Oral Abstract Presentations
Oral Abstract Presentations will be held:

Saturday, July 13, 2019
10:15 – 11:15am

10:15am
Intraoperative Stimulation Threshold of the Facial Nerve in Patients Undergoing Microvascular Decompression
Michael McDowell, MD, University of Pittsburgh

10:25am
Stentriever Salvage After Failed Manual Aspiration Thrombectomy
Daniel Tonetti, MD, University of Pittsburgh

10:35am
Glioblastoma Organoids: A model system for patient specific therapeutic therapy
Ryan Salinas, MD, University of Pennsylvania

10:45am
Complications of Robotic Spine Surgery
Daniel Myers, MD, Jefferson

10:55am
Body mass index (BMI) and global sagittal alignment with anterior correction surgery in patients with flat back syndrome
M. Burhan Janjua, MD, Penn State Health

11:05am
Mobile Device Based Screening of Prison Populations for Cognitive Impairments Using ImPACT Quick Test
Michael McDowell, MD, University of Pittsburgh
Intraoperative Stimulation Threshold of the Facial Nerve in Patients Undergoing Microvascular Decompression

Michael M. McDowell, MD
Rafey A. Feroze, MD
Jeffrey Balzer, PhD
Donald J. Crammond, PhD
Partha Thirumala, MD
Raymond F. Sekula MD, MBA

University of Pittsburgh Medical Center

Introduction
**Introduction**

*Preservation of facial nerve function after resection of vestibular schwannoma*

**Intraoperative Transcranial Motor-Evoked Potential Monitoring of the Facial Nerve during Cerebellopontine Angle Tumor Resection**

**Introduction**

**Facial nerve outcome with a peroperative stimulation threshold under 0.05 mA.**

**Table 1.** Characteristic and Distribution of Patients

<table>
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<th>ST &lt; 0.05</th>
<th>ST = 0.06</th>
<th>ST &gt; 0.09</th>
<th>Total</th>
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<td></td>
<td></td>
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<td>25</td>
<td>6</td>
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<td>20</td>
<td>5</td>
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<td><strong>Age (yr)</strong></td>
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<td>49.7</td>
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<td><strong>Tumor size (cm)</strong></td>
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<td>1.89</td>
<td>2.12</td>
<td>1.75</td>
<td>0.13</td>
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<td><strong>Approach</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
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<td>Posterior fossa</td>
<td>15</td>
<td>20</td>
<td>5</td>
<td>40</td>
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<tr>
<td>Transtemporal</td>
<td>30</td>
<td>24</td>
<td>6</td>
<td>60</td>
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ST = stimulation threshold.
Does the literature apply?

Methods

• We sought to determine the feasibility of a stimulation threshold lower than 0.05 in patients without facial nerve pathology
• Inclusion Criteria
  - Undergoing MVD for trigeminal neuralgia
  - No past or current facial nerve pathology
• No post-induction paralytics
• Seven patients recruited, all awoke with normal facial function
Methods

• After MVD, facial nerve stimulation was attempted at 0.025 mA, 0.05 mA, 0.1 mA, and 0.2 mA
• Stimulated attached segment of facial nerve
• EMG responses from the orbicularis oculi and mentalis muscles were recorded
• Statistics: Friedman test (SAS Version 9.4)
Limitations

• Small number of patients
• Facial nerves in patients with hemifacial spasm may not have same physiological responses
• Data does not assess sensitivity or specificity of lower starting stimulation threshold

Conclusions

• Stimulation of healthy facial nerves at thresholds below 0.05 generate consistent and similar EMG responses
• Select patients undergoing facial nerve stimulation may benefit from a lower stimulation threshold
• Further study is needed to determine if loss of a stimulation threshold of 0.025 mA is a more sensitive predictor of facial palsy
Thank You!
STENTRIEVER SALVAGE AFTER FAILED MANUAL ASPIRATION THROMBECTOMY

Dan Tonetti MD, Ashutosh Jadhav MD, Brian Jankowitz MD, Tudor Jovin MD, Bradley Gross MD
University of Pittsburgh

Funding Statement

- This research received no specific grant from any funding agency.

Competing Interests Statement

- The authors have no personal or institutional interest with regards to this study.
**INTRODUCTION**

- Mechanical thrombectomy is the standard of care for emergent large vessel intracranial occlusions

- Many techniques/acronyms exist
  - MAT, SMAT, Solumbra, Snake, SAVE, ADAPT etc..

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TABLE 1. SUMMARY OF NEW CLASS I STUDIES EVALUATING MECHANICAL THROMBECTOMY IN ACUTE ISCHEMIC STROKE

<table>
<thead>
<tr>
<th></th>
<th>MR CLEAN</th>
<th>EXTEND-IA</th>
<th>ESCAPE</th>
<th>SWIFT PRIME</th>
<th>REVASCAT</th>
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<tr>
<td>No. of centers</td>
<td>16 (the Netherlands)</td>
<td>10 (Australia/New Zealand)</td>
<td>22 (Canada, United States, South Korea, Ireland, United Kingdom)</td>
<td>39 (primarily United States and Europe)</td>
<td>4 in Spain</td>
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<td>No. of patients</td>
<td>502</td>
<td>70</td>
<td>316</td>
<td>196</td>
<td>206</td>
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<tr>
<td>Imaging criteria</td>
<td>Anterior circulation proximal occlusion</td>
<td>ICA/MCA occlusion, perinuclear, ischemic core &lt; 70 mL</td>
<td>Anterior circulation proximal occlusion; small-to-moderate infarct core; good-to-moderate collateral flow</td>
<td>Intracranial ICA or M1 MCA; small-to-moderate core infarct; strategy: first 71 patients with Rapid software</td>
<td>ASPECTS &gt; 6 on CT or &gt; 5 on diffusion-weighted MRI</td>
</tr>
<tr>
<td>Time criteria (h)</td>
<td>Intra-arterial treatment by 6 h</td>
<td>Intravenous alteplase by 4.5 h</td>
<td>Enrollment by 12 h</td>
<td>Within 6 h of onset/7.5 h of imaging</td>
<td>8 h of symptom onset</td>
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<td>Median stroke to groin puncture (min)</td>
<td>260</td>
<td>210 stroke to reperfusion, 248</td>
<td>Stroke to CT, 134 CT to groin puncture, 51 stroke to reperfusion, 241</td>
<td>Stroke to CT, 224 stroke to stent deployment, 252</td>
<td>Stroke to recanalization, 355</td>
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<tr>
<td>Endovascular treatment</td>
<td>Mechanical (83.7%); retrievable stent (81.5%); intra-arterial thrombolysis (10.9%); intra-arterial thrombolytic alone (0.4%)</td>
<td>Solitaire FR stent retriever</td>
<td>Retrievable stent (86.1%)</td>
<td>Solitaire stent retriever</td>
<td>Retrievable stent</td>
</tr>
</tbody>
</table>
At UPMC, we use a manual aspiration-first strategy
  ▪ Same successful thrombectomy rates as SMAT and same functional outcomes (ASTER, COMPASS)
  ▪ Improved cost-effectiveness ($5,000 - $6,000 per case)

MAT attempted first \(\rightarrow\) if failure, then SMAT

Prior literature has established this strategy as safe with similar functional outcomes
  ▪ There is a lack of data regarding which patients may benefit from up-front stent retriever usage

In both SMAT and MAT reviews, recanalization rates are highest for the first pass and decrease with subsequent passes

Identifying patients who may benefit from first-pass SMAT could lead to fewer passes required for successful reperfusion
  ▪ # of pass attempts required for aspiration is an independent negative predictor of good outcome*
**OBJECTIVE**

- Perform an analysis of prospectively-collected thrombectomy data over two years to identify predictors of the need for crossover to stent retriever usage

**METHODS**

- All patients undergoing thrombectomy for EVO during study period: N = 455 patients
- First Pass MAT for index thrombus: N = 215 patients
- Required Second Pass for Index Thrombus: N = 113 patients
- Second Pass - Attempted MAT: N = 87 patients; Successful MAT in 47 patients (54%)
- Second Pass - Attempted SMAI: N = 26 patients; Successful SMAI in 19 patients (73%)
- N = 47 patients; Required Third Pass for index thrombus
- Third Pass - Attempted MAT: N = 21 patients; Successful MAT in 9 patients (43%)
- Third Pass - Attempted SMAI: N = 26 patients; Successful SMAI in 20 patients (77%)
- First Pass SMAI: 114 patients excluded
- Successful Removal of Index Thrombus: N = 206 patients (62%)
RESULTS

- No demographic variables were predictors of the need for SMAT
- Patients requiring SMAT were more likely to have:
  - ICAt location (36% vs 20%, p=0.03)
  - Higher NIHSS (p<0.01)
- No differences in outcomes or complications

<table>
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<th>Crossover to successful SMAT for index clot</th>
<th>MAT-only OR failed SMAT for index clot</th>
<th>P-value</th>
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<td># Patients</td>
<td>39</td>
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<tr>
<td>Age, mean</td>
<td>73.5 ± 13.5</td>
<td>71.1 ± 14.6</td>
<td>0.3327*</td>
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<td>Co-Morbidities</td>
<td></td>
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<tr>
<td>HTN</td>
<td>33 (85%)</td>
<td>213 (76%)</td>
<td>0.3096*</td>
</tr>
<tr>
<td>Prior TIA/CVA</td>
<td>7 (18%)</td>
<td>58 (18%)</td>
<td>1*</td>
</tr>
<tr>
<td>Diabetes</td>
<td>7 (18%)</td>
<td>72 (26%)</td>
<td>0.3297*</td>
</tr>
<tr>
<td>Atrial Fibrillation</td>
<td>17 (44%)</td>
<td>113 (40%)</td>
<td>0.73*</td>
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<tr>
<td>DVT</td>
<td>10 (26%)</td>
<td>62 (22%)</td>
<td>0.6828*</td>
</tr>
<tr>
<td>CAD</td>
<td>14 (36%)</td>
<td>85 (30%)</td>
<td>0.854*</td>
</tr>
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<td>Daily ETOH Use</td>
<td>3 (8%)</td>
<td>19 (7%)</td>
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<td>HT</td>
<td>23 (60%)</td>
<td>144 (43%)</td>
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<td>NIHSS, mean</td>
<td>19.7 ± 7.0</td>
<td>16.8 ± 6.2</td>
<td>0.0075*</td>
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<td>ASPECTS, mean</td>
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<td>8.9 ± 1.2</td>
<td>0.3302*</td>
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<td>tPA</td>
<td>16 (41%)</td>
<td>96 (34%)</td>
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<td>Clot Location</td>
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<td>ICA terminus</td>
<td>14 (36%)</td>
<td>57 (30%)</td>
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<tr>
<td>M1</td>
<td>13 (33%)</td>
<td>147 (93%)</td>
<td>0.027*</td>
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<td>M2</td>
<td>10 (26%)</td>
<td>47 (17%)</td>
<td>1*</td>
</tr>
<tr>
<td>Other</td>
<td>3 (8%)</td>
<td>20 (7%)</td>
<td>0.7513*</td>
</tr>
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</table>

In this analysis of 319 consecutive patients undergoing first-pass MAT for emergent LVO, the crossover rate to successful SMAT was 12% (1-in-8)

After an initial failed MAT attempt, SMAT was more successful on subsequent passes:
- 2nd pass: 73% vs 54%, p=0.11
- 3rd pass: 77% vs 43%, p=0.03

DISCUSSION

- In this analysis of 319 consecutive patients undergoing first-pass MAT for emergent LVO, the crossover rate to successful SMAT was 12% (1-in-8)
- After an initial failed MAT attempt, SMAT was more successful on subsequent passes:
  - 2nd pass: 73% vs 54%, p=0.11
  - 3rd pass: 77% vs 43%, p=0.03
CONCLUSION

- Higher NIHSS and ICA terminus thrombus location were predictors of successful crossover to SMAT
  - We have modified our practice to start with stent retriever-assisted aspiration for ICA occlusions

- However, 7 of 8 patients have successful reperfusion with MAT alone
  - Similar functional outcomes and complications
  - Cost savings in these patients: ~$5,000 per patient

THANK YOU
Glioblastoma organoids: A model system for patient-specific therapeutic testing

Ryan Salinas, M.D.
University of Pennsylvania
PGY-5 Resident Physician
Department of Neurosurgery
Labs of Hongjun Song and Guo Li Ming
University of Pennsylvania
Department of Neuroscience

Disclosures

• No financial conflicts

• Funding sources:
  – Glioblastoma Translational Center of Excellence at The Abramson Cancer Center
  – National Institutes of Health (R37NS047344 and P01NS097206 to H.S., R35NS097370 and U19AI131130 to G-I.M.),
  – Sheldon G. Adelson Medical Research Foundation (to G-I.M.)
Most prevalent models of Glioblastoma use serum or recombinant EGF/FGF

Cultured neurospheres or monolayers involves dissociation into single cells in the presence of exogenous growth factors. This clonal selection may not reflect the original tumor (Ledur et al 2017)

Glioblastoma organoids resemble the primary tumor on pathology

H&E staining reveals significant similarity between the parental tumor and the corresponding organoids, which retain key histologic features

7966: gemistocytic cells
7884: vacuolated cells
8036 & 7955: multinucleated cells
RNA sequencing demonstrated similarity of GBOs to the primary tumor over time with significant inter-tumoral heterogeneity.

- RNA sequencing demonstrates a high Pearson correlation of the transcriptome up to 12 weeks in culture.
- Tumor-specific gene signatures are maintained over time.

GBOs for Therapeutic Testing

Can these organoids be utilized for investigational and translational purposes?

- Standard of care therapy (Radiation/Temozolamide)
- Targeted Inhibitors (EGFR, MEK, mTOR)
- Immunotherapy (CAR-T cells)
GBOs can be used to test patient-specific response to radiation and temozolamide *in vitro*

1. Differential response to radiation and temozolomide is not completely explained by MGMT status.
2. Functional analysis of gene expression (GSEA) demonstrates enrichment of gene sets associated with radiation response with Radiation SENS, and a stem cell phenotype with Radiation RES.

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**Efficacy of EGFR inhibitor, gefitinib is largely, but not entirely predicted by EGFR alteration**

- All tumors with a decrease in Ki67 from gefitinib inhibition had an EGFR alteration.
- Gene set enrichment analysis reveals enrichment in EGF pathway gene sets.
Clinical targeted treatment mirrored with GBO treatment

- Osimertinib was used on patient and was found to have some evidence of response (*Off-label use)
  - Decreased proliferation with osimertinib compared to control in GBOs

Downstream trametinib inhibition leads to a decrease in proliferation in two NF1 mutated tumors

- Two gefitinib resistant tumors with a downstream NF1 mutation responded to MEK inhibitor trametinib
- Gene set enrichment analysis reveals enrichment in RAS related genes
Treatment with mTOR inhibitor everolimus leads to a significant response in an otherwise resistant cell line

- Everolimus has no effect on a tumor with NF1 mutation and a significant effect on a PI3K mutated tumor
- Gene set enrichment analysis identified gene sets related to phosphoinositol (target of PI3K)

Dichotomous growth based on mutational status and drug treatment
Outline

• Characterization and Application of Glioblastoma Organoid (GBO) Model
  – Can these organoids be utilized for investigational and translational purposes?
    – Standard of care therapy (Radiation/Temozolamide)
    – Targeted Inhibitors
    – Immunotherapy (CAR-T cells)

CAR-T Cells currently being tested in matched organoids with patients on clinical trial

T-cell infiltration and some evidence of antigen loss seen in EGFRviii CAR-T cells but not CD19 CAR-T cells
CAR-T resistance can be studied by looking at GBO growth after CAR-T exposure

Antigen loss and significant decrease in proliferation seen 2 weeks after treatment with EGFR\textsuperscript{viii} CAR-T cells (2173)

Summary

- Glioblastoma pre-clinical and clinical studies are limited by cellular heterogeneity
- Glioblastoma organoids represent a novel culture method to maintain tumoral heterogeneity
- The rapid time frame of organoid generation and testing can be done concurrently with patient treatment
Thank you!

Song and Ming Labs
Dr. Hongjun Song
Dr. Guo-Li Ming
Dr. Kimberly Christian

Tumor Organoid Group
Fadi Jacob – culture method, histology
Daniel Zhang – sequencing
Phuong Nguyen – xenograft

Jordan Schnoll - histology
Sam Wong – single-cell sequencing

Department of Pathology
Dr. Maclean Nasrallah
Dr. Stefan Prokop

Department of Radiology Oncology
Dr. Jay Dorsey
Dr. Saad Sheikh
Dr. Deeksha Saxena

Department of Neurosurgery
Dr. Donald O'Rourke
Dr. Steven Brem
Dr. Zev Binder
Dr. H. Isaac Chen
Dr. Radhika Thaloka
Dr. Kali Abdullah
Dr. Eric Hudgins
Dr. Matthew Piazza

Neurosurgery Clinical Research Division
Whitney Sarchiapone
Timothy Prior

Dr. M. Sean Grady
Dr. James Schuster

Department of Oncology
Dr. Steven Bagley
Dr. Arati Desai

Questions?
Background

- Placement of spinal instrumentation freehand historically associated with high rates of inaccuracy with risk of nervous and vascular injury.
- Pedicle screw accuracy has increased with introduction of image guidance such as fluoroscopy, and CT-Neuronavigation.
- Robotic assistance remains a relative novelty in the field of spinal instrumentation. (1)
- First described experience with robotic spine surgery using Mazor system published 2006 Sukovich et al. (2)
- Roughly 2 dozen studies since then analyzing pedicle screw placement using Mazor (Caesarea, Israel) Mazor X and Renaissance systems and ROSA systems
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<th>Authors &amp; Year</th>
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<th>Study Type</th>
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<td>Freehand</td>
<td>Mazor</td>
<td>Pedicle screw</td>
<td>11</td>
<td>64</td>
<td>95.3</td>
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<tr>
<td>Sensalkovic et al., 2016</td>
<td>Retrospective</td>
<td>Matched cohort</td>
<td>None</td>
<td>Mazor</td>
<td>Pedicle screw</td>
<td>34</td>
<td></td>
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<tr>
<td>Sukovich et al., 2006</td>
<td>Retrospective</td>
<td>Case series</td>
<td>None</td>
<td>Mazor</td>
<td>Pedicle screw</td>
<td>14</td>
<td>98</td>
<td>96.0</td>
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<tr>
<td>Tsai et al., 2016</td>
<td>Retrospective</td>
<td>Case series</td>
<td>None</td>
<td>Mazor</td>
<td>Pedicle screw</td>
<td>35</td>
<td>176</td>
<td>98.9</td>
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<tr>
<td>Tan et al., 2015</td>
<td>Prospective</td>
<td>Case series</td>
<td>None</td>
<td>Mazor</td>
<td>Pedicle screw</td>
<td>113</td>
<td>404</td>
<td>92.8</td>
<td></td>
</tr>
</tbody>
</table>
Complication rate in Spine Surgery

- Nasser et al 2010 reported an overall complication rate 16.4% in spine surgery (5).
- Campbell et al 2011 reported up to 56.4% of patient undergoing spinal instrumentation surgery experienced at least one perioperative complication. (6)
  - 202 Pts
  - Significantly higher complication rate in tumor patients, and in posterior approach
- Robotic surgery- well established “Learning curve”
  - Complication rate significantly higher in Cases 5-25 by surgeon. (1)
- Systematic Review performed by Ghasem (7) found increased operative time in robot cases vs traditional navigation and freehand screws
  - Well described difficulty with alteration of trajectory by soft tissue pressures, “skiving” off facet, and forceful surgical application. S1 screws in particular required significant soft tissue exposure
  - Operative time increased especially when surgeon in early experience with robotic system
- Few data exist regarding overall complication rates in robotic assistance cases despite numerous studies focusing on accuracy on instrumentation.

Methods

- Electronic medical record was searched as well as operative case logs for cases utilizing the Mazor X Robot between May 1 2017 and Dec 1 2018.
- Electronic medical record was reviewed for operating surgeon, indication, procedure performed, total number of screws, numbers of levels instrumented, revision screws required if any, aborted levels.
- Postoperative imaging reviewed to evaluate pedicle screw accuracy. Patient’s excluded without some form of postoperative CT imaging which is required for use of Gertzbein-Robbins scale.
- Postoperative record in EMR was reviewed for any perioperative complications and subdivided into medical and surgical complications.
- EMR was reviewed for operative time.
- IRB approval was obtained
  - Study Number 2019-176
Methods

- Grading pedicle screw Placement
  - Most common grading scale is CT based Gertzbein Robbins scale (3,4)
  - Reproducable.
  - Requires CT Scan
      - Grade A: no identifiable breach
      - Grade B: a breach of < 2 mm
      - Grade C: a breach of 2 to < 4 mm
      - Grade D: a breach of 4 to < 6 mm and a
      - Grade E breach of > 6 mm is Grade E.

Results

- 67 patients undergoing 68 consecutive surgeries met inclusion criteria
- 5 surgeons identified utilizing the robot
- 30 Female, 37 Male
- Indications
  - Degenerative 37/68 (including 1 extension of fusion for pseudoarthrosis)
  - Trauma 25/67
  - Neoplasm 5/68
  - Infectious 1/68
Results

- Total of 306 instrumented levels. Mean = 4.6 levels Standard Deviation = 2.7
- **592 total pedicle screws placed.** Mean 8.3 Screws/case St. Dev = 5.34
  - 475 screws analyzed with postoperative CT study
- 26 (4.3%) screws were revised using the robot
- Additional 32 screws were converted to placement under fluoroscopy (5.4%)
- 9 screws were either aborted or not attempted due to anatomical constraints (3.3%)
- 54 surgeries underwent Preoperative CT scanning. 13 surgeries used intraoperative “Scan and Plan” technique

Results - Pedicle Screw Accuracy
(reviewed against selected studies)

<table>
<thead>
<tr>
<th>Gertzbein Robbins Scale</th>
<th>AHN Data n=269 (%)</th>
<th>Schatio et al 2014 (8) n=244 (%)</th>
<th>Tsai et al 2016 (9) N=176 (%)</th>
<th>Van Dijk et al 2015 (10) N=494 (%)</th>
<th>Devito et al 2010 (11) N=644 (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>417 (87)</td>
<td>204 (83.6)</td>
<td>151 (85.8)</td>
<td>301 (61)</td>
<td>577 (89.3)</td>
</tr>
<tr>
<td>B</td>
<td>52 (10.9)</td>
<td>19 (7.8)</td>
<td>25 (14.2)</td>
<td>188 (37)</td>
<td>58 (9.0)</td>
</tr>
<tr>
<td>C</td>
<td>5 (1.1)</td>
<td>9 (3.7)</td>
<td>0</td>
<td>8 (1.6)</td>
<td>9 (1.4)</td>
</tr>
<tr>
<td>D</td>
<td>1 (0.2)</td>
<td>4 (1.6)</td>
<td>0</td>
<td>1 (0.2)</td>
<td>2 (0.3%)</td>
</tr>
<tr>
<td>E</td>
<td>0</td>
<td>2 (0.8)</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Total Acceptable</td>
<td><strong>475 (97.9)</strong></td>
<td>223 (91.4)</td>
<td>176 (100)</td>
<td>487 (97.9)</td>
<td>635 (98.2)</td>
</tr>
</tbody>
</table>
Complications

- Death in 4/67 patients
  - 1 patient made Comfort Measures with post op respiratory failure due to lung tumor burden
  - 1 death of urosepsis
  - 1 death from respiratory failure and family refusal of tracheostomy
  - 1 death reported within 30 days of surgery without known cause

- Total complication Rate
  - 38 (55%) patients experienced complication
  - 18 patients (26%) experienced medical complication
  - 26 (38%) patients experienced surgical complication
  - 6 (9%) patients experienced both medical and surgical complication

- Reoperation Rate
  - 2 patients underwent revision surgery for screw malplacement

- Operative Time
  - Mean Operative time 277 min

Complications

Medical

- Respiratory Failure req Tracheostomy
- Adrenal insufficiency: Shock
- Pulmonary Embolism (4)
- Post op blood loss from non surgical bleeding source (inferior epigastric artery)
  - Resolved with IR embolization
- Cancer burden: Death
- Stroke (2)
  - 1 thrombosed Subclavian artery
  - 1 uncertain etiology
- Death (2)
  - CMO lung tumor burden
  - Unknown
- Sepsis/Bacteremia (3)
  - 1 death from urosepsis

Surgical

- New post op radiculopathy (5)
- Deep Wound Infection (8) requiring I&D
- Malplaced screw requiring return to OR (2)
- Pseudoarthrosis (3)
- Use of robot aborted (4)
- Acute blood loss anemia resulting in coagulopathy (2)
- Postlaminectomy Syndrome
- CSF leak requiring lumbar drainage or revision (4)
- New Post operative Weakness (2)
Results- Operative Time

- Operative Time noted from Procedure Start to Procedure Finish (min)
  - Shortest operative time-58 min. L4-5 TLIF
  - Longest Operative time 818 min. Metastatic spine tumor resection and T-11 Corpectomy with T6-iliac PSF
  - Mean operative time 277 min (st dev. 142 min)

Conclusions

- Previous studies have shown high rate of pedicle screw accuracy with robot assisted spinal instrumentation.
  - Our results have mirrored these results
- Long operative times with high variability consistent with early learning curve in the literature.
  - Increased operative times may be related to more frequent medical and surgical morbidity. Although complication rate similar to those previously cited in the literature for spinal fusion procedures.
- Although rates of pedicle screw accuracy are very high in these cases, these data suggest that more study is merited in assessing rates of perioperative complication rates in robotic assisted spinal instrumentation procedures.
- Overall complication rate fairly similar to previous studies of complications for spinal instrumentation
Takeaways

- High pedicle screw accuracy
- May not significantly impact overall complication rate.

Conclusions

- Limitations
  - Retrospective studies shown to have lower yield of complications in previous studies.
  - Follow up highly variable
  - Data may be more useful given case-control format with non-robot cases (ie case match with Neuronavigation vs fluoroscopic guided)
  - No consistency in how revision screws or aborted screws were documented. This may have been underestimated
  - Selection bias, only patient’s with postoperative CT were included. This did include CT obtained for indication other than hardware evaluation with hardware visible on scan.
  - Surgical Selection bias
References


Mobile Device Based Screening of Prison Populations for Cognitive Impairments Using ImPACT Quick Test

Michael M. McDowell, MD
Luke C. Henry, PhD
Ronak H. Jani, MD
Nicole Wang, PhD
Nathan Kruls, PhD
Robert M. Friedlander, MD, MA
Carroll P. Osgood, MD

University of Pittsburgh Medical Center

Introduction

<table>
<thead>
<tr>
<th>Population</th>
<th>TBI prevalence</th>
</tr>
</thead>
<tbody>
<tr>
<td>Prison diversion programme (non-incarcerated) probationers</td>
<td>50%</td>
</tr>
<tr>
<td>Forensic psychiatric hospital patients</td>
<td>22%</td>
</tr>
<tr>
<td>General prison prisoners</td>
<td>36–86%</td>
</tr>
<tr>
<td>Death row prisoners</td>
<td>100%</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>TBI severity</th>
<th>Recent TBI (within prior 12 months)</th>
<th>Lifetime TBI</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mild TBI</td>
<td>20 (29.0%)</td>
<td>40 (58.0%)</td>
</tr>
<tr>
<td>Moderate/severe TBI</td>
<td>5 (7.2%)</td>
<td>20 (29.0%)</td>
</tr>
<tr>
<td>Any TBI</td>
<td>25 (36.2%)</td>
<td>60 (87.0%)</td>
</tr>
</tbody>
</table>

Traumatic brain injury in a county jail population: prevalence, neuropsychological functioning and psychiatric disorders

BILL SLAUGHTER, JESSE R. FANN and DAWN EHDE
University of Washington School of Medicine, Seattle, WA, USA
Neuropsychological Assessment in Prisons: Ethical and Practical Challenges

Holly Vanderhoff, PhD, Elizabeth L. Jeglic, PhD, and Peter J. Dorevitch, PhD

Standard administration procedures for most available tests were developed in a quiet environment with adequate space, ventilation, lighting, and furniture.

Spaces available to evaluators for testing often lack adequate testing surfaces and sometimes are poorly lit.

Not only could other inmates easily observe the testing process but at times they stood outside the window making faces/gestures.

Testing sessions also are contingent on the availability of correctional staff to transfer prisoners and to supervise the assessment.

Depending on the security level of the facility and the possible threat posed by the inmate, some individuals must be assessed in restraint devices (e.g., handcuffs, ankle shackles, and manacles attached to “belly bands”).
Methods

• We sought to validate the IMPACT Quick Test in a prison population
• Inclusion criteria Age 18-70
• Exclusion criteria: History of TBI
• Compared to the 772 person normative sample from IMPACT designed to approximate the 2010 US Census demographics
• Statistics: Student’s t-test (SAS Version 9.4)
Methods

- Blair County Prison: 337 bed medium-security facility for men
- 100 volunteers recruited
- 2 excluded due to failure to complete

Results

<table>
<thead>
<tr>
<th>Table 1: Study Group and Normative Sample Demographics</th>
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</thead>
<tbody>
<tr>
<td>Study Group</td>
</tr>
<tr>
<td>--------------</td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td>ImPACT Quick Test Normative Data</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Attention Tracker Composite Score</th>
<th>Motor Speed Composite Score</th>
<th>Memory Composite Score</th>
</tr>
</thead>
<tbody>
<tr>
<td>Study mean ± standard deviation</td>
<td>Study mean ± standard deviation</td>
<td>Study mean ± standard deviation</td>
</tr>
<tr>
<td>18.74 ± 1.01</td>
<td>14.92 ± 5.20</td>
<td>9.80 ± 2.98</td>
</tr>
<tr>
<td>Normalized ImPACT Quick Test mean ± standard deviation</td>
<td>Normalized ImPACT Quick Test mean ± standard deviation</td>
<td>Normalized ImPACT Quick Test mean ± standard deviation</td>
</tr>
<tr>
<td>19.01 ± 9.59</td>
<td>18.70 ± 5.31</td>
<td>10.94 ± 1.72</td>
</tr>
<tr>
<td>p &lt; 0.0001</td>
<td>p &lt; 0.0001</td>
<td>p &lt; 0.0001</td>
</tr>
</tbody>
</table>
Limitations

- Limited scope of study due to sensitive nature
- Male only study group
- Comparative data cannot be subdivided
- IMPACT Quick Test is more useful as a dynamic testing program

Conclusions

- Mobile device testing is feasible in prison setting
- IMPACT may be a useful screening and assessment tool for TBI in prison populations
- Data functions as basis for new normative data
- Further study testing prisoners with TBI warranted
Thank You!

The Department of Neurological Surgery
at the University of Pittsburgh