Epistemological and bioethical considerations in cataract surgery

Rafael Dias Marques Nogueira
Roberto Wagner Bezerra de Araujo
Raphael Dias Marques Neto
Guilhermina Rego

Abstract

The objective of this study is to investigate the main epistemological contributions on the concepts of normal and pathological, health and disease, and to analyze these concepts in face of medical technology advances. It discusses particularly about the ethical conflict of the surgical ophthalmologist conduct, when he removes the normal eye lens (according to the concept of normality reported by these authors) and implants in its place, an artificial one, adding to patient's vision, carrier of ametropy and presbyopia, superior qualities than normal eye lens. Also, the author makes an attempt to forecast possible changes in the concepts of normal and pathological in people with and without implants. He concludes by considering the addition of visual qualities on the major portion of the population may change the concept of normal and pathological, making deficient the part of population that doesn't have access to those new technologies.

Key words: Bioethics. Epistemology. Cataract. Lens implantation, intraocular. Cataract extraction.

Rafael Dias Marques Nogueira
Ophthalmologist, graduated at the Federal University of Ceara (UFC), Master in Surgery at UFC, assistant professor of Ophthalmology at UFC Surgical Department, advisor to the Regional Medical Council of the State of Ceará, Fortaleza, Brazil

The concept of *normal*

The Latin word *norma* is a square (a carpenter's square). In 1830, the English word *normal* had an orthogonal meaning (a perpendicular line to a curved surface). Over the years, it went on to designate objects according current standards; shortly after, in America, it came to mean the habitual state or condition of things and people. During the last decade of the XIX century, *the norms* and *types* became the fundamental criteria for diagnosis and therapy; in the XX century, these words were applied in the assessment of beings. It is true that in France these words had moved from geometry to society around 1840, when Auguste Comte applied them for the first time as a medical connotation for the average [1]. However, many centuries before, Aristotle already thought in terms of averages when he considered the mid-point as the quality of

Roberto Wagner Bezerra de Araujo
Specialist in Pathology and Forensic Pathology from the Federal University of Ceara (UFC), Ph.D. in Pathology and Forensic Pathology from UFC/Ipatimup/UFTM, professor of the Pathology Master's program at UFC in the field Bioethics Research, co-supervisor of the Bioethics for the doctorate degree at Federal Council of Medicine /University of Porto, Fortaleza, Brazil

Raphael Dias Marques Neto
Medical Academic from the Federal University of Ceara (UFC), scholarship holder for scientific initiation from the National Scientific and Technological Development (CNPq), Fortaleza, Ceara, Brazil

virtue, in other words: normal as a virtue would be in the middle [2].

Normality, as an average, does not accurately express clinical and laboratory findings when measuring the function of healthy organs or organisms; these measurements oscillate around the average. This solution implies considering what is normal as a range of distribution. At the start of the XIX century, Gauss, studying the results of these measurements, decided to propose a form of distribution that is now used in physiological measurements. This distribution, which represents "normal" physiological limits, is interpreted as a pair of numbers that are equidistant from the maximum mid-point which encompasses 95% of the measurements on the functional activities of organs or systems. However, there is evidence that biological functions cannot be rigorously described by the Gauss curve in every circumstance [3].

Health as normality

Taking into account the normal characteristics of a population, a statistical expression that describes the majority is considered an indicative range of this normality. In medicine, the norm is regarded as an ideal standard, and the range of normality is seen as an indicator of good health [4].

According to Canguilhem, Leriche states that *a healthy life is in the silence of the organs* [5]. To Leriche, if signs or symptoms exist, than illness exists; Canguilhem, on the other hand, states that *there is no fact that is normal or pathological in itself. Your normality arises from your normativity* [6]. To Canguilhem, normal and pathological are not exclusive. There is a *continuum* for each aggressive factor, a complex that is constituted by society, the environment, and the agent, which trigger a response. When an attack provokes a dislocation of the established zone beyond a certain point, a qualitative jump occurs in the phenomenon, which makes it possible

Guilhermina Rego
Licensed in Company Management, Master in Finance and PhD in Business at the University of Porto Economics Department, professor at the University of Porto Medical School and coordinator of the ethics and healthcare management unit at the Bioethics and Medical Ethics Service at this same university. Coordinates the Post-graduate program in Hospital Administration, and is part of the Scientific Commission on Doctorate Program in Bioethics, Porto, Portugal

for signs and symptoms to appear. In response to this aggression, there could be a return to the initial point of stability (health), or it could remain in this qualitative jump, manifesting the illness. The return to stability does not signify a return to the initial state, since by provoking a biological response in the organism that tends toward health, the illness, in some cases, may also produce a greater resistance. Therefore, upon recovering health, the individual is no longer in the same situation that anteceded the manifestation of the illness.

The concept of normativity proposed by Canguilhem was an important step for understanding health and illness. Health would be the capacity of the organism to respond to external aggressions and to its own internal deficiencies. If there is an efficient response, than there is health; if there is not an efficient response, than there is illness. From this perspective, the abnormality of an organ does not necessarily imply illness. As "normal" is a relative value, in quantitative organic phenomenon its determination is almost always associated to statistics, as evidenced by the range of normality that corresponds with an average and its standard deviations; while for non-quantitative phenomenon the determination varies greatly. Therefore, normal, as one of the basic elements for the conceptualization of health, must be understood for its relativity [3].

If Comte established the pillars for this conceptualization[7], Durkheim constructed a more complete form of distinguishing between normality and pathology. Every line of Durkheim's thinking is based on the fundamental premise that, from observation, society *confuses two orders of fact that are quite distinct in certain aspects: those who are all that they should be, and those who should be different from what they are; the normal phenomenon and the pathological phenomenon* [8].

Durkheim established criteria to define the two states and developed his theory from the health-illness opposition. He points out the criteria of suffering and pain as being insufficient

to determine illness if such states of suffering as hunger, exhaustion, and the pains of child-birth are considered normal. He contests the concept of illness as a disruption of the organism in adapting to the environment. To him, principles which defined a hierarchy for the adaptive process would be necessary. These principles could be established in relation to the possibilities of survival, defining those with the highest possibilities of living as being in a healthy state, and those which diminished these possibilities, as unhealthy.

Durkheim also contests this concept, because a series of phenomenon, such as death, necessary to the reproduction of a few inferior species, and old age, cannot be considered as pathological. He considers that both biological and sociological phenomenon belong to two basic types: those which are common to all species *found in almost all individuals, at least in the greater part of them and with very close variations,* and exceptional phenomenon, which, *not only arise in minority, but sometimes last throughout the individual's entire life* [9].

Based on these two types of phenomenon, Durkheim establishes an average which serves as a genetic standard for the species. He states that the brand of the phenomenon (normal or pathological) must be seen in relation to its frequency, and formulates three criteria to distinguish normal from pathological:

> *1. A social fact is normal to a certain social type, considered in a certain phase of development, when it is produced within the averages of a society of that species, considered in a corresponding phase of development.* [10];
>
> *2. The results of the preceding method may be verified by showing that the general phenomena are connected to the conditions of the collective life of the social type in question* [10];
>
> *3 This diversification is necessary when a fact speaks of a social type that has not yet undergone an integral evolution* [10].

Foucault comments that, according to Durkheim, an illness is looked at from an aspect that is both negative and potential: negative, because it is defined in relation to an average, a standard; and potential, because the content of the illness is defined by the possibilities that manifest within it. Therefore, potentiality becomes a statistic in relation to the average [11].

Social model of deficiency

The basic idea of the social model of deficiency is that it should not be understood as an individual problem, but as an essentially social issue, transferring the responsibility for the disadvantages of the handicapped, due to their physical limitations, to society's inability to foresee and adjust to diversity. The theoretical starting point for the social model is that a handicap is an experience resulting from the interaction between the individual's physical characteristics and the conditions of the society in which they live, that is to say, the combination of the limitations imposed by the body, with a loss or reduction of functionality,

and a social organization that lacks sensitivity toward physical diversity [12]. In this manner, when society adapts to the characteristics of the handicapped, it promotes integration. .

To Canguilhem, an anomaly or mutation is not, in itself, pathological. A mutation can be the beginning of a new species that survives and reproduces. Normal, in biology, is not so much the old form, but the new form which, if able to find conditions for existing, surpasses the past forms which then become outdated and, perhaps, die shortly thereafter [5].

Sense of sight, and the concept of normal to the optical system of the eye

The human eye is composed of various biological systems (circulatory, sensorial, motor, optical, and protective) which have their own physiologies and work in harmony to exercise their principal objective: to send perfect images to the brain, providing good vision [13,14]. Among these systems, we call attention to the optical system that is made up of two main structures: the cornea and the crystalline lens. These structures are like lenses whose function is to refract the luminous rays that penetrate the eye, providing perfectly focused images in the retina. They can be measured with precision and seen in detail through ophthalmic equipment and are, therefore, likely to be identified and quantified in their normality [15,16].

If we examine the crystalline lens for our discussion, we might affirm that the most common deviations from its normal state occur when biological phenomenon arise from errors in refraction and age. Errors in refraction occur due to alterations in the dioptric values of the ocular lenses, causing nearsightedness, farsightedness, and astigmatism (refractive errors) [17]. Presbyopia (loss in adaptability for near vision which occurs around 40 years of age) and cataracts (a gradual loss of transparency in the crystalline lens, which generally begins after 50 years of age) result from aging. Presbyopia can be understood as a loss in the adaptive function, but with a transparent crystalline lens; while in a cataract there occurs a metabolic unbalance in the crystalline lens with the effect that there is opacification and, therefore, a progressive diminishing in visual acuity [18, 19].

Presbyopia is a functional pathology [19] that, by the light of the positivist theories of normal and pathological, would not be classified as an illness, for it is a part of the natural aging process, it does not interfere with the visual acuity of the patient. The loss of transparency due to a degenerative disorder in the crystalline lens (cataract) implies in a gradual loss of vision. This process limits the individual and, even though in most cases it is part of the aging process, it makes the patient become gradually different from what he/she was — what Durkheim called pathological. To Canguilhem, in this case a qualitative jump would occur, considering that after a certain point of opacification in the crystalline lens, the patient would present a visual low, therefore characterizing the manifestation of an illness — as such, it should be treated.

During the last few years, the surgical treatment of the cataract has undergone a dizzying technological breakthrough, becoming a more secure process and one of quick recovery [20, 21]. This treatment consists of a substitution of the opaque crystalline lens for an artificial lens of a high technological quality and with an optic precision that is superior to that of a normal crystalline lens, as it corrects the errors in refraction from the normal crystalline lens and reestablishes the near vision which was suppressed by the lack of adaptability. The security of the surgical treatment and the optical results obtained from the substitution of the opaque crystalline lens for this new lens has, with each passing day, modified medical conduct toward indicating the surgical treatment of cataracts, making it ever more precocious.

The ethical dilemma between normal and pathological for the ophthalmologist in the surgical treatment of the crystalline lens

The technological advance in the surgical treatment of the cataract has made the recommendation of surgery ever more precocious, in other words, they are no longer waiting for the cataract to appear to remove the crystalline lens. In Brazil, the removal a transparent crystalline lens to correct refractive errors and presbyopia is considered to be experimental by the Federal Council of Medicine (Conselho Federal de Medicina) [22] — however, in other countries an option is applied for the correction of elevated ametropia [23]. This conduct is being presented at medical conferences and is defended by a group of Brazilian ophthalmologists [24].

The concepts of normal and pathological, developed by scholars like Durkheim, Comte, Foucault, Canguilhem, have an understanding of the illness and how to treat it at their core.

Treating a sick organ, and substituting it for an artificial one, is an ethical and acceptable procedure. However, when a doctor proposes to substitute a normal organ in order to better functioning or add technological improvements, he/she subverts this concept and increases the risk/benefit relationship, for many complications could occur [20, 23] in the surgical procedure, causing enormous damage to the patient. This conduct leaves the patient with greater expectations for the end result, considering that this is a person with normal visual acuity.

According to Canguilhem, illness arises as a response from the organism which, upon suffering aggression, does not return to the initial point of stability. The response to such an alteration implies in treatment. This concept is perfectly applicable to the development of a cataract. A normal crystalline lens, after an aggression, suffers a degenerative process that makes it opaque and it no longer returns to its initial state of transparency. In this case, a recommendation for surgery would be correct, both from a ethical and scientific point of view.

In parallel, if the crystalline lens is transparent or at the beginning of the aging process, and is not interfering with visual acuity, there would be no need for recommending treatment according to the normal and pathological concepts utilized here. This ethical dilemma divides the opinions of ophthalmologists. Some defend surgery on a

transparent crystalline lens for refractive ends or the correction of presbyopia, based on technological evolution and security in the surgical procedure [20]; others defend that surgery should only be performed on crystalline lenses with an opacity that limits the visual quality of the patient, which justifies the risk of complications [22, 25].

The concept of illness as a deviation from the normal permanent state will no longer apply in the case of removing a crystalline lens in patients with normal visual acuity. The leap in the quality that would configure the illness did not occur in this case. Therefore, according to the concept of a normal organ, two types of normality have arisen. One would be related to the natural crystalline lens itself, with its normal genetic characteristics; and the other to the artificial implant, with optical qualities capable of correcting refractive errors and presbyopia [26], which were once corrected by the use of glasses. The pathological concept, in the sense of illness, does not fit in either of these cases, since both the carrier of a natural crystalline lens and an artificial one would be normal, as both present a normal sense of sight.

However, the carrier of a normal crystalline lens, upon substituting it for an artificial lens, is treated as though he/she were ill. We would then have two types of individuals living within the same society: the normal individual with a natural crystalline lens, and the normal individual with a lens capable of correcting refraction errors and/or presbyopia, which provides them with a better visual quality than the former.

The future of crystalline lens surgery: both normal and pathological

Making predictions is always a dangerous practice, even when the future is near. In the case of lenses to substitute the crystalline lens, the possibilities for its evolution are quite evident. To accomplish this, all one need do is look back over the evolution of the last ten years. As such, it is not too much to suppose that other qualities could be added to these lenses, which would provide the patients with an increase in their visual acuity, an increased capacity for nocturnal vision, a growth in their field of vision, and filter against UV rays. The use of these future lenses, with the addition of these qualities, could definitely transform the concepts of normal and pathological.

From the mass application of these ocular implants, new visual qualities will be added to the normal individual, giving rise to a group of individuals with a higher visual acuity than the rest of the population. These individuals, upon receiving implants superior to the natural crystalline lens, would be carriers - to make an analogy - of a technological mutation. They are, therefore, the starting point for a population that stands apart from the rest; normal, but without an implant. In a short space of time, the greater part of the population would go on to have new visual capacities; therefore, a normal distribution. This fact could transform the social model, which would have to be adjusted, from the point of view of visual needs, to this new population. Based on this new model, according to Morris [12],

society should offer the individuals without implants the conditions overcome there visual limitations, otherwise, a population that was once normal will become handicapped.

History has demonstrated that the people with greatest purchasing power have the quickest access to technological advances; followed by the poorer population who, when they gain access to these advances, discover that they are already outdated. At the beginning of the 80s, Brazilian ophthalmologists began to perform cataract surgery with the implanting intraocular lenses. For a time, such lenses were only implanted in patients with the financial conditions to pay for them. The public health service delayed a few years before covering the cost of the lenses. During this interval, all that was left for the patients who could not pay for the lenses was surgery without implants, which forced them to wear powerful glasses, diminishing their field of vision and increasing their dependence on glasses. With time, pressure from society, and company interest in placing more lenses on the market, led the public health service to cover these costs, but lack of money appropriated to healthcare only allowed for them to cover less costly lenses, with a structural and optical quality inferior to the latest generations. This discrepancy between the upper classes and the poor for technological benefits persists today and will, in all likelihood, persist forever.

Diego Gracia considers that public service prioritizes the ethical principles of justice and the non-malfeasance in relation to the principles of beneficence and autonomy [27]. One could then suppose that this is the logic which the public health managers follow. If there is not enough money for the latest lenses, the implantation of less sophisticated lenses could do no harm, and it would be more just to pay for inferior lenses to the whole population than to buy newer lenses for only a fraction of the same population.

The budgets for public healthcare will probably always be insufficient [28] to provide the poorer population with the latest healthcare. According to the current tendency, it will only become more expensive. The large multinational companies invest in product research which will bring them more profits. In the case of cataracts, for example, every year new models of intraocular lenses, new materials being used in surgery and new surgical equipment are launched on the market, which increase the costs of the procedure.

On the other hand, it would be a waste of time to research scientific works directed toward the clinical treatment of cataracts. These companies have no interest in this type of research since stopping cataracts from emerging or even retarding their effects would imply enormous losses for them. Investing in the discovery of new lenses, with qualities capable of surpassing normal vision, is something unavoidable.

Final considerations

The discovery of new technological products for implants in humans, especially in ophthalmology, and new discoveries in the fields of genetics and nanotechnology

will stir up new interpretations on the current philosophical understanding of normal and pathological and, in the future, the implant of lenses with special qualities could create social conflicts and new bioethical problems to be faced in the 21st century. The appearance of a population with superior visual qualities will create categories of people who, when in majority, could adjust the social model to their benefit, transforming normal people to a handicapped status.

Lastly, the adequate bioethical and philosophical discussion would be: should we intervene in a normal patient to add new technology to them? As the new technology substitutes the normal organs to correct the aging process, adding qualities that are superior to those that are considered normal, will they change the concept of normal? Will there be resources so that the poorer population may have effective access to these technologies?

Resumo

Reflexões epistemológicas e bioéticas na cirurgia de catarata

Este trabalho tem por objetivo analisar as principais contribuições de epistemólogos sobre as concepções de normal e patológico, saúde e doença, e fazer uma apreciação desses conceitos diante dos avanços tecnológicos da medicina. Discute em especial o conflito ético da conduta cirúrgica do médico oftalmologista, quando extrai o cristalino normal (segundo os pressupostos de normalidade referidos por esses autores) e implanta, em seu lugar, uma lente artificial, que acrescenta à visão do paciente, portador de ametropia ou presbiopia, qualidades superiores as com cristalino normal. Além disso, o autor faz um exercício de previsão das possíveis alterações nos conceitos de normal e patológico, nas pessoas sem implantes e com implantes. Conclui por considerar que o acréscimo de qualidades visuais em grande parte da população poderá modificar o conceito de normal e patológico, tornando deficiente a parcela da população que não tem acesso a essas novas tecnologias.

Palavras-chave: Bioética. Conhecimento. Catarata. Implante de lente intraocular. Extração de catarata.

Resumen

Reflexiones epistemológicas y bioéticas en la cirugía de cataratas

Este trabajo tiene como objetivo analizar las principales aportaciones de los epistemólogos sobre las concepciones de lo que es normal y lo que es patológico, salud y enfermedad, y hacer una apreciación de dichos conceptos frente a los avances tecnológicos de la medicina. Discute especialmente el conflicto ético de la conducta quirúrgica del médico oftalmólogo, cuando extrae el cristalino normal (según las presuposiciones de normalidad referidos por esos autores) e implanta, en su lugar, una lente artificial, que acrecienta a la visión del paciente, portador de Ametropía o Presbicia, capacidades superiores a las del cristalino normal. Además de eso, el autor hace un ejercicio de previsión de las posibles alteraciones en los conceptos de normal y patológico, en las personas con y sin implantes. Concluye considerando que el incremento de capacidades visuales en gran parte de la población podrá modificar el concepto de normal y patológico, tornando deficiente a parte de la población que no tiene acceso a esas nuevas tecnologías.

Palabras-clave: Bioética. Epistemología. Catarata. Implantación de lentes intraoculares. Extracción de catarata.

References

1. Illich I. A expropriação da saúde: Nêmesis da medicina. 3ª ed. Rio de Janeiro: Editora Nova Fronteira; 1975.
2. Aristóteles. Ética a Nicômaco. São Paulo: Editora Martin Claret; 2006.
3. Monte F. As bases do raciocínio médico. Rio de Janeiro: Papel Virtual Editora; 2000.
4. McCall MG. Normality. J Chron Dis. 1966;19(11):1127-32.
5. Canguilhem G. O normal e o patológico. 6ª ed. Rio de Janeiro: Forense Universitária; 2007.
6. Canguilhem G. Op.cit. p.103.
7. Comte A, Martineau H. The positive philosophy of Auguste Comte. Nova York: William Gowans; 1868.
8. Durkheim E. As regras do método sociológico. São Paulo: Martin Claret; 2007. p.68.
9. Durkheim E. Op.cit. p.74.
10. Durkheim E. Op.cit. p.81.
11. Foucault M. Doença mental e psicologia. 2ª ed. Rio de Janeiro: Tempo Brasileiro; 1975.
12. Morris J. The politics of disablement. London: MacMillan; 1990.
13. Moses RA. Fisiologia del ojo, aplicación clínica. Buenos Aires: Médica Panamerican; 1980. p.45- 64.
14. Moses RA. Op.cit. p.263-302.
15. Oréfice F, Boratto LM. Biomicroscopia e gonioscopia. Rio de Janeiro: Editora Cultura Médica; 1989. p.37-40. (Biblioteca Brasileira de Oftalmologia)

16. Oréfice F, Boratto LM. Op.cit. p.72-5.
17. Alves AA. Refração. Rio de Janeiro: Editora Cultura Médica; 1994. p.69-76. (Biblioteca Brasileira de Oftalmologia)
18. Bicas H. Ametropias e presbiopia. Medicina Ribeirão Preto. 1997 jan/mar.;30:20-6.
19. Moses RA. Op.cit. p. 302.
20. Arraes J, Diniz JR, Escarião P, Melo C, Arraes T. Extração do cristalino translúcido: resultados visuais e frequência de vítreo-retinopatias. Arq Bras Oftalmol. 2006;69(5):671-4.
21. Rezende F, Bisol RR, Bisol T. Troca do cristalino com finalidade refrativa (TCR). Rev Bras Oftalmol. 2009;68(3):180-7
22. Conselho Federal de Medicina. Resolução nº 1.459/95, de 6 de setembro de 1995. Dispõe das condições para Terapêuticas Oftalmológicas. Revoga-se a Resolução CFM nº 1.353/92. Diário Oficial da União. 12 dez 1995; Seção 1:20.497.
23. Carreras DH, Rodríguez HJV. Cirugía del cristalino transparente: balance de resultados de 2001. Arch Soc Canar Oftal [Internet]. 2002 [acesso 7 ago 2010];(13). Disponible: http://www.oftalmo.com/sco/revista-13/13sco08.htm.
24. Muccioli C, Goldechmit M, Campos M, Bechara SJ, Costa VP. A extração do cristalino transparente é experimental? Arq Bras Oftalmol. 2007:70(5):735-6.
25. Conselho Brasileiro de Oftalmologia. Catarata: diagnóstico e tratamento. In: Projeto Diretrizes volume III. São Paulo: Associação Médica Brasileira, Conselho Federal de Medicina; 2005. p.51-8.
26. Centurion V, Lacava AC, Caballero JC. Lentes intraocular multifocal difrativa apodizada: resultados. Rev Bras Otalm. 2007 Nov./Dec.;66(6):383-7.
27. Gracia D. Procedimientos de decisión en ética clínica. Madrid: Eudema; 1991.
28. Couttolenc BF, Zucchi P. Gestão de recursos financeiros. São Paulo: Editora Fundação Peirópolis; 1998. p.77-95.

Received 8.4.10 Approved 2.21.11 Final approval 3.9.11

Contacts

Rafael Dias Marques Nogueira - *rdmnrafael@gmail.com*
Roberto Wagner Bezerra de Araujo - *bezaraujo@yahoo.com*
Raphael Dias Marques Neto - *rdmneto@gmail.com*
Guilhermina Rego - *egsaude@medup.pt*

Rafael Dias Marques Nogueira - Rua Libanês José Lopes, 100, Bairro Luciano Cavalcante CEP 60813-610. Fortaleza/CE, Brasil.