whereas Selnes et al⁴ showed declines in visuoconstruction abilities, psychomotor speed, and gains in executive functioning at five years.

OBJECTIVES

- To compare the incidence of cognitive decline in conventional on-pump CABG patients with off-pump CABG patients

PATIENTS and METHODS

- Seventeen patients randomly assigned to conventional on-pump bypass surgery or off-pump surgery
- Cognitive testing was completed the day before surgery, then at followup of two weeks, five months and 22 months after surgery
- The following cognitive measures were administered:

Attention	1) Digit Span (from WAIS-R)
Verbal Memory	2) Mental Control Subtest (from WMS-R)
Visual Memory	3) Rey Auditory Verbal Learning Test (RAVLT)
Psychomotor Speed	4) Benton Visual Retention Test
	5) Grooved Pegboard
	6) Digit Symbol
Gross Cortical Function	7) Trails A & B

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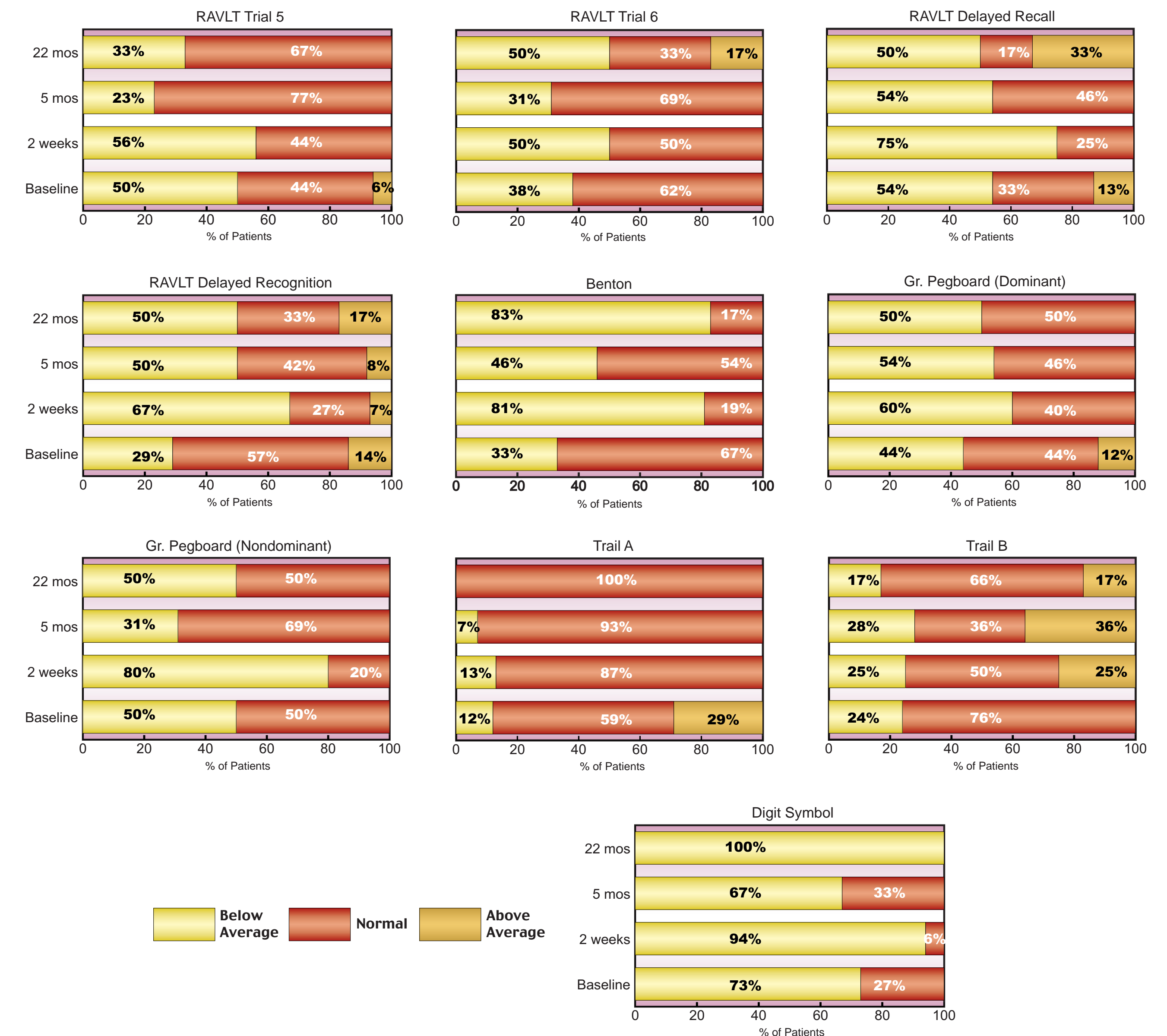
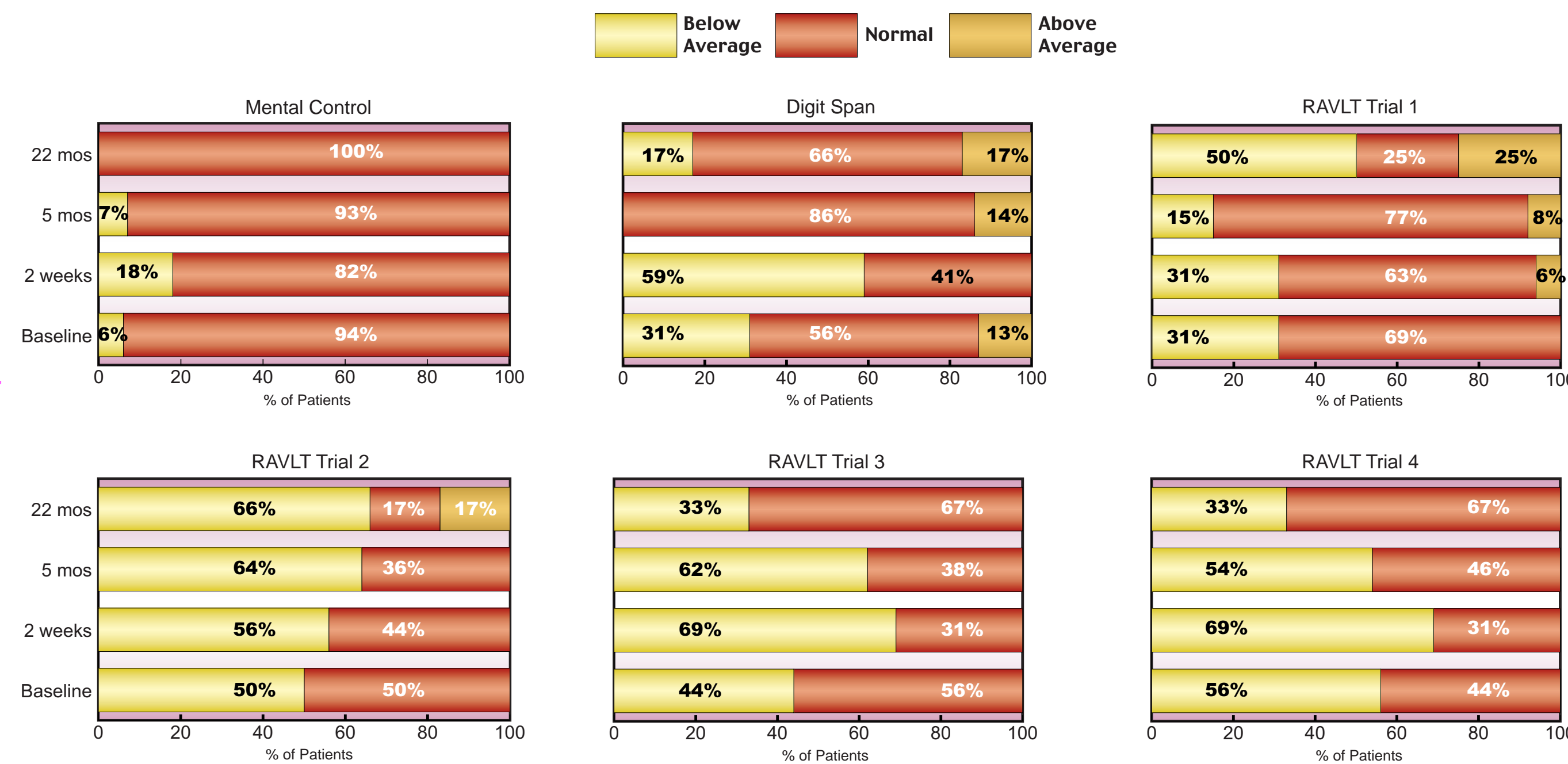
- The following measurement strategies were utilized to assess post-operative cognitive change
 - Percent Change Approach.** Difference scores were computed and then converted to percent of baseline scores for each measure. An overall percent change score was computed by taking the mean percent change scores across all measures. T-tests were used to compare the mean percent change scores for each group.
 - Standard Deviation Approach.** A decline of at least one standard deviation (utilizing the baseline standard deviation) on at least twenty percent of the measures was considered evidence of impairment. Chi-square was used to compare the number of patients in each group classified as “impaired”.
 - Twenty Percent Change Approach.** Patients who displayed at least a twenty percent decline on at least twenty percent of the measures were considered impaired. Chi-square was used to compare the number of patients in each group classified as “impaired”.
 - Z-score Method.** Scores were converted to z-scores, using the mean and standard deviation of baseline scores for all patients. Within subject changes were analyzed with paired t-tests, while group changes were assessed with independent t-tests.
 - Difference Score Method.** Difference scores were computed for each measurement. Within subject changes were assessed with paired t-tests, whereas independent t-tests were used to evaluate mean group differences.

RESULTS

Demographics of Patient Population

	All patients	Conventional CABG	Off-pump CABG
Number of patients	17	8	9
Mean Age	64.0	65.8	62.4
Males	14	6	8
Females	3	2	1

- A series of analyses using each of the measurement strategies yielded no consistent differences in cognitive performance between conventional on-pump CABG and off-pump CABG patients from baseline to follow-up.
- We decided to compare each participant’s score on each measurement, at each interval, to the established published norms. The graphs below summarize the percent of patients who scored within the normal range, the below average range, and the above average range for each assessment interval.
- At baseline, patients scored below-average on 35% of the measurements, while at two weeks post-surgery, they scored below-average on 52% of the measurements. At five months followup, patients scored below-average on 28% of the measurements and at final testing at 22 months, below-average scores were recorded on approximately 43% of the measurements.



LIMITATIONS

- The study is limited by low statistical power.
- Patients scored below average on more than a third of the assessment measurements before surgery, indicating that the patients had cognitive deficits prior to surgery.
- No measurements were utilized to estimate “premorbid” cognitive functioning. Without these reference measurements it is unclear if patients’ pre-surgery performance accurately reflected true abilities or if their performance was already compromised by neurocognitive deficits from an unspecified etiology.

CONCLUSIONS

- The large number of below-average scores on the baseline testing suggests that cognitive deficits in CABG patients may be attributed to pre-existing conditions (coronary artery disease) rather than the effects of surgery.
- Future studies should incorporate estimates of premorbid intellectual functioning.
- The impact of various moderator variables (eg: education, sex, motivation, mood disturbances, and culture) should be explored for their effect on the results measured before and after surgery.