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## European Lecture

### What the neurosurgeon of the 21<sup>st</sup>. century ought to be like

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One of the greatest honours a European neurosurgeon may have, is to be chosen by the Executive Committee of the E.A.N.S., to give the "European Lecturer". I would like to thank them for such a kind invitation, to which I hope to repay during the next minutes relating you some of my ideas, based on my personal experience, about what the neurosurgeon of the next century ought to be like.

These experiences are supported by my travelling over more than forty years through European neurosurgery.

I remember the first time I took part in these events in Thessalonika, Greece. This situation seemed so distant and impossible to me that I only permitted myself to think of the way that was ahead of me in order to become a good neurosurgeon, following the guideline of my Master, Professor H.W. Pia, pioneer of this group of advanced neurosurgeons that had an overview of Europe at the right moment, with the suitable scientific basis that have made it possible to get to the present situation. Since then, there have been many attempts to prove the influence that technical and scientific changes have had on the daily tasks of doctors, neurosurgeons in this case.

It's been more than thirty years now since those days in Thessalonika, and the moment has come to make some reflections and try to motivate, somehow, the new generations of neurosurgeons about the qualities I think must ornate their attitude and behaviour in the next century.

#### **The neurosurgeon of the 21<sup>st</sup>. century ought to be an excellent surgeon**

Being a neurosurgeon means having the great satisfaction of a quick gratification on the patient's part; gratification in the broad sense of the word, but mainly spiritual, if we have been able to understand that person, to whom we have given all our knowledge and art, using our hands.

The hands, from a humanist point of view, are the instruments that will always be present in any surgical activity whether past, present or future. When analysing the characteristics that make man and the rest of the living beings

different, we normally use parameters such as reason, or the ability to discuss things, thanks to language, to have a personal background, to understand, to grow up and to create specifically human things; but if we pay careful attention we'll see that the hand is at the crossroads of them all. The history of the human condition is made up insofar the hand is able to seize, combat, build, write, play, caress, heal and pray.

Art is a mixed expression, both cerebral and manual; no one can deny the value of the hand in neurosurgery, both as a technique and as an art. The hand appears in pictures and sculptures as the privileged organ of the senses it educates and controls, being able to modify the force of Nature or reconstruct that one which is ill due to a certain pathology.

The hand synthesises in itself -for good and for bad- the tremendous power man has over Nature, which he tries to either praise or degrade with more possibilities than Nature itself.

How shall we deny, then, the value of the hand for a neurosurgeon? After all, neurosurgery is a science that deals with the study of man suffering from an illness of his nervous system and tries to cure him by means of a manual action. Hippocrates<sup>6</sup> valued manual work quite appropriately when he said: "When there is love to humankind, there is love to technique".

The new neurosurgeon will be demanded not only what he can do, but most of all, to know when he must operate and why. The hand could be relegated to second place and the operation will be the work of intelligence, performed by a scientist that should have a series of qualities that define his technical and scientific personality, along with a great deal of current knowledge about subjects such as molecular genetics, computing and stemm cells, for instance. We can't go back to the time when Dielafoy<sup>3</sup> stated: "...because most of the times it is we, doctors, and not surgeons who have the responsibility to establish the indications and contraindications of surgery, in order to choose the right moment to assemble the surgeon's hand..".

This shouldn't be taken to the extreme and think that neurology must always be neurosurgical, although one thing is true: many of the neurological diseases that were

incurable from a medical point of view up to this moment, will be treated by the new generations of neurosurgeons with a great deal of success using the new techniques in molecular genetics, and immunology.

Technique is, therefore, essential to the neurosurgeon, and represents a required and significant stage in his training. If his scientific facet demands that he should acquire more and more theoretical knowledge, his technical character calls for his duty to know the different possible ways to perform his operations and the obligation to obtain a continuous perfection in their execution. So, the hand acquires once again all its prominent role.

It would be wrong to think that the diagnostic techniques, the sophisticated pre- and postoperative treatments make all the neurosurgeons equal, underestimating the delicacy of technique. The mediate and postoperative results are quite different when there is a good preformed technique and when there is not, or it is improvised or even not respected.

Neither the new technologies nor the most sophisticated pre- and postoperative techniques could make up for a surgery that has been inadequately performed.

In order to perform a surgical technique in the right way, we must be aware of our own possibilities and results. The final results are more and more analysed, even published -more or less accurately-. This should imply continuous, serene and dispassionate self-criticism that allows us to make all the necessary changes in our techniques and qualities in order to improve our results. Sometimes the "No Touch" strategy may have important effects on the final surgical results.

### **The neurosurgeon of the 21<sup>st</sup>. century ought to be a neurophysiologist**

New techniques have been arising lately, and in the next century there will be many more, and with more frequency. These techniques will change our present knowledge little by little and in a continual way. If the neurosurgeon is the one who has to select the patients<sup>10</sup>, he must have enough neurophysiological knowledge in order to be able to control the pre- and postoperative treatments, not only at the Intensive Care Units, but also when using the techniques in molecular neurobiology and neurogenetics.

The classical concepts of brain edema and physiopathology of the L.C.R., deeply studied in the last decades have been improved and complemented by the introduction of new technologies. All there must be useful instruments for the future neurosurgeon to consolidate and improve his knowledge, designed to get a better pre- and postoperative diagnosis of our patients.

The new generations of neurosurgeons will witness all this; we can only try to understand it, and, above all, accept it.

### **The neurosurgeon of the 21<sup>st</sup>. century ought to be a Master**

Every day the neurosurgeon stores some more knowledge, which proves that he is a master. He should be able to transmit<sup>7</sup> this knowledge with quality and excellence, so that the academic chain his teachers started will remain.

However, I am sure that the teaching agenda will become more complex and more complicated in the next century. One of the most important aspects to be taken into account must be the revision of our residents' teaching programmes. The point is: considering the fast and intense development of the knowledge we have to transmit to the new generations, should the general neurosurgeon's training period be extended or, on the contrary, should be the rotatinn system be reduced? Or maybe it would be necessary to modify the study of Medicine?

This subject has been the central issue of the discussion for a long time, not only because of the great amount of technical knowledge, but also because the main foundations of Medicine are being affected. These foundations are being reduced as a consequence of the conceptual and labour changes Medicine has undergone.

A possible suggestion could be made: keeping a general common training, rotating in some of the specialities of basic neuroscience and intensive care so that later on everyone could make their own personal choice with a more intense training in: neuro-orthopedics, vascular neurosurgery, functional neurosurgery, neuro-oncology, neuroimmunology and neurotransplants, neurogenetics, molecular biology, and so on...

Progress in general science, and in neurosurgery in particular is, in a way, analytical. Nevertheless the training of neurosurgeons must have a great sense of synthetis; that's to say, as Sanno stated, the neurosurgeon must be more and more synthetic, not only with regard to all the neurosurgical sub-specialities<sup>9</sup>, but also with regard to the humanization of neurosurgeons. Healing demands a unified vision of life in all of its aspects and this can only be achieved with a consistent cultural basis both on humanities and humanism.

Science approaches the patient as a case. The art of healing, or curing, treats the patient as a person

### **The neurosurgeon of the 21<sup>st</sup>. century ought to be well versed in Digital Technology**

In the last decade, the digital world of "bits" and the physical world of atoms have come so close to each other that the boundaries between them have almost completely vanished. We can carry "bits" in our pockets, have digital navigators in our cars, and buy almost anything "on line".

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But, what does this digital revolution provide neurosurgeons with? It means that we can easily get information about the possibilities that modern techniques can offer in order to put them into practice in our daily neurosurgical work.

We get all our scientific information through the internet. We can read the scientific magazines "on line", get in touch with other colleagues, get to know and consult clinical cases from all over the world and use telemedicine.

The neurosurgeon of the 21<sup>st</sup>. century needs to know, understand and take advantage of this emerging digital neurosurgical technology, thus increasing his knowledge of Computational Neurobiology.

Every significant breakthrough achieved in the field of image, location, and in every scientific level of interest to the neurosurgical community has meant a new concept: teamwork with biochemists, psychologists, electro-physiologists and molecular biologists in the very operating theatre, sharing efforts on the different levels of neurosurgery.

The stereotaxic techniques are definitive because of the safety and accuracy in the location of injuries that could undergo the same surgical procedure. A good stereotaxic image allows us to: determine the injury, stimulate, biopsy, resect and irradiate it.

The neurosurgery of the next century will have to revive a special interest in the basic neurosciences. It won't be too long before the neurosurgeon has to justify the sequential time of D.N.A. in gliomas or administer polymerase chains of lymphocytes, thus improving the concept of neuro-oncologist we now have.

The concepts of Neural Network will be applied -in fact they are already being applied- to some particular surgical procedures, but the real point is that we have to start changing our opinion about the brain; our way of interpreting and understanding it. This change in our way of thinking will bring about a change in the way we see our patients and in the way we act, as well as in the perception of what neurosurgery has been, is and will be.

### **The neurosurgeon of the 21<sup>st</sup>. century ought to be free, responsible, and have an extensive knowledge of bioethics**

The moral effect the biomedical revolution is having on the different medical specialities and, of course, on neurosurgery, is of the utmost importance for the future neurosurgeons<sup>8</sup>. The new generations of neurosurgeons will have to deal with bioethical matters that have practical effects and with genetic engineering programs. Questions such as the ones related to the beginning of life -indubitably human in the embryo-, termination of pregnancy, euthanasia, the use of stem-cells or embryonic tissues for the treatment of certain pathological processes, the establishment of the

causes of death, organ transplants, etc... These conflicts between science and ethics compel social and political bodies to regulate such activities by establishing control systems<sup>11</sup>.

Apart from these effects, both the bioethical revolution and technology have exerted such a profound influence on moral -as far as Medicine is concerned- that the concepts of "health" and "welfare" have become the highest moral criteria in the advanced societies.. It is not, by the way, the first time this happens in History, but the "medicalization" of moral criteria has never before been so strong as today. This is the reason why bioethics constitutes nowadays the regulations of civilian moral rather than a professional moral in the so-called western countries.

In these societies, these rules were accepted due to the secularization process. Men stray away definitively from all religious criteria and it doesn't seem probable that a moral order of religious connotations could be imposed on them.

The rules of coexistence and action, typical of plural and open societies, according to Popper's ideas, can't be deduced straight from religious beliefs or metaphysical systems but from the criteria of rationality that prevail in our cultures: scientific rationality.

Bioethics is destined to be of great significance in the training and practice of neurosurgeons. As any other area of human knowledge it involves a lot of problems, but what nobody dares to question is the fact that biomedicine won't possibly keep on progressing without it.

In this respect we want to invoke the responsibility of neuroscience and technology. But this matter is also the responsibility of other systems, particularly the political, legal and moral ones.

All of this, is enough to declare the freedom of Science, but it is insufficient to understand responsibility. For example, keeping to this Ethics of objectivity, we can't see why scientists or technologists should avoid experimenting with human beings, accept limitations when it comes to accept funds for their investigations, restrict their field of genetic manipulations and renounce to the production of equipment that could expose a person or population to danger during its normal use or in case of accident.

With regard to Moral, it can't be denied that a certain crisis of traditional moral is not due to a decrease of the morality or the values of our time, as people usually think, (Bartley<sup>1</sup>) but to the fact that certain situations have changed very much with respect to what the old rules imposed and, besides, there are many brand new situations to which the old regulations cannot be applied. Most of these neurosurgical innovations come out as a result of the technologic and scientific progress. It is up to Ethics to introduce new regulations and adapt the old ones in such a way that they can be applied to the new circumstances.

The specific task of investigating what is good and what is bad must still be undertaken by Moral. So, if Sociological Science points out that cloning, and the use of mother cells or embryonic tissues have become widespread techniques in a certain kind of society, this doesn't exempt the different schools of Ethic Thought from expressing a moral opinion about these practices, and eventually condemning them or laying down the limits inside which they are morally acceptable.

We can't think either, that, even though everything we have within reach is technically possible, it should be morally permitted.

### **The neurosurgeon of the 21<sup>st</sup>. century ought to be a Leader**

The functional and formative structure of neurosurgery demands that its professionals be leaders. The daily practice of our complex techniques puts us in a position of social and professional leadership. However, being in this position may also mean that we are not good leaders. Leadership means to accept without arguments the responsibility for our acts and for all those proposals carried out by our team, resulting in either the success or the failure of our efforts.

Without the guide of the leader, the community disappears; without the fight for power, the group stops developing. This may sound as praise for competence and individualism, but in fact it is quite the opposite. A good leader stirs up emotions and feelings, shows the way to success and must be the sounding board for teamwork.

In his book "The new Leaders", Daniel Goleman<sup>4</sup> refers to leadership as "emotional work" and states: "It is true that the minimum necessary requirements in order to accede to leadership have to do with questions related to intellect, capacity to make decisions and technical abilities. But it is also true that excellence depends on strictly emotional factors".

When someone is a leader, circumstances oblige him to be selfconscious, constantly aware of his inner feelings and to asses to what extent they affect his performance. As he knows his strong and weak points, he is in a permanent self-assessment. This ability allows him to aim at ambitious targets and have the impetus to achieve them. He doesn't wait for opportunities to come across; he looks for them and is the first one to make decisions.

### **The neurosurgeon of the 21<sup>st</sup>. century ought to be Adaptable**

The most successful of neurosurgeons must be, by nature, adaptable to the circumstances that every day occur in the clinic practice, in the operating theatre and in the

training of residents. In the years to come this adaptability will be even more necessary as a consequence of the great amount of changes we will witness in the diagnostic and treatment techniques of a large number of pathologies.

Cerebral vascular neurosurgical pathology, for instance, was one of the most appealing pathologies of all. Operating on an aneurysm represented the fulfilment of our neurosurgical training. This circumstance has dramatically changed; whether for good or for bad we can't tell yet, but the truth is that a profound change has been experienced in the diagnosis of these injuries as well as in their treatment, which requires a necessary adaptability. The same happens with the introduction of radiosurgery the treatment of certain kind of tumours, either profound or involving a high risk due to their localization. Adaptability will be essential.

Many may think that these technologies will relegate neurosurgeons. This is far from being true. Our surgical sensitivity, our intellectual ability, and most of all, our capacity for adaptation prove the inaccuracy of this statement. We all agree that it is a technique that improves the results, but it must be included in the training curricula and in the daily neurosurgical practice for being a kind of vascular minimally invasive neurosurgery.

In his book "Only the paranoid survive", Andy Grove<sup>5</sup> affirms that the more success someone achieves, the more possibilities of suffering attacks from different external and internal sources he has. In the book he sets out the theory about "strategic inflection points". The strategic inflection point is the time in life, or in any organisation, or medical or surgical speciality when its basis must be changed, or at least modified. These changes may, obviously, represent either the possibility of succeeding or the beginning of the end. Up to what extent are we adaptable and how would we react, considering that this strategic inflection point could mark our future?

Let's hope this system may as well bring about changes in the classical university departments, with the resulting advantage for all specialists from both the economic and therapeutic point of view. This would head them towards the long-awaited goal of cost-effectiveness<sup>2</sup>.

### **The neurosurgeon of the 21<sup>st</sup>. centuryv ought to be Persevering**

Perseverance is probably the most important quality of every self-respecting neurosurgeon. How often, when faced with difficult situations in the operating theatre, or in other circumstances, have his perseverance and training helped him to overcome all the obstacles. This was one of the greatest lessons I learned with my neurosurgical mentor, Prof. H.W. Pía: when things go wrong, remain firm in your work, go ahead with your planning and you will meet your target. This is a quality that must stay constant in most of

our activities.

The great composer Gustav Mahler said: "Nothing could ever replace perseverance in order to get success; talent alone is not enough to triumph; there is nothing more usual than a talented good-for-nothing. Education alone won't lead us to success; the world is full of educated jesters".

Along with perseverance, the neurosurgeon of the next century should know, or at least not forget about the history of our speciality in every scope, whether universal, European or that of his own country. There will always be someone that may contribute with some of the old concepts to the present advances. May I be permitted to make a nationalist but at the same time European and universal reference: Santiago Ramón y Cajal is still taking an active part in the development of the present histologic and neurophysiological concepts.

### **The neurosurgeon of the 21<sup>st</sup>. century ought to be a Humanist**

Despite the great technological progress, the changes in health economics and the remarkable advances in the surgical techniques, it is of great importance for the neurosurgeon of the future to be a good doctor who can prove to be a good connoisseur of man as he is. It is too often forgotten that all that happens to humans occurs in the everyday world; in the daily life. This concept is important, I would even say fundamental. Human life is made up of small instants and is subject to the inexorable passing of time. It is a life, therefore, quotidian.

The new century involves, at least symbolically, an upheaval, a certain state of surprise. The solution, however, does not consist in thinking that with the new century we will leave aside our daily life to start an extraordinary one; it consists in asking ourselves what the daily life in the new century should be like. On the one hand, individual actions, and on the other hand actions that take us closer to each one of our fellow men. Of course, such person-to-person contacts should be implicit in what we -using an old but inevitable term- call "new values of the century", which naturally don't allow us to consider our fellow men unable to reach the heights that are only in store for the chosen.

Sociologists depict a society that would have the following characteristics: planetary revolution based on computer science and biology; existence of virtual reality; interconnected navigation; intangible assets; bio-processes and techno-processes. The human beings of the next century have even been referred to as "bionic".

The kind of society that is being designed breaks away from the tradition of humanitarian unity; it is really a contradictory society with regard to human relationships; Contradictory in the sense that we all would be together

operating with a big computer but far away from each other. Far away because the relationship with the people beside us wouldn't be established through close contact but through the equipment we are working with. We may have the feeling that a new kind of humanism is being created. But the kind of humanism we are interested in for the new century doesn't show anywhere.

Humanism may be understood in many different ways and according to a variety of ages. On the other hand, humanism has often oozed a quite unpleasant air of weakness, or it has simply come down to being a concession of religious spiritualism. We must confess that we are not satisfied with those values.

In our opinion, in the next century the problem will focus on trying to reconcile the idea of a technology that comes up as an inevitable achievement with the idea of a humanity that keeps on being more and more human. A magic triangle made up of friendship, solidarity and patience could be a proposal that fits the idea of a human being that grows up inside its limits and is, at the same time, a reflection and a projection of other human beings.

Friendship is, above all, a value. Friendship would be like the other side of the necessary capacity for loneliness. It comes up as the necessary splitting of the ego.

Personal contacts with our patients seem to be essential in this new century. Friendship may act as a link, as a transcendental perception between the harshness of facts and the gentleness of rights. Friendship has, like no other affection, the capacity to be strong and mild at the same time. In its hands is the possibility of combining the respect for the world's progress with the necessary sensibility to understand and share pain. Friendship calls for the combination of gentleness and seriousness.

On the second place, a concept difficult to express in a single word is required: tranquillity, sweetness, pacifism, temperance, perseverance and magnanimity. This harmony is not easy to get but it is within reach of our successors. They have already proved to be qualified to do it.

When friendship goes a step beyond its evolution, and with a foot set in the new century, solidarity comes into view. It is the second of the values we think should prevail in the 21<sup>st</sup>. century, and constitutes another side of the magic triangle. The autonomy that leads to solidarity is what makes the embarrassing aspect of self-sufficiency vanish.

Solidarity consists in knowing how to establish relationships with the rest of the humans and, specially with our patients, without any trace of servility or dependence.

The last side of the triangle we have been referring to is "patience". We will define it as "the virtue of suffering". Considering such an unusual virtue, it wouldn't be strange to hear a lot of protests. Why suffer, when suffering is precisely what should be avoided? How can we display

patience in a world where everybody is always in a rush?

Patience is the capacity to withstand suffering till the end. Patience puts us on the alert so as not to be defeated, to never give up. But we could wonder: Patient wait for what? For a society where we inflict the least possible suffering; for a society where suffering is only caused by what is either mute or doesn't respond, or doesn't understand us. Patience withstands with the certainty that it must build a much better world, where technological advances must gradually become more human.

This triangle, made up of the values that, in our opinion, should prevail in the next century, could be extended in order to form a polyhedron; but it would be a great satisfaction to be able to confirm some time that these have been the values that have characterised the practice of neurosurgery in the 21<sup>st</sup>. century. We would face an age free from the tyranny of a kind of imagination that shows no respect for facts but still believes that almost everything is yet to begin. The new century brings about the opportunity for this.

### Conclusion

I have tried to set out some considerations which I think are of significance for a neurosurgeon at the turn of the century. In my opinion, it is necessary to know the challenging advances in physio-pathology; the therapeutic modifications and the necessity for co-operation and the creation of linking views among the different specialists of the Nervous System. Modern technology and the recent health economics are demanded by these changes.

We shouldn't forget that, despite this tremendous and positive technological evolution, hands will always be present in the course of our life. But, what will their future be like?

In an age such as the one we are living in, when so many things are disposable; when everything is mechanised and automated; when artificial satellites and interplanetary journeys allow Julio Verne's ideas to come true; in the age of in-vitro fertilization and artificial insemination; of chimeras and inter-specific reproduction; of cloning and genetic transfer; of robotics, tele-surgery, organ transplants and interventionist radiology, we might consider: Will man have hands in the future? Will they atrophy by lack of use? Will man carry out Peter's principle and reach his highest level of incompetence by disregarding his hands? This would mean that human progress would have destroyed man's progress. It would be the triumph of futile perfection

over dissatisfied creativity; of the History of humankind over humanity itself; the victory of what is only magnificent over what is great.

I hope these considerations would contribute some ideas to those that end up our neurosurgical work in the next few years, but above all, to those who -with renewed energy, determination, perseverance, magnanimity and, more than anything else commitment to the others-, have the historic obligation to continue this wonderful way through a speciality of incomparable harshness, beauty, elegance and human reward. Many years ago I heard Prof. Sanno say a sentence that he adapted from a police story. As I quite identify with it, I would like to use it to finish my speech: "If I wasn't hard, I wouldn't be a neurosurgeon. If I couldn't ever be gentle, I wouldn't deserve to be a neurosurgeon".

Thank you very much for your attention.

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