ANALYSIS OF INTELLIGENCE WECHSLER SCALES IN PEDIATRIC BRAIN TUMORS: INFLUENCE OF CLINICAL VARIABLES IN SUBTESTS

Badal, MD*; Bernabeu, J**; Cañete, A**; Barahona, A***; Suarez, J.M.****; Alvarez-Garijo, J*****; Castel, V**
*Radiotherapy, **Pediatric Oncology and *****Neurosurgery Units. "La Fe" Hospital, Valencia, Spain
***AECC. ****Research methods and diagnostic in education-Universitat de València

Objectives of the Study:

In our study about cognitive sequelae in brain tumor survivors, we try to find out specific features in intelligence quotient (IQ) Wechsler scale subtests in relation to clinical variables. Our objective is to define the subtest sensitivity in different situations.

Method:

A/Subjects: 91 patients from 1990 to 2002 were prospectively assessed on intelligence with WPPSI, WISC-R and WAIS-III, according to age.

B/Variables: age at diagnosis/radiotherapy/evaluation, time since radiotherapy, diagnosis, location, acute complications, motor handicap, sensorial handicap, hormonal disturbance, hydrocephalus, shunt, hemisphere, phase and type of treatment.

C/Procedure: data about disease characteristics and treatment were collected from clinical records. The assessment of IQ variables was carried out in established visits applied by psychologists.

D/Analysis: Univariate analysis (ANOVA) was performed (SPSS 11.5)

Results. Frequencies of the clinical variables

Sex	91 children, 46 Boys (50.5%) and 45 girls (49.5%)
Histology	28 PNET (31%), 9 optic pathway (10%), 36 other gliomas (40%), 3 Hypophysis (3%), 3 germ cell (3%), 4 ependymoma (4%), 4 no SNC tumor (4%), 4 non malignant (4%)
Location of the tumor	39 Supratentorial (43%), 41 Infratentorial (45%), 7 brainstem (8%), 4 others (4%)
Acute complications	19 yes (21%), 62 no (68%)
Motor handicapped	33 yes (36%), 58 no (64%)
Sensorial handicapped	36 yes (40%), 54 no (59%)
Hydrocephalus	50 yes (55%), 39 no (43%)
Shunt	41 yes (45%), 47 no (52%)
Hemisphere	29 right (32%), 24 left (26%), 21 Both (14.), 13 other (14%)
Cranial radiation	29 yes (32): 6 <35Gy (7%), 14 35Gy (15%), 6>35Gy (7%)
Local radiation	47 yes (52%): 19 <55Gy (21%), 27 >=55 Gy (59%)
Treatment	5 Chemotherapy (7%), 5 Radiotherapy (6%), 27 Surgery (30%), 3 Ch+Rt (3%), 5 Ch+Sur (6%), 16 Rt+Sur (18%), 25 Ch+Rt+Sur (28%), 6 transplanted (7%)

Differences* among groups in clinical variables through subtests and IQ's

	Verbal						Performance								Scores			
	Information	Similarities	Arithmetic	Vocabulary	Comprehension	Digit Span	Pict complete	Pict arrangement	Block design	Obj assembly	Coding	Mazes	Matrix	Verbal IQ	Performance IQ	Total IQ	V-P Discrepancy**
Age at diagnosis							x	x		x						x	
Age at radiotherapy										x							
Time since radiotherapy	x		x	x	x			x	x	x	x			x	x	x	
Diagnosis	x		x		x						x			x		x	
Localization			x											x			
Acute complications											x	x					
Motor handicap			x		x		x	x	x	x	x	x			x	x	
Sensorial handicap											x						x
Hormonal disturbance			x		x			x			x			x	x	x	
Hydrocephalus											x						
Shunt	x			x			x	x		x	x			x	x	x	
Phase									x				x				
Cranial Radiation	x	x	x	x	x		x	x	x	x	x	x		x	x	x	
Local radiation			x	x			x	x		x	x			x	x	x	
Local dose	x	x	x	x	x				x					x	x	x	
Chemotherapy			x				x			x							
Surgery		x	x		x									x			
Transplant							x	x		x	x		x		x	x	x
Treatment			x		x					x	x						

*Statistically significant differences p< .05. **More than 15 points

Digit Span is the only subtest that doesn't show differences among groups.

The difference between Verbal/Performance IQ is only statistically significant in patients with motor handicap or sensorial handicap or transplanted ones.

Verbal IQ discrepancies (>15 points,) are more common (66%) than Performance IQ ones.

Arithmetic, Coding and Object Assembly discriminate better among groups in nearly all variables controlled.

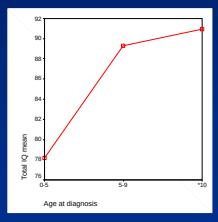
On the contrary, Similarities and Vocabulary discriminate worse. Half of the patients (54%) had Performance, Verbal and Global IQ below the mean.

Results:

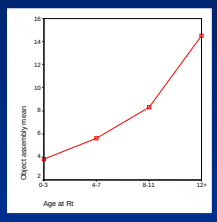
All variables included in the study show significative differences among groups except hemisphere, cranial dose and age at evaluation.

The most important ones lowering punctuations are: early age at diagnosis, early age at radiotherapy, 1 year after radiotherapy, cerebellum, PNET, holocranial radiation in comparison to local, high local dose.

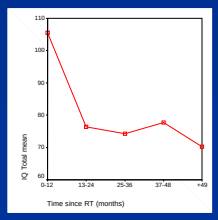
Early age at diagnosis



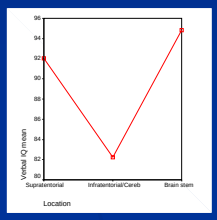
Early age at radiotherapy



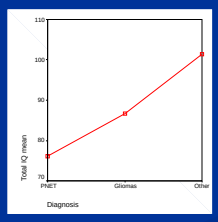
1 year after radiotherapy

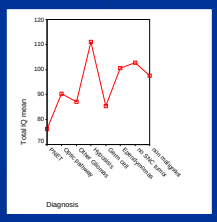


Cerebellum location

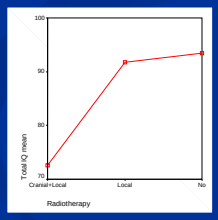


PNET

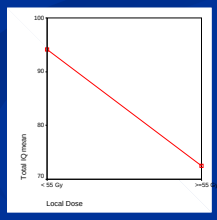




Holocranial radiation in comparison to local



High local dose



Conclusions:

1. Nearly all the variables controlled have been useful to detect differences among groups, specially Object Assembly and Coding. Differences in Object Assembly can be explained by deficits in visual memory while differences in Coding can be explained by a general disturbance (lowering of the mental process speed).

2. Different subtest patterns seem to appear with different clinical variables, specially in the Performance Scale. A deeper analysis is necessary to clarify the subtests structure among clinical variables.

3. Performance IQ subtests have showed better discrimination among groups. In our patients, the difficulties in Performance tasks (new to them) reflect a loss in their ability to achieve new tasks. Verbal tasks are better preserved and the last skills to disappear. We observe a tendency to preserve the prior learned tasks.

4. No differences between local radiotherapy and no radiotherapy groups have been found.

5. We observe a pattern in these children that is concordant with The Nonverbal Learning Difficulties (NLD) Syndrome (Rourke) and it explains the results presented in this work. The white matter model of NLD can explain the effects of radiotherapy in the long myelinated fibers which can be underdeveloped, damaged or dysfunctional.

6. We will develop a neuropsychological rehabilitation program based in this hypothesis and the deeper analysis performed after this work.