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# COMPARISON AMONG CLOSED LOOP COADMINISTRATION OF PROPOFOL AND REMIFENTANIL GUIDED BY BISPECTRAL INDEX VS VOLATILE ANESTHESIA AND TOTAL INTRAVENOUS ANESTHESIA ON EARLY POSTOPERATIVE COGNITIVE STATUS

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## BACKGROUND

Closed-loop controllers are encountered in all aspects of modern life in applications ranging from air-conditioning to spaceflight. Although these systems are virtually ubiquitous, they are infrequently used in anesthesiology because of the complexity of physiologic systems and the difficulty in obtaining reliable and valid feedback data from the patient. Despite these challenges, closed-loop systems are being increasingly studied and improved for medical use.

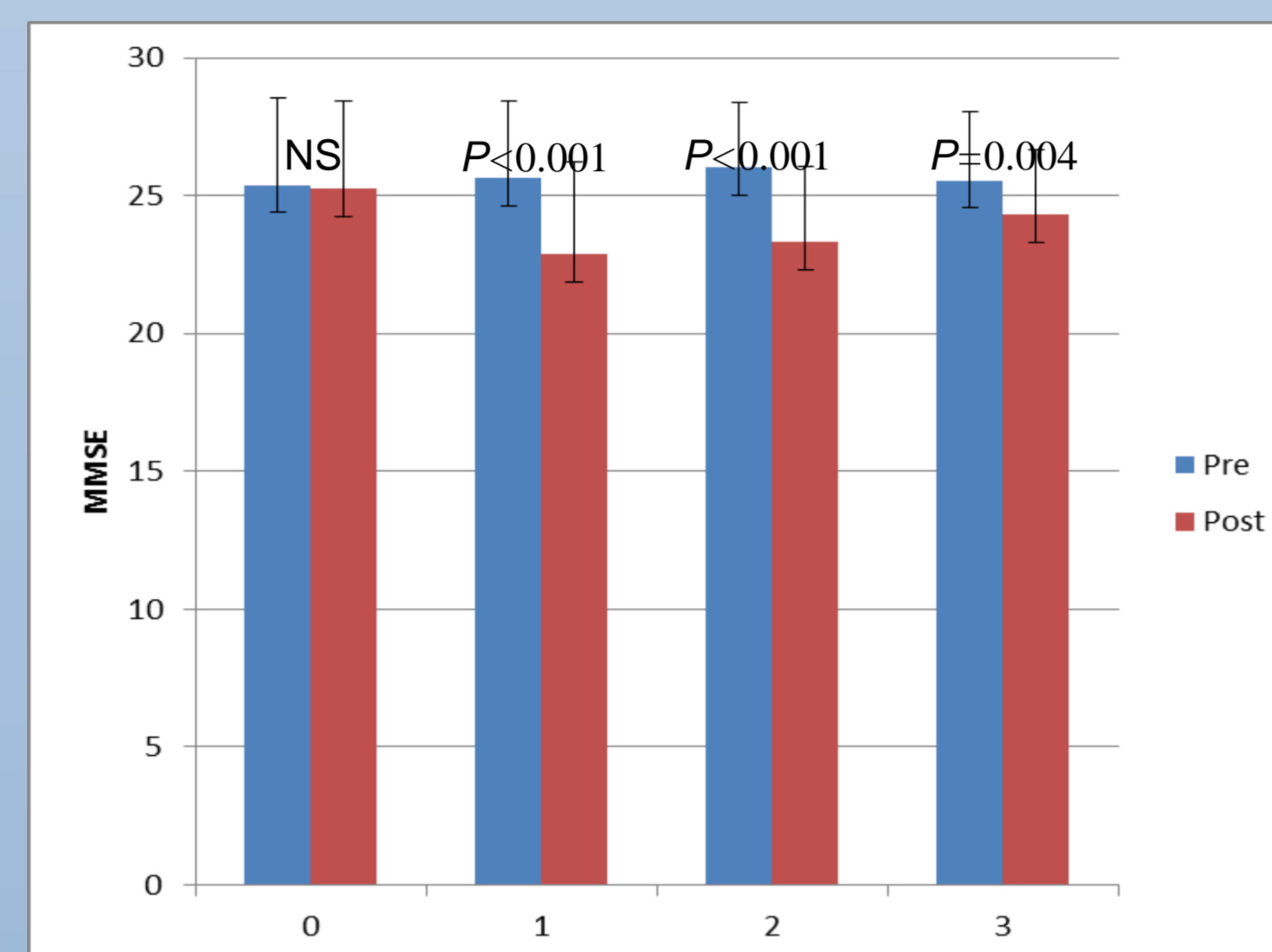
## OBJECTIVES

The purpose of this study was to compare postoperative cognitive status after general anesthesia performed by a Closed loop controller guided by Bispectral index (BIS), allowing the automated titration of propofol and remifentanil in comparison with the manual titration of sevoflurane, desflurane or propofol with remifentanil.

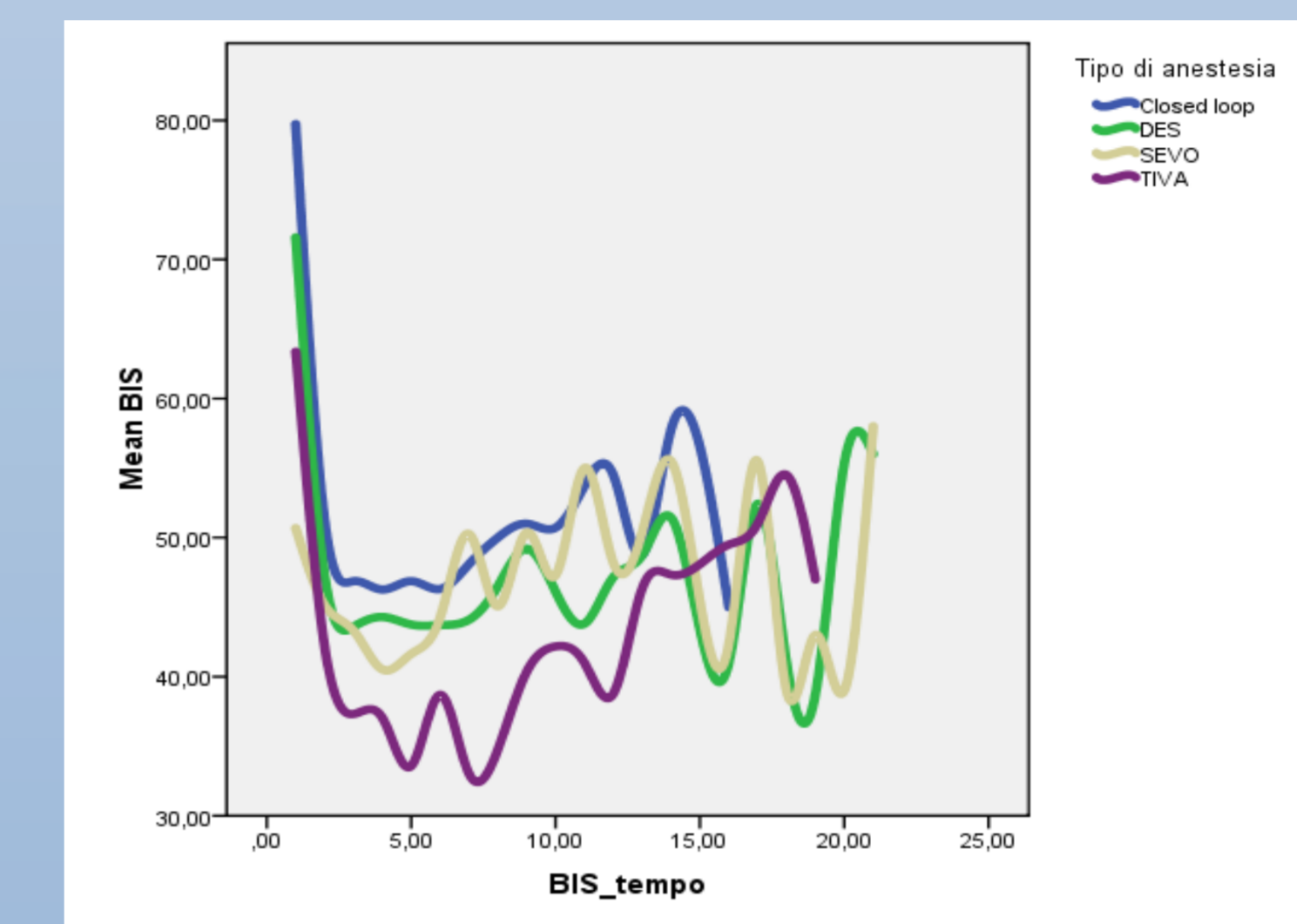
## MATERIALS & METHODS

116 patients scheduled for elective urologic surgery under general anesthesia with or without epidural anesthesia, after obtaining informed consent and ethics committee approval, were allocated into the four groups: automated coadministration of propofol and remifentanil guided by BIS (G0), manual titration of desflurane (G1) sevoflurane (G2) or propofol (G3) with or without remifentanil. All patients received routine intraoperative monitoring including BIS in the range of 40-60. The Mini-Mental State Examination (MMSE) was performed in the recovery room (MMSE PRE=T0), and at 15 min after the wake up from the end of general anesthesia with Aldrete score > 9 (MMSE POST=T1). At 24 h postoperative time the structured Brice interview was given to detect intraoperative awareness.

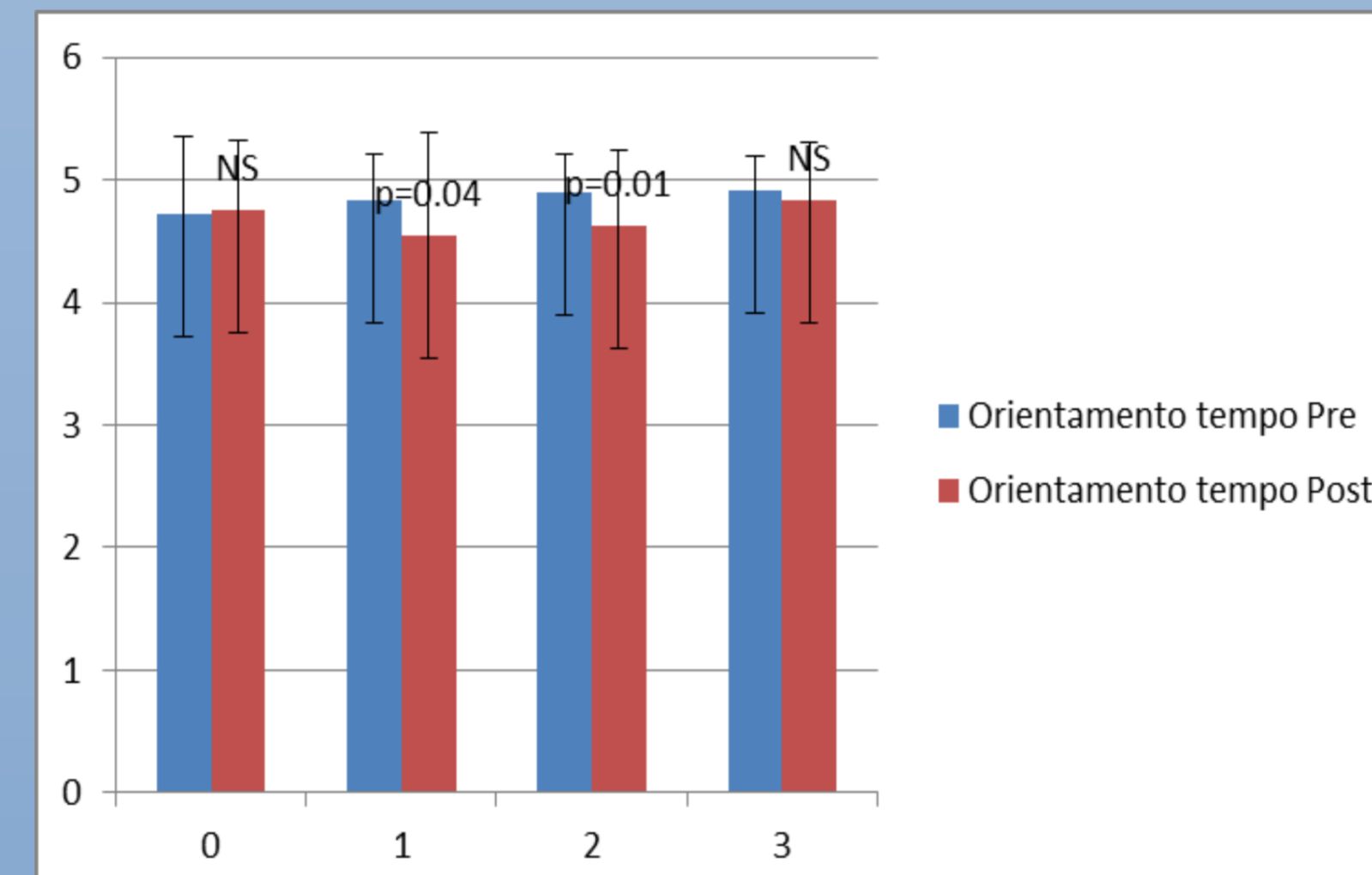
## RESULTS



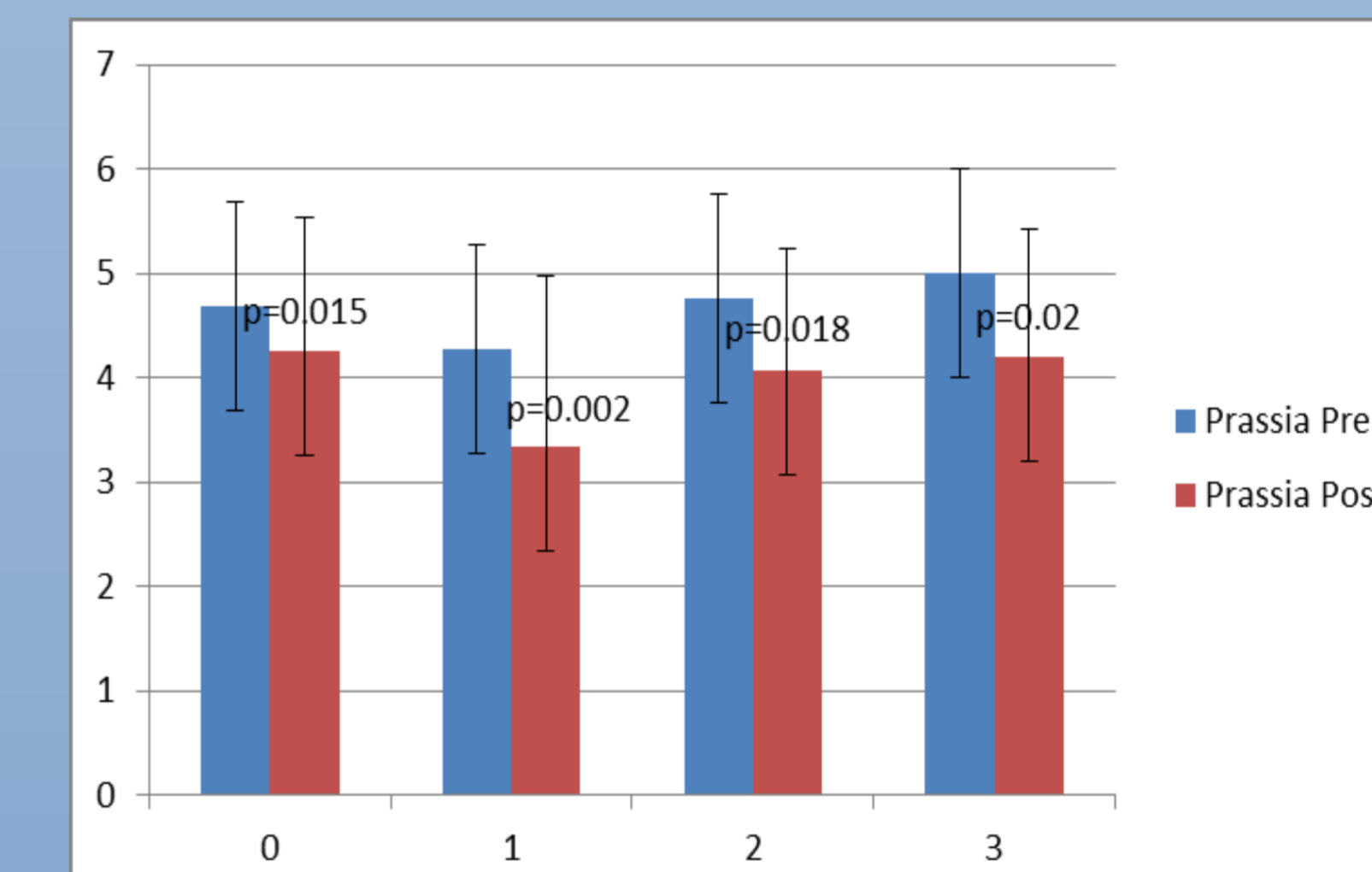
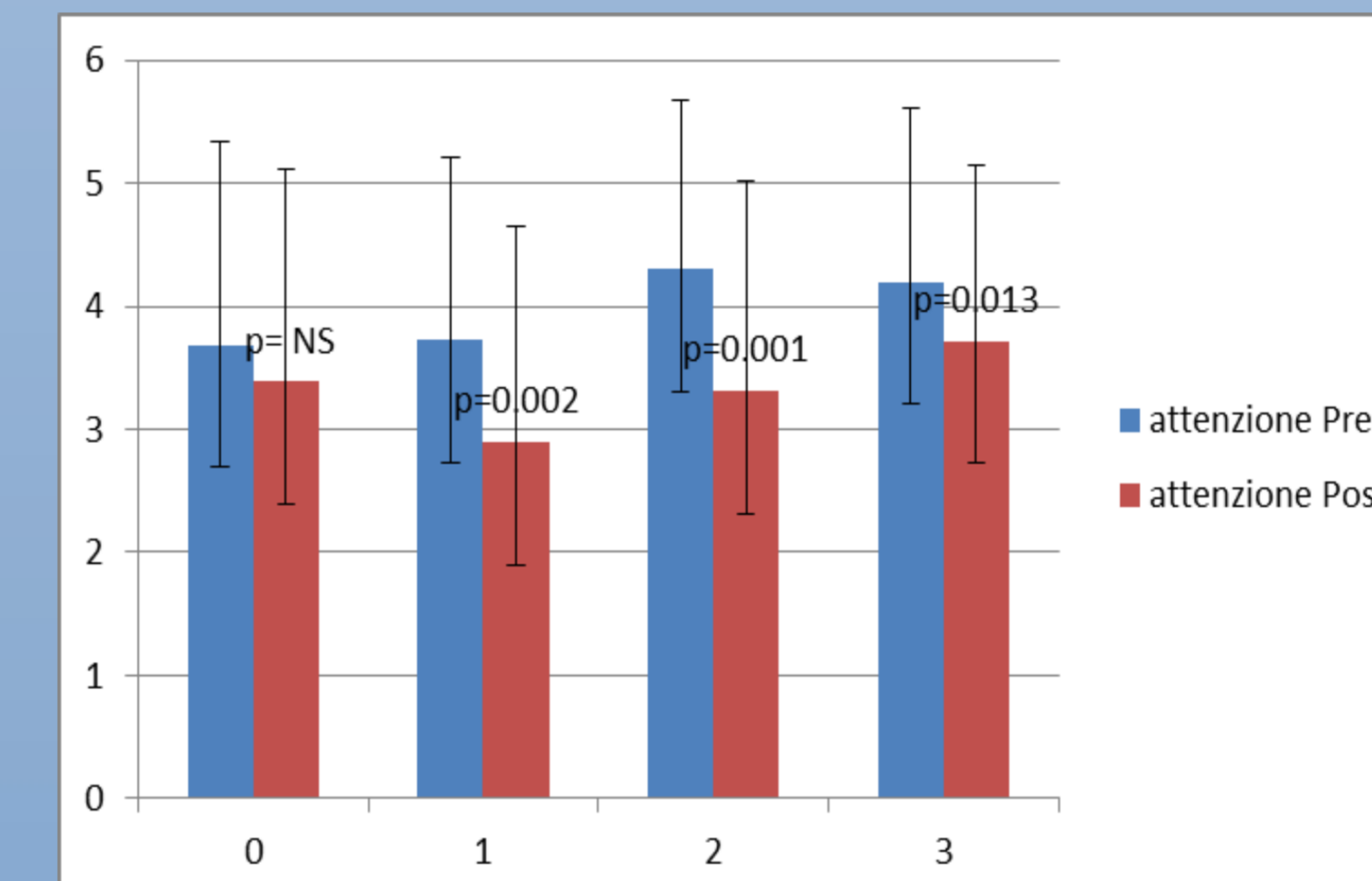
MMSE decreased significantly from T0 to T1 in G1 group (25.64±2.774 vs 22.88±3.319, P<0.001), in G2 group (26.03±2.359 vs 23.31±2.74, P<0.001) and in G3 group (25.54±2.508 vs 24.31±2.329, P=0.004), but the MMSE score was not statistically different in G0 from T0 to T1 (25.39±3.172 on vs 25.25±3.19).



The global score with BIS between 40 and 60 was better in G0 group than in manual administration of general anesthesia.



Temporal orientation was lower in G1 and G2 groups at T1 vs T0 (4.88±0.33 vs 4.52± 0.87, P = 0.04; 4.92±0.27 vs 4.64±0.63, P = 0.01), Attention and calculation were lower in three groups G1, G2 and G3 at T1 vs T0 (3.75±1.53 vs 2.88±1.78, P = 0.002; 4.24±1.45 vs 3.4±1.78, P = 0.001; 4.32±1.24 vs 3.68±1.4, P = 0.013) and Constructional apraxia was lower in all 4 groups at T1 vs T0 (4.72±1.27 vs 4.32±1.21, P= 0.015; 4.36±1.7 vs 3.36±1.7, P= 0.002; 4.84±1.1 vs 4.16±1.21, P= 0.018; 5± 1.25 vs 4.2±1.63, P= 0.02).



0-Closed Loop (G0)  
 1-Desflurane (G1)  
 2-Sevoflurane (G2)  
 3-TIVA (G3)

## Results

At time T0 no difference was found in MMSE score among groups. The temporal orientation was significantly decreased in G1 and G2 groups at time T1 vs T0, but were similar in G0 and G3 groups after general anesthesia. The spatial orientation, registration of words and the short-term memory were similar and comparable by all patients. The attention and calculation were significantly decreased in three groups G1, G2 and G3 at T1 vs T0, but were similar and comparable at T1 vs T0 in Closed Loop (G0). The constructional apraxia was significantly lower in all 4 groups, especially in Desflurane (G1) group. No intraoperative awareness was registered.

## CONCLUSIONS

We reported a cognitive impairment during the immediate postoperative period after manual titration of volatile and intravenous with remifentanil anesthesia while the automated titration of propofol and remifentanil using a controller avoids cognitive dysfunction. The BIS value was maintained in the significant higher range in the Closed Loop group then in other three manually controlled group.

*In terms of the costs of general anesthesia, the use of Closed Loop render the expenses reduction, as well.*

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