

SIMPLE AND QUICK NON-INVASIVE EVALUATION OF CIRCULATORY CONDITION
OF CEREBRAL ARTERIES BY CLINICAL APPLICATION OF THE "BI-DIGITAL O-RING TEST"

by

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ABSTRACT:

Using the "Bi-Digital O-Ring Test," generalized abnormal circulation of the distribution of the 3 cerebral arteries at each side of the brain (i.e., anterior cerebral artery, middle cerebral artery and posterior cerebral artery) can be predicted, without any expensive instruments usually in a few minutes. When abnormality was found in the bifurcation area of the common carotid artery by the "Bi-Digital O-Ring Test," there were always abnormal findings of the area of the brain where circulation was coming from either one or both of the anterior or middle cerebral arteries. When abnormal "Bi-Digital O-Ring" response was found at the vertebral artery and posterior cerebral artery representation point, discovered by the author, at the side of the 6th cervical vertebra (corresponding to the entry point of the vertebral artery into the transverse foramen), the areas of the cerebrum, cerebellum and brain stem where circulation is coming from the posterior cerebral artery, basilar artery and vertebral artery were also abnormal. Most of these abnormalities were found to be associated with problems of the cervical vertebrae and spastic muscles of the neck and shoulders and are often reversible. In this study, the author was able to differentiate abnormal brain circulation of any major branch of arteries in the brain due to organic changes or functional reversible changes by relaxing these spastic muscles and improving the circulation of the neck and shoulder area by giving either manual acupuncture, massage, or transcutaneous electrical stimulation. This in turn often improved brain circulation. If it was a functional abnormality, within a few minutes after one of these procedures the "Bi-Digital O-Ring Test" usually

showed normal response or improvement. However, if it was an organic abnormality, the abnormality remained.

When the supra-orbital arterial blood pressure at both sides of the forehead decreases below 40 or 30 mmHg, most patients develop so-called "Cephalic Hypotension Syndrome" which is characterized by 1) sleep disturbance pattern; 2) difficulty in concentration; 3) easy forgetfulness of recent events; 4) irritability; 5) decreased pain threshold with or without depression; 6) spastic skeletal muscles, particularly the neck, shoulder and back areas. All of these symptoms can be explained by decreased circulation to the Nucleus Raphe Centralis Superior (controls sleep and waking pattern), Nucleus Raphe Magnus (serotonin & modulation of pain), Nucleus Reticularis GiganteCellularis (controls muscle tone), etc. in reticular formation. When supra-orbital arterial blood pressure is below 20 mmHg, additional ringing in the ears and dizziness often appears. When the blood pressure goes up over 220, most patients have a severe headache at the side of the high blood pressure. These abnormalities can often be observed in many patients with normal blood pressure in the arms.

Key Words: Cephalic hypertension, cephalic hypotension, insomnia, pain, spastic muscles, depression, brain circulation, bifurcation area of the common carotid artery, internal carotid artery, cerebral artery, ophthalmic artery, supra-orbital artery, vertebral artery, posterior cerebral artery, cerebrum, cerebellum, medulla oblongata, reticular formation, differential diagnosis of organic functional abnormality of the brain.

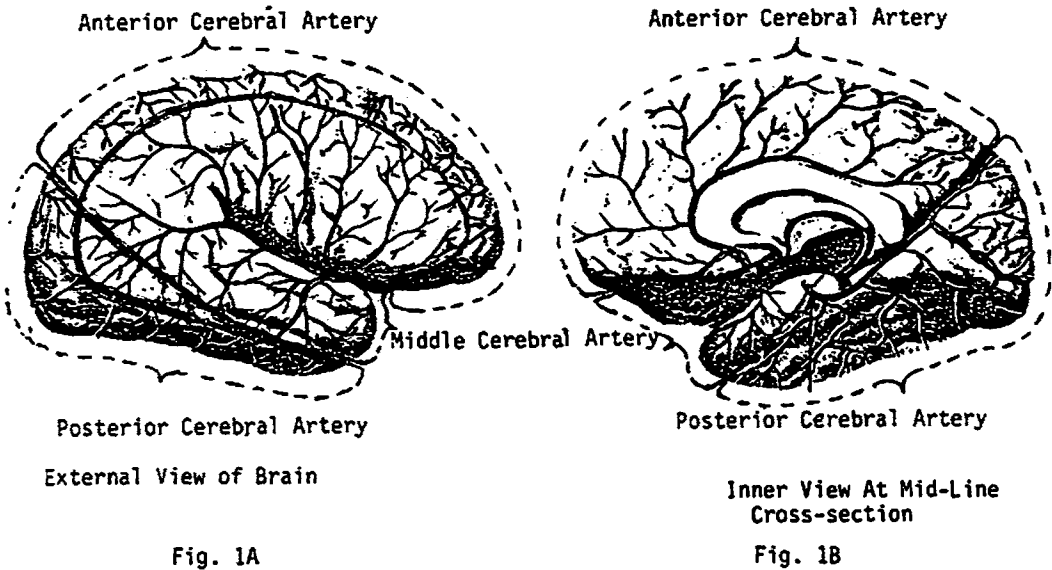
INTRODUCTION

In order to evaluate brain circulation or condition of cerebral arteries, angiography of the cerebral arteries is commonly used in clinical medicine. In addition, if the narrowing exists at the bifurcation area of the common carotid artery into the internal carotid artery and external carotid artery, the real time Doppler ultrasonic imaging technique is available in practically every hospital in the U.S.A. Evaluation of the vertebral artery can be performed by these two methods, but it is much more difficult because of the small diameter of the artery and the considerable distance from the surface of the skin on the neck. However, these techniques are not always available to every patient because such a procedure is usually done in the hospital or at least in the vicinity where portable X-Ray machines or real time Doppler ultrasonic imaging machines are available. Furthermore, angiography, by injecting a contrast medium into the internal carotid artery is not free of risk and sometimes creates considerable discomfort for the patient. Using the "Bi-Digital O-Ring Test," the author developed a simple method of estimating the general circulatory condition of the anterior cerebral artery, middle cerebral artery (most of the blood supply from these 2 cerebral arteries comes from the internal carotid artery), as well as posterior cerebral artery (most of the circulation of which comes from the vertebral artery).

‡ See References 15 - 19.

MATERIALS AND METHODS

50 human subjects (25 males and 25 females), ranging between about 22 years old to 83 years old, who had weak pinching force of most of the fingers of one or both hands, indicating abnormality in the cervical vertebrae and measurable abnormal blood pressure or relative blood flow at the supra-orbital artery or supra-trochlear artery were used, as our previous studies indicated a high incidence of abnormal brain circulation in this type of patient (1-20). While gently stimulating large-diametered sensory nerve fibers by contacting the skin of the different parts of the head with the tip of a rod, about 30cm in length with narrow round tip diameter of about 1mm. or less made of insulating material (such as plastic) the "Bi-Digital O-Ring Test" was carried out, and any abnormal responses were mapped on the head on the entire area of skin above the cerebrum and the cerebellum, with an interval of about every 5 mm or 1 cm. Particularly at the boundary between normal response area and abnormal response area, the "Bi-Digital O Ring Test" was given every 1 or 2 mm to delineate the exact boundary. The boundary was marked with magic ink to compare with known distribution of each of the major cerebral arteries. Both blood pressure and relative blood flow were non-invasively measured at the supra-orbital artery and supra-trochlear artery of the right and left forehead, as they are branches of the ophthalmic artery, which is the major branch of the internal carotid artery branching out before it goes to the base of the brain (4,7,10,14,17). These measured blood pressures were compared with theoretically predicted normal systolic blood pressure at a sitting position, based on the blood pressure of the arm, measured at the aortic valve level, and the vertical distance between the aortic valve level and the forehead (usually about 28-30 cm in most adults and therefore blood pressure is about $\frac{77\text{mm Hg}}{10\text{cm}} \times 30\text{cm} = 2.5 \text{ mm Hg}$ less than arm) (14, 17, 18)



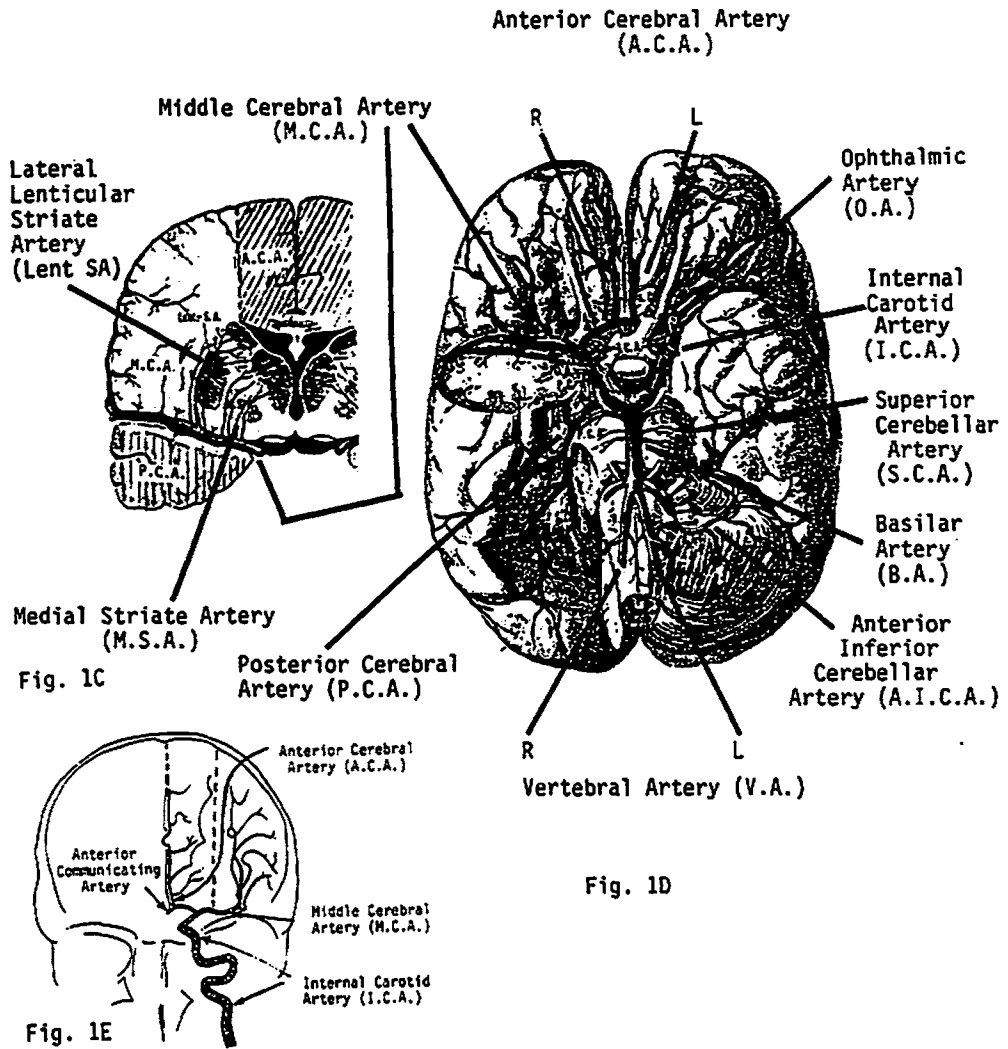


Fig. 1 Distribution of Cerebral Arteries On Brain Surface (modified from Frank H. Netter's Nervous System of Ciba Collection of Medical Illustrations). Please note on the external side view of the brain (Fig. 1A), our study by "Bi-Digital O-Ring Test" showed blood supply of left bottom corner of triangular wedge shape large area of brain comes from posterior cerebral artery and it is different from small L-shaped area illustrated by F. H. Netter. Also note that the ophthalmic artery branches off from the internal carotid artery (within about .1 cm) just before the internal carotid artery joins the "Circle of Willis" (fig. 1D)

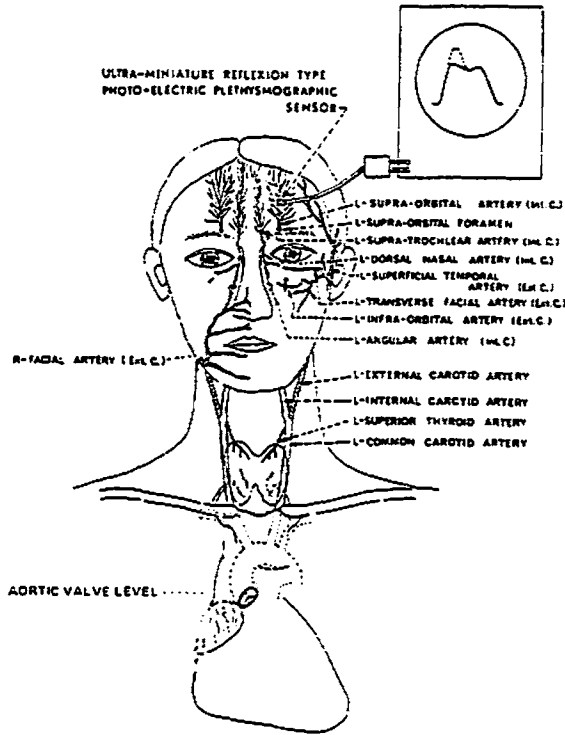


Fig. 2 Schematic diagram to illustrate the distribution of the small branches of the internal carotid artery coming out in the forehead (the supraorbital artery and supratrochlear artery) and face, as well as small branches of the external carotid arteries at the face. In 1969-1970, the author found that 85-90% of the blood flow in the supraorbital artery came from a branch of the internal carotid artery (ophthalmic artery) [2,5,8]. Supraorbital arterial blood pressure of the right and left sides of the forehead was measured by ultraminiature reflection-type photoelectric plethysmographic sensors, originally developed by Y. Omura in the late 1960s [2,5,8], as well as by the use of ultrasonic Doppler flowmeter Model BF5A (8MHz), made by Medasonics.

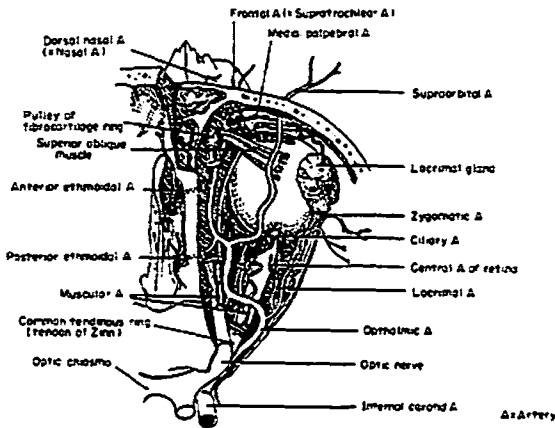


Fig. 3 The ophthalmic artery (one of the major branches of the internal carotid artery) and its 12 well-known branches, consisting of an orbital group (1. Lacrimal A. 2. Supraorbital A. 3. Posterior ethmoidal A. 4. Anterior ethmoidal A. 5. Medial palpebral A. 6. Supratrochlear A. 7. Dorsal nasal A.), distributed to the orbits and surrounding parts; and the ocular group (8. Central artery of the retina. 9. Short posterior ciliary A. 10. Long posterior ciliary A. 11. Anterior ciliary A. 12. Muscular A.) to the muscles and bulb of the eye. (Modified from Anatomy of Human Body by Henry Gray, Ed. by Charles Gross, Lea & Febiger Pub., Philadelphia, 1973.)

Methods of Estimating Normal Blood Pressure at Different Parts of the Body
in a Sitting Position in a Chair
GRAVITATIONAL EFFECT ON BLOOD PRESSURE

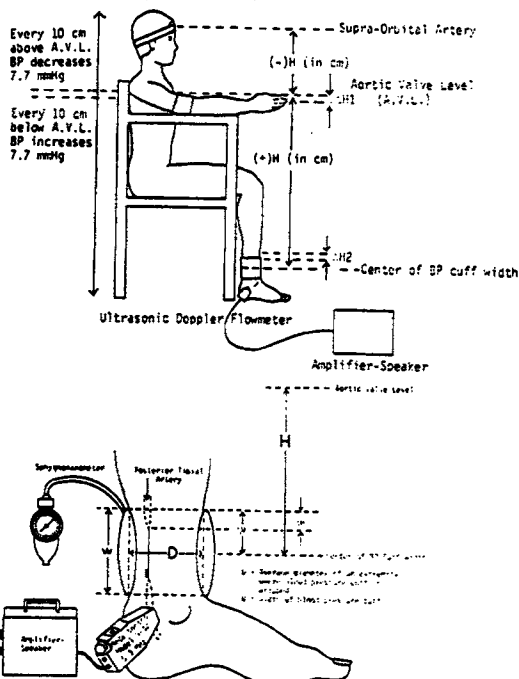


Fig. 4 In this schematic diagram, only the left leg is shown for convenience of illustration. Every 10 cm away from the aortic valve level on the vertical axis, the blood pressure change due to gravitational effect alone is about 7.7 mmHg/10 cm for $\pm H(\text{cm})$. The vertical distance $-H(\text{cm})$ above the aortic valve level corresponds to a decrease in B.P. of $\frac{-H(\text{cm})}{10 \text{ cm}} \times 7.7 \text{ mmHg} = \frac{-H}{10} \times 7.7 \text{ mmHg}$ from the $(\text{B.P.})_{\text{A.V.}}$ at the aortic valve level, which is roughly equivalent to the brachial artery B.P. measured at the 3rd intercostal level as shown above. The vertical distance $+H(\text{cm})$ below the aortic valve position corresponds to an increase in B.P. of $\frac{+H}{10} \times 7.7 \text{ mmHg}$ from the B.P. at the aortic valve level. [14, 17, 18]

Results and Discussion

When scanning the entire skin surface over the head with intervals every few mm if the "Bi-Digital O-Ring Test" shows abnormality of the brain (particularly -3~4) it can most commonly be identified as one of the following:

- 1) Diffuse area covering entire section of anywhere between 1 to 6 sections of circulatory distribution areas of anterior cerebral artery, middle cerebral artery or posterior cerebral artery at both right and left side of brain(see Fig. 5).
- 2) Well localized abnormality which does not involve entire section of any one of the 3 major cerebral arteries at each side of the brain.
- 3) Well localized organic abnormality is superimposed on diffuse abnormality of entire artery distribution area.
- 4) Combination of above.

Usually 1) or 3) is most frequently encountered clinically. If an abnormal area of the brain involving an entire section of one of 3 major cerebral arteries is making boundaries with an adjacent normal area one can detect very distinctive and rather linear boundaries as shown in schematic diagram in Fig. 5. Band like distribution (shown with black band shape going from forehead to occipital area) of anterior cerebral artery found by the "Bi Digital O-Ring Test" in Fig. 5 is almost completely identical with those shown in anatomical diagram of Frank Netter (see Fig. 1) but L shaped distribution area of posterior cerebral artery in left bottom corner of external view of the brain in Fig. 1 is slightly different from our triangular shaped distribution found in this study. Otherwise, distribution of both middle cerebral artery and posterior cerebral artery found by "Bi-Digital O-Ring Test" agrees rather accurately with angiographic finding as well as known anatomical diagrams from Frank Netter's Nervous System from the CIBA Collection of Medical Illustrations.

By plotting all the abnormal parts of the skin of the head above the cerebrum and the cerebellum, the author found the following: When the bifurcation area of the common carotid artery into the internal carotid artery and external carotid artery showed an abnormal (-) response of the "Bi-Digital O-Ring Test" on one side of the neck, the author often found the following possibilities.

- 1) The entire area which is supplied by the anterior cerebral artery and its branches (which covers each side of antero-posterior mid-portion of the cerebrum) in band like distribution shows similar abnormal(-) response in the "Bi-Digital O-Ring Test" but with a normal response to the area of the skin covering the middle cerebral artery which covers the distribution areas lateral to the anterior cerebral artery. (See Fig. 5).
- 2) The skin above the area where the blood supply is coming from the middle cerebral artery and its branches in the brain showed abnormal(-) response to the "Bi-Digital O-Ring Test" while the skin on the area where the blood supply is coming from anterior cerebral artery had a normal response to the "Bi-Digital O-Ring Test".
- 3) Combined areas of the skin under which both the anterior cerebral artery and middle cerebral artery are supplying blood to the brain showed an abnormal (-) response to the "Bi-Digital O-Ring Test".

When the bifurcation area of the common carotid artery shows an abnormal (-) "Bi-Digital O-Ring Test" response, one can always find one of the above 3 abnormal findings.

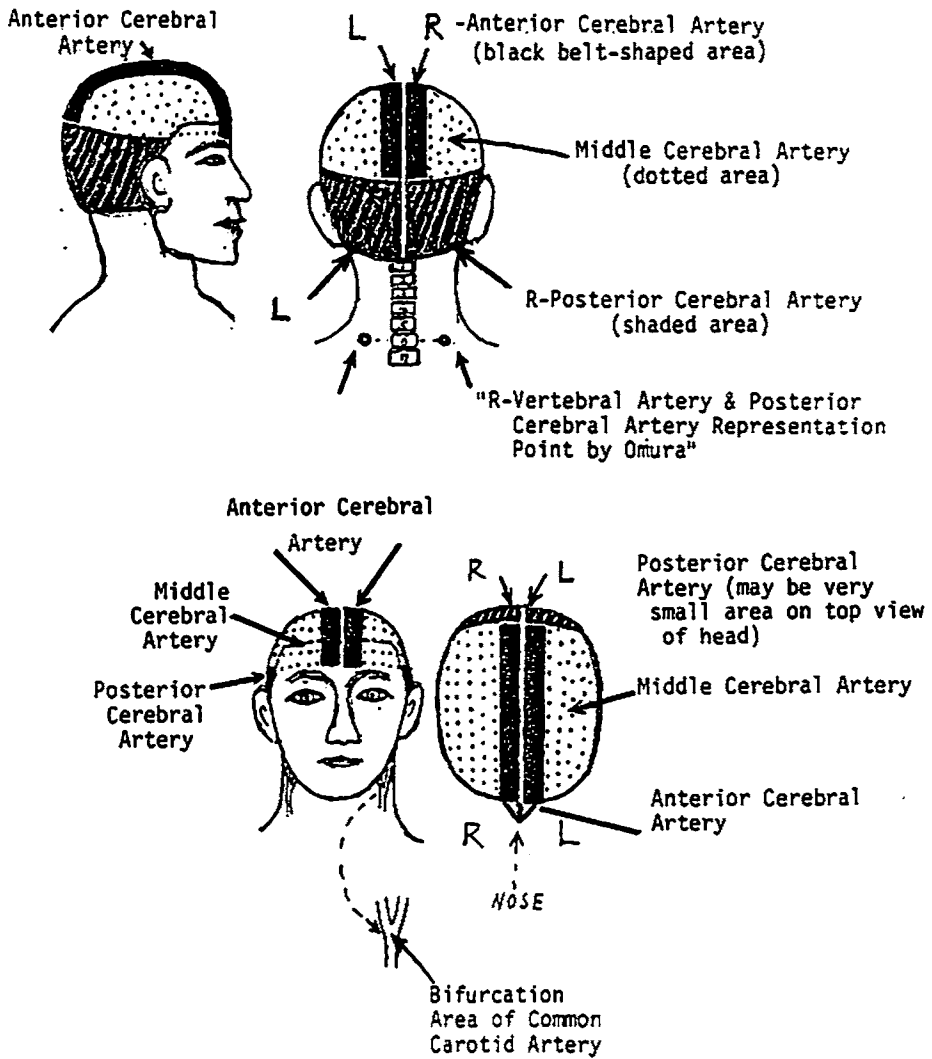


Fig.5 Distributions of Anterior Cerebral Artery, Middle Cerebral Artery and Posterior Cerebral Artery and their Representation Area found on the surface of the head by the use of "Bi-Digital O-Ring Test". Clinically very useful key evaluation points of brain circulation:1)Bifurcation area of common carotid artery (abnormality of this area often indicates presence of abnormal circulation of either one or both of Anterior Cerebral Artery and Middle Cerebral Artery) 2)"Vertebral Artery -Posterior Cerebral Artery Representation Points" at the both sides of 6th Cervical Vertebrae which correspond to entry point of vertebral artery into transverse foramen.

When the "Bi-Digital O-Ring Test" of the bifurcation area of the common carotid artery shows significant abnormal (-) response (such as -3 or -4) the blood pressure measurement and relative blood flow measurement at the supra-orbital artery and supra-trochlear artery often shows either abnormally high blood pressure or very low blood pressure, often accompanied by decreased blood flow. Whether this is organic narrowing of the artery due to plaque formation, generalized narrowing of the artery, or reversible functional spasticity of the common carotid artery can easily be differentiated by a real time ultra-sonic vascular imager. However our study indicated that even without having these exact laboratory confirmations, practically an equivalent diagnosis can be made by the following simple procedure developed by the author. When one gives either acupuncture, massage or repeated muscle contraction by electrical stimulation at the middle of shoulder area approximately corresponding to the acupuncture point Gall Bladder 21 to the patient who has a spastic muscle in the shoulder or neck area and an abnormal condition of cervical vertebrae with or without pain often abnormality found by the "Bi-Digital O-Ring Test" disappears within a few minutes, if it is a functional narrowing of the internal carotid artery. An abnormal "Bi-Digital O-Ring Test" existing at the bifurcation area of the common carotid artery or area of the skin above the anterior cerebral artery or middle cerebral artery of the brain often changes toward the normal "Bi-Digital O-Ring Test" response if the abnormality is due to functional reversible spasticity. However, if the narrowing of the artery is due to irreversible organic causes such as plaque formation or general narrowing of the artery due to deposit of blood corpuscles, calcium, cholesterol, etc., usually acupuncture will not improve the abnormal "Bi-Digital O-Ring Test" response, nor any other existing symptoms. Similarly with abnormal circulation in the vertebral artery-posterior cerebral artery representation point" at the side of the 6th cervical vertebra corresponding to the entry point of the vertebral artery into the transverse foramen of the 6th cervical vertebra, when there was an abnormal negative response to the "Bi-Digital O-Ring Test" to one side of the 6th cervical vertebra, the author found an abnormal negative "Bi-Digital O-Ring Test" exactly corresponding to the entire area of the cerebellum and the lower part of the cerebrum of the same side of the head. The author also found that if abnormal circulation was due to functional spasticity of the vertebral artery, acupuncture given at the "vertebral artery-posterior cerebral artery representation point" or vicinity of the Gall Bladder 21 area on the shoulder of the same side almost instantly improved the abnormal circulation and resulted in normal "Bi-Digital O-Ring Test" in the entire area of the cerebrum and cerebellum where blood supply comes from the posterior cerebral artery, (with corresponding improvement of symptoms if there were symptoms as a result of decreased brain circulation to this area before)(Figs. 1 & 5).

Some of the typical clinical examples demonstrating the above findings are shown in the following clinical cases without describing details of the patient's history, chief complaints or other findings.

Clinical Case 1

This 40 year old white male psychologist was complaining of general malaise and tightness in the neck. The skin over the entire head was examined by the "Bi-Digital O-Ring Test". The result indicated that the entire left anterior cerebral artery distribution area of the brain was an abnormal -3. The left middle cerebral artery distribution area was a normal +4. The left posterior cerebral artery was a normal +3. Therefore, as can be seen in Fig. 6, the boundary between the abnormal left anterior cerebral artery distribution area and the adjacent normal brain area appears as a distinctive band shaped pattern from the forehead toward the occipital area and has a distinctive boundary between the adjacent area of the brain corresponding to the distribution area of the middle cerebral artery and the left posterior cerebral artery as well as the right anterior cerebral artery of the brain.

In the same subject, the right anterior cerebral artery was a normal +4. However, the entire right middle cerebral artery distribution area was an abnormal -3. The right posterior cerebral artery distribution area at the lower lateral side of the head and occipital area was a normal +3. Therefore in the subject, the boundary between the normal right anterior cerebral artery and the abnormal right middle cerebral artery is very sharply delineated and the normal right anterior cerebral artery distribution area is almost identical in its band shaped pattern as the abnormal left anterior cerebral artery distribution area. The boundary between the abnormal right middle cerebral artery distribution area and normal right posterior cerebral artery distribution area can also be seen as a very distinctive boundary. (Note that between 2 adjacent normal distribution areas, no boundary can be detected.) These distribution areas of 3 major arteries are almost identical with the well-known anatomical distribution of the anterior cerebral artery, the middle cerebral artery and the posterior cerebral artery as shown in Fig. 1 (which was modified from Frank Netter's well known diagram in the Nervous System, with minor discrepancies) and agrees well with generally recognized angiographic distributions of these 3 arteries. This abnormal pattern appears quite often in the same subject when he feels very tired. However, this abnormal pattern can be easily reversed to a normal pattern by either of the following:

- 1) Acupuncture given at the middle of the spastic shoulder muscle area at both sides, using the author's pneumothorax proof method.
- 2) Repeated muscle contractions of both shoulders created by electrical stimulation by a pair of aluminum electrodes without creating pain.
- 3) Massage of the same area.

In addition, even oral intake of nutritionally balanced soup or certain foods containing garlic, Vitamin B1 rich substances and mushrooms can often reverse the abnormal pattern within 15 minutes, particularly in the person with unbalanced nutritional intake. Some of these examples are shown in the following figures where the abnormal left anterior cerebral artery distribution area and the right middle cerebral artery distribution area all become normal within a few minutes after one of these procedures. In this particular example, the boundary between the anterior cerebral artery and the middle cerebral artery at both the left and right sides of the brain are most distinctively seen as normal and abnormal areas of the brain are located alternately. Also notice that although the right and left anterior cerebral artery distribution area is almost identical and symmetrical, it is slightly curved in the middle portion of the top of the head. The subject

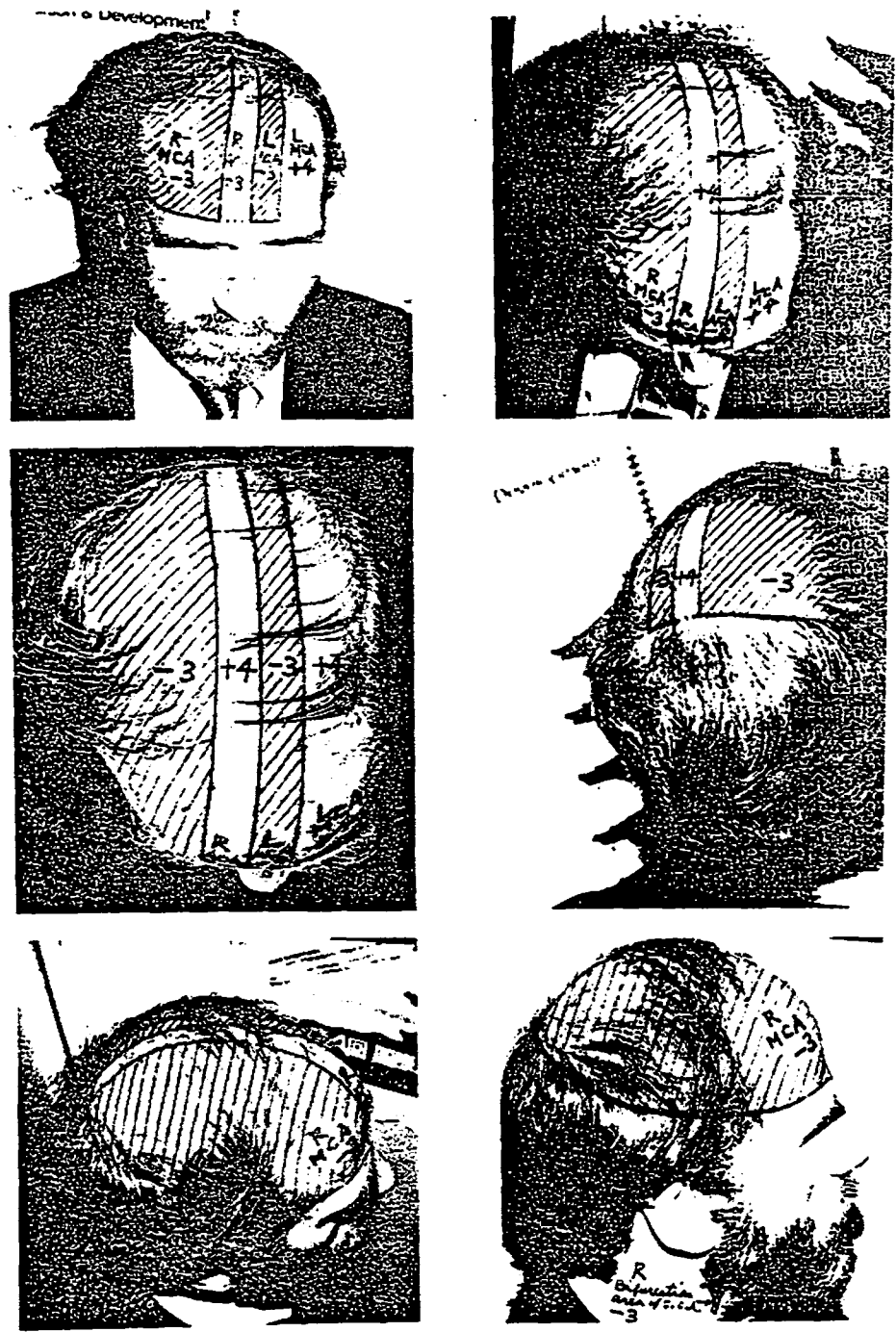


Figure 6

considered that when he was born, his head was slightly deformed by the use of clamps during breach birth. Clinically it is easy to evaluate all these abnormalities and draw the boundaries of normal and abnormal areas, but it is very difficult to take good pictures for documentation of those who have a full head of hair. Bald or partly bald individuals are ideal subjects for exact documentation directly on the head.

Please note that shading was applied on the finished photograph on the abnormal -3 area only.

In this subject as predicted, "Bi-Digital O-Ring Test" of bifurcation area of common carotid artery showed -3 abnormal grading at both right and left sides of neck before any one of the above procedures was applied. Once the above procedure was given, it changed the abnormal -3 gradings of distribution areas of left anterior acerebral artery and right middle cerebral artery to a normal +4. The abnormal -3 response found at bifurcation areas of the common carotid artery at both right and left side of neck also returned to a normal +4.

Clinical Case 2

This 26 year old Oriental woman had chief complaints of lower backache for half a year. Upon examination, the author also found the entire area of the rest of the brain was a +3 except the right middle cerebral artery distribution area which was +2. "Bi-Digital O-Ring Test" of the bifurcation area of left common carotid artery also showed correspondingly a -3 reading, while the right side was a +2. Therefore only her left anterior cerebral distribution area was abnormal and this was almost immediately changed to a +4 upon performing manual acupuncture on spastic muscle in left shoulder approximately corresponding to Gall Bladder 21 area.



Figure 7

The rectangular shaped Thymus gland representation area at lower half manubrium, was a very abnormal +4; (the thymus is the only exception where a +4 is an extreme abnormality). Using the "Bi-Digital O-Ring Test, it was found that she had bacterial infection superimposed on the back, thymus gland lower left

lung, etc. and sensitive to Ampicillin, Tetracyclin, Erythromycin, Keflex, Kanamycin, and insensitive to Chloramphenicol. It was also confirmed by nose and throat bacterial culture and sensitivity test for antibiotics.

The effects of acupuncture given at lower back only lasted less than 1 week. However, a combination of acupuncture (given at the lower back where the

Bi-Digital O-Ring Test" showed abnormalities) and effective antibiotics (given 1 hour before acupuncture to have enough blood concentration of antibiotics when acupuncture induces vaso-dilation), abolished most of the backache.

Because of the patient's full head of hair, it was difficult to indicate on the scalp the entire sharply delineated boundary of the left anterior cerebral artery distribution area resembling Fig. 6. The boundaries of the distribution areas of different arteries are shown only on the forehead.

Clinical Case 3

This 45 year old white male had chief complaints of increasing back pain for a few months. Upon examination in addition to his many problems, the author found the left side of 6th cervical vertebra, showed a -3 response by "Digital O-Ring Test". The right "Vertebral Artery - Posterior Cerebral Artery Representation Point" was +2 and was within the lower side of normal with a corresponding +2 in the right posterior cerebral artery distribution area. Examination of the entire skin over the head showed a -3 abnormal response only in the left posterior cerebral artery distribution area as shown in Fig. 8. Whenever there is a -3 or -4 abnormality at "Vertebral Artery-Posterior Cerebral Artery representation point" of one side of the 6th cervical vertebra, almost always the corresponding "Posterior Cerebral Artery Distribution Area" of the same side of the head also shows approximately the same degree of abnormality.

Manual Acupuncture given for 40 seconds at the "Left Vertebral Artery Representation Point", immediately changed from an abnormal -3 to a normal +4 at the right posterior cerebral artery. The right posterior cerebral artery distribution area changed from +2 (lower end or normal) to +4; the highest grading of normal. Because of hair, the boundary of the abnormal left posterior cerebral artery distribution area was marked by attaching a piece of narrow white tape.



Figure 8

Clinical Case 4

This 65 year old oriental business man had a brain hemorrhage in 1974 and 1983 and regained most functions except minor motor disturbances of left

lower extremities and speech, as well as mild cephalic hypertension syndrome. The "Bi-Digital O-Ring Test" showed that the bifurcation area of the right common carotid artery was -3, and correspondingly the entire area of the right anterior cerebral artery and the middle cerebral artery distribution area were -3, while the bifurcation area of the left common carotid artery was between +1 and +2, and the corresponding left anterior and middle cerebral arteries were +2. By giving manual acupuncture at the middle of the spastic tender right shoulder muscle, approximately around acupuncture point Gall Bladder 21, most of the -3 abnormality area changed to a +4, except the in the right anterior cerebral artery and the right middle cerebral artery distribution areas where the -3 abnormality area remained unchanged (as shown in Fig. 9). The right posterior cerebral artery distribution area and corresponding right "Vertebra Artery - Posterior Cerebral Artery Representation Point" remained the same abnormal -3 before and after acupuncture. The details of the results of old CAT Scans and other findings in this patient are omitted here as they were taken at the time of the cerebral hemorrhage and do not represent current conditions.



Figure 9A

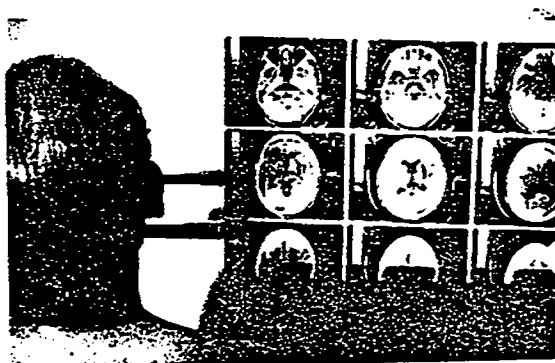


Figure 9B

Clinical Case 5

This 36 year old Indian Ph.D. had a compression fracture of the cervical vertebrae several years ago and is suffering from recurrent severe headaches with increased pressure sensations of head with nausea and tingling sensations of left face and tongue. Upon examination, the left anterior cerebral artery, left middle cerebral artery and left posterior cerebral artery distribution areas were all an abnormal -4 by the "Bi-Digital O-Ring Test" with corresponding abnormal -4 responses at the bifurcation area of the left common carotid

artery and the left "Vertebral Artery-Posterior Cerebral Artery Representation Point". The right side had all -1.5 responses. The findings in the corresponding areas of measurement of the left supra-orbital arterial blood pressure at sitting position was 250 mmHg which was very high and relative blood flow was reduced. This finding fit very well with the "cephalic Hypertension Syndrome" and can explain her severe headaches reported by this author. However her arm blood pressure was 110 - 65 mmHg at aortic valve level. The right supra-orbital arterial blood pressure was 90 mmHg and close to estimated normal blood pressure of 85 mmHg \pm 10% but relative blood flow was markedly reduced.

Her grasping force measured by the hand dynamometer showed right hand was only 4 lbs. and left hand was almost 0 lbs. After giving manual acupuncture with continuous twirling at the middle of spastic muscles of the right shoulder (where the response was -4) for 40 seconds, there were propagating sensations tingling all over the head, and neck and face with warm sensations. Then her headache, nausea, and abnormal sensations disappeared completely. After acupuncture, the left side supra-orbital arterial systolic blood pressure came down from a very high blood pressure of 250 mmHg to the normal level of 98 mmHg, with normal relative blood flow and the right supra-orbital arterial blood pressure also went down from 90 mmHg to 80 mmHg with normal relative blood flow. Within a few minutes of acupuncture treatment, the grasping force of the right hand increased from 4 lbs. to 23 lbs. and 30 minutes later to 38 lbs., while the grasping force of the left hand increased from 0 lbs. to 20 lbs. and 30 minutes later it further increased to 35 lbs.



Figure 10

Clinical Case 6

This 51 year old Oriental business woman was complaining of severe headaches (which reduced when was leaned forward in sitting position), with dizziness, insomnia, and weakness of all the fingers except the 1st and 2nd fingers of both hands for more than 20 years. The Bi-Digital O-Ring Test of entire scalp showed a -3 to -4 abnormality and corresponding bifurcation area of common carotid artery at both right and left side of neck showed -4 responses. Similarly, "Vertebral Artery - Posterior Cerebral Artery Representation Point" of both right and left sides of 6th cervical Vertebra also showed a -3 response. The Left supra-orbital arterial blood pressure was almost impossible to measure. Her arm blood pressure at the aortic valve level was 155 - 90 mmHg

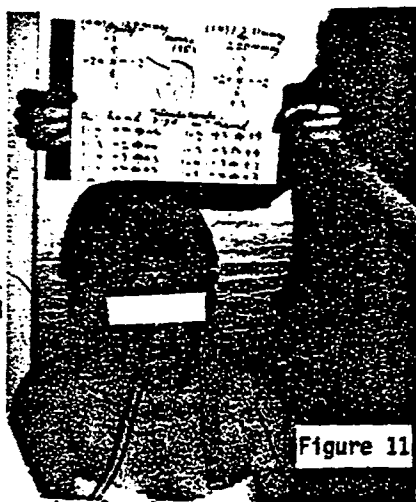


Figure 11

and the estimated normal blood pressure at the supra-orbital artery was 130mmHg \pm 10 %. As can be seen in Fig. 11, the Bi-Digital O-Ring was weak at both sides of the hands except between the 1st and 2nd fingers, therefore one can speculate that she has cervical problems at both sides of the 6th and 7th cervical vertebrae and this was confirmed by both history, symptoms of pain, and X-rays in the same area. This is a typical example of mixed cephalic hypotension and cephalic hypertension syndrome where one side of the head has very low blood pressure and the other side of the head has very high blood pressure. Upon giving acupuncture at both sides of the shoulder and para-vertebrally, all her clinical symptoms disappeared. Her left supra-orbital arterial blood pressure went down from 220 mmHg to 120 mmHg and the right supra-orbital arterial blood pressure went up from almost 0 to 120 mmHg. The abnormal Bi-Digital O-Rings of both the hands all changed to normal +4 or +3 values.

Please note that, although not mentioned in some of the brief clinical cases presented in this article, in order to get good therapeutic effects on the largest areas of brain circulation, manual acupuncture should be given para-vertebrally along the abnormal cervical vertebrae found by the "Bi-Digital O-Ring Test" as well as the spastic tender muscles present around acupuncture point Gall Bladder 21. When acupuncture is given at the "Vertebral Artery-Posterior Cerebral Artery Representation Point" at each side of the 6th cervical vertebra (approximately corresponding to the entry area of the vertebral artery of its transverse foramen) the effects are often limited to the posterior cerebral artery distribution area of the occipital area of the same side of the neck where acupuncture is given, but sometimes the effect extends to other areas of the brain as well.

Clinical Case 7

This 46 year old white female college professor had a telegraphic speech disturbance pattern for the past 3 years. By examining the entire skin area of the head by the "Bi-Digital O-Ring Test", an abnormal response of about -3 was found in every distribution area of the anterior cerebral artery, middle cerebral artery and posterior cerebral artery at both the right and left sides. However by using differential diagnostic methods developed by the author, acupuncture was given at the middle of the spastic shoulder muscles at both sides in the area approximately corresponding to Ac. point GB-21. After manual acupuncture, consisting of continuous manipulation of about 40 seconds, given at each side, a diffuse -3 abnormality found in the entire skin over the brain, changed to a normal +4 with the exception of the narrow bandlike -3 area, remaining from the tip of the head to just behind the ear at both the left and right sides of the head, as shown in Fig. 7. Thus this remaining abnormal area was considered to have organic abnormalities. The "Bi-Digital O-Ring Test" of the area showed a +4 response, with antibiotic tetracyclin. Therefore, after bacterial culture and sensitivity test for antibiotics was performed, and a tetracyclin 250 mg capsule was given every 6 hours for 1 week, and after a week's treatment, no abnormality could be found anywhere in the brain by the "Bi-Digital O-Ring Test". A speech test showed reduction of the test time from 15 minutes before treatment to 5 minutes after treatment. However, by talking to the patient the author could not find any recognizable improvement in the speech. However, by giving electrical stimulation through a pair of surface electrodes covering the area of the abnormality which existed earlier before initiation of the tetracyclin treatment, combined with acupuncture at both shoulders, within 10 minutes after initiation of electrical stimulation, the pulse rate of 1 pulse per second from WQ-10C portable electrical stimulator, with sufficient contraction of the muscles without creating any pain sensation resulted in dramatic improvement by changing telegraphic speech to near normal speech. However, the maximum dramatic improvement only lasted about 6 hours. The patient is going to be further evaluated and treated. The details will be reported in the future.



Figure 12A



Figure 12B

Clinical Case 8

This 57-year-old white female college professor had abnormal "Bi-Digital O-Ring Test" response ranging from -3 to -3.5 in all O-Rings of both hands. Our previous study indicated that approximately the following relationship exists between abnormal weakness of the O-Ring formed between the 1st finger and remaining fingers of one hand and location of abnormal cervical vertebrae of the same side of the neck and/or its surrounding tissue, including nerve, muscle, etc.

O-Ring formed between:

1st and 2nd fingers:	5th cervical vertebra	
1st and 3rd fingers:	6th cervical vertebra	{ upper half }
1st and 4th fingers:	6th cervical vertebra	{ lower half }
1st and 5th fingers:	7th cervical vertebra	{ may also include 1st thoracic vertebrae }

. Therefore, she most likely has a problem in the 5th, 6th and 7th cervical vertebrae on both sides of the neck.

This was also confirmed by both medical history and "Bi-Digital O-Ring Test."

In addition, our study also indicated that when there is an abnormality in more than one or two cervical vertebrae, "vertebral arteries - posterior cerebral artery representation point" of the same side very frequently show abnormal "Bi-Digital O-Ring Test" response. In such a patient, posterior cerebral artery distribution area of the occipital part of the brain also almost always shows abnormal response.

This particular patient had an abnormal -3 response in the bifurcation area of both the right and left common carotid arteries. We found that by examining the entire surface of the head, we also found -3.5 abnormalities in the entire distribution area of 3 major cerebral arteries (i.e. anterior cerebral

artery, middle cerebral artery, and posterior cerebral artery on both right and left sides). Although her chief complaint was intractable pain in r. hand, because of a diffuse generalized circulatory disturbance (as partly confirmed by measuring the blood pressure of the supra-orbital artery as shown in the following figure of the forehead), the right supra-trochlear arterial blood pressure was 40 mmHg and the left supra-trochlear blood pressure was fluctuating between 40 and 50 mmHg, with reduced relative blood flow on both sides.

However, her right supra-orbital arterial blood pressure was 80 mmHg, and her left supra-orbital arterial blood pressure was also fluctuating between 40 and 50 mmHg. All of these arteries had markedly reduced relative blood flow. The "Bi-Digital O-Ring Test" of the entire skin of the head showed a -3.5 response. Therefore, with all these abnormalities found at the bifurcation area of the common carotid arteries of both sides of the neck, as well as an abnormal response of the vertebral artery at both sides of the back of the neck suggested the possibility that the patient may have cephalic hypotension syndrome, which usually appear when supra-trochlear arterial or supra-orbital blood pressure reach below 40 mmHg and was originally described by the author. (14, 17) Further questioning of the patient reveals that she had all the characteristics of cephalic hypotension syndrome characterized by the following:



Figure 13A



Figure 13B

- 1) sleep disturbance pattern (insomnia or excessive sleepiness; 2) difficulty concentrating; 3) easy forgetfulness of recent events; 4) decreased pain threshold (very sensitive to pain); 5) various degrees of depression; 6) spasticity of skeletal muscles, (particularly muscles at the neck, shoulder and back area).

When these blood pressures further decrease to 20mmHg, often additional symptoms of dizziness and ringing in the ears appears. Further examination revealed that she also had an abnormally hypofunctioning thymus gland representation area at the rectangular area of the lower half of the manubrium

where the "Bi-Digital O-Ring Test" showed a very abnormal +4, with hypofunction of the thymus gland (thymus is the only exception where +4 is extremely abnormal.) Therefore, the author gave manual acupuncture at the thymus gland representation area, which was originally discovered by the author. As soon as manual acupuncture was given, not only did the thymus gland become -1.5, which is within normal range for the thymus gland representation area but also it influenced brain circulation as well as the "vertebral artery-posterior cerebral artery representation point", namely the latter changes from -3.5 to +4 at both sides of the back of the neck, with corresponding improvement in the "Bi-Digital O-Ring Test" at both sides of the "posterior cerebral artery distribution area of the occipital part of the brain from -3.5 to +4. Both the right and left anterior cerebral artery distribution area at both the right and left sides retained the same abnormality of -3.5. Most of her symptoms almost immediately disappeared. These cephalic hypotension syndromes are almost always associated with abnormally reduced blood pressure and low blood flow of the cerebral artery, particularly associated with abnormal "Bi-Digital O-Ring Test" findings of -3 or -4 at the "vertebral artery-posterior cerebral artery representation point" at both sides of the 6th cervical vertebra, as well as both sides of the posterior cerebral artery distribution area of the occipital part of the brain. Most of these symptoms of cephalic hypotension syndrome can be explained to a reasonable extent as the result of markedly decreased blood circulation through the reticular formation. For example, if the Nucleus Raphe centralis superior is controlling sleep and waking patterns, then decreased circulation in this area may result in sleep disturbance patterns. The Nucleus Raphe Magnus secretes serotonin and modulates pain. However, if release of serotonin decreases by reduced blood supply, decreased pain threshold, irritability, depression may result. If the Nucleus Reticularis Giganto Cellularis normally controls the muscle tone by negative feedback to the alpha motor neurons thus preventing excessive spasticity of the muscles in normal condition and if the blood circulation to this area diminishes, one can speculate that muscle tone will increase, as can be seen in this patient who had muscle spasticity of the neck, shoulder and back area. All other symptoms with the presence of markedly reduced circulation to various parts of the brain may be explained likewise.

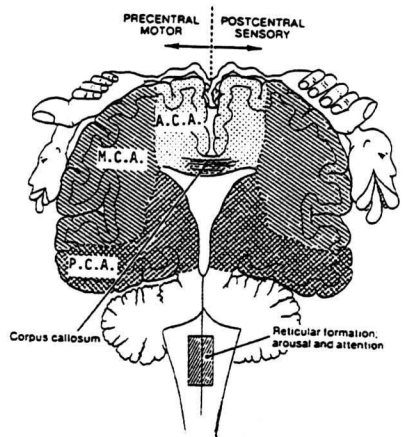


Figure 14A
 Cross section through brain, cerebellum, and brain stem showing areas supplied by the three major cortical arteries and the sensorimotor "homunculus." (adapted from V.D. Deshmukh & J.S. Meyer Non Invasive Measurement of Regional Cerebral Blood Flow in Man; by S.P. Medical & Scientific Books, New York, 1978)

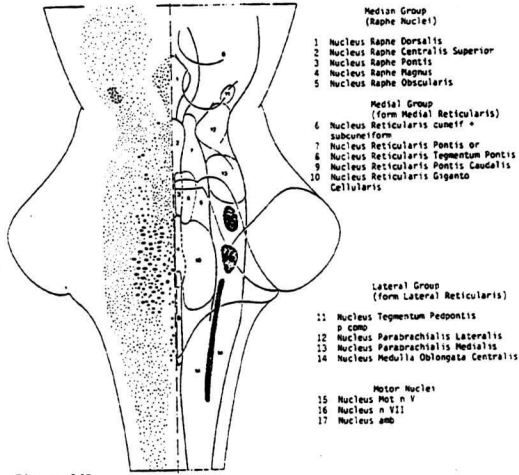


Figure 14B.
 Reticular formation in a dorsal view of brain stem. Right half is subdivision of 1) Median group of Raphe Nuclei; 2) Medial group of Reticular Nuclei; 3) Lateral group of Lateral Reticular Nuclei; 4) Cranial Nerve Motor Nuclei in dark shaded areas. Left half shows Cyto-Architecture. (adapted from Nieuwenhuys, Voogd, Von Huizen, Human Central Nervous System. Springer-Verlag, New York, Heidelberg, Berlin, 1981)

Although the measurement of the blood pressure and the relative blood flow was carried out non-invasively at the supra-orbital artery and the supra-trochlear artery, blood pressure was not measured at the vertebral artery as there appears to be no convenient branch coming up near the skin, compared with the case of the supra-orbital artery or supra-trochlear artery appearing near the skin on the forehead as the branches of the ophthalmic artery (which is the major branch of the internal carotid artery branching off just before it joins the "Circle of Willis"). In some patients, blood pressure of the vertebral artery is not measured, but relative blood flow can be measured when the patient is very thin; therefore, one might ask the following question: without actually measuring vertebral arterial blood pressure, how can one discuss the circulatory condition of the posterior cerebral artery or the vertebral artery? However, these clinically characteristic cephalic hypotension syndromes almost always appear with varying degrees of symptoms when the supra-orbital arterial blood pressure is reduced to near 40mmHg, or lower, compared with her estimated normal supra-orbital blood pressure of $112 \text{ mmHg} \pm 10\%$ calculated from the blood pressure of her arm (137 mmHg) at aortic valve level. Since the ophthalmic artery branches off from the internal carotid artery from a very short distance (within about 1 cm) from the "Circle of Willis," significant decrease in blood flow at the internal carotid artery and its branch at the ophthalmic artery may also drastically influence the circulation of the posterior cerebral artery in the same side of the head as these arteries are closely connected through the "Circle of Willis" (See Fig. 1, Fig. 2, Fig. 3). Therefore, we are simply using this useful clinical observation as a valuable diagnostic clue although we do not know the actual blood pressure at the vertebral artery, basilar artery or posterior cerebral artery. However, we can accurately measure non-invasively the blood pressure and relative flow of the supra-orbital artery, these being to a considerable extent representative of the internal carotid artery and its branches (the anterior cerebral artery and the middle cerebral artery) at the "Circle of Willis", thus often confirming the Bi-Digital O-Ring Test findings by objective measurement.

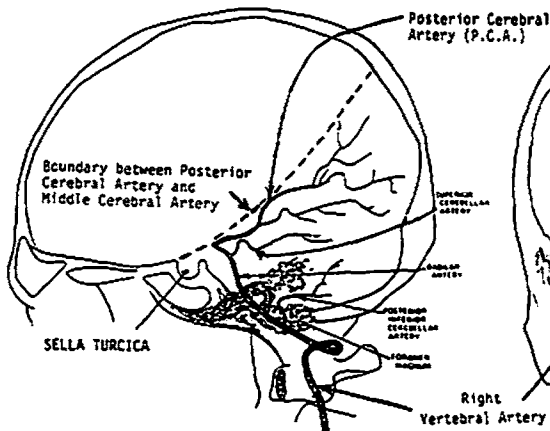


Fig. 14C.
Lateral view of right vertebral arteriography. Anterior inferior cerebellar artery is not filled. Please note similarity of boundary between middle cerebral artery & posterior cerebral artery shown in Fig. 6 on the head of a living human being and this angiograph of posterior cerebral artery, as well as the schematic diagram in Fig. 5.

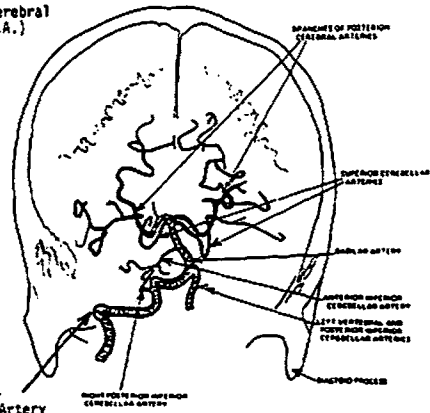


Fig. 14D.
Antero-posterior view of right vertebral arteriography. Partial filling of left vertebral artery and left posterior inferior cerebellar artery by reflux can be seen.

(Adapted from Survey of Functional Neuroanatomy by G. Garoutte, Jones Medical Publications, Greenbrae, Ca., 1981.)

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