Preliminary Results of Baseline Cortical Neural Activity in Men with Benign Prostatic Hyperplasia and Bladder Outlet Obstruction

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This is the first study evaluating cortical activity in men with benign prostatic hyperplasia (BPH) and bladder outlet obstruction (BOO). This human trial offers the first concurrent urodynamic (UDS) and functional MRI (fMRI) evaluation on alteration in cortical function during bladder filling and emptying cycles in men with BPH and bladder outlet obstruction.

Introduction

Benign prostatic hyperplasia (BPH) affects the entire micturition cycle including filling and storage phases, often creating bothersome lower urinary tract symptoms (LUTS).

Persistent bladder outlet obstruction (BOO) is known to remodel the bladder’s smooth muscle, connective tissue and local neural network; however, the extent to which it alters the central nervous system (CNS) in BPH patients is unknown.¹

Objectives

Utilization of fMRI to:
- Identify baseline brain activation patterns in men with BPH and BOO.
- Compare areas of cortical activity to predetermined regions of interest in healthy adult men from the literature.

Subjects

Men ≥ 45 years old who failed conservative BPH therapy planning to undergo BOO procedure.
- After exclusion 7 men were evaluated.
- All subjects underwent concurrent fMRI/urodynamics (fMRI/UDS) testing platform.

Methods

Concurrent UDS and fMRI setup

Brain Activation Pattern in Seven Men with BPH

Table 1. Baseline Demographics

<table>
<thead>
<tr>
<th>Baseline Demographics</th>
<th>Mean (range)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Patients n=7</td>
<td></td>
</tr>
<tr>
<td>Prostate Volume</td>
<td>61 (48-71)</td>
</tr>
<tr>
<td>IPSS</td>
<td>47 (29-69)</td>
</tr>
<tr>
<td>SHIM</td>
<td>18.5 (12-27)</td>
</tr>
<tr>
<td>ASA</td>
<td>18.2 (9-24)</td>
</tr>
<tr>
<td>Liverpool Percentile</td>
<td>2.2 (2-2)</td>
</tr>
<tr>
<td>Free Flow Data</td>
<td></td>
</tr>
<tr>
<td>Functional bladder capacity (PVR + Voided volume in ml) Qmax (mL/s)</td>
<td>300</td>
</tr>
<tr>
<td>Mean Voided Volume (ml)</td>
<td>210 (47-381)</td>
</tr>
<tr>
<td>PVR (ml)</td>
<td>90 (0-167)</td>
</tr>
<tr>
<td>Volding time (s)</td>
<td>29 (13-60)</td>
</tr>
<tr>
<td>Mean Flow (ml/s)</td>
<td>4.6 (3-5)</td>
</tr>
<tr>
<td>fMRI-UDS Characteristics</td>
<td></td>
</tr>
<tr>
<td>Baseline PVR (ml)</td>
<td>227 (15-900)</td>
</tr>
<tr>
<td>End PVR (ml)</td>
<td>267 (60-470)</td>
</tr>
<tr>
<td>Ability to Void (%)</td>
<td>1</td>
</tr>
<tr>
<td>Presence of DO (%)</td>
<td>4</td>
</tr>
<tr>
<td>Total Time to Scanner (sec)</td>
<td>49 (36-61)</td>
</tr>
</tbody>
</table>

Consort Diagram at time of Submission

Baseline demographics represented in Table 1.

At strong urge to void there was neural activation in the right inferior frontal gyrus (IFG) (p<0.05), fig. 1.

At Strong urge to void, there was deactivation noted bilaterally in the:
- Thalamus
- Middle Frontal Gyrus
- Insula
- Parahippocampal gyrus
- L middle and superior temporal gyrus

During voiding initiation, activity was seen in the:
- Left angular gyrus
- Superior temporal gyrus
- IFG

Conclusions

- Baseline demographics represented in Table 1.
- At strong urge to void there was neural activation in the right inferior frontal gyrus (IFG) (p<0.05), fig. 1.
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- During voiding initiation, activity was seen in:
  - Left angular gyrus
  - Superior temporal gyrus
  - IFG

Acknowledgements

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References