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Microsurgical Anatomy of the Root Entry Zone of the Fifth Nerve in Trigeminal Neuralgia

M.J. Chandy and Shankar Prakash

Department of Neurological Sciences, Christian Medical College and Hospital, Vellore

SUMMARY

In sixty-five consecutive patients with trigeminal neuralgia operated by the senior author, microsurgical findings at the root entry zone of the fifth nerve were carefully studied. Arterial loop indentation was seen in 34 patients, and arterial loop contact in 11 patients. Other findings included venous sling, venous contact at the root entry zone, adhesions and tumors. Normal findings were seen in five patients.

KEY WORDS: Microsurgical Anatomy – Root Entry Zone – Trigeminal Neuralgia – Vascular Compression

Introduction

It has been shown by Haines *et al* (1980) that the association between vascular compression of the fifth nerve at the root entry zone (REZ) and trigeminal neuralgia is not coincidental, emphasizing the hypothesis that this could be an etiological factor in trigeminal neuralgia as put forth earlier by Dandy (1934), Gardner (1968) and Janetta (1967).

However, not all patients with trigeminal neuralgia have vascular compression as its cause and the type of vascular compression is not stereotyped (Haines *et al* 1980). The root entry zone of the fifth nerve was therefore examined carefully using microsurgical techniques following a retromastoid craniotomy, in a series of 65 patients with trigeminal neuralgia, to determine the vascular relationship and the presence of other lesions. Other incidental features such as the length of the REZ following earlier root section were also noted.

Material and Methods

Sixty-five patients with trigeminal neuralgia were operated by retromastoid craniectomy in a modified park bench position over a period of five years. The REZ of the fifth nerve was exposed using microsurgical techniques.

Results

Table 1 shows the relationship of the fifth nerve, REZ with various structures. These were classified into various groups. Group I included arterial loop indentation of the nerve in the axilla between the root and the brain stem whereas a mere contact with an arterial loop was included in-group II. A venous sling and veins contacting the REZ were classified in groups III and IV respectively. Group V included adhesions and group VI, tumour. Five cases (out of 65) had tumour; epidermoid was seen in four cases and a schwannoma in one. The final category (Group VII) included the REZ, which was normal. Five patients had root section by the subtemporal route earlier. The REZ of the nerve was markedly thinned and identified with difficulty in two cases as if there was no artery in the axilla.

Arterial indentation was seen in 52.3% (34 patients) and arterial loop contact in 16.9% (11 patients). Veins either making contact at the REZ or venous slings were observed in approximately 10% of cases. Thus in all, 80% of the cases showed a vessel in relation to the REZ of the fifth nerve. The remaining 20% of cases showed adhesion (4.8% - 3 cases) or normal REZ (7.6% - 5 cases).

Discussion

Arterial compression by branches of the superior cerebellar artery at the REZ of the fifth nerve has been suggested as one of the etiological factors in trigeminal neuralgia by Dandy (1934) and later by Janetta (1967). Hardy and Rhoton (1978) reported that 29 of the 50 trigeminal nerves examined in 25 adult cadavers, had contact of an artery with the trigeminal nerve. Of these in only six nerves was the arterial contact at the REZ of the fifth nerve.

Haines *et al* (1980) in their study of 40 trigeminal nerves (20 cadavers) showed that only 35% had neurovascular contact whereas patients with trigeminal neuralgia had 85% arterial contact with the nerve suggesting that the association of vessels with the REZ is not coincidental but supports the hypothesis that vascular compression of the REZ of the fifth nerve is associated with trigeminal neuralgia.

Group	Findings			
I	Arterial loop indentation	34	SCA	30
			AICA	02
			AICA+SCA	02
II	Arterial loop contact	11	AICA	02
			SCA	09
III	Venous sling	03		
IV	Venous contact	04		
V	Adhesions	03		
VI	Tumours	05	Neurinoma of eighth nerve	1
			Epidermoid	4
VII	Normal	05		

Various other investigators have also found vascular compression of the REZ in most of their cases viz. Janetta (1980) in 96.3% of 411 cases, Van Loveren (1982) in 82% of the 50 cases, Kolluri and Heros (1984) in 97.2% of 72 cases and Virani and Palande (1985) in 80% of 20 cases.

In the present study 80% of the 65 cases showed vascular compression or contact as the cause for trigeminal neuralgia. Of these 39 cases were due to superior cerebellar artery (SCA) and two cases showed both anterior inferior cerebellar artery (AICA) and SCA indenting the REZ. AICA was seen indenting in two cases and making contact with REZ in two cases. The authors have separated out these arteries actually indenting the nerve as against only those making contact to study the late results of microsurgical decompression. While data regarding venous compression are less clear, Haines *et al* (1980) in their study found 12.5% of the 40 trigeminal nerves having only venous compression. IN the present study venous compression was seen in approximately 10% of cases.

Presence of other lesions such as adhesions, tumours and even normal findings at the REZ of the fifth nerve suggests the view that there are other causes for the neuralgia although in the majority of cases vascular compression is noted.

Conclusions

1. All space occupying lesions in the brain stem should be operated upon, because their diagnosis is anatomical and radiotherapy without histology may allow benign lesions to be missed. In these situations not only is radiotherapy useless, but dangerous. Moreover the chance to cure the patient of his ailment may be lost.
2. Some gliomas have a cystic component, evacuation of which has been reported to improve the quality and length of survival.
3. Computed tomography is of great help in planning the approach to the space occupying lesion. Tumours that are anterolaterally situated in the upper pons and midbrain, should be dealt with, via the subtemporal, transtentorial approach. The inferior pontine and medullary tumours are best approached by the suboccipital, midline or paramedian route.
4. At this juncture, computed tomographic image morphology cannot dictate the form of therapy to be adopted. This will have to await better scanners and radiopathological correlation in a larger number of cases.

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