

## A RADIOLOGICAL ANALYSIS OF EARLY FAILURE OF CERVICAL FIXATION FOR TRAUMA IN THE SUBAXIAL CERVICAL SPINE





SPINE  
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AUSTRALIA

# Disclaimer

**No Conflicts of Interest**

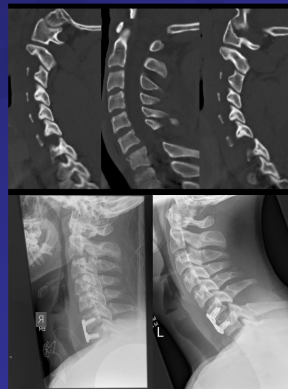
**No Financial Gain**

Melbourne, 2011



## Introduction

- A problem was seen
- Audit
  - Identify a standard
  - Identify problems
  - Compare to “standard”
  - Strive to improve



## Background

- Subaxial Cervical Spine Injuries
    - Dislocations
      - uni and bifacet
      - +/- facet / endplate fracture
    - Body Fractures
  - Anterior surgery ↑↑↑
  - Posterior Surgery
  - Both
- Tailor to the pathology

**Treatment of Cervical Spine Injuries with Anterior Plating 86 pts**  
Indications, Techniques, and Results

FEY, K. ZUBER, MD, and D. MARCHESI, MD

**Series of Nine Traumatic Cervical Spine Injuries Stabilized with Anterior ASIF Plate Fusion Technique**

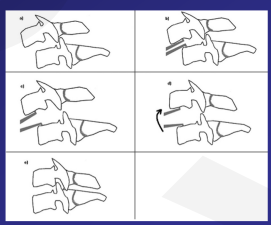
DANIEL R. RIPA, MD, MARK G. KOWALL, MD, ALAN J. COOPER, JR., MD, and JOSEPH J. RUSIN, MD

**Anterior Reduction for Cervical Spine Dislocation 41 pts**

Rudy Roroff, MD, Juan Quilley, MD, Edward J. Haney, MD, Greg Barry, MD, and Vincent Adler, MD

**The Radiographic Failure of Single Segment Anterior Cervical Plate Fixation in Traumatic Flexion Distraction Injuries 87 pts**

Michael G. Johnson, MD, Charles G. Fisher, MD, Michael Boyd, MD, Tobias Pitzer, MD, Thomas R. Olsrud, PhD, and Marcel F. Dvorak, MD



| Radiographic Failure |              |             |
|----------------------|--------------|-------------|
|                      | Yes          | No          |
| Facet fracture       | Yes 10 (26%) | No 28 (74%) |
| Endplate fracture    | Yes 1 (3%)   | No 35 (97%) |
|                      | 9 (24%)      | 58 (96%)    |

**Key Points**

- A 13% radiographic failure rate is reported for anterior plate fixation of distractive flexion injuries of the subaxial cervical spine where 75% of the subjects had bilateral facet injuries.

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**Comparison of Outcomes for Unstable Lower Cervical Flexion Teardrop Fractures Managed With Halo Thoracic Vest Versus Anterior Corpectomy and Plating**

**24 Halo vs 21 Op**

Charles G. Fisher, MD, MHSc, FRCS, Marcel F. S. Dvorak, MD, FRCS, Jordan Leith, MD, FRCS, and Peter C. Wing, MB, MSc, FRCS

**Conclusions.** The results of this study indicate that anterior cervical plating is a safe and effective treatment for cervical teardrop fractures, and that it is superior to the halo thoracic vest for restoring and maintaining sagittal alignment and for minimizing treatment failures.

No Failures Fixation

## Aims

- Define the rate of early loss of fixation in fusion for cervical trauma and to identify potential modes of failure

## Materials and Method

- 2005-2010
  - Spinal Surgery Operative Database
  - Spinal Injury Unit Database
  - Hospital Coding Database
- Retrospective radiological analysis on PACS
  - pre-, intra- and post-operative imaging

## Materials and Method

- Demographics
  - age, sex, diagnosis, endplate and facet fractures, treatment modality, immediate and follow up reduction and alignment, time to follow up, Bridwell fusion grade, screw pullout / lucency, pseudarthrosis
- Early failure defined as loss of position
  - First 8 weeks
  - Change in angular kyphosis / loss reduction / loosening / frank failure

## Inclusion / Exclusion

- All injuries C3 to C7/T1 treated operatively
  - Single Centre
- > 8 weeks F/U

## Results

- 104 pts → 84 (81%) FU >8 weeks avail
- Mean 38 yrs
- 70% Male
- Mean 30 week FU
- 33 bifacet # dislo
- 13 unifacet # dislo
- 27 vertebral body #s
  - with or without dislocation
- 5 chalkstick #s
- 6 other miscellaneous

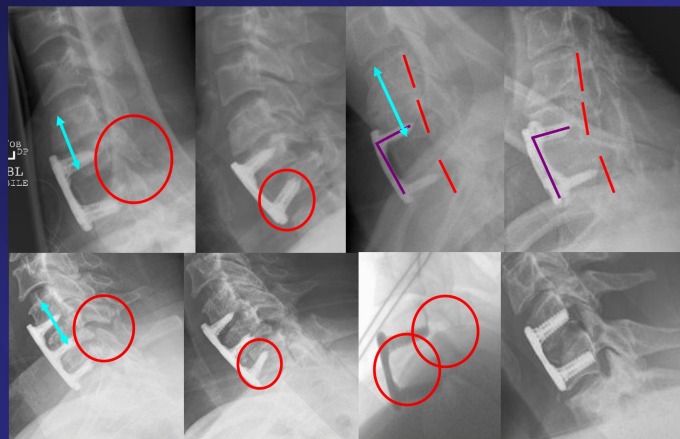
## Results

- 13 cases (15%) early failure
  - 6 reoperation (7%) all ACDF
  - 6 loss position - went on to fuse
  - 1 catastrophic failure - conservative Mx
- Further 6 underwent additional “planned” procedure < 2/52 after ACDF
  - 3 unsatisfactory reduction, 1 over distracted, 1 address post #s, 1 retrolisthesis
- ↑ age associated reop / add procedure ( $p < 0.05$ )

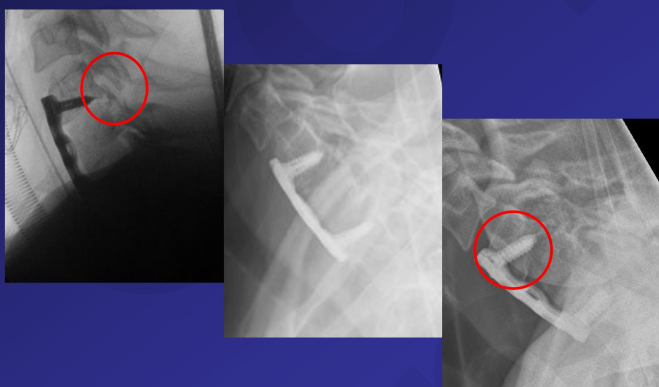
## Results

- 40 Primary ACDF
  - 10 (25%) loss position – 9 Bi Uni
  - Endplate #s ≠ ACDF
  - Facet # present then 1/3 required add op
- 22 Corpectomy
  - 2 loss position
- 12 AP
  - No failures
- 10 Post
  - 1 loss position

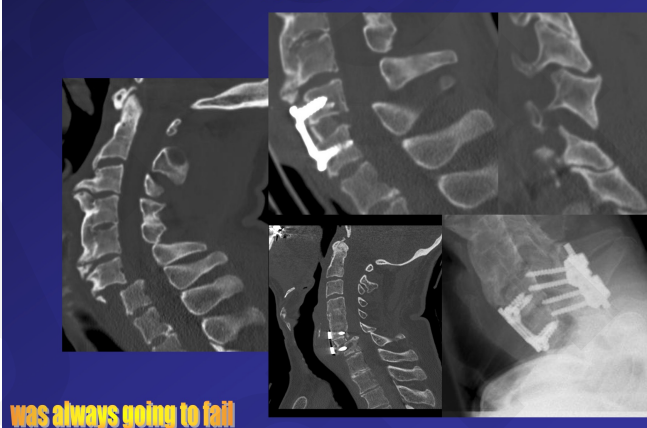
## Results – Lordosis / Distraction / Lever / #s



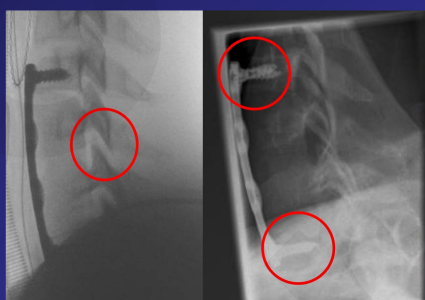
## Results – Distraction / Lever



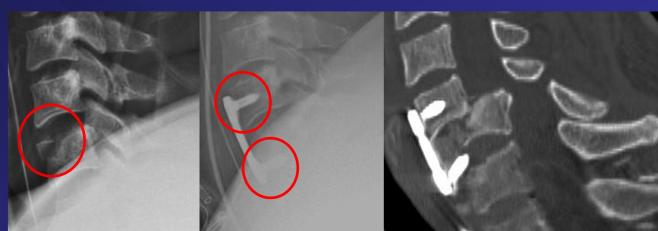
## Results – Distraction / Lever



## Results – Distraction / Lever



## Results – End Plate Fracture



## Results – Poor Bone



## Discussion

- Beware facet and endplate #s
- Ensure adequate reduction and Lordosis
  - Bend the plate
- Avoid over distraction
- Observe the biomechanics
  - Lever arms
  - VA plates
- Beware soft bone
- Often difficult at 4am
- Get check film asap

## Conclusions

- Results compare favourably with literature
- Patients undergoing ACDF as a sole treatment for subaxial cervical trauma should be followed up closely and should be warned preoperatively of the possible need for more than one operation

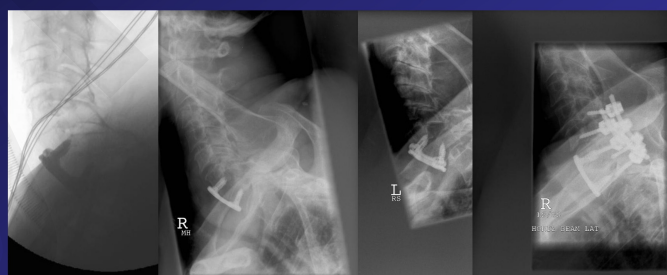
## Update May 2011

- 170 cases
  - 86 ACDF
  - 40 Corp (4AP)
  - 24 Post
  - 24 AP
- 20 Early Failures
- 12%
- > 8 weeks follow up
- 127 cases
  - 67 ACDF
  - 30 Corp (4AP)
  - 15 Post
  - 19 AP
- 17 Early Failures
- 13%

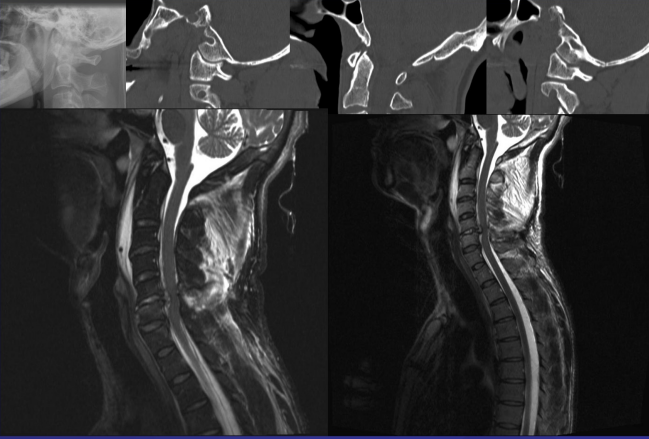
## Results – Distraction Reduction Lordosis



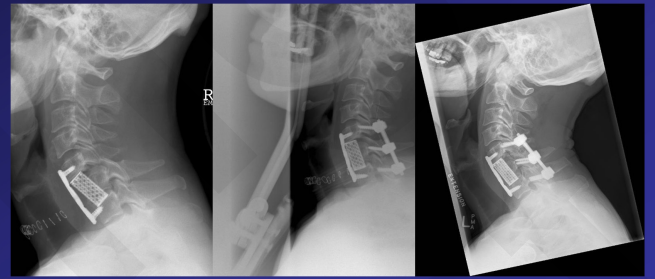
## Results – More Old Bone



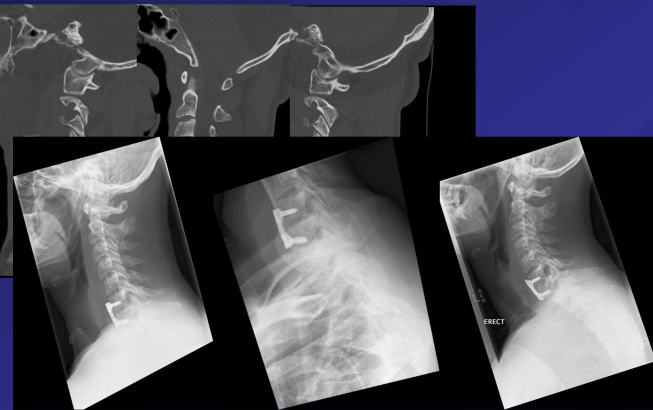
## Results – Poor Op Choice (?)



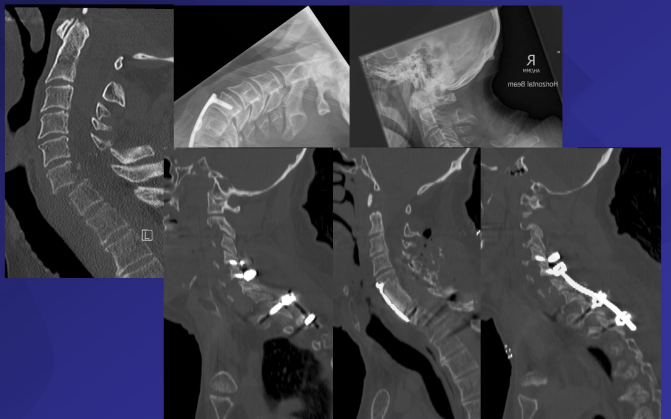
## Results – Poor Op Choice (?)



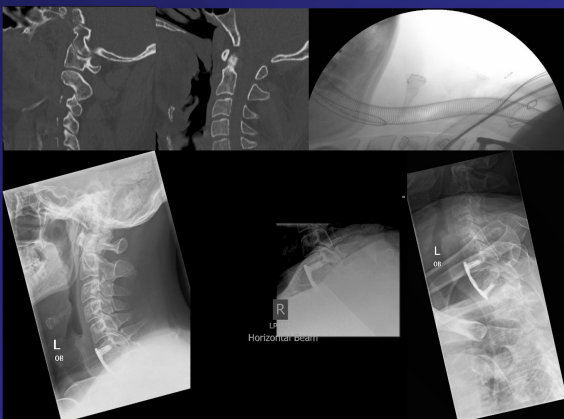
## Results – Poor Op Choice (?)



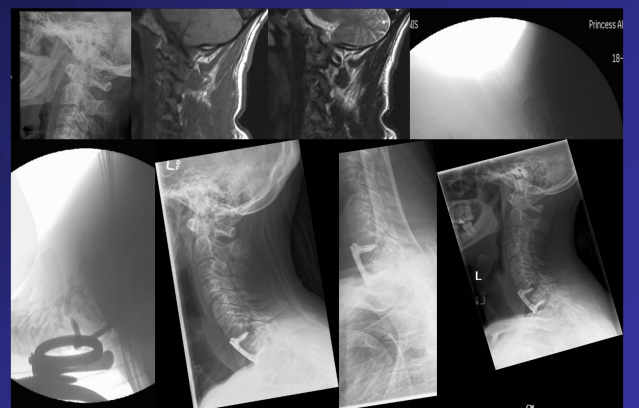
## Results – Poor Op Choice (?)



## Results – Poor Imaging / Reduction



## Results – Poor Imaging / Reduction



## Additional Recommendation:

- Beware facet, endplate #s, low #s / poor II
- Ensure adequate reduction and Lordosis
  - Bend the plate
- Avoid over distraction
- Observe the biomechanics
  - Lever arms
  - VA plates
- Beware soft bone
- Often difficult at 4am
- Get check film asap – If unsure get a CT?

## Oblique II XRs

