What to do when spine surgery fails

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MISTAKES
It could be that the purpose of your life is only to serve as a warning to others.
Failed Back Surgery Syndrome

- Non-specific term
- Lumps together many “problems”
  - Structural pathology
  - Neuropathic changes
  - Psychological issues
  - Surgeon’s judgment
FBSS: Definition

Final outcome of spine surgery did not meet the expectations of:

- Both the patient \textit{and} surgeon
- Established \textit{before} surgery
FBSS: structural causes

- Can be isolated in 80-90% patients!
FBSS Etiology

- Retrospective review
- 183 consecutive patients with FBSS
  - Definitive diagnosis in 174 (94%)
  - 9 patients more than 1 Dx

Waguespack, Reynolds, Schofferman, et al
Pain Medicine 2002;3:18-22
FBSS Etiology

Causes of FBSS

– Foraminal Stenosis – 25-29%
– Discogenic Pain – 20-22%
– Pseudoarthrosis – 14%
– Neuropathic Pain – 10%
– Recurrent Disc Herniation – 7-12%
– Facet Arthropathy – 3%
– SI Joint Pain – 2%
FBSS: Etiology: Slipman

Retrospective review of 267 charts

- 197 full evaluation
  - 186 (94%) diagnosis established
  - 11 (6%) no diagnosis

Slipman et al. Pain Medicine 2002
FBSS: Slipman et al

- Surgical
  - Lateral stenosis: 18%
  - Central stenosis: 6%
  - Painful disc: 22%
  - HNP: 12%

- Nonsurgical
  - Fibrosis: 8%
  - “radicular”*: 10%
  - Neuropathic pain: 10%

All Neuropathic??
THE REAL ISSUE IS DIAGNOSING THE PROBLEM IN FAILED BACK SURGERY
Tools we have

- The Patient
  - History, examination

- Imaging
  - CT, MRI, Plain Radiographs

- Injections
  - Epidurals (SNB), Facet Injections/ Medial Branch Blocks, +/-Discogram
The FBSS Patient

When I learned, 'You are what you eat', I realized I was nuts.
History in a patient with FBSS

- **Back pain**
  - Instability, facet pain, disc pain

- **Leg Pain**
  - Neuropathic pain, radiculopathy, ? SI pain, piriformis

- **Provocative actions**
  - Rising from seated position- instability
  - Hyperextension pain- facets
  - Pain while seated- discs
This patient...

- Could be that no surgery or treatment can help... need to know your limitations!
The Next Step… Imaging

- Use your clinical judgment to order the appropriate test
  - Fusion Evaluation: CT
  - Recurrent Disc Herniation: MRI +/- Gad
  - Stenosis:
    - Bony = CT/ MRI
    - Soft Tissue = MRI
FBSS in the Immediate Post Op Period (1d to 2 weeks)

- Usual indication is to diagnose a post op mass
  - Hematoma
  - Seroma
  - Pseudomeningoceole
  - Abscess
  - Residual or recurrent disc fragment
MRI is very good for this...

- High Field Strength Magnets
  - 1.5 T minimum (All in Portland are at or above this strength)

- Sequences
  - T1 and T2 weighted sequences in both axial and sagittal planes
  - Use of fat suppressed sequences
  - Avoid gradient echo imaging.
Techniques

- Use of intravenous gadolinium
  - Crucial in immediate post op period
  - Occasionally useful in the 6 mo to 1 year post op period
  - RARELY NEEDED AFTER 1 YEAR
  - NEVER NEEDED IN THE C SPINE
  - Adds ~ $600 to the cost of the exam
  - Turns non-invasive study to a minimally invasive one, with small risks.
The Disc in the immediate post operative period

- Disc will often show mass effect
- 80% of pts 3 days post-op had a “pseudoherniation”
  - Spallone et al, Acta Neurchir 1997
  - At 8 weeks 50%
- The underlying tissue will be bright on T2
- Will enhance w/ contrast in 20%, no correlation to clinical outcome (Ross AJNR 1996)
- Mass effect may persist for a year
Disc deformity may persist

- 23 pts scanned 1 year post successful discectomy
- 13 pts had persistent moderate discal deformity with thecal sac compression
- The tissue under the anulus enhanced
- On T2 weighted images, the tissue was bright.
  - Deutsch et al, Spine 1993
Disc deformity post op

1 month

24 months
Recurrent Disc Herniation

- Intravenous Gd injection useful within the first year post op
- After one year, heavily T2 weighted images better than post contrast
- Heavily T2 weighted images may be more accurate and easier to interpret.
Recurrent Disc Herniation

Images Courtesy of Jay A. Kaiser MD
National Orthopedic Imaging Associates
San Francisco, Ca
RECURRENT EXTRUSION

T1 WEIGHTED POST CONTRAST

HEAVILY T2 WEIGHTED
RECURRENT DISC FRAGS.
Other findings in the immediate postop period

- Infection
- Pseudomeningocele
- Abscess
- Rare- Postop facet fracture (after wide decompression)
Infection
Pseudomeningocele / CSF
Post Op Abscess
Now you are a few months out, patient still complaining of “leg pain”
Spinal Stenosis

- **Lateral Stenosis** remains a major cause of FBSS (20-58%) - Can be secondary to:
  - Failure to recognize preoperatively
  - Inadequate decompression
  - Secondary to further degeneration after surgery
- **Central Stenosis**
  - Can result from instability above a solid fusion or overgrowth of posterior fusion mass
- **Neuropathic Pain**
  - When all other workups fail, nonanatomic distribution
Spinal Stenosis

Post Surgical Development
- Overgrowth at a laminectomy defect
- Overgrowth of posterior fusion
- Lateral stenosis due to loss of disc height
- Level above a solid fusion/hardware
CENTRAL STENOSIS
Pinhole Lami with Stenosis
CENTRAL STENOSIS ABOVE SOLID FUSION
STENOSIS ABOVE FUSION
Instability above Fusion
FORAMINAL STENOSIS
Anatomy of Foraminal Stenosis
"UP-DOWN"  "FRONT BACK"

FORAMINAL STENOSIS
Inadequate Lateral Decompression
Pseudarthrosis- a major cause of pain in lumbar fusion patients 9-18 months after surgery

Workup-
- CT scan is best
- Flex/Ex radiographs
- MRI works well in uninstrumented fusions
CT

Multidetector CT scanners allow rapid acquisition of data
  – 1mm thick images
  – Reformations in all planes
  – 3-D Volume rendering

Indications
  – Fusion evaluation
  – Stenosis
  – Hardware Evaluation
MULTIPLANAR CT OF FUSION
MULTIPLANAR CT OF FUSION
MULTIPLANAR CT OF FUSION
Evaluation of fusion

- MRI
  - Evaluate fusions without hardware
  - Also evaluates levels above (or below) fusion
    - New disc herniation or stenosis
    - Instability
MRI of Solid Fusion
Pseudoarthrosis
Now you have identified the problem...

- Foraminal Stenosis – 25-29%
- Discogenic Pain – 20-22%
- Pseudoarthrosis – 14%
- Neuropathic Pain – 10%
- Recurrent Disc Herniation – 7-16%
- Facet Arthropathy – 3%
- SI Joint Pain – 2%
Treat the problem like you normally would!

- See, spine surgery is really easy…
Treatment of FBSS

- Foraminal Stenosis –
  - Epidural injections, time, surgery if all else fails (SIAEF)
- Discogenic Pain –
  - PT, Core strengthening, +/- Chiropractic manipulations, SIAEF
Treatment of FBSS

- **Recurrent Disc Herniation**
  - Epidural injections, surgical resection

- **Facet Arthropathy**
  - Facet injections, medial branch blocks, radiofrequency neurotomy, Surgery? Debatable

- **SI Joint Pain**
  - SI Joint injections, SI Belts, Surgery

- **Pseudoarthrosis / Non-fusion**
  - Repeat surgery, bone growth stimulator, ? BMP-2
MISS-Minimally Invasive Spine surgery

- Primary goal is to reduce iatrogenic tissue damage during surgery and subsequently reduce pain and disability
  - “An MIS procedure is one that by virtue of the extent and means of the surgical technique results in less contralateral tissue damage, results in measurable decrease in mortality and a more rapid functional recovery than traditional exposures” – Society for Minimally Invasive Spine Surgery
  - Reduced morbidity has allowed more of the patient population to access spine surgery
  - In 2010 1 in 6 spinal procedures were MIS, in 2016 it is 1 in 3*
  
Minimally Invasive Spine Surgery

- MIS Concept in spine surgery has been progressing over the last 30 years
  - Recent major advancement in instrumentation, endoscopy and computer guidance
  - A steep learning curve and a exceptional understanding of the functional neuroanatomy and pathology is necessary to be proficient in MIS

- Park, Yung MD; Ha Joong Won MD, “Comparison of One-Level Posterior Lumbar Interbody Fusion Performed With a Minimally Invasive Approach or a Traditional Open Approach” Spine; Mar 1 2007, Vol 32, Issue 5, pp537-543
  - Found improved blood loss/transfusion rates, less post operative back pain, shorter time to ambulation and hospital stay BUT significantly longer surgery and increased technical complications during surgery.
Why consider MIS for your chronic pain patients? MIS versus Open

- Primary objective of MIS is to reduce blood loss and local tissue damage, reduce OR times, faster postoperative ambulation, reduced opiate usage, shorter hospital stays when compared to open procedures.
- Long term objectives are to meet or exceed traditional open procedures in long term reduction in pain, equal or improved fusion rates, and reduced complication rates and cost.
- Multiple studies measuring outcomes for MIS versus open procedures demonstrate significantly improved primary objectives with MIS and equivalent long term objectives.

- Retrospective cohort comparison between MIS and open TLIF
- Median hospital stay for MIS TLIF and Open TLIF was 3 versus 5.5
- Post operative opiate use in weeks for MIS TLIF versus Open TLIF was 2 versus 4
- Time to return to work in weeks for MIS TLIF versus Open TLIF was 8.5 versus 17.1

- Comparison study on MIS TLIF versus traditional PLIF-
  - 59 patients were enrolled and given VAS and ODI scores, 16 were given MRIs after 1 year to look at lean multifidus and psoas muscle as well as measured post operative creatinine kinase levels

- The MIS group (n=28) demonstrated significantly improved VAS and ODI scores compared to the traditional open population (n=31)

- Demonstrated significant reduction in postoperative multifidus atrophy of nearly 30% when compared to the traditional open procedure
Treatment of FBSS

- Neuropathic Pain –
  - Injections
  - Lyrica/ Neurontin/ Cymbalta
  - Spinal cord stimulator?
Chronic Pain

- The International Association for the Study of Pain (IASP) defines pain as chronic if it persists beyond the normal tissue healing time (usually 3- to-6 months).

- At any given time, approximately 9% of U.S. adults experience moderate to severe non-cancer-related pain. The estimated annual economic losses attributed to chronic pain exceed $100 billion.
  - Lower back pain has a life time prevalence of 85% where only 10% of the patient population with LBP have identifiable underlying pathology.

Neuropathic Pain – difficult to treat
- Not the "normal" pain we associate with stubbing a toe or getting a paper cut – this is nociceptive pain.

Neuropathic pain is caused by abnormal nerve signaling in the nervous system
- does not respond to most pain relief strategies.

SCS is a very exciting area of development and is becoming widely accepted for use in many areas of neuropathic pain management.
- SCS does not eliminate pain but creates a numbness / paresthesia in the area. This results in a masking of the pain.
Spinal Cord Stimulators

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  - SCS does not eliminate pain but creates a numbness / paresthesia in the area. This results in a masking of the pain.
As part of the continuum of care for patients who suffer from FBSS, proper diagnosis is the first phase, followed by first- and second-tier therapies. SCS, among other advanced pain therapies, is considered a late resort.
The Clinical and Economic Case For SCS

According to a 2007 analysis, “In spite of the apparent clinical success of SCS reported in the literature and the data presented by the authors, there continues to be concern, particularly among third-party payers, that SCS is an expensive and even ineffective therapy.”12

Percentage of Pain Reduction for Different Treatments

- More patients receiving SCS achieved 50 percent or more pain relief compared with those who underwent reoperation.1,13

- According to a study conducted by North et al. in 2005,14 47 percent of patients who received SCS found that it relieved their pain by 50 percent or more; this is significantly more than the 12 percent who achieved the same effect through reoperation.
SCS relieves more pain overall compared to other treatment modalities.\textsuperscript{15}

In the figure to the left,

- IPRP = interdisciplinary pain rehabilitation program
- AntiD/C = antidepressants/anticonvulsants
- SCS = spinal cord stimulation

The Clinical and Economic Case for SCS
In 2007, Kumar et al. published a study on the largest trial of SCS for managing neuropathic pain. Called the PROCESS study, it was a randomized controlled trial that showed SCS’ positive effect on FBSS. Key results from this study are as follows:

- Compared with conventional medical management (CMM) alone, SCS improved pain relief, quality of life, function capacity, and patient satisfaction in selected patients with neuropathic pain related to FBSS.
- At 6 months, 24 SCS patients (48 percent) and 4 CMM patients (9 percent) achieved at least 50 percent or more pain relief in the legs.
- Compared to CMM, treatment with SCS resulted in greater improvement in all SF-36 domains, which evaluate quality of life.
Clinical studies on SCS continue to support the effectiveness of this therapy. The following charts summarize studies of SCS and its effects on the quality of life of patients.

### Reduction of Pain

<table>
<thead>
<tr>
<th>Reference</th>
<th>Number of Patients</th>
<th>Follow Up</th>
<th>Results</th>
</tr>
</thead>
<tbody>
<tr>
<td>Kumar\textsuperscript{17}</td>
<td>410</td>
<td>8 years</td>
<td>74% had $&gt;$50% relief</td>
</tr>
<tr>
<td>North\textsuperscript{14}</td>
<td>19</td>
<td>3 years</td>
<td>47% had $&gt;$50% relief</td>
</tr>
<tr>
<td>Barolat\textsuperscript{9}</td>
<td>41</td>
<td>1 year</td>
<td>50%-65% had good to excellent relief</td>
</tr>
<tr>
<td>Van Buyten\textsuperscript{18}</td>
<td>123</td>
<td>3 years</td>
<td>68% had good to excellent relief</td>
</tr>
<tr>
<td>Cameron\textsuperscript{19}</td>
<td>747</td>
<td>Up to 59 months (4.9 years)</td>
<td>62% had $&gt;$50% relief or significantly reduced pain scores</td>
</tr>
</tbody>
</table>
# Reduction in Medication

<table>
<thead>
<tr>
<th>Reference</th>
<th>Number of Patients</th>
<th>Follow Up</th>
<th>Results</th>
</tr>
</thead>
<tbody>
<tr>
<td>North(^{14})</td>
<td>19</td>
<td>3 years</td>
<td>~50% reduced their medications</td>
</tr>
<tr>
<td>Van Buyten(^{18})</td>
<td>123</td>
<td>3 years</td>
<td>As a group, reduced medication use by &gt;50%</td>
</tr>
<tr>
<td>Cameron(^{19})</td>
<td>766</td>
<td>Up to 84 months</td>
<td>45% reduced their medications</td>
</tr>
<tr>
<td>Taylor(^{20})</td>
<td>681</td>
<td>n/a</td>
<td>68% no longer needed analgesics</td>
</tr>
</tbody>
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## Improvements in Daily Activities

<table>
<thead>
<tr>
<th>Reference</th>
<th>Number of Patients</th>
<th>Follow Up</th>
<th>Results</th>
</tr>
</thead>
<tbody>
<tr>
<td>Barolat⁹</td>
<td>41</td>
<td>1 year</td>
<td>As a group, significantly improved function and mobility</td>
</tr>
<tr>
<td>North¹⁴</td>
<td>19</td>
<td>3 years</td>
<td>As a group, improved in a range of activities</td>
</tr>
</tbody>
</table>
## Return to Work

<table>
<thead>
<tr>
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<th>Follow Up</th>
<th>Results</th>
</tr>
</thead>
<tbody>
<tr>
<td>Van Buyten(^{18})</td>
<td>123</td>
<td>3 years</td>
<td>31% returned to work</td>
</tr>
<tr>
<td>Taylor(^{20})</td>
<td>1,133</td>
<td>n/a</td>
<td>40% returned to work</td>
</tr>
<tr>
<td>Dario(^{21})</td>
<td>23</td>
<td>3 years</td>
<td>35% returned to work</td>
</tr>
</tbody>
</table>
Cost-Effectiveness of SCS

SCS is cost-effective, as several experts have shown:

- Based on a randomized controlled SCS trial, North reported in 2007, “At a mean 3 years of follow-up, SCS is dominant [less expensive and more effective] than reoperation.”\textsuperscript{12} In this study, the mean cost per success was $177,901 for patients who crossed over to SCS. No crossovers to reoperation were successful, despite a mean per-patient cost of $260,584.
Cost-Effectiveness of SCS

SCS is cost-effective, as several experts have shown:

- Bell et al.\textsuperscript{22} showed that SCS pays for itself within 2.1 years with patients who have clinically effective SCS.
- Another study by Kumar\textsuperscript{23} determined the average cumulative cost for SCS therapy for 5 years was $29,123 per patient, less than the per-patient cost of $38,029 for conventional pain therapy.
Cost-Effectiveness of SCS

SCS is cost-effective, as several experts have shown:

- A cost-benefit analysis by Mekhail et al. in the *Clinical Journal of Pain* revealed that the cost savings associated with SCS was $30,221 per patient per year.\(^{24}\)

- Mekhail attributed this savings largely to patients dramatically reducing nerve blocks, emergency department visits, and hospitalizations.
In Summary...

- The workup and treatment of a patient who has failed surgery is not as difficult as it appears.
- A methodical method will often find an answer...
  But even if no cause is found there are still options for patients.
Thank you!!!
References

References


THANK YOU