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Statistical Study On Peripheral Nerve Injury

by

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Received for Publication 20, Jan, 1976.

The development of industry and transportation and advances in civilization have inevitably brought about a drastic increase of industrial and traffic injuries in the recent decades, and the peripheral nerve injuries that are encountered in daily practice present increasing complexity in their features.

I. Clinical Material

The present investigation was undertaken with the aim of statistical review of the data from a series of 590 cases of peripheral nerve injuries which were examined and treated at this department in the period of 12 years between April 1, 1963 and March 31, 1975. Patients with peripheral nerve injuries possibly or apparently due to viral infections or systemic diseases were excluded from this study.

II. Statistical Analysis

(1) Age, Sex and Side of Nerve Injury

The subjects ranged widely in age from 1 day to 73 years, where those in the lowest age group or less than twelve months of age were all with birth paralysis.

Among the males, those at ages between 10 and 49 years accounted for more than a half of all cases and a marked increase of the proportion occupied by those from 10 to 19 was conspicuous, thereby providing evidence in support of increase in traffic accidents in the young. By contrast, there was no significant difference in the incidence among the various age groups of females. (Figure 1)

According to Sakellarides³⁾, the peak incidence was between 3 and 40 years of age, and school children predominated (26%), followed by laborers (15%) and by house wife (8.5%).

Figure 1 showed the incidence of injury in both sexes and in successive age groups. The sex ratio (male : female) of our case material was approximately 2.5: 1. It was close to

Key words : Traffic accidents, industrial injury, Compression nerve paralysis, Iatrogenic nerve injury, neurolysis, neurorrhaphy.

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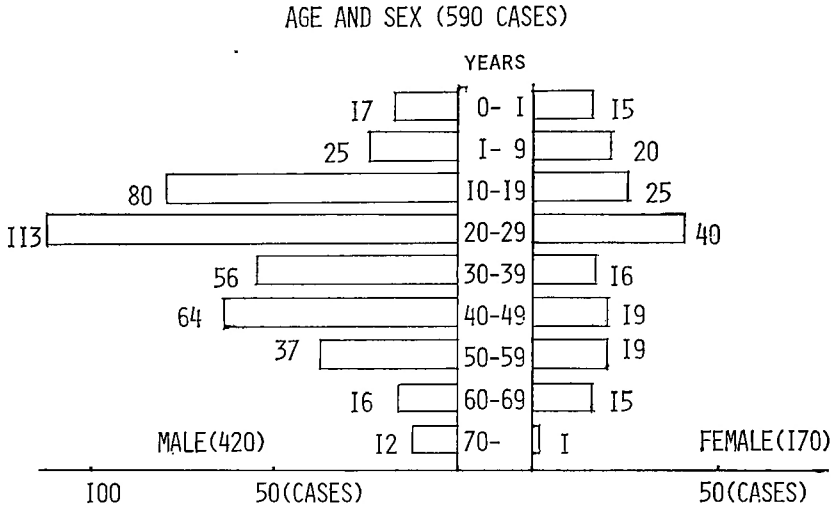


Fig. 1.

the ratio of patients studied by Matsumori²⁾ and showed a higher rate for females as compared with the reports by Ishikawa¹⁾ et al. (6 : 1) or that by Sakallarides³⁾ (3.5 : 1).

There were 326 patients with right-sided peripheral nerve injuries and 270 who had injuries on the left side of the body. Bilateral injury was in 6 cases. (Figure 2) Particulary

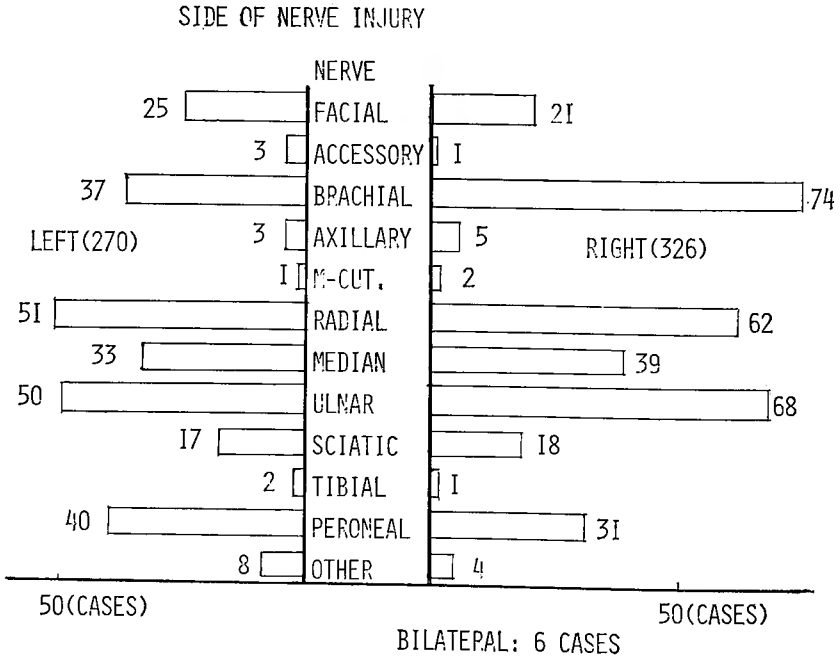


Fig. 2.

significant difference in the incidence between right and left was noted with cases of brachial nerve paralysis, i. e. right in 74 cases and left in 37 cases. It was of profound interest that 42 of them (37.8%) were victims of traffic accidents occurring while driving a motorcycle.

(2) Distribution of Nerve Injury

Facial nerve paralysis was notably frequent, being as many as 46 cases practically all of which had been referred here from the otorhinolaryngology department of this hospital or other E.N.T. clinic. Surgical invasion or compression by tumor constituted the cause in about 47.8 per cent of the cases of facial nerve paralysis. There was 113 cases of radial nerve paralysis, 118 cases of ulnar nerve damage and 72 cases of paralysis inflicted on the median nerve, accounting altogether for as high as 51.4 per cent of all cases which was of considerable note. (Figure 2) Radial nerve paralysis was due in most cases to injury of the upper arm, ulnar nerve palsy due to injury of the elbow, and median nerve paralysis arising from that of the wrist joint, respectively. Most frequent among various peripheral nerve damages of the lower limbs was peroneal nerve palsy seen in 71 cases and most of these cases were caused by fracture or by plaster cast application for treatment of fracture. There were 35 sciatic nerve palsy, in which 15 cases were due to fracture, 7 due to injection of drug, 4 contusion, 4 surgical invasion, 3 laceration and other.

(3) Cause and Mechanism of Nerve Injury

Shown on Figure 3 was the incidence of injuries according to causes. Traffic accidents occupied 125 cases (21.2%) and industrial injury 76 cases (12.9%). 87 per cent of these injuries were in males. These findings appeared to correlate with the increased victims of

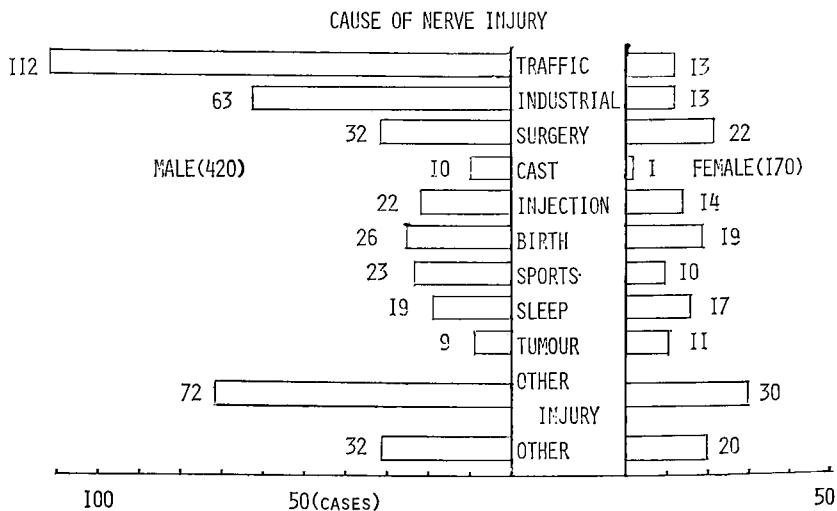


Fig. 3.

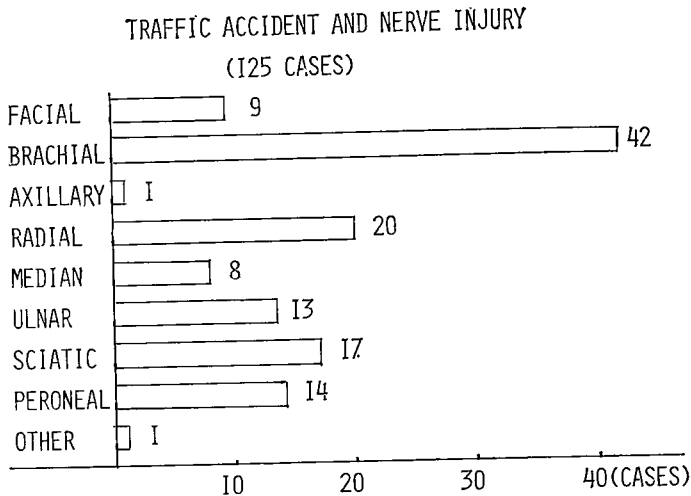


Fig. 4.

traffic and industrial accidents in recent decades.

Brachial nerve paralysis occupied 33.6 per cent of the traffic injury (Figure 4), which were mostly caused by the motorcycle accidents in the younger age group. There were 20 cases of radial nerve palsy and 14 cases of peroneal nerve palsy due to traffic injury. It was interesting that sciatic nerve palsy due to traffic accidents was seen in 17 cases (13.6%), which occupied almost 50.0 per cent of all sciatic nerve palsy. This suggested the increasing complexity and severity of motor car injury.

Iatrogenic nerve injury was in 102 cases, which occupied 17.3 per cent of all nerve palsies, their absolute number being comparable to that of cases due to traffic or workers' accidents. Among them, 49 cases (48.0%) were due to surgical operation, wherein injuries could be ascribable to otorhinolaryngological operation in approximately 40 per cent of them. There were 36 cases of palsy caused by injection of drugs and 17 cases due to plaster cast fixation. Injuries caused by medical or surgical treatment in females accounted for as high as 21.8 per cent of all female cases. The presence of large number of iatrogenic palsy suggested caution to those who were engaged in medical and surgical treatments.

Compression nerve paralysis (Figure 5) accounted for 23.0 per cent of all nerve paralysis. Among the paralysis due to compression 36 cases (26.5%) were due to pressure during sleep, causing radial nerve paralysis in nearly half of these cases, 17 cases (12.5%) due to plaster cast application, 20 cases (14.7%) due to carpal tunnel syndrome, 9 cases (6.6%) rucksack, 10 cases (7.4%) tumor, 5 cases (3.7%) unfavourable position of extremity during the surgery, 6 cases (4.4%) prolonged cross-legged sitting, and so on.

On the other hand, traumatic peripheral nerve injuries due to fracture, contusion, incision and laceration formed the great majority (42.5%). Contusion, crushed wounds and

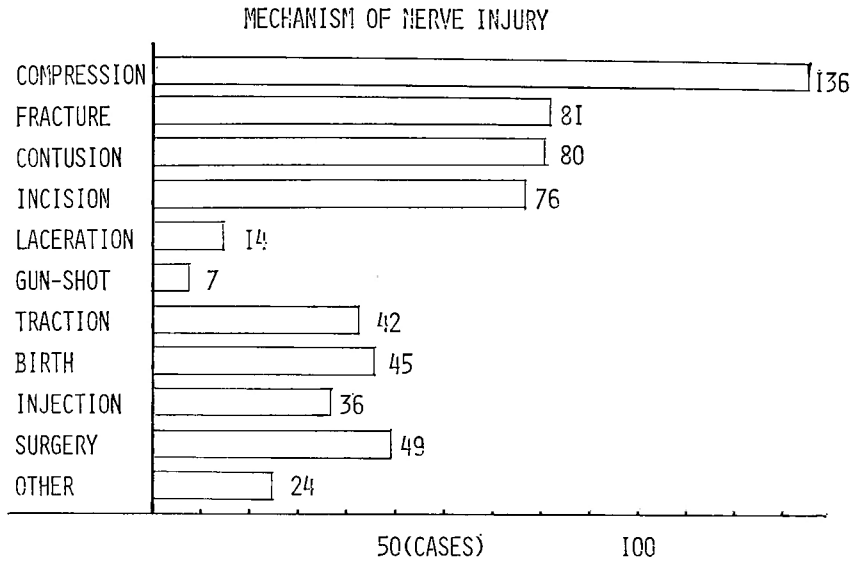


Fig. 5.

fracture were noted to be frequent among various other injuries both in males and females while cuts with a knife or broken glass occurred in an overwhelmingly higher incidence in males.

(4) Associated Injuries

There were associated dislocation or fracture in 137 cases (23.2%), associated tendon injuries in 47 cases (8.0%), associated arterial injuries in 19 cases (3.2%) and others in 44 cases (7.5%) in this series. Associated injury with birth palsy were 6 cases of muscular torticollis, a case of cerebral palsy, 4 cases of fracture (2 humeral, 2 clavicular fractures) and one shoulder dislocation.

According to Sakellarides³⁾, there were associated fractures in 10.0 per cent, associated tendon injuries in 46.5 per cent and associated arterial injuries in 14.7 per cent.

According to our statistics, there were 41.9 per cent of associated injuries. This large number of the associated injury indicated the increased complexity due to the multiple injury of the traffic and industrial accidents.

(5) Result of Treatment

A follow-up study was conducted in 362 of the cases by assessment with the criteria made up according to the British Medical Research Council. (Table 1)

Conservative treatment (Table 2) produced good to excellent improvement in 60.8 per cent of patients (132 cases). Fair result was in 54 cases (24.9%), failure in 31 cases (14.3%). Those in whom the treatment was begun within a month after injury displayed a higher rate of improvement whereas the prognosis in those placed upon conservative treatment after a lapse of more than three months following injury tended to be poor. (Table 5)

Table. I.

Clinical evaluation method	
Failure :	no improvement or worse, M _{0,1} , S _{0,1}
Fair :	slight improvement. M ₂ , S ₂ , or 1 degree improved.
Good :	almost recovered subjectively, with slight abnormality by objective examinations (E.M.G. etc.) M ₃ , S ₂ ⁺ , S ₃ , or 2 degrees improved.
Excellent	complete recovery. M ₄ , S ₃ ⁺ , S ₄
Based mainly on nerve injuries committee of the British Medical Research Council.	

Table. II.

	Result of Conservative Treatment				
	Excellent	Good	Fair	Failure	Total
Facial	5	10	5	4	24
Accessory			1	1	1
Axillary		1	1	2	4
Brachial	8	19	11	7	45
M-cut.		1			1
Radial	12	25	9	3	49
Median		8	3	3	14
Ulnar	5	5	9	7	26
Sciatic	1	6	6	2	15
Tibial					0
Peroneal	2	21	9	2	34
Other	1	2	1		4
Total	34	98	54	31	217

Table. III.

	Neurolysis	Transfer		Neurorrhaphy	Homografting	Total
		Costal	Ulnar			
Brachial	5	5		1		11
Radial	16			6		22
Median	17			12	1	30
Ulnar	15		16	14	6	51
Sciatic	9			2	1	12
Peroneal	10				1	11
Other	4			3	1	8
Total	76	5	16	38	10	145

Of 145 patients surgically treated, there were 76 cases of neurolysis, 5 costal nerve transfer, 16 ulnar nerve transposition, 38 neurorrhaphy, 10 nerve homografting. (Table 3)

The overall results of surgical treatment were summarized on Figure 4. Excellent and good were 87 cases (60.0%), and fair 51 cases (35.2%), failure 7 cases (4.8%).

As shown on Table 5, the data obtained indicated that a favourable recovery might be expected in a patient receiving surgical operation within three months after injury and that the outcome was liable to be poor if the patient was operated on after more than a year had passed.

Sakellarides³⁾ stated that nerve suture could be worth while even after delays of three years or more. Seddon⁴⁾ obtained M₃ and S₃ recovery in 2 cases after 48 months delay of the nerve repair. According to Zachery⁵⁾, a delay of 3 to 6 months was compatible with a good results, but a delay of more than 6 months put the outcome in jeopardy.

Table. IV.
Result of Surgical Treatment

	Excellent	Good	Fair	Failure	Total
Facial	2	1	1		4
Accessory					0
Axillary					0
Brachial	1	2	5	3	11
M-cut.		1			1
Radial	6	9	7		22
Median	6	15	9		30
Ulnar	6	23	20	2	51
Sciatic	3	2	7		12
Tibial				1	1
Peroneal	1	7	2	1	11
Other	1	1			2
Total	26	61	51	7	145

Possibly owing to the particularity of our institution being a University-affiliated hospital, many of the cases in the present investigation were treated at this department after considerable delay of time after injury, viz. 23.8 per cent of cases after more than six months post injury; hence a trend to poor prognosis. This stresses importance of early treatment.

III. Summary

A statistical review was done on a series of 590 cases of peripheral nerve injuries which were examined and treated at this department in the period 12 years between April 1, 1963 and March 31, 1975, and the following results

were obtained.

Table. V
Time Lapsed Between Injury and Treatment

	Conservative				Surgical			
	Excellent	Good	Fair	Failure	Excellent	Good	Fair	Failure
Within 1 Week	19	37	14	3	7	8	9	1
1 Month	11	36	17	8	8	12	10	0
3 Months	3	17	15	7	2	18	13	1
6 Months	0	7	4	3	4	9	5	2
12 Months	1	1	1	3	1	6	6	1
24 Months	0	0	2	2	0	2	1	0
More Than 24 Months	0	0	1	5	4	6	7	2
Total 362 cases	34	98	54	31	26	61	51	7

1. Those at ages between 10 and 49 years accounted for more than a half of all cases in man.
2. The sex ratio (male : female) was approximately 2.5 : 1.
3. Significant difference in the incidence between right and left was noted in injury to brachial nerve.
4. There were 113 cases of radial nerve paralysis, 118 ulnar nerve and 72 median nerve paralysis, accounting altogether for as high as 51.4 per cent of all cases which was of considerable note.
5. Traffic accidents occupied 125 cases (21.2%) and industrial injury 76 cases (12.9

%) . Brachial nerve paralysis occupied 33.6% of traffic injury.

6. Introgenic nerve injury occupied 17.3 per cent of all nerve paralysis. Among them, 48.0 per cent were due to surgical operation, 35.3 per cent due to injection of drug, 16.7 per cent due to plaster cast fixation.

7. Compression nerve paralysis accounted for 23.0 per cent of all nerve paralysis. Traumatic paralysis due to fracture, contusion, incision and laceration formed the great majority.

8. There were associated dislocation or fracture in 137 cases (23.2%).

9. Conservative treatment produced good to excellent improvement in 60.8 per cent, surgical treatment in 60.0 per cent.

10. A favourable recovery might be expected in a patient receiving surgical treatment within three months after injury and the outcome was liable to be poor if the patient was operated on after more than a year had passed.

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和文抄録

末梢神経損傷の統計的観察

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1963年4月1日より1975年3月31日までの12年間に当教室を受診した末梢神経損傷患者 590 名について統計的観察を行った。

男女比は 2.5 : 1 と男性に多く，交通，労働災害など外傷に遭遇する機会の多いことを示している。

左右差のある神経損傷は腕神経叢麻痺であり，右37例，左74と左側に多い。

全症例中，橈骨神経麻痺 113 例，尺骨神経麻痺 118 例，正中神経麻痺72例，合計 303 例（51.4%）であり，この三者が半数以上を占めている。

原因別にみると交通災害125例（21.2%），労働災害76例（12.9%）と多く，交通災害によるもののうち腕神経叢麻痺が33.6%を占めている。医療行為による神経損傷は101例（17.8%）を占め，このうち手術によるもの48.0%，注射麻痺35.3%，ギプスによるもの

16.3%である。

成因別にみると圧迫麻痺は全体の23.0%を占め，骨折，打撲，切創，挫創などの外傷による神経麻痺は全体の42.5%を占めている。

合併症としては骨折，脱臼を合併した神経麻痺が137例（23.2%）と最も多い。

British Nerve Injuries Committee による判定基準を中心として follow up できた症例は362例であり，このうち保存療法のみ217例，手術療法145例であった。保存療法の成績は著効，有効が60.8%であり，手術療法は著効，有効が60.0%であった。また受傷後3カ月以内に手術療法を受けた症例は治療成績は良いが，受傷後1年以上の症例は予後が悪い傾向を示していた。