

Oral Presentation

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## Outcome predictors in patients with normal pressure hydrocephalus: Preston NPH study – preliminary results from the first year

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from 48th Annual Meeting of the Society for Research into Hydrocephalus and Spina Bifida  
Dublin, Ireland, 23–26 June 2004  
Published: 23 December 2004

Cerebrospinal Fluid Research 2004, 1(Suppl 1):S15 doi:10.1186/1743-8454-1-S1-S15

This article is available from: <http://www.cerebrospinalfluidresearch.com/content/1/S1/S15>

### Clinical background

Despite our advances in investigation and our knowledge of the disease over the years, the postoperative results of shunt implantation in patients with Normal Pressure Hydrocephalus (NPH) have not improved significantly. Reliable predictors of the course of the disease need to be identified. In the Preston NPH study we are trying to identify these factors, which are simple, reliable, cost-effective and reproducible in a prospective research.

### Materials and Methods

Criteria for inclusion were 2 or more clinical symptoms of the classical triad for more than 6 months and a CT/MR scan finding consistent with normal pressure hydrocephalus. Exclusion criteria were defined. Figure 1 gives an evaluation algorithm. Table 1 describes with various tests used. Codman Programmable shunts were used and pressure set at opening pressure. Follow-up of the patients was carried out on all patients irrespective of treatment (Fig. 2).

### Results

44 patients were referred for assessment but only 36 met our criteria. 16 were shunted and 15 were not shunted. Average age was 77 years. 73% had Rout more than 12 mmHg/ml/min. Overall, lumbar drain did not significantly alter the performance of patients on the MMSE ( $F(1,28) = 1.7$ , ns) or the verbal fluency test ( $F(1,28) = 0.06$ , ns). However, lumbar drain significantly improved scores on the clock drawing task from 5.2 to 6 ( $F(1,28) = 6.8$ ,  $P < 0.02$ ). Overall, lumbar drain did not significantly alter the performance of patients on the time taken to walk 10 m ( $F(1,28) = 0.03$ , ns), or the time taken to turn 360 degrees ( $F(1,28) = 1.6$ , ns). However, lumbar drain

significantly decreased the number of steps taken for the 10 m walk from 36 to 28 ( $F(1,28) = 4.8$ ,  $P < 0.05$ ). Similarly, the number of steps taken for the patients to turn 360 degrees also decreased from 8 to 5 ( $F(1,28) = 11.1$ ,  $P < 0.01$ ).

There were no significant differences between patients selected for shunts and those not on any of the neuropsychological tests or gait assessments. Patients selected for shunting showed a significant increase in number of words generated in the verbal fluency FAS task following

Table 1

Neuropsychological test:

1. NART – premorbid IQ
2. BDI – screen for depression
3. MMSE
4. Verbal fluency
5. Clock drawing test
6. CANTAB:
  - a. Motor screening
  - b. Pattern recognition
  - c. Spatial recognition memory
  - d. Spatial span
  - e. ID/ED attentional set shifting
  - f. Reaction time

Gait assessment:

- 10 m walking-time/steps
- 360° turn-time/teps

Nursing assessment:

- Interaction
- Family feedback
- Incontinence Pads
- Feeding

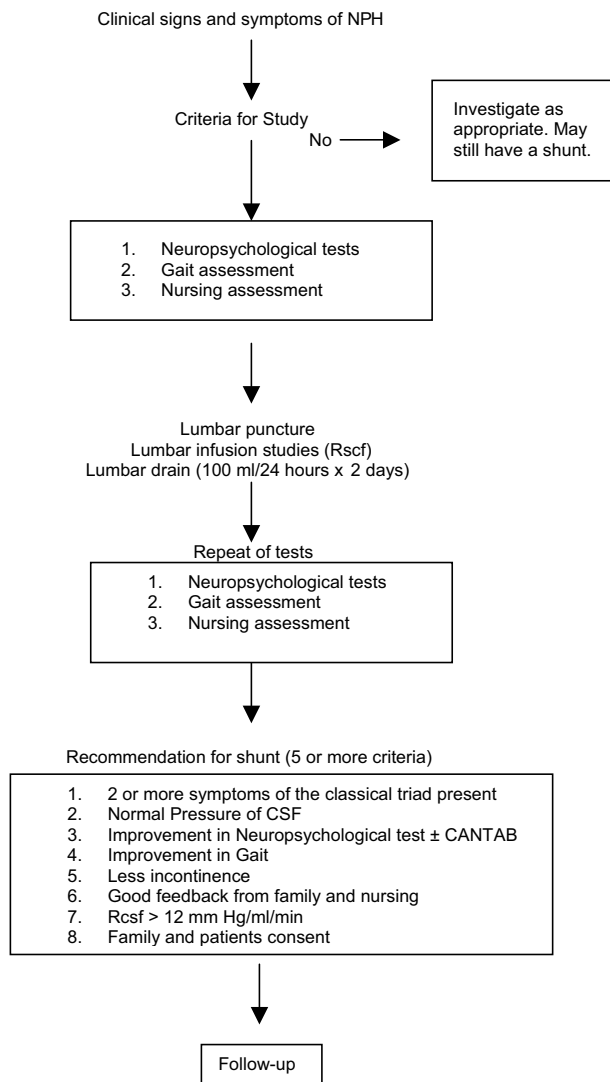


Figure 1

lumbar drain from 24 to 35, whilst those who were not selected actually showed a small decrease from 32 to 29 ( $F(1,28) = 10.1, P < 0.01$ ). Only one patient developed meningitis, two had chronic subdural and one had a shunt revision. Outcome is measured with QOL scores (SF-36, EURO-QOL).

**Conclusion**

Lumbar drain improves test performance on the clock drawing task whilst also improving gait. Verbal fluency (FAS) task appeared to selectively improve following lumbar drain in those selected for shunts. There were no overall differences in the neuropsychological or gait performance in the patients selected for shunts and those

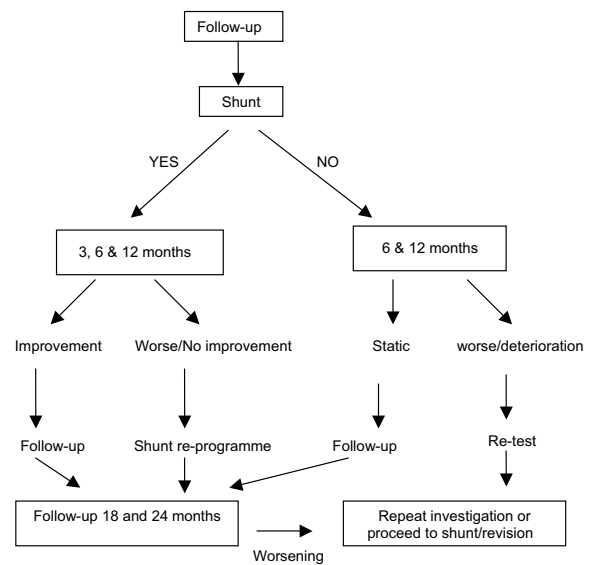


Figure 2

who were not. Rout > 12 mmHg/ml/min and drainage test predict a positive outcome. Clearly these conclusions must be interpreted with some caution as the sample size is limited and no follow up results are included. These indicate that administering one single test may not be useful in assessing suitability for shunting. However, further assessments need to be undertaken before any firm conclusions can be reached. We plan to recruit and follow up our patients for at least 2 years.

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