Medical Statistics Methods used in the study of ischemic and haemorrhagic strokes diagnosed through computer-tomography

ANDREA FLEANCU, GABRIELA SECHEL, MIHAI TURCANU
TRANSILVANIA University of Brasov, Romania
Bdul Eroilor nr.29, Brasov
fleancumed@yahoo.com, gabisechel@yahoo.com, mihaiturcanu@gmail.com

Abstract: The work presents some statistical methods applied in medicine. The investigations have been realized through computer-tomography, in the domain of ischemic and haemorrhagic strokes. The statistic results of a lot of 2200 patients with stroke is presented, cases examined at the University Emergency Hospital, Bucharest, Romania In the presented study the accent is over the computer-tomography exploration, because it is accessible, informative and with a potential of repeatability, the results being sufficient in establishing the emergency therapeutic protocol.

Key words: computer-tomography, medical statistics, haemorrhagic and ischemic stroke

1. INTRODUCTION

In medical research data are often collected serially on subjects. The statistical analysis of such data is often inadequate in two ways: it may fail to settle clinically relevant questions and it may be statistically invalid. A commonly used method which compares groups at a series of time points, possibly with t tests, is flawed on both counts. There may, however, be a remedy, which takes the form of a two stage method that uses summary measures. In the first stage a suitable summary of the response in an individual, such as a rate of change or an area under a curve, is identified and calculated for each subject. [5] In the second stage these summary measures are analysed by simple statistical techniques as though they were raw data. The method is statistically valid and likely to be more relevant to the study questions. If this method is borne in mind when the experiment is being planned it should promote studies with enough subjects and sufficient observations at critical times to enable useful conclusions to be drawn. [2] Use of summary measures to analyse serial measurements, though not new, is potentially a useful and simple tool in medical research.

2. MATERIALS AND METHODS

Material: The study has been done on a batch of 2200 patients admitted in the Neurology Department of SUUB during the period 2006-2007.The patients that have been included in the lot all presented in the emergency room with a neurological deficit abruptly installed. The study is retrospective. The data has been gathered from the observation papers of the patients and for the computer-tomography result registry. The data has been introduced mechanically, unselective.

For the statistic analysis there have been used:

Structure and frequency charts, errors of arithmetic media indicators, moments and asymmetry indicators, χ^2 test, „2x2" contingency tables, and correlation method [4].
Method: The CT evaluation has been done using one of the two CTs in the department: Siemens Somatom Plus and Siemens Volum Zoom. [1]

3. RESULTS AND DISSCUTIONS

General characteristics of the batch: The study lot has comprised of 2200 patients with stroke, diagnosed clinically and imagistic.
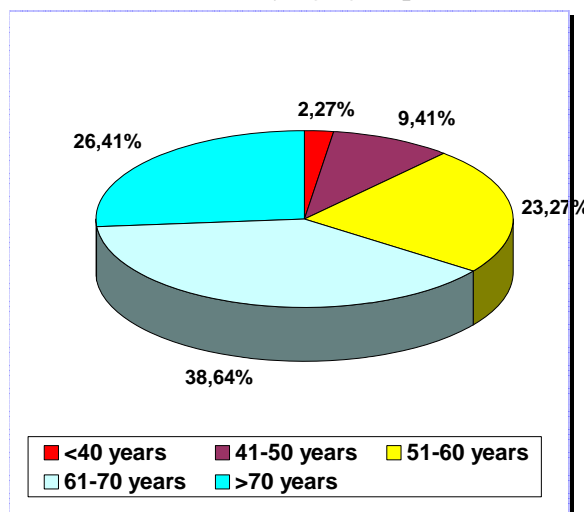
1. ***Lot structure by age groups:***

Chart 1 –
The structure of the study batch on age groups

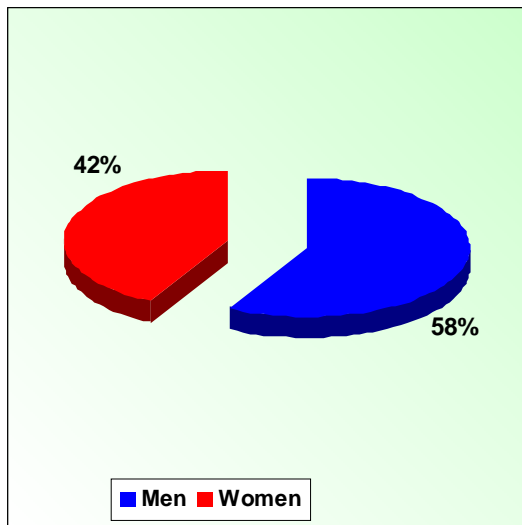## *2.   Lot structure by sex*

Chart 2. Lot structure by sex

Discussions:

- the age group that is most affected by stroke is >60 years
- there is a sensibly higher frequency of stroke in men than in women
  Statistic interpretation:
- In the case of stroke, the variable that must be preponderantly taken into discussion in order to characterize the studied lot is the age of the subjects. In our study, the grouping by age
- groups (see chart 1) has been used, which determined us to use the centre of the class in order to simplify the mathematic calculus. The obtained results are the following:

- The arithmetic average of the age =55 years
- The ponderate average os the age = 60.71 years
- The age modulus = 68 years
- The age mean = 69.5 years

  Thus, by calculating the moments, we can say that, in the case of the studied lot, the average age of the subjects with stroke is 65.64 years, with a 99.71% probability (standard deviation = ±0.29 years; variation coefficient = ±5.44%). Because CV<10%, the studied collectively presents a small dispersion, so it's homogenous from the age point of view.
  B. Characteristics of the Lot by Type of Stroke (Ischemic or Hemorrhagic)

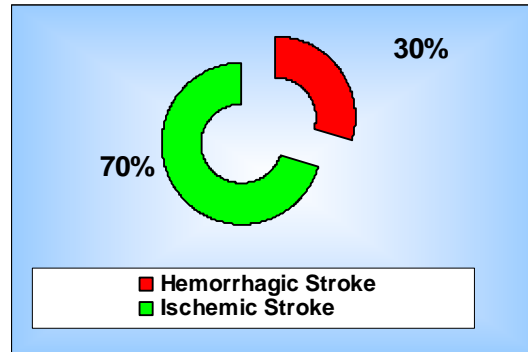### *3.   Structure of the lot by type of stroke (ischemic or hemorrhagic)*

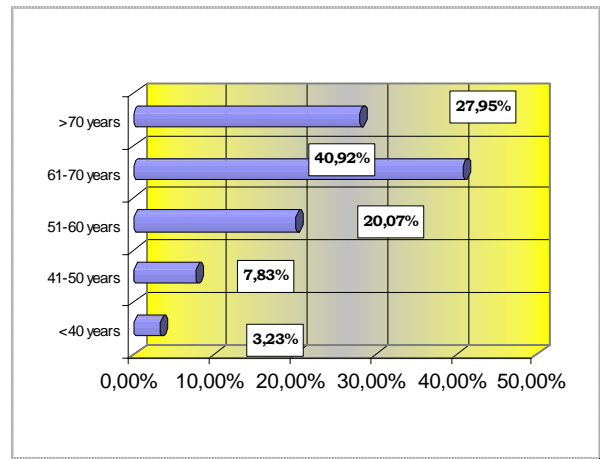*Chart 3. Structure of the lot by type of stroke (ischemic or hemorrhagic)*

Chart 4. The frequency of ischemic stroke depending on age group

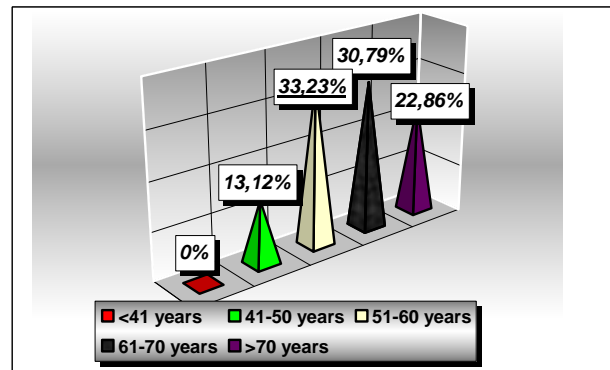### *4.   The frequency of hemorrhagic stroke depending on age group*

Chart 5. The frequency of hemorrhagic stroke depending on age group

Statistic interpretation: By observing charts 3 and 4, and also by taking into consideration the statistic calculus, we can make the following statements:
The average age of ischemic stroke apparition is 66.01 years, with a probability of 99.51% (standard

deviation = ±0.85 years)

Also we can tell (with a probability of 99.22%) that the hemorrhagic stroke apparition age is 53.50 years (standard deviation = ±0.78 years)

We can conclude that hemorrhagic stroke is encountered at a younger age (by 10.71 years) than the ischemic stroke.

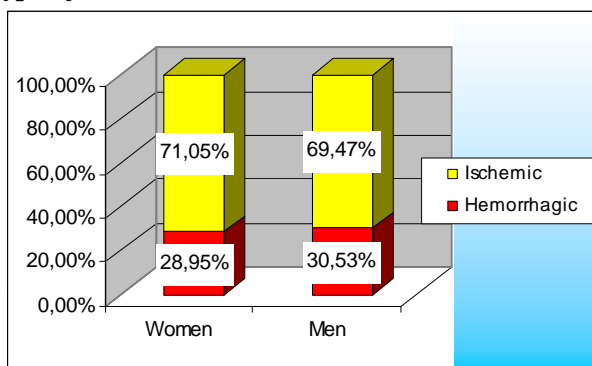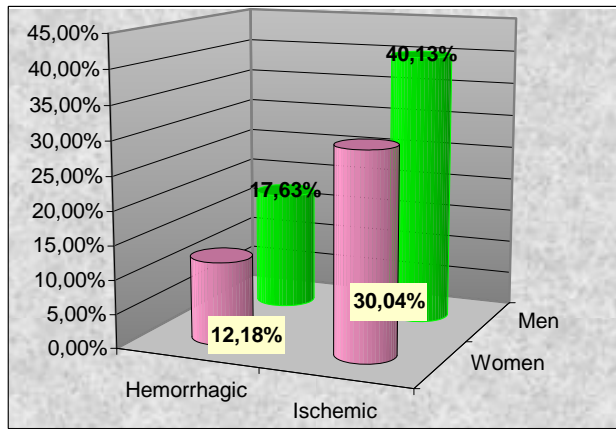## 5. Correlation between patient sex and type of stroke

Chart 6. Lot structure depending on the sex of the patients and type of stroke

6. The frequency of stroke types depending on the sex of the subjects

Chat 7. The frequency of stroke types depending on the sex of the subjects

Discussions

• The frequency of ischemic strokes is significantly higher than the hemorrhagic ones, and it can be explained by the multiple cases of ischemic strokes.

• The under 40 age group is less affected by the ischemic strokes

• In the under 50 age group, the incidence of the hemorrhagic strokes overwhelmingly exceeds the ischemic one.

• As regards the correlation of type of the cerebral vascular accidents (ischemic or hemorrhagic) with evolution in age ,it can be remarked that, if at the middle group age the weight are sensibly equal, even if the favor of the cerebral vascular hemorrhagic accidents, once with aging(more specific after 65 years),the frequency of apparition of the cerebral ischemic vascular accidents is growing exponentially

• If strokes are more frequent at males then women a significant difference between the type of stroke (ischemic or hemorrhagic) and the frequency of these two sexes can't be shown.
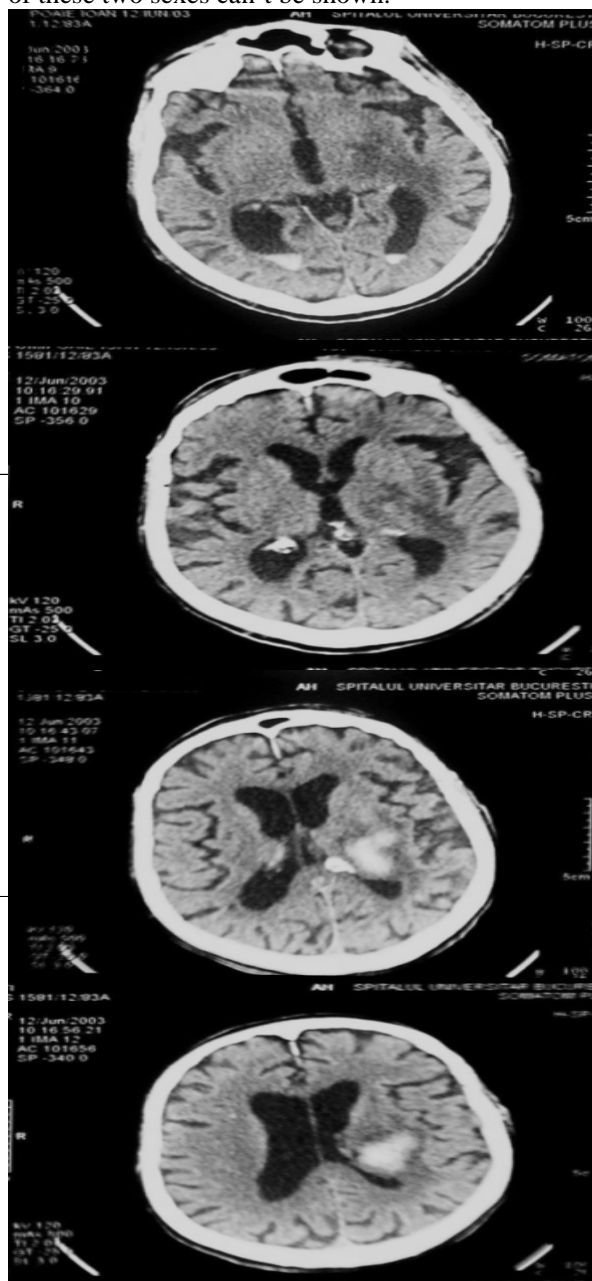

Fig. 1. C.I., male sex, 67 years

Initia CT examination (made at 5h from the debut) - cerebro-ventricular examination highlights an area of spontaneous hyperdensit, with hematical aspect, situated at left capsulo-nuclear level, surrounded of perilesional oedema, witch impress the lateral ventricle of the same part, ventricular sanguine efraction [3]

Statistic interpretation

Using the χ^2 test method and a contingent table 2 X 2, we can affirm the fact that the ischemic stroke is more frequent in males then in females, with a probability of only 95% ($3.84 < \chi^2 < 6.85$).Using the same method, results that indifferent of the patients sex ischemic stroke is more frequent then hemorrhagic ($\chi^2 = 7.7$ la 1 grade of liberty => hypothesis valid with a probability of 99%
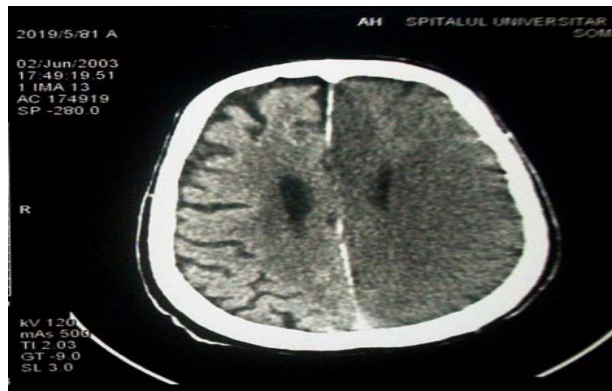

Fig 2: H.C., male sex,72 years 1

Initial CT examination (made at 36 h from the debut) – cerebro-ventricular examination points out a tense area of vascular-ischemical hypo density, situated in all the carotidian left territory.

4. CONCLUSIONS

1. In this study the computer-tomography examination was preponderantly emphasized, because it is accessible, informative and with potential of repeatability, the results being sufficient in the establishment of therapeutic conduit in conditions of maximum emergency.

2. The age group mostly affected by stroke, indifferent of type (ischemic or hemorrhagic) is over 60 years, with an average of 65, 64 years.

3. There is a frequency of stroke, hemorrhagic and ischemic, sensibly higher in men then in woman, the differences between men and women being rather small.

4. The big number of cases that we followed permits us to state that the frequency of the ischemic stroke is significantly higher the hemorrhagic ones.

5. Predominantly, the age of apparition of the ischemic stroke is over 60 years (with an average of 66,01 years) and of the hemorrhagic one is over 50 years (with an average of 50,30 years). It is pointed out that at over 60 years the frequency of the ischemic stroke exceeds the hemorrhagic one (considering the incriminated etiologic factors: atherosclerosis, trombembolism), and under the age of 50 years the frequency of the hemorrhagic stroke significantly exceeds the frequency of the ischemic one (hemorrhagic stroke is more specific to younger ages)

References

[1]. Bonaffini N, Altieri M, Rocco A, Di Piero V – "Functional neuroimaging in acute stroke" – Clin Exp Hypertens. 2002 Oct-Nov;24(7-8):647-57.

[2]. Corea F, Tambasco N, Luccioli R, Ciorba E, Parnetti L, Gallai V – "Brain CT-scan in acute stroke patients: silent infarcts and relation to outcome" – Clin Exp Hypertens. 2002 Oct-Nov;24(7-8):669-76.

[3]. Rother J. – "CT and MRI in the diagnosis of acute stroke and their role in thrombolysis." – Thromb Res. 2001 Sep 30;103 Suppl 1:S125-33.

[4]. Tambasco N, Corea F, Luccioli R, Ciorba E, Parnetti L, Gallai V – "Brain CT scan in acute ischemic stroke: early signs and functional outcome" – Clin Exp Hypertens. 2002 Oct-Nov;24(7-8):687-96.

[5]. Wintermark M, Bogousslavsky J – "Imaging of acute ischemic brain injury: the return of computed tomography" – Curr Opin Neurol. 2003 Feb;16(1):59-63