OBLIQUE (ANTERIOR TO PSOAS) CAGE TECHNIQUES FOR DEFORMITY

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DISCLOSURES

Honorarium Recipient- Stryker
Oblique Interbody Fusions

- Define: Anterior retroperitoneal lumbar discectomy and cage insertion
- Exploits plane to left of aorta, and anterior to psoas (ATP)
- Main rationale – avoid trans-psoas dissection

Oblique Cage Techniques for Deformity

- Lateral cages are helpful in adult deformity
- Does the oblique cage offer substantive differences between LLIF?
- Examine
  - Oblique fusions mobile lumbar spine
  - Oblique approach to L5-S1

Agenda

- Brief history of anterior retroperitoneal surgery
- Rationale for anterior oblique work in adult spinal deformity
- Technical points
- Complications
- Cases
Anterior Spinal Surgery

Figure 7. A. Chiseling of the end-plates and preparation of graft bed. B. Tricortical iliac crest autograft held by a graft holder and packed into the intervertebral space.

Figure 5. Placement of craniocaudal valves onto the distraction screws. Sharp valve is retracting the psoas muscle laterally.
Adult Spinal Deformity Surgery 1970s

Scoliosis Surgery in Adults
J. P. Kostuk, M.D.,* J. Israel, M.D.,** and John E. Hall, M.D.***

Results of Harrington Instrumentation and Fusion in the
Adult Idiopathic Scoliosis Patient**

BY R. CRAIG PONDER, M.D., JESSE H. DICKSON, M.D., PAUL R. HARRINGTON, M.D.,
AND WENDELL D. ERWIN, M.D., HOUSTON, TEXAS

in all but six patients. Complications developed in 53 per cent of the patients, the most common problems being pseudarthrosis, urinary tract infection, wound infection, instrumentation problems, a pulmonary disorder, and loss of lumbar lordosis. Paraplegia occurred in one patient. The over-all mortality rate was 1.4 per cent. Complications increased with age, and the highest mortality rate was in patients with congenital scoliosis who had car pulmonale.

Scoliosis in patients older than twenty years is a topic of concern and interest, as more patients in this age group are seeking evaluation and treatment. The complaints are

1973 CORR

1975 JBJS

1981 JBJS

11/13/2015

4

Adult Deformity Surgery 1980s/1990s

As a precautionary, preemptive, or major curves measured an average of 83 degrees, and on the best side, they averaged 59 degrees, a 29 per cent degree of flexibility. At the time of discharge from the hospital the curve had improved to an average of 44 degrees, a correction of the preoperative curve of 39 degrees or 47 per cent.

At an average length of follow-up of forty-nine months, the major curves measured an average of 50 degrees, a 41 per cent correction compared with the initial curves. Twenty-three of the major curves were better than when they were measured on the preoperative radiographs of the best side-hand.

Long Scoliosis Fusion to the Sacrum in
Adults with Nonparalytic Scoliosis
An Improved Method

EDWARD H. SAER, III, MD* ROBERT B. WINTER, MD,† and JOHN E. LONSTEIN, MD†

Management of Adult Spinal Deformity with
Combined Anterior–Posterior Arthrodesis
and Luque–Galveston Instrumentation


Southern California Complex, Spine and Scoliosis Center, Wittner, California; and *Tracy City, Scoliosis Spine Center, Minneapolis, Minnesota, U.S.A.
Adult Deformity Surgery – Posterior Only

**Posterior Only Versus Combined Anterior and Posterior Approaches to Lumbar Scoliosis in Adults**
A Radiographic Analysis

Ostrom G. Pateler, MD, Khadija M. Kebaisi, MD, Brett M. Gassie, MD, Philip Neubauer, MD, David M. Maltzer, MD, and John P. Kastl, MD

**Surgical Treatment of Adult Scoliosis**
Is Anterior Apical Release and Fusion Necessary for the Lumbar Curve?

Youngho Kim, MD, * Laurence S. Leske, MD, * Yongjung J. Kim, MD, * Youngwoo Kim, MD, * Keith H. Bridwell, MD, and Georgia Staubis, MPH

MIS Deformity

**Stage I**
- LLIFs L1-2, 2-3, 3-4, 4-5
- L3-4 and up: chest wall impedes access
- Osteotomize ribs in line with spine
- Diaphragm perforated (and sewn) for tube
- Chest tube postop X 36 hrs

**Stage II**
- L5-S1 TLIF, T11-Ilium
- Hybrid open TL, MIS L2-S1
- V. small concave apical pedicles - left
- Coronal plane bend built back in for balance
Technical problems with LLIF in deformity

1. Dealing with high iliac crest and 'deep-seated' L4-5
2. Hip pain or cruralgia
3. Nerve injuries
4. Inadequate lordosis
   • Place cages anteriorly
   • Need for ACR
5. Inability to access L5-S1 from lateral approach

Deep-seated L4-5

Very painful – far out of the ordinary

Did 2. Never again.
Iliac crest osteotomy

Deep-seated L4-5

Iliac crest osteotomy to enhance exposure of the L4–5 interspace in minimally invasive lateral transpsoas interbody fusion: a cadaveric feasibility study

Answers
• Angled implants (can’t see disc preparation directly)
• Iliac osteotomy (pain)
• Oblique approach
Deep-seated L4-5

Cage goes in obliquely, but can be maneuvered to lie transversely

R.A. Hynes
From Chapter 34, Surgical Approaches to the Spine, 3rd Ed, Springer 2015

Hip Pain after LLIF

- Femoral nerve
- Obturator nerve injuries
- LFCN injuries
- Genitofemoral nerve injuries
- Cummock et al JNS 2013
  - 64% postoperative symptoms
  - By 3 months, more than ½ of these resolve
  - By 1 year, 90% resolve
- Lee et al Spine J 2013
  - Hip flexion strength decreased for first 2 / 52 postop
  - No differences afterwards
Hip pain after LLIF

- Can be a great source of discomfort
- In our experience, large psoas (young men and women) means more postoperative thigh discomfort
- Avoiding going through psoas altogether may be useful

Nerve injury and LLIF

- In over 600 cages, we have had no permanent motor palsies – MEPs and SSEPs used
  - Have had 3 late quads palsies (after 2\textsuperscript{nd} stage instrumentation) – in conjunction with SPO in 2 cases
- 4 or 5 L4-5 levels abandoned – no reasonable place to dock
  - (Importance of blunt finger dissection through psoas)
- Lykissas 2013 (n=453 patients, 919 levels)
  - 9.6% permanent sensory deficits
  - 2.3% permanent motor deficits
How do nerve injuries occur?

- Uribe 2015
  - Retraction time at L4-5
  - Coincident increase in t-EMG threshold
- Bendersky 2015 – rigorous electrode positioning, including upper lumbar roots
  - Answer if alert: Move retractor anteriorly
How do nerve injuries occur?

- Retraction of blades on femoral nerve
- Staying anterior to psoas avoids the problem.

Inadequate Lordosis

- Can LLIF restore lordosis?
Inadequate lordosis

- Literature is mixed
  - Sembrano 2014
  - Acosta 2011
  - Kepler 2012
  - Anterior cage placement best
    - Kepler 2012
  - Sridharan (submitted for publication)

Inadequate Lordosis - ACR

From Akbarnia et al 2013
Potential complications – oblique approaches

- Sympathetic injury
- Vessel injury
- Iliolumbar vein
- Inadvertant anterior annulus and ALL resection
- Dural tear

Case – Painful Adult Idiopathic Scoliosis
Case – Painful Adult Idiopathic Scoliosis

3 mg rhBMP2 / level
Percutaneous posterior lumbar
Open thoracic

Complications:
Ileus
Edema
Transaminitis (hx of EtOH)

Doing well

Case – Rapidly progressive deformity after intrathecal narcotic pump / syrinx

Symptoms
  Intractable LBP
  R leg pain

Not flexible

PMHx
  Syrinx
  Chiari
  Narcotic pain pump
Case – Rapidly progressive deformity after intrathecal narcotic pump / syrinx

Anterior stage
uncomplicated
x hours
y EBL

Posterior stage
missing 10 deg
required PSO
x hours
y EBL
z complications

Pt doing well

Case – Previous fusion, now painful TL curve with distal degeneration

Fused to L2
L4-5 very oblique and deep

First stage
OLIF L L4-5 and L5-S1
LLIF R L2-3 and 3-4
Case – Previous fusion, now painful TL curve with distal degeneration