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ORIGINAL ARTICLE

The Incidences of Perioperative Complications in the Elderly Following Minimally Invasive Lumbar Transforaminal Interbody Fusion

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Object: This study was conducted to survey the perioperative complications in a patient more than 70-year-old undergoing minimally invasive transforaminal lumbar interbody fusion (miTLIF) and to examine if the incidence of complications differs from that of younger patients. **Materials and Methods:** A retrospective, comparative study was conducted. Patients who underwent miTLIF in our hospital between September 2007 and December 2010 were included and divided into two groups according to age: the elderly group (≥70) and the young group (<70). The perioperative complications of both groups were analyzed and compared. **Results:** A total of 185 consecutive patients were included. Of the 185 patients, 132 patients were <70 years and 53 patients were more than 70 year old. There were no statistically significant differences between the two groups regarding patient characteristics except for diagnosis. The incidences of comorbidity were similar as well. There were no significant differences between the young and the elderly groups regarding intraoperative (3.79% vs. 9.43%, $P = 0.1527$), major (0% vs. 3.77%, $P = 0.08$), minor (24.24% vs. 16.98%, $P = 0.28$), and total complications (27.27% vs. 28.30%, $P = 0.8874$). There was no mortality in both groups. **Conclusion:** Based on our results, the incidences of intraoperative and perioperative major complications in the elderly were higher than that in the young, but the differences did not reach statistical significance.

Key words: Complications, elderly patients, minimally invasive spine surgery, transforaminal lumbar interbody fusion

INTRODUCTION

As the general population ages in Taiwan,[1] the elderly patients with lumbar degenerative disorders increase. Low back pain and radicular leg pain usually disable the elderly to perform essential daily life activity, and chronic disabling pain can significantly impair psychosocial function in the elderly.[2] Thus, prompt recognition and treatment of back pain in the geriatric population are critical. Lumbar fusion is one of the most efficient treatments. Unfortunately, lumbar fusion by traditional open approach has a considerable risk of morbidity and mortality for the geriatric population. The incidence of complication and mortality of the elderly following lumbar fusion had been reported as 15.6%–80% and 0%–2.2%, respectively, in several studies.[3-17] Some of them even recognized age as an independent predictable factor of complication.[4,6-8] Recent advancement of minimally invasive approach to the spine has enabled surgeons to perform lumbar fusion in the elderly safely. Lee and Fessler reported that compared to younger patients, the elderly patients were not at increased risk of perioperative and postoperative complications after the single-level minimally invasive transforaminal lumbar interbody fusion (miTLIF).[18] However, there is scant literature regarding the perioperative complication of the elderly following single-level or multilevel miTLIF. This study is conducted to examine the perioperative complications in patient 70 years and older undergoing miTLIF and to examine if the incidence differs from that of a younger cohort.

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MATERIALS AND METHODS

A retrospective analysis was conducted on 185 consecutive patients who underwent miTLIF at Taipei Medical University Hospital, Taipei, Taiwan, during September 2007 to December 2010. Exclusion criteria included patients undergoing lumbar operations for nondegenerative conditions (e.g., infection, trauma, or tumor) or revision surgery. The miTLIF procedures were performed using a tubular retractor for total facetectomy, diskectomy, and interbody fusion, followed by percutaneous instrumentation. All operations were performed by the senior author (Yung-Hsiao Chiang) with/without the assistance of the junior authors (Yi-Shan Yang and Jiann-Her Lin). Hospital records, including operative notes, progress notes, and discharge summaries, were studied for patient demographics and perioperative complications. All patients enrolled were divided into two groups according to the age: the elderly group included patients 70 years and older and the young group younger than 70 years.

Complications were identified in the hospital records and categorized by the classification system described by Carreon *et al*. with modification. Complications were defined as any event where the patient required a specific intervention or treatment. Complications which adversely disturbed the recovery of the patient were defined as "major," while complications which did not change the patient's recovery were considered as "minor." The perioperative period was defined as 7 days after the operation, and the intraoperative complication was defined as complications occurring during the operative room.

Statistical calculations were performed using the JMP 9.2 software (Statistical Analysis System, SAS Institute, Cary, NC, USA). In addition to standard descriptive statistical calculations, the results of operation and complications were analyzed using Student's *t*-test and Fisher's exact test. P <0.05 was considered statistically significant.

RESULTS

One hundred and eighty-five consecutive patients who underwent miTLIF from September 2007 to December 2010 met the study inclusion criteria. Of the 185 patients, 53 were 70 years and older and 132 patients were < 70 years. There were no statistically significant differences between the two groups regarding patient characteristics except for height, weight, and diagnosis [Tables 1 and 2]. Although there was a difference regarding height and weight, body weight mass index was not different between two groups. Compared to the young group, the elderly group had more spondylolisthesis and fewer disc herniations in diagnosis. Remarkably, elderly patients had similar length of hospitalization (6.25 days vs. 5.79 days, P = 0.157), intraoperative blood loss (197 ml vs. 171 ml, P = 0.334),

Table 1: Demographics of patients

	Age				*P*
	<70	y/o	≥70	y/o	
Number of patients	132		53		
Age (years)	56.30±9.32		76.9±5.4		<0.0001*
Gender, *n* (%)					
Male	45 (39.04)		18 (33.96)		0.9867
Female	87 (65.91)		35 (66.04)		
Mean height (m)	161±9.28	116	156±7.71	44	0.0006*
Mean weight (kg)	67.3±13.93	119	61.2±8.83	45	0.0012*
BMI (kg/m²)	25.7±3.82	116	25.2±2.88	44	0.3461
Prior surgery, *n* (%)					
No	112 (86.15)	130	43 (81.13)	53	0.3920
Yes	18 (13.85)		10 (18.87)		
Diagnosis, *n* (%)					
Spondylolisthesis	85 (64.39)		46 (86.79)		0.0024*
Disc herniation	57 (43.18)		10 (18.87)		0.0019*
Spinal stenosis	50 (37.88)		34 (64.15)		0.0012
Foraminal stenosis	12 (9.09)		5 (9.43)		1.0000
Lever for fusion, *n* (%)					
1	91 (68.94)		34 (64.15)		0.1113
2	39 (29.55)		15 (28.30)		
3	2 (1.52)		4 (7.55)		
Surgical time (min)	413±116.20		418±111.9		0.7845
Blood loss (ml)	171±104.50	99	197±151	38	0.3343
Length of stay (days)	5.79±1.92	131	6.25±2.06	52	0.1568

BMI=Body mass index. *Indicated P<0.05

Table 2: Comorbidity

	Age		*P*
	<70	≥70	
Number of patients	132	53	
Hypertension, *n* (%)	39 (29.55)	22 (41.51)	0.1176
Coronary artery disease, *n* (%)	5 (3.79)	5 (9.43)	0.1527
Noninsulin-dependent diabetes mellitus, *n* (%)	14 (10.61)	6 (11.32)	0.8874
Myocardial infarction, n (%)	4 (3.03)	4 (7.55)	0.2287
CVA, *n* (%)	3 (2.27)	2 (3.77)	0.6255
Gastroesophageal reflux disease, *n* (%)	1 (0.76)	-	1.0000
Chronic obstructive pulmonary disease, *n* (%)	2 (1.52)	1 (1.89)	1.0000
Pulmonary embolism, *n* (%)	-	-	-
Hypothyroid, *n* (%)	-	-	-

CVA = Cerebral vascular accident

and surgical time (418 min vs. 413 min, $P = 0.785$) with the younger cohort.

Among the perioperative major complications, there was no incident of pneumonia, respiratory failure, cerebrovascular accidents, myocardial infarctions, pneumonia, or renal failure [Table 3]. One elderly patient with a diabetic mellitus history had a major complication when wound infection developed on postoperative day 10 that required antibiotics treatment. The wound healed well 1 month later without surgical intervention. The other major complication was in an elderly obese female patient with severe spinal stenosis at L4/5, who receiving L4/5 TLIF and unilateral approach for bilateral decompression. Urine retention developed postoperative day 3, and the urine dynamics study demonstrated a neurogenic bladder.

The most common minor complication was ileus in 19 patients, three patients in the elderly cohort, and 16 patients in the young cohort [Table 3], followed by leg dysesthesia in 13 patients. There were two intraoperative incidental durotomies (treated with primary repair followed by a synthetic absorbable hydrogel sealant). There were no statistically significant differences between two groups with respect to any one specific complication. In our study, no incident of anemia requiring blood transfusion, altered mental status, or deep venous thrombosis after surgery was observed.

Table 3: Intra- and peri-operative major and minor complications

	Age		*P*
	<70	≥70	
Number of patients	132	53	
Intraoperative complications, *n* (%)			
Incidental durotomy	1 (0.76)	1 (1.89)	0.492
Massive blood loss requiring transfusion	-	-	-
Position-related	5 (3.79)	5 (9.43)	0.1527
Others	-	-	-
Perioperative major complications, *n* (%)			
Wound infection	-	1 (1.89)	0.2865
Pneumonia	-	-	-
Renal failure	-	-	-
Myocardial infarction	-	-	-
Respiratory failure	-	-	-
Neurological deficit	-	1 (1.89)	0.2865
Congestive heart failure	-	-	-
CVA	-	-	-
Perioperative minor complications, *n* (%)			
UTI	2 (1.52)	2 (3.77)	0.3239
Anemia requiring transfusion	1 (0.76)	-	1
Confusion	-	-	-
Ileus	16 (12.12)	3 (5.66)	0.1906
Arrhythmias	-	-	-
Transient hypoxia	1 (0.76)	-	1
Wound seroma or ecchymosis	3 (2.27)	1 (1.89)	1
Leg dysesthesia	10 (7.58)	3 (5.66)	-

UTI=Urinary tract infection; CVA=Cerebral vascular accident

Although the elderly patients had a higher number of major complications [Table 4], this was not statistically significant. There was no difference between two groups regarding intraoperative, major, minor, or total complications ($P = 0.1053$, 0.081, 0.2391, and 0.7349, respectively). Thirty-six of the 132 younger patients (27.27%) developed 39 complications (six intraoperative complications, no major complications, and 33 minor complications) and 15 elderly patients (28.30%) had a total of 17 complications (six intraoperative complications, two major complications, and nine minor complications). There were no significant differences between the younger and elderly patients in terms of the number of patients experiencing at least one complication [$P = 0.8874$, Table 5].

DISCUSSION

This study demonstrated that there were no significant differences in the incidences of intraoperative, perioperative major, or minor complications following miTLIF between the elderly group (≥70 year old) and the young group (<70 year old), but there was a trend that the incidences of intraoperative and perioperative major complications were higher in the elderly.

Table 4: Total numbers of complications

n=185	Age		*P*
	<70	≥70	
Intraoperative complication (*n*)	6	6	0.105
Major complication (*n*)	-	2	0.081
Minor complication (*n*)	33	9	0.239
Total complication (*n*)	39	17	0.735

Table 5: Number of patients experiencing ≥1 complication

n=185	Age		*P*
	<70	≥70	
Intraoperative complication, *n* (%)	6 (4.55)	6 (11.32)	0.1053
Major complication, *n* (%)	0	2 (3.77)	0.081
Minor complication, *n* (%)	32 (24.24)	9 (16.98)	0.2823
Total complication, *n* (%)	36 (27.27)	15 (28.3)	0.8874

In our series, these two groups have comparable characteristics including gender, body mass index, level for fusion, prior surgery rate, intraoperative blood loss, operation time, and comorbidity. The incidences of minor and intraoperative complication in the elderly were low and comparable with that in the young group. There were two incidents of major complication in the elderly and none in the young, but this was not statistically significant. This fact resulted in the similar length of stay in both groups.

Our results were comparable with the results following one level miTLIF reported by Lee and Fessler and much lower than that by traditional open lumbar fusion, with respect to major, minor, or total complication. The incidence of complication following transitional open lumbar surgery was high in the elderly. Carreon *et al*. reported 80% of total complication rate in the elderly. The incidence of complication of the elderly following lumbar fusion had been reported as 15.6%–80% in several studies.[3-17] With advanced minimally invasive technique, one could perform lumbar fusion safely in the elderly. In 2007, Rosen *et al*. showed that minimally invasive decompression could be performed safely in elderly patients with lumbar stenosis and spondylosis.[19] Lee and Fessler concluded in 2012 that the incidences of perioperative and postoperative complications in elderly patients are not increased compared to younger patients when undergoing single-level miTLIF. Our results supported Lee and Fessler's conclusion that the elderly was the most benefit group from minimally invasive spine surgery.

Based on our study, age was not an independent predictable factor of intra- and peri-operative complication following miTLIF. Several studies had recognized age as an independent predictable factor of complications following transitional open spine surgery with/without fusion.[4,6-8] In contrast, our results demonstrated that age was not an independent predictable factor of perioperative complications following miTLIF. For the elderly, minimal tissue damage and the resulting less postoperative stress response[20] may reduce the risk of complications. In addition, early ambulation allowed by minimally invasiveness procedures during postoperative recovery period also may help to reduce the risk of complications.

In our study, the elderly had more complicated spine condition than the young did, but it seemed not to increase the risk of perioperative complications following miTLIF. Due to aging, the incidences of spondylolisthesis, as well as spinal stenosis, increased in the elderly, both of which were thought to be more challenging than disc herniation for surgeons. However, using minimally invasive lumbar surgery technique, intraoperative complications, intraoperative blood loss, and surgical time did not increase in the elderly group according to our results. Perioperative complications did not increase in the elderly neither. Diagnosis seemed to have little impact on complications following miTLIF. A further study was warranted to elucidate the impact of the diagnosis on the outcomes following miTLIF in the future.

Limitations of this study included its retrospective design, the patient series of one single surgeon, and the lack of long-term clinical and radiographic outcomes. Although the risk of complications for the elderly in our series was low, one should interpret these data cautiously. We did not operate on every elderly adult who had a painful lumbar spinal disorder. All patients, regardless of age, received preoperative medical clearance to ensure they were surgical candidates.

CONCLUSION

Based on our results, the incidences of intraoperative and perioperative major complications in the elderly were higher than that in the young, but the differences did not reach statistical significance.

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