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MASTIKATORNA, FONETSKA I ESTETSKA FUNKCIJA OROFACIJALNOG SISTEMA – PRIRODA ILI KULTURA ČOVEKA

THE MASTICATORY, THE PHONETIC AND THE AESTHETIC FUNCTION OF THE OROFACIAL SYSTEM – NATURE OF MAN OR CULTURE

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Kratak sadržaj

Od svog filogenetskog početka tokom dugog vremenskog perioda orofacijalni sistem trpi raznovrsne promene uslovljene brojnim činiocima prirodne i kulturne sredine. Dominantan faktor u razvoju orofacijalnog sistema čoveka u odnosu na druge sisare je bila vrsta hrane i način njenog nalaženja. To će usloviti skoro podjednaku razvijenost svih funkcionalnih grupa zuba, kao i odgovarajućih mišića i koštanog fundamenta. Snažan emocionalni život i artikulisan govor uticaće na razvoj mimične muskulature, što navodi na pitanje koje je izražajno sredstvo starije: zvuk ili pokret. Mastikatorna i fonetska funkcija u skladu su sa strukturom i proporcijama orofacijalnog sistema što uslovljava postavljanje estetskih standarda. Različito poimanje lepote lica karakteristika je različitih epoha i kultura. Plastičnost funkcija orofacijalnog sistema na uticaj prirodne i kulturne sredine preduslov je njegove dalje progresije.

Ključne reči: *orofacijalni sistem, mastikacija, fonetika, estetika*

Abstract

From its phylogenetic beginning and throughout time the orofacial system underwent various changes conditioned by numerous natural and cultural factors. In comparison with other mammals, the dominant factor in the development of the orofacial system with men was the kind of food and the manner in which it was found. That would condition almost equal development of all the functional groups of teeth, as well as the corresponding muscular and bone base. Intense emotional life and articulated speech would influence the development of mimic musculature, which would lead to the question what means of expression is older: sound or movement. The masticatory and phonetic functions are in accordance with the structure and the proportions of the orofacial system, which would condition the establishment of aesthetic standards. Different notions of the beauty of face would be the characteristics of different epochs and cultures. The flexibility of the functions of the orofacial system in its influence on the natural and cultural environment is the precondition of its further progress.

Key words*: orofacial system, mastication, phonetics, aesthetics*

Uvod

Proces razvitka biljnih i životinjskih vrsta od postanka do danas (filogeneza), kao i proces razvića jedinke od njenog začeća do smrti (ontogeneza), složeni su i višedimenzioni procesi. U njima učestvuju jednako genetski,

Introduction

The process of the evolution of animal and plant species from the very beginnings until today (phylogenesis), as well as the process of development of an organism from their conception till death (ontogenesis), is complex and multidimensional. In the aim of an appropriate

ekološki, socijalni i kulturni činioci. U težnji za svrsishodnijom komunikacijom sa spoljnom sredinom, isti procesi koji su omogućili uspostavljanje odgovarajućeg organizacionog oblika, vode ka njegovoj daljoj progresiji. Plastičnost i raspoloživost prema novim uticajima prirodne i kulturne sredine njeni su preduslovi.[1] Proces hominizacije se ne bi mogao održati da paralelno sa telesnom organizacijom Homo sapiensa nije evoluirala i njegova sredina i to onako kako je on sam oblikovao. Stihijski ili namerno, stvorio je svoju specifičnu materijalnu i duhovnu kulturu. Upravo ta kultura mu je omogućila da se održi na novom filogenetskom nivou, nastalom sa njegovim ortostatizmom.

U biologiji se razlikuju filogenetska ili pasivna adaptacija i fiziološka ili aktivna adaptacija. Filogenetska adaptacija je proces koji vodi razvoju organskih oblika čija je građa i funkcija u saglasnosti sa njihovim životnim uslovima. Fiziološka adaptacija se označava i kao fenotipska ili somatska jer je to sposobnost tkiva i sistema da reaguju na promenu okoline. Genotip učestvuje kao osnov reakcione norme.[2] Adaptivni tip ne zavisi od rasne i etničke pripadnosti. U istim geoklimatskim uslovima grupe različitog porekla imaju isti pravac adaptivnih reakcija. U različitim uslovima života genetski bliske grupe pokazuju razlike u morfo-funkcionalnim obeležjima. Prilagođavanje po pravilu dostiže samo onaj stepen adaptacije, koji je u datim uslovima dovoljan za opstanak.[3,4,5] Lobanja Homo sapiensa pokazuje niz osobenosti adaptacijskog značenja, u smislu progresije ili regresije. Vertikalan položaj tela zahtevao je značajne anatomsko-fiziološke preobražaje. Upravo ti preobražaji uzrokovaće dezintegracije postojećih koordinacija i korelacija. Rudimentacija je jedna od manifestacija dezintegracije određenih korelativnih zavisnosti. Unutar njih moguća su odstupanja koja se ogledaju u raznim malformacijama.[6] Takva odstupanja nastaju kao rezultat interakcije izmenjene nasledne osnove i egzogenih teratogenih faktora. Svaki organ koji je daleko napredovao u filogenetskom razvoju pokazuje određenu labilnost funkcije.

Dug evolutivni put zuba pod strogom je genetskom kontrolom produkcije specijalizovanog matriksa zubnih tkiva.[7] Ona se javlja veoma rano, prvi put u periodu od pre 500 miliona

communication with the surroundings, the same processes which enabled the establishment of the corresponding organisational shape lead to their further progress. Availability and openness towards the new influences of the natural and cultural surroundings have been the precondition of this progress.[1] The process of hominisation couldn't have maintained its path if man's corporal organisation had not evolved together with his surroundings, exactly the way he shaped them himself. Unintentionally or intentionally, he created his specific material and spiritual culture. This culture precisely enabled him to maintain his new phylogenetic level, which derived from his own orthostatism.

In biology we can distinguish between the phylogenetic or passive and physiological or active adaptation. The phylogenetic adaptation is the process which leads to the development of the organic shapes, whose morphology and function are in accordance with their environment. The physiological adaptation is designated as phenotypic or somatic, because it represents the capacity of tissue to react to the change of the environment. The genotype participates as the base of the reaction standard.[2] The adaptive type does not depend on racial and ethnic belonging. In the same geo-climatic conditions, groups of different background have the same direction of adaptation reactions. In different living conditions genetically close groups show differences in morpho-functional characteristics. By rule, adaptation reaches only the level which, under the given circumstances, enables survival.[3,4,5] The skull of the Homo sapiens reveals numerous particularities of adaptational significance, in the sense of progression or regression. Vertical position of the body requires significant anatomic and physiological transformations. Those trasformations precisely cause disintegration of the existing coordinations and correlations. Rudimentation is one of the manifestations of disintegration of certain correlative dependance, within which aberration, depicted as numerous malformations, is possible.[6] Those aberrations arise as a result of interaction between the changed genetic base and exogenous teratogenic factors. Each organ which advanced immensely in its phylogenetic development exerted certain instability of function.

The long evolution of teeth has been under strict genetic control of the specialised matrix production of dental tissue.[7] The first time it appeared very early, some 500 million years ago,

godina, što odgovara geološkom periodu paleozoika. Kod antropoidnih majmuna i recentnog čoveka u toku evolucije dolazi do anterio-posteriornog skraćenja vilica i do povećanja njihove vertikalne dimenzije. Zapaža se i redukcija alveolarnog nastavka, kao i pojava brade. Tokom evolucije hominida redukcija zubnog sistema ogledala se u mezio-distalnom smanjenju dimenzije premolara i molara. U poslednjih nekoliko hiljada i stotina godina proces redukcije broja, veličine i oblika zuba se nastavlja. Smanjuje se osim mezio-distalnog i vestibulo-lingvalni dijametar zuba.[8,9] Evolutivne tendencije vode ka čoveku budućnosti sa jednim sekutićem, jednim očnjakom, jednim premolarom i dva molara u svakom kvadrantu. To je rezultat prilagođavanja mastikatornog aparata novim funkcionalnim potrebama, odnosno posledica nedovoljnog angažovanja u procesu ishrane savremenog čoveka.[10]

Vilice kao glavni delovi skeleta lica imaju veliku ulogu u razvitku i formiranju lobanje. Kod novorođenčeta najveći deo glave čini upravo skelet lobanje, dok je lice vrlo nisko i široko. Ta se disproporcija menja vrlo brzo u prvim godinama života, jer je razvitak vrlo intenzivan. U toku rasta iz niskog i širokog lica postaje ubrzo visoko i usko lice, pa odnos između skeleta lobanje i lica dobija skladne proporcije.[11,12,13] Veliki doprinos daljem oblikovanju vilica daju funkcija žvakanja i govora.

Razvoj zuba je složen proces i neraskidivo povezan sa razvojem okolnih struktura orofacijalne regije. Zubi započinju svoj razvoj i rast baš u vreme kada se skelet vilica toliko razvio da ih može prihvatiti. Humani zubi se razvijaju u dve generacije. Veličina i oblik mlečnih zuba, prve generacije zuba, u skladu je sa veličinom vilica, koje su u skladu sa veličinom i funkcionalnim potrebama organizma. Rastom i razvojem organizma i potreba za snažnijom funkcijom organa za žvakanje postaje izrazitija. Sklad interaktivnih događaja u procesu razvoja, dovešće u tačno određenom uzrastu do razvoja i nicanja funkcionalno adekvatnijih, stalnih zuba.

Mastikatorni aparat i njegova funkcija u ishrani, pa i u odbrani, od postanka čoveka je u službi instinktima, na prvom mestu instinktu za samoodržanje. U službi instinkta za samoodržanje nalazi se i fonetski aparat. Pokret (gest i mimika) je najstariji način iskazivanja misli. Mnogo vremena je proteklo u razvitku čoveka

which corresponded to the geological period of paleozoic. During the evolution, with the anthropoid ape and recent man anterio-posterior shortening of the jaws occurred, as well as the augmentation of their vertical dimension. The reduction of the alveolar extension was also noticed together with the appearance of the chin. During the evolution of hominidae the reduction of the dental system was shown in the mesiodistal reduction of the dimension of molars and premolars.[8,9] In the last few thousand and hundred years the process of the reduction of the number, the size and the shape of teeth continued. Besides the mesiodistal the vestibulo-lingual diametre of teeth had also decreased. Evolutionary tendences had led toward the man of the future with one incisor, one canine, one premolar and two molars in each quadrant. That was the result of the adjustment of the masticatory apparatus to the new functional needs, that is, insufficient engagement in the process of nourishment of the contemporary man.[10]

As the main parts of the skeleton of the face, the jaws play a big part in the development and the formation of the skull. The biggest part of the head with the newborn is comprised precisely of the skeleton of the skull, while the face is very low and broad. This kind of disproportion changes very quickly during the first years of living, as the development is rather intensive. During growth, the low and broad face soon becomes high and narrow, thus the relation between the skeleton of the skull and the face acquires harmonious proportions.[11,12,13] The function of chewing and speech contributes immensely to the further shaping of the jaws.

The development of teeth is a complex process which is closely connected to the development of the surrounding structures of the orofacial region. Teeth commence their development and growth precisely at the time when the skeleton of the jaws has developed to the extent when it is ready to 'accept' them. Human teeth develop in two generations. The size and the shape of milk-teeth, the first generation of teeth, is in accordance with the size of the jaws, which are in accordance with the size and the functional needs of the organism. With the growth and development of the organism the need for the stronger function of the chewing apparatus becomes more expressive as well. The harmony of the interactive circumstances during the process of development will lead at a certain age to the development and irruption of permanent teeth, which are functionally more adequate.

dok se u njegovom govornom aparatu nije obrazovala raznolika kombinacija glasova, a u njegovoj svesti pojam o svim vrstama pojava i odnosa. Potreba da se određene prirodne pojave obeleže biva zadovoljena na taj način što ih čovek podražava tonovima koje same te pojave proizvode (onomatopeja).[14] To se dešava i u razvitku govora kod male dece koja još ne mogu da stvore pretstavu o izvesnoj pojavi, pa reč obrazuju kroz čulo sluha. Artikulisani govor i snažan emocionalni život uticali su na razvoj mimične muskulature. To je imalo za posledicu oblikovanje koštanog fundamenta i mastikatornog aparata čoveka kakav je danas. Za materijalni proces stvaranja glasa odgovorni su: pluća, dušnik, grkljan sa glasnim žicama, nos, tvrdo i meko nepce, jezik, zubi i usne. U ustima se od vazdušne struje potekle iz pluća stvaraju glasovi uz učešće jezika i usana. Priroda glasova zavisi od položaja koji delovi govornog aparata pri izgovoru zauzimaju jedan prema drugom. Samoglasnici nastaju tako što je rastojanje između jezika i nepca takvo da ne ometa tok vazdušne struje. Pri izgovoru suglasnika jezik ili donja usna pokreću se prema nepokretnim delovima govornog aparata, dodiruju se sa njima, ometaju tok vazudušne struje, što uslovljava drugačiju prirodu ovih glasova. Neki od suglasnika nastaju uz pomoć usana, drugi uz pomoć jezika. Izgovor pojedinih suglasnika (F, V, L, T, D, Z, S) zavisi od položaja sekutića i premolara u prostoru između usana i jezika. Gubitak jednog inciziva lako menja izgovor pojedinih glasova, izazivajući neugodno vrskanje. Ta vrsta poremećaja govora javlja se, mada privremeno, i u doba smene mlečnih zuba. Gubitak tri zuba već ozbiljno narušava izgovor, time što oslabljuje rezonancu usne duplje. Gubitkom stalnih zuba dolazi do narušavanja mastikatorne i fonetske funkcije kao i do estetske insuficijencije.[15]

Iz instikta za samoodržanje kod čoveka verovatno potiče i prva težnja za odabiranjem. Težnju za odabiranjem sa korisnog (veći zalogaj) čovek je preneo i na sve ostale pojave. Posmatrajući prirodne pojave i samoposmatranjem, čovek sve jasnije uočava razliku između lepog i ružnog, prijatnog i neprijatnog... U najstarijem periodu praistorije koji je poznat kao paleolit (30 000 g. stare ere) prvobitno osećanje lepog čovek će pretočiti u likovni izraz. Još od tada čovek veliča lepotu lica. Idol

The masticatory apparatus and its function in nourishment, and even in defence, has from the beginnings of man served his instincts, firstly his self-preservation instinct. The phonetic apparatus also serves this self-preservation instinct. Movement (gesticulation and mimics) is the oldest way to express thoughts. A lot of time elapses in the development of man until diverse combinations of sounds are formed in his speech apparatus, and until notion about all kinds of phenomena and relations appears in his awareness. The need to note certain natural phenomena is gratified in the way that man imitates them with tones produced by the phenomena themselves (onomatopoeia).[14] This also occurs during the development of speech with small children, who cannot yet form the notion of a certain phenomenon, so they form a word through the sense of hearing. Articulated speech together with strong emotional life influence the development of mimic musculature. This initiates the formation of the bone base and the masticatory apparatus as it is today. The actual process of the formation of a sound involves the lungs, the trachea, the larynx with the vocal cords, the nose, the hard and the soft palate, the tongue, the teeth and the lips. The airstream coming from the the lungs with help of the tongue and the lips initiates the production of sounds in the oral cavity. The nature of sounds depends on the position which the parts of the speech apparatus have between them. Vowels are formed in the way that the distance between the tongue and the palate is such that it does not obstuct the flow of air, which conditions different nature of these sounds. Some of the consonants are formed with the help of the lips, and some with the help of the tongue. The articulation of certain consonants depends on the position of incisors and premolars in the space between the lips and the tongue. The loss of one of the incisors slightly changes the articulation of certain sounds, causing unpleasant lisping. The same type of speech impediment occurs temporarily at the age of the replacement of milk-teeth. The loss of three teeth seriously affects articulation, by weakening the resonance of the oral cavity. The loss of permanent teeth leads to the obstruction of the masticatory and the phonetic function. It leads to aesthetic insufficiency as well.[15]

Man's first striving for selection probably derived from the self-preservation instinct. Man probably transferred his striving for selection

iz Lepenskog vira, kamena skulptura iz perioda najstarijeg neolita, prenaglašenih usana sa uglovima savijenim nadole predstavlja čoveka ribolikog izgleda. Oblik idola Lepenskog vira ima sličnost sa prirodnim oblicima organskog porekla. Lice uvek dominira figurom. Čak i onda, kada sam oblik kamena pokazuje pored lica i postojanje tela, ovaj deo skulpture ostaje neobrađen. Nešto kasnije predstava lepog se upotpunjuje geometrijskim motivima koji predstavljaju dopunske pojedinosti lika. Najšire prihvaćena teorija estetskog iskustva je teorija o proporciji i ravnoteži koja potiče iz antičke Grčke. Po Platonu najsavršenija lepota najbliža je lepoti geometrijskih tela. Od renesanse antički principi postaju dominantni, posebno njen glavni estetski činilac – proporcija. Od fizičke lepote blagog "arhajskog osmeha" preko "vanvremenskog osmeha" Đokonde, kao odraz uma i stanja duše, do današnjih dana, lepota je imperativ kroz vreme i prirodu.[16] Savremeno shvatanje estetike uopšte, kao i sa stomatološkog aspekta se zasniva na poistovećivanju pojma lepog sa onim što najviše odgovara prirodnom.

Ovako viđen dualizam prirode i kulture, nagona i inteligencije, stečenog i nasleđenog, možda je samo naša mehanistička projekcija zbog nemoći da uslovljenost ovih procesa sagledamo dublje u interakciji.

from the useful (a bigger bite) to all other phenomena. By observing natural phenomena and by self-observation man can notice more distinctly the difference between the beautiful and the ugly, the pleasant and the unpleasant, etc. During the oldest period of pre-history, known as the palaeolithic period (30.000 BC), man transforms his sense of the beautiful into artistic expression. Ever since then man had glorified the beauty of the face. The idol from 'Lepenski Vir', the stone sculpture from the oldest times of the neolithic period, with overstressed lips and corners of the lips curved downwards, represents man of fish alike appearance. The shape of the idol of 'Lepenski Vir' was similar to natural shapes of the organic origin. The face always dominated the figure. Even when the shape of the stone revealed the existance of the body besides the face, this part of the sculpture was never chiselled. Some time later the notion of the beautiful is supplemented with geometric shapes, which represent the supplementary details of an image. Most widely accepted theory of the aesthetic experience is the theory of proportion and equilibrium, which originats in classical Greece. According to Plato most perfect beauty is closest to the beauty of geometric figures. Classical Greek principles become dominant since the Renaissance. This is especially true of its main aesthetic principle – the proportion. Through the physical beauty of the mild 'archaic smile' and the 'timeless smile' of Gioconda, as the reflexion of the mind and the state of the soul, till the present times, beauty has been an imperative 'through' time and nature.[16] Contemporary apprehension of aesthetics in general, as well as from the point of view of dentistry, is based on the identification of the notion of the beautiful with what most corresponds to the natural.

Dualism between nature and culture, instincts and intelligence, the acquired and the hereditary is perhaps our mechanical projection due to our inability to grasp further the interaction of conditioned state of these processes.

LITERATURA/REFERENCES

1. Ivanović M. Novine u antropogenezi na kraju drugog milenijuma. Glasnik antropološkog društva Jugoslavije 2002; 37: 19-25.

2. Martinović Z. Razmatranje procesa adaptacije s biokibernetskog aspekta. Acta Stomatologica Naissi 1991; 16: 39-45.

3. Зубов АА. Проблема термина "раса" и росових классификации современои физическои антропологиии. Етнографическое обозрение 1996; 1: 73. 1996; 1: 73.

4. Wand K. Conrtoversial evidence indicates that thes hominids interbred with anatomically modern humans and sometimes behaved in suprisingly modern ways, Who were the neandertals. Scientific American 2000: 79.

5. Stefanac-Papic, Alhadri KZ, Legovic M, Galic N. Comparison of dental maturity between two ethich groups. Coll Aropol 1998; 22(10): 123-6.

6. Švob T. Odnos filogenetskih i genetskih faktora u genezi malformacija čovjeka. Glasnik antropološkog društva Jugoslavije1991; 28: 89-92.

7. Davideau JL, Demri P, Hotton D, Gu TT, MacDougall M, Sharpe P, et al. Comparative study of MSX-2, DLX-5, and DLX-7 gene expression during early human tooth development. Pediatr Res 1999; 46: 650-6.

8. Freeman JE, Maskeroni AJ, Lorton L. Frequency of Bolton tooth-size discrepancies among orthodontic patients. Am J Orthod Dentofacial Orthop 1996; 110: 24-27.

9. Smith SS. Interarch tooth size relationships of 3 populations: "Does Bolton's analysis apply?" Am J Orthod Dentofacial Orhop 2000; 117: 169-174.

10. Beloica D. Dečja stomatologija. Beograd, Elit Medica; 2003: 108-9.

11. Avery JK. Oral development and histology. Stuthgart-New York: Thieme 2002: 61-70.

12. Proffit RW, Fields WH. Contemporary orthodontics - 3rd ed. Mosby Inc 2000: 24-30.

13. Nikolić I, Rančić G, Radenković G, Lačković V, Todorović V, Mitić D. Embriologija čoveka. Niš, Medicinski fakultet 2004: 37-40.

14. Nušić B. Retorika. Niš, Zograf 2004: 10-28.

15. Sokolović B. Bezubost klinika dijagnoza tretman. Niš, Prosveta 1997: 453-459.

16. Prette CM, De Giorgis A. La storia dell' arte. Firenze - Milano, Giunti Editore S PA 2004: 6-134.

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