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SYMPATHECTOMY AND ITS INDICATION IN THE TREATMENT OF THE CEREBRAL ARTERIOSCLEROTIC VASCULAR DISEASES

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The manifestations of palsy, such as clumsy hand and uncoordinated gait, originate not only from the area of the ischemic softening following thrombosis or haemorrhage, but also from its surrounding zone of vasospasm. The former is, of course, incurable, but the latter is recoverable.

The fact that surrounding an ischemic softening focus there is a zone of stasis with contraction of pial vessels, has been observed by VILLARET and CACHERA (1939) by means of a brain window in animals. The experimental studies of COBB and others have shown that the sympathetic stimulation at the neck can produce the vasocontraction of mild degree in cerebral vessels, whereas the resection of the upper cervical sympathetic chain causes the moderate vasodilatation (1933). These facts give us some hope in the therapy of the cerebral palsy following a vascular accident, because the palsy may improve, if the vessels in the vasospastic area of the arteriosclerotic brain are dilated by the resection of the upper cervical sympathetic ganglion. Our long experiences with sympathectomy in the treatment of peripheral vascular sclerosis in extremities seem to support this idea.

The present report is concerned with our experience with vascular diseases of the brain treated by resection of the upper cervical ganglion on the side of the cerebral lesion. The operation consisted in the removal of the lower pole and the rami communicantes of this ganglion.

The operation is obviously not sufficient to intercept completely the sympathetic innervation of the brain, and the efore the resulting vasodilating effect is far less than in the total resection of the cervical sympathetic system. The latter procedure including thoracic ganglionectomy and adventitia resection of cervical vessels (SOUSA-PEREIRA, 1951) seems, however, too heavy for the aged to tolerate, therefore I would not adopt it. Neither we made stellate ganglionectomy recommended by NAFFZIGER, because of obstinate shoulder pain after operation, even though this

operation is simple and easily endured by the patient.

In our method, the magnitude of the operation is so small that most patients do not usually worry about it.

METHOD OF OPERATION

The patient is placed on the operating table with his head rotated toward the opposite shoulder and the neck is extended backward over a narrow pillow. A 5cm long incision is made along the middle part of the sternomastoid muscle. Then the muscle is incised in the direction of its fibres which are retracted bilaterally. The underlying adipose tissue is separated in the same direction. The juglar vein is retracted together with the fat tissue upwards from m. longus capitis and m. longus colli. By this procedure, the vagus nerve appears running in the carotid sheath. The upper cervical ganglion can be found lying just behind the vagus nerve. The upper cervical ganglion is a fusiform structure about 3 cm in length. Once the sympathetic ganglion has been found, a solution of 0.5 % procaine is infiltrated into the ganglion and the carotid sheath.

The lower pole of the ganglion is elevated from its bed and dissected upward bluntly. The superior cardiac nerve and numerous gray rami are cut which connect the ganglion with the upper three cervical nerves, the carotid plexus, and the closely associated glossopharyngeal, hypoglossal and vagus nerves. After all these connections have been successively cut, the lower pole of the ganglion should be resected. If the entire length of the ganglion has been resected, there often appears after the operation severe pain in the parotid region at the beginning of each meal and the pain persists for a long time. We make at times resection of the lower pole and the rami communicantes bilaterally in two stages on one and the same day to avoid the asymmetrical drooping of the upper eyelid (HORNER's sign).

RESULTS

1. *The Results of the operation in unselected cases:* We have operated on 61 unselected cases of cerebral palsy, except fresh cases of haemorrhage within 3 weeks after an apoplexy, which constitute a definite contraindication against the operation.

Table 1. Hemiplegia in the early stage after thrombosis (within 4 months after accident)

	Complete recovery	Improvement	Slight improvement or unaltered	Death
Number of cases	1	3	5	0

Table 2. Hemiplegia in the early stage after haemorrhage (within 4 months after accident)

	Complete recovery	Improvement	Slight improvement or unaltered	Death
Number of cases	0	6	6	6

As was shown in Tables 1 and 2, the result of the operation in the early stage after an apoplectic insult was nearly similar in cases of both thrombosis and haemorrhage of 21 cases, 7 showed immediately after the operation the improvement

in speech and motor power and one showed complete recovery, and in the course of a few months after the operation 3 additional cases improved.

As WHITE, SMITHWICK and SIMEONE stated, the immediate improvement would be the result of the operation, while the improvement appearing after a long interval should not be attributed to the operation.

In considering that in Japan the spontaneous improvement of this disease is 50 per cent, the above mentioned result does not seem to indicate the effectiveness of the operation.

2. *The results of the operation in* 39 *cases of late hemiplegia persisting for more than* 4 *months after accident and even several years :* In 22 cases of mild

Table 3. Late hemiplegia

Symptoms	Complete recovery	Improvement	Slight improvement or unaltered	Aggravated
Mild	4	9	9	0
Severe	0	0	17	0

paralysis where the symptoms consisted of slight clumsy hand, uncoordinate gait, headache or other encephalopathic symptoms, the improvement was observed in 13. In 17 cases of severe paralysis i. e. total or nearly total paralysis, none showed any improvement in hemiplegia, which deserved to be ascribed to the operation.

Slight improvement in motor power, speech or headache never led to the thanks on the part of the patient, because their paralyzed limbs remained unuseful.

Conclusions are as follows. 1) Early stage of hemiplegia would not constitute an indication of sympathectomy for the time being. 2) And in the operation in the later stage also, if performed in unselected cases of palsy, the results were not to be regarded as encouraging.

3. *Procaine blocking of the cervical sympathetic chain :* LERICHE and FONTAINE (1936), DE TAKATS (1949), AMYES and PERRY (1950), NAFFZIGER and ADAM (1950) and others recommended blocking of the cervical sympathetic trunk for the treatment of vasospasm after cerebral vascular accident. They differ somewhat in their opinions from each other, but of one thing we may be sure——this blocking causes occasionally some temporary improvement of symptoms. In 985 cases we have performed procaine blocking on the side of the cerebral lesion.

We, however, have not resorted to the blocking in cases of fresh intracerebral bleeding. The following tables show the result of our experience.

Table 4. Hemiplegia due to cerebral arteriosclerosis without apoplectic stroke (97 cases)

	Total number of cases	Improvement	Per cent
Within one month after occurrence	51	24	47
Over one month after occurrence	46	21	45

Table 5. Thrombosis within one month after accident

Symptoms	Total number of cases	Improvement	Per cent
Slight	31	12	37
Moderate	92	7	7
Severe	97	9	4

Table 6. Thrombosis over one month after accident

Symptoms	Total number of cases	Improvement	Per cent
Slight	44	14	31
Moderate	108	19	18
Severe	142	0	0

Table 7. Haemorrhage within one month after accident

Symptoms	Total number of cases	Improvement	Per cent
Slight	5	2	
Moderate	5	1	
Severe	12	3	

Table 8. Haemorrhage over one month after accident

Symptoms	Total number of cases	Improvement	Per cent
Slight	32	6	18
Moderate	91	7	7
Severe	210	2	1

As is shown in these tables, the good results were obtained in the patients with slight symptoms, i. e. in those without advanced cerebral arteriosclerosis. Even after an interval of several years, the block was often effective, if the symptoms were slight. In general, the shorter the duration after insult and the slighter the symptoms, the greater improvement was regained by block. All the inveterated cases with severe hemiplegia were highly resistant to the treatment.

In our experience, it was not certain that the recovery in patient could be accelerated by repeated blocks. We have, however, supposed that the better and permanent improvement may be obtained if we perform additional cervical sympathectomy in the inveterated cases of hemiplegia which have been once improved by the block.

4. *Sympathectomy following a preliminary procaine block test:* Althogh the results of sympathectomy are undefinite in the patients who have recently suffered an apoplectic stroke from either cerebral thrombosis or haemorrhage, it may be expected that the cases of apoplectic hemiplegia which have no tendency of spontaneous improvement in the course of some months, may give us a good promise of recovery through this operation, when a preceding procaine block has given a good result. In such cases we have performed sympathectomy and followed

up the results 1～2 years after the operation. The cases operated on had slight hemiplegia with or without a past apoplectic episode due to haemorrhage or thrombosis. They were presumably the cases of mere arteriosclerotic vasospasm or those with small foci of infarction.

The results of operation in those cases, which had been favorably influenced on by the preliminary block, were shown in Table 9.

Table 9.

Number of cases	Almost complete recovery	Improvement	Slight improvement or unaltered	Aggravated
34	19	3	12	0

The satisfactory improvement was obtained in 22 out of 31. In these cases increase in moter power, recovery of speech disturbance and dissolution of headache took place successively or all at the same time. Among these cases there was the one in which the recovery after cervical sympathetic ganglionectomy was only temporary and then gradually disappeared within 6 months. In this case we performed additional stellate ganglionectomy with renewed recovery.

The results of the operation in those cases, where the effect of the preliminary block had been unsatisfactory, were as follows.

Table 10.

Number of cases	Almost complete recovery	Improvement	Slight improvement or unaltered	Aggravated
81	17	27	21	16

The postoperative improvement for which the patients were grateful, occurred in 44 out of 81. The aggravation listed in the table means some complications such as nostril clog, HORNER's sign and others. We were at times told "I ought not to have undergone such a distressful operation as this." The aggravation was observed in 16 of 81.

In 7 cases with no benefit from the preliminary block, the results of the operation were as follows.

Table 11.

Number of cases	Almost complete recovery	Improvement	Slight improvement or unaltered	Aggravated
7	0	1	5	1

There was no effect at all in 5 of 7, and aggravation in 1. Thus sympathectomy should not be done in these cases.

5. *Complications and recurrence:* The incidence of various complications in 156 cases is shown in Table 12.

Table 12.

	Immediately after operation	1-2 years after operation
HORNER's sign	156	156
Nostril clog	30	5
Hoarseness	2	2
Shoulder pain	2	0

The HORNER's sign after operation persists for many years. The complaints on the parts of the patient of the drooping of the upper eyelid can be reduced by bilateral resection of the cervical ganglion. Nostril clog usually recovers spontaneously in 1～2 years at the latest. It can be brought to temporary dissolution, if adrenaline solution are dropped into nostril. Hoarseness after operation is a sign of slight injury to the vagus nerve, which can be avoided by careful manipulation. Soulder pain usually disappear of itself.

Recurrence and death in our cases have no direct connection with the operation, because these took place over 6 months after the operation. Beside, 17% death occurring over one year after the operation is not a high incidence, because almost all of our patients had arteriosclerotic hypertention of degree Ⅱ～Ⅳ KEITH-WAGENER. The same can be said about the recurrence.

COMMENT

Although the influence of the sympathetic nerve on the cerebral blood flow has not been so far definitely evidenced, impressive results of procaine block of sympathetic cervical nerve for the treatment of hemiplegia were reported by many authorities (LERICH and others). Our experience with procaine blocking was the same as that of LERICH and others.

SHENKLIN, CABIESES and NOORDT have observed that bilateral stellate ganglionectomy influences on the cerebrovascular resistance.

NAFFZIGER and ADAM, in a report on their extensive experience with the procaine block for treating cerebral thrombosis, stated that they performed cervical sympathectomy in 15 cases, in which they had observed remarkable improvement by previous stellate blocking, even when it was long after the cerebral vascular accidents. RODRINGEN and ZAMORANO- ESTAPÉ and also POPPEN and FAGÈR performed the same operation in some cases of both cerebral thrombosis and haemorrhage. The operation made by all these authors was stellate ganglionectomy.

CONCLUSION

The slight hemiplegia following a vascular accident of the brain may constitute an indication of cervical sympathectomy, if the palsy does not show any tendency of recovery in the course of several months. On these patients we should try at first a procaine block test of the cervical sympathetic chain. And if there appears a satisfactory reaction in improving motor power and speech disturbance, resection of the lower pole of the upper cervical sympathetic ganglion together with its communicating rami is recommended. In this way we have gained a good recovery of 73% of such patients.

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和文抄錄

腦動脈硬化性腦血行障碍に対する交感神經切除術竝にその適應

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半身不随を主訴とする動脈硬化性腦血行障碍に対する罹患腦側頸部交感神経遮断の治効に就いて，我々は昭和24年以来多数の症例を得て研鑽を重ね，次の様な見解竝に知見に到達した．1. 余生の永くない老人に対する手術として過大な侵襲を避けるために上頸交感神経節下極竝に交通枝切除が適当である．2. 本手術は手術側に現われる上眼瞼下垂の醜形をかくすために両側に行うのがよい．両側同一日に手術を行つてさしつかえない．3. 本疾患に対して無選択に手術が行われても満足すべき成績は得られない．発病後日の浅い半身不随は自然治癒の傾向が強いので，斯る病期に手術して軽快したからといつて，その治効を手術に帰することは出来ない．陳旧な病期には手術効果が殆んど見られない場合が多い．4. 本疾患に対する頸部交感神経プロカイン遮断は既に多数の研究者によつて行われて居るが，その治効を信ずるには尚研究の余地がある．唯一つ諸家の一致した見解は，本遮断によつて一時的ではあるが，本疾患の運動発語等の障碍が緩解するものがすくなくないという点である．我々の経験もこれに一致した．陳旧な症例でプロカイン遮断に反応するのは，併し，軽症半身不随のみであつて，重症なものは無効である．5. 陳旧な本疾患でプロカイン遮断を予備的に行つて，極めて満足すべき効果のあつたものは上記の手術を行つたが満足すべき結果を得，その75%は1～2年を経ても良好であつた．プロカイン遮断効果の不満足な場合はそれに相当して手術効果も不満足である上に，本手術に時に併発するわずかではあるが気にすればわずらわしい鼻閉塞感等の苦情が患者側からおこつて来るので，手術は行わない方がよい．遮断効果無効の症例には手術を行つても無効である

以上の根拠によつて我々は次の様に結論した．動脈硬化性腦血行障碍に起因する陳旧軽症の半身不随は，数ケ月に亘り治癒軽快の傾向が認められない場合には，プロカイン予備遮断を行つて見て，症状の満足すべき軽快が認められるならば，上頸交感神経節下極竝に交通枝切除術の適応となる．