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Original Investigation

Effects of Discontinuance of Preoperative Anti-Platelet Medication in Multi-Level Thoracolumbar Spine Surgery

Jun Seok LEE, Dong Wuk SON, Soon Ki SUNG, Sang Weon LEE, Geun Sung SONG

Pusan National University, School of Medicine, Yangsan Hospital, Department of Neurosurgery, Yangsan, Korea

ABSTRACT

AIM: To evaluate the perioperative morbidities of patients taking anti-platelet medication prior to multi-level thoracolumbar spine surgery.

MATERIAL and METHODS: We retrospectively reviewed the medical records of 65 patients who underwent multi-level spine surgery from January 2009 to November 2014 at our institution. These patients were divided into two groups: the control group (n=45) did not take any anti-platelet medications prior to surgery; the anti-platelet group (n=20) discontinued the anti-platelet medication 7 days before the spine surgery. The patients' age, body mass index (BMI), medical history, operation time, and estimated intraoperative blood loss were assessed. The incidence of postoperative major complications, such as spinal epidural hematoma or operative site infection, was also compared.

RESULTS: The overall postoperative complication rates were similar in both groups. The rates of major complications were 5% (1/20) for the anti-platelet group and 8.9% (4/45) for the control group. In the anti-platelet group, one patient experienced surgical site infection, which has no relationship with bleeding tendency. Severe bleeding-related complications in the perioperative period were not observed in either group. Multiple logistic regression analysis demonstrated that cancer history and long hospital stay were independent predictors of operation-related complications. Among intraoperative parameters such as estimated intraoperative blood loss and intraoperative transfusion rates, there were no statistical differences between the groups.

CONCLUSION: Surgical complication-related perioperative bleeding has had a serious influence on surgical outcomes. According to our study, preoperative anti-platelet therapy did not increase bleeding-related complications. Spine operations can be performed relatively safely if the co-morbidities of patients are considered.

KEYWORDS: Anti-platelet, Multi-level fusion operation, Aspirin, Complication

INTRODUCTION

As elderly patients with chronic degenerative diseases increase, it is likely that they will present with multiple co-morbidities. Anti-platelet medications are commonly used for preventive and curative purposes in patients who have had myocardial infarction or stroke (10,14,18). Anti-platelet medications, such as aspirin and clopidogrel, block the hemostatic cascades, increasing the likelihood of bleeding during and after surgery (17). In the surgical field, several studies have indicated that aspirin increases the perioperative

risk of bleeding and blood loss (2,3). Thus, to avoid undesirable hemorrhagic complications postoperatively, it is common consensus to discontinue anti-platelet medication 7 days prior to major operations (11,12).

Although multi-level thoracolumbar spine fusion surgery is useful for degenerative spine diseases, it has many operation-related complications. Intraoperative bleeding is the major cause of the surgical complications. Excessive blood loss may also cause transfusion-related complications and increase infection rates (8). Thus, spine surgeons have been reluctant

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Corresponding author: Dong Wuk SON

E-mail: md6576@naver.com

to perform multi-level spine surgery on patients who are taking anti-platelet medications.

Our study evaluated the perioperative morbidities of patients who were taking anti-platelet medication prior to multi-level thoracolumbar spine surgery. Our goal was to confirm the operative results including the clinical improvement and complication rates.

■ MATERIAL and METHODS

We retrospectively reviewed the medical records of 65 patients who underwent multi-level spine surgery from January 2009 to November 2014 at our institution. Multi-level spinal fusion operations were performed by a single surgeon and all patients underwent posterior lumbar interbody fusion surgery and posterolateral lumbar fusion surgery with pedicle screw instrumentation.

The inclusion criteria of this study were as follows;

- (1) All patients were American Society of Anesthesiologists (ASA) classification II and III (Table I).
- (2) All operations were performed for degenerative spinal disease.
- (3) The patients should have had more than 2 level pedicle screw fixation operations.

The exclusion criteria of this study were as follows;

- (1) Cervical spine surgery and simple lumbar laminectomy operations were excluded.
- (2) Patients who were previously operated on at the thoracolumbar level were excluded.
- (3) Operations for resection of neoplasm and infection control were excluded.

These patients were divided into two groups based on their preoperative anti-platelet medication. The anti-platelet group (n=20) discontinued their medications 7 days before the spine surgery was performed. The control group (n=45) did not take any anti-platelet medications. The patients' age, body mass index (BMI), medical history, operation time, intraoperative estimated blood loss (EBL), ASA score, and transfusion of blood products were assessed. The incidence of major complications postoperatively such as spinal epidural hematoma and operative site infection rates were also compared.

Table I: Patient Distribution According to ASA Classification

Class	Definition
I	No systemic disease
II	Mild to moderate systemic disease
III	Severe systemic disease
IV	Severe systemic disease that is life threatening
V	Moribund patient with little chance of survival

Postoperative complications were classified as major (adversely affecting the recovery of the patients) and minor (recorded in the medical chart, but did not alter the recovery of the patients). Major complications included operative wound infection and severe medical problems such as acute renal failure, pseudomembranous colitis, pulmonary edema, pneumonia, or acute myocardial infarction. Minor complications included urinary tract infection, ileus, and psychiatric problems such as postoperative delirium or depression.

Statistical analysis was performed using SPSS version 18.0 (SPSS, INC., Chicago, IL, USA). P value <0.05 was considered significant. Normally distributed data was compared using the unpaired t test. Fisher's exact test and Chi-square test were used to analyze the categorical data. Simple logistic regression was performed to determine the risk factor of complications.

■ RESULTS

Clinical Condition of the Patients

The demographics of the 65 patients, who underwent multi-level thoracolumbar spinal fusion operation, are summarized in Table II. Univariate analysis demonstrated that values such as hypertension (HT), diabetes mellitus (DM) and previous operative history were different between the control group and anti-platelet group.

The medical record of each patient was reviewed for evidence of preoperative complications. Only 18 patients had unremarkable past medical history. Hypertension was the most common co-morbidity and was present preoperatively in 57% of the patients. The second most common medical disease was diabetes, which was seen in 42% of the patients. Others were cerebral vascular disease, chronic respiratory disease, heart problem, neoplasm, osteoarthritis, and rheumatoid arthritis.

Operative Data

The fusion level (n=2.35) in the aspirin group was slightly higher than the fusion level in the control group (n=2.28). However, mean intraoperative EBL in the control group (842±504 cc) was slightly higher than in the anti-platelet group (792±383 cc), but there was no statistical significance. The transfusion rate was almost same in the two groups (control group 60% vs. anti-platelet group 55%, p=0.525). Operative time was also similar in both groups (control group 6.07 hrs vs. anti-platelet group 6.01 hrs, p=0.917). This result indicated that the anti-platelet agent did not increase the intraoperative bleeding tendency and prolong the operative time.

Operative results considering fusion level can be seen in Table III. The elongation of the fusion level caused a tendency to increase the EBL, operative time, and transfusion rate. However, except for the transfusion rate, nothing was statistically significant. Cases of major complication were so rare and had no significant linear outcomes.

Relationship Between Postoperative Complications and Anti-Platelet Medication

The types and degrees of complications are described

Table II: Patient Demographic Data

Characteristic	Control group (n=45)	Anti-platelet group (n=20)	p value
Age (y), mean (range)	64.84	67.1	0.137
Sex			0.479
(male/female)	20/25	12/8	
BMI, mean±SD	24.95±2.8	25.38±2.04	0.269
Hypertension	20/45(44%)	17/20(85%)	0.000
Diabetes mellitus	13/45(29%)	9/20(45%)	0.061
Cancer History	4/45(9%)	1/20(5%)	0.275
Previous OP Hx	15/45(33%)	15/20(75%)	0.010
Hematologic data (preoperative)			
Hemoglobin	12.9±1.4	13.1±1.6	0.214
Platelet (10 ³ /mm ³)	254±71	273±80	0.162
PT INR	1.01±0.07	1.05±0.08	0.243
aPTT (s)	39.4±3.1	38.5±2.8	0.251
Number of fusion level (n)			
2	37	15	
3	3	4	
≥4	5	1	
ASA grade			
II	41	18	0.780
III	4	2	
Operation time (hr)	6.07	6.01	0.917
EBL (cc)	842	793	0.291
Transfusion (n)	27/45(60%)	11/20(55%)	0.525
Hospital stay (day)	23.73	26.45	0.209

y: Years, **EBL**: Estimated blood loss, **BMI**: Body mass index, **PT**: Prothrombin time, **aPTT**: Activated partial thromboplastin time, **INR**: International normalized ratio, **ASA**: American Society of Anesthesiologists, **OP Hx**: Operation history.

Table III: Operative Data Considering Fusion Level

	2 level fusion (n=52)	3 level fusion (n=7)	≥4 level fusion (n=6)	p value
Mean OP time (hr)	5.98	6.02	6.67	0.234
Mean EBL (cc)	802	907	950	0.388
Transfusion rate (%)	50%	86%	100%	0.006
Major complication rate (%)	7.7%	0%	16.7%	0.691
Hospital stay (day)	24.12	24.29	25.67	0.738

OP: Operation, **EBL**: Estimated blood loss, **hr**: Hour.

in Table IV. Operative site infection is a major cause of major complications. Some cases did not improve with the administration of antibiotics, and revision operations had to be performed. One patient who had acute kidney injury in the control group recovered without medical procedures, but the hospital stay was prolonged. Surgery-related complications did not develop in all cases. Minor complications were recorded in the medical chart, but did not alter the recovery of the patients and did not prolong the hospital stay.

The total rate of minor complications was the same in both groups (24% in the control group vs. 25% in the anti-platelet group) but considering that minor complications did not influence the prognosis, this figure is insignificant. Major complication rates were slightly higher in the control group (8.9% in the control group vs. 5% in the anti-platelet group). According to the Fisher's statistical results, there was no relationship between anti-platelet medication and complication rate ($p=0.163$, $p>0.05$).

Other Factors Associated with Major Complications

To find out the risk factor of complications, we used logistic regression analysis. According to the result, only patients with a long hospital stay and a prior history of cancer had a significantly higher risk for the incidence of complications.

Other values such as age, HT, DM, fusion level, and operative time did not influence the incidence of complications (Table V).

DISCUSSION

Multi-level pedicle screw instrumentation techniques are frequently performed for the treatment of spine disorders (4,7). However, the multi-level spine fusion operation requires relatively longer hospitalization time and massive bleeding loss, and therefore, has been associated with high perioperative complication rates (19). Aspirin is thought to increase the risk of hemorrhage, and even a small hemorrhage can cause significant morbidity in spinal surgery. In a survey of 201 spine surgeons, two-thirds recognized that aspirin is a risk factor for excessive perioperative hemorrhage, and half of them had experienced excessive perioperative hemorrhage during surgery in patients who were taking aspirin (16). This is why spine surgeons have been reluctant to perform multi-level spine surgery on patients who are taking anti-platelet medication.

In our study, 20 patients in the anti-platelet group used four types of anti-platelet agents: aspirin ($n=15$), clopidogrel ($n=6$), cilostazol ($n=2$). Some patients took two kinds of anti-platelet medications. Aspirin irreversibly inhibits the function of platelets. Clopidogrel acts by inhibiting the adenosine

Table IV: Complications List

	Control group (11 cases)	Anti-platelet group (5 cases)
Major complication (5 / 65)	Deep wound infection ($n=3$)	Deep wound infection ($n=1$)
	Acute kidney injury ($n=1$)	
	Op-site abrasion ($n=1$)	Superficial wound infection ($n=1$)
Minor complication (12 / 65)	Dysuria ($n=2$)	Delirium ($n=1$)
	Abdominal discomfort ($n=2$)	Mild neuropathy ($n=1$)
	Tremor ($n=1$)	Insomnia ($n=1$)
	Lymphedema ($n=1$)	

Table V: Logistic Regression Analysis Associating with Major Complications

Patient factor	p value	Operative data	p value
Sex	0.992	Hospital stay	0.009
Age	0.890	EBL	0.402
Fusion level	0.145	Operative time	0.294
Anti-platelet medication	0.981	Transfusion rate	0.071
BMI	0.218	Hemoglobin level	0.384
HT	0.931	Platelet count	0.452
DM	0.493	PT INR	0.225
Cancer Hx	0.014	aPTT	0.352

BMI: Body mass index, **HT:** Hypertension, **DM:** Diabetes mellitus, **HX:** History, **EBL:** Estimated blood loss, **PT INR:** Prothrombin time International normalized ratio, **aPTT:** Activated partial thromboplastin time.

diphosphate receptor on the platelet cell membrane and appears to be slightly more effective as an anti-platelet drug than aspirin (5). Although the mechanism of anti-platelet drugs is different, we could not perform the comparison analysis of each medication due to the limited number of cases.

Our study found that multi-level spine fusion operation can be performed safely even when patients have co-morbidities and are taking anti-platelet medications. Although the analysis showed that there was no statistical significance, the anti-platelet group had better outcomes regarding specific operative data such as EBL and operative time. We are unsure of why the rate of operative bleeding and the operative time were higher in the control group. The anti-platelet group had worse scores than the control group in the preoperative health state and had higher co-morbidity rates. Meticulous preparation can be performed to avoid the complications in the preoperative period. Intraoperative bleeding may be affected by a variety of factors, such as the abdominal pressure, patient's position, operation time, surgeon's skill, and co-morbidities. Use of an anti-platelet drug is just one of several risk factors in intraoperative bleeding. As the lifespan of a normal platelet is 7 to 10 days (9), we looked at patients who discontinued aspirin 7 days before surgery.

The most important factor is that the numbers of fused segments did not have linear relevance to the major complication rate. Considering our outcomes, we can perform multi-segment thoracolumbar fusion operation on patients who are taking anti-platelet drugs.

There are many studies on the relationship between aspirin administration and perioperative morbidities in spine surgery. Kang et al. (15) found that intraoperative blood loss was similar in the aspirin group and control group, but postoperative blood drainage was significantly higher in patients who had taken prophylactic low-dose aspirin, even after discontinuation of aspirin 7 days before surgery. Park et al. (18) compared postoperative surgical outcomes between an aspirin group and control group, considering the fusion level and types of surgical procedure and whether aspirin was discontinued for a period greater than 7 days before the operation. They found that there was no clinically significant difference between the two groups. The results of these studies are identical to our study. However, our study limited the patients to those who underwent more than 2 level spine fusion operation and excluded patients who had cervical fusion operation or simple laminectomy operations. Though the number of cases was smaller than other studies, our study results are useful to the surgeons who will prepare patients for multi-level fusion spine operation.

Some authors reported the surgical outcomes with continuation of anti-platelet therapy during the perioperative period. Akhavan-Sigari et al. (1) reported that spine surgery with continuation of clopidogrel can be done without postoperative bleeding complications. Cuellar et al. (6) found that daily aspirin administration did not increase the perioperative morbidities. Even if the rationale is lacking, perioperative anti-platelet medications in the perioperative period can be continued with low risk of co-morbidities.

In our study, we identified the risk factors of major complications: cancer history and long hospital stay. However, cancer history is a wide category, so it is a limited parameter and hard to specify. Long hospital stay may be the result of major complications. Nevertheless, it is important that we did not observe significant epidural hematoma among the major complication lists. There are some studies that say that aspirin can significantly enhance such risks (16). Although spinal epidural hematoma has been reported in rare cases (13), our cases required a wider incision and a longer operation time than other studies. Our cases also included patients with dual anti-platelet medications. Therefore, our results are significant. However, much larger studies will be needed to exclude the possibility that perioperative aspirin therapy enhances the rate of spinal epidural hematoma.

■ CONCLUSION

We compared the operative outcomes of multi-level thoracolumbar spinal fusion surgery between the anti-platelet group and control group. According to our study, anti-platelet agents did not encourage intraoperative bleeding tendency and cause an appreciable increase in bleeding-related complication. In addition, long segment fusion surgery can be safely performed and not increase the major complication rates even if the patient has taken anti-platelet drugs in the past. If we consider the co-morbidities of the patients carefully and prepare for the operations meticulously, we can avoid fatal outcomes.

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