RISK FACTORS FOR UNCHANGED VENTRICLES DURING PEDIATRIC SHUNT MALFUNCTION

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INTRODUCTION

- Hydrocephalus is one of the most common pediatric neurosurgical conditions
- Ventriculoperitoneal shunting remains most common method of surgical treatment
- Increased ventricular size on CT or MRI usually a indicator malfunction
- However, an estimated 10-20% of all malfunctions associated with unchanged ventricular size
- Diagnostic dilemma with prolonged workup
- Opinions vary as to the cause of symptomatic shunt failure without radiographic findings
- This multicenter case-control study aimed to identify risk factors for unchanged ventricular size

METHODS

- Retrospective 1:1 age-matched case-control study at three institutions
- Children with shunted hydrocephalus who underwent shunt revision with intraoperative evidence of malfunction
- Cases = patients with a change in the frontal-occipital horn ratio (FOR) between malfunction and baseline of < 0.05,
- Controls = FOR changes ≥ 0.05.
- Presence of infection, abdominal pseudocyst, pseudomeningocele, wound drainage, and lack of baseline cranial imaging at the time of malfunction warranted exclusion.

RESULTS

- On multivariable analysis with collinear variables removed, unchanged ventricles were associated with frontal shunt, programmable valve, non-siphoning shunt, larger baseline FOR, and no prior shunt infection

<table>
<thead>
<tr>
<th>Variable</th>
<th>Odds ratio (95% CI)</th>
<th>p-value</th>
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<tbody>
<tr>
<td>Larger baseline FOR</td>
<td>1.63 (2.49, 5.51)</td>
<td>&lt;0.001</td>
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<td>Frontal entry point malfunction</td>
<td>1.74 (1.06, 2.86)</td>
<td>0.028</td>
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<td>Malfunction valve: programmable</td>
<td>2.12 (1.06, 4.31)</td>
<td>0.019</td>
</tr>
<tr>
<td>Malfunction system: non-siphoning</td>
<td>2.00 (1.69, 4.97)</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>No prior shunt infection</td>
<td>2.34 (1.27, 4.32)</td>
<td>0.007</td>
</tr>
<tr>
<td>First shunt malfunction</td>
<td>1.37 (0.83, 2.24)</td>
<td>0.215</td>
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CONCLUSION

Children with a frontal shunt, programmable valve, non-siphoning shunt, baseline large ventricles, and no prior shunt infection were more likely than others to have unchanged ventricles at shunt failure.

REFERENCES

- Multiple surgeons performed the operations.
- Thresholds for surgical revision may have varied, which was mitigated by documented catheter or valve malfunction and replacement in the operative report.
- May be some variables with high degrees of freedom that are underpowered.
- Patients may have ventricular change in third or fourth ventricles that would misclassify them as unchanged ventricles (used FOR).
- Many people were involved in measuring FOR, increasing variability.

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