REGISTRATION STUDY ON CAMISS-TLIF SURGERY VERSUS OP-TLIF ON TREATMENT OF ADULT SPONDYLOLISTHESIS

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INTRODUCTION

Lumbar spondylolisthesis is a common disease in spinal surgery and is considered to be one of the most common causes of low back pain. Till now, the traditional method to relieve nerve compression caused by lumbar spondylolisthesis is transforaminal lumbar interbody fusion (TLIF). However，the traditional TLIF has various shortcomings，such as larger wound area, more damage when stripping the muscles, larger amount of bleeding, more slowly recovery and more serious lower back pain[1].

The appearance of three-dimensional intraoperative navigation technology is helpful in realizing the change from the visual to non-visual spinal surgery, especially in the field of minimally invasive aspects. This technique has been widely used to make up the shortcomings of minimally invasive surgery such as lower visibility and higher radiation doses[2,3,4].

MATERIALS AND METHODS

27 patients who accepted the TLIF surgery of lumbar spondylolisthesis in our hospital from May 2010 to March 2014 are enrolled in our study. In all the 27 cases, 18 cases are female and 9 cases are male. The average age is 60.74 years old. All the surgeries are completed by the same group of skilled doctors.

All patients are divided into two groups. The CAMISS-TLIF (Computer assisted minimally invasive spinal surgery-TILF) group has 13 patients while the OP-TLIF (Open-TLIF) group has the rest 14 patients. All the demographic data including age, gender and the preoperative data including spondylolisthesis segments, spondylolisthesis type, spondylolisthesis degree, pre-operative JOA (Japanese Orthopaedic Association) scores, pre-operative ODI (Oswestry low back pain dysfunction Questionnaire) scores and pre-operative VAS (Visual analogue) scores are recorded. Besides, the perioperative data including blood loss, operative duration, days of hospitalization are also collected. When it comes to the follow-up, we completed the information of follow-up JOA, follow-up ODI, follow-up VAS, Odom's criteria, lumbar X-ray, vertebral CT, and other imaging results for both groups.

RESULTS

Patients from both the two groups got stage I surgical incision healed, without hematoma, infection, cerebrospinal fluid leakage, nerve damage and other

complications. Besides, no reoperation is occurred. There was no statistically significant difference in demographic data and the preoperative data between the two groups. The blood loss of CAMISS-TLIF group is (376.92 ± 165.34) ml, which is significantly reduced compared with the OP-TLIF group (857.14±720.81) ml, and the result has a significant difference (P<0.05) (Table 1). In addition, both the operative duration and days of hospitalization between two groups have no statistical differences.

For the follow-up aspects, fortunately, no patients were lost to follow-up, so the follow-up rate is 100 %. In CAMISS-TLIF group we followed up for 3-21 months, with an average of 12.36 months, while in the OP-TLIF group we followed up for 3-22 months, with an average of 11.53 months. The JOA improvement rate in the CAMISS-TLIF group is (74.74% ± 11.07%) while in the OP-TLIF group it is (61.97% ± 19.03%). Therefore, there is a statistically significant difference between the two groups in JOA improvement rate (P<0.05) (Table 2). In the field of follow-up ODI scores, the data in CAMISS-TLIF group is (2.00 ± 1.915) while in the OP-TLIF group it is (7.07 ± 7.760). So the follow-up ODI scores were statistically significant between the two groups (P<0.05) (Table 2). When it comes to the follow-up VAS scores and the Odom's criteria excellent rate there is no significant difference between the two groups.

Totally, all the patients from the two groups have completed 127 pedicle screw placements. The patients in the CAMISS-TLIF group have 56, while those in the OP-TLIF group have 71. In the field of pedicle screw accuracy rate, the CAMISS-TLIF group has 53 excellent, 3 good, 0 medium, so the excellent rate is 94.64%. In the OP-TLIF group, there is 71 excellent, 7 good, 0 medium, so the excellent rate is 90.14%. In conclusion, there is no significant difference between the two groups (P = 0.651).

Table 1. Comparison of the perioperative data

	CAMISS-TLIF (13 cases)	OP-TLIF (14 cases)	Statistics	
			t	p
Operation duration(min)	213.1±52.5	172.7±58.0	t=-2.193	P=0.144
Blood loss(ml)	376.92±165.34	857.14±720.81	t=-2.425	P=0.029*
Days of hospitalization(d)	12.92±3.25	14.21±2.97	t=-1.079	P=0.291

*P＜0.05, means this data has significant difference between the two groups

Table 2. Comparison of the follow-up data

	CAMISS-TLIF(13cases)	OP-TLIF(14 cases)	Statistics	
			t/χ^2	p
Follow-up JOA	24.23±2.49	22.43±3.32	t=1.585	P=0.150

Follow-up JOA Improvement rate	74.74%±11.07%	61.97%±19.03%	t=0.177	P=0.045*
Follow-up ODI	2.00±1.92	7.07±7.76	t=-2.289	P=0.032*
Follow-up VAS	0.38±0.87	1.64±2.50	t=-1.719	P=0.095
Follow-up Odom's				
Excellent	5	6		
Good	8	7	χ^2=1.122	P=1.000
Medium	0	1		
Poor	0	0		

*P＜0.05, means this data has significant difference between the two groups

DISCUSSION

TILF has gradually become a routine method for the treatment of adult spondylolisthesis. However, in order to get a better field of view during surgery, the traditional TILF methods have to extensively strip the para-spinal muscles and inevitably cause a larger destruction to the muscle ligament complex, which is one important reason for the low back pain after traditional TILF [5]. Foley firstly reported the minimally invasive TILF technique in 2002 [6], from then on, this technology was widely applied and shew the advantages. Schizas [7] pointed out that the minimally invasive TLIF rather than traditional TLIF can reduce the blood loss and shorten hospital stay. However, there is no statistically significant difference in operative duration and ODI changes. Many researches have proved that minimally invasive TILF can not only achieve a better effects than traditional methods, but also have some significant advantages in reducing blood loss, shortening hospital stay and releasing the low back pain after surgery [8, 9]. However, at the same time, some researches also pointed out that during minimally invasive surgery, the narrow surgical field will cost longer surgical time and repeatedly imaging positioning caused more radiation exposure than traditional TLIF. Besides, due to the longer learning curve, the minimally invasive TILF is hard to master for spine surgeons.

To solve the above problems, the navigation technology emerged and made up the disadvantages of narrow surgical field, poor accuracy and poor learning curve of minimally invasive surgery.

In this study, there is significant differences between the CAMISS-TLIF group and the OP-TLIF group in blood loss, follow-up ODI scores and JOA improvement rate, which indicates the advantages of minimally invasive surgery. Due to the less peel and damage to the para-spinal muscles and ligaments, patients recover more quickly, the recovery of postoperative back muscle function is better and the quality of life is improved more significantly.

The development of minimally invasive spinal surgery techniques can achieve the

same or better effects than traditional surgery by a smaller surgical wound. With the help of navigation techniques, we can finish the surgery precisely and safely. It is a promising technique in treating spinal diseases in the future [10].

Considering the relative short follow-up duration, we have just received the short-term results, so some long-term materials such as the interbody fusion rates are being analyzing. Even so, we still get some meaningful results. In the future, we will continue to follow up and improve the information both on the image and the clinical effects.

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