Ostalo

Što je uistinu znao Baglivi ili od Baglivija do Dopplera

(uz 300-tu obljetnicu smrti)

Other

What Baglivi truly knew or from Baglivi to Doppler

(Commemorating the 300th year of his death)

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Dubrovčanin **Đuro Baglivi** rođen je 1668. godine u Dubrovniku, godinu dana nakon velikog potresa. U rodnom gradu stječe osnovnu humanističku naobrazbu u Isusovačkom kolegiju. U dobi od 14 godina odlazi u Lecce na jugu Italije, gdje ga posinjuje ugledni mjesni liječnik **Pier Angelo Baglivi**. Studij medicine odslušao je u Napulju, a diplomirao u Salernu. Njegova blistava liječnička, akademska i znanstvena karijera započinje nakon što je njegov talent uočio najslavniji liječnik toga vremena **Marcello Malpighi**. Prema današnjim saznanjima od 1717. do 2000. god. objavljeno je oko 150 biografskih notica, traktata i ogleda na latinskom, talijanskom, engleskom, njemačkom, francuskom, hrvatskom i armenskom jeziku. Prof. **Mirko Dražen Grmek**, (umro 2000. god.) misli da je "De fibra motrice et morbosa" jedan od najvažnijih događaja u povijesti biostrukturalizma, te da je u njemu iznesena teorija fibrilarne patologije u stvari preteča čuvenoj Virchowljevoj celularnoj patologiji.

Mnoge Baglivijeve pretpostavke o radu srca ili patofiziološkim podlogama bolesti srca, koje je on navijestio u tom djelu "O zdravom i bolesnom motoričkom vlaknu", mogu kasnije u suvremenoj medicini naći zvoju znanstvenu podlogu.

Funkcija srca kao pumpe ovisi o četiri osnovna čimbenika: tlačnom opterećenju ili afterloadu, volumnom opterećenju ili preloadu, kontraktilnosti, snagi srčane kontrakcije neovisnoj o volumnom i tlačnom opterećenju i srčanoj frekvenciji.

"Ta čudnovata sila srca ne potječe toliko od skrivene sposobnosti, niti od pogonske jakosti srca, niti njegova ustrojstva i čvrstoće njegovih vlakana, koliko od ravnoteže i omjera čvrstih i tekućih dijelova u odnosu prema srcu i sili njegova kretanja što olakšava rad sile koja djeluje u postojanim pokretima: riječ je o skladnosti čvrstih dijelova dok primaju tekućinu i dok je potiskuju tako kamo treba teći; o

The citizen of Dubrovnik, **Đuro Baglivi** was born in Dubrovnik in 1668, a year after the big earthquake. He received his elementary humanity education at the Jesuit school in his home-town. At the age of 14 he departs for Lecce in the south of Italy where he was adopted by a local physician **Pier Angelo Baglivi**. He attended medical studies in Naples and graduated in Salerno. His splendid medical, academic and scientific career started after his talents were spotted by the most famous physician of that time, **Marcello Malpighi**. According to information available, from 1717 to 2000, around 150 biographic notes, tractates and essays were published in Latin, Italian, English, German, French, Croatian and Armenian. Prof. **Mirko Dražen Grmek**, (died in 2000) thought that "De fibra motrice et morbosa" is one of the most important events in the history of biostructuralism, and that its theory of fibrillar pathology is in fact a precursor of the famous Wirchov Cellular Pathology.

Many of the Baglivi's postulates on the function of the heart or the pathophysiological heart diseases which he put forward in this paper "On the healthy and diseased motor fiber", can later find their scientific backing in modern medicine.

The function of the heart as a pump depends on the four basic factors: compressive load or the afterload, volume load or the preload, contractility, the strength of the heart contraction independent of the volume and compressive load and the heart frequency.

"That amazing power of the heart does not derive from a secret aptitude so much, neither from the driving strength of the heart, nor from its construction and the strength of its fibers, but from the balance and the ratio of solid and liquid parts in relation to the heart and the force of its movement which facilitates the action of the force which is active in persistent movements: it is about the harmony of solid parts while they receive the liquid and while they expel it where it needs to flow; about due position of each

dužnom položaju svakog čvrstog dijela, bila to utroba ili žlijezda, kako bi primio tekućinu s određenim stupnjevima njezina naleta; o skladnosti tekućine u odnosu prema srcu, tj. o nužnoj količini opće i posebne tekućine koju treba pognati; o fluidnosti, o najmanjem i nužnom kontaktu svih čestica bilo koje tekućine; o uravnoteženom dotjecanju i otjecanju, koja su u svakom pojedinom dijelu usklađena koliko s obzirom na dotični dio toliko s obzirom na srce."

U subendokardijalnom sloju i subepikardijalnom sloju, osnovna orijentacija miofibrila je longitudinalna dok u srednjem mišićnom sloju su mišićne niti orijentirane cirkumferencijalno. Tako da je long axis funkcija poglavito ovisna o subendokardijalnom sloju i to su niti koje su najosjetljivije na redukciju koronarnog optoka.

"Dva su u ljudskom tijelu dijela koja se razlikuju među sobom po podrijetlu, funkciji i ustrojstvu, tj. vlakna mišića i vlakna opnasta.

Srce je mišić, sklopljen na divno vješta način od triju nizova vlakana, ne kreće se tako da se povećava i širi, nego time što se steže i stvrdnjuje kako pažamo od seciranja živih životinja... čak ako se rasiječe na dijelove, sami će rasječeni dijelovi ponovno i ponovno obavljati kretanje sistola i dijastola... ako je srce mišić i ako se kreće nekim stezanjem, napinjanjem i ponavljanim titranjem vlakana te ako dobiva veliku pokretnu silu ne toliko od rijetke građe spiritusa i mekog mozga koliko od posebnog mehanizma vlakana, što priječi da prema zakonima o kretanju srca objasnimo također kretanja ovih mišića.

Mnogi podatci potvrđuju da vlakna trajno titraju i grče se po nekoj prirođenoj sili (vis innata) što je proizvode najmanji čvrsti djelići krvne mase koja ih pritišću...

... da su veća mesna vlakna i njihova najsitnija vlakanca zapravo bezbrojne pluge ili konopčići. Dokazano je da konopčići vlakana, povučeni na kapljicama krvi kao na kotačićima stječu u kretanju veliku snagu."

Austrijski fizičar **Christian Johann Doppler**, 1842. god. objavio je rad u Pragu pod naslovom "O obojenom svjetlu dvostrukih zvijezda i nekih drugih nebeskih zvijezda". Frekvencija odbijenog ultrazvučnog vala od prepreke, koja se kreće prema izvoru ultrazvučnog vala je veća od frekvencije emitiranog ultrazvučnog vala. Eritrociti predstavljaju reflektore.

"Masa se krvi sastoji od bezbrojnih vrlo sitnih čvrstih zrnaca (globuli, kuglice) koja se okreću poput podložaka. A budući da se kreću brzo, jer im pulsirajuće srce utiskuje vrlo veliku brzinu, nužno je da konusi vlakana u dodiru sa zrncima u pokretu, podliježu pritisku te se bibaju i boraju."

Tkivni Doppler je u upotrebi od 1994. god. i koristi se za mjerenje manjih brzina pokretljivosti jačih reflektora ultrazvučnog vala, kao što su srčane strukture. Odbijeni signal od srčane strukture, kod tkivnog doplera, karakterizira visoka amplituda i mala brzina za razliku od odbijenog signala od krvi koji ima nisku frekvenciju i veliku brzinu.

Dilatacija klijetke je mehanizam prilagodbe koji klijetka koristi da bi osigurala adekvatni kardijalni output s ciljem zadovoljiti potrebe organizma. Dilatirana klijetka može lakše generirati veći stroke volumen od male klijetke. Otponac za remodeliranje je lokalni miokardni "wall stress".

Wall stress je ovisan o tlaku klijetke koji se prenosi na miokard ovisno o lokalnoj geometriji. Wall stress lijeve kli-

solid part, be it the intestine or a gland, so it can receive the liquid at given surge levels; about the equilibrium of the fluid in relation to the heart, that is about the required amount of general and special liquid it needs to drive; about fluidity, about the smallest and necessary contact of all the particles of any liquid; about the balanced flow and outflow, which are in every single detail synchronized not only in respect to the given part but also in respect to the heart."

In the subendocardial layer and the subepicardial layer, the main orientation of the myofibrile is longitudinal while in the medial muscular layer, muscular fibers are oriented circumferentially. So is the long axis function mainly dependent on the subendocardial layer and those are the fibers most sensitive to the reduction of the coronary flow.

"There are two parts in the human body which differ in origin, function and structure, i.e. muscle fibers and membrane fibers.

Heart is a muscle, made in a magnificently skilful way from three series of fibers, it does not move by enlarging and expanding, but by contracting and hardening as we can observe from dissecting wild animals... even if it is cut in pieces, the cut pieces themselves will perform the systolic and diastolic movement... if the heart is a muscle and if it moves by a kind of contraction, tension and repeated oscillation of fibers and if it gets a great movement force not so much from the sparse structure of spiritus and the soft brain but from a special mechanism of fibers, which prevents us to use the laws of the heart movements to explain the movement of all other muscles.

A lot of data supports the fact that the fibers continuously oscillate and contract according to some natural force (vis innata) which is produced by the smallest solid parts of the blood mass that press them...

... so that the bigger flesh fibers and their smallest strings are in fact countless stripes or strings. It is proven that the fiber strings, pulled on the drops of blood, like on little wheels, acquire a great force while moving.

Austrian physicist **Christian Johann Doppler**, published a paper in Prague in 1842 titled "On the colored light of the double stars and certain other stars of the heavens". The frequency of the reflected ultrasonic wave from an obstacle moving toward the source of the ultrasonic wave is greater than the frequency of the emitted ultrasonic wave. The erythrocytes represent reflectors.

"The blood mass consists of a countless number of very small solid particles (globule, pellets) which turn around like coasters. And since they move fast, because the pulsating heart gives them a very high speed, it is necessary that the fiber cones in touch with the moving particles are subjected to pressure, so they move and fold."

The tissue Doppler has been in use since 1994 and it is used for the measurement of small speeds of movement of some stronger reflectors of ultrasonic waves, like heart structures. The signal bounced from the heart structure, in the tissue Doppler, is characterized by high amplitude and small speed unlike the signal bounced from the blood which has a low frequency and a high speed.

The ventricular dilatation is a mechanism of adjustment which the ventricle uses to ensure an adequate cardiac output with a goal of fulfilling the needs of the organism. The dilated ventricle can easier generate a higher volume than the smaller ventricle. The trigger for remodeling is the local myocardial wall stress.

Wall stress is dependent on the pressure of the ventricle carried to the myocardium depending on the local

jetke raste s porastom tlaka, raste s povećanjem veličine šupljine, a smanjuje se s porastom debljine klijetke. ***Grossman*** *i autori* smatraju da je otponac dilatacije klijetke u porastu enddijastoličkog wall stressa. Porasli enddijastolični wall stress oslobađa čimbenike u miokardu koji će stimulirati replikaciju i produživanje kontraktilnog materijala rezultirajući u proširenje šupljine. Porasli peak sistolic wall stress stimulira hipertrofiju paralelnom repliciranju kontraktilnog materijala u miocitima. To će sve imati za posljedicu da povećanjem šupljine srca raste i posljedični wall stress.

"I kao što pretpostavljamo da zrak poput stupa svojom težinom djeluje odozgo prema dolje, tako i kod tekućina moramo zamisliti stupove od dotične tekuće tvari, koji se, svaki pojedini svojom osnovicom opiru o jednake dijelove dna one posude koja tekućinu sadržava, i odozgo vrše pritisak, pa tako pritišće to dno te svojim jednakim dijelovanjem između sebe tvore ravnotežu. A veće je djelovanje odozgo u smislu težine, koja je većas u dužem ili višem stupu negoli u kraćem ili nižem, uz pretpostavku da je riječ o istoj debljini.

Srce se kreće zbog zračenja koje mu šalje mozak, zbog zračenja i utjecaja koji dolaze iz glave kroz živce posredstvom živčane tekućine i titranjem čvrstog dijela ovojnice bez sudjelovanja tekućine."

Baglivi je bio svjestan teškog problema otkrivanja tajni zdravlja i bolesti i dugog puta znanstvenika do cilja.

"Kako smo to učinili do danas, do mjeseca listopada 1701. kada ovo pišemo, tako nećemo ni ubuduće prestati dok ovaj teški predmet posve ne obradimo. Ako se ovo nezadovoljnima ne sviđa dovoljno, izazov je svima pristupačan i ostavljena je prigoda da se učini bolje. Ako se sviđa dobrima i poštenima, to je nagrada koju želimo i za svoj napor.

Stoga neka bude tako!"

Problem ulaska u veliku tajnu rada srca i srčanih poremećaja nije ni danas, tristo godina poslije Baglivija, sasvim riješen. I put se nastavlja.

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geometry. Wall stress of the left ventricle increases with rising pressure, increases with an increase in the cavity size, and decreases with an increase in the ventricle thickness. ***Grossman*** *et al* consider that the trigger of the ventricle dilatation is in increase in the end-diastolic wall stress. The increased end-diastolic wall stress releases the factors in the myocardium which will stimulate the replication and extension of the contractile material resulting in the dilatation of the cavity. The increased peak systolic wall stress stimulates the hypertrophy to the parallel replication of the contractile material in myocytes. All this will result in causing increased consequential wall stress by enlargement of the heart cavity.

"And as we may presume that the air just like a column exerts force with its weight from the top downwards, so we must also imagine fluids like columns of the respective fluid, which each by itself presses against equal parts of the bottom of the container holding the liquid, exerting pressure from above, and pressing that base thus forming a balance with their equal interaction. Greater force is exerted from the top in terms of weight, which is greater in the longer or the taller column, than it is on the shorter or the lower column presuming that the same thickness is concerned.

The heart moves because of the radiation received from the brain, because of the radiation and influence received from the head through the nerves by nervous fluid and the oscillation of the solid part of the coat without the assistance of the fluid."

Baglivi was aware of a difficult problem related with revealing the secrets of health and disease and a long journey to reach the scientific target.

"As we learned it until today, until October 1701 as we are writing this, so shall we not stop in the future until we completely solve this difficult case. If this is not to the liking of the dissatisfied, the challenge is accessible to everyone and opportunity to do ones best is given. If it is to the liking of good and honest, it is the reward we seek for our toils.

So be it!"

The problem of disclosing the big secret of the heart functioning and heart disorders has still not been solved today, three hundred years after Baglivi. So the journey continues.

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