

SURGICAL MANAGEMENT OF CHRONIC LOW BACK PAIN: FUSION VS. ARTIFICIAL DISC REPLACEMENT

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"My topic is 'How To Give A Presentation Without Losing Your Audience's Attention'. The End. Thank you for coming."

LUMBAR INTERBODY FUSION

PREOP IMMEDIATE POSTOP ONE YEAR PREOP



SPINAL ARTHRODESIS

• HISTORY OF SPINAL FUSION

- 1911 – Hibbs / Albie – Potts Disease
- 1929 – Chandler – Fusion for LBP
- 1934 – Mixter and Barr – poor results of LBP with disc excision
- 1947 – Barr – “combined operation” – disc excision and fusion
- **SPINAL FUSION POPULARIZED DURING THE NEXT THREE DECADES**

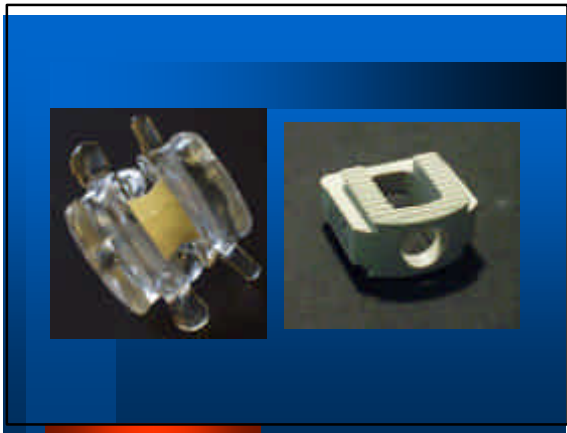
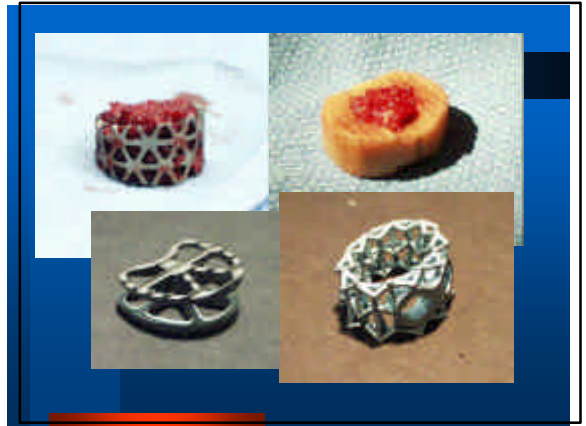
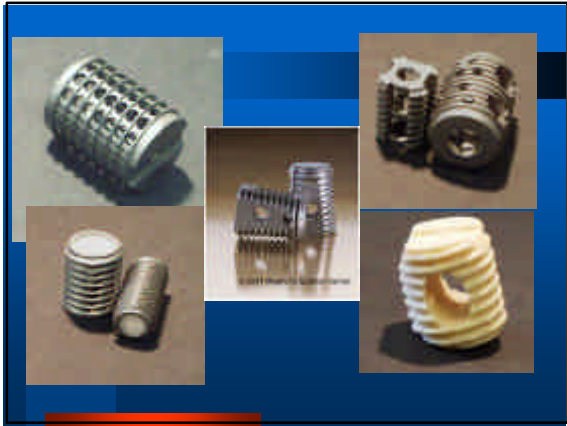
SPINAL ARTHRODESIS

• HISTORY OF SPINAL FUSION

- 1978 – Frymoyer – poor results of fusion with 10 year follow-up
- 1980's – hiatus from spinal fusion
- 1990's – increased rates of fusion
 - 1999 – 350,000 / year
 - **188,000 LUMBAR FUSION**

SPINAL ARTHRODESIS





SPINAL ARTHRODESIS

SPINAL ARTHRODESIS

RATIONALE

LUMBOSACRAL FUSION

- PROVIDE PAIN RELIEF?
 - LOAD REDISTRIBUTION
 - LOAD SHARING
 - ELIMINATION OF INFLAMMATORY PROCESSES
- COMBINATION OF MECHANICAL AND BIOCHEMICAL FACTORS

DISC ARTHROPLASTY

- BASICS OF DISC BIOLOGY AND FUNCTION – RELATIONSHIP WITH FACETS

- EVALUATION OF CHRONIC LBP

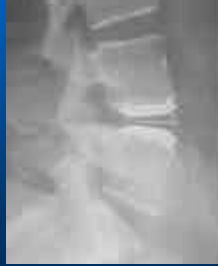
WHY?

- DISC REPLACEMENT ALTERNATIVES

- TBSG EXPERIENCE

- PROCEDURE

- POSTOP REHAB



INTERVERTEBRAL DISC

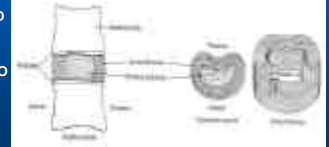
- INTERVERTEBRAL DISC

- COMPOSITE STRUCTURE

- NUCLEUS / ANNULUS
- CARTILAGENOUS END PLATES

- BIOMECHANICAL PROPERTIES RELATED TO COMPONENTS

- PRESSURE DISTRIBUTION
- SHOCK ABSORPTION
- MULTIDIMENSIONAL FLEXIBILITY



INTERVERTEBRAL DISC

- DISC BIOMECHANICS

- COMPRESSION

- INCREASE WITH FLEXION
- 30 DEGREES BENDING – 2.73X BODY WEIGHT

- SHEAR

- AFFECTED BY SAGITTAL ALIGNMENT
- 30 DEGREES LS ANGLE – 50% BODY WEIGHT

INTERVERTEBRAL DISC

- DISC BIOMECHANICS

- KINETICS

- GREATEST ROM (degrees) IN SAGITTAL PLANE ROTATION AT L4L5 / L5S1

	FLEX-EXT	AXIAL ROT	LAT BEND
L3L4	6-17	4-12	1-3
L4L5	9-21	3-9	1-3
L5S1	10-24	2-6	0-2

INTERVERTEBRAL DISC

- DISC BIOLOGY

- COMPONENTS

- CELLS
 - CHONDROCYTES / FIBROCYTES / NOTOCHORDAL-LIKE
- EXTRACELLULAR MATRIX
 - COLLAGEN / PROTEOGLYCANS

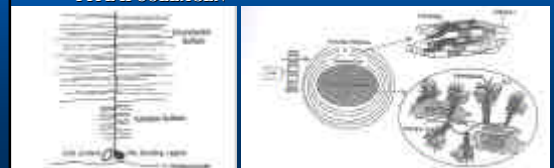
INTERVERTEBRAL DISC

NUCLEUS PULPOSUS

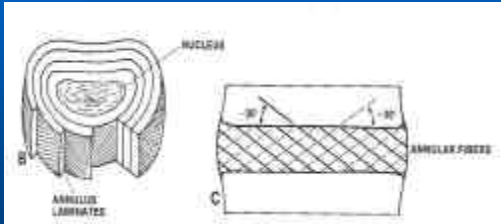
- PROTEOGLYCANS

- PROTEIN CORE ATTACHED TO GLYCOSAMINOGLYCAN – ATTACHED TO HYALURONATE FILAMENT BY LINK PROTEIN

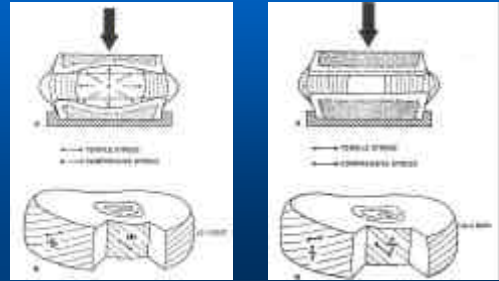
- TYPE II COLLAGEN



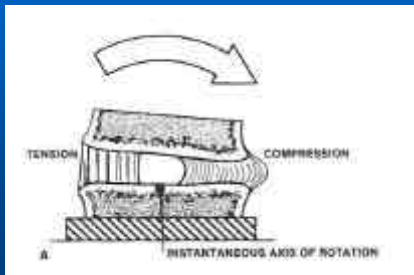
INTERVERTEBRAL DISC



INTERVERTEBRAL DISC

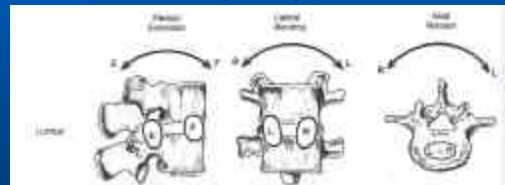


INTERVERTEBRAL DISC



INTERVERTEBRAL DISC

INSTANTANEOUS AXIS OF ROTATION



INTERVERTEBRAL DISC

POSTERIOR COLUMN

- FACET JOINT - COMPRESSIVE LOAD / COORDINATION OF MOVEMENT
- LUMBAR SPINE MOTION COUPLING - INTERACTION BETWEEN DISC AND FACETS
 - TRANSLATION
 - ROTATION



PATIENT EVALUATION WITH CHRONIC LOW BACK PAIN



CHRONIC LOW BACK PAIN

POTENTIAL SOURCES OF PAIN

- INTERVERTEBRAL DISC
- FACET JOINTS
- MUSCLE / SOFT TISSUES
- NONSPINAL ETIOLOGY



CHRONIC LOW BACK PAIN

Identification of pain generator

- diagnostic dilemma
- must answer to determine who will benefit from surgical intervention
 - MRI
 - provocative discography /CT discography
 - Facet blocks
 - preop external immobilization
 - psychosocial evaluation

CHRONIC LOW BACK PAIN

PATIENT EVALUATION

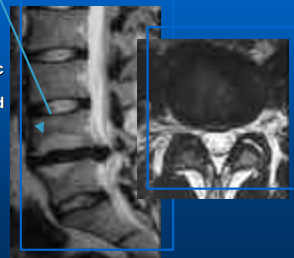
- Difficulty in Rx lies in identification of "pain generator"
- majority with DDD asymptomatic
- disc degeneration physiologic
 - 28% 30 y.o. w/o LBP or sciatica MR evidence of disc degeneration

Boden JBJS 1990

CHRONIC LOW BACK PAIN

MRI

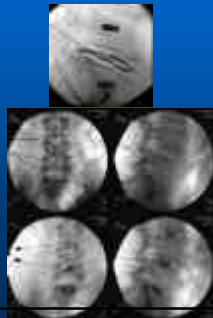
- Look for "dark disc", disc herniations, Modic changes, bone signal and facet changes
- Good for soft tissue
- Image quality varies with equipment and technician
- High false-positive rate
- New standing MRI



CHRONIC LOW BACK PAIN

DISCOGRAPHY

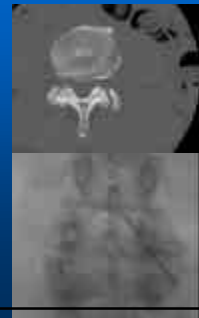
- Clinical pain provocation test
- Radiographic images
- Test is positive only if:
 - the disc is abnormal in appearance
 - AND
 - patient's clinical pain is provoked during injection



CHRONIC LOW BACK PAIN

FACET BLOCKS

- PAIN REDUCTION TEST
- Test is positive only if:
 - RADIOGRAPHIC DEMONSTRATION OF FACET INJECTION
 - AND
 - IMMEDIATE PAIN REDUCTION (LOCAL ANESTHETIC) +/- LONG-TERM REDUCTION (STERIOD)



CHRONIC LOW BACK PAIN

- Self-administered questionnaires
 - depression / anxiety common with LBP
 - assess pain drawings / Waddell Testing / psych profile
 - MMPI -Oswestry- high scores associated with poor surgical results
 - Distress and Risk Assessment Method Score

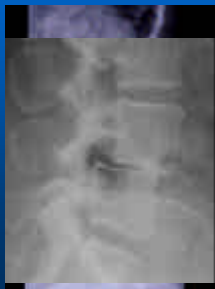


SPINAL ARTHRODESIS

- NASS CLINICAL GUIDELINES – 2002
 - CONTROVERSIAL
 - ESPECIALLY IN THE ABSENCE OF INSTABILITY
 - ETIOLOGY DIFFICULT TO DEFINE
 - DISCECTOMY FOR LBP – NOT ACCEPTABLE AND VERY UNLIKELY TO REDUCE AXIAL PAIN SYMPTOMS
 - EMPHASIS ON NONOPERATIVE TREATMENT

SPINAL ARTHRODESIS

- NASS CLINICAL GUIDELINES
 - INDICATIONS FOR FUSION
 - FAILURE OF A COURSE OF NON-OP TREATMENT FOR AT LEAST 6 MONTHS
 - STABLE PSYCHOLOGICAL STATE
 - INSTABILITY
 - >4mm TRANSLATION / >10 degrees ANGULATION
 - DEGENERATIVE DISC DISEASE



SPINAL ARTHRODESIS

- CLINICAL RESULTS
 - WHAT IS SUCCESS RATE FOR PAIN RELIEF AND FUNCTIONAL IMPROVEMENT?
 - NEW TECHNIQUES / INNOVATIONS EFFECT ON OUTCOMES?
 - LITERATURE REPLETE WITH STUDIES
 - DIFFER BY STUDY DESIGN / INDICATIONS / SURGICAL TECHNIQUES

SPINAL ARTHRODESIS

- CLINICAL RESULTS
 - META-ANALYSIS
 - 7,043 PATIENTS – 84 ARTICLES
 - “SPINAL FUSION FOR DDD”
 - FUSION RATE - 87% - CLINICAL SUCCESS RATE 76%
 - MEAN CLINICAL SUCCESSFUL RESULT
 - 1990-2000 - 74%
 - 1979-1989 –79% (p=NS)
 - NO DIFFERENCE IN FUSION RATE OVER TIME
 - INCREASED FUSION RATE WITH INSTRUMENTATION – NO CORRELATION WITH CLINICAL OUTCOME

Bono, Lee Spine 29:455-453, 2004/

SPINAL ARTHRODESIS

- CLINICAL RESULTS
 - SWEDISH LUMBAR SPINE STUDY GROUP
 - 2 YEAR FOLLOW-UP – INDEPENDENT REVIEW
 - 294 PATIENTS –19 CENTERS
 - DISCOGENIC BACK PAIN
 - RANDOMIZED BLINDED STUDY – 4 GROUPS
 - NONOPERATIVE n=72 / 3 SURGERY n=222
 - DISABILITY RESULTS
 - OSW SCALE - 25% SURGERY vs. NONOP 6%
 - RTW - 36% SURGERY vs. 13% NONOP (p=0.002)

Fritzell, et al, SPINE 2001

SPINAL ARTHRODESIS

•POTENTIAL COMPLICATIONS

- PSEUDARTHROSIS
- HARDWARE FAILURE
- BONE GRAFT DONOR SITE PAIN
- ADJACENT SEGMENT DEGENERATION
- SPINAL STENOSIS



SPINAL ARTHRODESIS

•ADJACENT SEGMENT DEGENERATION

- RETROSPECTIVE STUDY
- 215 PATIENTS – POSTERIOR FUSION
- 6.7 YEARS AVG FOLLOW-UP
- 27.4% ALD REQUIRING SURGERY
- KAPLAN-MEIER ANALYSIS PREDICTED DISEASE-FREE INTERVAL

- 5 YEARS = 83.5%
- 10 YEARS = 63.9%

- NO CORRELATION WITH PREOP DEGENERATION

Ghiselli, et al JBJS:86A, 2004

DISC ARTHROPLASTY

•IDEAL DISC SPACER

- ALLEVIATE PAIN
- PRESERVING FLEXIBILITY
- RESTORING STABILITY
- STRENGTH TO WITHSTAND NORMAL FORCES
- LIMIT ADJACENT LEVEL STRESS TRANSFERENCE

DISC ARTHROPLASTY

• DESIGN EFFORTS

- 40 YEARS OF RESEARCH
- MAJORITY THEORETICAL – FEW IN VIVO TESTING
 - COMPLEXITY DESIGN / FUNCTION
 - LIFESPAN – 50-100M LOAD CYCLES
- ONE DEVICE HAS ACHIEVED FDA APPROVAL

DISC ARTHROPLASTY



DISC ARTHROPLASTY

KEY ISSUES IN DISC REPLACEMENT

- NUCLEUS VS. TOTAL DISC REPLACEMENT
- CONSTRAINT OF IMPLANT
- COMPONENT FIXATION

DISC ARTHROPLASTY

- ARTIFICIAL NUCLEUS REPLACEMENT
 - ATTEMPT TO RESTORE FUNCTION/TENSION TO ANNULUS – FOCUS ON BIOMECHANICAL ASPECT OF SPINE FUNCTION
 - LESS INVASIVE TECHNIQUE
 - INITIAL CLINICAL STUDIES 1950's - PMMA INJECTED INTO DISC
 - SELF-CURING SILICONE – 1962 - NACHEMSON
 - INABILITY TO CONTROL FLOW / CURING ACTIVITY

DISC ARTHROPLASTY

- ARTIFICIAL NUCLEUS REPLACEMENT
 - SPHERICAL STAINLESS STEEL BALL BEARING IMPLANTS – 1966 (Fernstrom)
 - SPHERICAL ENDOPROSTHESIS
 - MIGRATION OF IMPLANT
 - DISC HEIGHT COLLAPSE
 - HIGH END PLATE CONTACT STRESS LED TO SUBSIDIENCE
 - 125 PATIENTS – 191 PROSTHESES



DISC ARTHROPLASTY

- ARTIFICIAL NUCLEUS REPLACEMENT
 - SILICON – DACRON COMPOSITE
 - CONTAINED / PREFORMED
 - PRECLINICAL STUDIES
 - BONE RESORPTION / REACTIVE NEW BONE FORMATION
 - LED TO A PHILOSOPHICAL CHANGE IN APPROACH TO AUGMENTATION
 - DEVELOPE BIOMECHANICAL/BIOLOGICAL COMPOSITE SIMILAR TO NP (HYDROPHILIC / VISCOELASTIC PROPERTIES)

DISC ARTHROPLASTY

- ARTIFICIAL NUCLEUS REPLACEMENT
 - HYDROGEL FORMULATIONS
 - VISCOELASTIC PROPERTIES
 - RATIO NONHYDROPHILIC / HYDROPHILIC CO-POLYMERS DETERMINE WATER ABSORBING CAPACITY (POLYVINYL ALCOHOLS)
 - CREEP UNDER COMPRESSION
 - CYCLIC LOADING WITHOUT LOSS OF ELASTICITY
 - SPACE FILLING CAPACITY IMPROVED TO MECHANICAL LOCK-AND-KEY BONDING
 - LESS ANNULAR INJURY DURING IMPLANTATION
 - SURGEON DEFINED IMPLANT SIZE
 - TRANSFER END PLATE LOADS TO ANNULUS

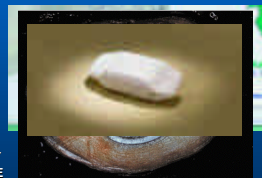
DISC ARTHROPLASTY

- ARTIFICIAL NUCLEUS REPLACEMENT
 - IN SITU CURABLE POLYMERS
 - INTACT ANNULUS
 - SHORT POLYMERIZATION TIME
 - LIMIT TOXICITY OF MONOMER
 - PROSTHETIC INTERVERTEBRAL NUCLEUS (Disc Dynamics, MN)
 - INJECTED FROM CATHETER INTO POLYURETHANE BALLOON INTO NUCLEOTOMIZED DISC
 - BioDisc (Cryolife, GA)



DISC ARTHROPLASTY

- ARTIFICIAL NUCLEUS REPLACEMENT
 - PREFORMED POLYMERS
 - AQUARELLE (Stryker Spine, NJ)
 - PVA 80% WATER
 - INSERTED VIA CANNULA / ANNULOTOMY
 - NEWCLUEUS SPIRAL IMPLANT (Centerpulse)
 - MEMORY COILING PROPERTY
 - POLYCARBONATE URETHANE
 - COMBINATION DESIGN IMPLANTS
 - PREDETERMINED SIZE
 - CHANGE SHAPE WHEN HYDROGEL EXPOSED TO ENVIRONMENT – ABSORB WATER CAUSING EXPANSION IN SITU



DISC ARTHROPLASTY

- NUCLEUS REPLACEMENT
 - RAYMEDICA PDN - 1988
 - > 750 IMPLANTED IN EUROPE
 - PVA ENCLOSED IN UHMWPE JACKET (INELASTIC)
 - SEMIPERMEABLE CYLINDERS
 - IMPLANTED POSTERIORLY / ANTEROLATERAL APPROACH
 - EARLY PUBLISHED CLINICAL RESULTS
 - MODIFIED SEVERAL TIMES DUE TO EXTRUSION



DISC ARTHROPLASTY

- ARTIFICIAL NUCLEUS REPLACEMENT
 - CRITICAL ISSUES
 - SIZING OF THE IMPLANTS
 - "OVERSIZE" - DIFFICULT TO INSERT / INCREASED RISK OF EXTRUSION
 - "UNDERSIZE" - LACK OF RESTORATION OF MECHANICAL PROPERTIES OF DISC
 - "UNMATCHED" - UNEVEN STRESS DISTRIBUTION

DISC ARTHROPLASTY

- TOTAL DISC REPLACEMENT
 - NUMEROUS DESIGN TYPES
 - HINGED OR SPRING LOADED
 - LOW FRICTION SLIDING SURFACES
 - CONSTRAINED FLUID FILLED CHAMBERS
 - ELASTIC DISC PROSTHESES

DISC ARTHROPLASTY

KOSTUIK DEVICE

- COMPLICATED DESIGN - MIMIC SEVERAL RANGES OF MOTION
- SCREWS INSERTED INTO VERTEBRAL BODY
- COBALT CHROME ALLOY
- ANTERIOR TITANIUM SPRINGS
- POUROUS COATING



DISC ARTHROPLASTY

- TOTAL DISC REPLACEMENT
 - METAL-SYNTHETIC "SANDWICH"
 - Froning - 1975
 - HOLLOW FLEXIBLE CORE FILLED WITH INCOMPRESSIBLE FLUID
 - TITANIUM END PLATES WITH PINS FOR FIXATION



DISC ARTHROPLASTY

- TOTAL DISC REPLACEMENT
 - METAL-SYNTHETIC "SANDWICH"
 - SYNTHETIC CORE - METAL END PLATES
 - STEFFEE DESIGN - ACROFLEX
 - 1ST GENERATION POLYOLEFIN CORE
 - ? CARCINOGENIC
 - TITANIUM END PLATES WITH BEADS - DIFFICULTIES WITH SHEAR STRESS



DISC ARTHROPLASTY

- CONTEMPORARY TOTAL DISC REPLACEMENT DESIGNS
 - MAVERICK DISC (Medtronic, Memphis, TN)
 - FLEXICORE DISC (Stryker, Allendale, NJ)
 - PRODISC (Spinal Solutions, Synthes)
 - CHARITE (Depuy Spine, Raynham, MA)

DISC ARTHROPLASTY

- MAVERICK DISC
 - 2 COMPONENT METAL-METAL BALL-AND-SOCKET DESIGN
 - COBALT CHROME
 - CURRENTLY UNDER IDE TRIAL
 - RANDOMIZED TO ALIF – LT-CAGES/INFUSE



DISC ARTHROPLASTY

- FLEXICORE DISC
 - LINKED METAL-METAL BALL-AND-SOCKET DESIGN
 - INSERTED AS A SINGLE UNIT
 - MANIPULATE WITHIN DISC SPACE
 - DOMED ENDPLATE SURFACES CONFORM TO CONCAVITY OF END PLATES
 - TITANIUM PLASMA SPRAY COATED
 - IDE TRIAL – RANDOMIZED TO 360 FUSION



DISC ARTHROPLASTY

- PRODISC II (Spinal Solutions/Synthes)
- 3 COMPONENT DEVICE – COBALT CHROME
- SPHERICAL ARTICULATIONS
- 1980's - Marnay – 1st Implanted 1990



DISC ARTHROPLASTY

PRODISC II (Spinal Solutions/Synthes)

- SNAP-FIT CONVEX BEARING SURFACE
- UHMWPE INSERT
- LARGE CENTRAL KEEL / 2 END PLATE SPIKES
- LORDOSIS FROM SUPERIOR END PLATE
- CURRENTLY UNDER IDE RANDOMIZED TO 360 FUSION – 1 OR 2 LEVEL



DISC ARTHROPLASTY

SB CHARITE LINK DEVICE

- 1984 – 1ST IMPLANTED
- S = Kurt Schellnack
- B = Karin Buttner-Janz
- C = Charite Hospital
- 3 Types / Generations developed
- 1987 – Waldemeyer Link



DISC ARTHROPLASTY



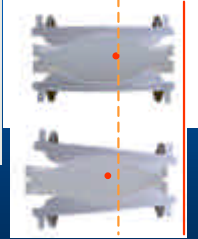
MOBILE BEARING CORE



BIOMECHANICS

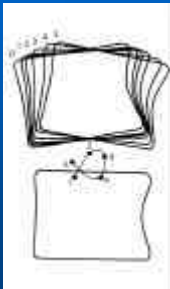
Translation Importance of unconstrained Sliding Core

In an intervertebral segment two types of translation occur during flexion:



- 1) the cranial vertebral body translates ventrally, and 2) the center of the nucleus translates dorsally.

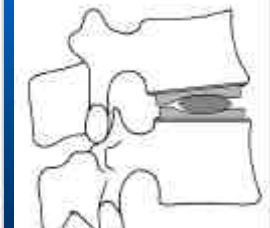
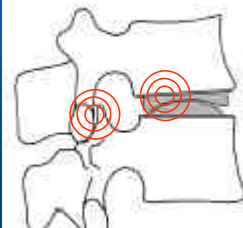
BIOMECHANICS



X-axis: flexion and extension

BIOMECHANICS

Vertebrae loaded in Extension

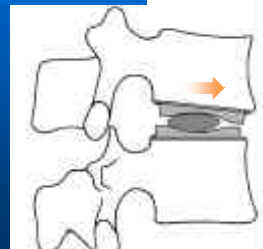


Fixed inferior component

Sliding intermediate component

BIOMECHANICS

Vertebrae loaded in Flexion



Fixed inferior component

Sliding intermediate component

CLINICAL INDICATIONS

- Chronic low back pain +/- leg pain
 - Persisting > 6 months
 - Associated with degenerative disc changes
- Leg pain
 - NOT Radicular
 - Pseudoradicular
- Foraminal stenosis
 - Secondary to disc space height loss
 - may be relieved indirectly by disc height restoration

CLINICAL IDE TRIAL

- First Disc Implanted in U.S. in March 2000 – April 2000 at NEBH
- US Multicenter (14 Centers) FDA IDE Study SB Charité III
- Randomized to ALIF BAK / autograft



The Boston Spine Group

CLINICAL IDE TRIAL

- Single level DDD L4L5 L5S1
- Randomized 2:1 Ratio of Charité:BAK Fusion Cages
- 2 Year Follow-up Clinical / Radiographic Study

CLINICAL IDE TRIAL

INCLUSION CRITERIA

- Age 18 - 60 Years
 - Symptomatic DDD Confirmed by Discography
 - Single Level DDD at L4-5 or L5-S1
 - Oswestry Score ≥ 30
 - VAS Score ≥ 40 (of 100)
 - Failed ≥ 6 mo of Appropriate Non-operative Care
- Back and/or Leg Pain With No Nerve Root Compression <3 Prior Abdominal Surgeries
- Able / Willing to Comply with Follow-up Schedule
- Written Inform Consent

CLINICAL IDE TRIAL

EXCLUSION CRITERIA

- Previous Fusion
 - Multilevel Degeneration
 - Fracture at L4, L5, or S1
 - Non-contained HNP
 - Osteoporosis or Metabolic Bone Disease
 - Spondy >3 mm
 - + Straight Leg Raise
- Scoliosis ($>11^\circ$ Sagittal Deformity)
- Spinal Tumor
- Infection
- Facet Joint Arthrosis
- Psychosocial Disorder
- Morbid Obesity
- Radiographic instability

CLINICAL IDE TRIAL

- Data Collected Periods:
 - Pre-op
 - Operative Data
 - 6 Weeks
 - 3 Months
 - 6 Months
 - 12 Months
 - 24 Months

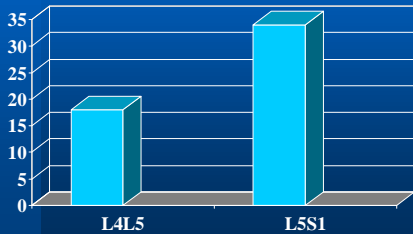


TBSG CLINICAL OUTCOMES

- 52 PATIENTS RANDOMIZED TO LINK - CHARITE DISC SPACER
- 34 MALES / 18 FEMALES
- AVERAGE AGE – 40.4 +/-8.1 YRS (24 – 58)
- DURATION OF SX – 58.8+/-65 MONTHS
- AVERAGE FOLLOW-UP
 - 67% 12 MONTHS / 31% 24 MONTHS

TBSG CLINICAL OUTCOMES

OPERATIVE LEVELS

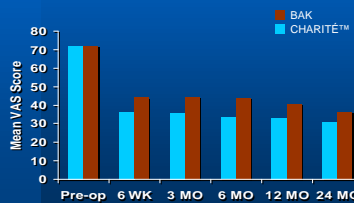


TBSG CLINICAL OUTCOMES

- SURGICAL TIME - 159 +/-47.8 MIN
- ESTIMATED BLOOD LOSS -185 cc
- HOSPITAL STAY - 3.5 days

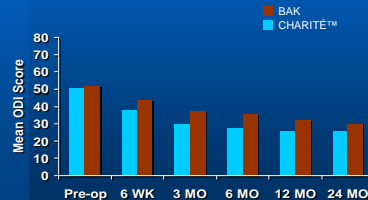
U.S. IDE CLINICAL OUTCOMES

Mean Pain on VAS Score Over Time

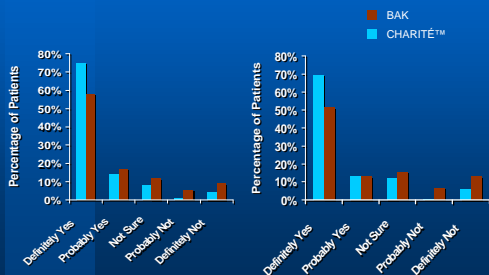


U.S. IDE CLINICAL OUTCOMES

Mean Oswestry Score Over Time

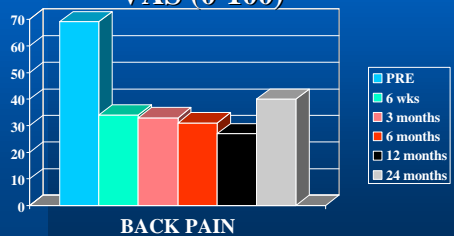


U.S. IDE CLINICAL OUTCOMES

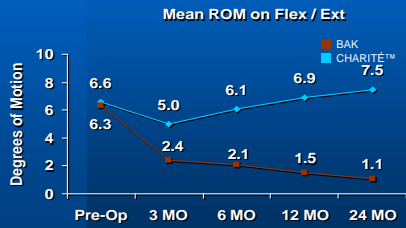


TBSG CLINICAL OUTCOMES

VAS (0-100)

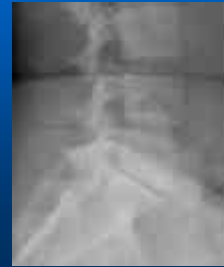


U.S. IDE CLINICAL OUTCOMES



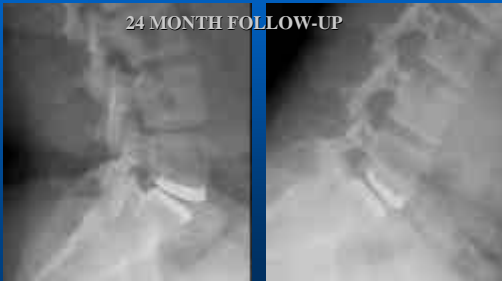
CASE PRESENTATION

- 38 year old female
- 10 year h/o LBP
- Concordant pain at L5S1



CASE PRESENTATION

24 MONTH FOLLOW-UP



SURGICAL PROCEDURE

- SURGICAL KEYPOINTS
 - PATIENT POSITIONING
 - INTRAOPERATIVE EXPOSURE
 - DEVICE PLACEMENT



ANTERIOR LUMBAR EXPOSURE

- ANATOMICAL KEY POINTS
 - PREOP ASSESSMENT
 - LEVEL OF BIFURCATION
 - TRANSITION VERTBRAE
 - VASCULAR ANATOMY
 - PRESACRAL PARASYMPATHETIC PLEXUS

SURGICAL PROCEDURE

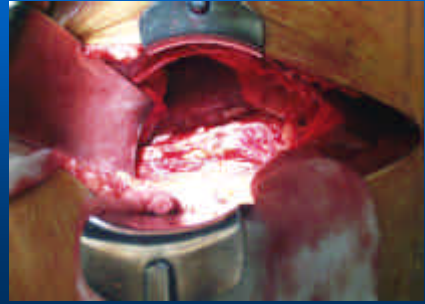
VERTICAL /
TRANSVERSE
INCISION



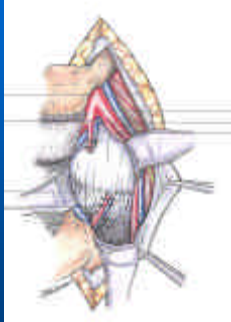
SURGICAL PROCEDURE



SURGICAL PROCEDURE



OPEN RETROPERITONEAL EXPOSURE



L5-S1



L4-L5

SURGICAL PROCEDURE

VERIFICATION OF
APPROPRIATE
LEVEL

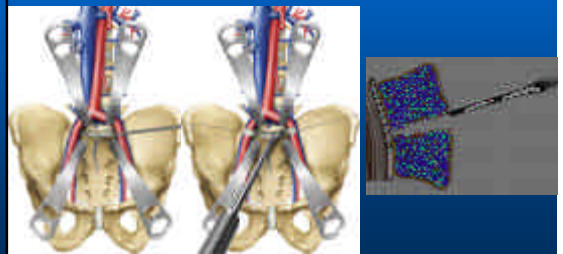


SURGICAL PROCEDURE

MIDLINE
IDENTIFICATION



SURGICAL PROCEDURE



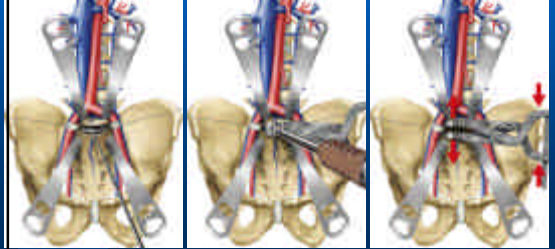
SURGICAL PROCEDURE

COMPLETE
DISCECTOMY



SURGICAL PROCEDURE

Sizing the Disc Space and Distraction



SURGICAL PROCEDURE

Use of the Central Spreader



SURGICAL PROCEDURE

Parallel Distraction



SURGICAL PROCEDURE



SURGICAL PROCEDURE

Midline Insertion of Implant
Endplates

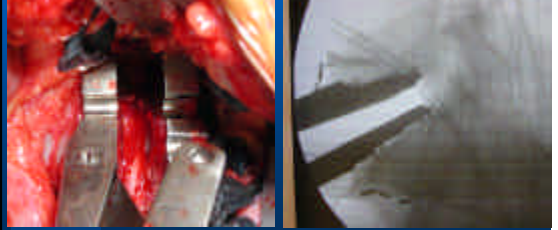


SURGICAL PROCEDURE

Proper Sagittal Positioning



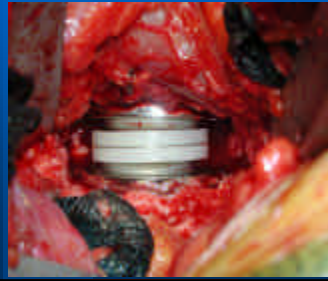
SURGICAL PROCEDURE



SURGICAL PROCEDURE



SURGICAL PROCEDURE



SURGICAL PROCEDURE

FINAL POSITIONING



Endplates Parallel



Aligned with Spinous Process



POSTOPERATIVE CARE

● REHABILITATION

- Begin with sitting and gentle abdominal flexion to “seat” the implant
- Lumbar corset use (optional) to avoid peak loading of implant which occurs at the “extremes” of the patient’s range of motion
- Begin ambulation as soon as possible either the same day or the following morning
- Use TED hose and Sequential Compression Device to avoid DVT

POSTOPERATIVE CARE

● Medication – Oral Narcotics , NSAIDs

- Wean off narcotics depending upon preoperative pain medication regimen
- Utilize services of pain management physician if available to aggressively wean patient from narcotics at 4-6 weeks, when incisional pain should be mostly resolved

POSTOPERATIVE CARE

● Rehabilitation

- Lumbar corset (optional) to avoid “peak loading” of implant
- Avoid hyperextension
- Patient activity program should be determined based on preoperative physical conditioning of the patient
- All patients should initiate flexibility program, core strengthening, trunk stabilization and aerobic conditioning program

POSTOPERATIVE CARE

● Physical Therapy

- All patients should avoid the following:
 - hyperextension exercises
 - heavy lifting
 - Impact-loading activities such as jumping or running
 - contact sports and twisting sports such as tennis or golf
- The pace of the aerobic and core exercise programs should proceed depending on the patients’ level of preoperative strength, conditioning and flexibility

POSTOPERATIVE CARE

● Rehabilitation

- Physical therapy program of flexibility, core strengthening and trunk stabilization, aerobic conditioning should begin at 4 weeks using water exercises if possible, especially in the overweight sedentary patient
- Lumbar spine rotation and side bending can begin at 6 weeks
- Abdominal strengthening can begin at 6 weeks
- Golf and Tennis can begin at 3 months

RETURN TO WORK!!!

- This is determined by the type of work
- Most patients can return to sedentary work in 2-4 weeks unless severely de-conditioned
- Full duties ~ 3months reasonable

DISC ARTHROPLASTY

Factors Critical for Good Result:

- Patient Selection
- Selecting Correct Prosthesis Size
- Proper Prosthesis Positioning



DISC ARTHROPLASTY

Factors Critical for Good Result:

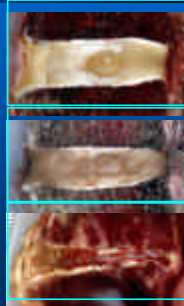
RADIOGRAPHIC APPEARANCE	PREOPERATIVE DIAGNOSTIC EVALUATION
"TALL" DISC	DISCOGRAPHY
COLLAPSED DISC	DISCOGRAPHY + FACET BLOCKS
FACET ARTHROSIS	DISCOGRAPHY + FACET BLOCKS



DISC ARTHROPLASTY

WHEN ARE ARTIFICIAL DISC REPLACEMENTS SUCCESSFUL?

- INTERNAL DISC DISRUPTION vs DEGENERATIVE DISC DISEASE
 - CONTINUUM OF DEGENERATIVE CHANGES
 - "EARLY" – NUCLEUS
 - "MID" – TDR
 - "LATE" - FUSION



INDICATIONS FOR DISC ARTHROPLASTY

- The CHARITÉ™ Artificial Disc is indicated for spinal arthroplasty in skeletally mature patients with degenerative disc disease (DDD) at one level from L4-S1
- DDD is defined as discogenic back pain with degeneration of the disc confirmed by patient history and radiographic studies
- These DDD patients should have no more than 3mm of Spondylolisthesis at the involved level
- Patients receiving the CHARITÉ™ Artificial Disc should have failed at least 6 months of conservative treatment prior to implantation

CONCLUSIONS

- PREOPERATIVE EVALUATION CRITICAL
- DEVICE POSITIONING DEMANDING
- HOW MANY ARE CANDIDATES BASED ON CONTRAINDICATIONS?
- DELAYED DEVELOPMENT OF FACET ARTHROSIS
 - REVISION OPTIONS

THANK YOU

