HEAD AND NECK INJURIES IN TRAFFIC ACCIDENTS IN GÖTEBORG IN 1983

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ABSTRACT

A hospital-based registration of traffic accident casualties was introduced in Göteborg in 1979. From 1983 the data of this register and the accident data recorded by the police can be matched and analysed with a computer program developed in cooperation with the Traffic Planning Department of the Town Planning Council of Göteborg. The data base contains 1856 casualties from 1983.

Head injuries are common in traffic accidents and they can constitute a great threat to life. Neck injuries are less common but these include critical injuries to the medulla oblongata caused by fractures and dislocations of the cervical spine. Most of the neck injuries are sustained by car occupants. The symptoms of neck injuries are not always noted immediately but there is a considerable risk of prolonged disability in some of these cases.

The purpose of this paper is to describe the epidemiology of head and neck injuries in urban traffic and to identify accident factors and trauma mechanisms which may correlate to an increased risk of serious injuries and permanent impairment.

INTRODUCTION

Head injuries are often paid attention to in accidents. This is justified in many cases as intracranial injuries may be life-threatening. The risk of head injuries has lead to mandatory use of helmets for motorcyclists and moped-drivers in many countries. Protective helmets are also recommended or mandatory in some sports and industrial work, and the use of helmets has reduced the severity of head injuries in many accidents (1-3). In some cases the helmet is equipped with supplementary protective devices such as visors to prevent face injuries. Injuries to the face are seldom life-threatening but they may cause disfiguring sequelae and psychological handicaps. Face injuries may also lead to blindness and other physiological impairments. Head injuries are usually easily recognized. They are often caused by direct impact forces and they may be associated with unconciousness. On the other hand, head injuries may sometimes distract the attention from other injuries.

Neck injuries are less easily recognized (4,5). Serious and critical neck injuries are probably due to head contact and compression of the neck.

These injuries, including fractures or dislocations of the cervical spine, may be life-threatening and lead to tetra- or paraparesis with a high risk of significant permanent impairment. Minor or moderate neck injuries are usually caused by inertia forces. Even a moderate distorsion of the cervical spine may be the cause of prolonged disability and ligitation (6-9). The additional mass of a protective helmet may increase the risk of neck injuries in a cervical spine distorsion and cause fatigue of the neck muscles (10,11). Thus the head and neck complex should be judged and treated as a functional unit in many accidents.

A computer-based system for traffic accident analysis has been used by the Traffic Planning Department of the Town Planning Council in Göteborg since 1971. This system was intended to store and process accident data for a defined region to describe the accident development, analyse the cause of the accidents, especially traffic environment factors, and to facilitate priority judgements for traffic safety investments on the road network.

A registration of traffic accident casualties was introduced in 1979 at the hospitals in Göteborg (430000 inhabitants). The primary intention was to complete the official accident outcome data and decrease the number of non-reported accidents. A further intention was to classify the accident outcome for different categories of road users and age groups. The first result from this registration was reported at the 1982 IRCOBI conference (12).

SCOPE

The purpose of this study was to investigate the head and neck injuries sustained in traffic accidents and treated at the hospitals in Göteborg during one year.

Another intention was to test the availability of the computer-based system which is developed for registration and analysis of injuries in traffic accidents.

Special attention was given to

- the head and neck injuries in bicyclists, moped-drivers, and motorcyclists in order to evaluate the use and effect of helmets
- the head and neck injuries in car occupants in order to evaluate the use and effect of safety belts and the influence of the position in the car on the injury severity.

MATERIAL AND METHOD

The material includes all injured and killed road users which were recorded by the Traffic Injury Register in Göteborg during 1983. A preliminary set of accident and injury data were recorded by the ordinary staff at the emergency departments. These data were completed with the injury and treatment data obtained from the ordinary hospital records during the first continous period of hospital stay after the accident at one or more clinics.

The location, type and severity of the injuries were assessed and coded by one person at the Traffic Injury Register. The injury severity was described according to the AIS- and ISS-system (13,14).

The following injury parameters are used to describe the occurrence of certain injuries:

1. Relative injury incidence

The relative injury incidence is defined by the equation

$I = \frac{n}{N}$; in which

n is the total number of injuries in a specific part of the body (e.g. the head) in one road user category (e.g. pedestrians).

N is the total number of injured road users of that category.

The relative injury incidence is a measure of the risk of sustaining an injury in a specific part of the body, in a specific road user category, injured in a specific type of traffic accident.

2. Relative injury severity

The relative injury severity is defined by the equation

$S = \frac{n(AIS>C)}{n}$; in which

n(AIS>C) is the number of injuries in a specific part of the body with the AIS severity greater than C.

The relative injury severity is a measure of the risk that a specific injury is serious (AIS>2) or life-threatening (AIS>3).

3. Injury location

In this study the following definitions are made:

Head = Brain and/or skull

Head-Face = Head and/or face

RESULTS AND COMMENTS (TABLES I-XIII)

The relative incidence of head, face, and neck injuries in all road user categories and ages was 26, 25, and 10 per cent respectively (Table I). The relative incidence of head and face injuries was almost the same (about 25%) in adults and elders and 2-5% greater in children. The relative incidence of neck injuries in children was very low (0.3%). Head and face injuries were related to the age and head protection in two-wheelers (Table V-IX). Head-face and neck injuries were related to the position in the car and the use of safety belts in car occupants (Table X, XI).

Head injuries (Table I,II,V)

Irrespective of age, head injuries were most frequent (33%) in pedestrians (Table I). In children, head injuries were more frequent in car occupants (47%). In adult and elderly car occupants head injuries were noted in 28 and 29% respectively. This is probably due to the use of safety belts in these categories. A major part (70%) of the children did not use safety belts as they were sitting in the rear seat. The relative incidence of head injuries was smaller (16%) for motorcyclists and moped-drivers, which illustrates the protective effect of helmets (Table I). Life-threatening head injuries (AIS>3) were noted in 35 casualties (1.9%, Table II). Pedestrians sustained life-threatening head injuries in 10 cases (3.7%), car occupants in 17 (2.8%), bicyclists in 3 (0.5%), and moped-drivers and motorcyclists in one each (0.4% in total). These percentages represent the relative head injury incidences in these categories. Pedestrian head injuries were life-threatening in 12%, car occupants' in 10, moped-drivers' and motorcyclists in 5, and cyclists' in 2. These percentages represent the relative head injury severities.

Face injuries (Table I,III,VI)

Face injuries were most frequent (33%) in cyclists (Table III). The relative incidence of face injuries was greatest (42%) for cyclists below 10 (Table VI). Almost all (96%) of the cyclists' face injuries in children below 10 were of minor severity (AIS=1). Serious face injuries (AIS=3) were noted in 14 casualties (0.8%). Eight of these were car occupants (Table III).

Neck injuries (Table I,IV,XI,XIII)

Neck injuries were unusual in all road user categories except car occupants (Table IV). Eighty-six per cent of the neck injuries were noted in the car occupants. The relative incidence of neck injuries was 26 and 29% for adult and elderly car occupants respectively (Table I). One life-threatening (AIS=5) neck injury was noted in a pedestrian, one another (AIS=4) in a cyclist (Table IV). Ninety-four per cent of the neck injuries in car occupants were of minor injury severity (AIS=1). Only one child sustained a neck injury. This was a car occupant with an AIS=1 injury.

Head and face injuries in two-wheelers (cyclists, moped-drivers, and motorcyclists; Table V-IX)

Head-face injuries were noted in injured cyclists in 57% (Table VII). The relative incidence of head-face injuries in cyclists had maxima in children 4-6 (79%) and in adults 40-49 (74%). No serious (AIS=3) head-face injuries were noted in children in bicycle accidents. Serious (AIS=3) head-face injuries were noted in 9 cases (1.4%), all adults. Life-threatening head-face injuries were noted in three cyclists. One of these died of a AIS=5 head injury sustained in a collision with a car (Table VIII), one another died of a AIS=6 head injury in a single accident. The third survived a AIS=4 head injury in a collision with a car. Helmets were not used in these cases. Helmets were used by only 10 cyclists (10/630 = 1.6%). Moped-drivers

and motorcyclists were less frequently injured in the head or face than cyclists (Table IX). However, life-threatening head injuries were somewhat more frequent in moped-drivers and motorcyclists.

Head-face injuries in car occupants (Table X)

Head-face injuries were noted in 53% of all injured car occupants. Life-threatening head-face injuries (AIS>3) were noted in 17 car occupants (2.7%), maximal (AIS=6) head-face injuries in 9 (1.5%). Safety belts almost halved the overall relative head-face injury incidence from (64-78) to 35%. Head-face injuries were somewhat less frequent in drivers (46%) compared to front and rear passengers (62% each).

Neck injuries in car occupants (Table XI)

Neck injuries were noted in 25% of the car occupants. Almost all (144/154 = 94%) of the neck injuries were of minor severity (AIS=1). Only four (2.6%) of the neck injuries were serious (AIS=3). Life-threatening neck injuries were not noted in the car occupants. The use of safety belts seems to be correlated to a greater relative incidence of neck injuries (36% with and 13% without safety belts irrespective of the position in the car). The difference was greatest for passangers in the front seat. One passanger of 42 in the front seat without safety belt sustained a neck injury compared to 26 of 77 with safety belts.

Types of head, face, and neck injuries (Table XII,XIII)

1016 head-face injuries were noted in 1856 casualties. Most (61%) of the head-face injuries were superficial, such as excoriations and minor wounds and contusions. Head-face fractures were noted in 136 casualties (7.3%). Cerebral conussion was noted in 223 (12%). Cerebral concussion was noted in 90 of 630 cyclists (14.8%). Maximal (AIS=6) head injuries were noted in 20 casualties (1.1%). Neck injuries were noted in 178 casualties (9.6%). A major part (78%) of the neck injuries were distorsion of the cervical spine. Almost all (94%) of the cervical spine distorsions were noted in car occupants. Severe neck injuries such as dislocations and/or fractures of the cervical spine were noted in 11 casualties (0.6%). One contusion of the medulla oblongata was noted without any dislocation or fracture of the cervical spine.

DISCUSSION

Head and face injuries are common in traffic accidents and head-face injuries were noted in 47% of the 1856 road accident casualties in Göteborg in 1983. Intracranial injuries may be life-threatening, face injuries are usually not. Life-threatening head injuries were noted in 35 casualties (1.9%) and 16 (0.9%) died of these injuries. The probability of death from a head injury seems to be greatest for pedestrians hit by car and for car occupants in automobile accidents. About 10% of the head injuries were life-threatening in these categories (Table II). Life-threatening head injuries were less frequently noted in injured motorcyclists, moped-drivers, and bicyclists. The greater relative incidence of life-threatening head injuries in

moped-drivers and motorcyclists compared to bicyclists could be explained by greater velocities in the motorcycle accidents (Table IX).

The risk of sustaining head-face injuries in bicycle accidents seems to be highest (79%) in children between 4 and 6 (Table VII). Modern bicycles are easily driven fast that life-threatening head injuries are risked. In adults (>16 years) 12 serious (AIS≥3) head injuries were noted in 395 injured bicyclists (3%). Three head injuries were life-threatening, two fatal. Serious (AIS≥3) head injuries were not noted in children in bicycle accidents. The relative head-face injury incidence (74%) in injured adult bicyclists 40-49 years old was almost as high as in small children.

The protective effect of helmets is illustrated by the smaller relative incidence of head (16%) and face (13%) injuries in motorcyclists and moped-drivers compared to bicyclists (24 and 33% respectively). Head protection was used only exceptionally in bicyclists and almost exclusively in children 4-6 years old in single accidents. More than 80% of the drivers injured in motorcycle and moped accidents wore helmets. Thus it seems important to recommend protective helmets also for bicyclists, especially for adults who regularly use bicycles in commuting traffic (15). Bicycle helmets probably protect more from head injuries than face injuries. Helmets would probably reduce the incidence of the bicyclists head injuries by 30-50% according to this study.

The protective effect of safety belts against head-face injuries in car occupants is quite obvious. Safety belts seem to reduce the general risk of head-face injuries by approximately 50% (Table X). The protective effect against life-threatening head injuries in car occupants was less obvious as the use of safety belts was unknown in many fatal accidents.

Neck injuries are less common than head-face injuries in traffic accidents. Neck injuries were noted in 10% of the casualties in this study. Only two life-threatening neck injuries were noted, one in a pedestrian and one in a bicyclist (Table IV). A major part (86%) of the neck injuries were noted in car occupants. Distorsions, dislocations, and fractures of the cervical spine were noted almost exclusively (93%) in car occupants. The neck injuries of the car occupants were not life-threatening in any case. Four of them (2.6%) were serious (AIS=3).

The correlation between the use of safety belts and a greater relative incidence of minor neck injuries, which was noted in this study (Table XI), might be explained by the inertia forces of the head which is moving in the initial direction of the vehicle during the first part of the collision when the body is restrained by the safety belt. This is easily understood in frontal collisions but may occur even in rear collisions if the resilience of the seat back is too great. Further studies should be made to investigate the long term results of the cervical spine distorsions and the injury mechanisms in these accidents.

An increased risk of neck injuries caused by heavy protective helmets could not be demonstrated in this study. Theoretically this might be possible in accidents where the head impact accelerates the head and helmet violently

and the cervical spine retards the distorsion (11). Severe neck injuries have been noted in some fatal motorcycle accidents in Sweden in which heavy helmets might have contributed (10).

Neck injuries, even serious ones, may be overlooked during the first period after an accident if the patient is unconcious or if there are other injuries which distract the attention of the patient and the doctor. Also the actual symptoms of strain injuries do not show immediately. Sequelae of neck injuries were noted in 5% in adults in car-pedestrian accidents (16). Early recognition of neck injuries seems fundamental to start adequate therapy which may reduce the risk of permanent impairment.

This is a study of injuries in urban traffic. In this study the injury parameters "relative injury incidence" and "relative injury severity" were introduced. This made it possible to compare the occurrence of specific injuries in specific road user categories injured in specific accidents. These parameters do not illustrate the real risk to be injured in a specific accident type. However, they do if they are related to the exposition of different road users in urban traffic.

The accident outcome expressed as the time of hospital care was not investigated in this study. This accident outcome depends on many other factors such as other injuries and social circumstances of the injured. However, more detailed analysis could be made with the computer program used in this study including long-term follow-up studies. This also includes studies of the causes of the accidents and traffic environment factores processed by the Traffic Planning Department which could be linked with the hospital data of the Traffic Injury Register.

CONCLUSIONS

Head and face injuries are common in urban traffic accidents and the head injuries constitute a great threat to life.

Fatal head injuries are most frequent in pedestrians hit by car and in car occupants in automobile accidents.

Safety belts reduce the incidence of head-face injuries by approximately 50%.

Serious (AIS>2) head-face injuries are uncommon in children in bicycle accidents.

In bicyclists head-face injuries are most frequent in young children and in adults 40-49 of age.

Bicycle helmets would probably reduce the incidence of head injuries in bicyclists by 30-50%.

Severe neck injuries are uncommon in traffic accidents, especially in children.

The major number of the neck injuries in traffic accidents are noted in car occupants. Most of these injuries are of minor or moderate severity but

may cause pain and discomfort a long time after the accident.

Inertia forces will promote neck injuries in traffic accidents. This is seen in car occupants restrained by safety belts in some automobile collisions and might be true in some motorcycle accidents with heavy helmets.

The head and neck should be judged and treated as a functional unit in many accidents. There is a significant risk that neck injuries are overlooked in some accidents. This may lead to delayed treatment of neck injuries and increase the risk of sequelae.

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Table I. Road users injured in traffic accidents in Göteborg in 1983. Total number of injured and percentage of the injured with head, face, and neck injuries in children, adults, and elders of different road user categories.

Category			Age (years)			Sum
			Children (< 16)	Adults (16-64)	Elders (> 64)	
Pedestrians	Total	nr	55	155	62	268
	Head	(%)	35	34	27	33
	Face	(%)	37	21	26	25
	Neck	(%)	0	2	3	2
Cyclists	Total	nr	235	375	20	630
	Head	(%)	26	22	30	24
	Face	(%)	32	35	15	33
	Neck	(%)	0	3	0	2
Mop + Mc drivers	Total	nr	54	222	5	281
	Head	(%)	13	15	(60)	16
	Face	(%)	17	11	(20)	13
	Neck	(%)	0	2	0	1
Car-occupants	Total	nr	38	540	38	616
	Head	(%)	47	28	29	29
	Face	(%)	26	24	26	24
	Neck	(%)	3	26	29	25
Other categories	Total	nr	3			
	Head	(%)	(67)	41	(7)	34
	Face	(%)	0	16	(29)	18
	Neck	(%)	0	9	0	7
Sum	Total	nr	381	1336	139	1856
	Head	(%)	28	25	27	26
	Face	(%)	30	24	25	25
	Neck	(%)	0	12	9	10

Table II. Head injuries in traffic accidents in Göteborg in 1983. Total number of injured (N), number of head injuries of different severities (AIS), total number of head injuries (n), relative incidence of head injuries, and relative severity of head injuries for different road user categories.

Category	Number of injured (N)	Head injury severity (AIS)						Number of skull injuries (n)	$\frac{n}{N}$ (%)	$\frac{n(AIS>3)}{n}$ (%)
		1	2	3	4	5	6			
Pedestrians	268	39	27	11	5	2	3	87	33	12
Cyclists	630	70	74	5	1	1	1	152	24	2
Mop+MC dr.+pass	281	13	21	8	1		1	44	16	5
Car-occupants	616	91	63	7	7	1	9	178	29	10
Other categories	61	10	8			1	2	21	34	14
Sum	1856	223	193	31	14	5	16	482	26	7

Table III. Face injuries in traffic accidents in Göteborg in 1983. Total number of injured (N), number of face injuries of different severities (AIS), total number of face injuries (n), relative incidence of face injuries, and relative severity of face injuries for different road user categories.

Category	Number of injured (N)	Face injury severity(AIS) 1	2	3	Number of face injuries (n)	$\frac{n}{N}$ (%)	$\frac{n(AIS>2)}{n}$ (%)
Pedestrians	268	59	8	1	68	25	1,5
Cyclists	630	191	15	4	210	33	1,9
Mop+MC	281	30	4	1	35	13	2,9
Car-occupants	616	123	16	8	147	24	5,4
Other categories	61	10	1		11	18	0
Sum	1856	413	44	14	471	25	3,0

Table IV. Neck injuries in traffic accidents in Göteborg in 1983. Total number of injured (N), number of neck injuries of different severities (AIS), total number of neck injuries (n), relative incidence of neck injuries, and relative severity of neck injuries for different road user categories.

Category	Number of injured (N)	Neck injury severity(AIS) 1	2	3	4	5	6	Number of neck injuries (n)	$\frac{n}{N}$ (%)	$\frac{n(AIS>2)}{n}$ (%)	$\frac{n(AIS>3)}{n}$ (%)
Pedestrians	268	3		1		1		5	1,9	40	20
Cyclists	630	11			1			12	1,9	8	8
Mop+MC	281	4						4	1,4	0	0
Car-occupants	616	144	6	4				154	25,0	3	0
Other categories	61	4						4	6,6	0	0
Sum	1856	166	6	5	1	1		179	9,6	4	1

Table V. Head injuries in bicyclists in traffic accidents in Göteborg in 1983 total number of injured bicyclists (N), number of head injuries of different severities (AIS), total number of head injuries (n) and relativ incidence of head injuries for different age classes.

Age	Number of injured bicyclists (N)	Head injury severity (AIS)						Number of head injuries (n)	n/N (%)
		1	2	3	4	5	6		
0-9	125	20	15					35	28
10-19	166	21	17			1		39	24
20-29	149	11	23	2				36	24
30-39	83	7	8					15	18
40-49	34	4	6	1			1	12	35
50-59	40	3	2	2				7	18
60-65	20	3	2		1			6	30
70	13	1	1					2	15
Sum	630	70	74	5	1	1	1	152	24

Table VI. Face injuries in bicyclists in traffic accidents in Göteborg in 1983 total number of injured bicyclists (N), number of face injuries of different severities (AIS), total number of face injuries (n), and relative incidence of face injuries for different age classes.

Age	Number of injured bicyclists (N)	A I S			Number of face injuries (n)	n/N (%)
		1	2	3		
0-9	125	51	2		53	42
10-19	166	40	1		41	25
20-29	149	48	6	1	55	37
30-39	83	25	2		27	33
40-49	34	10	1	2	13	38
50-59	40	10	3	1	14	35
60-69	20	4			4	20
69	13	3			3	23
Sum	630	191	15	4	210	33

Table VII. Head-face injuries in bicyclists in traffic accidents in Göteborg in 1983. Total number of injured (N), number of head-face injuries of different severities (AIS), total number of head-face injuries (n) and relative incidence of head-face injuries for different age classes.

Age	Number of injured bicyclists (N)	Head-face injury severity (AIS)						Number of head-face injuries (n)	n/N (%)
		1	2	3	4	5	6		
0-3	8	3						3	38
4-6	63	42	8					50	79
7-9	54	26	9					35	65
10-12	61	27	4					31	51
13-15	49	12	7					19	39
16-19	56	22	7			1		30	54
20-29	149	59	29	3				91	61
30-39	83	32	10					42	51
40-49	34	14	7	3			1	25	74
50-59	40	13	5	3				21	52
60-69	20	7	2		1			10	50
69	13	4	1					5	38
Sum	630	261	89	9	1	1	1	362	57

Table VIII. Head-face injuries in bycyclists in traffic accidents in Göteborg in 1983. Number of injuries of different severities (AIS) in different types of accidents.

Type of accident	Head-face injury severity (AIS)						Sum
	1	2	3	4	5	6	
Single accident	182	56	9			1	248
Coll. with car	48	16		1	1		66
Other types	31	17					48
Sum	261	89	9	1	1	1	362

Table IX. Bicyclists and moped+Mc drivers (+passengers) injured in traffic accidents in Göteborg in 1983. Total number of injured and percentage of the injured with head and face injuries of different severities.

Category	Total number of injured	Percentage of the injured with			
		injuries to the		serious injuries to the	
		head (%)	face (%)	head(%) (AIS>3)	face(%) (AIS>2)
Bicyclists	630	24	33	2	2
Moped+Mc-drivers+pass	281	16	13	5	3

Table X. Head-face injuries in car occupants in traffic accidents in Göteborg in 1983. Total number of injured (N), number of head-face injuries of different severities (AIS), total number of head-face injuries (n), and relative incidence of head-face injuries for different positions in the car and the use and non-use of safety belts.

Position in the car	Total number of injured (N)	Head-face injury severity (AIS)						Total number of h - f injuries (n)	n/N (%)
		1	2	3	4	5	6		
Driver total	359	110	43	7	2		4	166	**46**
with s.b	214	50	16	2			1	69	**32**
without s.b	82	38	9					47	**57**
unspec.	63	22	18	5	2		3	50	79
Front pass total	150	58	21	5	4	1	4	93	62
with s.b	77	19	9	1	1			30	39
without s.b	42	29	5				1	35	83
unspec.	31	10	7	4	3	1	3	28	90
Rear pass total	107	46	15	3	1		1	66	62
with s.b	7	4					1	5	71
without s.b	75	36	10					46	61
unspec.	25	6	5	3	1			15	60
Car occup total	616	214	79	15	7	1	9	325	53
with s.b	298	73	25	3	1		2	104	35
without s.b	199	103	24				1	128	64
unspec.	119	38	30	12	6	1	6	93	78

Table XI. Neck injuries in car occupants in traffic accidents in Göteborg in 1983. Total number of injured (N), number of neck injuries of different severities (AIS), total number of neck injuries (n), and relative incidence of neck injuries for different positions in the car and the use and non-use of safety belts.

Position in the car	Total number of injured (N)	Neck injury severity (AIS)			Total number of neck injuries (n)	n/N (%)
		1	2	3		
Driver total	359	97	5	3	105	29
with s.b	214	77	3	1	81	38
without s.b	82	9	2		11	13
unspec.	63	11		2	13	20
Front pass total	150	30	1	1	32	21
with s.b	77	24	1	1	26	34
without s.b	42	1			1	2
unspec.	31	5			5	16
Rear pass total	107	17			17	16
with s.b	7	1			1	14
without s.b	75	14			14	18
unspec.	25	2			2	8
Car occup. total	616	144	6	4	154	25
with s.b	298	102	4	2	108	36
without s.b	199	24	2		26	13
unspec.	119	18		2	20	17

Table XII. Different types of head and face injuries in traffic accidents in Göteborg in 1983.

Types of injury		Road user category					Sum
		P	Cy	Mo/Mc	Ca	O	
Inj.spf.	capitis	2	3	1	5	2	13
	facei	17	42	6	23		88
Vulnus	capitis	14	15	3	23	3	58
	facei	27	114	16	60	6	223
Contusio	capitis	20	41	7	63	5	136
	facei	16	38	6	40	4	104
Fractura	capitis	11	1	5	8		25
	nasi	3	14	4	8	1	30
	mandibulae	3	2	1	7		13
	ossium al.	6	7	1	8	1	23
	dentis	5	27	3	10		45
Commotio	cerebri	32	30	26	67	8	223
Contusio	cerebri	3	1		2		6
Haemorr.	cerebri	1	1	1	6		9
Inj.mult.	cerebri	5	1	1	10	3	20
Sum		165	397	81	340	33	1016

Table XIII. Different types of neck injuries in traffic accidents in Göteborg in 1983.

Type of injury	Road user category					Sum
	P	Cy	Mo/Mc	Ca	O	
Vuln. colli	1			1		2
Cont. colli	2	8	1	14	1	26
Dist. colli		3	3	129	3	138
Lux.vert.cerv.	1	1		2		4
Laesio med.spin.				1		1
Fr.cerv.s.l.m.s				6		6
Fr.cerv.c.l.m.s				1		1
	4	12	4	154	4	178