

Anterior approaches to the lumbar and lumbosacral junction

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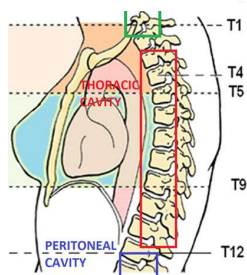
Istanbul Cadaver Course - Spine - Thoracic, Lumbar, Sacral Spine Surgery
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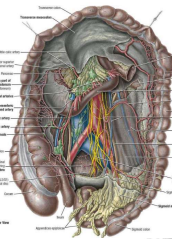
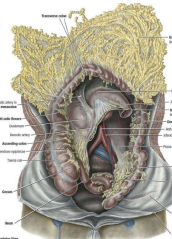
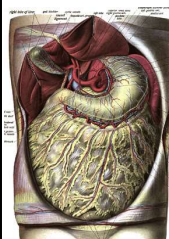
- **Educational objectives**
 - List available approaches for anterior lumbar spine
 - Appreciate historical evolution of techniques
 - Choose the appropriate technique
- **Level**
 - Advanced
- **Duration**
 - 38 Slides, 15 minutes
- **Disclosure/conflict of interest**
 - None

Anterior approach to spine

- **Cervical:** No cavity
- **Thoracic:** Thoracic cavity
- **Lumbosacral:** Peritoneal cavity



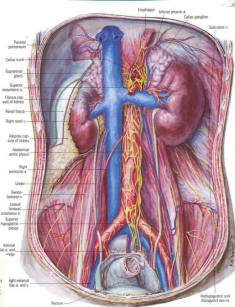
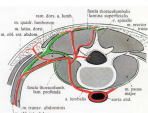
Abdominal cavity



Retroperitoneal space

The **connective tissue space** behind the posterior parietal peritoneum

is occupied by
the **kidney**,
the **suprarenal gland**,
the **ureter**,
the **major blood vessels (abdominal part of the aorta, inferior vena cava, common and external iliac vessels)**, and
the **sympathetic trunk**.

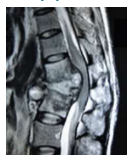


Evolution of spinal approaches

- **Posterior surgery:** The **only** route in the beginning
 - **Smith AG.** Account of a case in which portions of the three dorsal vertebrae were removed for the relief of paralysis from fracture, with partial success. *North Am Med Surg J.* 1829;8:79-94
- **Anterior surgery:** 19th and early 20th centuries
 - Exploration of the thoracic and abdominal cavities
 - Louis Pasteur: Research in microbiology
 - Joseph Lister: Techniques of antisepsis

Need for anterior approach?

- Pott disease: Need for anterior debridement



- Ménard, 1894

– Costotransversectomy

- Ménard V. Causes of paraplegia in Pott's disease. Its surgical treatment by directly opening the tuberculous focus of the vertebrae. Rev Orthop. 1894;5:47-64.



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Anterior lumbar approach

- Müller W, 1906. The first report of a successful anterior approach to the lumbar spine
 - Müller W. Transperitoneal exposure of the spine in tuberculosis spondylitis. Dtsch Ztschr Chir. 1906;85:128.
- Transperitoneal approach to treat a suspected sarcoma of the sacrum (intraoperatively determined to be Pott's disease)

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Need for anterior fusion

- Capener N. Spondylolisthesis. Br J Surg. 1932;19: 374-386.

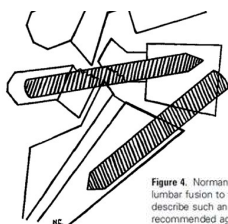


Figure 4. Norman Capener's diagram of a theoretical operation for anterior lumbar fusion to treat spondylolisthesis. Although Capener was the first to describe such an operation, he believed it to be too technically difficult and recommended against the procedure.²²

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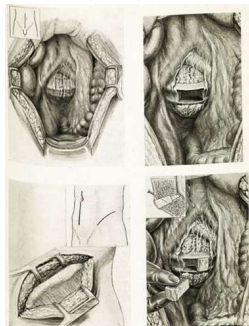
Anterior lumbar fusion for spondylolisthesis

- Burns (Burns BH. An operation for spondylolisthesis. Lancet. 1933;221:1233)
 - 14-year-old boy with traumatic spondylolisthesis
 - Drilling a hole through center of the L5 and S1 vertebral bodies and filling the hole with bone graft
- Mercer (Mercer W. Spondylolisthesis: with a description of a new method of operative treatment and notes of ten cases. Edinb Med J. 1936;43:545-572)
 - More similar to the modern ALIF
 - Transperitoneal approach, resection of the intervertebral disc and placement of bone graft

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Anterior lumbar fusion for spondylolisthesis

- Mercer (Mercer W. Spondylolisthesis: with a description of a new method of operative treatment and notes of ten cases. Edinb Med J. 1936;43:545-572)



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Medical therapy of Pott disease

- Streptomycin in 1947
 - Medical treatment for Pott's disease was finally possible

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Extraperitoneal lumbar anterior approach

- Extraperitoneal ventral approach for Pott's Disease (with experience with the lumbosacral sympathectomy)
 - Ito H, Tsuchiya J, Asami G. A new radical operation for Pott's disease. J Bone Jt Surg. 1934;16: 499-515

Extraperitoneal lumbar anterior approach

- Southwick and Robinson (Southwick WO, Robinson RA. Surgical approaches to the vertebral bodies in the cervical and lumbar regions. J Bone Jt Surg. 1957;39-A: 631-644)
- Harmon (Harmon PH. Anterior extraperitoneal lumbar disk excision and vertebral body fusion. Clin Orthop Relat Res. 1960;18:169-198)
 - Early mobilization in the postoperative period
- During 60s and 70s: ALIF was controversial and limited to cases with repeated posterior failure

Extended indications for lumbar anterior approach

- Hodgson et al: anterior approach was also useful for tumors, trauma, and spondylolisthesis
 - Hodgson AR, Stock FE, Fang HS, Ong GB. Anterior spinal fusion. The operative approach and pathological findings in 412 patients with Pott's disease of the spine. Br J Surg. 1960;48: 172-178.

Deformity surgery

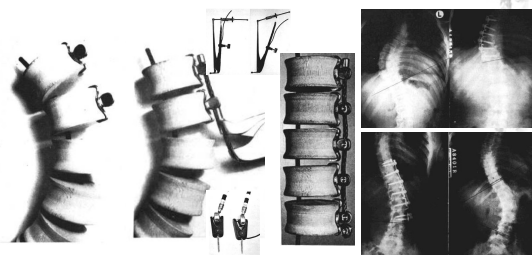
- The 1960s: Scoliosis surgery with Harrington rod
- Dwyer, 1969 and 1974
 - Anterior approach to correct thoracolumbar scoliosis
 - Extraperitoneal approach
 - Fusion of discs at the motion segments
 - Use of titanium cables placed through vertebral body screws

Dwyer AF, Newton NC, Sherwood AA.
An anterior approach to scoliosis. A preliminary report. Clin Orthop Relat Res. 1969;62:192-202

An Anterior Approach to Scoliosis

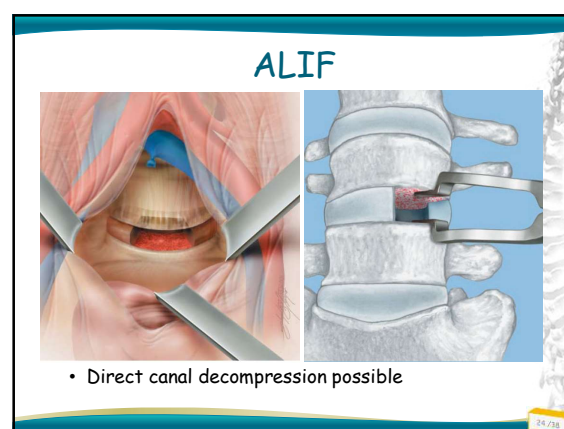
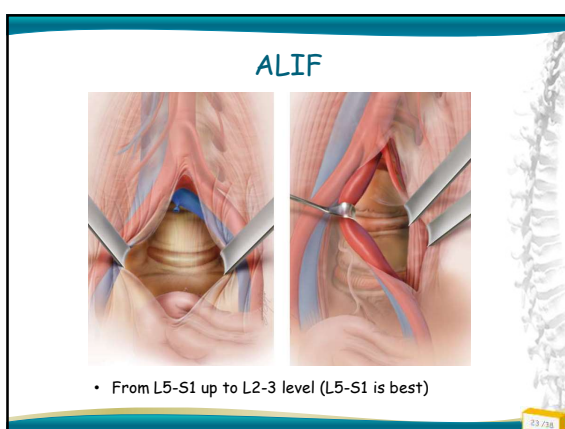
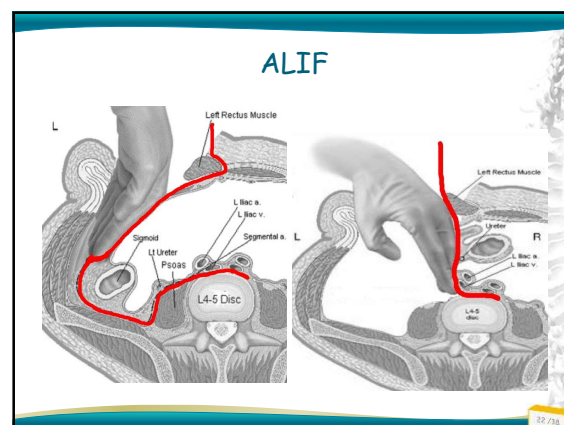
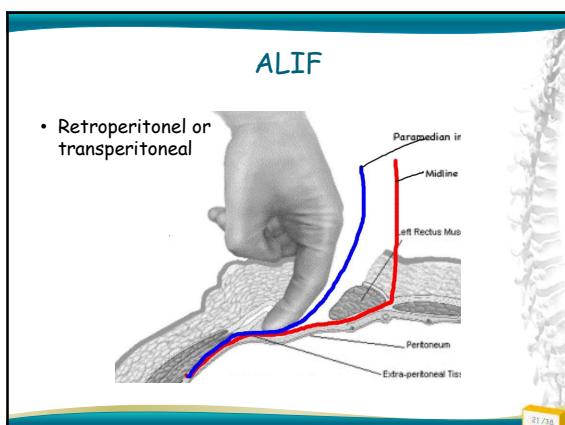
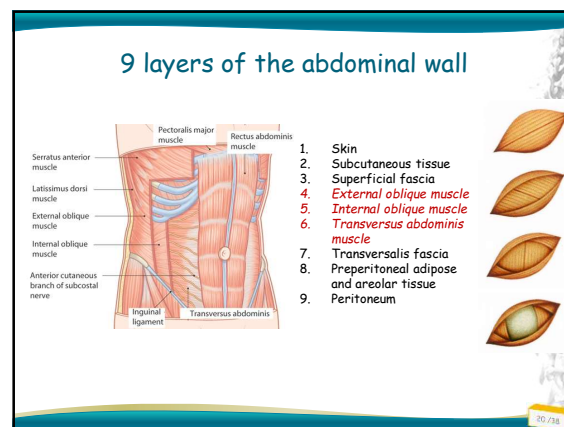
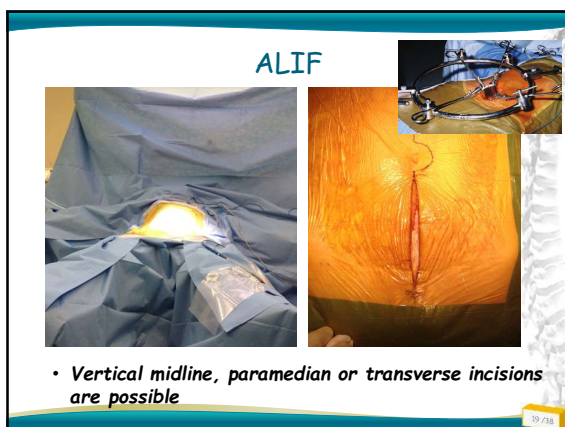
A Preliminary Report

A. F. DWYER, M.B., M.S., F.R.A.C.S.,* N. C. NEWTON
AND A. A. SHERWOOD



Refinement of ALIF

- Obenchain, 1991. Report of the laparoscopic transperitoneal ALIF
 - Obenchain T. Laparoscopic lumbar discectomy: case report. J Laparoendosc Surg. 1991;1:145-149
- Fraser and Gogan's, 1992. Muscle splitting approach (involved only dividing the external oblique in the direction of the fibers)
 - Fraser RD, Gogan WJ. A modified muscle splitting approach to the lumbosacral spine. Spine (Phila Pa 1976). 1992;17:943-948.
- Mayer, 1997. Modified Fraser's muscle splitting access to the retroperitoneal space, using microscope: mini-open approach
 - Mayer HM. A new microsurgical technique for minimally invasive anterior lumbar interbody fusion. Spine (Phila Pa 1976). 1997;22:691-700
- Race between 2 ALIF techniques:
 - Laparoscopic approach
 - Mini-open approaches (won)



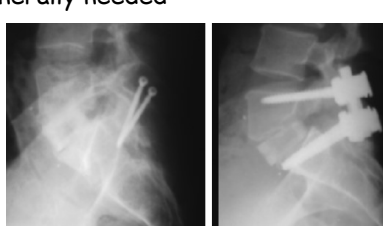
ALIF



• Ant. long. ligament resection =
hype lordotic cage insertion

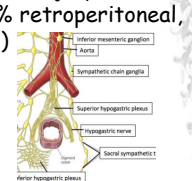
ALIF

- Additional posterior stabilization is generally needed



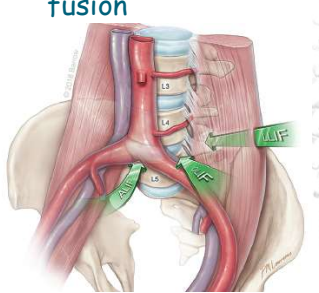
ALIF

- Complications
 - Visceral damage (rare)
 - Vascular injury (3%)
 - Superior hypogastric plexus injury:
Retrograd ejaculation (2% retroperitoneal,
10x more transperitoneal)

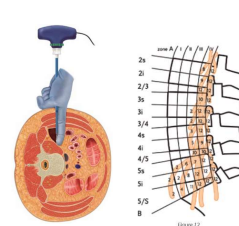


Anterior/Lateral lumbar interbody fusion

- ALIF
- XLIF
- OLIF

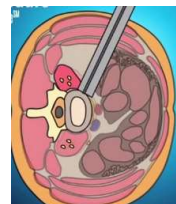


LATERAL XLIF (Nuvasive) DLIF (Medtronic)



Best works at L1-L5

OBLIQUE OLIF (Medtronic)



Best works at L1-S1

Risk of collateral damage

	ALIF	OLIF	XLIF
Visceral	↓	↓	↓
Vascular	↑*	↑	↓
Neural	↓**	↑	↑↑

* Upper levels
** Sup. Hypogastric plexus

Comparison

- **ALIF:** Well documented/time proven/standard, hardware is brandless/standard
- **XLIF/OLIF:** Newer, new technology needed (cages, retractors, neuromonitoring), company-dependent

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Comparison

- ALIF, XLIF and OLIF have similarly succesful clinical results
- Complications are rare and comparable
- Works best at:
 - ALIF: L4-S1
 - XLIF: L1-L5
 - OLIF: L1-S1 (XLF+ALIF)

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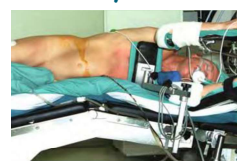
Lumbotomy

(Thoraco-Phrenico-Lumbotomy: T9-L5)

- Indications:
 - Spinal deformity
 - Fracture
 - Degenerative disorders
 - Infection
 - **Tumor**

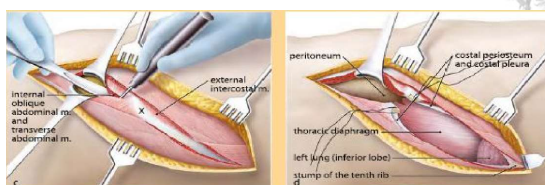
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Lumbotomy - Technique



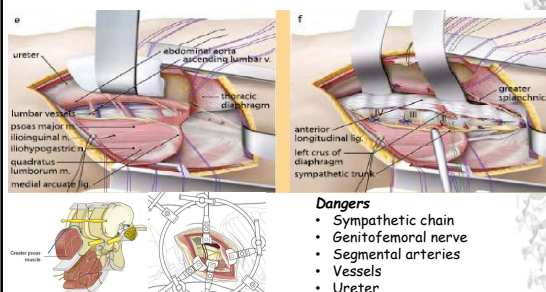
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Lumbotomy - Technique



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Lumbotomy - Technique

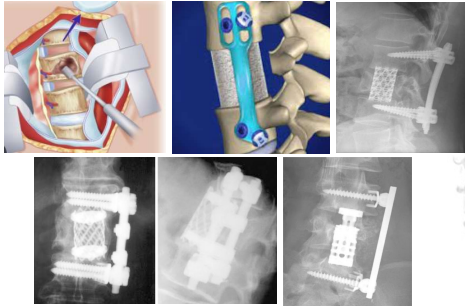


Dangers

- Sympathetic chain
- Genitofemoral nerve
- Segmental arteries
- Vessels
- Ureter

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Lumbotomy - Technique



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Summary

- Approach to anterior lumbar spine may be required for
 - Degenerative disease (discectomy) and deformity via: ALIF/OLIF or XLIF
 - Tumor, infection or trauma (corpectomy) via lumbotomy
- Various types of skin incisions and positions (supine, lateral decubitus, prone) can be used
- Extraperitoneal route is preferred in most cases
- The technique selected according to: pathology, level, patient characteristics and surgeon's armamentarium

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ISTANBUL SPINE CADAVER COURSE

Thoracic, Lumbar, Sacral Spine Surgery
24-26 February 2023



... thank you

Questions / Comments ?

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