

Managing CSF Complications in Spine Surgery

William C. Welch, M.D., F.A.A.N.S., F.A.C.S., F.I.C.S.
Professor of Neurosurgery, Vice Chair (Clinical) Neurosurgery
Kerry Vaughan, M.D.
Resident in Neurosurgery
Perelman School of Medicine, University of Pennsylvania,
Philadelphia, PA



Disclosures

Transcendental Spine

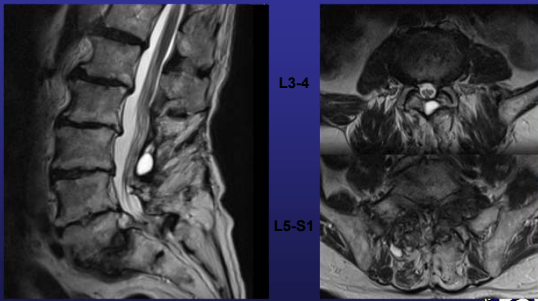


Case 1: 82 year old man with lumbar claudication

- 3 previous lumbar laminectomies (2011, 2007, 2014)
- Low back pain that travels to buttock, left thigh
- Using cane, shopping cart at stores
- Can only walk a few city blocks
- Physical therapy, epidural injections, oral steroids without relief
- Past Medical History: Heart murmur, BPH, urinary retention



Preoperative MRI

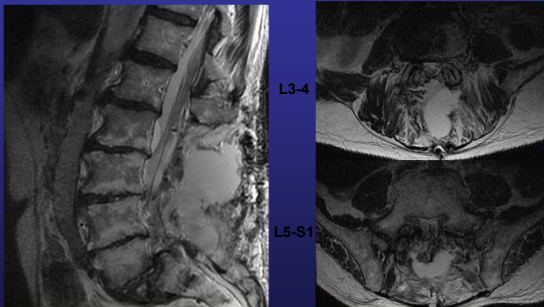


Surgery 7/5/16

- Redo L3-5 laminectomy; non-instrumented fusion L3-L4, L5-S1 using locally harvested autograft bone supplemented with ChronOS
- CSF leak, closure of dural rent L5-S1.
- Postoperatively: Patient laid flat for 3 days, noted on sitting up to have severe headache, increased output from JP drains
- MRI ordered postoperative day 6



POD 6: MRI with CSF leak



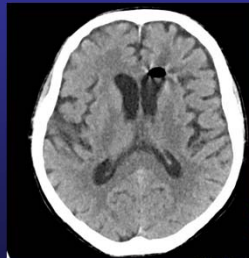
Surgery 7/13/16

- ◆ Closure CSF leak, Placement of lumbar drain under direct visualization
- ◆ Postoperatively: Laid flat for 3 days, postoperative delirium, discharged to rehab with JP drain in place
- ◆ Returned to clinic POD 25 (from original surgery), ambulating and mentating well, ready for discharge from rehab. JP drain removed
- ◆ Later that evening, while at rehab, developed fever delirium and transferred to Pennsylvania Hospital



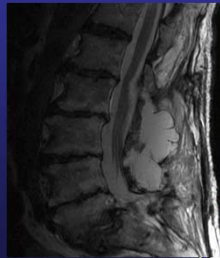
Head CT POD 26

- ◆ Fever 103, Tachypneic, Altered
 - Flat, 100% O2 nonbreather and broad spectrum antibiotics
- ◆ Assessment:
 - Pulmonary embolism study negative
 - UTI/CXR/Blood cultures negative
 - No drainage or erythema at wound site



Hospital Course

- ◆ Repeat HCT with resolving pneumocephalus, all cultures negative (including fluoro cervical LP)
- ◆ **MRI POD 33 with fluid collection**
 - Fever 2 days later



Hospital Course continued

- ♦ Re-exploration surgery POD 36
 - Strongly encouraged by infectious disease consult service
 - Fascia intact
 - Small subfascial fluid pocket, non-purulent
 - Closure with plastic surgery
 - Coagulase negative staph; continued antibiotics 2 weeks postoperatively

- ♦ S/p IVC filter placement for development of PE and PICC line for antibiotics



Outcome

- ♦ Ultimately did very well and sends me cards thanking me
- ♦ Family reports that he is doing well



Dural Lacerations

- The bane of the spine surgeon
- Occur
 - Lumbar posterior, including during instrumentation placement
 - Thoracic (anterior, lateral and posterior)
 - Sacral (Tarlov cysts)
 - Cervical (anterior and posterior)



Dural Lacerations

- 0.5-25% incidence
- Avoidance
 - Curette dissection between scar and bone
 - Leave scar on dura
 - Cottonoid/Woodson between dura and Kerrison
 - Protection of dura during screw insertion, drill use, etc.
 - Special considerations for OPLL



Dural Lacerations

- Treatment (General)
 - Denial, anger, bargaining, despair, acceptance
 - If you thought that you saw CSF, you probably did
 - Valsalva may help to locate tear
 - Tiny leaks seem to be more problematic than larger, linear tears (“jetting of CSF?”)
 - Re-check following repairs after dural sac is fuller-there may be another tear
 - If patient develops new radicular findings post-op, consider extrusion of rootlets through a dural rent
 - Just because you didn’t see a leak doesn’t mean that it didn’t occur



Dural Lacerations

- Treatment
 - Increase exposure-visualize full extent
 - Partial pedicle, facet, etc. resection
 - Evaluate the tear
 - Usually occurs because of Kerrison-there will be two holes, not one
 - Remove instrumentation, repair leak if possible, replace instrumentation
 - Prepare the closure
 - Hemostasis
 - Cottonoids
 - Push rootlets back into sac
 - Have good help available
 - Consider a dural closure kit (small needles, fine instruments, etc.)



Dural Lacerations

- Treatment

- Closure (first-line)

- Have fresh edges to work with if possible
- Consider using a graft if necessary
- Individual sutures
- Convert ragged dural edge to sharp dural edge
- Muscle is an excellent patch
- Tissue glue is wishful thinking, triumph of hope over experience



Dural Lacerations

- Treatment

- Closure (more advanced)

- Paraspinous muscle flap
- Spinal drain
- Tie off nerve root (thoracic)
- Wound drains in placed for prolonged period

- Closure (very advanced)

- Ventriculo-peritoneal shunt
- Lumbo-peritoneal shunt
- Prolonged bed rest



Dural Lacerations

- Other considerations

- Complications beget complications

- Bed rest-DVT
- Wound dehiscence
- Meningitis

- Close vigilance in post-op period

- New headache
- Non-healing wound
- "Wound seepage"



Dural Lacerations

- Other considerations
 - Inform nursing to be vigilant
 - In- and out-patient
 - Outline event in operative note
 - Prior surgery increases persistent leak
 - Consider increased ICP as source of persistent leak
 - Consider the development of Chiari
 - Nutritional status (obesity, low serum protein levels)
 - Immune-modulating medications/disease processes



Final Thoughts

- No drill without dural protection
- Two hands on Kerrisons for residents
- Nothing gets handed over the field
- Always observe the distal tip of the K-wire
- Image guidance is a relative reality
- X-ray can have overlays, obliquity issues, etc.



- K-Wire Insertion

