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Title	Regional and Inter-Laminar Differences of Postnatal Development of Pyramidal Cells in the Primary Visual, Visual Association, and Prefrontal Cortex of Macaque Monkeys
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Citation	大阪大学, 2017, 博士論文
Version Type	VoR
URL	https://doi.org/10.18910/61879
rights	
Note	

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論　文　内　容　の　要　旨

氏　名　（　小　賀　　智　文　）	
論文題名	Regional and Inter-Laminar Differences of Postnatal Development of Pyramidal Cells in the Primary Visual, Visual Association, and Prefrontal Cortex of Macaque Monkeys （マカカ属サル一次視覚野、視覚連合野、前頭前野における錐体細胞の領野および層特異的生後発達）

論文内容の要旨

Pyramidal cells in the primate cerebral cortex, particularly those in layer III, exhibit regional variation in both the time course and magnitude of postnatal growth and pruning of dendrites and spines. Less is known about the development of pyramidal cell dendrites and spines in other cortical layers. Here I studied dendritic morphology of layer-V pyramidal cells in primary visual cortex (V1, sensory), cytoarchitectonic area TE in the inferotemporal cortex (sensory association), and granular prefrontal cortex (Walker's area 12, executive) of macaque monkeys at the ages of 2 days, 3 weeks, 3.5 months, and 4.5 years. We found that changes in the basal dendritic field area of pyramidal cells were different across the three areas. In V1, field size became smaller over time (largest at 2 days, half that size at 4.5 years), in TE it did not change, and in area 12 it became larger over time (smallest at 2 days, 1.5 times greater at 4.5 years). In V1 and TE, the total number of branch points in the basal dendritic trees was similar between 2 days and 4.5 years, while in area 12 the number was greater in the adult monkeys than in the younger ones. Spine density peaked at 3 weeks and declined in all areas by adulthood, with V1 exhibiting a faster decline than area TE or area 12. Estimates of the total number of spines in the dendritic trees revealed that following the onset of visual experience, pyramidal cells in V1 lose more spines than they grow, whereas those in TE and area 12 grow more spines than they lose during the same period. These data provide further evidence that the process of synaptic refinement in cortical pyramidal cells differs not only according to time, but also location within the cortex. Furthermore, given the previous finding that layer-III pyramidal cells in all these areas exhibit the highest density and total number of spines at 3.5 months, the current results indicate that pyramidal cells in layers III and V develop spines at different rates.

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論文審査の結果の要旨及び担当者

氏　名（　小賀　智文　）		
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論文審査担当者		
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論文審査の結果の要旨

本研究は、カニクイザルの大脳皮質の形態額的特徴の領野間差異とその生後発達について検討を行った。一次視覚野（V1野）、側頭葉視覚連合野（TE野）、前頭葉腹外部（12野）の３層および５層において、錐体細胞の樹状突起の広がりはV1，TE，12野の順に大きくなる。この特徴は、V1野においては生後から成体にかけて樹状突起が刈り込まれるのに対して、TE野、12野では伸長が優勢であることによる。スパイン密度は、3層では全領野が3.5ヶ月齢で最大となり、その後、減少する。5層ではそれよりやや早く、特にV1野は3週齢がピークとなる。領野間形態差異はスパインの形態にも存在し、V1野は中小型のスパインがほとんどであるのに対して、TE野、12野は、頭部膨大部を持たないものや大型の頭部を持つものなど多様である。本研究は、以上のように、霊長類の大脳皮質の構造的分化とその生後発達過程を、厳密な解析、膨大なデータに基づいて詳細に解明し、サルやヒトの大脳皮質構造の生後発達の理解への大きな基礎を築いた。博士号学位を授与するのにふさわしい成果であると考える。