CHAPTER IV

DISCUSSION AND CONCLUSION

Results obtained from this experiment confirm previous experiments by King et al. (1989) after extracellular injection of biocytin. Some neurons in the FN are well labelled with biocytin and transport along their axons even for a long distance. It was found that biocytin are well localized within perikarya and axons without any evidence of diffusion into the adjacent area. Very few neurons on the opposite FN at the same level of injection site are clearly labelled with biocytin in the cytoplasm. This indicates the retrograde transport of biocytin from the injured nerve terminals at the injection site (Izzo, 1991).

Effect of Electrical Stimulation in the Specific Area of the FN on ABP and HR

Electrical stimulation through glass micropipette filled with KCl (3M) in the W.ant.rFN (550 μm posterior to the rostral pole), rFN (430 μm posterior to rostral pole) and mFN (210 μm posterior to the rostral pole) areas could produce an increase in ABP and HR. At 0.3 mA constant stimulation produce strongest response in the W.ant.rFN (27.96$\pm$5.61 %MAP) and gradually decrease in the rFN (20.97$\pm$6.79 %MAP) and mFN (16.47$\pm$1.88 %MAP) respectively. There is no response after in the cFN. These results confirm previous experiment by Luk-in (1992) who described variation of response in the specific areas of the FN, the highest response is in the area 550 μm anterior to the rostral pole, then the response slightly decrease in the area 430 μm posterior to the rostral pole (rFN). The smallest response is obtained in the area 210 μm posterior to the rFN after electrical stimulation with tungsten electrodes.

Efferent Projections from the Rostral Part of the FN

After stimulation followed by injection of biocytin into the rostral part of the FN, labelled fiber tracts and terminations are observed as follow:

1. Fastigiospinal Projections

It is clearly demonstrated that, after unilateral injection in the rFN, fiber tracts are observed along the TSC of both sides. They curved down ventrolaterally along the medial boundary of brachium pontis and lateral boundary of the TS V. At more caudal levels, this tracts area splitted into the upper and lower groups and the latter gradually move to the ventromedial position; at first they are observed to accumulated lateral to the inferior end of the TS V, then descend caudally in the area ventrolateral to the OS, facial nucleus, inferior olivary nucleus. The labelled tracts then are observed in the lateral and ventral column of the upper cervical spinal cord. The upper groups descend caudally through the whole medulla; they gradually move down along the medial boundary of the ICP and lateral boundary of the TS V. These tracts are observed in the TSD and connected to labelled fiber in TSC and the lower groups at the caudal level of ICP. Number of fibers in the contralateral side are somewhat fewer than those of the unilateral side.

Observations from serial sections can be concluded that these tracts are projected from the FN to spinal cord. The FN projects fibers out into two subdivisions, the upper and lower. The upper ones are projected along the TSC toward the ventrolateral position of the base of the braln. Then the tracts descend caudally into the lower pons and medulla to spinal cord. The upper ones are projected

along the medial boundary of ICP, lateral boundary of the TS V and join the former tract through the TSD at the caudal medulla.

These evidences have not been described in previous reports. Degeneration study in the common tree shrew (Ware and Mufson, 1979) described fiber tracts in both sides of the brain. However, the authors described diffused fibers pass through midline of the pons and medulla. The courses of these fibers are uncertain and ambiguous. Some fibers are described in the raphe nuclei, tectospinal tract, medial longitudinal fasiculus and the medial reticular formation. Autoradiographic study using H3 (L-Leucine, L-Lysine and L-Proline) described the FN projects the contralateral UF mainly to the vestibular nuclei and few fibers pass through the nuclei and turn caudally beneath the TS V and descend along the ventrolateral aspect of the pons and medulla (Batton et al., 1977).

Evidences obtained from previous reports are unable to localize the injection or lesion sites and limitations of the degeneration and autoradiographic techniques prevent them to obtain discrete results. Conversely, this experiment has chosen the specific injection of biocytin in a very small volume (30 pl) into a small discrete area of the FN. Moreover, serial sectioning of the whole pons and medulla allows the detailed study of the courses of fibers tracts.

2. Fastigiovestibular Projections

Two fiber tracts are observed in the vicinity of vestibular nuclei of both sides of the brain. Both tracts arise from the medial border of the BC. Then they split into two tracts, one spreads laterally along ventral boundary of the BC into

the VS, then they turn ventrolaterally into the VL and VI, this tract lies along medial boundary of the ICP. The second one projects ventrally into the VM in a dorsoventral direction. Terminals are observed only in the VM, VL and VI intermingles with fibers. Fewer fibers observed in the contralateral vestibular nuclei and very few terminals are observed in the VM, VL and VI.

Previous reports described terminations in all vestibular nuclei of both sides of the brain with greatest numbers are found in the VL an VI in rhesus monkey (Carpenter, 1959) and cat (Walberg et al., 1962). Conversely, evidences from autoradiographic study (Batton et al., 1977) described similar pattern of terminations in ventral portion of VL and VI. Carleton and Carpenter (1983) described terminations in the VM arise from neurons in all parts of FN which those in the VL arise from both side of the rostral part of FN after retrograde transport study of HRP and WGA-HRP. This seems to be relevant to this study. However, this study found greatest numbers of terminals in ipsilateral VM, VI and VI with very few on the contralateral side.

3. Fastigioreticular Projection

This study reveals scattering terminals mainly in the medullary FRS and FRG and PGI ; those in the ipsilateral is outnumbered than those in the contralateral side; there are fewer terminals in the lower medulla. However, there are mainly small fibers accumulate in ipsilateral RL, only very few terminals are observed intermingled with the fibers. Previous report in rhesus monkey, after degenerative study, (Carpenter, 1959) described termination mainly in the contralateral paramedian reticular formation of the pons and medulla from the level of the abducen nuclei to the level of hypoglossal nucleus. This seems to be contrast to those described in cat (Walberg

et al., 1962) which present terminations mainly in the contralateral FRG, PRN. Only few terminals are observed in nucleus reticularis pontis oralis and caudalis FRS and RL. Autoradiographic study in the FPR area (Moolenaar and Rucker, 1976) reported the heaviest deposition of silver grains in the contralateral medullary PRN and PGI. Moderate degree of labelling was observed in RL perihypoglossal nucleus, nucleus ambiguous and parvocellular nucleus of reticular formation. Evidences obtained from the retrograde transport of WGA-HRP by Qvizt (1989) reveal the contralateral projection from rostral FN to the RL. This is contrast to results obtained in this study. This may be due to the fact that the injection of WGA-HRP probably damages the fastigiospinal tract in the area of RL and causes the retrograde transport the substance to the FN. This can be confirmed by Chida et al. (1990) who performed electrolytic or chemical lesioning in the bilateral rostral ventrolateral medulla and abolish the FPR in the rat after electrical stimulation in the rostral FN.

4. Efferent Projections to Other Areas

Accumulations of terminals are observed in the CNL, CN since the rostral part of the TSD. Then, at level of NH, the terminals accumulation in the medial boundary of the CN spread in the NTS, terminals in the NTS are observed until the caudal level of RL. Previous reports described bilateral projections from the caudal FN to the nucleus prepositius in the cat (Walberg, 1961) after degeneration study but not in monkey after autoradiographic study (Carpenter and Batton, 1982). Terminals accumulation in the contralateral paraolitarius nucleus are reported in the degenerative studies in the rat (Achenbach and Goodman, 1968) cat (Walberg et al., 1962) and autoradiographic study in monkey (Batton, 1977). However, these results cannot be concluded since the authors found it difficult to classify whether or not it is a part of VI. However, there is previous report describes the accumulations of terminals in the CN and CNL.

Efferent Projections from the Middle part of the FN

Injections of biocytin in the mFN demonstrates similar bilateral fastigiospinal projection in the rFN injection, terminals in the CNL, CN and NTS as shown the rFN injection. However, terminals in FRS and FRG are hard observed. Only small group accumulation of terminals in the contralateral FRP are observed. These evidences have not been described in previous report.

Efferent projection from the Caudal Part of the FN

Injections of biocytin in the cFN fails to demonstrate the fastigiospinal tract. Dense accumulation of terminals are demonstrated bilaterally in the area ventral to the VM at the rostral levels of the C VII. They are found to spread laterally into the VL and VI, and medially across the nerve into FRS. Few terminals are observed in VM at the level of C VII but accumulations are clearly observed bilaterally in the VM at the levels caudal to the FN until the caudal medullary levels.

Terminal accumulations are observed in the NTS, CNL and CN as those observed in the rFN and mFN injection.

Degenerative study after lesioning in the caudal FN of monkey (Carpenter, 1959) described only fibers all contralateral vestibular nuclei, reticular formation and medullary paramedian reticular nucleus, in the area lateral to the twelveth cranial nerve. Likewise, autoradiographic study in monkey (Batton, 1977) described terminals accumulation in the bilateral VL and VI and contralateral VS. Moreover they authors also described terminals in the medullary FRG no labelled fiber and terminals are found in RL.

Conclusion

From this study it could be concluded that the fastigial pressor areas in the rostral and middle parts of the FN project bilateral in discrete bundle presumably to spinal cord which is not shown in the caudal injection. Thus, these evidences suggest the direct connection from the fastigial nucleus to spinal cord which control cardiovascular functions.