

Clinical Symptoms of Atrial Fibrillation in Different Ranges of QRS Duration

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Reasons to Investigate

- Atrial fibrillation (AF) is the most frequent arrhythmia and generates 1/3 of all hospitalizations by arrhythmic cause.
- The incidence of AF increases with age and varies between less than 1% in people older than 60 years and almost 10% in all people older than 80 years.
- AF is associated to an increase in risk of stroke, heart failure (HF), and total mortality.
- Both QRS shortening and prolongation cause myocardial electric instability, intra- and interventricular asynchrony, intracardiac hemodynamic disorders, a decrease in cardiac ejection effectiveness, being as well, an independent predictor of mortality.
- Up to this date, there are no studies conducted to prove the relationship between the clinical symptoms of AF and QRS duration.

Objective of the Investigation

- To study the relationship between QRS duration and the clinical symptoms of AF, to improve the quality of the diagnosis and the management of this arrhythmia.

Investigated Population

Patients selected for the study

- 98 patients (67 male and 31 female), ages between 45 and 87 years old with AF duration 6 ± 5 years
- Form of AF
 - chronic – 65
 - persistent – 27
 - paroxysmal – 6
- High blood pressure – 89 patients
- Coronary heart disease – 63 patients
- Combination of hypertension and CHD – 32 patients

Investigated Population

Classification of the characteristics of patients

- Sex
 - male
 - female
- Age:
 - adults (45-60 years old men, 45-55 years old women)
 - older adults (61-74 years old men, 56-74 years old women)
 - elderly (75-87 years old men and women)
- Characteristics of AF
 - Time of evolution (up to 10 years or more than 10 years)
 - form (chronic, persistent, paroxysmal)
 - classification by HR (bpm) – bradycardia (less than 60), normal (60-90) and tachycardia (more than 90)
- Degree of HF (FC I-III)
- LV ejection fraction (EF) (20-43%, 44-66% and 67-88%)
- Stable chronic angina (FC I-III)
- Systolic and diastolic pressure: normal BP – below 140/90 mm.Hg.
 - mild HBP (systolic 140-159 mm.Hg. , diastolic 90-99 mm.Hg.)
 - moderate HBP (systolic 160-179 mm.Hg., diastolic 100-109 mm.Hg.)
 - severe HBP (systolic more than 180 mm.Hg., diastolic more than 110 mm.Hg.)
- History of AMI
- History of stroke

Investigated Population

Inclusion and Exclusion Criteria

Inclusion criteria

- AF
- HBP
- Stable chronic angina, FC I-III
- Endocarditis, myocarditis, pericarditis
- Valve diseases
- Extrasystole
- Conduction disorders
- HF (FC I-III)

Exclusion criteria

- Stable chronic angina, FC IV
- Acute coronary syndrome
- HF FC IV

Equipment Used and Parameters Evaluated

Computer electrocardiograph "Cardiolab+"

Parameters evaluated:

- ✓ HR (bpm)
- ✓ QRS duration (ms)

■ Echocardiograph "SIM 5000 plus"

Parameters evaluated:

- ✓ LV ejection fraction (%)

■ Blood pressure cuff

Parameters evaluated:

- ✓ Systolic blood pressure in mm.Hg
- ✓ Diastolic blood pressure in mm.Hg

Measurement of QRS Duration

- QRS duration was measured in 3 consecutive complexes in leads II, V1, V5, V6
- Among the measured complexes, the one with the longest duration was chosen

Classification of QRS according to Duration

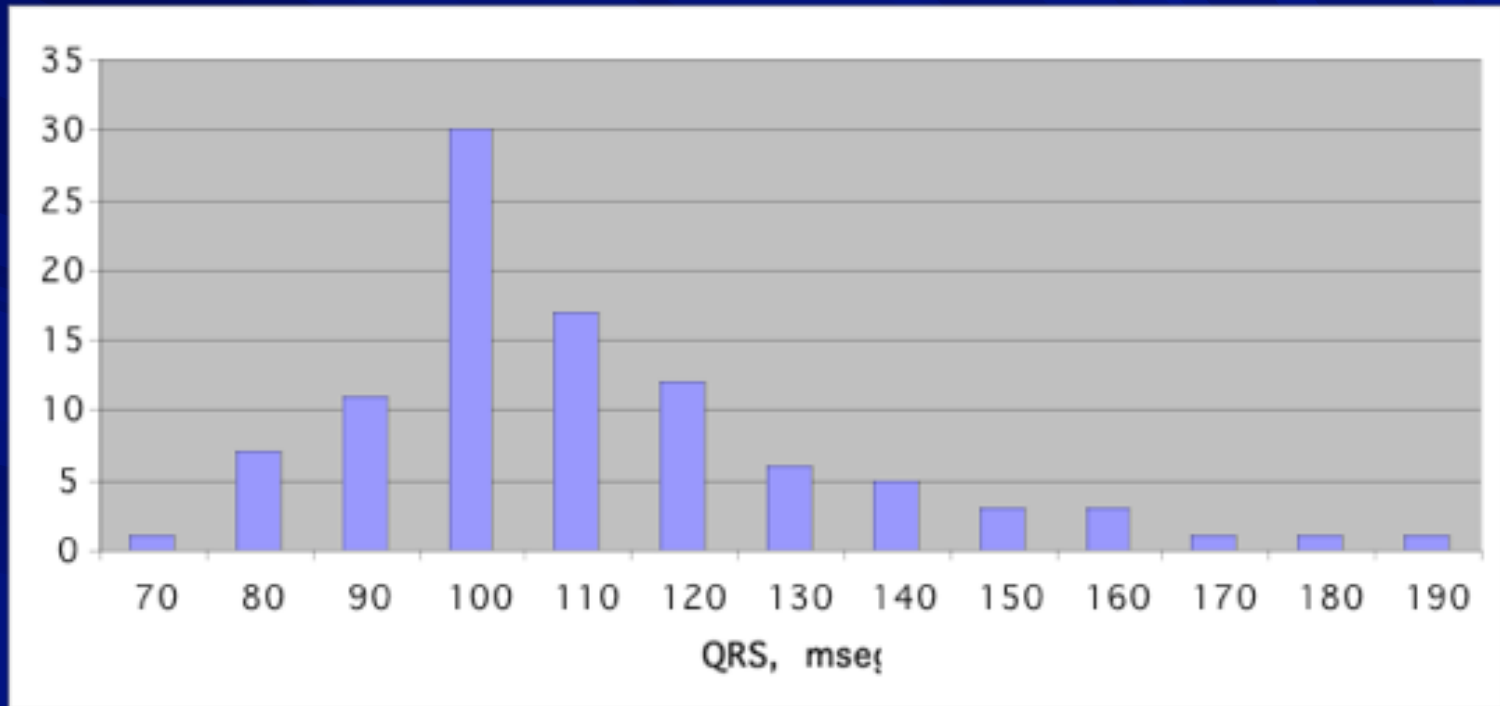
■ Classification of QRS according to duration:

- narrow (less than 60 ms)
- normal (from 60 to 100 ms)
- prolonged (longer than 100 ms)

Statistical Analysis

- Data base in Microsoft Excel
- Statistical analysis with parametric methods
- Construction of graphs on the duration of QRS in different ranges

Distribution of QRS Duration in all the Patients

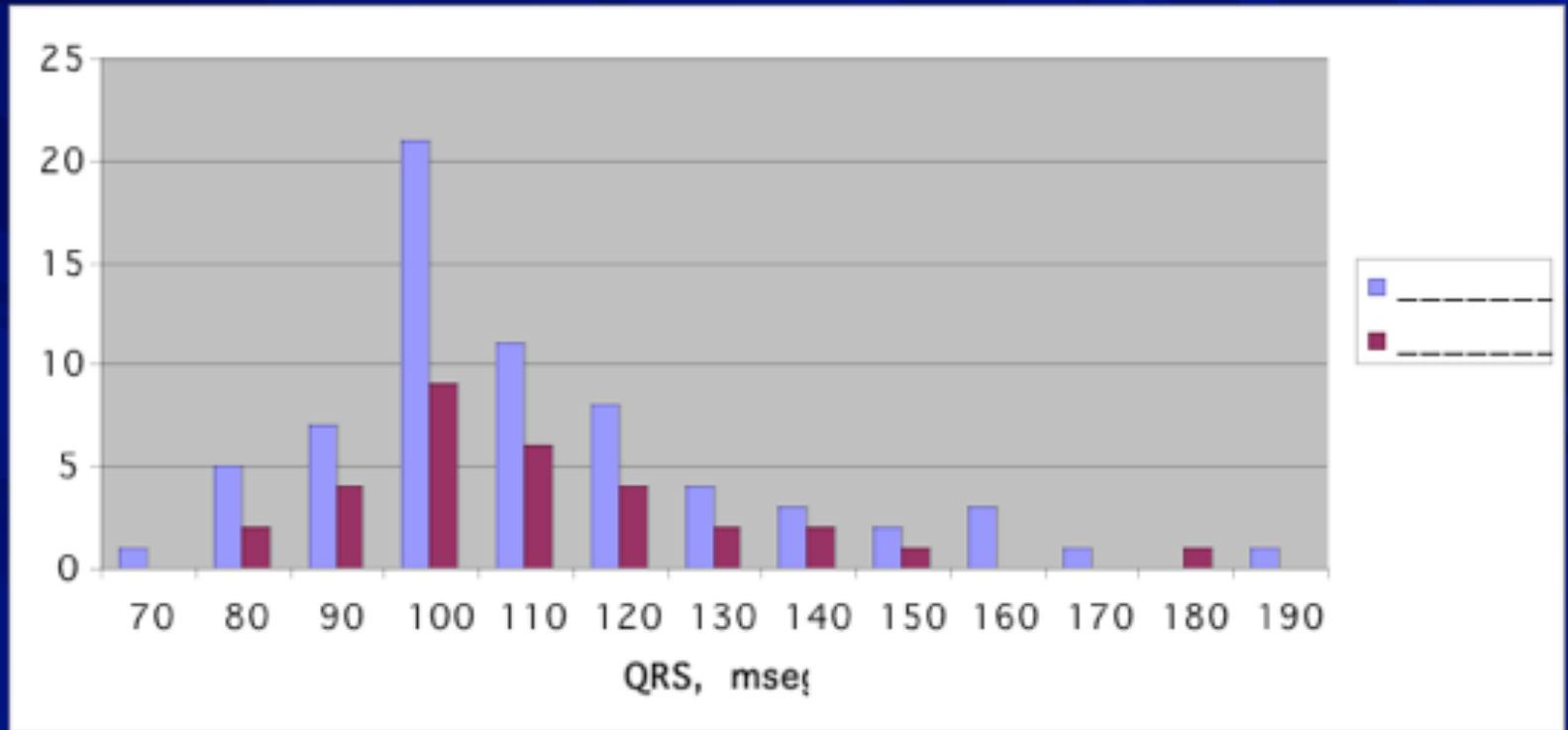


The distribution is asymmetrical, shifted to lower values.

The QRS duration of most patients is within the range of 91 to 100 ms.

No narrow complexes are observed (of less than 60 ms). Most patients had prolonged complexes.

Relationship between Gender and QRS Duration

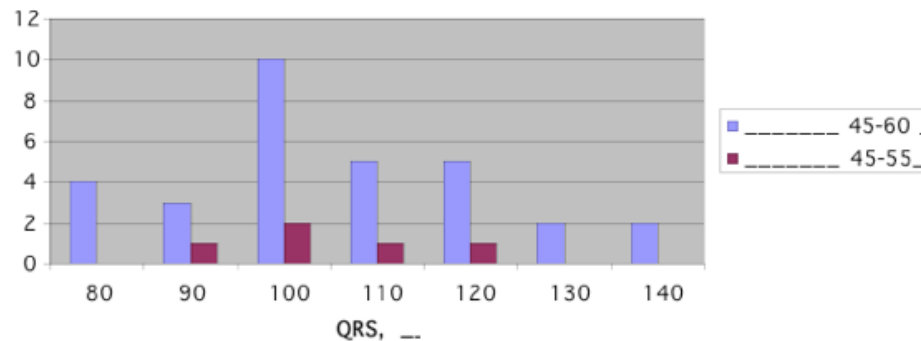


The ratio between women (dark violet bars) and men (light violet bars) was 2:1.

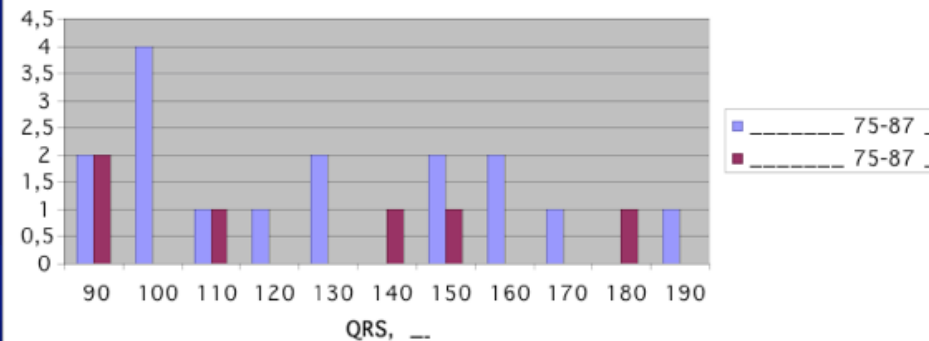
The distribution of QRS duration in all the patients was similar to the one in each group separately.

Relationship between Age and QRS Duration

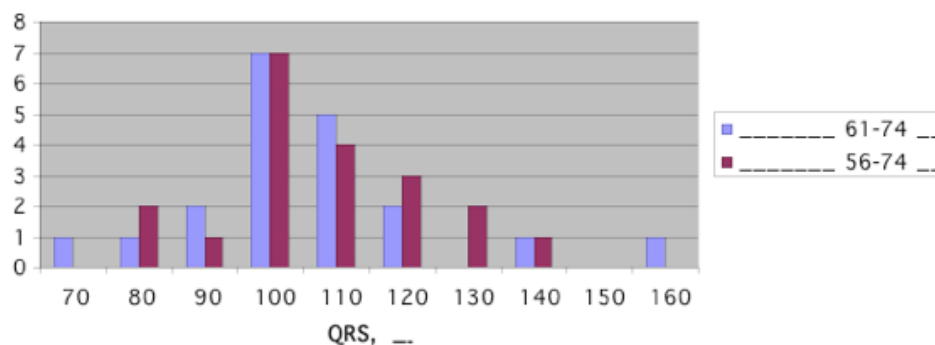
Adults



Elderly



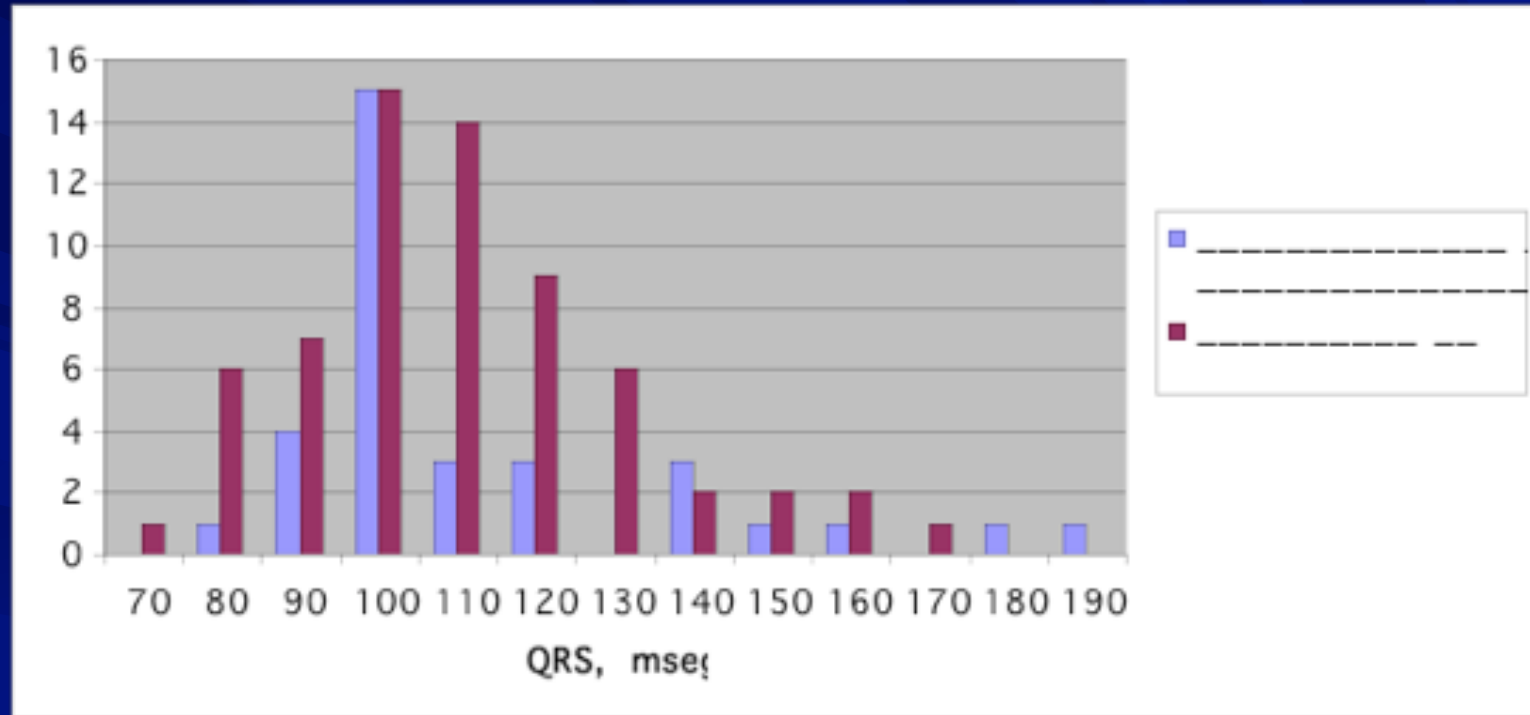
Older adult:



The greatest range of QRS duration dispersion was observed in the subset of elderly patients, the smallest in the adults subset.

In the subsets of adults and elderly patients, most individuals are men, in the subset of older adults the ratio of men to women is 1:1.

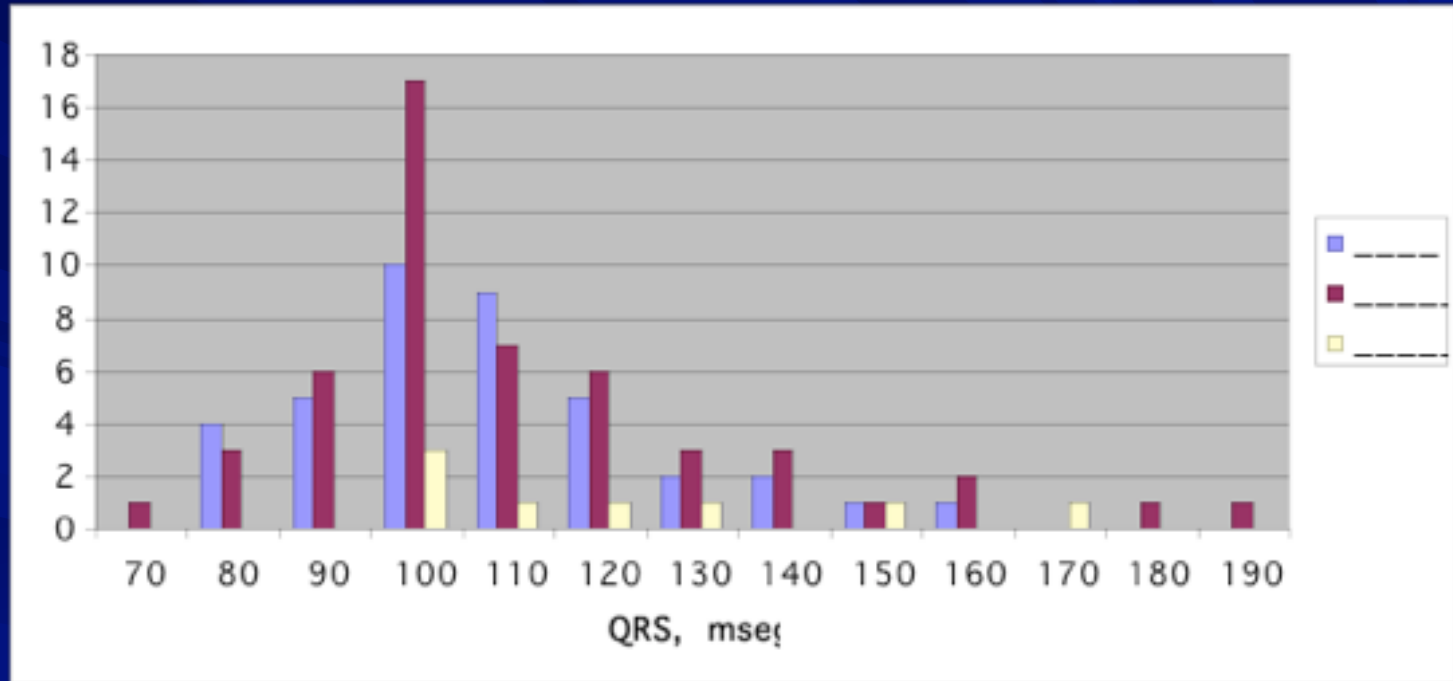
Relationship between AF Forms and QRS Duration



The ratio between the patients with paroxysmal or persistent AF (light violet bars) and chronic AF (dark violet bars) was 1:2.

An asymmetrical distribution is observed, shifted to the lower values. For the chronic AF subset, the distribution is similar to the normal one. The patients with persistent or paroxysmal AF are in the range within 91 to 100 ms.

Relationship between HR and QRS Duration

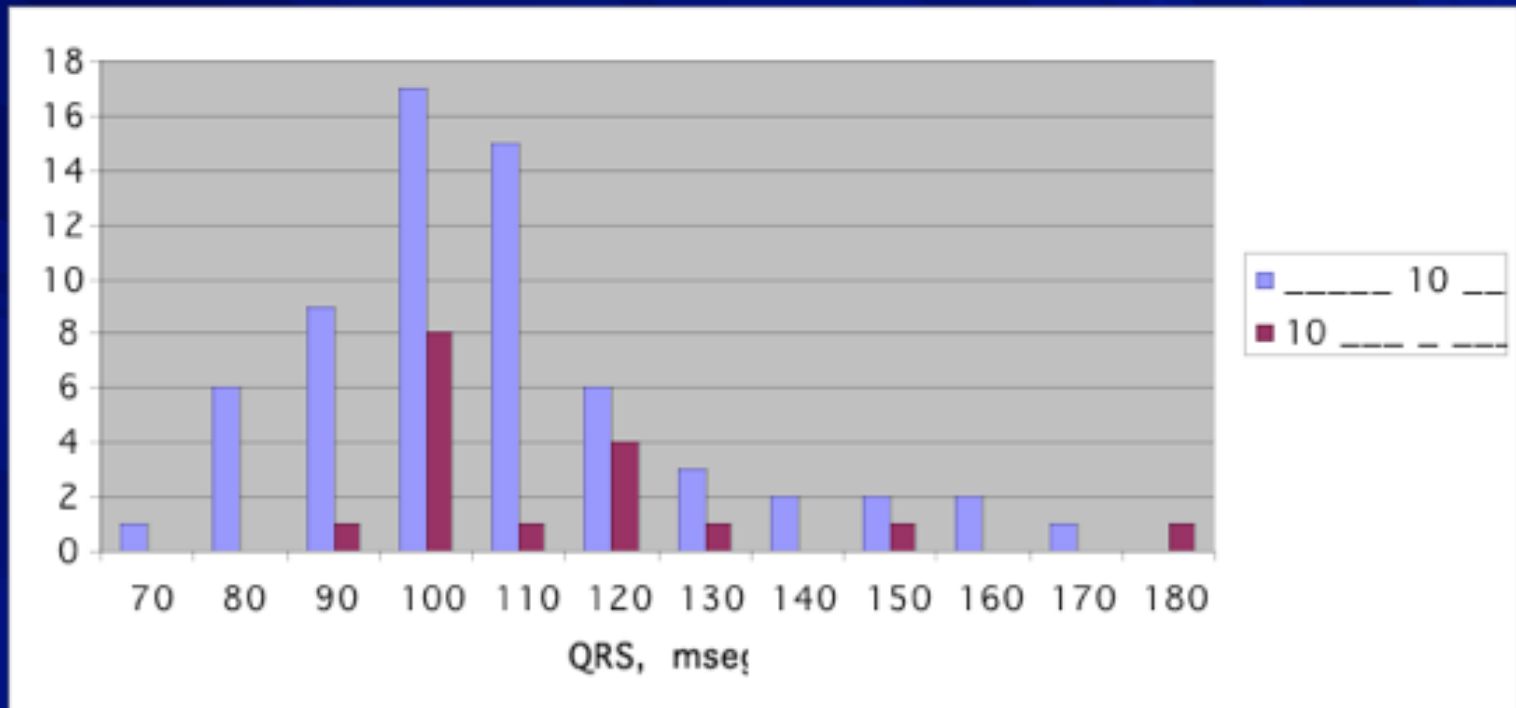


The ratio between the subsets with bradycardic (white bars), normal (dark violet bars) and tachycardic (light violet bars) AF was 1:6:5 respectively.

The greatest range of QRS duration was for "normal" AF (between 70 and 190 ms), the smallest for bradycardic AF (between 100 and 170 ms).

For normal and tachycardic AF, an asymmetrical distribution is observed, shifted to the lower values; for bradycardia, the distribution is more even throughout the range.

Relationship between the Time of Evolution of AF and QRS Duration

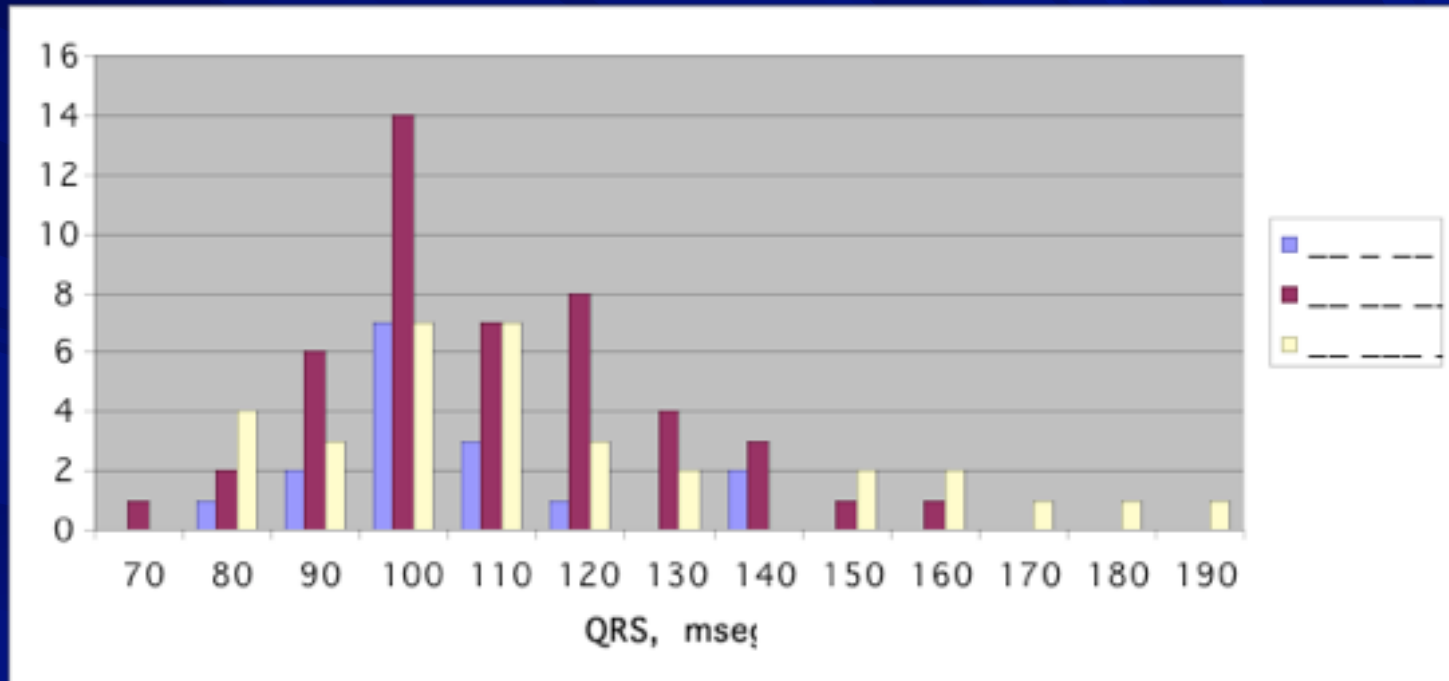


The ratio between the patients with AF of less than 10 years (light violet bars) and of more than 10 years (dark violet bars) of evolution was 4:1.

In the subset of less than 10 years of evolution, the range of QRS dispersion was broader, in the subset of more than 10 years, narrower.

The distribution in both subsets was asymmetrical, shifted to the lower values.

Relationship between the Functional Class of HR and QRS Duration

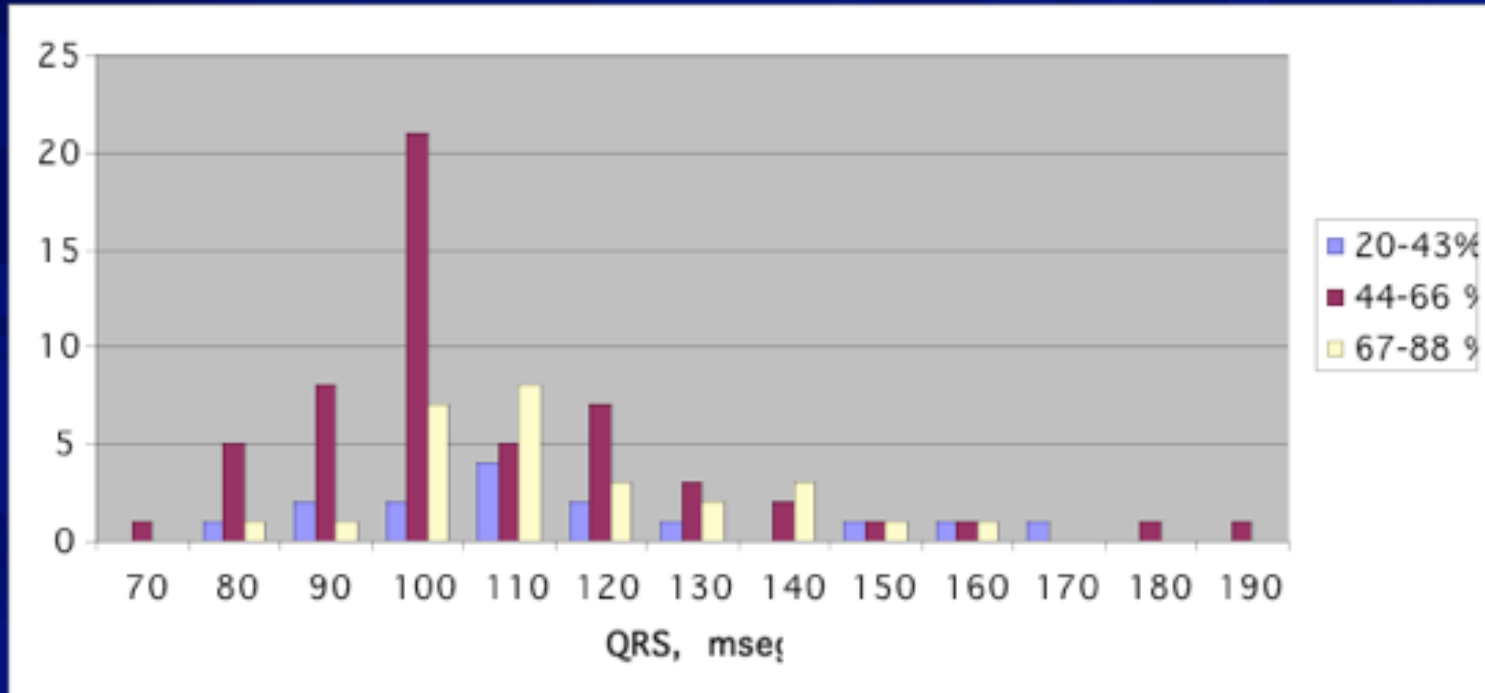


The ratio between the patients with FC I (light violet bars), FC II (dark violet bars) and FC III (white bars) HR was 1:3:2, respectively.

While the FC advances, QRS duration increases (the maximal QRS duration increases from 140 to 190 ms).

The distributions in all subsets are asymmetrical, shifted to the lower values.

Relationship between the LV Ejection Fraction and QRS Duration



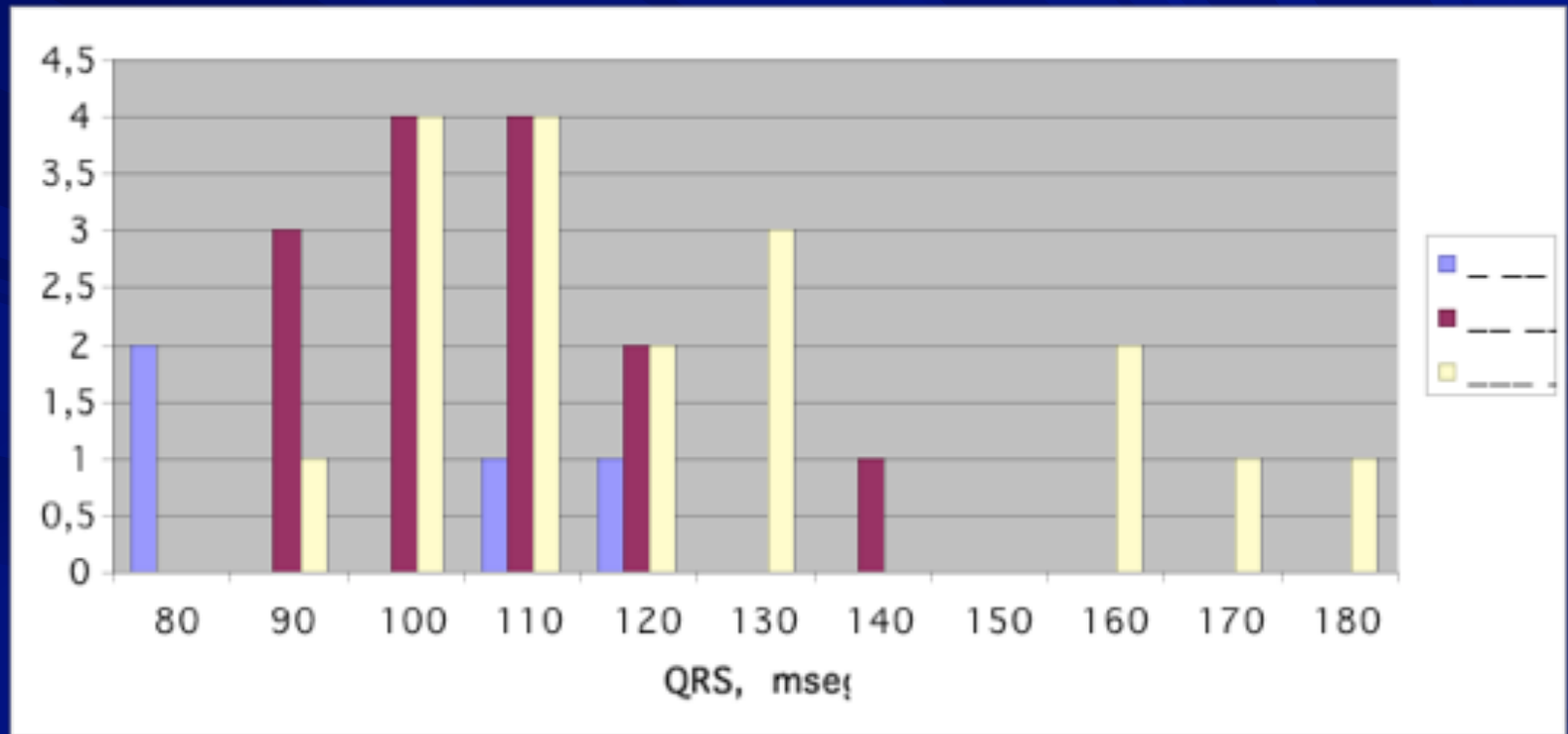
The ratio between the patients with ejection fraction of 20-43%, 44-66%, and 67-88% was 1:4:2, respectively.

As QRS duration increases, the ejection fraction decreases.

The maximal QRS duration was observed in the subset with the ejection fraction of 44-66%.

The distributions in all subsets are asymmetrical with a shift to lower values.

Relationship between Functional Class of Stable Chronic Angina and QRS Duration

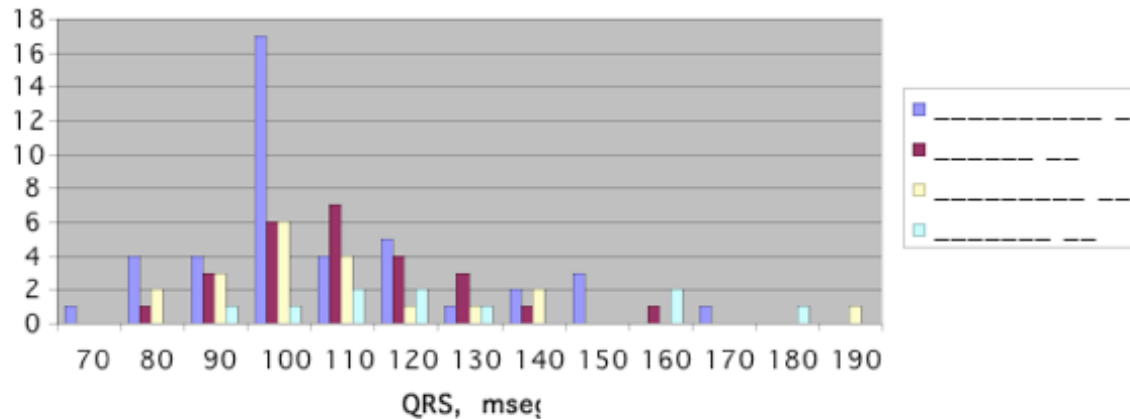


The ratio between patients with FC I, FC II, and FC III was 1:3:4, respectively. While the FC increases, QRS duration increases (its maximal values increase from 120 to 180 ms).

The distributions in all subsets are asymmetrical with a shift to lower values.

Relationship between Blood Pressure and QRS Duration

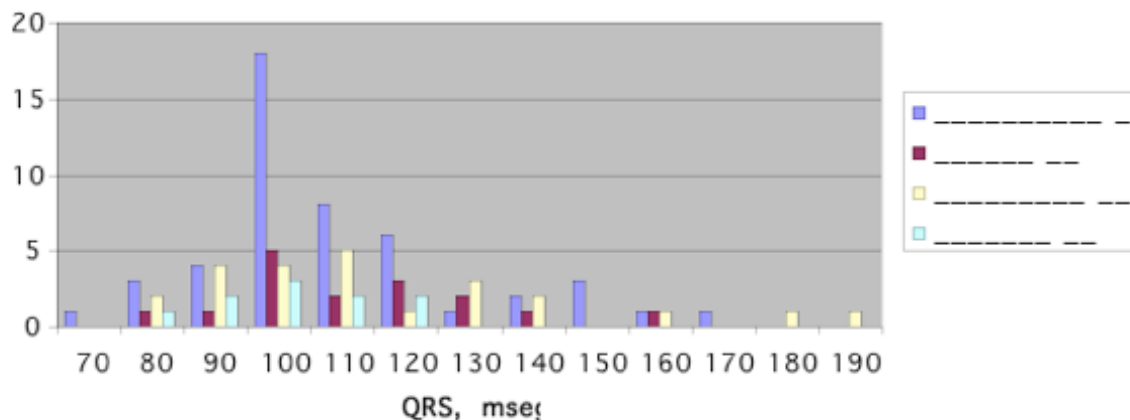
Systolic B



The ratio between patients without HBP (light violet bars) and with a mild (dark violet bars), moderate (white bars), and severe increase (light blue bars) of systolic BP was 5:3:2:1, respectively.

The ratio between patients without HBP and with mild, moderate, and severe increase of diastolic BP was 5:2:2:1.

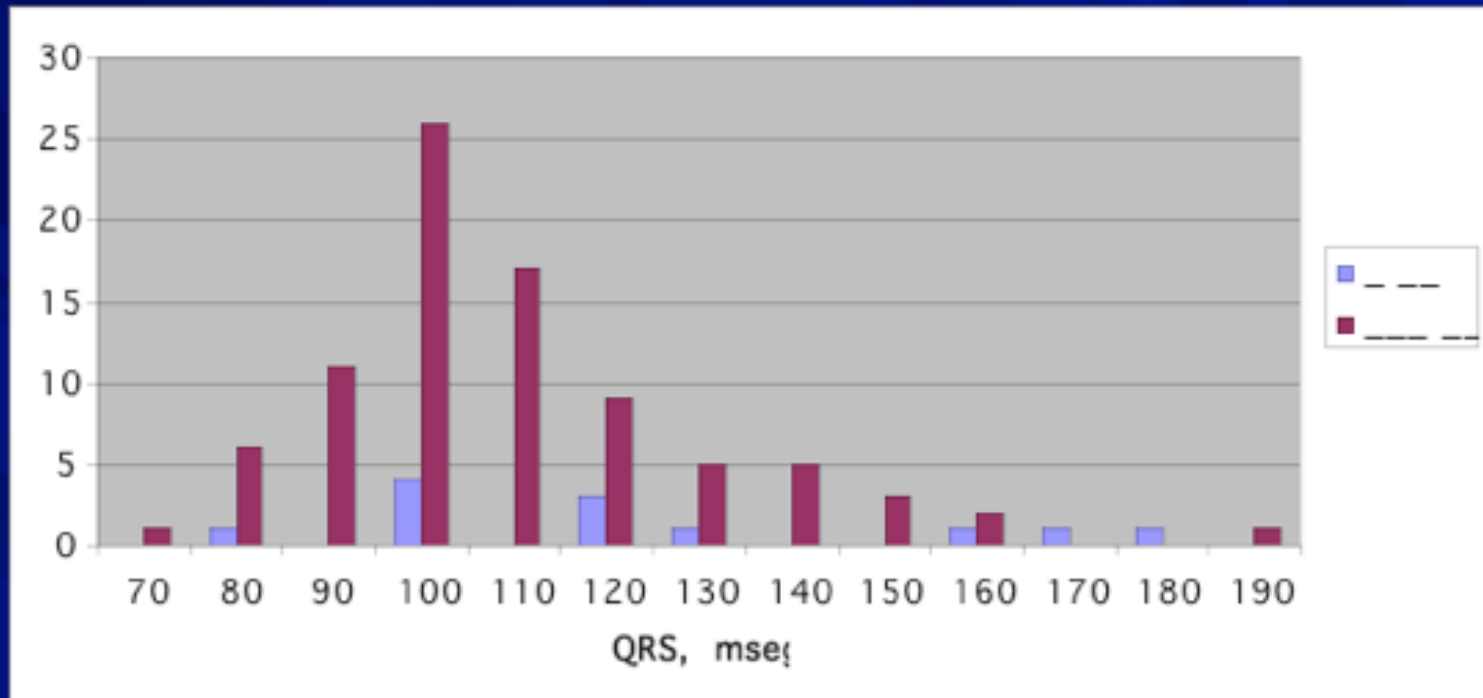
Diastolic B



The maximal duration of QRS is observed in patients with moderate and severe HBP, according to their systolic BP, and moderate HBP, according to their diastolic BP.

The distributions of systolic and diastolic BP are asymmetrical with a shift to lower values.

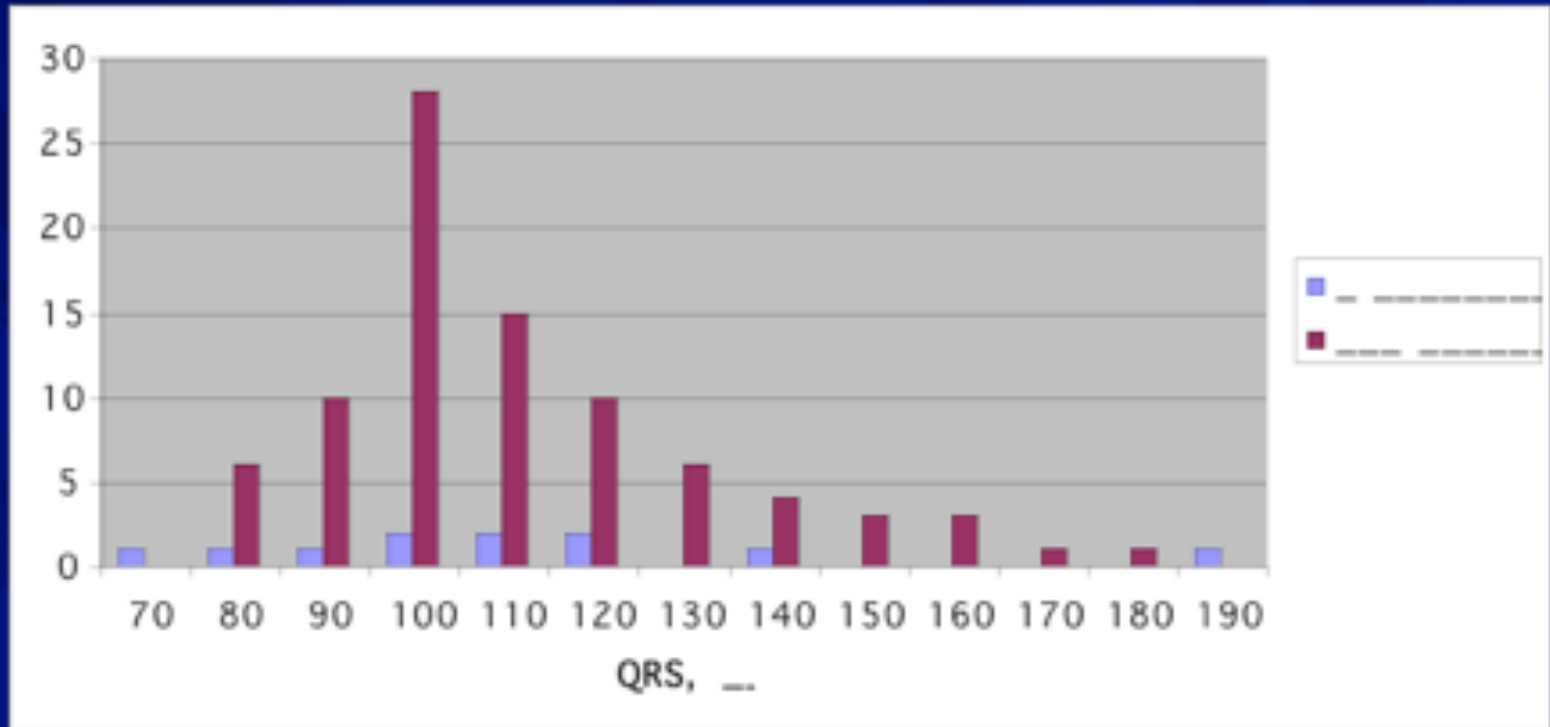
Relationship between History of AMI and QRS Duration



The ratio between the patients with history of AMI (light violet bars) and without it (dark violet bars) was 1:8.

The distributions in all the subsets are asymmetrical with a shift to lower values.

Relationship between History of Stroke and QRS Duration



The relationship between the patients with history of stroke (light violet bars) and without it (dark violet bars) was 1:8.

The distributions in all subsets are asymmetrical with a shift to lower values.

Conclusions

- In the patients studied, the dispersion of the QRS duration range was between 65 and 190 ms.
- No narrow complexes were seen, while in turn, broad complexes were found in half of the patients.
- The distributions of QRS duration were asymmetrical with a shift to lower values.
- The greatest variability of QRS duration was observed in the following subsets: men, elderly patients, persistent and paroxysmal AF, "normal" AF, AF with no more than 10 years of evolution, FC III of heart failure, LV ejection fraction of 44-66%, FC III of stable chronic angina, moderate HBP, no history of AMI or stroke.
- The greatest variability of QRS duration was observed in the following subsets: women, older adults, chronic AF, bradycardic AF, AF of more than 10 years of evolution, FC I of heart failure, LV ejection fraction of 67-88%, FC I of stable chronic angina, mild HBP with history of AMI without stroke.
- While QRS duration increases, the FC of heart failure and the severity of HBP increase, and the LV ejection fraction decreases.
- It is important to consider the QRS duration in AF diagnosis.
- QRS duration changes may reflect the effectiveness of therapeutic steps.