LOWER LIMB INJURIES

OF TWO WHEELERS

by

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The noticeable decline of car crashes these last few years has shown that two-wheelers vehicles crashes were a growing curse.

Although motorbikes are very attractive for hot-headed teenagers, it is shown only in this cause publication that it is not the only one to cause such accidents, and an important part must be given to motorcycles and cycles, concerning this traumatology.

Faced with the extent of such crashes, we thought that it was important to look for specific mechanisms of those crash injuries, and to suggest protective measures.

We supported this work with the statistical results from the Department of Traumatology of the Hospital of SALON, during the last thirty monthes.

We selected those accidents whose seriousness required hospitalisation of the injured.

Although it is short, this work allows us by studying well defined cases, to get some ideas about the mechanisms producing the lower limb injuries which are still heavy.

Although the obligatory crash helmet for drivers of two-wheeled vehicles has saved the life of many drivers, no protective measure concerning the lower limb has been suggested.

Our preventive action must be towards on increase of lower limb protection in order to minimize initial injuries and to simplify treatment.

The total of lower limb injuries consitutes about one third of the total of all injuries, an other third is compound with cranial and facial traumatisms, whichever their seriousness is.

Thus we have identified one hundred and ninety six lower limb injuries among six hundred and eleven injuries. Before talking about detail of lower limb injuries, it seems advisable to research the most frequentely associated injuries and it appeared that apart from cranio-facial injuries, there were frequent traumatisms of the scapular area and of the upper-limb.

So we have noticed thirty four fractures concerning the upper limb :

- three dislocations of the shoulder,
- and five fractures of the clavicle.

Concerning pelvic traumatisms, they were not serious.

Concerning the spinal column traumatisms, we have never encountered any fracture at the cervical level, where the most frequent injuries are sprains of which we found seven.

No fractures occured at the thoracic level, but we have noticed three fractures without neurologic complications, concerning the lumbar column.

Relating to the number of injuries denoted on injured persons, we could count :

- eighty eight injured persons with only one injurie,
- eighty two with two injuries,
- fifty-three with three injuries,
- twenty with four injuries,
- ten with five injuries,
- four with six injuries.

And we have only found :

- one injured person with seven injuries,
- one with eight injuries,
- one with nine injuries.

Visceral injuries are encountered only when there is a high number of injuries.

Now, let us explain in detail the lower limb traumatic injuries.

We could have worked on documents containing precisious about the exact progress of the accident. Those documents are very significant for us.

We could notice that the point of impact on the direction of the strength led to types of fairly similar and specific injuries. Of course, as soon as the driver has been ejected and strikes an obstacle, a large variety of injuries occur which are difficult to prevent, except by wearing a helmet.

On the other hand, a two-wheeled vehicle crash against an either fixed or moving obstacle, will produce specific injuries.

These were classified according the level of the point of impact :

- the knee,
- tibia (concerning the upper part and the diaphyse),
- ankle and foot.

Crashes applied from the front to the back of the bent knee will produce injuries reminding this well-known "instrument panel syndrom" which associates :

- fracture of the patella (either open fracture or with a contusion of the anterior part of the bone, in six cases),
- fracture of the neck of the hipbone, one case,
- or coxo-femoral dislocation, or fracture with dislocation, or detachment of the epiphysis in one case.

Those injuries are typical if the strength is applied towards the axle of the hipbone.

The cutaneous opening is frequent at the level of the patella, in our series there are as many open fractures as closed ones.

When the crash is given obliquely, still considering the knee, there will be an other type of injuries :

- either we have found diaphysal fractures of the hipbone, which are close fractures in fourteen cases and open fracture in one case.
- or we have found metaphyso-epiphyseal fractures at the lower part of the hipbone, especially serious on often open fractures. We have noticed five of them.

In such cases, injuries of the ligaments of the knee are frequent.

If the point of impact is lower, at the upper part of the tibia, we can notice articular fractures of the tibia, which we counted seven of them, two being open fractures.

Ligamentar injuries mainly concerning the central posterior ligament, which is interrupted or the more often pulled out at its tibial insertion.

At last, a lateral crash will give injuries of the internal lateral ligament, as noticed in four cases.

Concerning the leg, it seems that the injuries are dependent for their seriousness on the contacted surface during the crash.

Contact with a bumper will produce the typical fracture of the tibia and the fibula, by flexion, which is easy to repair.

But if the contact is made with a larger part of the vehicle, such as the radiator grill, several fractures of the leg will occur, considering that the limb has been stuck "between the anvil and the hammer".

These fractures come with serious injuries of soft tissues. The most serious of them being the stripping of the leg. In such cases, vascular and nervous injuries are usually encountered ; that makes the repair very difficult.

We must say here that many mechanic parts of the motorbike are very dangerous, producing injuries at the internal part of the leg. In one case, a secondarily occuring skin necrosis was noticed at the lower quarter of the leg, at its internal side, that had been made by the spring of the rear wheel.

Concerning the ankle, there is a relatively high frequency of external malleolar injuries : twelve injuries, with two open fractures.

At last, concerning the foot, metatarsial fractures are the most frequent : five about seven foot injuries.

Mechanism is mainly an hupper extension of the forefoot, the rear foot being pinned up by the foot wedge.

Thus, the sight of those injuries and the understanding of the mechanism that made them to occur will allow us to design a protective device for the lower limb.

The protection that seems to be the most efficient would be, from our standpoint, a lateral shield copied from racing bikes streamlined, rigid enough to resist against lateral schocks ; and with an aerodynamic shape making the trajectory turned off course ; the internal part of this streamlining would be covered with some material allowing the absorption of schocks, such as polyurethane with closed cells.

At last the protection of the lower limb could be completed by covering the mechanical parts of the motorbike, to decrease their dangers.

This protective system may appear as very heavy, but it is the one which can really protect the knee.

We also have imagined a protective system lighter than the first, and called "leg helmet". It would be a boot protected by polyurethane with closed cells, which would avoid in many cases fractures, as well as injuries of the skin that come with those fractures.

We will study those mechanisms of protection at our trial center of MARSEILLE-Nord.

The lower limb protection is a topical subject. Recent works ended at the same conclusions : Professor MERVEIS, at St Anne's Hospital of TOULON maid recent researches and proposed solutions to streamline the two-wheeled vehicles.

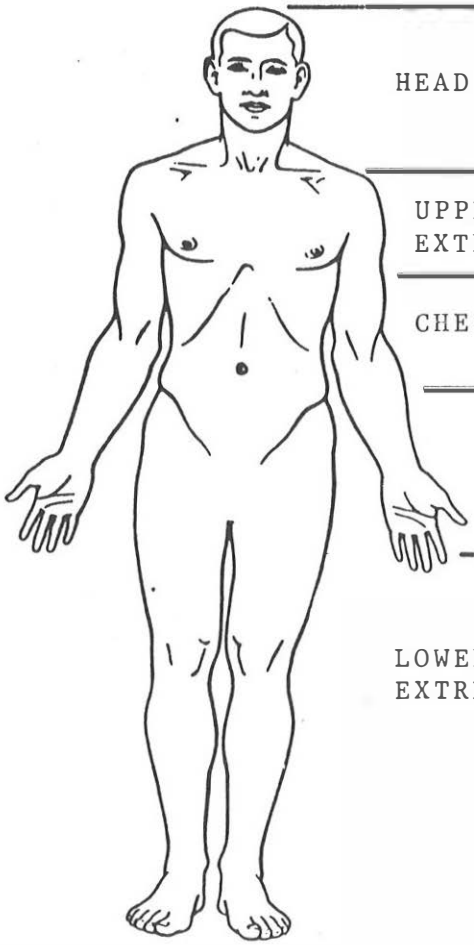
We, in the company of makers and authorities, must consider the protective measures which are necessary for two-wheels.

A P P E N D I X

	Number	%
MOTORBIKES	I20	45,3 %
AUTO-CYCLES	72	27,2 %
BICYCLES	38	I4,3 %
UNKNOW	35	I3,2 %
TOTAL	265	IOO %

BOARD n° I

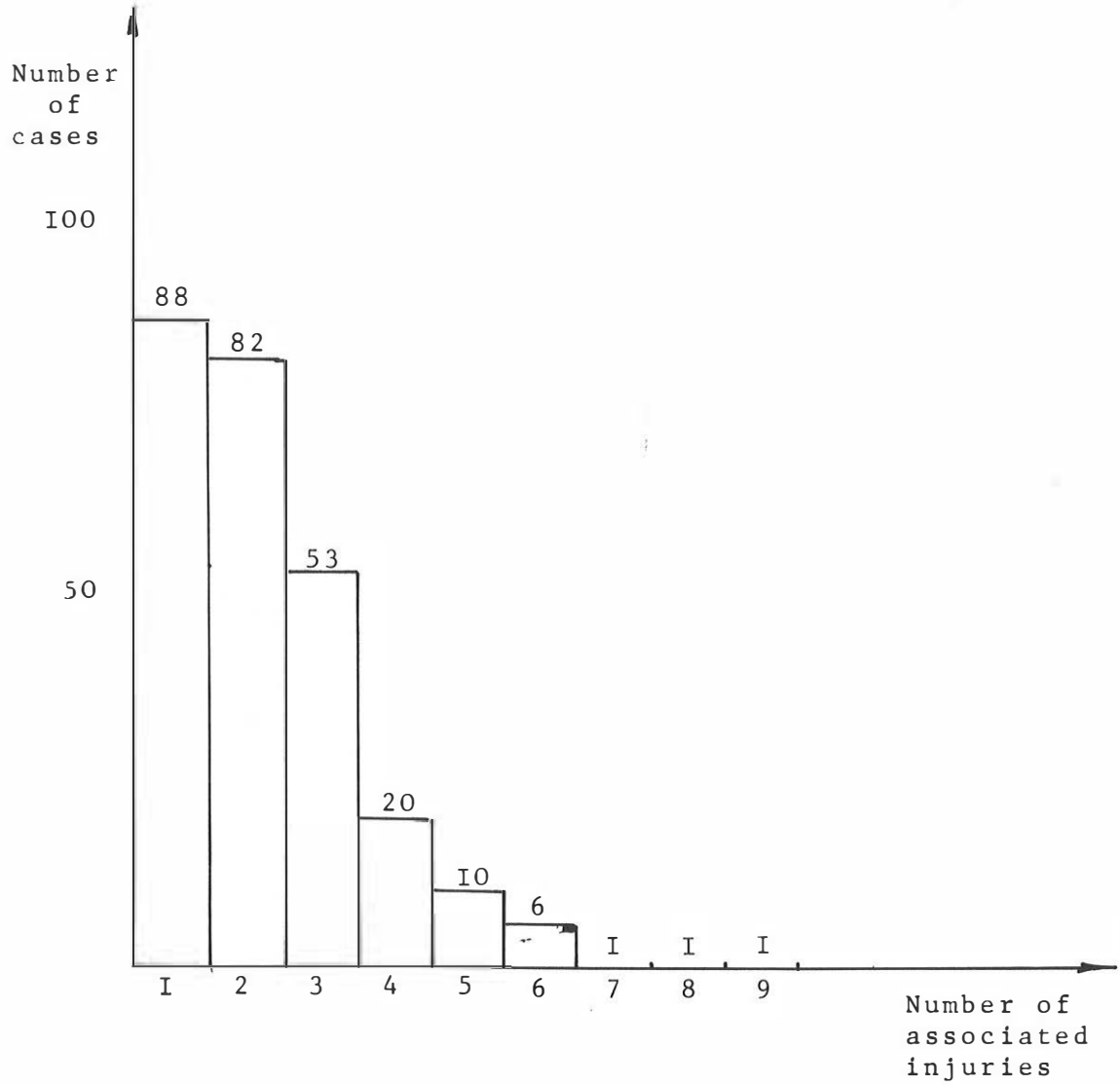
DISTRIBUTION OF THE OCCUPANTS ACCORDING TO THE TYPE OF TWO-WHEELED VEHICLE



	Number	%
HEAD	I9I	30,85 %
UPPER EXTREMITIES	I44	23,26 %
CHEST	33	5,33 %
ABDOMEN PELVIS	53	8,56 %
LOWER EXTREMITIES	I98	3I,98 %
TOTAL	6I9	IOO %

BOARD n° 2

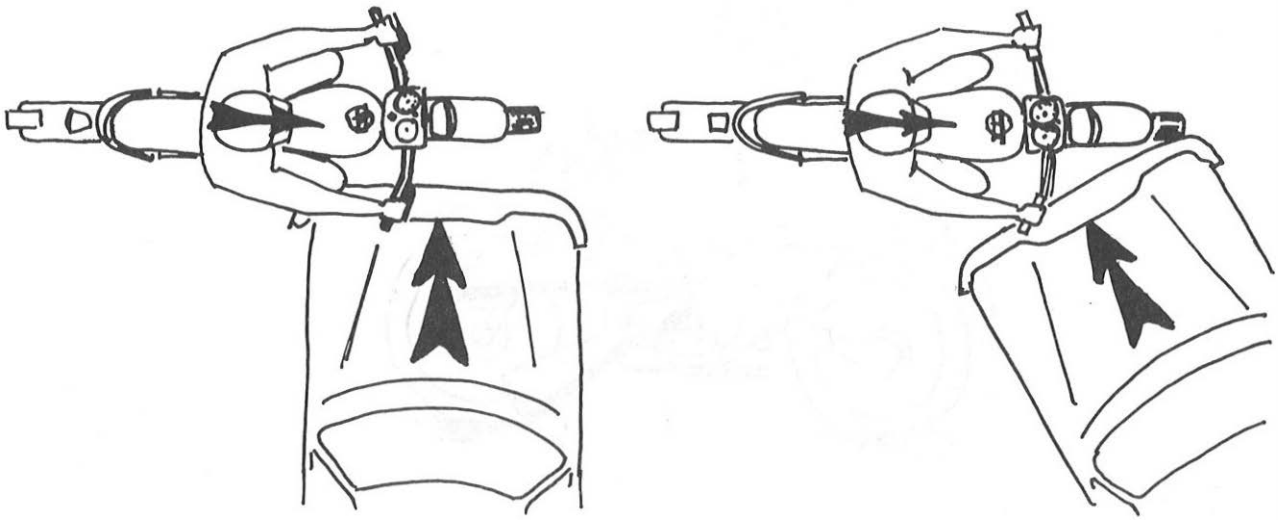
INJURIES DISTRIBUTION ACCORDING TO THE INJURED CORPOREAL SEGMENTS (265 TWO-WHEELED OCCUPANTS)



BOARD n° 3

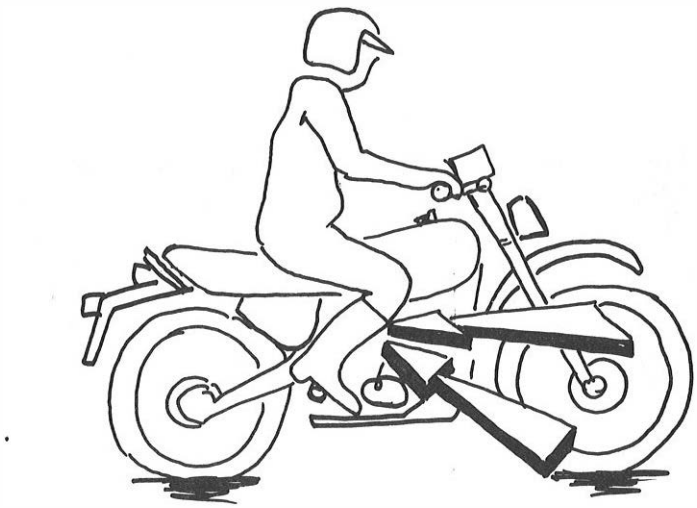
ASSOCIATED INJURIES

BOARD n° 4 DIFFERENT TYPES OF THE IMPACT

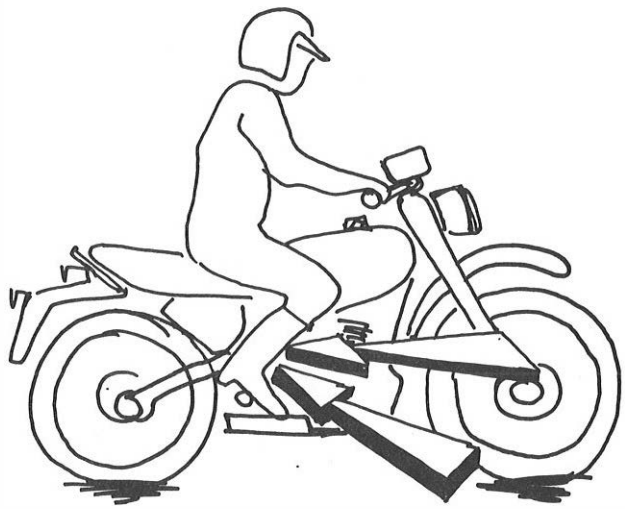


BOARD n° 5 KNEE IMPACTS

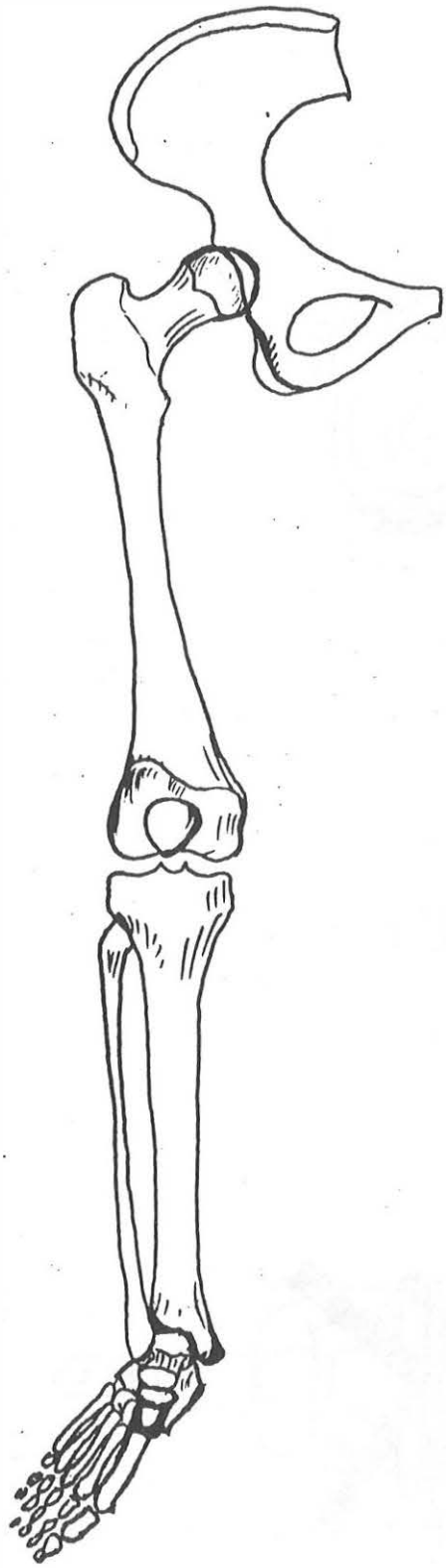
BOARD n° 6 UPPER PART OF THE TIBIA IMPACTS



BOARD n° 7 TIBIA IMPACTS



BOARD n° 8 POSITION OF LEGGS-INJURIES



PELVIS

Soft injuries : 38
Other injuries : I3

FEMUR

Soft injuries : 6
Other injuries : 24

KNEE

Soft injuries : 63
Other injuries : I0

TIBIA-FIBULA

Soft injuries : I4
Other injuries : 27

ANKLE

Soft injuries : 8
Other injuries : 20

FOOT

Soft injuries : I2
Other injuries : I2

BOARD n° 9 PROTECTION BY LATERAL SHIELD