CASE SERIES

General anesthesia and intraoperative opioids do not affect postoperative delirium in femoral neck surgery

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ABSTRACT

Objective: Both, general anesthesia (GA) and the amount of opioids used have been reported to be factors in the development of postoperative delirium (POD) in some studies, it remains unknown whether they affect delirium after hip surgery.

The aim of this study was to investigate whether GA and the amount of intraoperative opioid increase delirium after femoral neck surgery.

Methodology: This study included 188 patients who underwent for hip surgery between January 2009 and July 2013. The patients with POD (delirium group) were diagnosed using the Confusion Assessment Method (CAM) based on a review of electronic medical records were included in Group D, and rest of the patients in Group ND. Preoperative comorbidities, method of anesthesia, and method of intraoperative analgesia were retrospectively compared between the groups. Univariate analysis was performed to examine factors in the two groups. Then, variables with $p<0.05$ on univariate analysis were examined by multivariate analysis. Multivariate analysis was performed using logistic regression to determine the adjusted odds ratio and 95% confidence interval.

Results: 43 (22.87%) patients were diagnosed with POD (Group D). No significant differences were observed between groups in the method of anesthesia (spinal anesthesia, GA, combined spinal-epidural anesthesia), the amount of intraoperative opioid (dose of remifentanil or fentanyl). The only independent risk factor for POD found was the old age (95% CI 1.021-1.126, P=0.005).

Conclusion: This study demonstrated that general anesthesia and the amount of intraoperative opioid did not affect delirium after femoral neck surgery.

Key words: Postoperative delirium; Opioid; General anesthesia

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INTRODUCTION

Postoperative delirium (POD) in elderly patients increases the length of hospital stay, worsens the prognosis, and increases mortality rate. In particular, delirium after hip surgery has attracted attention because its incidence is almost 3 times higher compared with non-orthopedic surgery.[1]

Peripheral nerve blocks reduce the incidence of POD in contrast with postoperative intravenous opioids in total knee arthroplasty (TKA).[2] Multimodal optimization of perioperative care (the first–track methodology) reduces the incidence of POD in TKA or total hip arthroplasty.[3] This indicates that the incidence of POD reduces after orthopedic surgery of lower limb when the amount of postoperative opioids is limited. However, there is little information whether the amount of intraoperative opioid affect POD. In addition, it remains unknown whether general anesthesia (GA) affects POD after hip surgery although it did not affect POD in TKA or mixed various orthopedic surgeries.[4,5]

Therefore, we aimed to investigate whether GA and the amount of intraoperative opioid affect POD in femoral neck surgery.

METHODOLOGY

This study was approved by the Clinical Research Ethics Committee of the institution. This study comprised all of the 188 patients who underwent elective surgery for a femoral neck or trochanteric fracture between January 2009 and July 2013. The patients preoperatively diagnosed dementia, Alzheimer's dementia, addiction to alcohol and/or sedative hypnotics, or any other psychiatric diseases were excluded. Electronic medical records were retrospectively reviewed for the occurrence of POD during the first week after surgery using the Confusion Assessment Method (CAM) by Inouye et al.[6] CAM is a tool with established reliability and validity for assessing delirium. It combines an assessment of the patient's sedation or level of consciousness with an evaluation of mental status, inattention, disorganized thinking, and an altered level of consciousness.[7] The patients were divided into two groups, those with POD (delirium group) and those without POD (non-delirium group). Patient characteristics, preoperative comorbidities, method of anesthesia, and method of intraoperative/postoperative analgesia were retrospectively compared between the two groups.

Univariate analysis was performed with the unpaired t-test, chi-square test, and Mann-Whitney U test, to examine predictive factors in the two groups. Variables with $p<0.05$ on univariate analysis, were then examined by multivariate analysis performed using logistic regression to determine the adjusted odds ratio and 95% confidence interval. The data are expressed as mean ± SD.

RESULTS

Among the 188 patients, 43 (22.87%) suffered from POD. There were no significant differences between the groups with the amount of intraoperative opioid (remifentanil and fentanyl) and the method

Table 1: Univariate analysis of risk factors for incident of delirium after femoral neck and trochanteric fractures

Parameter	Group D N=43	Group ND N=145	*P* value
Age (year) [a]	82 ± 8	76 ± 12	0.001
Male (%)	8 (19 %)	32 (22 %)	0.013
BMI(kg/m^2)[a]	21.2 ± 4.1	20.9 ± 3.3	NS
ASA-PS (rate of 1/2/3 %)	2 /75 /23	11 /76 /13	0.06
Anesthetic time (min)[a]	140 ± 37	144 ± 47	NS
General anesthesia (%)	14 (32.6 %)	49 (33.8 %)	0.014
Combined spinal-epidural anesthesia (%)	4 (9.3 %)	16 (11.0 %)	0.013
Spinal anesthesia (%)	23 (53.5 %)	75 (51.7 %)	0.014
Dose of remifentanil (μg/kg/min)[a]	0.09 ± 0.08	0.08 ± 1.0	NS
Dose of fentanyl(μg)[a]	171 ± 91	163 ± 115	NS

[a]Mean ± SD; NS = not significant; BMI = body mass index; ASA-PS = American Society of Anesthesiologist- Physical Status

Table 2: Multivariate analysis of risk factors for incident of delirium after femoral neck and trochanteric fractures

Variable	OR	95% CI	P-value
Age	1.069	1.020-1.120	0.006
Male	1.285	0.500-3.304	NS
ASA-PS	0.125	0.013-1.165	NS
General anesthesia	1.937	0.474-7.914	NS
Combined spinal-epidural anesthesia	1.070	0.191-6.005	NS
Spinal anesthesia	1.081	0.284-4.123	NS

OR = odds ratio; CI = confidence interval

of anesthesia (GA, spinal anesthesia or combined spinal-epidural anesthesia). Statistically significant factors were extracted with univariate analysis of 10 factors, age, sex, ASA-PS, the method of anesthesia (Table 1).

The factors were then set as objective variables for logistic regression analysis. Only old age (95% CI 1.021-1.126, P=0.005) was found to be independent risk factors for POD (Table 2).

DISCUSSION

The main findings of this study were the following: (a) there is no difference on the incidence of POD for 1 week after hip surgery with GA or local anesthesia (LA); (b) the amount of opioids used during surgery did not affect the incidence; (c) The incidence of POD in this study was 22.87%, which is approximately the same as previously reported on hip surgery (22-42%).[8,9]

When the incidence of POD after orthopedic surgeries was compared between GA and LA, there was no significant difference in most of previous studies. In these studies, the surgical procedures included TKA or various orthopedic surgeries, and the endpoint was assessed for 1 week or 3 months postoperatively.[4,5] Our study is the first one that has investigated early POD focusing on hip surgery alone. Our results were similar to other studies on orthopedic surgeries. Kudoh et al. compared GA with spinal anesthesia in TKA and found that the incidence of postoperative cognitive dysfunction was higher after GA.[10] However, since the significant difference was observed only during 1 hour after extubation, this might not have been true in case of POD.

We found that the amount of remifentanil and fentanyl administered during surgery did not affect the incidence of POD. Several studies have found that the smaller amount of postoperative opioids reduces the incidence of POD.[11,12] Based on our results, we believe that intraoperative use of remifentanil and fentanyl have no effect on the incidence when used only during surgery.

As many of patients who undergo hip surgery are elderly, they tend to be taking oral anticoagulant drugs for cerebrovascular and cardiovascular diseases. Indeed, approximately 20% of the patients in our study were taking the drugs.[12] Our results indicate that the anticoagulant drugs do not increase the incidence of POD after GA.

Limitations: There are several limitations to this study. First, preoperative factors not omitted in this study such as prior stroke, diabetes, hypertension which could have affected the incidence of POD. Second, postoperative factors not being considered in this study such as pain, NSAIDs which could have affected the incidence of POD. Investigating these factors, a prospective study involving a larger number of subjects is needed to confirm our results.

CONCLUSION

In conclusion, we found that the anesthetic method or the amount of intraoperative opioids do not affect postoperative delirium after hip surgery.

Conflict of interest: There is no potential COI to disclose.

Authors' contribution:

YM: Analyzed data and wrote manuscript

KT and KS: Conceived the idea, participated in design and coordination, helped to draft the manuscript.

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"The first method for estimating the intelligence of a ruler is to look at the men he has around him."