Morbidity & Mortality Survey of Spinal Deformity Surgery in 2012—Report by the Japanese Scoliosis Society

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Abstract:

Introduction: The Japanese Scoliosis Society (JSS) planned to make a longitudinal survey of the mortality and morbidity (M&M) of spinal deformity surgery and established the M&M Committee in 2012. We reported the analysis of the surgical complication (M&M) survey in 2012.

Methods: A request to participate in this survey was mailed to all JSS members. Questionnaires were sent by email to members who agreed to cooperate, and their answers were obtained. Diagnosis was grouped into idiopathic scoliosis, congenital scoliosis, neuromuscular scoliosis, spondylolisthesis, pediatric kyphosis, and adult spinal deformity. Complications were grouped into death, blindness, neurological deficit, infection, massive bleeding, hematoma, pneumonia, cardiac failure, DVT/PE, gastrointestinal perforation, and instrumentation failure.

Results: A total of 2,906 patients were reported from sixty-eight hospitals: idiopathic 488, congenital 91, neuromuscular 82, others 214, spondylolisthesis 1,241, pediatric kyphosis 41, and adult spinal deformity 749. Complications were death in 3, neurological deficit in 49, early infection in 37, late infection in 14, massive bleeding in 91, hematoma in 18, pneumonia in 6, cardiac failure in 1, DVT/PE in 9, gastrointestinal perforation in 2, and instrumentation failure in 73. The complication rate of having a neurological deficit, massive bleeding, and instrumentation failure was 4.88%, 7.32%, and 4.88% respectively in patients with pediatric kyphosis, and 3.07%, 8.01%, and 5.21% respectively in patients with an adult spinal deformity. The complication rate of early infection was 4.88% in the patients with pediatric kyphosis.

Conclusions: The complication rates of pediatric kyphosis and adult spinal deformity were high.

Keywords:

Spinal deformity, Surgery, mortality, and morbidity

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Introduction

Spinal deformity surgery causes various complications. The clarification of the complication rates and risk factors is important for taking preventive measures, as well as therapeutic measures, at the time of their occurrence and for obtaining informed consent from patients. The worldwide members of the Scoliosis Research Society (SRS) have performed morbidity and mortality research since at least 1996, and there have been recent studies based on about 110,000 cases[1,2)]. However, the Japanese Orthopedic Association and the Japanese Society for Spine Surgery and Related Research (JSSR) have performed a few nationwide surveys on complications related to spine surgery[3,4)], but there has been no continuous survey or a survey on spinal deformity surgery alone.

Due to the recent advances in surgical techniques and devices, spinal deformity surgery has been increasing. In addition, since Japan has an unprecedented aging society, aged patients with complications who undergo surgery have also been increasing. Under such circumstances, the Japanese Scoliosis Society (JSS) planned to make a longitudinal survey of mortality and morbidity (M&M) of spinal deformity surgery, and established the M&M Committee in 2012 for continuous data collection and disclosure. We report the analysis of the surgical complication (M&M) survey in

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Table 1. Diagnosis of Spinal Deformity.

Diagnosis		Total number (%)
Idiopathic scoliosis	<10 yo	30 (1.03)
	10-18 yo	458 (15.76)
Congenital scoliosis		91 (3.13)
Neuromuscular scoliosis		82 (2.82)
Other types of scoliosis		214 (7.36)
Spondylolisthesis	Isthmic	167 (5.75)
	Degenerative	1067 (36.72)
	Dysplastic	7 (0.24)
Kyphosis in patients excluding adults	Congenital	7 (0.24)
	Scheuermann's kyphosis	0 (0)
	Others	34 (1.17)
Adult spinal deformity	19-<40 yo	80 (2.75)
	40-<65 yo	205 (7.05)
	≥65 yo	464 (15.97)
Total		2,906 (100)

* yo: years old

Table 2. Complications and Their Rates in All Patients.

Complication	Number	Complication rate (%)
Death	3	0.10
Blindness	0	0
Neurological Deficit *1	49	1.69
Early infection *2	37	1.27
Late infection *3	14	0.48
Massive bleeding *4	91	3.13
Postoperative hematoma *5	18	0.62
Postoperative pneumonia	6	0.21
Postoperative cardiac failure	1	0.03
Postoperative DVT/PE	9	0.31
Gastrointestinal perforation	2	0.07
Instrumentation failure	73	2.51
Total	303	10.42

*1 Including that due to postoperative hematoma formation

*2 Within 1 month after the operation

*3 More than 1 month after the operation

*4 ≥3,000 mL

*5 Symptomatic hematomas surgically removed

2012.

Materials and Methods

The subjects consisted of patients who underwent spinal deformity surgery between January and December in 2012 in institutions with which the JSS members are affiliated. A questionnaire was produced based on the basic survey items of the M&M research by the SRS with modifications for practical use in Japan. The only survey items were the number of patients who underwent spinal deformity surgery and surgical complications and did not include data allowing the identification of individual persons. A request to participate in this survey was mailed to all JSS members. Questionnaires were sent by email to members who agreed to cooperate, and their answers were obtained.

The diagnoses were: idiopathic scoliosis (classification according to the patient's age: <10 years, ≥10 years), congenital scoliosis, neuromuscular scoliosis, other types of scoliosis, spondylolisthesis (isthmic, degenerative, and dysplastic), pediatric kyphosis (congenital, Scheuermann's kyphosis, and others), and adult spinal deformity including kyphosis (classification according to the patient's age: 19-<40 years, 40-<65 years, ≥65 years). The surgical complications were: death, blindness, neurological deficit (including that due to postoperative hematoma), early infection (within 1 month after the operation), late infection (more than 1 month after the operation), massive bleeding (≥3,000 mL), postoperative hematoma (symptomatic hematomas surgically removed), postoperative pneumonia, postoperative cardiac failure, postoperative DVT/PE, gastrointestinal perforation, and instrumentation failure.

Results

Responses were obtained from 68 (19.15%) of the 355 institutions with JSRS members, and a total of 2,906 patients were reported: 488 patients with idiopathic scoliosis, 91 with congenital scoliosis, 82 with neuromuscular scoliosis, 214 with other types of scoliosis, 1,241 with spondylolisthesis, 41 with pediatric kyphosis, and 749 with an adult spinal deformity (Table 1). Complications were observed in 303 patients (10.42%), such as: death in 3 patients (0.10%), blindness in none (0%), neurological deficit in 49 (1.69%), early infection in 37 (1.27%), late infection in 14 (0.48%), massive bleeding in 91 (3.13%), postoperative hematoma in 18 (0.62%), postoperative pneumonia in 6 (0.21%), postoperative cardiac failure in 1 (0.03%), postoperative DVT/PE in 9 (0.31%), gastrointestinal perforation in 2 (0.07%), and instrumentation failure in 73 (2.51%) (Table 2). The rate of each complication according to the diagnosis is shown in Table 3. The complication rate of a neurological deficit, massive bleeding, and instrumentation failure was higher in patients with pediatric kyphosis and those with an adult spinal deformity. The complication rate of massive bleeding was higher in patients with neuromuscular scoliosis, and instrumentation failure was also higher in patients aged <10 years with idiopathic scoliosis and other types of scoliosis. The complication rate of an early infection was higher in the patients with pediatric kyphosis.

Discussion

In this survey, the complication rate of spinal deformity surgery was 10.42%. In Japan, the complication rate of spinal deformity surgery was 15.6-16.7% in the survey in 2001[4] and 19.0% in the survey in 2011[3]. Therefore, the

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Table 3. The Rate of Each Complication According to the Diagnosis.

		Total number	Death	Blind-ness	Neurological deficit	Early infection	Late infection	Massive bleeding	Postoperative hematoma	Postoperative pneumonia	Postoperative cardiac failure	Postoperative DVT/PE	Gastrointestinal perforation	Instrumentation failure
Idiopathic scoliosis	<10 yo	30	0	0	0	3.33 (1)	0	0	0	0	0	0	0	16.7 (5)
	10-18 yo	458	0	0	2.62 (12)	1.31 (6)	1.09 (5)	2.40 (11)	0	0.22 (1)	0	0.22 (1)	0	0.22 (1)
	total	488	0	0	2.46 (12)	1.43 (7)	1.02 (5)	2.25 (11)	0	0.20 (1)	0	0.20 (1)	0	1.23 (6)
Congenital scoliosis		91	0	0	1.10 (1)	2.20 (2)	0	1.10 (1)	0	0	0	0	0	2.20 (2)
Neuromuscular scoliosis		82	0	0	1.22 (1)	2.44 (2)	0	12.2 (10)	0	3.66 (3)	0	0	1.22 (1)	1.22 (1)
Other types of scoliosis		214	0.47 (1)	0	0.93 (2)	1.40 (3)	0	2.34 (5)	0.47 (1)	0	0	0	0	3.74 (8)
Spondylolisthesis	Isthmic	167	0	0	1.20 (2)	0.60 (1)	0	0	0.60 (1)	0	0	0	0	1.20 (2)
	Degenerative	1067	0.09 (1)	0	0.56 (6)	0.56 (6)	0.19 (2)	0.09 (1)	0.47 (5)	0	0	0.09 (1)	0.09 (1)	1.22 (13)
	Dysplastic	7	0	0	0	14.29 (1)	0	0	0	0	0	0	0	0
	Total	1241	0.08 (1)	0	0.64 (8)	0.64 (8)	0.16 (2)	0.08 (1)	0.48 (6)	0	0	0.08 (1)	0.08 (1)	1.21 (15)
Kyphosis (Pediatric)	Congenital	7	0	0	0	14.29 (1)	14.29 (1)	14.29 (1)	0	0	0	0	0	14.29 (1)
	Scheuermann	0	0	0	0	0	0	0	0	0	0	0	0	0
	Others	34	0	0	5.88 (2)	2.94 (1)	0	5.88 (2)	2.94 (1)	0	0	0	0	2.94 (1)
	Total	41	0	0	4.88 (2)	4.88 (2)	2.44 (1)	7.32 (3)	2.44 (1)	0	0	0	0	4.88 (2)
Adult Spinal Deformity (including kyphosis)	19-<40 yo	80	1.25 (1)	0	0	2.50 (2)	0	2.50 (2)	0	0	0	1.25 (1)	0	1.25 (1)
	40-<65 yo	205	0	0	3.90 (8)	1.46 (3)	0.98 (2)	6.83 (14)	0.98 (2)	0.49 (1)	1 (0.49)	0	0	4.39 (9)
	≥65 yo	464	0	0	3.23 (15)	1.72 (8)	0.86 (4)	9.48 (44)	1.72 (8)	0.22 (1)	0	1.29 (6)	0	6.25 (29)
	Total	749	0.13 (1)	0	3.07 (23)	1.74 (13)	0.80 (6)	8.01 (60)	1.34 (10)	0.27 (2)	0.13 (1)	0.93 (7)	0	5.21 (39)

* The number in parentheses

complication rate in the present survey was lower than that in the previous studies. The previous reported rates of each complication of spinal deformity surgery were 0.05-0.19% for death[2,3,5-7], 0.3-2.8%[3-6] for a neurological deficit, 1.1-2.8% for an infection[1,5,6], and 1.0-1.6% for instrumentation failure[4,6,8,9]. The rates of these complications, excluding instrumentation failure, in the present study were comparable to or lower than those previously reported.

The decrease in the complication rate in this survey compared with the two previous surveys in Japan may have been because complications investigated in the previous surveys included mental disorders and medical complications in the broad sense, resulting in a higher number of complications. The present survey showed lower rates of all complications than the previous surveys or the SRS report, excluding instrumentation failure, but it showed higher complication rates of pediatric kyphosis and adult spinal deformity. In particular, instrumentation failure was frequently observed in patients aged <10 years with idiopathic scoliosis and patients with other types of scoliosis, pediatric kyphosis, or adult spinal deformity. The level of surgical difficulty for these disorders is high even using instrumentation showing marked advancement in recent years, which may naturally result in high complication rates. In addition, due to the aging of the population, the age of patients who undergo spinal deformity surgery is expected to further increase, and therefore the complication rates, particularly for adult spinal deformity, may increase in the future. Attention should be paid to the high surgical complication rates for pediatric kyphosis and adult spinal deformity, and their surgical indications should be carefully evaluated.

For continuous surgical complication surveys, the survey items should be standardized, and annual changes in the same items should be evaluated for more accurate surveys and evaluations. Due to the low questionnaire recovery rate in this survey, caution is necessary for the generalization of the obtained data. We intend to perform a complication survey in 2014 and request the active participation of members. Methods that increase the incentive should be used to obtain a higher questionnaire recovery rate.

Conclusion

We surveyed the complication rate of spinal deformity surgery performed in Japan in 2012. The complication rate of each disorder was comparable to or slightly lower than that previously reported. However, the complication rates of pediatric kyphosis and adult spinal deformity were high.

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Conflicts of Interest: The authors declare that there are no conflicts of interest.

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