

Original Article

Preoperative risk factors of postoperative delirium after transurethral prostatectomy for benign prostatic hyperplasia

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Abstract: The aim of this observational study was to investigate the occurrence of post operation delirium in the elderly patients undergoing the transurethral prostatectomy and to identify these factors associated with the delirium. 485 patients, undergoing the transurethral prostatectomy, were selected. Demographics, medical, cognitive and functional data, IPSS and NIH-CPSI score were collected as predictors for delirium. After surgery, the patients were divided on the basis of delirium onset within one week observation period, and the delirium was diagnosed by the Confusion Assessment Method. Totally, 21.23% (103) subjects were identified as the delirium and it lasted 2.9 ± 0.8 days. Patients with post operation delirium were significantly older and single, widowed and divorced, had a previous history of prehospitalization, were with the poor International Prostate Symptom Score (IPSS) and National Institutes of Health Chronic Prostatitis Symptom Index (NIH-CPSI) score, were more impaired in the instrumental activities of daily living (IADL), and had poor clock drawing test (CDT) and geriatric depression scale (GDS) score. Age, marital status, IPSS and NIH-CPIS score, cognitive and functional status and previous history of hospitalization are the predictors of post operation delirium. Our study has implications in preventing delirium via an early and targeted evaluation.

Keywords: Benign prostatic hyperplasia, transurethral prostatectomy, delirium, post operation

Introduction

The benign prostatic hyperplasia (BPH) is one of the most common causes of hospitalization disease, but men with less bothersome symptoms are often unaware and not to seek the medical attention [1, 2]. The transurethral prostatectomy (TURP) has been the most common approach to treatment the BPH, which has been performed all around the world [3, 4]. The prostatic disease also contributes to sexual dysfunction in a large amount of men who have undergone surgical treatment; for example, TURP can cause sexual problems like impotence, retrograde ejaculation, etc [3]. The prostatic disease also has couples of psychological impact, e.g. a high level of depression, anxiety, psychiatric morbidity, etc. Among them, the depression and anxiety may exert adverse effects on the morbidity, longevity and overall

quality of life among men with the BPH, but there have been a few studies to probe into the correlation between the delirium after operation and TURP surgical treatment for BPH [5].

The people over 65 years as a main group has increased rapidly in the recent years and couples of demographic studies predict a progressive increase in the future [6]. The older age is characteristic of aging of tissues and organs, a great occurrence of cognitive decline, functional impairment and an increasing number of frail subjects [6-9]. These frail older are more prone to be several complications, for instance, the delirium, affecting a large number of the hospitalized older patients and a wide range of post-surgical elderly [10]. The elderly are a large group of patients undergoing urological surgery, both for endoscopic and open surgery, and the postoperative delirium is also an important

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Table 1. Range of patient ages of non-delirious and delirious patients

Age Range	Total (%) (number)	Non-delirious (number)	Delirious (number)	χ^2 test <i>P</i> -value
65-70	129 (40.2%)	101	28	< 0.05
71-75	125 (24.9%)	103	22	< 0.05
76-80	121 (17.5%)	83	38	< 0.05
> 80	110 (17.4%)	95	15	< 0.05
Total	485	382	103	< 0.05

Table 2. Patient demographics and medical characteristics of non-delirious and delirious patients

	Non-delirious (n=382)	Delirious (n=103)	χ^2 test <i>P</i> -value
Marital status (%)	86%	51%	0.013
BMI mean (SD)	26.3 (3.8)	26.8 (4.1)	0.765
Hypertension (%)	46%	13%	0.341
Diabetes (%)	25%	16%	0.401
Alcohol consumption (%)	48%	46%	0.445
Hyperlipidemia (%)	28%	22%	0.482
Prehospitalization (%)	7.1%	16.2%	0.015

Marital status: married vs widow, single or divorced; %: percentage; SD: standard deviation.

issue in the daily clinical practice. The delirium is a common complication in the elderly patients after urological surgery. Estimation of the prevalence of a delirium after urological surgery varies from 9% to approximate 50% [10]. Systematic screening for the presence of a delirium in the population at risk is needed to avoid adequate detection and, as a consequence, inadequate treatment.

Hallmark symptoms of a delirium are consciousness disturbances, concentration disorders and cognitive disorders such as disorientation, memory disturbance and hallucinations. The motoric presentation of a delirium may vary from an apathetic, inactive state to an agitated, hyperactive state. The variability of presentation, abrupt onset and fluctuating course can make the recognition of a delirium difficult. In the epidemiological data, delirium is associated with increased morbidity, prolonged hospital duration, diminished functional outcome and increased mortality [11]. Thus, the delirium, in elderly patients, is a potential consequence of the surgical approach with a serious impact on the quality of life.

Several studies evaluated various risk factors to identify those most factors in predicting the

onset of the delirium and outcome development [10, 12, 13]. Thus, we conducted a psychological study to probe into the potential prediction factors of post operation delirium in a group of aged male patients undergoing the TURP procedures.

Patients and methods

Totally, 485 men, all over 65 (mean age, 71.25 ± 2.35), with BPH who underwent the TURP were recruited. All the patients' consent was obtained during the recruitment and the study was approval by the Ethical Committee of the Anhui Medical University. A complete description of the research protocol was provided to all the patients, and then a written informed consent to participate to this study was obtained. In all the recruited patients, demographics, previous medical disorders and alcohol abused were all collected. The International Prostate Symptom Score (IPSS) and National Institutes of Health Chronic Prostatitis Symptom Index (NIH-CPSI) score were also collected for each patient. According to the Nickel et al, the patients were classified as having prostatitis-like symptoms with the NIH-CPSI if they complained of perineal and/or ejaculatory pain or discomfort and their total index pain score was 4 or greater [14].

All the surgeries were conducted with spinal (regional) anesthesia, which is easy to monitor for intra-operative mental status. All the patients were undergone the TURP, and the saline fluid was used during procedures, which might help decrease the risk of delirium due to the TURS (hyponatremia). The hyponatremia may result in the subsequent delirium, so all the patients' serum sodium levels were checked post-operation immediately (serum sodium from 135-142 mmol/l).

Preoperatively, a trained researcher administered the psychological questionnaire, including the Mini-Mental State Examination (MMSE), the Yesavage's geriatric depression scale (GDS) short version, the Mendez calculation score clock drawing test (CDT), and functional assessment, as the activities of daily living (ADL) and instrumental activities of daily living (IADL). All the patients were evaluated postoperatively, daily, for a week and at the onset of confusion

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Table 3. Preoperative clinical and functional characteristics of non-delirious and delirious patients

	Non-delirious (n=382)	Delirious (n=103)	Mann-Whitney U test P-value
IPSS score (SD)	15.2 (2.1)	28.5 (2.5)	0.027
Prostatitis-like symptoms (%)	31.4%	54.1%	0.009
NIH-CPSI score (SD)	25.3 (3.9)	37.8 (3.2)	0.019

#: percentage; SD: standard deviation.

Table 4. Preoperative mental characteristics of non-delirious and delirious patients

	Non-delirious (n=382)	Delirious (n=103)	Mann-Whitney U test P-value
MMSE score (SD)	25.15 (1.32)	26.03 (1.19)	0.214
GDS score (SD)	3.13 (0.77)	8.65 (0.29)	0.020
CDT score (SD)	18.73 (0.49)	16.01 (0.99)	0.038
IADL score (SD)	3.01 (0.24)	6.54 (0.35)	0.011
ADL score (SD)	4.25 (0.19)	4.99 (0.23)	0.236

MMSE: Mini-Mental State Examination; GDS: Geriatric Depression Scale; CDT: Clock drawing Test; IADL: Instrumental activities of daily living; ADL: Activities of daily living; SD: standard deviation.

regarding the symptoms, the confusion assessment method (CAM) was performed, according to the Diagnostic and Statistical Manual of Mental Disorders (DSM-IV TR). According to the CAM, the delirium was considered when 4 basic criteria were satisfied: acute and fluctuating starting, lowering of attention, thought disorganization, alteration of alertness.

All the data are expressed as mean \pm standard deviation. The *t*-test, Mann-Whitney U test and χ^2 test were performed between two groups. The statistical tests were performed using the SPSS version 13.0 software package. A probability lower than 5% ($P < 0.05$) was considered to be as the statistically significant.

Results

All the 485 patients underwent the TURP with spinal (regional) anesthesia. Totally, 21.23% (103) was identified as the delirium according to the CAM. The onset of transient delirium occurred on the first post operative day and lasted 2.9 ± 0.8 days. The characteristics of TURP surgery patients with or without transient delirium are shown in the **Tables 1-4**.

The rank age analysis showed non-delirious patients were all more than delirious patients among every rank age group ($P < 0.05$) (**Table 1**). The demographics results showed the mari-

tal status and prior hospitalization for other reason may induce the occurrence of the post operation delirium. The married percentage was significant lower in the delirious patients when compared with the non-delirious group (51% vs. 86%, $P=0.013$) (**Table 2**). In addition, the prior hospitalization for other reason percent was much higher in the delirious patients compared with the non-delirious group (16.2% vs. 7.1%, $P=0.015$) (**Table 2**). The other demographics showed non-significant difference between the delirious and non-delirious group.

The IPSS and NIH-CPSI scores were both much higher in the delirious patients when compared with the non-delirious group (28.5 vs. 15.2, $P=0.027$; 37.8 vs. 25.3, $P=0.019$, respectively) (**Table 3**). According to the Nickel et al criteria [14], the significantly higher incidence of prostatitis-like symptoms was recorded in the delirious patients than in non-delirious ones (54.1% vs. 31.4%, $P=0.009$) (**Table 3**).

The preoperative MMSE score was lower in the non-delirious patients when compared with the delirious patients, but there was no statistically significant (**Table 4**). In addition, the preoperative ADL score in the delirious patients was similar to the non-delirious group (**Table 4**). But the GDS and IADL scores were both much higher in the delirious patients when compared with the non-delirious group (8.65 vs. 3.13, $P=0.020$; 6.54 vs. 3.01, $P=0.011$, respectively) (**Table 4**). The CDT Score was less in the delirious patients when compared with the non-delirious group (16.01 vs. 18.73, $P=0.038$) (**Table 4**).

Discussion

It has been reported that the delirium occurs in hospitalized patients, especially in patients having surgical procedures [15]. The rate of post operation delirium is variable depending on the type of surgical and anesthetic proce-

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dures [16]. The orthopedic surgery has much greater post operation delirium, and ophthalmic surgery much lower (< 5%) [17].

The delirium incidence of 21.23% was found in patients of 60 years and older. This incidence is in the low range when compared with other studies with elderly populations [18]. Age is a well-established predictor for the occurrence of a delirium [15, 19, 20]. In our study, the delirious group was, on average, 7.1 years older than non-delirious group, and this difference was also significant ($P=0.039$). Although it is not certain why elderly patients, in particular, are at risk for the development of delirium, there are several possibilities that is the age is associated with increased atherosclerosis and endothelial dysfunction [20]. As a result, elderly patients have an increased risk of cerebral embolism. What's more, cerebral atherosclerosis combined with post-surgical inflammatory changes may inhibit cerebral blood flow [21]. There are also neuro-chemical factors predisposing elderly patients for a delirium, such as lack of cholinergic reserves [21]. This risk will be provoked by commonly used medications with anti-cholinergic activity such as ipratropium and opiate analgesics.

In our group of urological patients, post operative delirium occurred approximate 20%, confirming the hypothesis that urological surgery is associated with a low rate of delirium. However, some intriguing results came from the analysis of records of the present group of patients. The risk factors previously reported in literature was confirmed in the present study: delirious patients were slightly, but significantly older (76.3 vs. 69.2, $P < 0.05$) and with a single, widowed and divorced and prior hospitalization for other reason [20]. In our cohort study of patients the CDT and GDS scores appears to be more sensitive in predicting the post operation delirium than the MMSE score. This data suggests that when an initial cognitive derangement is present, a vascular damage with a spatial impairment and/or apraxia, as seems to be assessed by CDT [22], is more critical for the post operation delirium onset than a more general cognitive impairment. Another risk factor linked to post operation delirium in the presence of functional decline in the IADL. The assessment of IADL, in our study, is more sensitive than ADL for the prediction of delirium, further suggesting that an initial functional

deterioration is sufficient to contribute to the onset of delirium. Nevertheless, the evaluation of functional status is an important issue in the pre-surgery assessment [5, 15, 20].

It has been reported that the post operation delirium is associated with the single, widowed and divorced [23-25]. Consistent with other studies, in our study, the married percent was much less in the delirium patients' group, suggesting that the single, widowed and divorced may be another risk factor for occurrence of delirium. Consistent with other studies [26], the prior hospitalization for other reason was also a risk factor for post operation delirium, suggesting the physicians had better include this item in the pre-operative assessment. The IPSS score is correlated to the severity of BPH [27, 28], and patients with high IPSS score may be prone to suffer from the delirium after operation. It has also been reported that the prostatitis-like symptoms may be comorbid with BPH [29], and prostatitis-like symptoms is also correlated to the psychological disorders, for example, the delirium [30]. Consistent with other studies, we showed that the patients with poor NIH-CPSI score and prostatitis-like symptoms are more prone to be delirium after the TURP, suggesting these are also risk factors for developing the post operation delirium.

A limitation of this study is that it was conducted in a specific group of elderly patients undergoing the urological surgery. This warrants carefulness in extrapolating the findings to other patient populations. Another limitation is that the patients' recollection of their own medical history was used to establish earlier diagnoses. All the medical records were reviewed to minimize discrepancies due to forgetting or misunderstanding of medical facts for each subject.

The approximately 20% of the elderly patients in this study developed the post operation delirium. The age, marital status, prehospitalization (any prior hospitalization for any reason), IPSS score and NIH-CPSI score are the predictor of post operation delirium in this setting. Our findings also have showed that the patients with poor GDS, CDT and IADL scores are at risk factors for post operation delirium, suggesting that preventing delirium in elderly by an early multidimensional evaluation focusing on the GDS, CDT, IADL test and on their integrated and multidisciplinary approach to the issue.

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Disclosure of conflict of interest

None.

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