

DEPTH OF HUMAN HYPOPHYSIAL FOSSA DUE TO AGING PROCESS: A MORPHOLOGIC RESEARCH

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ABSTRAK

Penuaan adalah proses yang berlangsung normal pada kehidupan manusia. Fossa hipofisis merupakan pelindung kelenjar hipofisis, dimana kelenjar hipofisis mengalami atrofi saat terjadi penuaan. Saat proses penuaan berlangsung, bagaimana keadaan fossa hipofisisnya? Penelitian kolaborasi dilakukan pada laboratorium anatomi Fakultas Kedokteran Universitas Airlangga dan laboratorium anatomi Fakultas Kedokteran Universitas Wijaya Kusuma Surabaya dengan subyek penelitian: jenazah pada kedua laboratorium tersebut. Jenazah mayoritas etnis Jawa dan berasal dari golongan sosial rendah: pengemis, kaum duafa dan tanpa identitas pengenalan, yang jasadnya didonasikan kepada Fakultas Kedokteran untuk proses belajar deseksi anatomi. Usia jenazah tidak diketahui secara tepat, sehingga dipergunakan metode penentuan usia berdasar antropologi. Metode antropologi yang dipergunakan adalah: penentuan usia berdasarkan penyatuan sutura kalvaria dan derajat keausan permukaan kunyah gigi geraham. Kedalaman fossa hipofisis diukur dengan menggunakan kaliper digital melalui garis horisontal terbentang dari tuberkulum sellae dan dorsum sellae menuju kedalaman dasar fossa hipofisis secara akurat. Hasil penelitian menunjukkan bahwa hubungan positif antara kedalaman fossa hipofisis dengan pertambahan usia jenazah, dengan $p:0,01$ dua ekor. Keadaan ini sesuai dengan proses penuaan, dimana terjadi proses atherosclerosis pada usia tua yang berdampak pada vaskularisasi fossa hipofisis. Penelitian ini sebagai dasar bagi penelitian selanjutnya guna mewujudkan penuaan manusia secara berkualitas.

ABSTRACT

Aging was normal process of human living. Hypophysial fossa as a protector of hypophysial gland, in aging process hypophysial gland was atrophy. For this phenomena happened in older age, what will happen through the hypophysial fossa?. Collaborative research had done between anatomy laboratory Medical Faculty of Airlangga University and anatomy laboratory Medical Faculty of Wijaya Kusuma Surabaya University, subject of research was cadavers from both medical faculty. The cadavers were majority javanese and from lower class of social community, such as beggar, poor, and unidentified person which donated to medical faculty for studying of anatomy dissection. The cadavers age was exactly unknown, so to identify the age of cadavers by using an anthropologist method of age determinate. In this research, the anthropologist method to determinate age was: observation of cadaver's calvaria suture and surface molar teeth damage as a support method. The depth of hypophysial fossa was measured by digital caliper which depth measuring face located at horisontally line between tuberculum sellae and dorsum sellae, therefore depth measuring blade of digital caliper can reach bottom of hypophysial fossa accurately. The result of research showed that depth of human hypophysial fossa due to aging process was positive correlation, significant at 0.01 level of two-tailed. That condition were happens as a reflection of aging process in human during alive, in which paralel to aging the increase of the aging the so that the impact begins clear, particularly the severity of atherosclerotic process there were that of to the blood vessels of the vascularisation to hypophysial fossa. This research as a foundation to next research which explore causes of changing the hypophysial fossa depth, which could be early sign of aging process so human can reach optimum quality of aging.

Keywords: depth of hypophysial fossa, aging process, calvaria suture, surface molar teeth damage, optimum quality of aging

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INTRODUCTION

The human's cranium is a protector structure of the brain. There was some mystery over the cranium which as value object of research. A dynamic change during human lifetime will be an interesting for a researcher. The changing of human's cranium along with the age is

easily to be observed at the splanchno-cranium, rather than a difficulty to observe neurocranium of the basis cranii from the outer side. Since the domination of Chepal at the fetal-infant period otherwise at pubertal period was decreased and mostly at the adult period (Corliss, 1976).

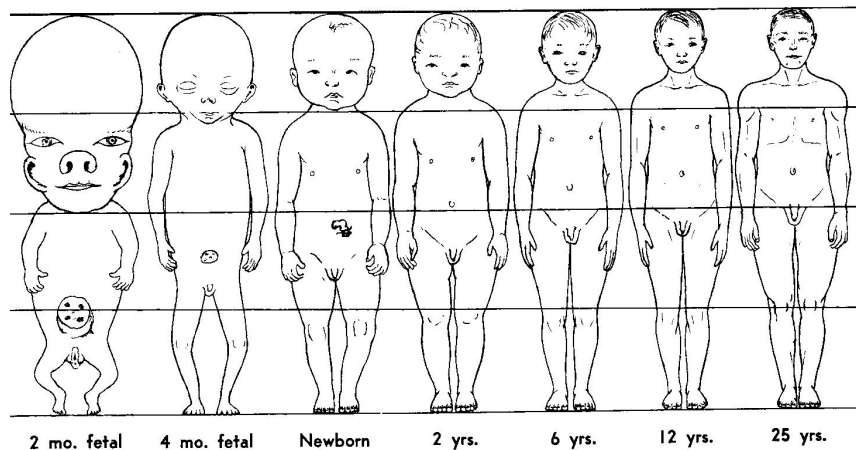


Fig. VII-10 Two fetal and five postnatal stages drawn to the same total height to show the characteristic age changes in the proportions of various parts of the body. (Redrawn from Scammon, in Schaeffer, 1953.)

Figure 1. Cephal domination in human (Corliss, 1976).

The change of basis cranii itself does not appear both internal and external as well from the outer aspect. Aging process particularly at the puberty, young adult and adult which underwent change at basis cranii. For example at under twenty years of age there were no bone completely unification between tuberculum pharyngeum and corpus os sphenoidale. Along with the aging process which cannot be avoid in humans so do the change it self. The aging process in human cranium are not well understood whether its shape at the splanchno-cranium or neurocranium region. However, in fact human face are change along with the aged. Despite the human face mostly determined by its soft tissues and face skin structure. So far, there is still another factors which influenced the cranial changing. Those change process are followed by the hypotheses that there were an efforts to achieved the dynamic homeostasis stability. It means that there are any adaptive process to the change processe aging include the aging process in human. For example the change effects in human is the decrease of measurement and density of the organs or glands which called atrophy. This aging process was followed by hypophysial gland atrophy, whose functions are important for dynamic homeostasis stability achievement (www.en.wikipedia/wiki/Sella_tursica).

The hypophysial gland or mostly known as the mother of gland of all glands (Saladin, 2004) and the only gland which protected by the depth skeleton of sphenoidale bone called hypophyseal fossae or sella tursica. This fossa is located at superior-posterior in a space called sinus sphenoidale. At this moment there were a consensus that the female hypophysial gland were larger than of male (Iskantijah, 2010) at the begining of puberty till young adult. Even more weighting than at gravidation and through the parturition onset. However at the begining of menopause the dimension of this

gland are similar to the male due to atrophy process (Silbernagl, Lang, 2006). The hypophysial gland change is the fundamental theory of aging which called neuroendocrine theory. This theory means that at the old age there were a decreased of hormonal secretion particularly the growth hormone which produced by adenohypophyseal gland that undergo atrophy. Since the atrophy process it doesn't mention by literatures about the condition of hypophysial fossa or sella tursica at the time of atrophy process. Based on those condition we try to examine the change of hypophysial fossa related to the age of cadaver in both anatomy laboratory of Wijaya Kusuma Medical Faculty and anatomy laboratory of Airlangga University in Surabaya.

The problem formulation: is there any relation between age and the depth of human hypophysial fossa of internal cranial basis at cadaver? While the aim of this study was to understand the relation between age and the depth of human hypophysial fossa of internal cranial basis at cadaver in both anatomy laboratory of Wijaya Kusuma Medical Faculty and anatomy laboratory of Airlangga University in Surabaya. The benefits of this study were : 1) Hopefully this is the preliminary studies of human hypophysial fossa. 2) There were a connection the depth of human hypophysial fossa of internal cranial basis which could be used for a completed identification of the age of human cranium due to developed of medical anthropology-anatomy and medical forensic in order to identification of cadaver age as well.

MATERIALS AND METHODS

The hypophysial fossa from basal cranium were collected from cadaver of non-identity of Medical

School of Wijaya Kusuma University and Medical School of Airlangga University in Surabaya after approved by Ethical Committee on June 2011. The age of cadaver was determined by using two parameters: first, the damage of dental surface of the upper and lower jaws; second, the condition of calvary suture unification. Those samples are prepared for depth measurement of hypophyseal fossa.

The measurements include: a) To measure the length of tuberculum sella, i.e the distances between both processus clinoideus medius, and then those distance divided is by two into central parts which will be a basic surface for a digital caliper. b) To measure the length of dorsum sella, i.e the distance between both processus clinoideus posterior, and then those distance is divided by two into central parts which will be a basic surface for a digital caliper. c) To put a measured tools at right position which determined previously for calibrating it. d) To measure the depth of human hypophyseal fossa of cadaver in the smallest scale of 0.01.

This research began with the observation and measurement of cadaver cranial population of the damage of dental surface of the upper and lower jaws; the condition of calvary suture unification. Then a determination of the cadaver's age. Samples were collection from cranium which ha been determined previously, the results was above 50 years. The to measure the depth of cadaver's hypophyseal fossa basis crania. This study was observational research of non experimentally. 2) Sample and population: Population were all of the cadaver in Medical School of Wijaya Kusuma University and Medical School of Airlangga University in Surabaya. Minimum amount of the samples were 30 cadaver from those laboratories without sex limitation. 3) Inclusion criteria were cadaver population of those laboratories, while exclusion criteria were pathological change of hypophyseal fossae such as hyphophysial tumor. The

research variables were: age, the depth of human hypophyseal fossa of internal cranial basis.

Data were collected from by used age selection at the population by the damage of dental surface of the upper and lower jaws; the condition of calvary suture unification. Those samples are prepared for depth measurement of hypophyseal fossa. Data processing consisted of two stages there were the surface molar teeth damage and the depth of hypophyseal fossa. These two steps were processed as a theory norm in aged determination due to formulation and the references table of and the depth of hypophyseal fossae. Data analysis: by using statistics test i.e parametric and Pearson correlation

Age determination of the cadaver, by using the damage of dental surface of the teeth, was closed of dental tissues since the email to pulpa dentin (Schuurs, 1993). The etiology of the damage of dental surface of the molar teeth were both internal and external factors. The internal factors such as nutrient deficiency of calcium which caused decalcification particularly the molar (Schuurs, 1993). While external factors such as mechanical traumatic which caused by surface contact of the teeth each other. If these contact caused by chewable is called physiologic atrisi and if by foreign bodies is called abrasi (Schuurs, 1993).

The molar teeth damage caused by many factors such as: a) Food, b) Chewing power, c) Saliva, d) Disharmony due to teeth extraction. Based on these explanation the etiology of molar surface dental damage paralel to the human's aged. So, in order to evaluate molar surface dental damage which divided into: (0) without dental damage; (1) a little bit enamel damage; (2) yellowed colour of dentin layer in many sites; (3) damage of all of dental surface dan jellowed in dentin layer; (4) damage in parts or all of dental crown which reach dental neck.

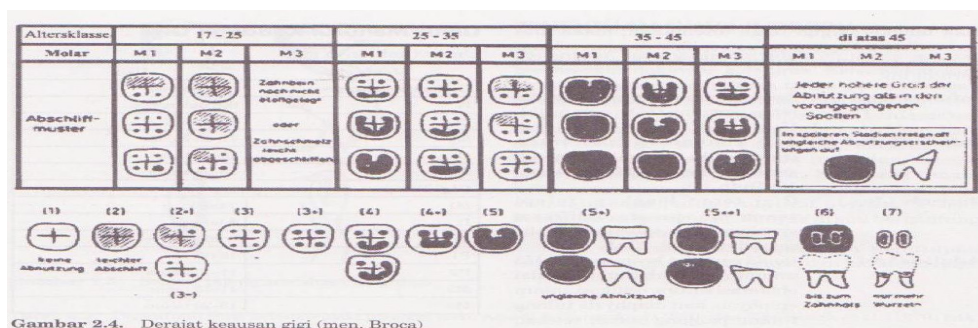


Figure 2. Dental surface damage (Glinka, 2008).

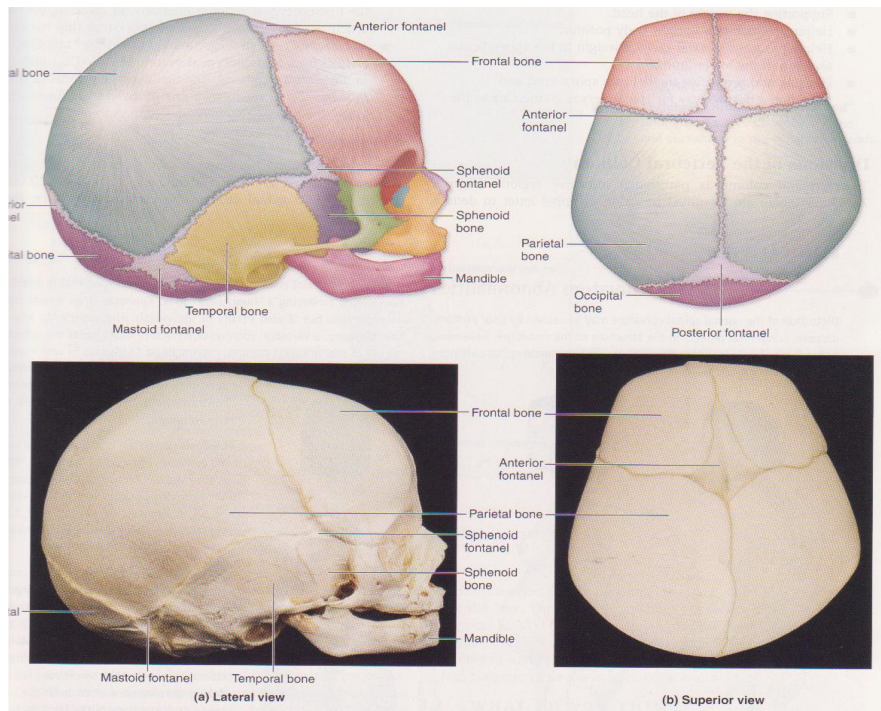


Figure 3. Relations among fetal cranial bones (Mc Kinley, 2006).

Age determination based on the calvary suture unification of cadaver. Calvary is the roof of human's cranium which composed os frontale, os parietale, os occipitale, which each of them was connected by loose suture in some areas look like a membrane which called fontanela. The loose connection or synclitismus are needed for fetal head in parturition process through the vaginal pathway as well as give chance for brain growth (Gardner et al, 1966); if not so due to early suture disclosed which has an impact of cranium anomali such as schapochepaly, plagiocephaly, oxycephaly (Glinka J, 2008., Schwartz, 1995) .

As long as human age development therefore the narrowing of fontanela and at last covered or unification of fontanela. They are: Fontanela major/ Bregma between os frontale and os parietale; Fontanela minor/ lambda located between os parietale and os occipitale; Fontanela Sphenoid/ Fontanela anterolateralies/ Ptherion located between frontale-ala major os sphenoidale- pars squamosa os temporale dan os parietale; Fontanela mastoidea/ Fontanela posterolateralis/ Asterion located between os parietale-pars petrosa os temporale-os occipitale (Mc Kinley, 2006).

The calvaries' sutures are (Glinka et al, 2008., Schwartz, 1995): 1) Sutura coronalis which connect to os frontale-os parietale-pars squamosa os temporale,

this position lead to divide of coronalis suture into three parts: a) Pars bregmatica,(C1) which connected to os frontale and both right and left os parietale b) Pars complicata, (C2) is a continuation of Pars bregmatica to the lateral side of stephanion. c) Pars temporalis, (C3) is a curve line from stephanion to astherion. 2) Sagitalis suture which connect to os parietale dextra et sinistra, was divided into four parts: a) Pars bregmatica (S1) is a curve line from bregma to vertex. b) Pars verticalis (S2) is a curve line at vertex area. c) Pars obelica (S3) is a linier line at foramina parietale, in limited long less than 17-20 mm. d) Pars postica (S4) is a continuation of curve line back to lambda. 3) Lambdoidea suture which connect os parietale and os occipitale, divided into three parts: a) Pars lambdoidea/ pars lambdica (L1) is curve line from lambda to an angel dan little circle. b) Pars media (L2) is curve line to the lateral side to achieve a linier line. c) Pars asterica (L3) is curve line to astherion.

Total parts of calvary cranium are ten, then we need to examine the unification condition of calvaries based obliteration degree criteria: (0) obviously clear bend of suture, no obliteration unification; (1) there is an obliteration/less than half part unification; (2) there is half part of suture have had a unification; (3) there is more than half part of suture have had a unification; (4) clearly total unification without a curve line again.

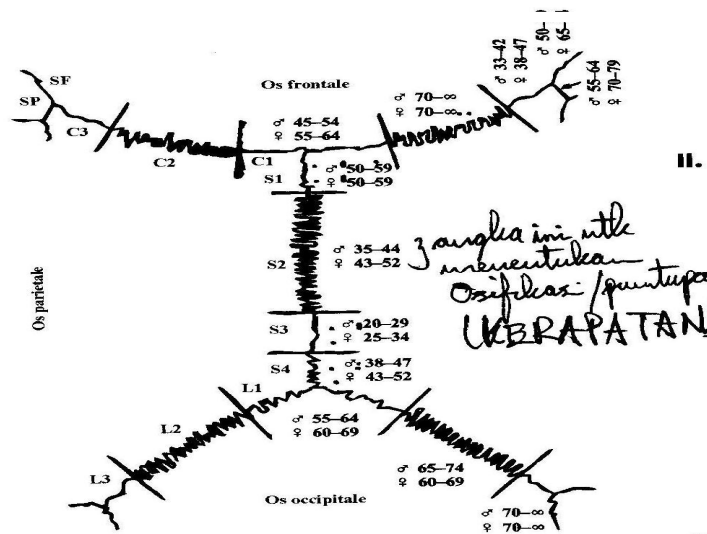


Figure 4. A border line of unification of calvary's suture (Glinka et al, 2008).

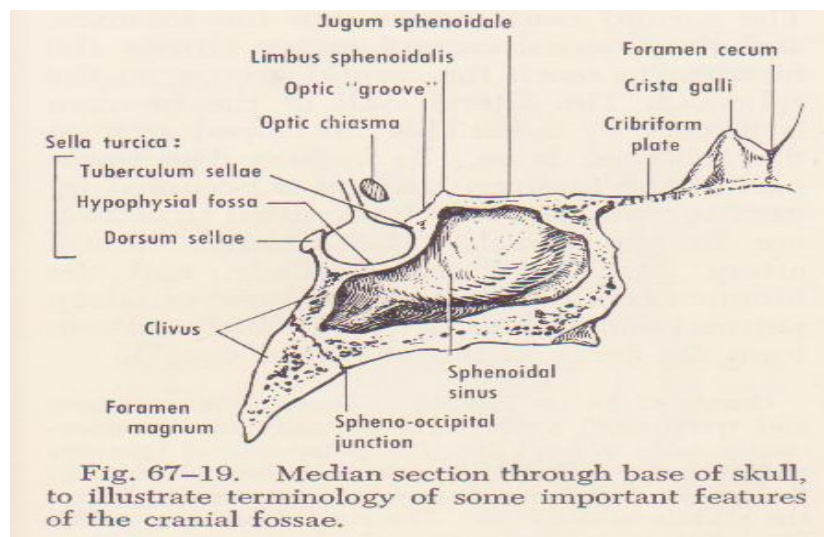


Figure 5. The morphology of hypophyseal fossa (Gardner, 1966).

The circumstance of unification of calvary suture is used by Todd and Lyon's in 1924, and then completed by Acsadi and Nemeskeri in 1970, as the criteria previous (Schwartz, 1995).

The Anatomy of Hypophyseal Fossa

The hypophyseal fossa are located in medial fossa cranii, its function as protection of hypophyseal gland, commonly is called sella turcica which means Turkey saddle is a flat bone as part of os sphenoidale. This bone was classified as irregular bones, it has complex shape parts (McKinley, 2006). The borders of sella turcica are: a) the anterior border is tuberculum sellae,

which locate sulcus (Kahle et al, 1990., Schwartz, 1995) chiasmatis. b) The lateral border is sulcus caroticus. c) the posterior border is dorsum sellae. d) the infero anterior part is sinus sphenoidale, this sinus vascularized by ramus sinus sphenoidalis artery is a branch of internal maxillary artery (Netter, 2006). The basic of hypophyseal fossa is flat bones which dominates by componen of compact bone, therefore this area is exposure to the osteoclast any more (Saladin, 2004).

Aging and hypophyseal gland. Aging was a changing process to be more mature or an aging processed, which means a degenerative changing. Aging process was commonly supposed to a normal physiologic process.

However, a normal physiologic process is hard to find due to an aging process is commonly followed by diseases which ended by death. The changing process begins since in cell as smallest vital unit followed by tissue and finally at systemic organ. The changing at cellular level never manifest by clinical disorders otherwise after a degenerative changing in organs. At this level of disorders could be followed by clinical manifestation. Aging has began since 30 years of age, signed by skin wrinkle around the eyes and forehead. At the age of 40s fatty deposit around the waist, upper arms and buttock. At the age of 50 give rises any disorders such as sight, hearing, mobility, reflex responsive,

respiration, and fatigue (Waluyo, 2010). The understanding about aging process were needed as a fundation of either aging happens and etiology which will followed by preventive steps or effort for delaying aging process. There were many theories of aging, which could be divided into two groups: I) Wear and tear theory (Wimpie, 2007), which cause: 1) DNA disorders or damage; 2) Glucosylation; 3) Free radical or oxidation theory. II) Programme theory, include: 1) Decreased or limitation of cell division or telomere theory. 2) Immune degradation theory. 3) Neuro-endocrine theory.

RESULTS

Table 1. Data analysis was done by using normality test i.e Kolmogorov-Smirnov 1 sample, the results were: distribution is Normal.

		The depth	age
N		30	30
Normal Parameters(a,b)	Mean	7,6757	41,70
	Std. Deviation	1,14375	11,576
Most Extreme Differences	Absolute	,135	,152
	Positive	,135	,152
	Negative	-,074	-,148
Kolmogorov-Smirnov Z		,740	,832
Asymp. Sig. (2-tailed)		,644	,493

Table 2. Pearson's correlation analysis.

		The depth	age
kedalaman	Pearson Correlation	1	,642(**)
	Sig. (2-tailed)	,	,000
	N	30	30
UMUR	Pearson Correlation	,642(**)	1
	Sig. (2-tailed)	,000	,
	N	30	30

** Correlation is significant at the 0.01 level (2-tailed).

These data were processed and the results was significantly correlation between age and the depth of hypophyseal fossae as shown in table 2. Based to the analysis, there were a positive correlation between age and hypophyseal fossae depth, the more the age, the depth the hypophyseal fossa in cadaver.

DISCUSSION

The study results has shown that there were a significant relationship between cadaver's age and the depth of hypophyseal fossa. Thereby a positive relationship means the more cadaver's age the more the depth of hypophyseal fossa. This phenomena is likely of the condition of paranasal sinuses which consist of: frontale sinus, maxillare sinus, ethmoidale sinus, and sphenoidale sinus. Since the aging, the paranasal sinus has also been enlarged which caused by the aging that of decreased paranasal sinuses mucosae i.e paranasal sinus mucosae atrophy (Lucente, 2011). The functional decrease of mucosae are related to aging. Whereby the cell division are reach the limitation of well division ability. According to Batas Hayflick the cell division ability were limited. Exactly the division enable to 52 times. However every cell has a difference limitation in this context the more its divide the more smallest the ability of cell division which will end of cell death (Haruyama, 2011). While Batas Hayflick is connected to aging theory of telomere. Its the condition that similar to explain that the more the cell division the more decrease of cell division ability. While sinus paranasal atrophy is ause by the decrease of blood circulation which take care the paranasal sinus. So it caused an mucosal atrophy and blood supply diminish for the surface of paranasal sinus. So the sinus tend to be great at the old age.

That condition were happens as a reflection of aging process in human during alive, in which paralel to aging the increase of the aging the so that the impact begins clear, particularly the severity of atherosclerotic process there were that of to the blood vessels of the vascularisation to hypophyseal fossa. That is the narrowed of inferior hypophyseal artery. This circumstances arfe likely to the hypophyseal gland atrophy due to aging theory ie. Neuroendocrine theory (Wimpie, 2007) by which the aging process could be happened to all human body's cells affected by diminished of hypophyseal hormonal secretion. This situation is parts of connection by both decrease of blood circulation to the hypophyseal fossae and its gland. The decrease of growth hormone secretion were caused by atrophy of the hypophyseal gland so as the decrease of regeneration ability in humans at the old

age. This decrease has an impact to the regeneration ability of the cell.

CONCLUSION

his study results has shown there were a significantly positive relationship between the depth of hypophyseal fossa of cadaver to the age. More aging, more depth of hypophyseal fossa. This circumstance was related to the age process of human which sure to everyone. This research as a foundation to next research which explore causes of changing the hypophyseal fossa depth, which could be early sign of aging process so human can reach optimum quality of aging.

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