



Ventricular Size and Executive Functioning Outcome in Endoscopic Third Ventriculostomy.

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Learning Objectives

To gain a better understanding of the relationship between ventricular size and executive functioning.

To gain a better understanding of the potential long term neurocognitive impact of ETV intervention.

Study Rationale and Aim

Endoscopic Third Ventriculostomy(ETV) has become the primary treatment for aqueductal stenosis hydrocephalus.

While research suggests surgical advantages, the potential for continued ventriculomegaly raises concerns regarding cognitive outcome.

Specifically, ongoing ventriculomegaly may result in greater frontal executive dysfunction post intervention.

In the current study we examined the relationship between ventricular size and executive performance in patients post ETV.

We hypothesized that the larger ventricular size seen in ETV will result in reduced performance on executive tasks.

Methods

Participants: Ten post-ETV hydrocephalus patients, neurologically stable one year post surgery.

Ventricular Cortex Ratio calculated as the maximal frontal–ventricular width divided by the cortical width on the same slice at the same anterior–posterior level of MRI/CT scans.

Test Battery: The Wechsler Test of Adult Reading (WTAR); The Repeatable Battery for Neuropsychological Status (RBANS), Trail Making Test (TMT), Stroop Color Work Test (SCWT) and Delis Kaplan Executive Function System (DKEFS)\_Sorting Test

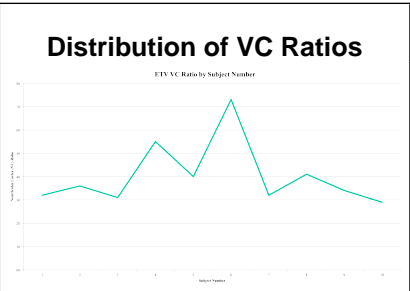
Mood Assessment:Beck Depression Inventory, 2nd edition (BDI-II) and the Symptom Checklist, revised (SCL-90-R)-Anxiety Scale

Statistical Analysis: Pearson correlations were conducted between tests and VC ratios.

Results

| Demographics        |        |               |               |               |
|---------------------|--------|---------------|---------------|---------------|
|                     | N size | Minimum Value | Maximum Value | Mean (Sd)     |
| Age                 | 10     | 17            | 58            | 37.71 (14.17) |
| Education           | 10     | 9             | 18            | 13.30 (3.47)  |
| Premorbid Intellect | 6      | 77            | 119           | 97.33 (16.72) |
| VC Ratio            | 10     | 0.29          | 0.73          | 0.40 (0.14)   |
| Depression          | 10     | 3             | 30            | 13.30 (9.44)  |
| Anxiety             | 8      | 44            | 68            | 57.13 (9.64)  |

Note. Scores on intellect are presented as standard scores; standard deviation in parentheses; depression is measured by the BDI-II; anxiety is measured by the SCL-90-R.



| Results on RBANS |               |                   |         |
|------------------|---------------|-------------------|---------|
|                  | Mean (Sd)     | r (with VC Ratio) | p-value |
| RBANS Total      | 85.10 (15.74) | -0.582*           | 0.04    |
| ImMem            | 92.10 (13.63) | -0.147            | 0.34    |
| List             | -0.63 (1.03)  | -0.287            | 0.21    |
| Story            | -0.25 (0.79)  | -0.106            | 0.39    |
| VisCon           | 87.00 (17.28) | -0.672*           | 0.02    |
| Figure           | -2.09 (3.50)  | -0.762**          | 0.005   |
| Line             | -0.37 (1.30)  | -0.466            | 0.09    |
| Att              | 85.90 (20.17) | -0.620*           | 0.03    |
| Digit Span       | -0.69 (0.88)  | -0.073            | 0.42    |
| Coding           | -1.14 (2.20)  | -0.846**          | 0.001   |
| Lang             | 97.50 (13.82) | -0.438            | 0.10    |
| Name             | 0.36 (0.56)   | 0.042             | 0.45    |
| Fluency          | -0.18 (1.39)  | -0.414            | 0.12    |
| DelMem           | 82.60 (20.11) | -0.336            | 0.17    |
| List Recall      | -1.17 (1.35)  | -0.703*           | 0.01    |
| List Recog       | -1.04 (2.21)  | -0.038            | 0.46    |
| Story Recall     | -0.90 (1.41)  | -0.451            | 0.10    |
| Figure Recall    | -1.31 (1.95)  | -0.658*           | 0.02    |

Note. RBANS index scores presented as standard scores; RBANS subtest scores presented as z-scores; standard deviation in parentheses; Middle column presented as Pearson Correlations (r); p-values are one-tailed, \*p<0.05, \*\*p<0.01.

| Results on Other Executive Measures |               |                   |         |
|-------------------------------------|---------------|-------------------|---------|
|                                     | Mean (Sd)     | r (with VC Ratio) | p-value |
| Trails A                            | 44.70 (13.07) | -0.926**          | 0.00    |
| Trails B                            | 39.50 (21.49) | -0.650*           | 0.02    |
| SCWT-W                              | 44.70 (13.82) | -0.898**          | 0.00    |
| SCWT-C                              | 38.00 (12.48) | -0.814**          | 0.002   |
| SCWT-CW                             | 42.90 (14.34) | -0.642*           | 0.02    |
| SCWT-I                              | 47.00 (9.71)  | -0.064            | 0.43    |
| DKEFS SorCor                        | 43.3 (10.2)   | -0.697*           | 0.01    |
| DKEFS SortFree                      | 45.6 (10.4)   | -0.582*           | 0.04    |
| DKEFS SortRec                       | 43.8 (12.7)   | -0.627*           | 0.03    |
| DKEFS Compr                         | 45.1 (11.8)   | -0.463            | 0.09    |

All measures are presented as T scores; p-values are one-tailed, \*p<0.05, \*\*p<0.01.

Significant correlations were found between the V/C ratio and several executive functioning tasks including: RBANS total r=-0.582, p=.04; Figure Copy r=-.762, p=.005, Coding r=-0.846, p=.001, List Recall r=-0.703, p=.01,

Figure Recall r=-0.658, p=.02, Visuospatial / Constructional r=-0.672, p=.02, Attention r=-0.620, p=.02, ; TMT-A r=-.926, p=.000, TMT-B r=-.650, p=.021; SCWT-W r=-0.898, p=.00, SCWT-C r=-0.814, p=.002, SCWT-CW r=-.642, p=.023; DKEFS Free Sort r=-.697, p=.013; DKEFS Description Sort r=-.582, p=.039; DKEFS Sort Recognition r=-.627, p=.026].

Discussion

While ETV may result in better surgical outcome (Kulkarni et al., 2000), these data suggest that ongoing ventriculomegaly may hinder executive functioning.

Specifically, the present exploratory data revealed that ventricular size negatively correlated with performance on measures of processing speed, sustained attention, mental flexibility, problem solving, and planning skills.

The pressure on surrounding frontal networks and white matter tracks may explain this relationship.

Limitations of this study include small sample size.

References

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