

Tonic Neck Reflex in Patients¹

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The tonic neck reflex was discovered in decerebrate animals by R. Magnus and A. de Kleijn (1912). In human subject it was reported in cases where the cerebral development was in an early stage or abnormally retarded and where brain function was impaired by diseases or traumatic lesions. In healthy subjects, existence and regularity of this reflex was first reported by the author (1944). H. S. Wells (1944) studied a salon trick which he showed to conform with the existence and regularity of this reflex, in healthy subjects. H. E. Hoff (1933) examined the reflex by recording motor nerve impulses in cat. Recently Tokizane (1951) tried to study this reflex by electromyographic method in healthy subject.

In patients of hydrocephalus, brain tumor and other cerebral lesions, tonic neck reflex is found without special technique; but in patients of slight disorders of the central nervous system, it is necessary to use some mechanical magnifying method or electrical device. Sassa (1929) and Kôno (1934) tried to examine the existence and regularity of this reflex by measuring the resistance of limb musculature to extension in healthy subjects and patients of central nervous diseases.

The author studied this reflex in patients of cranial trauma and neurosis after chronic fatigue by a simple mechanical method of his own device. Tonic neck reflex was found intensified in many cases of these patients and its regularity did not always conform with that of normal subjects. This irregularity, so-called reflex reversal, was found by Brouwer (1917), Simons (1923), Sassa (1929) and Kôno (1934) and others. In author's present cases, the reflex extension predominated over the reflex flexion which was remarkable, since it had not been the case in the previous papers. The crossed limb reflex was also recorded.

Method

A simple mechanical device described by the author (1944, 1951) was used. Intensity of this reflex was presented as the change of flexion or extension angle at the elbow-joint and pattern of this reflex was recorded as smoked paper tracings. The method for demonstrating crossed limb

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reflex was reported by the author (1951). In healthy subjects, extension of the right arm coincides with the left knee jerk, and flexion of the right arm coincides with the right knee jerk.

Observation was made in patients of cranial trauma, contusion of the head and neurosis after chronic fatigue. Most of the patients was well on the way to recovery by the hospitalization for a few months since their accidents. Medical examination and diagnosis was given by hospital staff.

Results

Tonic neck reflex was found intensified in many cases of cranial trauma or neurosis after chronic fatigue. Pattern of this reflex was in some cases regular, in others irregular. Intensity and pattern of this reflex in these patients were shown here with respective diagnosis and clinical symptoms. Data on crossed limb reflex was also entered in the table (Table 1).

In some cases obviously slight injuries, intensity and pattern of this reflex was normal (2-6 degrees) and regular (Fig. 1A); in many cases of cranial trauma, intensity was enhanced (7-10 degrees) but its pattern regular (Fig. 1B); in some cases of cranial trauma and neurosis, intensity was enhanced (7-12 degrees) and its pattern was changed in such a way as extension occurred when reflex flexion was expected (fig. 1C). Typical tracings of these cases are shown in Fig. 1.

Crossed limb reflex was found intensified and paradox extension occurred in many cases of these patients.

General Consideration

In many pathological cases, tonic reflex was found by many authors;

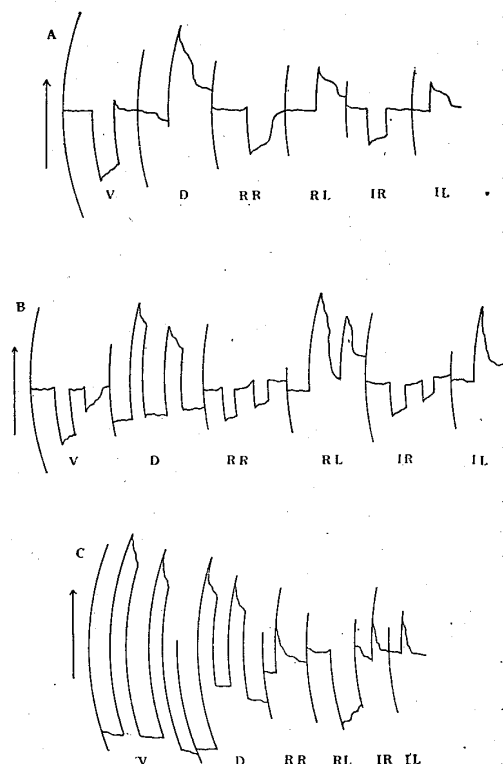


Fig. 1 Typical tracings of tonic neck reflex in patients of cranial trauma and neurosis after chronic fatigue.

- A: Intensity and pattern are normal.
 B: Intensity was enhanced and pattern was regular.
 C: Intensity was enhanced and its pattern was changed in such a way as extension occurred when reflex flexion was expected.

Arrows in A and B show the direction of extension of the right arm, arrow in C shows the direction of extension of the left arm. Letter (V) represents reflex of the arm on ventriflexion of the head, (D) dorsiflexion, (RR) rotation toward the right shoulder, (RL) rotation toward the left shoulder, (IR) inclination to the right and (IL) inclination to the left.

Table 1. Results of tests in patients of cranial trauma and neurosis

Subject's number	Diagnosis	Clinical symptom	Tonic neck reflex		Crossed limb reflex
			Intensity	Pattern	
1	fracture of frontal bone	low ability in mental test	normal	normal	normal
2	fracture of frontal bone	low ability in mental test	enhanced	normal	normal
3	fracture of occipital bone by explosion	contracted visual field	normal	normal	enhanced extensor reflex
4	trauma in occipital region	slight symptom of cerebellar disorder	normal	normal	enhanced extensor reflex
5	trauma in occipital region	low ability in mental test	normal	normal	enhanced extensor reflex
6	trauma in the head	disorders of speech	enhanced	normal	enhanced extensor reflex
7	sprain in frontal region	dizziness, slight disorder of speech	enhanced	normal	enhanced extensor reflex
8	fracture of frontal bone	low ability in mental test	enhanced	normal	enhanced extensor reflex
9	contusion of the head	anaesthesia in the frontal region and diplopy	enhanced	normal	enhanced extensor reflex
10	contusion of the head	slight paralysis in bilateral arms	decreased	normal	decreased
11	trauma of the head & breast	nervous temperament	normal	normal	decreased
12	trauma of the head	low ability in mental test	normal	normal	decreased
13	fracture of frontal bone	low ability in mental test	enhanced	normal	normal
14	trauma in the head	disorder in equilibrium	enhanced markedly	normal	decreased
15	trauma in the head	headache, symptom of left cerebellar lesion, disfunction of left labyrinth	enhanced on the right side, decreased on the left side	enhanced extensor reflex on the right, decreased on the left	enhanced extensor reflex on the right, decreased on the left
16	trauma in the head	low ability in mental test	enhanced	normal	enhanced extensor reflex
17	trauma in the head	headache	enhanced	normal	enhanced extensor reflex
18	sprain of frontal region	headache, dizziness, disorder of standing equilibrium	enhanced	altered	enhanced extensor reflex
19	contusion of the head & neurosis after trauma	headache, disorder of equilibrium	enhanced	altered	enhanced extensor reflex
20	contusion by explosion in whole body	disorder of equilibrium	enhanced	normal	enhanced extensor reflex
21	neurosis after chronic fatigue	failing of audition & nystagmus, disorder of speech, headache in occipital region, disorder of equilibrium	enhanced	normal on the right, altered on the left	enhanced extensor reflex on the left arm
22	neurosis after chronic fatigue	insomnia, nightsweating, sometimes feverish	enhanced	enhanced extensor reflex	enhanced extensor reflex
23	neurosis after chronic fatigue	spontaneous nystagmus, disorder of equilibrium	enhanced	irregular & plastic tonus	—

in cerebral haemorrhage by Brouwer (1917), in suppurative encephalitis, amaurotic idiocy, syphilitic hemiparesis and other cerebral lesions by Simons (1923) and Walsche (1923). At Winkler's clinic, its typical pattern was found in traumatic encephalitis, cerebral gumma and hemiparesis. It was confirmed by many authors that neck reflex was enhanced and its pattern coincides with the regularity as stated by Magnus and de Kleijn in patients of cerebral lesions.

Reflex reversal of tonic reflex was found in rare occasions in patients by Brouwer (1917) and Simons (1923). According to their statements, flexion of the head to the right side bends fore-limb of the right side and stretches fore-limb of the left side. This is reverse of the pattern which was found in decerebrate animals by Magnus and de Kleijn. In this respect, Kôno (1934) stated that neck reflex existed in patient of Parkinsonism or hemiplegia but that all the cases did not conform with the regularity of the reflex as stated by Magnus. General consideration on reflex reversal has been offered by many authors, and it is stated by Sherrington (1911), Magnus (1924), Fulton (1926, 1946), and Akiyama (1930) and others that reflex reversal is concerned with the mode of stimulation, drug and posture.

In some cases of the present cases, reflex extension appeared enhanced and reflex flexion was replaced with extension which both are regarded to represent an enhanced tendency of domination on the part of extension activity. So this modification of the reflex pattern is termed in this paper alteration rather than reversal of the reflex.

Higher intensity in these patients is obviously due to the diminution of cortical influence or abnormal enhancement of activity of the reflex center. Alteration of neck reflex as shown in this study suggests that the center for the extensor outbalanced in tonus that for the flexor. Enhanced intensity found in oxygen deficiency was not necessarily accompanied with reflex alteration. On the other hand enhanced intensity in alcoholic intoxication induced in healthy persons was found with reflex alteration by the author (1951). Crossed limb reflex changes in the same manner.

Summary

Tonic neck reflex in patients of cranial trauma and neurosis was examined by a simple mechanical device. The results are summarized as follows:

1. In some cases of cranial trauma, intensity and pattern of this reflex did not differ from that of healthy subjects.

In many cases of cranial trauma and contusion of the head, intensity of this reflex was enhanced but its pattern remained normal.

In neurosis after chronic fatigue, some cases of cranial trauma and

contusion of the head, enhanced intensity of this reflex was accompanied with reflex alteration.

4. Enhancement and alteration of the crossed limb reflex were also found in many cases of these patients.

5. Enhancement of the tonic neck reflex in these patients resembled that caused by oxygen deficiency in healthy subjects, while alteration of this reflex in some cases of these patients is similar to that in alcohol intoxication.

6. Mechanism underlying the alteration of the reflex was discussed.

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