

Neuro Vascular Relationship between Superior Cerebellar Artery and Trigeminal Nerve

Pages with reference to book, From 140 To 143

Nawab Mohammad Khan, Mohammad Afzal Khan, Fazal Karim Aasi (Department of Anatomy, Faculty of Medicine, King Abdulaziz University, Jeddah, Saudi Arabia.)

Abstract

One of the mechanisms suggested for the etiology of trigeminal neuralgia is compression and distortion of the nerve in the pontine zone by the superior and anterior inferior cerebellar arteries or their branches. Conflicting reports have been presented by various workers on this issue. The present study was conducted on cadaveric specimens. The superior cerebellar artery was found to be in contact with the trigeminal nerve in 34.1% and within 1 - 2 mm in 19.5% of cases. Other features of the neurovascular relationship were also studied. It is concluded that due to its very close relationship the superior cerebellar artery could possibly cause compression and distortion of the trigeminal nerve (JPMA 35:140, 1985).

Introduction

The mechanism producing trigeminal neuralgia lacks a satisfactory explanation. Dandy¹ in 1934 first suggested that arterial compression and distortion of the trigeminal nerve at its point of entry into the pons could be a possible etiological factor in this condition. Sunderland² reported that superior cerebellar artery (SCA) or one of its branches frequently looped around and made contact with the root of the trigeminal nerve. Hardy and Rhotson³ have also studied this microsurgical relationship and have discussed the role of neurovascular contact. Jannetta⁴ has studied the problem in living subjects undergoing posterior fossa operations. Mehta et al.⁵ concluded their study by saying, "While the possible role of such neurovascular contact in the genesis of neuralgia is of interest, a causal relation cannot be established".

Since the available reports in the literature are only scanty, we considered it of value to study this neurovascular relationship with two objects in mind: firstly, to see the normal pattern and secondly, to evaluate its possible role in the generation of trigeminal neuralgia.

Material and Methods

The arterial relationship between 41 trigeminal nerves and SCA's was examined in adult male and female cadavers. In each case the calvaria was removed and the brain stem transacted at the level of superior colliculi. The cerebral hemispheres were removed and the tentorium cerebelli was sectioned along the straight sinus and retracted laterally. Under x 10 magnification the arachnoid coverings of the basal cistern were opened and the relationship between SCA and trigeminal nerve was observed on each side.

The site and type of origin, the course, the branches and variations of the artery were recorded. The size of the artery at its origin, close to the trigeminal nerve and at its bifurcation was measured. The distances from origin to bifurcation and from trigeminal nerve were also recorded. Other vessels close to the trigeminal nerve in this region were also looked for.

Observations and Results

Our observations support the previously held view that SCA is the most consistent in its origin and location of all the posterior cranial fossa arteries^{6,7}. Thirty-nine (95.1%) SCA's arose as single trunks and only two (4.8%) were found as duplicate vessels of the 41 SCA's studied (Table 1). This duplication of vessels was only unilateral. Bilateral duplication was not seen. Most (70.7%) of the SCA's arose from the basilar apex (Table 1).

Table – 1.
Site and Type of Origin of the Superior Cerebellar Artery (SCA).

	Number	Percentage
SITE OF ORIGIN		
Basilar Apex*:	29	70.7%
Within 2 mm of Basilar apex:	8	19.7%
Within 2-4 mm of Basilar apex:	4	9.7%
More than 4 mm from Basilar apex:	Nil	0.0%
Total	41	100%
TYPE OF ORIGIN		
Single trunk:	39	95.1%
Double trunk:	2	4.8%
Total	41	100%

*Basilar apex is considered the level at which the basilar artery divides into posterior cerebral arteries.

Caudal looping of the SCA was observed in almost all the cases (Fig.!).

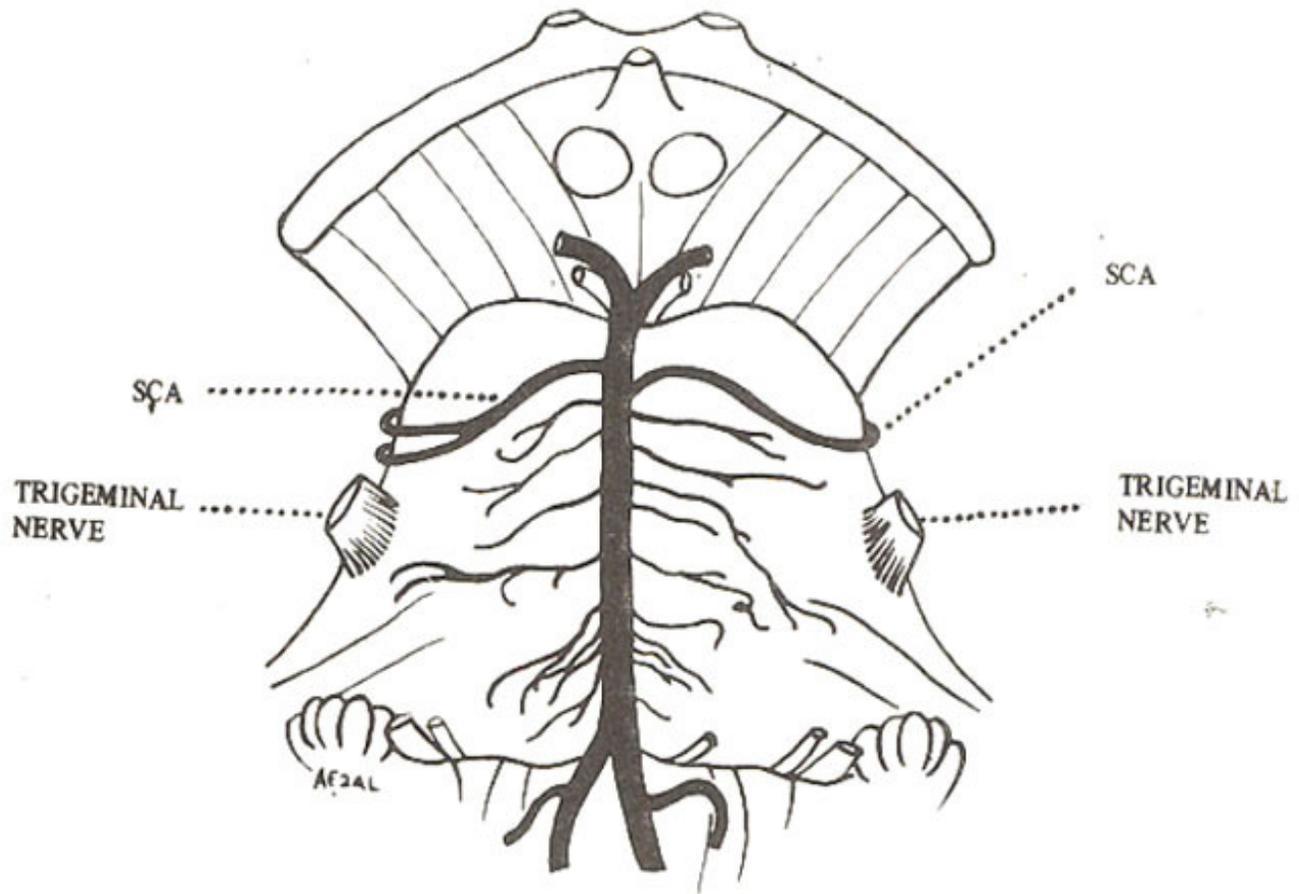


Fig. 1. Showing the ventral view of the pons. Note the close relationship of the superior cerebellar artery (SCA) and the root of the trigeminal nerve.

This looping was more pronounced in the part of SCA proximal to the trigeminal nerve. Distance from the trigeminal nerve was reduced where this looping was more pronounced. The mean length of SCA from its origin to bifurcation was 19.4 ± 7.4 mm and the total mean diameter was 1.7 ± 0.4 mm (Table II).

Table – II
Length and Various Diameters of the Superior Cerebellar
Artery SCA

	Number	Percentage
LENGTH (from origin to bifurcation)		
Mean 19.4 ± 7.4		
Less than 5 mm	2	4.8%
5 – 20 mm	28	68.2%
More than 20 mm	11	26.8%
Total	41	100%
DIAMETER* = Mean 1.7 ± 0.4 mm (n = 41x3 = 123)		
A At origin: 1.6 ± 0.4 mm (n = 41)		
B Close to trigeminal nerve: 1.7 ± 0.3 mm (n = 41)		
C At bifurcation: 1.6 ± 0.4 mm (n = 41)		

* Comparisons among A, B and C were statistically not significant.

The comparisons between its diameters at origin, close to the trigeminal nerve and at bifurcation were statistically not significant.
 In fourteen cases (34.1%) the SCA or its caudal part (in both duplicate cases) was in contact with the trigeminal nerve. The mean distance from the nerve in the remaining 27 cases was 4.3 ± 2.4 (Table III).

Table – III

**Distance of Superior Cerebellar Artery (SCA) or its Branch
from the Trigeminal Nerve* .**

	Number	Percentage
In contact	14	34.1%
1 – 2 mm	8	19.5%
More than 2 mm	19	46.3%
Total	41	100%

* The Mean Distance of SCA from trigeminal nerve was 4.3 ± 2.4 mm (n = 27).

We did not find any sign of indentation or compression of the trigeminal nerve by the SCA in those cases where it was in contact with the nerve. Looping of the SCA, however, was invariably present in all these cases.

Other features of the results are summarised in tables I, II, and III. The anterior inferior cerebellar artery (AICA) was lying far away from the trigeminal nerve and we did not find any other vessel close to the nerve in this region in our study.

Discussion

The origin, course and bifurcation of the SCA in our study is fairly consistent with that of the previous workers^{2,3,7}. Caudal looping of the artery has also been observed by Hardy and Rhotson³, Dandy¹ and Sunderland². Duplicate origin of the SCA was 4.8% in the present study which is roughly in agreement with the findings of Mehta et al⁵ and Hardy and Rhotson³.

The diameter of the SCA from its origin to bifurcation was fairly uniform (Table 1), a finding consistent with that of Mehta et al⁵. The length of the artery from its origin to bifurcation (Mean 19.4 ± 7.4) is in agreement with Hardy and Rhotson³.

Sunderland² stated that SCA “frequently” loops downward to the upper surface of the trigeminal nerve and may indent or even perforate it. Jannetta⁴ found no signs of compression or distortion of the nerve in his series of study. In our study we did find looping of the artery invariably but could not find any compression or distortion of the nerve (Fig. 2).

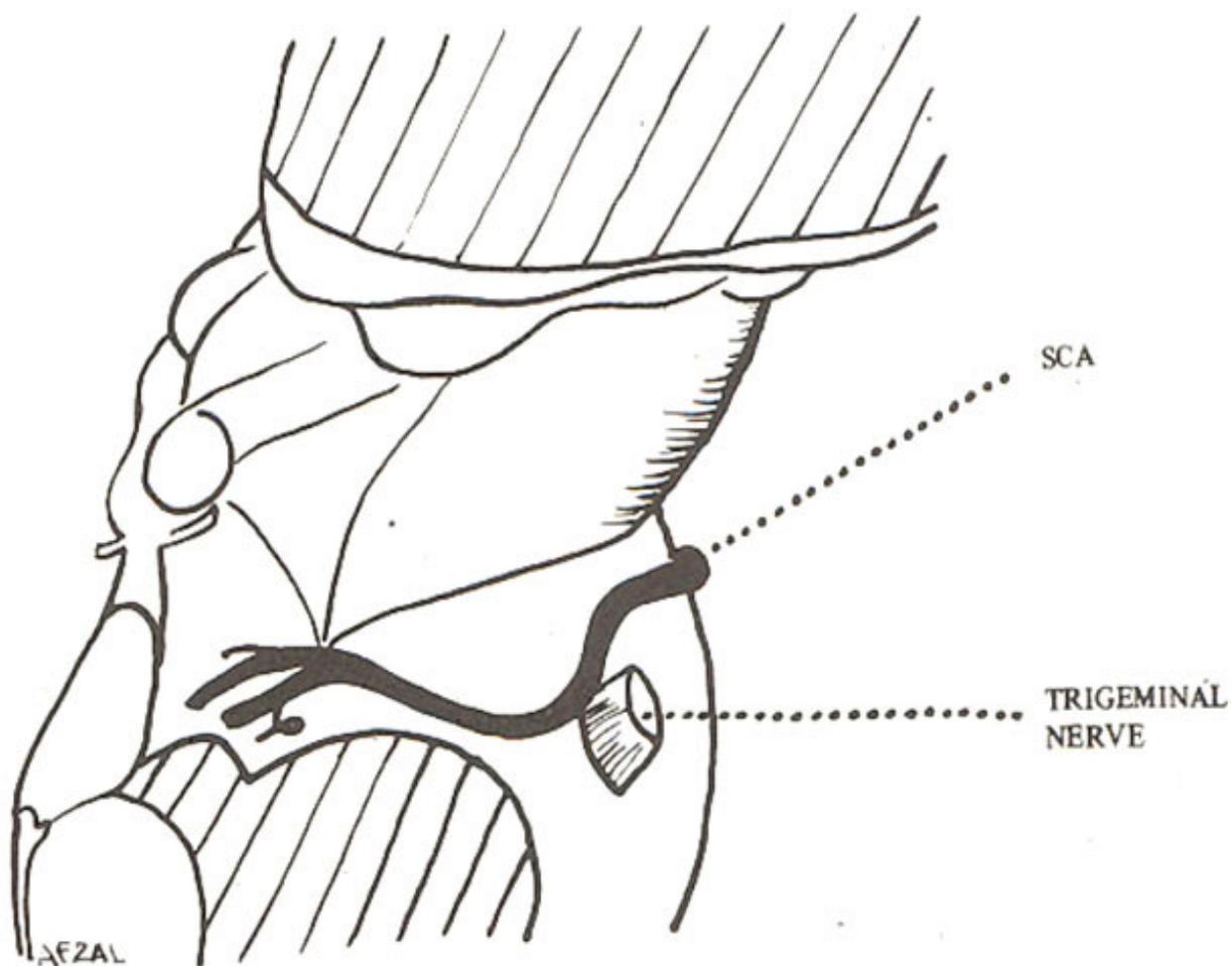


Fig. 2. Showing lateral view of the pons and the relationship between SCA and root of trigeminal nerve.

The AICA never reached close enough to affect the nerve.

We found that in 34.1% of cases the artery was in actual contact with the trigeminal nerve and in another 19.5% it reached very close to it (within 1-2 mm). This raises the percentage to 53.7. Hardy and Rhotson³ have already reported this neurovascular relationship in 52% of cases, where as, Mehta et al. have reported actual contact in only 8.3%; our observation seems to confirm that of the previous author.

Studies of cadaver specimens are of limited value in discussing the etiology of pain producing conditions such as trigeminal neuralgia but the frequency with which this neurovascular contact occurs makes it possible that vascular compression and distortion of the nerve may indeed, be important in the etiology of this painful condition. In our study the main trunk of the SCA, rather than one of its branches, came in contact with the nerve. In life, pulsations in an artery of this size may produce distortion and compression of the nerve.

Whether or not SCA can be implicated in the etiology of trigeminal neuralgia will only be settled conclusively when, as suggested by Jannetta⁴, postmortem studies in subjects with and without trigeminal neuralgia are carried out.

References

1. Dandy, W.E. Concerning the cause of trigeminal neuralgia. *Am. J. Surg.*, 1934; 24: 447.
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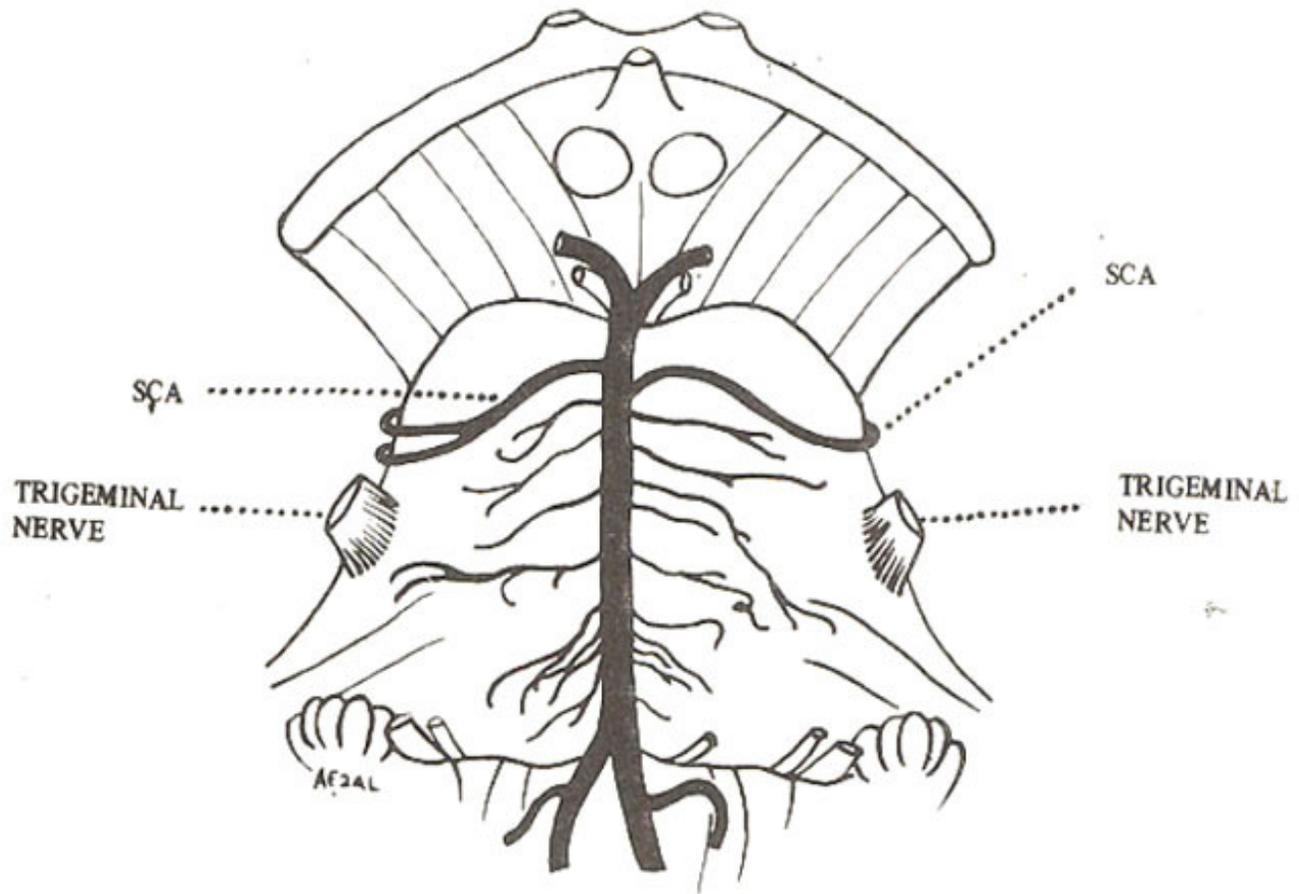


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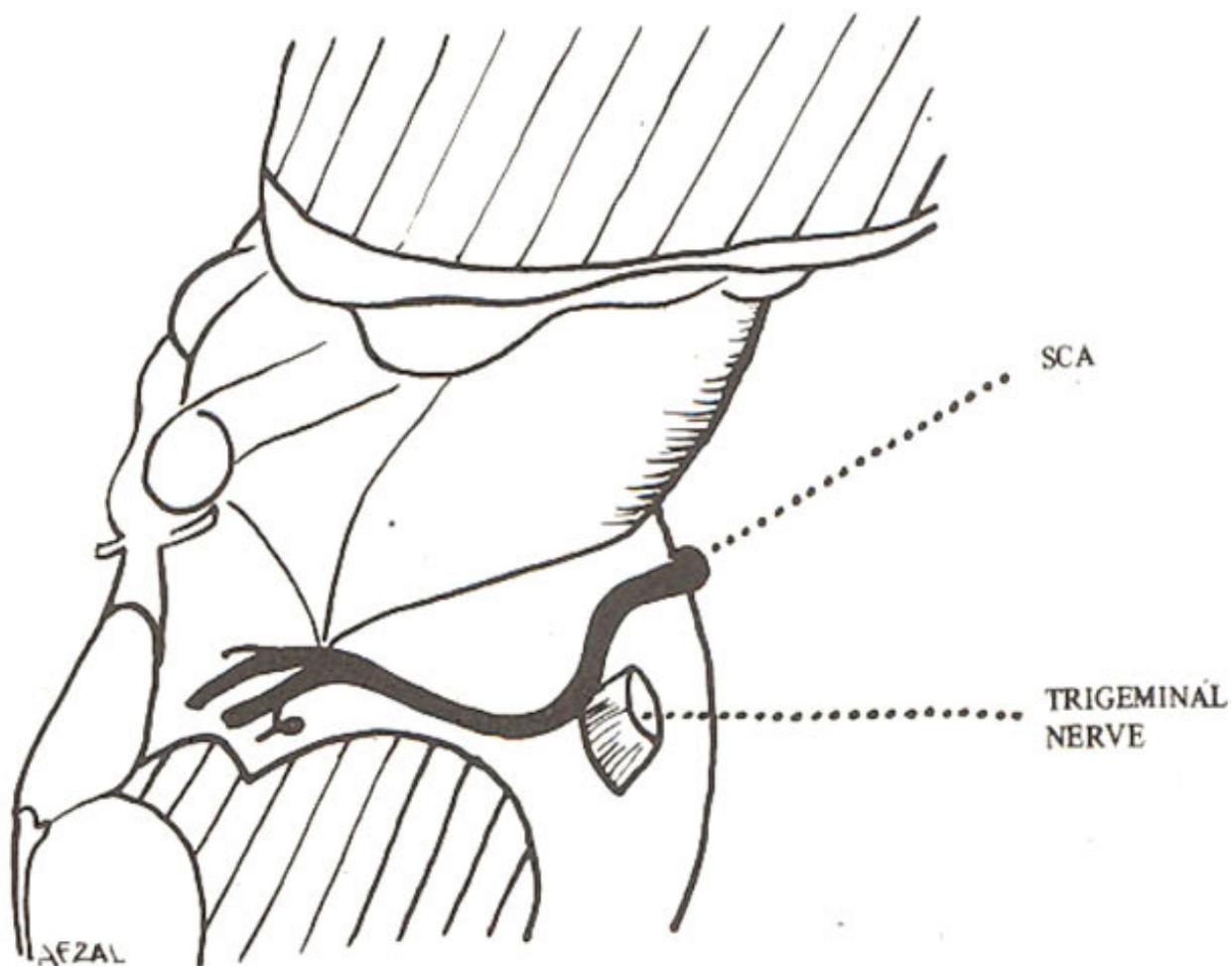


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