

ANTEROLATERAL THORACOLUMBAR SPINE SURGERY A REVIEW OF 41 CASES SERIES

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Résumé : *Contexte :* Nous avons cherché à résumer notre expérience et nos résultats en matière de chirurgie antérolatérale, thoracique et lombaire du rachis lombaire. *Méthodes :* De janvier 2018 à décembre 2021, nous avons analysé rétrospectivement 41 patients ayant subi une chirurgie antérolatérale du rachis thoracique et lombaire. Il y avait 22 femmes et 19 hommes avec un âge moyen de 38 ans (intervalle) et un suivi moyen de 36 mois. Les approches XLIF, ALIF, thoracotomie transpleurale et thoracophrénotomie ont été utilisées. *Résultats :* XLIF dans 13 cas, thoracophrénotomie dans 14 cas, thoracotomie dans 9 cas et ALIF dans 5 cas. La rupture par éclatement était la principale indication chirurgicale (80,48%). Le dispositif intersomatique le plus utilisé était la cage en maille de titane avec os autologue ou BMP (95,12%). Les complications postopératoires sont survenues dans 29,26 % des cas, principalement par les infections (9,75 %). Des complications sont survenues dans 27,27 % des cas de thoracotomie-thoracophrénotomie et 33,33 % des cas de XLIF. La pseudarthrose était la complication la plus à long terme, survenue chez 14,36% des patients. La durée moyenne d'hospitalisation était de 6,86 jours et la sonde thoracique a été retirée à 2,36 jours en moyenne. *Conclusion :* L'étude de chirurgie antérolatérale du rachis a montré des taux de complications élevés avec une faible incidence de mortalité. Cette chirurgie ouverte s'est avérée utile dans un contexte où il n'y avait pas de techniques de chirurgie mini-invasive.

Mots-clés : *Chirurgie du rachis antérolatéral, Lobotomie rétropéritonéale, Thoracotomie, Thoracotomie, Colonne vertébrale.*

Abstract : *Background:* We aimed to summarise our experience and results of anterolateral thoracic and lumbar spine surgery. *Methods:* From January 2018 to December 2021, we retrospectively analysed 41 patients who underwent anterolateral thoracic and lumbar spine surgery. There were 22 women and 19 men with an average age of 38 (range) years and a mean follow-up of 36 months. The XLIF, ALIF, transpleural thoracotomy and thoracophrenotomy approaches were used. *Results:* XLIF was made in 13 cases, thoracophrenotomy in 14 cases, thoracotomy in 9 cases and ALIF in 5 cases. Burst fracture was the main surgical indication (80.48%). The most used interbody device was the titanium mesh cage with autologous bone or BMP (95.12%). Postoperative complications occurred in 29.26%, dominated by infections (9.75%). Complications occurred in 27.27% of thoracotomy-thoracophrenotomy and 33.33% of XLIF. Pseudarthrosis was the most long-term complication which occurred in 14.36% of patients. The mean hospitalisation stay was 6.86 days, and the chest tube was removed at 2.36 days on average. *Conclusion:* Anterolateral spine surgery study showed high complication rates with low mortality incidence. This open surgery was still helpful in a context with no minimally invasive surgery technics.

Keywords : *Anterolateral spine surgery, Retroperitoneal Lobotomy, Thoracotomy, Thoracophrenotomy, Spine.*

INTRODUCTION

Thoracic and lumbar spine are subjected to significant vector forces during maturity.[1] Numerous causes, such as traumatic injuries, degenerative diseases, infectious and tumoral lesions, lead to spine instability which may result in kyphotic spine

deformation, spinal fusion defect or vicious vertebral cal as the main consequences of chronic back pain and hence, low-quality of life (QOL).[2] Posterior surgery and instrumentation were historically used in thoracic and lumbar spine lesions.[7,14] Posterior surgery allowed direct neurologic

decompression and solid spine stabilisation.[9] Posterior decompression and fusion were nevertheless insufficient to treat anterior spine extensive lesions. The anterior vertebral body defect made it necessary for complementary anterior thoracolumbar spine surgery. Several studies widely reported the significant complications of anterolateral spine surgery, such as vascular injury, visceral damage (pulmonary and intra-abdominal), and neurological complications.

The complication rate could be high as 40% post-anterolateral lumbar spine surgery.[13]

This surgery aimed to access anterior decompression, prevent posterior spine pseudarthrosis and postoperative kyphosis. [12] The use of this technique is very recent in our local practice.

This review summarises our experience and results carrying out this technique in our setting.

MATERIAL AND METHODS

From January 2018 to December 2021, we retrospectively reviewed the files of 41 patients treated in our institution by anterior or anterolateral thoracic and lumbar spine approach. There were 18 men and 23 women with a mean age at surgery time of 38 years. We used lateral retroperitoneal transpsoatic approach to reach L2 to L4 levels, anterior retroperitoneal direct approach to perform ALIF for L5-S1 access, transpleural thoracotomy for T5 to T11 lesions and transpleural thoracophrenotomy in T12 and L1 lesions. The mean follow-up was 18.22 months. The surgery was performed by the same neurosurgeon without the need for open access surgeon. The postoperative complications were reviewed.

RESULTS

Lateral retroperitoneal transpsoatic approach was used in 13 cases (Fig. 1) and anterior retroperitoneal direct approach in 5 cases.



Figure 1: burst fracture of L3 (A) with anterior reconstruction after lateral retroperitoneal lombotomy (B).

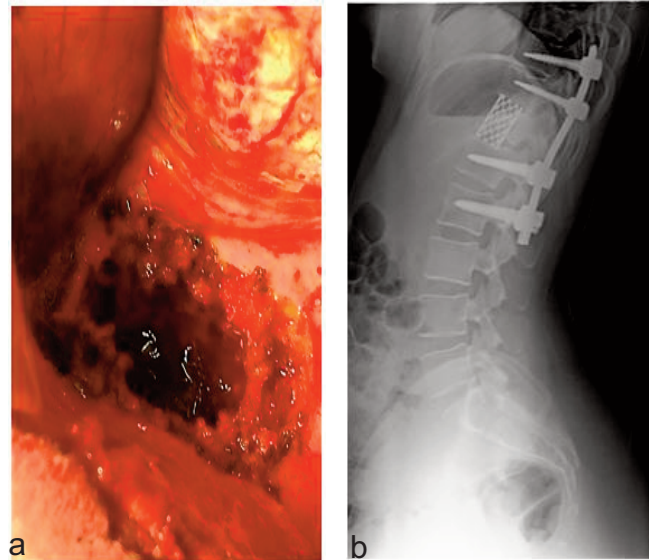


Figure 2: operative view of thoracophrenotomy for T12 corpectomy (A) with anterior reconstruction on thoracic spine xray control (B)

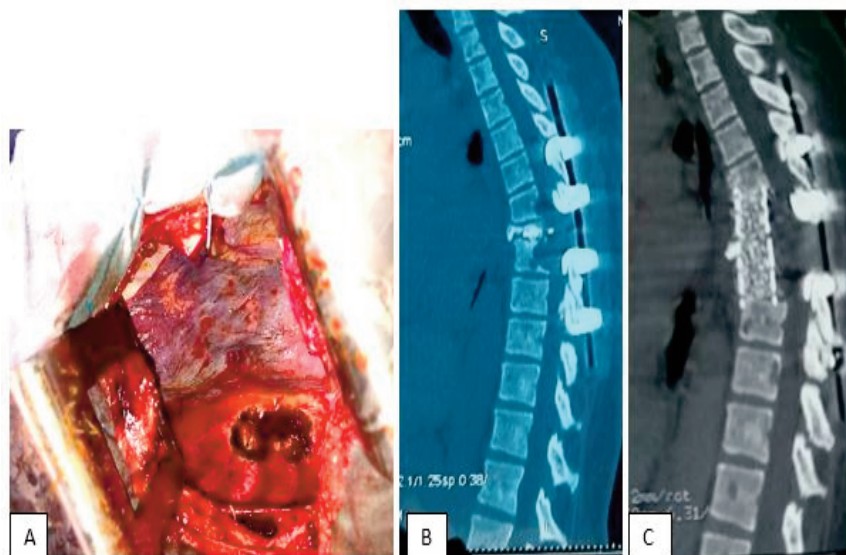


Figure 3: operative view of transpleural thoracotomy (A) for thoracic plasmocytoma (B) with anterior control and fusion after resection of T6,T7,T8 (C).

Thoracophrenotomy was used in 14 cases (Fig. 2) and thoracotomy in 9 cases (Fig. 3). Retropleural thoracotomy was not used in our practice.

Surgical indications were mainly high energy trauma leading to burst fracture in 24 cases and a seat belt fracture. Neoplasia was seen in 6 cases (1 hemangiopericytoma, 2 plasmacytomas, 2 metastatic tumours and 1 osteoblastoma). We had 7 cases of Pott's disease sequelae and 3 disc herniations (1 thoracic spine disk herniation and 2 L5-S1

disk herniation). Posterior instrumentation and fusion prior to anterior reconstruction were carried out in 38 out of 41 cases. The posterior surgery was the first step of circumferential arthrodesis in case of trauma or vertebrectomy in case of neoplastic disease.

In 3 cases we performed anterior surgery solely (1 thoracic disk herniation, 1 burst fracture pseudarthrosis and one L5-S1 disk herniation).

We carried out corpectomy in 33 cases (94.87%), 6 piecemeal vertebrectomies and 2 discectomies. Interbody devices used were titanium mesh cages in 39 cases and 2 Medtronic Sovereign cages.

Autologous bone graft was mostly used in the interbody implant, except in 8 cases, tumoral and disc herniation, where BMP was used instead. The average hospital length of stay was 6.86 days. In the case of

thoracotomy and thoracophrenotomy, chest tube was removed at an average of 2,36 days.

We had a complication rate of 27.27% for thoracotomy and thoracophrenotomy, and 33.3% for retroperitoneal lombotomy. We noticed 1 death 3 weeks after surgery (1 XLIF) due to digestive hemorrhage.

The data of all patients are summarised in table 1.

Case	A/S	Indication	Surgery	Action	Post instr	Chest tb Remo (days)	Hosp (days)	Cpl	Fusion (12M)
1	30/M	burst L3	XLIF	Cpt	yes	-	5	yes	-
2	24/F	burst T12	Tph	Cpt	yes	2	5	-	-
3	42/M	burst L3	XLIF	Cpt	yes	-	7	-	no
4	27/M	burst L2	XLIF	Cpt	yes	-	21	-	-
5	25/M	burst L2	XLIF	Cpt	yes	-	5	-	-
6	52/F	Fract T9	Thc	Cpt	yes	2	21	yes	-
7	46/M	burst L1	Tph	Cpt	yes	2	15	-	-
8	25/M	FL T11	Tph	Cpt	yes	2	21	yes	-
9	32/M	meta T10	Thc	VCR	yes	7	15	yes	-
10	33/F	burst T12	Tph	Cpt	yes	2	5	-	no
11	24/F	burst L3	XLIF	Cpt	yes	-	5	-	-
12	27/F	burst T11	Tph	Cpt	yes	2	5	-	-
13	36/M	HP T10	Thc	VCR	yes	2	5	-	-
14	44/F	meta T10	Thc	VCR	yes	2	7	yes	-
15	54/M	burst L3	XLIF	Cpt	yes	-	5	yes	-
16	32/F	Pott	Thc	Cpt	yes	5	10	yes	-
17	47/F	T6T7T8	Thc	Cpt	yes	2	5	yes	-
18	34/M	burst T9	Thc	Cpt	yes	2	7	-	-
19	43/F	Pott L5	ALIF	Cpt	yes	-	5	-	no
20	26/M	burst L1	Tph	Cpt	yes	2	5	-	-
21	30/M	SBF T12	Tph	Cpt	yes	2	5	-	-
22	53/M	burst T12	Tph	Cpt	yes	2	5	-	-
23	63/F	Pott L3	XLIF	Cpt	yes	-	5	-	-
24	33/F	Otb T10	Thc	VCR	yes	2	5	-	-
25	35/F	Pott	Tph	Cpt	yes	2	5	-	-
26	20/M	burst L5	ALIF	Cpt	yes	-	5	-	-
27	32/F	burst	Tph	Cpt	yes	2	7	-	-
28	53/F	Pott L3	XLIF	Cpt	yes	-	5	yes	-
29	37/M	burst L5	ALIF	Cpt	yes	-	5	-	-
30	35/M	burst L1	Tph	Cpt	yes	2	5	-	-
31	53/F	burst L2	XLIF	Cpt	yes	-	5	yes	-
32	35/M	burst L1	Tph	Cpt	yes	2	5	-	-
33	32/F	plsm	XLIF	VCR	yes	-	5	-	no
34	25/M	Pott L2L3	XLIF	Cpt	yes	-	5	-	-
35	37/M	burst L2	XLIF	Cpt	yes	-	5	-	-
36	30/M	burst L1	Tph	Cpt	yes	2	5	-	-
37	22/F	Pott L3	XLIF	Cpt	yes	-	5	yes	-
38	35/M	DH T11T12	Tph	Dst	no	2	5	-	-
39	38/F	DH L5S1	ALIF	Dst	no	-	5	-	-
40	53/F	DH L5S1	ALIF	Dst	yes	-	5	-	no
41	22/F	burst T12	Tph	Cpt	yes	2	5	-	-

Table 1 : Patients characteristics

A/S= Age/Sex, Post instr= posterior instrumentation, Chest tb remo= chest tube removal, Hosp= hospitalization, Cpl= complication, Tph= thoracophrenotomy, Thc= thoracotomy, Cpt= corpectomy, Fract= fracture, Meta= metastasis, VCR= vertebral column resection, FL= fracture-luxation, HP= hemangiopericytoma, Plsm= plasmocytoma, SBF= seat belt fracture, OTB= osteoblastoma, DH= disk herniation.

Complications	Number	Surgery	Treatment	Evolution
Infections	4	XLIF (2) thoracotomy (2)	surgical debridement +ATB (1), a local daily care+ATB (3)	healing healing
Repeat atelectasia	1	thoracophrenotomy	endoscopic aspiration of mucus plug	healing
Hemothorax	1	thoracotomy	prolonged chest aspiration	complete resorption
Hemopneumothorax	1	thoracotomy	prolonged chest aspiration	complete resorption
Transitory intercostal pain	1	thoracotomy	gabapentine	improvement
Eventration	1	XLIF	surgery, abd prosthesis	healing
Major Bleeding	1	XLIF	intraoperative cauterization	control
LCS leak	1	XLIF	DLE	drying up
Significant peritoneal Breach	1	ALIF	in situ repair	closed

Table 2 : Complications of anterolateral thoracolumbar spine surgery

Case	Age/sex	Indication	surgery	signs	Device	Aetiology	Traitement
1	42/M	Burst L3	XLIF	lumbar Pain	Harms cage+ autologus bone	Ext bone resec > cage lenght	surgery
2	33/F	Burst T12	thoracophr	-	Harms cage+ Autologus bone	wide Cpt > cage lenght	none
3	43/F	Pott L5	ALIF	lumbar Pain	Harms cage+BMP	cage malposition	surgery
4	32/F	plasmocytoma	XLIF	lumbar Pain	Harms cage+ BMP	wide bone resection+ difficulties in anterior reconstruction	surgery
5	53/F	L5-S1 disc herniation	ALIF	lumbar pain	Sovereign cage + BMP	cage pull out	surgery

Table 3 : Non fusion cases in anterolateral thoracolumbar spine surgery

In early postoperative stage, we experienced 12 complications (29.26%) (Table 2). Infection (Fig. 4) was the most important complication and occurred in 4 (9.75%).

These infections required rehospitalisation and were treated by general antibiotics and local daily wound dressing. They resolved with reoperation in 1 case and without in 3 cases. We had 2 infections in thoracotomy and 2 infections in lateral retroperitoneal approaches.



Figure 4 : postoperative deep infection after transpleural thoracotomy

Long-term complications were resumed by six cases of pseudarthrosis (14.63%), 1 year after surgery (table 3). Among these patients, 2 showed evidence of failing surgical implants.

DISCUSSION

Anterolateral second look surgery is essential for anterior spinal defect reconstruction. These surgical routes could be complex with serious complications. The extremely complex anatomy of these

regions justifies a sometimes high rate of complications. These potential complications have allowed the growth of endoscopic techniques potentially less invasive.[5]

In our context, where minimally invasive spine surgery is not yet available, the classic open approaches retain all their importance. According to series and authors, the complication rate of the classic open anterolateral surgery varies significantly.

Dai et al. report no complication in 22 patients series of anterior instrumentation in pyogenic osteomyelitis in the thoracic and lumbar spine.[1] In an analysis of nationwide spine surgery complications conducted by the Japanese Society for spine surgery and associated research, 22.2% of anterior thoracic spine surgeries and 19.2% of anterior lumbar spine surgeries had complications.[4] We report a complication rate of 29.26% in thoracic and lumbar anterolateral spine surgery. For example, open thoracotomy showed numerous disadvantages, such as pulmonary function impairment, extensive blood loss, prolonged chest tube time, prolonged hospitalisation and the need for an access surgeon. [6] When analysing these open thoracotomy complications individually, we can make some observations.

A case of pulmonary function impairment was observed with found aetiology, a bronchial obstruction by a mucous plug. Lung injury can't be a frequent complication in spine surgery due to no direct action on the organ. In addition, the absence of specific actions on the lung in spine surgery causes it to return faster to the wall, reducing chest drainage duration. Interestingly, in 90% of our cases of thoracotomy and thoracophrenotomy, the chest tubes were removed on the second day except in 2 cases in which prolonged chest drainage was required due to hemothorax, with a mean hospital length of stay of 6.86 days.

The causes of prolonged hospitalisation were recidivating atelectasis, persistent hemothorax, and infection not specific to open thoracotomy.

A video-assisted thoracoscopic spine surgery series by Kim et al demonstrated a lower complication rate (1 chylothorax followed by paraspinous abscess, 1 pleural effusion and 1 case of CSF leak). In minimally invasive spine surgery, the chest tube is removed within 2 to 18 days after surgery.[5] This delay is substantially longer than our series of chest tube removal with presumable lengthy hospital stays discussed in Kim et al studies.

The main retroperitoneal approach used in the lumbar spine was XLIF. The main disadvantages of this surgery were lumbar plexus, iliopsoas and bowel injuries. Compared to ALIF, this approach's risk of vascular complications is low, but it can still be challenging to repair when they occur.[3,8] Some publications do not include all related complications of anterolateral spine surgery as specific complications of this surgery.[10] According to Ozgur et al. XLIF complications can be classified as minor or major, and this author published 19% of complications from a series of 12.[10]

As specific complications of this surgery, he took wound infections, cardiovascular events, respiratory events and pseudarthrosis. This state of affairs does not account for the exact rate of complications and induced bias in various studies.[10] Anterolateral spine surgery complications must include all surgery-related complications. [13]

The findings of Sofianos et al. showed that 40% of complications associated with anterolateral spine surgery are related to this procedure.[13] Our patients' global complications are reported without their characterisation. The most significant long-term difficulty was pseudarthrosis. We experienced 6 cases of these complications. In our cases, the main fact leading to pseudarthrosis was the inadequacy between bone resection and the titanium mesh cages' diameter.

In these cases, bone resection was more extensive than cage size. Despite careful endplate preparation, pseudarthrosis

developed. Thus, care must be taken to avoid extensive bone resection in anterior reconstruction in fracture cases, unlike anterior reconstruction in tumour cases.

CONCLUSION

Anterolateral approaches are beneficial very in anterior defect reconstruction. The complications in these complex surgeries can be high and major. This surgery is difficult compared to posterior surgery.

We experienced a high complication rate in this study without lethal complications. The goal must be to minimise lethal complications. Nevertheless, we can teach them to resort to classic anterolateral spine surgery in case of the absence of minimally invasive surgery.

Notes :

Conflict of interest: none

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