A Measure to Avoid Pleura Injuries in XLIF at Upper Lumbar Levels

Takao Nakajima ¹, Yong Kim ², Masabumi Miyamoto ³
Dept. of Orthop. Surg., Nippon Medical School, Chiba Hokusoh Hospital¹
Dept. of Orthop. Surg., Nippon Medical School²
Dept. of Orthop. Surg., Nippon Medical School, Tamanagayama Hospital³
Objective & Methods

【Objective】 XLIF specific complications

(1) Upper lumbar levels: Risk of pleural or diaphragmatic injury
(2) Lower lumbar levels (especially L4/5): Thigh symptoms and muscle weakness of lower extremity on the approach side

To report the review of the problems and solutions of pleural injury associated with the procedure at the upper lumbar levels.

【Methods】 Study Cases  31 patients with the topmost fusion vertebrae proximal to the 2nd lumbar vertebra

( Of The first consecutive 60 patients who underwent XLIF between September 2013~December 2014 )

19males, 12females
Ave.68.7y/o (30~82y/o)

＊All operations were performed by left incision with NVM5 nerve monitoring system

unstable spines 9 cases
degenerative scoliosis 6 cases
spinal kyphosis 6 cases
foraminal stenosis 5 cases
degenerative spondylolisthesis 4 cases
burst fracture 1 cases

The occurrence of intraoperative pleural injury, postoperative pneumothorax, etc were investigated.
Results

proximal fusion end

**Th12** 1 case/1 (100%) intraoperative pleural injury

( open conversion, pleural suture, and intraoperative chest drain insertion. POD 6 chest drain remove )

**L1** 1 case/8 (12.5%) postoperative pneumothorax

( chest drain insertion POD 1. POD 4 chest drain remove )

**L2** 1 case/22 (4.55%) intraoperative pleural injury

( intraoperative pleural suture, but postoperative pneumothorax and chest drain insertion on the day of procedure. POD 3 chest drain remove )
There are several limitations of the LLIF approach. Access to the L4-5 disc level can be obstructed by a high iliac crest or aberrant lumbar plexus anatomy. Similarly, access to the L1-2 level can sometimes be hindered by lower ribs.
Dennis S. M, MD, et al

Extreme Lateral Interbody Fusion (XLIF) in the Thoracic and Thoracolumbar Spine: Technical Report and Early Outcomes

(HSSJ (2013) 9:25–31)

N=18 patients ( 13 females, 5 males )
( Number of levels fused: Th12/L1: 8    L1/2: 2 )

All patients were extubated by the first postoperative day. Chest tubes were removed on average of 2 days (range, 1–5 days) Eight patients developed a pulmonary effusion following removal of the chest tube. Six were minimally symptomatic. In one patient, the effusion was significant enough to require reinsertion of a chest tube on POD 2. In a second patient, respiratory symptoms related to the effusion were deemed significant enough to warrant transfer from the inpatient floor to a monitored care setting.
1. Transthoracic approach:
   - A chest drain may be required for thoracic closure
   - Even if a chest drain insertion can be avoided, risk of postoperative pneumothorax remains

2. Retropleural approach:
   - Procedures during operation are associated with risk of pleural injury

3. Transdiaphragmatic approach:
   - Associated with risk of pleural injury and/or lung injury
   - Diaphragm repair may be required
   - Risk of postoperative pneumothorax remains

4. Retroperitoneal approach:
   - Angle technique for rib interference may be required

An approach that enables access to the upper lumbar vertebra via the retroperitoneal space without causing pleural injury and without rib interference is needed.

We developed a new approach that resolves these issues!
Our Measure 1

Discussion

exposing and removing a section (5-8cm) of the 11th rib for access and subsequent auto bone graft
Confirming the retroperoneal area by touch, inserting finger into the posterolateral incision(sub-incision) and another(lateral incision) from the end or distal side of the 12th rib.
Using the angle technique (set guide wire and retractor).

Easy to raise the retractor vertical to the lateral side of the interbody due to the removal of the 11th rib.
Thoracotomy is inevitable if the 10\textsuperscript{th} rib is removed and insertion is performed.

Pulmonary alveoli become visible through the pleura at the point between the 10\textsuperscript{th} and 11\textsuperscript{th} ribs, or 11\textsuperscript{th} and 12\textsuperscript{th} ribs in some cases.

The 11\textsuperscript{th} rib is removed.

If instrument is inserted from the tip of the 12\textsuperscript{th} rib or the point distal to the 12\textsuperscript{th} rib level to pass the retroperitoneal space, insertion to the retroperitoneal space can be achieved without thoracotomy.

This approach can be applied for access up to the L1/2 level.
There have been ZERO pleura injuries since we began this procedure. Additionally, this method avoids the angle technique, and donor site pain of iliac bone which should be considered since bone harvests are still common in Japan.
Conclusion

1. We reported issues on XLIF operations of upper lumber vertebra and our measures.

2. Pleura injury and pneumothorax after the surgery occurred;
   1) 1 / 8 at the L1 upper fusion end
   2) 1 / 22 at the L2 upper fusion end

3. We consider that pleura injury can be avoided with our method mentioned above for L1/2 level operations.

4. Further investigations are required to apply it to Th12/L1 level operations.

The authors declare no conflict of interest associated with this presentation.

E-mail: kyohei@nms.ac.jp