

Comparative analysis of endoscopic techniques for lumbar spinal stenosis with a proposal of a decision-making algorithm.

Ludmilla Bazin* ¹, Henri d'Astrog ², Sébastien Schuller ³, Tanguy Vendevre ¹, Xavier Castel ², Marc Szadkowski ²

¹ CHU, Service colonne vertébrale, Poitiers, France

² Centre Santy, Unité rachis, Lyon, France

³ Centre chirurgie du rachis, Unité rachis, Strasbourg, France

INTRODUCTION

Background:

Endoscopic spine surgery has emerged as a key component of minimally invasive strategies for the treatment of lumbar spinal stenosis (LSS). Multiple endoscopic techniques are currently available, including uniportal and unilateral biportal approaches, but clear guidance regarding their optimal use remains limited.

Objective:

To compare clinical outcomes, operative parameters, and complication rates across different endoscopic techniques for LSS, and to identify patterns that may guide surgical decision-making.

MATÉRIEL ET MÉTHODE :

We conducted a retrospective observational study of consecutive patients undergoing endoscopic decompression for degenerative LSS at two spine centers. Patients were treated using one of five techniques: small working-channel uniportal endoscopy (SWUE), large working-channel uniportal endoscopy (LWUE), unilateral biportal endoscopy (UBE), transforaminal uniportal endoscopy (TUE), or multiportal endoscopy (ME). Clinical outcomes (VAS, ODI, SF-12), operative time, and complications were analyzed. Comparative analyses focused primarily on SWUE, LWUE, and UBE.

RÉSULTATS :

A total of 164 patients were included. After exclusion of TUE and ME for comparative analysis,

149 patients remained. All techniques resulted in significant improvement in pain and functional outcomes, with no significant differences between groups. Operative time differed significantly, with shorter durations observed in SWUE, followed by LWUE, while UBE procedures were longer. UBE was more frequently used in older patients and in more complex cases, including bilateral symptoms and associated degenerative conditions. Complication and reoperation rates were low and comparable across techniques.

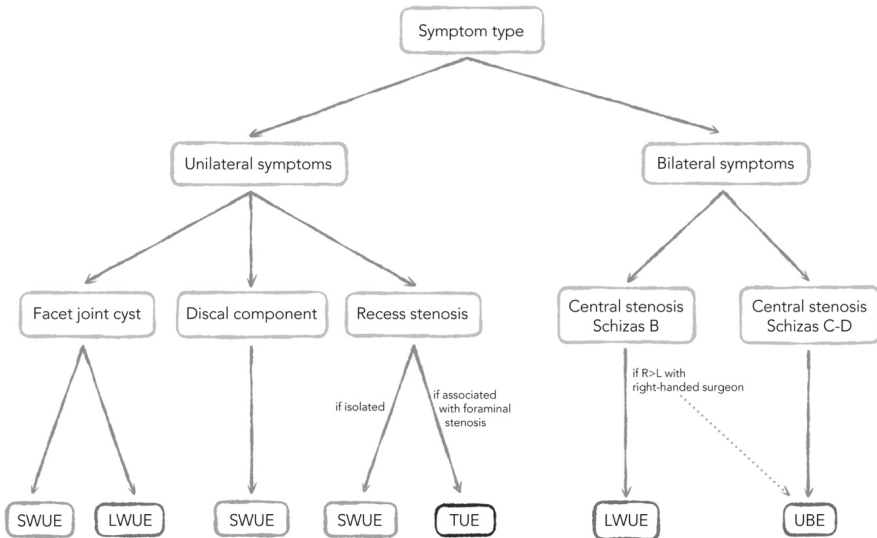
CONCLUSION :

Endoscopic techniques for lumbar spinal stenosis provide comparable clinical outcomes, with differences primarily related to operative time and case complexity rather than intrinsic superiority of a given approach. These findings support a tailored surgical strategy based on anatomical and clinical factors. A pragmatic decision-making algorithm is proposed to assist in selecting the most appropriate endoscopic technique.

Keywords: Lumbar spinal stenosis; endoscopic decompression; uniportal; biportal; minimally invasive spine surgery; surgical decision-making.

Table 2.4.1.2. Right pain VAS - Analysis population (N=164)

	LWUE (N=64)	ME (N=5)	SWUE (N=43)	TUE (N=10)	UBE (N=42)	Analysis Population (N=164)
Preoperative right pain VAS, N	64	5	43	10	42	164
Mean (SD)	6.6 (2.2)	6.4 (1.1)	6.4 (2.2)	7.3 (1.7)	6.5 (2.2)	6.6 (2.1)
Median (IQR)	7.0 (5.0; 8.0)	6.0 (6.0; 7.0)	7.0 (6.0; 8.0)	8.0 (7.0; 8.0)	7.0 (5.0; 8.0)	7.0 (5.0; 8.0)
Min:Max	[0;10]	[5;8]	[0;10]	[3;9]	[1;10]	[0;10]
Missing	0	0	0	0	0	0
Preoperative right pain VAS, N (%)	64	5	43	10	42	164
0-3 = Mild pain	7 (10.9)	0 (0.0)	4 (9.3)	1 (10.0)	3 (7.1)	15 (9.1)
4-7 = Moderate pain	32 (50.0)	4 (80.0)	24 (55.8)	2 (20.0)	22 (52.4)	84 (51.2)
8-10 = Severe pain	25 (39.1)	1 (20.0)	15 (34.9)	7 (70.0)	17 (40.5)	65 (39.6)
Missing	0	0	0	0	0	0
Postoperative right pain VAS, N	64	5	43	10	42	164
Mean (SD)	3.5 (2.9)	4.6 (2.1)	2.3 (2.6)	3.4 (3.0)	3.1 (2.8)	3.1 (2.8)
Median (IQR)	3.5 (1.0; 5.5)	5.0 (3.0; 6.0)	1.0 (1.0; 3.0)	3.0 (1.0; 7.0)	3.0 (0.0; 5.0)	2.0 (1.0; 5.0)
Min:Max	[0;10]	[2;7]	[0;10]	[0;7]	[0;9]	[0;10]
Missing	0	0	0	0	0	0
Postoperative right pain VAS, N (%)	64	5	43	10	42	164
0-3 = Mild pain	32 (50.0)	2 (40.0)	33 (76.7)	5 (50.0)	26 (61.9)	98 (59.8)
4-7 = Moderate pain	26 (40.6)	3 (60.0)	7 (16.3)	5 (50.0)	12 (28.6)	53 (32.3)
8-10 = Severe pain	6 (9.4)	0 (0.0)	3 (7.0)	0 (0.0)	4 (9.5)	13 (7.9)
Missing	0	0	0	0	0	0
Variation of right pain VAS (post-pre), N	64	5	43	10	42	164
Mean (SD)	-3.0 (3.3)	-1.8 (2.2)	-4.1 (3.1)	-3.9 (3.7)	-3.5 (3.1)	-3.4 (3.2)
Median (IQR)	-3.0 (-5.5; 0.0)	-1.0 (-4.0; -1.0)	-5.0 (-6.0; -1.0)	-4.5 (-7.0; 0.0)	-4.0 (-6.0; -1.0)	-4.0 (-6.0; -1.0)
Min:Max	[-9;6]	[-4;1]	[-9;4]	[-8;1]	[-8;4]	[-9;6]
Missing	0	0	0	0	0	0



SWUE = standard working-channel uniportal endoscopy

LWUE = large working-channel uniportal endoscopy

TUE = transforaminal uniportal endoscopy

UBE = unilateral biportal endoscopy