Neurootological Aspects of Presbyvertigo

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Abstract:
Old-age vertigo nowadays is much related to a combination of multisensorial deficits in humans. Thus old-age patients are suffering from communication deficits as well as organizational deficits in their personal life. For investigational reasons, we have investigated especially patients above the age of 60 years. They were neurootological patients coming to see our service in a neurootological laboratory in combination of the University of Würzburg and the Institute for the Investigation of Taste, Smell, Equilibrium and Hearing Deficits (4-GF) at Bad Kissingen. Especially, we have built up a sample of patients between 61 and 70 years of age, which we have compared to the full sample of 10,335 patients of all the 10 decades. The analysis of the statistical evaluation over groups of neurootological patients shows an elevated symptomatology with respect to the rocking vertigo, the falling tendency and especially the instability. The subjective findings are compared with the objective neuro-otometric results by testing the patient with electronystagmography, calorization, per- and postrotatory nystagmus and vestibular spinal tests like the standing and stepping test recorded by the Cranio-Corpo-Graphy. The results lead to the conclusion that it is well proved that the objective and quantitative tests can steer a neurootological differential therapy on the basis of indicators for selecting special pharmacotherapies and physiotherapies.

Key words: Presbyvertigo, presbynausea, presbydystaxia, neurootological diagnosis, equilibriometry, special pharmacotherapy, customized vestibular rehabilitation program

Introduction:

The data used for this study are taken from a sample of the German population under the name of “NODEC IV”, which means a neurootological databank from patients complaining of disturbances of their cranial senses including a major sample of normal persons. The neurootological databank comprises 10,335 persons of both genders and all the 10 decades of life. 56,15 % are males and 43,77 % are females (The sum of the percentage of two genders amounts to 99,92 %. This means that, in a few cases, it could not be decided by the name reported in the files whether the person was male or female).

Material & Methods:

During the last decades we have studied many neurootological patients according to a combined scheme of history taking, inspection and neuro-otometric investigations.

This was performed within our group at geographically different locations, like for instance in Budapest, Hungary, in Würzburg, Germany, in Bad Kissingen, Germany, in Porto, Portugal, etc.
When talking about presbyvertigo, the related period of life the presbyvertigo arises at the decade of retirement. The decade of retirement this lies between 61 and 70 years of age. Therefore, we have compared the all-over statistics with a group of persons between 61 and 70 years of age, which in total comprises 1,033 persons, of which 49,47 % are male and 50,53 % are female. Thus, the genders are equally distributed in this sample.
All the patients were submitted during their investigations to a systematized history of the type NODEC (Claussen). When following this type of exploration, we have compared the amounts of positive answers to the different questions.

For the statistical analysis we are using a material being available at the 4GF-Institute Bad Kissingen, Germany. The neurootological patients belong to both genders and many decades of life.

The neuro-otometric investigations, which were individually applied, follow the scheme:

1. ENT inspection
2. Systematic history questionnaire NODEC
3. Polygraphic ENG
4. Simultaneous ECG
5. Caloric Butterfly-test
6. Rotatory Intensity Damping Test (RIDT)
7. Vestibular Stimulus Intensity Comparison (VESRIC)
8. Cranio-corpo-graphy (CCG)
9. Standing-test (Romberg)
10. Stepping-test (Unterberger-Fukuda)

All the tests were objectively and quantitatively evaluated. The data were transferred into a spreadsheet of Microsoft Excel.
Based on this array of digital data about our patients we performed various statistical analysis for obtaining answers to our different clinical questions.

Results:

Our digital data store was built up as described above. During the following description of the results, the output was limited to the questions in relation to the topic of this paper.

With respect to the systemic vertigo symptoms, we found the following distributions:

Table 1: Vertigo symptoms

Symptoms	NODEC IV (10,335 = 100 %)	Age group 61-70 (1,033 = 100 %)	Δ Observations % NODEC - % 61- 70 years
Rocking vertigo	39.11	49.61	-10.50
Lifting sensation	5.30	5.16	0.14

Rotating vertigo	35.90	35.21	0.69
Falling tendency	19.70	24.51	-4.81
Blackout	19.75	19.55	0.20
Instability	35.25	45.04	-9.97

The variation of this table shows that the group of the retirees significantly shows an elevated symptomatology with respect to the rocking up and down vertigo, the falling tendency and especially the instability. Thus, it can already be concluded from this statistic, that older persons will be more careful in their movements, for instance, by walking around the house or in the streets, as they feel instable, the world seemingly goes up and down like the rocking on a boat, and they are afraid of falling hazards.

We then compared the vegetative aetiology, which is also called nausea, in the two groups. The results and the differentiations are shown in Table 2.

Table 2: Nausea symptoms

Symptoms	NODEC IV (10,335 = 100 %)	Age group 61-70 (1,033 = 100 %)	∆ Observations % NODEC - % 61- 70 years
Increased Sweating	11.89	12.17	-0.28
Malaise	30.11	32.13	-2.20
Retching	3.71	3.02	0.69
Vomitus	15.15	16.55	-1.40
Collapse	5.82	7.50	-1.68

From Table 2, it can be concluded that the group of the retirees in comparison to the total sample is not as big as it has been in the group of pure vertigo symptoms. However, we find a tendency towards an increased symptomatology in the group of retirees with most of the differences in malaise, vomitus and collapse. Table 3 exhibits the vertigo releasing factors in comparison of the two samples.

Table 3: Vertigo releasing factors

	NODEC IV (10,335 = 100 %)	Age group 61-70 years (1,033 = 100 %)	∆ Observations % NODEC - % 61- 70 years
Travelling by car	4.46	4.71	0.75
turning the head	24.22	27.2	-2.98
bending down	23.46	25.15	-1.69
getting up	36.45	43.25	-6.80
quick gaze movements.	6.85	8.51	-1.66

All in all, table 3 exhibits that the vertigo releasing factors are active in all the events described for releasing vertigo attacks. This means, that there is more of a sensibility towards vertigo attacks in the concentrated older group of retirees.

When questioning ”How long does a vertigo disease last in the different patient groups?”, we find the following distribution between the two samples:

Table 4: Duration of vertigo disease

	NODEC IV (10,335 = 100 %)	Age group 61-70 (1,033 = 100 %)	Δ Observations % NODEC - % 61- 70 years
Days	4.36	2.95	1.41
Weeks	10.12	10.43	0.31
Months	17.01	18.09	-1.08
Years	34.95	40.20	-5.25
Decades	2.52	4.03	-1.51

From Table 4, it can be concluded that the vertigo disease significantly lasts longer in the age group of retirees between 61 and 70 years. On the other side, we find more indications for short vertigo disorder in the total group “NODEC IV” with much younger members.

We also have explored the patients for the duration of the single vertigo attack. The data are displayed in Table 5.

Table 5: Duration of single vertigo attack

	NODEC IV (10,335 = 100 %)	Age group 61-70 (1,033 =100 %)	Δ Observations % NODEC - % 61- 70 years
Seconds	34.95	39.25	-4.30
Minutes	25.73	30.32	-4.59
Hours	10.67	12.17	-1.50
Days	3.84	4.51	-0.67
Weeks	0.42	0.39	0.03
Months	0.36	0.49	-0.13
Equally long lasting	5.43	7.16	-1.73
Undulating long lasting	4.79	5.4	-5.61

Time measurements and estimations of the durations of the single attacks are more frequently found in the group of retirees with a tendency to shorter vertigo attacks, which only last seconds (-4.30 %) or minutes (-4.59 %). Patients who cannot estimate in calendar extensions of their disorders, are telling us more frequently about an equally long lasting vertigo, which, however, occurs more frequently in the age group of 61 to 70 years.

The vertigo complains frequently are combined with visual disturbances. Therefore, we have evaluated in Table 6 the different symptoms for visual deficiencies.

Table 6: Visual disturbances

	NODEC IV (10,335 = 100 %)	Age group 61-70 (1,033 = 100 %)		Δ Observations % NODEC - % 61- 70 years
Loss of visual acuity	50.13	74.10		-23.97
Double vision	4.39	4.40		-0.01
Oscillopsia with blurred vision	2.99	4.11		-1.12
Oscillopsia with jerking movement	0.73	1.73		-0.64
Amaurosis	1.30	1.66		-0.36
General oscillomotor oscillopsia	10.51	11.83		-1.37

When summing up all the phenomena with oscillopsia, we find many occurrences related to subjectively perceived ocular movements disturbing the vision process. Thus, these movement-related optical disturbances sum up to a difference of 3.8 % between the two samples. This then shows that the vertigo in the older group of the retirees is much combined with active motor disturbances introduced into the visual process.

In Table 7, we have brought the data together about subjective hearing disturbances.

Table 7: Hearing disturbances

	NODEC IV (10,335 = 100 %)	Age group 61-70 (1,033 = 100 %)	Δ Observations % NODEC - % 61- 70 years
Tinnitus	44.80	52.72	-7.92
Hearing loss	53.27	68.45	-15.18
Deafness	8.23	9.13	-0.90

This table shows that the older group of the retirees at the age between 61 and 70 significantly suffer from subjective ear noise (tinnitus) as well as from subjective hearing loss.

Concerning the underlying disorders, we have investigated the amount of head and neck trauma in the different samples. The data are shown in Table 8.

Table 8: Head and neck trauma

Head trauma due to	NODEC IV (10,335 = 100 %)	Age group 61-70 (1,033 = 100 %)	Δ Observations % NODEC - % 61- 70 years
Traffic accident	13.71	11.13	2.58
Working hazard	7.23	7.19	0.04
Sports accident	2.24	1.08	1.16
Home accident	6.24	7.00	-0.76

Table 8 describes the underlying background pathology due to accidents. It exhibits that the frequency of accidents is found rather in the total NODEC IV group than in the retirees.

The important background conditions for releasing vertigo are the different cardiac and vascular disorders. They are exhibited in Table 9.

Table 9: Cardiac and vascular disorders

	NODEC IV (10,335 = 100 %)	Age group 61-70 (1,033 = 100 %)	∆ Observations % NODEC - % 61- 70 years
Hypertension	13.13	22.00	-8.87
Hypotension	24.92	20.04	4.88
Atherosclerosis	0.74	2.06	-1.32
Cardiac insufficiency	9.65	22.30	-12.65
Myocardial infarction	1.33	2.75	-1.42
Period up to 1 year after myocardial infarction	0.46	0.30	0.16
Period larger than 1 year after myocardial infarction	1.116	2.66	-1.50

All in all, it can be concluded from Table 10 that the older group of the retirees suffers much more from cardiovascular disorders than the total sample of NODEC IV.

The most prominent complaints are hypertension with a difference of 8.78 % and cardiac insufficiency with a difference of 12.65 %. On the other hand, the younger group of total sample NODEC IV exhibits 4.88 % more cases with hypotension or low blood pressure. A very important metabolic disorder falls into the group of diabetes mellitus. The diabetes cases are described in table 10.

Table 10: Diabetes mellitus

	NODEC IV (10,335 = 100 %)	Age group 61-70 (1,033 = 100 %)	∆ Observations % NODEC - % 61- 70 years
Diabetes mellitus as such	5.16	12.91	-7.76
Diabetes mellitus with diet treatment	0.75	1.79	-10.4
Diabetes			

mellitus with oral treatment	0.88	2.59	-1.71
Diabetes mellitus with insulin treatment	0.31	0.70	-0.39

It can be concluded from table 10 that the complaint of a metabolic disorder of the type of diabetes mellitus is significantly elevated in the group of retirees. Among the different forms of treatment, we find a maximum description in the oral treatment with antidiabetic drugs.

Table 11 characterizes the sample by quantitative parameters:

Table 11: Quantitative parameters

	NODEC IV (10,335 = Mean)	NODEC IV Standard deviation	Age group 61-70 (1,033 = Mean)	Age group 61-70 Standard deviation	∆ Mean
Age (year)	42.56	17.46	64.77	2.76	-22.20
Height (cm)	168.10	11.35	166.00	9.45	2.07
Weight (kg)	69.96	13.45	70.41	12.30	-0.45

Table 11 exhibits that the physical parameters like height and weight are very similar between the two samples. However, the average age of the group of NODEC IV is 22.21 years lower than the average age of the group of retirees. So, this describes that the main age distribution of the group NODEC IV with 42.56 ±17.46 years is lying in the best-working age of the German population. Whereas the other group with a mean age of 64.77 ±2.76 years exhibits the characteristics of sample in the process of retiring from work.

Here, it also has to be mentioned that the 1,033 cases of the age group of 61 till 70 years has been extracted from the total sample of NODEC IV with 10,335 patients. This shows that the amount of the patients between 61 and 70 years makes up 10 % of the total sample of NODEC IV. Of course, therefore, we have to see that there is a certain amount of overlap between the two samples we have in the focus of our investigations.

Table 12 shows the different patterns of blood pressure behaviour in the two samples.

Table 12: Blood pressure behaviour

	NODEC IV (10,335 = Mean)	NODEC IV Standard deviation	Age group 61-70 (1,033 = Mean)	Age group 61-70 Standard deviation	∆ Mean
Systolic blood pressure (mmHg)	136.10	28.47	154.00	29.40	-17.90
Diastolic					

blood pressure (mmHg)	85.33	16.22	87.15	12.40	-1.82

Table 12 therefore shows that the expected elevation of the blood pressure values in an age group of 22 years older than the group of NODEC IV is to be found. It is not exorbitant but still significantly to be seen more for the systolic blood pressure than for the diastolic blood pressure.

Among the quantitative parameters, we investigate the electrocardiogram during the nystagmus measures of spontaneous, caloric, perrotatory and postrotatory nystagmus. The electrocardiogram was evaluated with respect to the cardiological beat rates during the culmination phases of the central nystagmus over half a minute or 30 seconds. There we find the following relations as shown in table 13.

Table 13: Heart beat rate/minute (ECG)

	NODEC IV (10,335 = Mean)	NODEC IV Standard deviation	Age group 61-70 (1,033 = Mean)	Age group 61-70 Standard deviation	∆ Mean
lying silently in supine position	79.74	14.28	76.58	13.5	3.16
44° caloric test culmination phase	79.14	14.47	76.16	13.30	2.98
30°R-beating nystagmus culmination phase	79.11	15.06	76.05	14.70	3.06
44° L-beating nystagmus culmination phase	79.13	14.78	76.04	13.30	3.09
30° L-beating nystagmus culmination phase	79.26	14.62	75.93	13.80	3.33
right perrotatory nystagmus culmination phase	77.12	14.43	72.77	12.70	4.35
left perrotatory nystagmus culmination phase	77.59	14.16	73.39	12.20	4.20
right-beating postrotatory nystagmus 30 seconds	78.92	14.43	74.04	12.70	4.88
left-beating					

postrotatory nystagmus 30 seconds	79.15	14.43	74.50	11.60	4.65
In sitting position at the rotatory chair	77.47	13.67	73.63	12.80	3.84

When regarding table 13 with the different reactions of the heartbeat rate, we find out that the heartbeat rate is more active in the total sample with a medium age lying 22 years below the age group of the retirees. That holds for all the series of tests which we have undertaken.

In a cross analysis attempt, we have made available the data of the most important vertigo symptoms: rocking vertigo and instability, which seemingly occur more frequently in the old-age group of the retirees. For showing the quantities of patients in our total sample of NODEC VI with 10,335 patients, we have brought together the amount of patients with respect to number of sex and age in Table 14.

Table 14a: Identification criteria of the samples

	NODEC IV n	NODEC IV %	Rocking vertigo - n	Rocking vertigo - %	Instability - n	Instability - %
Total samples	10,335		10,375		3,287	
Male	5,803	56.15	1,884	53,73	1,678	51,00
Female	4,524	43,77	1,689	47,27	1,609	48,95

Table 14b: Quantitative reminders concerning the different samples

	NODEC IV - Mean	NODEC IV - Standard deviation	Rocking Vertigo .- Mean	Rocking Vertigo – Standard deviation	Instability .- Mean	Instability – Standard deviation
Age	42.56	± 17.46	46.96	± 15.02	47.76	± 14.66
Height	168.09	± 11.35	167.92	± 10.58	167.73	± 10.64
Weight	69.96	± 13.54	70.47	± 12.60	70.43	± 12.60
Systolic blood pressure	136.11	± 28.47	138.70	± 28.05	140.01	± 29.51
Diastolic blood pressure	85.33	± 16.22	84.82	± 14.05	87.23	±16.71

When comparing the age distributions of the two samples with significant symptoms like rocking vertigo, instability, we find that, all in all, the group suffering from rocking vertigo has a mean age which is elevated by 4.4 years with respect to the totals sample of NODEC IV. However, the significant symptom of instability already has an increase of the mean age of 5.20 years, whereas the difference between the two samples suffering from rocking vertigo and instability is less than one year. Thus, it can be concluded that rocking vertigo and a subjective feeling of instability in relation with vertigo occurs in an elevated age above the mean age of 42.56 years in the total sample of NODEC IV. However, it can be deduced from these data that this specific

symptomatology of old age, vertigo occurs mainly beyond the middle of the 5th decade, which is 46.96 years in rocking vertigo and 47.76 years in instability.

It is well known that the age point of 49 years defines already the height of the human functional abilities; thereafter, most of the humans start a soft landing on decay in the direction the old age and retirement.

When comparing the values of the blood pressure in the three samples, it can easily be found that the blood pressure is most elevated in the group suffering from the sensation of instability. The blood pressure with its systolic component is 3.90 millimetres of mercury elevated in the instability group with respect to the NODEC IV group, and there, it is also elevated by 1.31 millimetres of mercury with respect to the group with the rocking sensation. We have even more of elevation of the diastolic blood pressure in the difference between rocking and instability, where the instability group shows exhibits 2.41 millimetres of mercury elevation of the diastolic blood pressure with respect to the group of rocking sensation. The rocking sensation as such in comparison to the whole sample of NODEC IV, however, is slightly diminished by 0.51 millimetres of mercury.

As these samples are sufficiently big, there can be found a trend which shows that the first step of blood pressure elevation, together with elevation of the symptom of vertigo of the rocking and the instability type, is rising.

The neurootological history NODEC allows to uptake a whole spectrum of qualitatively different subjective impressions about vertigo. Now, it is interesting which vertigo symptoms go more or less together with the specific old age vertigo sensations of rocking and instability. The interrelations are displayed in table 15. There, we expose the percentage differences between the sensation of rocking against NODEC IV, the sensation of instability against NODEC IV, and finally the sensation of rocking with respect to instability.

Table 15: Vertigo interrelations in percent

	Differences NODEC IV – Rocking	Differences NODEC IV – Instability	Differences Rocking – Instability
Rocking	-60.89	-23.59	+37.30
Lifting sensation	-2.26	-2.67	-0.41
Rotating vertigo	+5.74	-11.16	-16.90
Falling tendency	-12.50	-16.50	-4.00
Blackout	-7.86	-11.62	-3.76
Instability	-22.46	-64.75	-42.29

This table allows us to conclude that the sensation of rocking vertigo with respect to the total sample of NODEC IV shows much increase of falling and instability and also of blackout. The rotating vertigo seems to be interrelated to other qualities. When going for the differences of NODEC IV subtracted by the percentages of instability, we observe that instability goes much together with rocking vertigo, falling tendency, but also with blackout and, in difference to the rocking vertigo, also to rotating vertigo.

When going into the differences, the rocking vertigo subtracted by the percentages of instability vertigo, we, of course, observe a higher compartment of rocking vertigo in the positive figures and a higher one for instability. But in between, it is astonishing

that the instability prominently exhibits much more combinations with rotating vertigo.

Thus, it can be concluded from table 14 that rocking vertigo is not so highly combined with the rotating vertigo. However, the feeling of instability is interacted and connected much with rotating vertigo.

In table 16, we are analyzing the more vegetative nausea symptoms in the differentiation between the total sample NODEC IV and the specially created samples of rocking vertigo and instability.

Table 16: Nausea interrelations in percent

	Differences between NODEC IV – Rocking vertigo	Differences between NODEC IV – Instability	Rocking vertigo – Instability
Sweating	-4.51	-7.06	-2.55
Malaise	-12.11	-16.33	-4.22
Retching	-1.39	-1.90	-0.51
Vomitus	-3.94	-7.37	-3.43
Collapse	-1.81	-4.51	-2.70

It can be easily concluded by table 16 that in the field of the vegetative nausea symptoms, there are major differences between rocking vertigo as well as instability when it comes to compare the amount of malaise as the stadium before retching. Furthermore, when comparing the difference between rocking vertigo and instability, we see that most of the malaise symptoms occur in instability. The combination of the symptoms rocking vertigo and instability with interferences with the human vegetative system also can be found when looking upon the symptom of increased sweating. Both groups rocking vertigo as well as instability are significantly more combined with the symptom of sweating. However, when going into the quantitative scaling, we find that most of the sweating as well as most of the malaise occurs in the combination with the symptom of instability. In the same direction goes the symptom of vomiting. Both the subjective vertigo symptoms of rocking vertigo and instability show an elevated level of vomitus in reference to the total sample of NODEC IV. However, again, the elevation of vomitus is significantly higher in the symptom of instability. In the same direction points the symptom of vertigo-related collapse. Also this occurs significantly more frequent in the combination with a sign of instability.

All in all, it can be concluded from the tables 14, 15 and 16 that the symptoms of rocking vertigo and instability are very important indicator symptoms for old age vertigo.

In table 17, we are comparing the vertigo releasing mechanisms under the aspects of combinations with a basic vertigo symptoms rocking vertigo or instability.

Table 17: Vertigo releasing mechanisms in percent

	Differences between NODEC IV – Rocking vertigo	Differences between NODEC IV – Instability	Rocking vertigo – Instability
Car	-1.40	-2.30	-0.63

Turning the head	-14.37	-16.81	-2.44
Bending down	-11.97	-11.79	-0.18
Getting up	-20.48	-20.80	-0.32
Fast gaze movements	-3.83	-4.87	-1.04

Specially, the mechanism of getting up from a lower position is significantly increased with respect to the total sample of NODEC IV, however, nearly equally in the group of the rocking vertigo as well as in those of instability. The same holds for the mechanism of vertigo releasing by bending down. However, when looking into the mechanisms of turning the head, both groups of rocking vertigo as well as instability show an increased potential of releasing vertigo and instability. However, this is more sensitive with the higher part in the group complaining for instability. The gaze mechanism also is more active in releasing instability vertigo than rocking vertigo.

Presbyvertigo is mainly defined through the subjective complaints of our patients. However, all the samples of patients being evaluated above have been submitted to a series of neuro-otometric investigations with a monaural caloric test, which is standardized to the procedure of Claussen and evaluated by the butterfly. All the butterflies can be separated and groups into normal responses and pathological responses. When doing grossly so, we get a distribution of normal and pathological findings as shown in table 18. For sharpening the vestibular ocular neuro-otometric investigations with electronystagmography, we can combine the monaural caloric test with the binaural perrotatory test. When doing so, the perrotatory test of the so called RIDT (Rotatory Intensity Damping Test) is the stronger stimulus, whereas the caloric warm water stimulus is the weaker stimulus. When comparing these two, we can define the vestibular stimulus response intensity comparison (VESRIC). This allows describing normal behaviour, parallel inhibition or disinhibition as well as vestibular recruitment and decruitment phenomena. This test combination is also evaluated with respect to the normal responses and the pathological responses. The third neuro-otometric tool which we have applied are the vestibulo-spinal tests with the stepping procedure being recorded by means of Cranio-Corpo-Graphy and evaluated according to the four parameters longitudinal deviation, lateral sway, angular deviation and body spin. In Table 18, we compare the normal responses and the pathological responses in these quantitative neuro-otometric tests with respect to the three groups as shown below:

Table 18: Responses of neuro-otometric tests

Responses	Total sample of NODEC IV %	Total sample of rocking vertigo - %	Total sample of instability - %
Trinary coded butterfly, normal response	38.39	35.43	35.83
Pathological caloric responses	60.61	64.57	64.17
Trinary coded VESRIC normals	32.22	33.68	34.61
Pathological VESRIC	67.78	66.32	65.39
Normal stepping CCG	43.06	39.97	41.29

Pathological stepping CCG	56.94	60.03	58.71

The differences, especially in the pathological equilibriometric findings, are displayed in table 19.

Table 19: Differences in the pathological equilibriometric findings

	Differences between NODEC IV – rocking vertigo - %	Differences between NODEC IV – instability- %	Differences between rocking vertigo – instability- %
Pathological butterfly patterns	-2.96	-2.65	+0.40
Trinary VRRV pathological VESRIC	+1.46	+2.39	+0.93
Pathological step test CCG	-3.09	-1.77	+1.32

When taking together the two tables 18 and 19, we find that the caloric butterfly exhibits more pathology than in the two symptoms rocking vertigo and instability than it occurs in the total sample. All in all, however, we conclude from table 18 that all three tests demonstrate pathology in more than 60 % of the patients. The butterfly calorigram, which lies with its pathological cases at 61.61 % in NODEC IV, increases the presence of pathology in combination with both the signs rocking vertigo and instability up to 64.57 or 64.17 %.

The most sensitive tool for demonstrating pathology, however, is the VESRIC, especially in the total sample of NODEC IV, where it amounts to two thirds of the whole sample of 67.78 %, whereas the amount in the sample of rocking vertigo is slightly lower with 66.32 % and in instability with 65.39 %. The stepping CCG is pathological in 56.94 % of NODEC IV. The amount is increased most by rocking vertigo up to 60.03 % and in instability up to 58.71 %.

As we have overlaps between the tests, we reach more than 80 % of all the patients with these three tests showing deviant equilibric behaviour.

Discussion:

People suffering from equilibrium diseases mainly seek the help of their medical doctor and especially of ENT doctors and neurologists being trained in modern neurootology. The first contact of the patient goes via his anamnesis by which he describes his complaints. When using an operative map of the most various vertigo complaints, this already allows a certain grouping of the patients into different kinds of vertigo. The more concise analysis of the dysfunctions in the various equilibrium regulating pathways and circuits within the receptors in the inner ear, the 8th nerve, and the brainstem however, need a specific objective and quantitative modern investigation.

By the statistical analysis of a sample of 10,335 cases (neurootological databank NODEC), we separated by a thorough computer analysis 3,573 cases complaining,

amongst others, for rocking vertigo, and 3,287 cases complaining, amongst others, for instability.

When dealing with old age vertigo, we had to inspect a series of patients in our databank NODEC IV of the age group where humans retire from work. There, we extracted a special sample of the retirees in the age between 61 and 70 years. The mean age of the total databank NODEC IV showed that the patients have an age of 42.56 ± 17.46 years. However, the mean age of the retirees was between 64.77 ± 12.76 years. Thus, we reached populations which had a focus in within the middle of their professional lives when being 42 years old, even as the spread did not reach 60 years from there, whereas the group of retirees had a mean age of 64.77 with a spread of 2.7 years not reaching below 60 years. In the age group between 61 and 70 years, we then found the most prominent symptoms as shown in table 1 being typically rocking vertigo and instability but also rotating vertigo and falling tendency. When, however, subjecting the symptomatology of the age group 61 till 70, we came to the conclusion that the greatest differences in comparison to the basic sample of NODEC IV exist in rocking vertigo, falling tendency, and instability as shown in table 1. As show in table 9, the sample of the age group of 61 till 70 shows more pathology. This older age group has a tendency to hypertension and to elevated systolic blood pressure.

When dividing the principle sample of NODEC IV into the groups of 3,573 cases suffering from rocking vertigo and 3,287 cases suffering from instability, we find that the mean age of these patients lies significantly above the mean age of NODEC IV. The sample of rocking vertigo shows a mean age of 46.96 years and the sample of instability a mean age of 47.76 years. By studies in gerontology and so on, we know that the human efficacy starts to show a bend and decay around these ages of 47 years. However, in our old age group between 61 and 71, we are lying higher. When now comparing the various principle equilibriometric methods based upon electronystagmography, the caloric butterfly, and the Vestibular Stimulus Intense Comparison or on a head body movement control measurement based on Cranio-Corpo-Graphy, we find that in our special groups, the amounts of pathologies are elevated.

The differences in normal and pathological findings in neuro-otometry are displayed in table 20.

Table 20: Differences in normal and pathological findings

	NODEC IV - %	Age 61-70 - %	NODEC IV – old age %
Normal butterfly patterns	38.39	32.78	+5.61
Pathological butterfly	61.61	67.22	-5.61
Normal VESRIC	32.22	29.66	+2.56
Pathological VESRIC	67.78	70.34	-2.56
Normal stepping test CCG	43.06	38.60	4.46
Pathological stepping test CCG	56.94	61.4	-4.46

Table 20 comprises that the age 61 till 70 together with the old age vertigo exhibits significantly more objective and quantitative findings in their pathology. Each of the different tests amounts to more than 60 or even up to 70 %. When we get into the overlap between the different vestibulo-ocular and vestibulospinal tests, we see that it comes to approximately 90 % of pathology which is objectivated by this series of vestibulo-ocular tests.

Here, we have also to mention that, usually, we are exploring the vestibulo-ocular system not only by the two tests we mentioned here but also by the postrotatory nystagmus. Additionally, we are investigating the optokinetic retino-ocular nystagmus and the kinaesthetic responses in the differentiated systems of Cranio-Corpo-Graphy like method, for instance NEFERT.

When approaching patients suffering from old-age vertigo, we should first ask them about their rocking vertigo sensations, secondly their instability sensations and thirdly their falling tendency. We must be aware that within this group, the blood pressure has risen into the direction of hypertension.

For a first screening of the patient, the Cranio-Corpo-Graphy together with a stepping test is optimal as it does not require too much of test effort. The finer analysis then takes care of the vestibulo-ocular nystagmus and the retino-ocular nystagmus.

Conclusion:

The basis, which then is established within neurootological and equilibriometric diagnosis, is to be used with a specific differential therapy in old-age patients. This therapy is not standing alone in the mind of the neuro-otologist. He also has to look for a combination, especially with the cardiologists for solving some blood pressure problems and the gastroenterologist for solving some problems with diabetes mellitus and other metabolic disorders. Finally, also the orthopaedic surgeon should be included for treating musculoskeletal degenerations. Neurootology is always working closely together also with the psychiatrists and the neurologist.

BIBLIOGRAPHY

Anadao, C. A.; Moreira, E.; Campos. M. I.; Godoy.N. P. (1987):
Exercises of Vestibular Compensation: Neurootological Evaluation Before and After Exercises (preliminary remarks).
Proc.NES (Vol.XV,2)pp.221-223.

Aust G. (1988)
Das Nystagmussignal des alten Menschen
Proc. NES, 12/13, 29 – 41,

Aust, G., Claussen, C.F. (1975):
Über die technische Durchführung der klinischen Elektronystagmographie.
Mediz.Markt/Acta Medicotechnica,9, 282-286,

Bartual Pastor, J., N.Perez Fernandez: (1999)
El sistema vestibular y sus alteraciones. Tomo II : Patologia.
Masson S.A., Barcelona,

Bencze G., C.F. Claussen, L. Heid, M. Kersebaum, E. Nagy: (2003)
Comparing neurootological complaints in patients at the end of their professional lives (51 – 60 years) with those during the 1st phase of retirement (61 – 70 years) .
Published on the Archives for Sensology and Neurootology in Science and Practice ASN (Internet), Buenos Aires,

Bergmann J., Bertora G "Cognitive Disorders: Diagnosis and Treatment" Archives for Sensology and Neurootology in Science and Practice – ASN – Proceedings of the XXIX Congress of the NES. Bad Kissingen.Germany. 2002. ISSN 1612-3352. http//:www.neurootology.org

Bergmann J., Bertora G "Cognitive Disorders: Diagnosis and Treatment". International Tinnitus Journal, Vol.8, No 2, 104-107 (2002)

Bergmann J., Bertora G "Tinnitus Neurotopography: Pathways and Areas Studied Through Brain Electric Tomography (LORETA) "
Archives for Sensology and Neurootology in Science and Practice – ASN – Proceedings of the XXX Congress of the NES. Porto. Portugal. 2003. ISSN 1612-3352. http//:www.neurootology.org

Bertora, G.; Claussen, C.F.; Bergmann, J.; Böhm, T.; Dahinten, A.; Schneider D.: (1991)
Automatic Nystagmus Analysis on digital Computers.
Proc.14. World congr. of ORL, Kugler & Ghedini Publ., Amsterdam, Milano, New York, pg. 803 - 804,

CaovillaHH, Ganança MM, Fukuda Y, Serafini F, Ganança FF. (1994)
Tratamiento del vertigo por medio de la rehabilitación física.
An Otorrinolaringol (Mex).; 39 Supl. 6:17-8.

Claussen C,. Bertora G. Bergmann J.;Otoneurooftalmología. Modernas Técnicas Topodiagnósticas y Terapéuticas" Springer Verlag Berlin - Heidelberg Pg 1-124.1988.

Claussen C.-F. (2004)
The standing test results displayed by means of the differential HUSPATRAC®-charts.
Published on the Archives for Sensology and Neurootology in Science and Practice – ASN [Internet], Buenos Aires,

Claussen C.F., Nagy E., Bencze G., Heid L., Kersebaum M. (2003)
Vertigo and other neurootological signs in cases after apoplexia .
Published on the Archives for Sensology and Neurootology in Science and Practice – ASN [Internet] Buenos Aires,

Claussen, C F.:(1975)
Therapy of Vertigo
NES Proceedings, Volume 4, Hamburg

Claussen, C.-F. (1986)
Therapie von Schwindelzuständen - Erfahrungen mit Dimenhydrinat
Z.Allg.Med. 62, 864-869,.

Claussen, C.-F., Claussen, E.: (1986)
Vertigo, Nausea, Tinnitus and Hypoacusia in Cardiovascular diseases.
Proc.NES, (Vol.XIV)pp.43-45.

Claussen, C.F , Constantinescu, l. (1995)
Mode of Action of Antivertiginous Drugs
Proceedings - NES volume XXI, edition m+p .Hamburg, pg65-72

Claussen, C.F., von Lühmann, M (1976).:Das Elektronystagmogramm und die neurootologische Kennliniendiagnostik.
Edition medicin & pharmacie, Hamburg u.Neu-Isenburg,

Claussen, C.F.;Claussen,E.: (1991)
The Syndrome of the Slow Brainstem.
Aus:C.T.Haid - Vestibular Diagnosis and Neuro-Otosurgical Management of the Skull Base. Demeter Verlag, Gräfelfing, pg. 139 - 141,

Claussen, C.F.: (1971)Der rotatorische Intensitätsdämpfungstest und seine Auswertung mit Hilfe der L-Schemas.Arch.klin.exp.Ohr.-,Nas.-u.Kehlk.Heilk. ,197, 351-360,

Claussen, C.F.: (1973)
Butterfly vestibulometry, a practical evaluation scheme.
Equilibrium Res., 3, 80-85,

Claussen, C.F.: (1978)
Die vestibulo-spinalen Gleichgewichtsfunktionsprüfungen und ihre klinisch-praktische Bedeutung.
Verhdlg.d.GNA, Bd. VI, 1. Teil, edition medicin & pharmacie, Hamburg und Neu-Isenburg,.

Claussen, C.F.: (1981)
Cranio-Corpo-Graphy (CCG), a simple objective and quantitative whole-body as well as intracorporal

posturography.
VIe Symposium international de posturographie, Kyoto 17-19 Sept.,
Agressologie , 24, 2:97-98,1983

Claussen, C.F.: (1985)
Presbyvertigo, Presbyataxie, Presbytinnitus - Gleichgewichts- und Sinnesstörungen
m Alter.Springer-Verlag, Berlin, Heidelberg, New York, Tokio,

Claussen, C.F.: (1990)
Cranio-corpo-Graphy, an objective and quantative representation of movement patterns during the stepping and standing test.
Aus:A.Cesarani u. D.Alpini : Diagnosi e Trattamento dei Disturbi dell'Equilibrio. Mediamix Edizioni Scientifiche, Milano, pg. 79 - 84

Conn H.F.: (1982)
Current Therapy.
Saunders Co., Philadelphia, London, Toronto, Mexico City, Rio de
Janeiro, Sydney, Tokio,.

Cooksey FS. (1946)
Rehabilitation in vestibular injuries.
Proc Roy Soc Med.;39:273-8.

Deeg, P., Claussen, C.F.: (1983)
Schwindel und Nausea: Alarmzeichen gefährlicher Herz-Kreislauf-Erkrankungen.
Deutsch.Ärzteblatt,80, 41-44

Haralanov S, Claussen C-F, Milushev E, Haralanova E, Kmetska K (2002)
Computerized Ultrasound Cranio-Corpo-Graphy (Comp-USCCG) for Objective and Quantitative Treatment Monitoring in Multiple Sclerosis Patients
Published on the Archives for Sensology and Neurootology in Science and Practice – ASN [Internet], Buenos Aires,

Kersebaum M., E. Nagy, C.F. Claussen, G. Bencze, L. Heid: (2003)
Vertigo in relation to orthopaedic cervical syndromes .
Published on the Archives for Sensology and Neurootology in Science and Practice ASN (Internet), Buenos Aires

Kessler L. (1991)
Functional complications after the otobasal fracture
Proc. NES 17 (1990), Excerpta Medica 929, 113 – 117

Nagy E., Claussen C.F., Bencze G., Heid L., Kersebaum M.: (2003)
Neurosensorial complaints of patients with diabetes receiving oral versus insulin treatment .
Published on the Archives for Sensology and Neurootology in Science and Practice ASN (Internet), Buenos Aires

Nagy, E., Claussen, C.F., Kersebaum, M., Heid, L., Bencze, G(2002)
USCCG a quick, objective and quantitative tool for vestibular spinal equilibrium testing.
Published on the Archives for Sensology and Neurootology in Science and Practice ASN (Internet), Buenos Aires

Nagy, E., Köves P., Bodo, GY., (1992)
Diagnostical and theapeutical problems of an old-standing cerebral lesion and recently occurred vertignous attacks
Proc. NES, 18 , Vol. 19, 41 – 45

Norré, M. E.: (1988)
Treatment by exercises:Stimulating the adaptability of the mechanisms of balance.
Proc.NES, (Vol.XI)pp. 201-204

Ödkvist, L.M., Malmberg, L. and Möller,C.: (1988)
Age-related vertigo and balance disorders according to a multiquestionnaire.
Proc.NES, (Vol. XVI)pp. 423-427

Patil, N., Schneider, D., Claussen, C.-F.: (1988)
Ginkgo Biloba Extract and the Vestibular System - A Cranio-Corpo-Graphic and Electronystagmographic Assessment.
Verhdlg.d.GNA, Elsevier, Amsterdam

Reuss-Borst M., Claussen C.-F(2004)
Cardiovascular findings in neurootological rehab-patients.

Published on the Archives for Sensology and Neurootology in Science and Practice ASN (Internet), Buenos Aires

Ribari, 0., Büki, B., Niebudek-Bogusz, E., Faludi, M. and Nador, J.: (1988)
Vertigo, nausea, tinnitus and hypoacusia in haemodialysed patients.
Proc.NES, (Vol. XVI)pp. 339-342

Sakata E: (1966)
Diagnostic significance of spontaneous and positional nystagmus in cases with vertigo and disequilibrium.
Otolaryngology (Tokyo) 38:1041

Samant,H. C., Kumar, R. N. and Mohanty,S.: (1983)
Optokinetic Abnormalities Following Head Injury
Proc.NES, (Vol.IX)pp.99-102

Schimrigk, K.: (1978)
Die Ataxie aus klinischer Sicht.
On clinical aspects of ataxia.
Proc.NES, (Vol.VI,2)pp.709 - 722.

Schneider D.;Claussen, C.F.;Hahn, A.;Fraaß, U.E.: (1990)
Die Darstellung per- und postrotatorischer Vestibularisreaktionen mittels des Brain Electrical Activity Mapping.
Arch.Ohr-,Nas- u.Kehlk.heilk.,Supplement II, 252 – 253

Schuhknecht H.F.: (1974)
Pathology of the ear. Harvard University Press, Cambridge Massachusetts and London, England.

Szirmai A., Ribari O., Repassy G. (2002)
Migraine related vestibular disorders in childhood and adolescents
Neurootology Newsletter, 6(2) 56-59

Torok, N.: (1948)
Significance of the Frequency in Caloric Nystagmus.
Acta Otolaryng (Stockh.), 36, 38

Toupet, M.: (1988)
Vestibular compensation.
Proc.NES, (Vol. XVI)pp. 574-574.

Unterberger S.: (1938)
Neue registrierbare Vestibularis-Körperdreh-Reaktionen, erhalten durch Treten auf der Stelle. Der Tretversuch.
Arch.Ohr.-,Nas.-u.Kehlk.Heilk., 140, 273-282

Updegraff, W.R. (1979)
Diabetes mellitus and vertigo (Historical abstract of vertigo)
Proc. NES, 6; 247 – 250

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