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CORRESPONDENCE

Procedural sedation duration and the relation with formation of atelectasis and respiratory complaints

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To the Editor,

Moderate-to-deep sedation (MDS) is increasingly used for diagnostic and therapeutic procedures. Procedures of increasing complexity and duration are continually being introduced, but the increased duration is associated with greater risk of respiratory problems.[1–3] One conceivable cause is insufficient breathing mechanisms (shallow breathing, lack of deep breaths, and lack of coughing) causing atelectasis, leading to postprocedural respiratory problems such as hypoxemia or pneumonia. As more and more patients undergo longer MDS procedures, it is important to be aware of the risk of atelectasis and its possible consequences.

We studied whether the incidence of atelectasis formation correlates with the duration of procedures under MDS (primary objective) and if so, whether atelectasis is associated with respiratory complaints (secondary objective). The study was registered (Dutch Trial Register; NL8320; 5 November 2019), and we obtained institutional review board approval and written informed consent. We included 194 patients undergoing cardiac catheterization ablation under MDS (the sample size was calculated at 190). To detect the presence of postprocedural atelectasis, we used the "AIR-test" method described and validated by Ferrando *et al.*,[4] based on physiologic principles described by Jones *et al.*[5] This method compares pre- and postprocedural pulse oximetry measurements in patients without previous lung disease breathing a sequence of protocolized fractional concentrations of inspired oxygen to detect pulmonary shunting. It diagnoses postoperative atelectasis with an area under the receiver operating characteristic curve of 0.90 (95% confidence interval [CI], 0.82 to 0.98; sensitivity, 82.6%; specificity, 87.8%).[4] For the secondary objective, all patients were contacted by telephone after seven days with a five-item questionnaire investigating postprocedural respiratory problems and the need for treatment.

The mean (SD) duration of MDS was 140 (58) min (range, 36–271 min). The AIR-test result was positive, indicating atelectasis formation, in 47 (24%) patients. For patients with a positive test result, the mean (SD) MDS duration was 152 (72) min compared with 135 (51) min for patients with a negative test result (P = 0.09). Logistic regression analysis showed no significant relationship between MDS duration and a positive test result (OR, 1.005; 95% CI, 0.999 to 1.010; P = 0.10). We corrected this result for age, American Society of Anesthesiologists Physical Status score, and body mass index, but MDS duration remained unrelated to the frequency of positive test results (OR, 1.004; 95% CI, 0.998 to 1.010; P = 0.19; Table). Five (11%) of the patients with a positive test result had one or more respiratory complaints: three (6%) had newly developed cough, and three (6%) had newly developed dyspnea. One of these patients also had cough and dyspnea. Two of these patients sought medical advice from a general practitioner but antibiotic or corticosteroid treatment was not started. The proportion of patients with a negative test result and respiratory complaints was 10%.

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Table Results of the logistic regression analysis

	Odds ratio	95% confidence interval		*P* value
		Lower bound	Upper bound	
MDS duration, uncorrected	1.005	0.999	1.010	0.10
MDS duration, corrected for:				
BMI	1.005	0.999	1.010	0.10
BMI and age	1.004	0.999	1.010	0.11
BMI, age, and ASA PS	1.004	0.998	1.010	0.19

ASA PS = American Society of Anesthesiologists Physical Status; BMI = body mass index; MDS = moderate to deep sedation

The 95% CI for the difference between proportions was –4 to 3, indicating no significant difference.

Two aspects require consideration when interpreting these results. First, as the AIR-test is only validated in individuals with normal lung function and no previous lung surgery,[4] our conclusion only pertains to those categories. Second, it is important to realize that our group of patients did not undergo procedures with oropharyngeal instrumentation like esophagoscopies or endoscopic retrograde cholangiopancreatographies. Our study thus better reflects an effect on atelectasis formation by MDS alone, conceivably filtering out procedure-related effects that may have been seen in studies indicating a relation between duration and atelectasis incidence.[2] Although shallow breathing, or lack of deep breaths and coughing, may cause atelectasis, our data suggest this is a time-independent process. In conclusion, while respiratory problems are less common with procedures of shorter duration,[1–3] in patients with normal lung function, our results suggest that it is not the duration of the sedation itself which increases the risk of atelectasis formation.

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