

EPIDEMIOLOGY OF SPINAL CORD INJURY

RHONE-ALPES REGION, FRANCE, 1970-75

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540 inhabitants of the Rhône-Alpes Region have sustained spinal cord lesions from January 1st 1970 to December 31 st 1975 :

- 351 are traumatic (65 %)
- 189 non-traumatic (35 %),

figures comparable to those of Guttman.

Related information has been assembled for a retrospective study concerning 783 cases during the same period, but covering a larger geographical area. We limited ourselves to the Rhône-Alpes Region, a well-defined administration entity, of which social and economical structures fairly well to the rest of France.

This Region had a population of 4 780 723 at the 1975 census, divided into 8 departments :

- 3 with agricultural vocation : Ain, Drôme, Ardèche,
- 3 largely urbanized : Isère, Loire, Rhône,
- 2 with "mixed" population : Savoie, Haute-Savoie.

The study only takes into account the 351 traumatic cases for 6 years (1970-1975).

I TRAUMATIC SPINAL CORD INJURY PER DEPARTMENT AND PER YEAR OF ACCIDENT (fig 1)

Only one department (Ardèche) shows a gradual increase. In all cases except one (Haute-Savoie) 1975 has about the same number of accidents as 1972 with between, especially in department with large cities, an increase in 1973 and 1974. There is no special relationship between the number of spinal cord injuries and the relative annual increase of the population.

One must bear in mind, for this period in Rhône-Alpes Region, the following factors :

- the modification of the French traffic legislation (safety belt, speed limit) and the increase of the fleets of cars, and above all motorcycles.

- a best prevention of occupational accidents during the past ten years.

- the possible referral of some cases to other centers than Henry Gabrielle Hospital, especially from the border-line districts (some parts of Ardèche, Drôme, Haute-Savoie).

- the de facto exclusion of some cases of mild lesions, as they did not need rehabilitation, at least as in-patients.
- it was not possible to collect the cases listed dead on arrival to hospital or morgue.

We only count those reached the hospital alive, and whose main problem was spinal cord injury. Henry Gabrielle Hospital is the only spinal cord injury center of the Rhône-Alpes Region.

The incidence of spinal cord injury is 1,27/100 000 population in the Rhône-Alpes Region. For the Rhône department, the most populated, where the center is located, the incidence is 1,85/100 000. This figures are lower than those of Kraus for Northern California : 3,32/100 000, and Tusji in Japan : 2,71/100 000, Key for Cape Province, South Africa : 1,67/100 000, Sutton for Brisbane, Australia : 1,44/100 000, Cheshire for Victoria, Australia : 1,71/100 000.

Extrapolation from our incidence rate of 1,27/100 000 and a average duration of life of about 20 years in Western countries gives a prevalence of traumatic spinal cord injuries in the Rhône-Alpes Region of 25/100 000. This figure is close to that of Kraus for complete lesions in Northern California : 20/100 000. But this author estimates that, according to factors above-mentioned, the real prevalence in Northern California would rather be around 50/100 000. It is likely then that the prevalence rate of 25/100 000 for the Rhône-Alpes Region is under- estimated.

II AGE

The average of the spinal cord injured patients in Rhône-Alpes Region is 39 years and 3 months, with little variations between extreme figures : Ardèche, 36 yrs, and Ain, 41 yrs.

The repartition of ages of patients is percentage and by five year groups is compared to that of the whole population of the Region (fig 2). Spinal-cord injured people are overwhelmingly under 50. The largest proportion of cases is between 20 and 30. These findings are similar to other surveys, except for the fact that teen-agers are only 13 % (from 16 to 28,6 %, except Japan). Nevertheless, 50 % of our patients are less than 35 yrs old.

III SEX DISTRIBUTION

There are 276 males, and 75 females, respectively 78,63 % and 21,37 %. The male female ratio is 3,68 in our region, exactly Kraus's ratio in Northern California. But it is much higher in other countries where professional activity of women may be more limited.

IV REPARTITION OF TRAUMATIC SPINAL CORD INJURIES ACCORDING TO RACE

We have differentiated French, Mediterraneans (Italians, Spanish etc.) and North-Africans (Algerian, Moroccan, Tunisian). Mediterranean and North-African are temporary or permanent immigrants. There were :

- 287 French	= 79,7 %
- 42 Mediterraneans	= 11,6 %
- 25 North-Africans	= 6,9 %
- 6 Others	= 1,6 %

360 cases (from 1.10.69)

The percentage of foreigners in our survey (people born out of France) is 20,1 %. In Rhône-Alpes Region, this percentage was 9,3 % in 1975. To explain this discrepancy, one must realize that in 1976 in the Region 30 % of occupational accidents concerned foreigners.

V CAUSES OF TRAUMATIC SPINAL CORD INJURY

They are compared to the results of three comprehensive studies from England, Australia, and United States.

Car accidents make 1/3 of traumatic spinal cord lesions in Rhône-Alpes Region, slightly more than in England, less than in U.S. and above all Australia. Motor and bicycles accidents are very frequent, more than 15 % of all lesions. Only Frankel's and Zrubecky's studies show higher figures, respectively 20,1 % and 17,9 %. It is likely that the numbers of motorcycles and bicycles are smaller in "new" continents (longer distances ?). Cord injuries by falls have the higher incidence in Rhône-Alpes Region. Except 4,31 % of voluntary falls (attempted suicides), they are occupational, in industrial and agricultural environments.

Incidence of direct blow is the same as in England. Sports injuries have about the same incidence in England, Northern California or Rhône-Alpes, but not in Australia, especially for diving accidents : 3,78 % vs 14 %. It is comforting to establish that the percentage of gunshot wounds is only 0,8 % in Rhône-Alpes Region, versus 5,8 % in Brisbane, Australia, and 12,3 % in Northern California.

Distribution of types of accident according to the year of accident does not show any particular trend, even after 1973 (speed limit). Nevertheless, during the 6 years of our survey, the number

of all vehicles (2 and 4 wheels) increased from 1 352 640 to 1 710 180 (26,4 %).

The causes of accident according to the sex of the patient are clearly different (fig 3). Car accidents are the leading cause of spinal cord injuries in females : 48 % vs 28 %. But motor and bicycles accidents are rare : 3,9 % vs 18,5 %. Falls, direct blows, sports accidents are strongly predominant in males. But falls by attempted suicide concern mainly females.

The distribution of the causes according to the age of the patient reveals a wider range of ages for motor and bicycle accidents, perhaps in relation with a greater proportion of occupational injuries in this groupe : 17/40 instead of 19/99 for car accidents. Incidence of falls and direct blows increases with age, at least until age 50. This point is confirmed par Kurtzke in United States.

There is a different repartition of causes according to race. If Mediterraneans and North-Africans have a smaller incidence of spinal cord injuries by car accident, they have on the other hand the same incidence of motor and bicycle accidents, and a much greater incidence of falls and direct blows. Sports injuries are rare among them.

VI THE LEVEL OF FRACTURE

It is a good approach of the severity of the lesion from a functional point of view. Completeness or incompleteness of lesions is not mentioned in this paper, as well as the percentage of recovery.

The incidence of tetraplegia is greater in car accidents and above all sports accidents. If we distribute the causes of accidents according to five vertebral level (cervical, upper-thoracic, lower-thoracic, thoraco-lumbar and lumbo-sacral), it appears a high incidence of involvement of the upper-thoracic vertebrel in motorcycle and bicycle accidents (Fig 4 and 5). Thoraco-lumbar lesions are largely predominant in falls and direct blows (fig 6 and 7). In case of fall by attempted suicide, fractures are mostly located in thoraco-lumbar and lumbo-sacral vertebral. Sports accidents concern almost exclusively the cervical spine (fig 8). This distribution is comparable to Goutelle's figures for the same Region, but concerning only tetraplegias.

VII ASSOCIATED INJURIES

They are, too, a sign of severity. The incidence of head injuries is the same in car and motor-bicycle accidents : 66/118 vs

vs 35/57, as well as fracture of the limbs : 32/118 vs 16/57. But visceral traumas (thoraco-pleural, abdominal, pelvic) are more frequent in car accidents : 25/118 vs 6/57. Associated injuries are comparable in falls and direct blow to those in car accidents.

VIII PROFESSION

The distribution of the professions is different according to the cause of accident. Students are more involved in sports and motor-bicycle accidents. Car accidents are frequent among all professions, except farmers and agricultural workers. Falls, direct blows are obviously frequent among specialized or non-specialized manual workers.

CONCLUSIONS AND SUMMARY

1) From 351 cases of traumatic spinal cord injuries recruited exclusively in the Rhône-Alpes Region (4 780 000 pop. in 1975), it is possible to calculate an incidence rate of at least 1,27/100 000 and a prevalence rate of at least 25/100 000.

2) Mean age is 39 years 3 months.

3) Male/Female ratio is 3,68.

4) 79,7 % of subjects were born in France, 11,6 % are mediterraneans and 6,9 % North-Africans.

5) Car accidents are the most frequent (32 %), followed by motor and bicycle accidents (15 %), sports accidents (7,8 %), direct blows (7,5 %). Gunshot wounds have a percentage of 0,8 %.

6) There is no particular trend in the distribution of causes during the 6 year period covered by the survey.

7) Distribution of causes of accident is different in males and females.

- 8) Distribution of causes of accidents is different with races.
- 9) Distribution of causes of accidents differs according to age.
- 10) The level of the vertebral fracture has a relationship with the type of accident.
- 11) Visceral lesions are less frequent in motor and bicycle accidents. Head injuries and fractures of the limb have the same distribution, for each cause of accident.
- 12) There is a difference of distribution according to professional categories.

- Figure 1 : Distribution of traumatic Spinal Cord Injuries per year of survey and per Department of Rhône-Alpes Region, with mention of the annual increase of population per Department.
- Figure 2 : Percentage Frangency Distribution for age at injury in spinal cord injury : comparaison of spinal Cord Injury cases and population of the Region (Males + Females).
- Figure 3 : Causes of accident according to sex.
- Figure 4 : Car accidents : vertebral level of injury.
- Figure 5 : Motor-bicycle : vertebral level of injury.
- Figure 6 : Falls : vertebral level of injury.
- Figure 7 : Direct blows : vertebral level of injury.
- Figure 8 : Sports accidents : vertebral level of injury.

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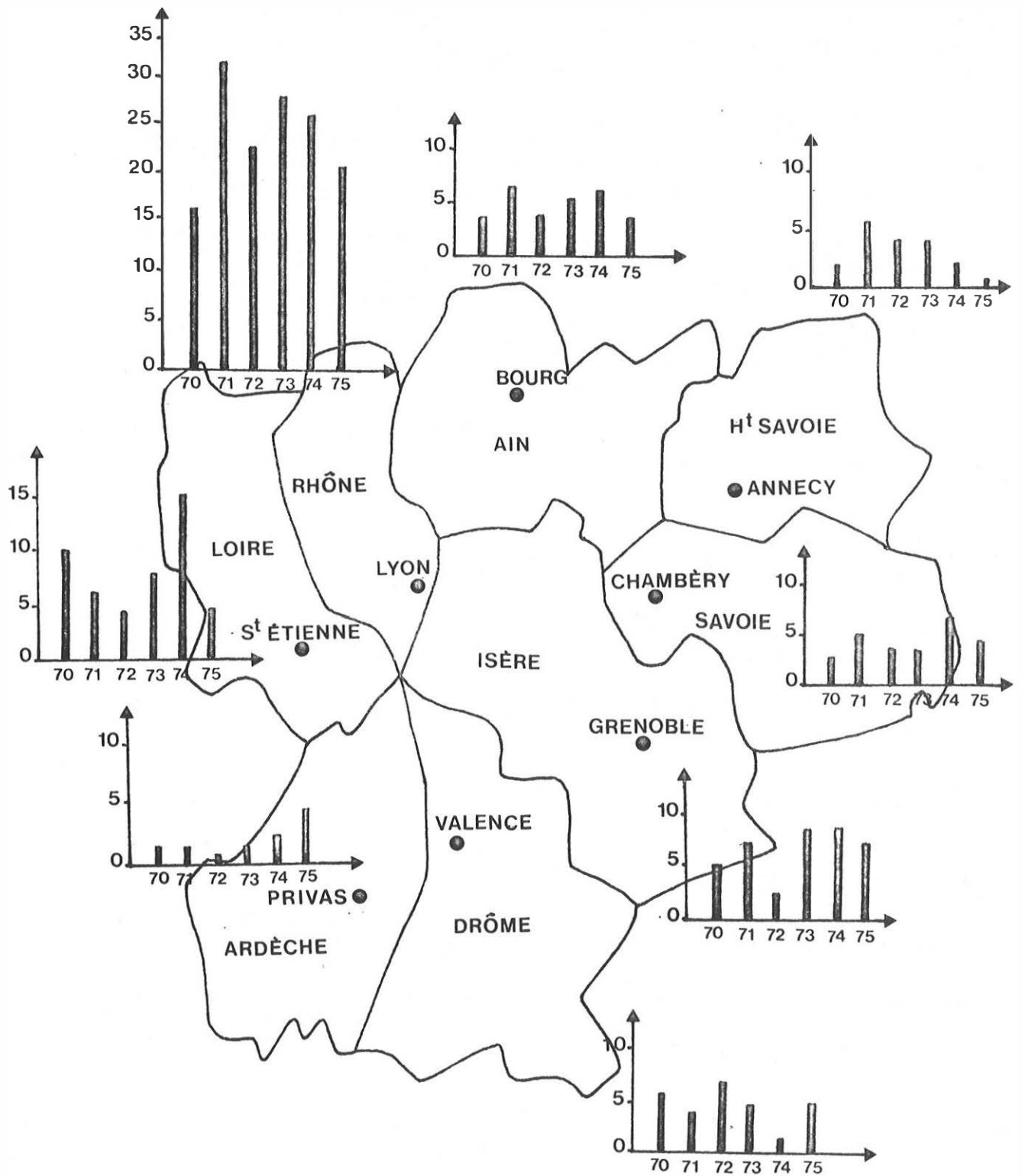


Figure 1

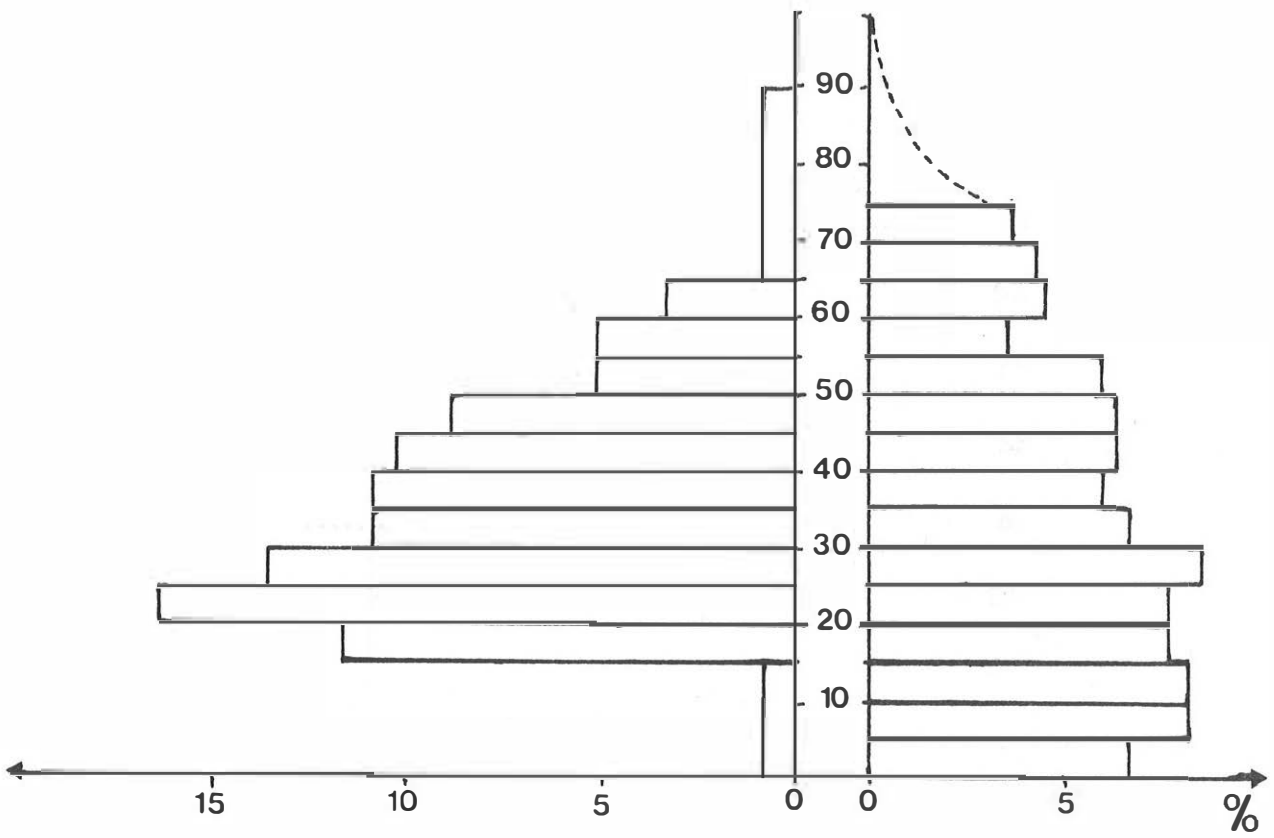


Figure 2

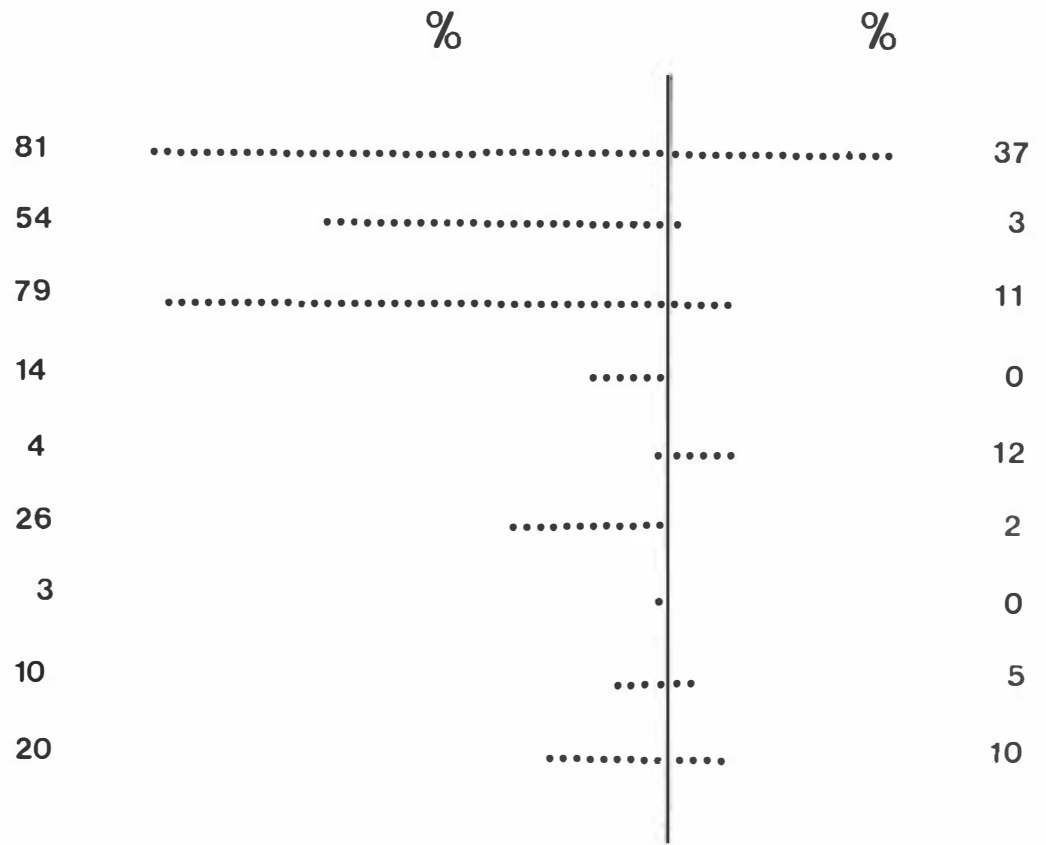
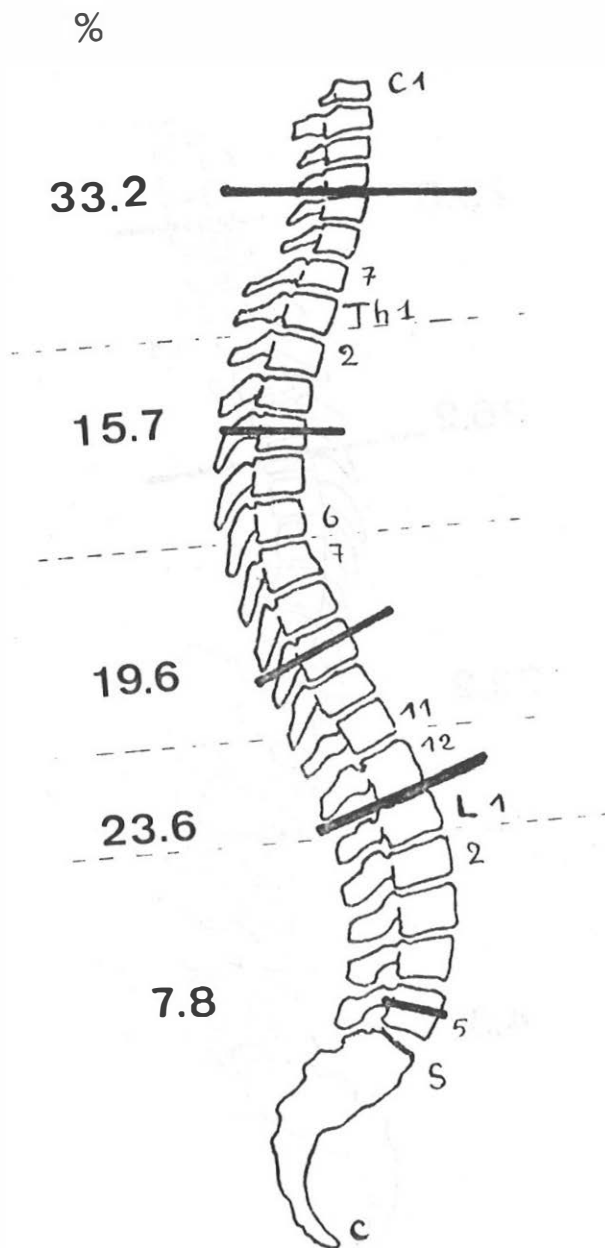
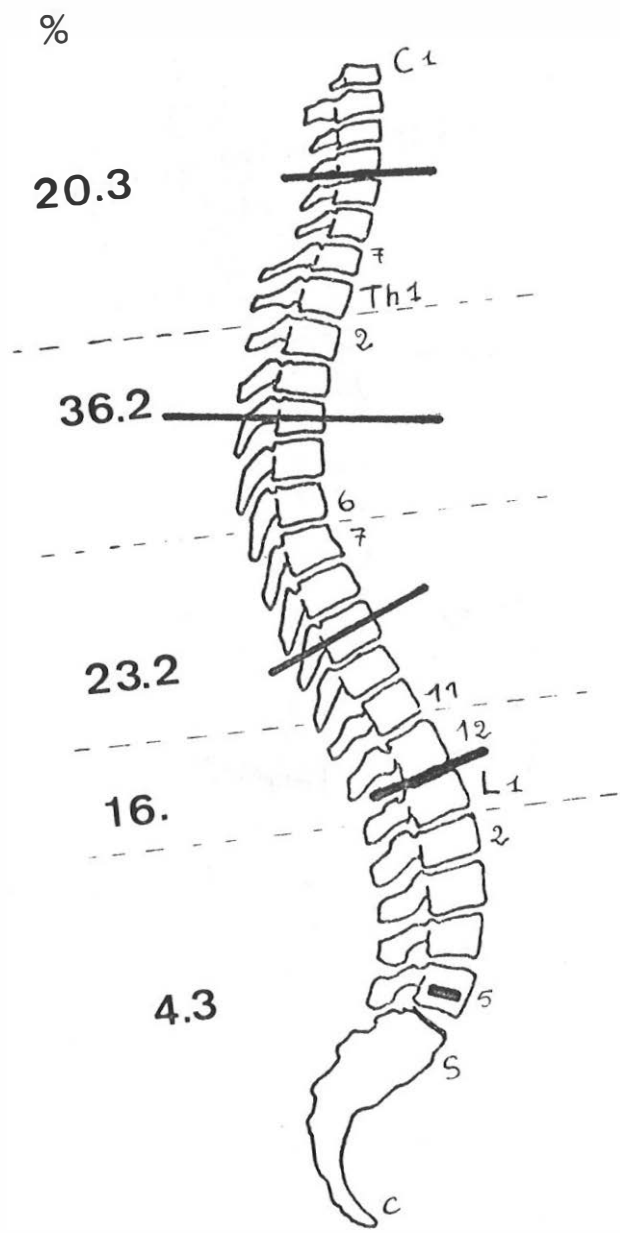


Figure 3



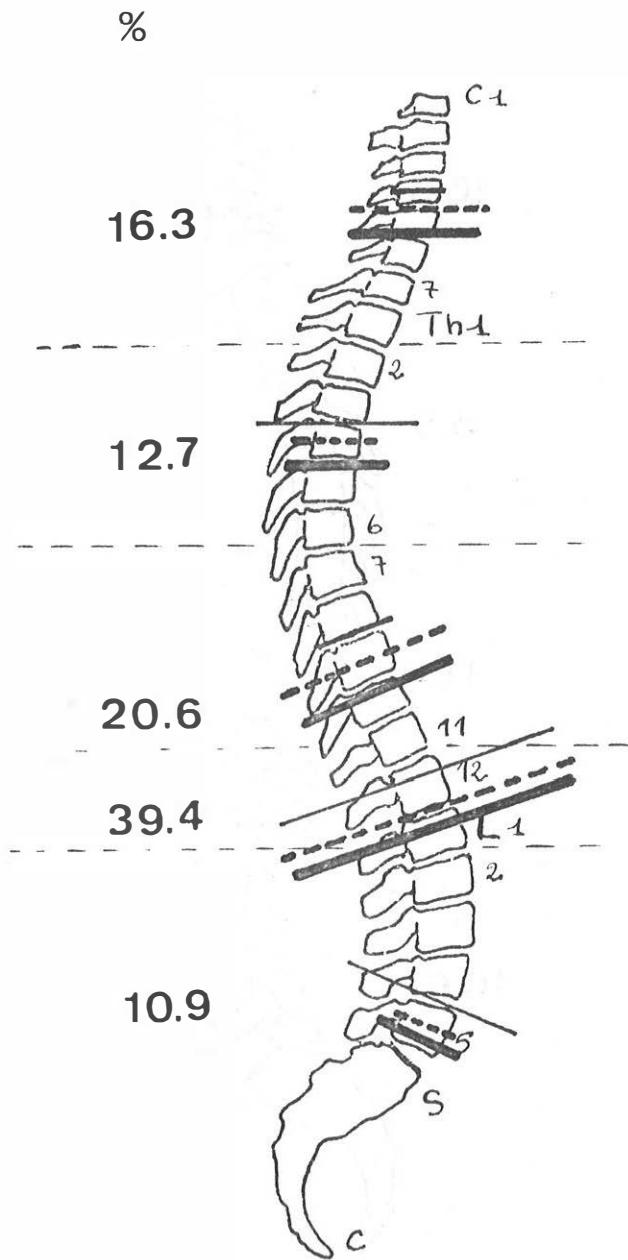
CAR ACCIDENTS

Figure 4



MOTOR- AND BICYCLE ACCIDENTS

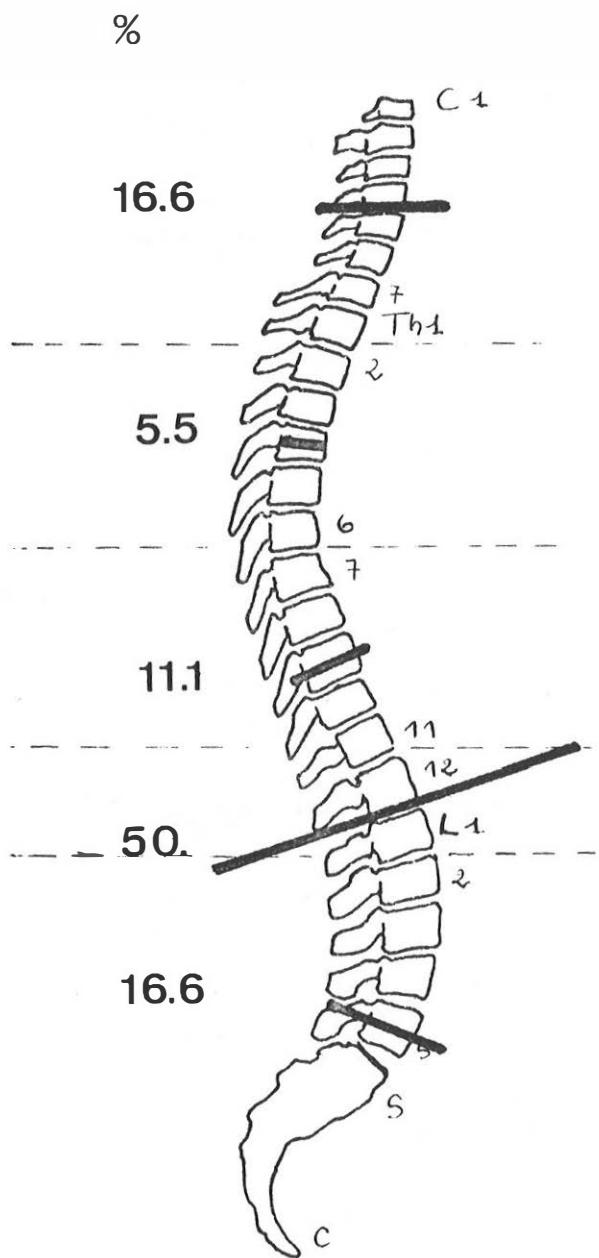
Figure 5



FALLS

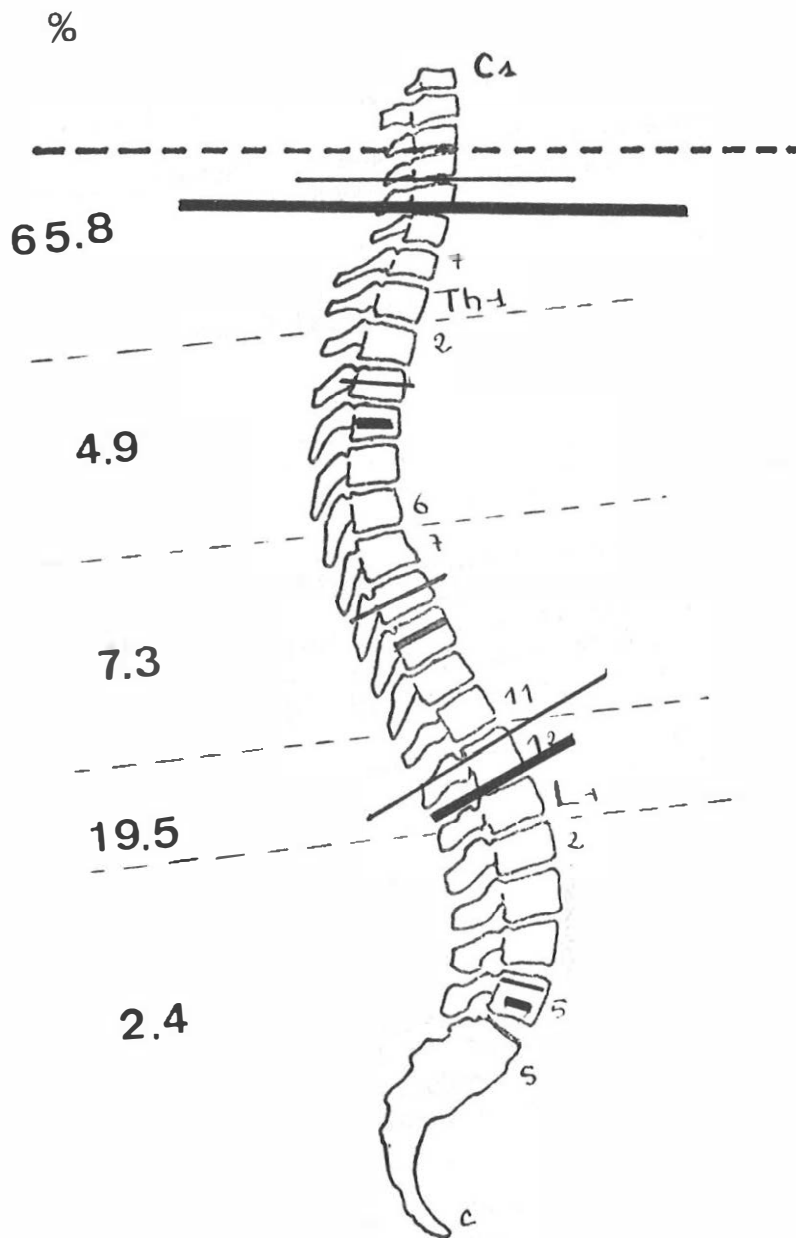
- Attempted suicides
- - - - Occupational accidents
- TOTAL

Figure 6



DIRECT BLOWS

Figure 7



SPORTS

- Diving
- Others
- TOTAL

66

Figure 8