

## ORIGINAL ARTICLE

# The incidence of postoperative delirium in elderly patients undergoing urologic surgery

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## ABSTRACT

**Background & objectives:** Postoperative delirium is a frequent disorder in sick and elderly patients and has been associated with extended hospital stay and increased cost. The purpose of this study was to assess its etiology and incidence and the effectiveness of routine screening of vague postoperative delirium in the elderly using Confusion Assessment Method (CAM). We aimed to evaluate the risk factors and strategies for prevention and treatment as well as the impact of this psychiatric disorder on postoperative morbidity and mortality. We also assessed the economic impact of this disorder.

**Methodology:** In this prospective, descriptive study, 640 patients, age 65 years or older, were included who underwent surgery at a urology clinic. All patients with a history of psychological problems and treated for these before admission were excluded from the study. Variables noted were: age, use of medications, signs and symptoms, biochemical and clinical balance, hemodynamic profile, and pre, intra and postoperative evaluation.

**Results:** Postoperative delirium (POD) occurred in 166 (26%) out of 640 patients. Incidence was increased with increasing of age from 19% to 31%. POD was present in 27(26%) patients of the 65-70 year age group or in 4.2% of the total patients, in 74 (25%) patients of the 71-75 year age group or in 11.6% of the total patients, in 45 (26%) patients of the 76-80 year age group or in 7.0% of the total patients and in 20 (32%) patients of the >80 year age group or in 3.1% of the total patients. The association with many co-morbid conditions was not significant.

**Conclusion:** The incidence of postoperative delirium with increasing age is significantly high. Further studies are required to relate it with physiologic changes in the brain due to preexistent or concomitant diseases, with blood biochemistry abnormalities, and with hormonal disturbances and with hemodynamic instability.

**Key word:** Postoperative delirium; Confusion Assessment Method (CAM); surgical stress, physiological age.

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## INTRODUCTION

According to the American Psychiatric Association, delirium is defined as "a disturbance of consciousness with reduced ability to focus, sustain, or shift in attention, a change in cognition (memory deficit, disorientation, and disordered speech) or the development of clutter perception". Postoperative delirium (POD) has been associated with increased morbidity and mortality and longer hospital stay. Diagnosis is confirmed with the 'gold standard' test, Confusion Assessment Method (CAM), which is administered without any laboratory examinations or radiological tests, in patients who do not have any apparent physical disorders.<sup>1,2</sup> With the increase in longevity, there has also been an increase in the number of surgical operations being performed in the elderly.<sup>3</sup> These surgical operations have a considerable impact on the psychological status of the elderly. Improvements in surgical techniques, anesthesia, and intensive care units, have made surgery for the elderly

a safe and effective modality of treatment. Despite the improved operative outcomes in the elderly, a large portion of these patients develop postoperative cognitive impairment.

We aimed to assess the etiology and incidence of POD and the effectiveness of routine screening for vague POD in the elderly using CAM. We also aimed to evaluate the risk factors and strategies for prevention and treatment of POD as well as the impact of this psychiatric disorder on postoperative morbidity and mortality.

## METHODOLOGY

After Ethics Committee approval, this prospective, descriptive study was conducted at UHC "Mother Teresa", Tirana (Albania) January 2010 through October 2011. We included all 640 patients, over 65 years of age, admitted to the urology clinic who underwent

surgery,. All patients who had known psychological/psychiatric disorders e.g. Alzheimer's, dementia, schizophrenia etc. were excluded from the study. We used CAM to identify the presence of delirium during the postoperative phase. All patients were analyzed according to the CAM questionnaire. Factors that were important and could be associated with or influenced the emergence of these disorders were also assessed.

**Preoperative evaluation:** The details of any concurrent disease, including drugs being used for these concomitant pathologies and use of alcohol or tobacco were noted. Information regarding the proposed surgery, type of surgery, type of anesthesia and the laboratory work-up (complete blood count, blood biochemistry and electrolytes etc.) were recorded.

**Intraoperative evaluation:** The use of inhalational anesthetic agents, intravenous drugs, local and epidural anesthetics and type of muscle relaxants (if any) were noted. Respiratory and hemodynamic parameters during intraoperative period, e.g. any fall of SpO<sub>2</sub> (desaturation of hemoglobin as measured by arterial blood samples), operative blood loss and total intravenous fluids given were also noted.

**Postoperative evaluation:** Data recorded included: postoperative respiratory and hemodynamic status, medications such as opioids or non-opioid pain killers given during the recovery period, and any treatment with antibiotics or antimicrobials, H1 and H2 antagonists, antihypertensive drugs, or minor tranquilizers, or anticonvulsants, diuretics, or insulin if required.

## RESULTS

A total of 640 patients were included in the study. 615 (96%) were males and 25 (4%) were females ( $\chi^2=543.9$   $p<0.01$ ). The vast majority of cases, 475 (74.2%) belonged to the 71-80 year age group with a significant difference from other age groups ( $\chi^2=206.9$   $p<0.01$ ) (Table 1).

**Table 1: Data of age**

Age (years)	No. of patients	Gender	
		F	M
65-70	102	11	91
71-75	302	8	294
76-80	173	4	169
>81	63	2	61
Total	640	25	615

POD was found in 166 (26%) patients, 95% CI (22.7–29%), ( $p<0.01$ ). All patients were males. There were no cases of postoperative delirium among female patients,

and this was insignificant due to their small number as compared to males. The frequency occurrence of this disturbance increased with increasing age but the trend was not significant ( $\chi^2_{\text{for trend}}=0.5$ ;  $p=0.4$ ). The incidence of POD was higher among the >81 year age group but without a statistically significant difference with other age groups ( $\chi^2=1.3$ ;  $p=0.5$ ). The relative risk (RR) of patients of the age group 71-75 years was 0.9 and 95% CI of 0.6-1.3, compared to 1 and zero for age group 65-70 years. The relative risk (RR) of patients of the >81 year age group was 1.2 and 95% CI 0.7-1.9, without a significant difference when compared to the 65-70 year age group. POD in the 65-70 year age group was found in patients, who presented with hemodynamic complications during intraoperative period and received blood transfusion during this period, or were given atropine or epinephrine.<sup>11</sup> POD among the patients of this age group was not relevant or influenced by the method of anesthesia: epidural anesthesia nor spinal anesthesia. POD in the 71-75 year age group was found not only in patients who presented with hemodynamic complications during intraoperative period but also among patients with preoperative comorbidities, especially patients with anemia. POD in the 76-80 year age group was found not only in patients who presented with hemodynamic complications during the intraoperative period but also among patients with preoperative comorbidities, especially patients with anemia.

Two (10%) out of 20 patients with POD among the >81 year age group required blood transfusion, whereas another 6 (30%) patients were given treatment with epinephrine or/and atropine, during the intraoperative period.

The study did not show a significant difference in the incidence of POD among the above age groups. The frequency of POD is not influenced by age and the relative risk is similar in regard to age group.

## DISCUSSION

According to the American Psychiatric Association, delirium is defined as “a disturbance of consciousness with reduced ability to focus, sustain, or shift in attention, a change in cognition (memory deficit, disorientation, and disordered speech) or the development of clutter perception”. Currently, delirium occurs in 25-60% of older hospitalized patients, with associated mortality rates of 25-33%. Based on 1994 U.S. vital health statistics, each year delirium complicates hospital stays for over 2.3 million older persons, involving over 17.5 million inpatient days, and accounting for 8 billion dollars of Medicare expenditures.<sup>1,2</sup>

Postoperative delirium (POD) has been associated with increased morbidity and mortality and longer hospital stays. With the increasing longevity, there has also been an increase in the number of surgical operations being

**Table 2: Incidence of postoperative delirium**

Age group	No. of Patients	% of the age group	% of total	RR	95%CI	P-value
65-70	27	26%	4.2%	1		
71-75	74	25%	11.6%	0.9	0.6-1.3	0.6
76-80	45	26%	7.0%	0.9	0.6-1.4	0.9
>81	20	32%	3.1%	1.2	0.7-1.9	0.4

performed in the elderly.<sup>3</sup> These surgical operations have considerable impact on the psychological status of the elderly. Improvements in surgical techniques, anesthesia, and intensive care units, have made surgery a viable and safe option for treatment. Despite the improved operative outcomes in the elderly, a large portion of these patients have postoperative cognitive dysfunction.

Diagnosis is confirmed with the 'gold standard' test, Confusion Assessment Method (CAM), which is administered without any laboratory examinations or radiological tests, in patients who do not have any apparent physical disorder.<sup>1,2</sup>

CAM was developed in 1988-1990, to improve the identification and recognition of delirium. It aimed to provide a new standardized method to enable clinicians from specialties other than psychiatry, to identify delirium quickly and accurately in both clinical and research settings. Since its development, CAM has become the most widely used instrument for detection of delirium world-wide. It has strong validation results and is easy to use. When validated against the reference standard ratings of geriatric psychiatrists based on comprehensive psychiatric assessment, the CAM had a sensitivity of 94-100%, specificity of 90-95%, and high interobserver reliability.<sup>1</sup> That's why we preferred to use this test to find out the incidence of POD in our patients.

Patients with delirium often display disorders of thinking, perception and memory.<sup>4</sup> Patients with this disorder are usually above 70 years of age, are on various drugs, have chronic brain diseases, have had previous surgery and anesthesia, are hypoxic, have chronic and recurrent infections, have sensorial problems, have various electrolyte disorders, have pain, and have chronic endocrine and metabolic disorders.

Delirium is a very costly disorder. Health services costs associated with diagnosing, treating, and the consequences that flow from it are very high.<sup>1</sup> Impairment of eyesight and hearing have been associated with a higher incidence of this disorder. Causes of postoperative psychotic disorders (POPD) are multi-factorial. Mechanisms that contribute to POPD are not well known. A lot of theories support abnormal neurotransmission

during this period. One widely accepted mechanism is cholinergic deficit. Neuronal damage is an alternative explanation, secondary probably to oxidative stress.<sup>5</sup> An increase of serum anticholinergic activity is also associated with a risk of increased incidence of delirium.<sup>6</sup> Another hypothesis supports melatonin and serotonin abnormality, abnormal tryptophan metabolism.<sup>7</sup> Tryptophan is a precursor for both melatonin and serotonin. Other hypotheses are: noradrenergic overactivity, neuronal damage from stress factors, e.g. oxidative and inflammatory factors, increased levels of proinflammatory cytokines (especially IL-6 and IL-8, 25), and increased C-reactive protein.<sup>8</sup> So, delirium can occur in the setting of uncertain etiology and may be multifactorial. Some researchers have proposed a link between inflammation and abnormal neurotransmission, in which inflammation can cause perivascular edema and as a consequence hypoxia.<sup>9</sup> Hypoxia is associated with reduction of acetylcholine synthesis. Generally, delirium represents a global dysfunction of the brain. EEG has helped us in the discovery of a rapid reduction of alpha rhythm and a slowly increasing theta rhythm. When the patient is hypoactive, they may have a total hypoperfusion of the temporal, frontal and occipital lobes, and in focal areas of the thalamus (caudal head and lenticular cells). Delirium can be improved when blood flow in these areas reverts to normal, and this suggests that hypoperfusion may play an important role. Preexisting comorbidity is another factor contributing to these disturbances.<sup>10</sup> Various diseases like diabetes, hypertension, cerebrovascular accidents, acute myocardial infarction, atrial fibrillation, malnutrition, emergency surgery cases, alcohol abuse, prolonged postoperative analgesic drug use, prolonged surgery, prolonged benzodiazepine treatment, anticholinergic treatment, prolonged immobilisation, multi-drug treatment, prolonged urinary catheterisation, electrolyte disturbances, unstable perioperative hemodynamic states, frequent blood transfusions, increased postoperative cortisol, and hypoxemia, can all contribute as factors of POD in the elderly.<sup>10,11</sup> Aging is a unique multifactorial process. During aging there is a reduction in adaptive capacities, and diminution of functional reserve of many organs systems,<sup>12</sup> although, physiologic and psychic age is not the same with chronologic age.

In the elderly there is a generalized reduction of neuron density and a loss of 30% of brain volume, especially after 80 years of age. There is also a diminution of serotonin receptors in the cerebral cortex, diminution of acetylcholine receptors of various areas of brain, a decreased dopamine level to the striate nucleus (neostriate) and substantia nigra, associated with dopamine receptors reduction in the striatum nucleus as well.

In our study, the frequent occurrence of this disturbance increased with increasing age but the trend was not significant ( $\text{I}^2_{\text{for trend}} = 0.5$ ;  $p = 0.4$ ). The incidence of POD was higher among the age group >81 years old but without a statistically significant difference with other age groups ( $\text{I}^2 = 1.3$ ;  $p = 0.5$ ). The relative risk (RR) of patients of the 71-75 year age group was 0.9 and 95% CI of 0.6-1.3, compared to 1 and zero for 65-70 year age group. The relative risk (RR) of patients of the >81 year age group was 1.2 and 95% CI 0.7-1.9, without a significant difference when compared to the 65-70 year age group. POD in the 65-70 year age group was found in patients, who presented with hemodynamic complications during intraoperative period and received blood transfusion during this period, or were given atropine or epinephrine.<sup>11</sup> The type of anesthesia was not relevant or implicated in our study. POD in the 71-75 year age group was found not only in patients who presented with hemodynamic complications during intraoperative period but also among patients with preoperative comorbidities, especially patients with anemia. Hypotension may have caused an adverse

effect on the cerebral functions. POD in the 76-80 year age group was found not only in patients who presented with hemodynamic complications during intraoperative period but also among patients with preoperative comorbidities, especially patients with anemia.

The number of patients with POD associated with blood transfusion and treatment with epinephrine or/and atropine was seen only in the >81 year age group, but was not significant. Similarly association of other co-morbid conditions in patients with POD was not found statistically significant in our study, similar to other studies.<sup>13,14</sup>

Analyzing and finding out the factors that cause POPD, understanding of pharmacokinetics and pharmacodynamics, can lead us to treat, and to take measures to prevent this postoperative complication in the elderly. So, prevention and meticulous treatment of these disturbances have direct influence in good performance of post operative condition of the patient.

## CONCLUSION

The incidence of postoperative delirium with increasing age is significantly high. Further studies are required to relate it with physiologic changes in the brain due to preexistent or concomitant diseases with blood biochemistry abnormalities, with hormonal disturbances and with hemodynamic instability.

**Conflict of interest:** Nil declared.

## REFERENCES

- Inouye SK. The Confusion Assessment Method (CAM): Training Manual and Coding Guide. 2003; Yale University School of Medicine. Available at [http://www.viha.ca/NR/rdonlyres/OAC07A64-FF24-41E3-BDC5-41CFE4E44F33/0/cam\\_training\\_pkg.pdf](http://www.viha.ca/NR/rdonlyres/OAC07A64-FF24-41E3-BDC5-41CFE4E44F33/0/cam_training_pkg.pdf) Accessed on 071212)
- Marcantonio ER, Flacker JM, Michaels M, Resnick NM. Delirium is independently associated with poor functional recovery after hip fracture. *J Am Geriatr Soc.* 2000; 48(6): 618-24. [PubMed]
- Rudolph JL, Jones RN, Rasmussen LS, Silverstein JH, Inouye SK, Marcantonio ER. Independent vascular and cognitive risk factors for postoperative delirium. *Am J Med.* 2007; 120(9): 807-13. [PubMed]
- Leslie DL, Marcantonio ER, Zhang Y, Leo-Summers L, Inouye SK. One-year health care costs associated with delirium in the elderly population. *Arch Intern Med.* 2008 Jan 14; 168(1): 27-32. [PubMed]
- Karlıdag R, Unal S, Sezer OH, Bay Karabulut A, Battaloğlu B, But A, et al. The role of oxidative stress in postoperative delirium. *Gen Hosp Psychiatry.* 2006; 28(5): 418-23. [PubMed]
- Mussi C, Ferrari R, Ascari S, Salvioli G. Importance of serum anticholinergic activity in the assessment of elderly patients with delirium. *J Geriatr Psychiatry Neurol.* 1999; 12(2): 82-6. [PubMed]
- Lewis MC, Barnett SR. Postoperative delirium: the tryptophan dysregulation model. *Med Hypotheses* 2004; 63(3): 402-6. [PubMed]
- Uchida K, Aoki T, Ishizuka B. Postoperative delirium and plasma melatonin. *Med Hypotheses.* 2004; 63(3): 402-6. [PubMed]
- Hála M. Pathophysiology of postoperative delirium: systemic inflammation as a response to surgical trauma causes diffuse microcirculatory impairment. *Med Hypotheses.* 2007; 68(1): 194-6. [PubMed]
- Sieber FE. Postoperative Delirium in the Elderly Surgical Patient. *Anesthesiol Clin.* 2009; 27(3): 451-64. [PubMed]
- Bowman AM. Sleep satisfaction, perceived pain and acute confusion in elderly clients undergoing orthopaedic procedures. *J Adv Nurs.* 1997; 26(3): 550-64. [PubMed]
- Inouye SK. Predisposing and precipitating factors for delirium in hospitalized older patients. *Dement Geriatr Cogn Disord.* 1999; 10(5): 393-400. [PubMed]
- Large MC, Reichard C, Williams JT, Chang C, Prasad S, Leung Y, Dubeau C, Bales GT, Steinberg GD. Incidence, Risk Factors, and Complications of Postoperative Delirium in Elderly Patients Undergoing Radical Cystectomy. *Urology.* 2012 Nov 13. pii: S0090-4295(12)01046-1. doi: 10.1016/j.urology.2012.07.086. [Medline]
- Olin K, Eriksdotter-Jönhagen M, Jansson A, Herrington MK, Kristiansson M, Permert J. Postoperative delirium in elderly patients after major abdominal surgery. *Br J Surg.* 2005 Dec; 92(12): 1559-64. [Medline]

