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"Hot Points" in Scientific Research in Surgery

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ABSTRACT

In the last century, surgery has changed dramatically. We have moved from considering only the demolition sphere, to trying more and more approaches as less invasive as possible, trying not only to eradicate the disease, but also to protect the validity of the Person as much as possible. This change of views has been possible only thanks to innovation, which has allowed surgeons to possess increasingly efficient and sophisticated biotechnological instruments and approaches. However, it should not be forgotten that, unlike clinical trials of drugs, experimentation in surgery is more empirical and still little standardized and codified and is left to the intuition of the individual surgeon, who tries to put into practice his original idea. The authors analyze the official and unofficial rules where present and the criticalities of this specific experimental field also from a regulatory and deontological point of view. Finally, they propose ideas for a bioethical debate of no small moment, but still largely unexplored and open on experimentation in Surgery and which now cannot be avoided nor delude.

Introduction

Medicine and Surgery in the last century have undergone profound changes and although the goal is always the same, namely, the protection of the life and health of the Person, the relational priorities have changed extremely. Historically, for centuries, surgery has focused mainly on amputations and cauterizations of wounds, in which mainly the demolition approach was codified and inescapable There have been periods, especially in medieval times, in which Surgery was distinguished from Medicine, because while the latter was closely linked to academic rank and culture, Surgery was also practiced by people with lower degrees of education - 'minor' surgeons and cerusici - who dedicated themselves to the exercise of bloodletting, on the recommendation of the doctor, to the treatment of abscesses, fistulas, fractures, dislocations in general, but they could also perform the most complex operations. Subsequently, while remaining the main problems faced unchanged, the professionalism of the surgeon, with the advent of anesthesia and antisepsis and sterilization techniques, has developed up to the current era, in which surgery has become increasingly complex, technologically sophisticated, minimal in the approach and careful not only to eradicate the disease, but also to safeguard the suffering person, in its relational sphere. This radical change has required the surgeon not only those manual skills, typical of his profession, but also in-depth biological, pathophysiological and technological knowledge about the materials and biomaterials, biological and synthetic, that are used and about the instrumentation used (which is no longer limited to the scalpel alone, as in the past).

Evaluation Criteria

Traditionally, the criteria for evaluating the effectiveness of a surgical innovation have been the reduction of morbidity and mortality of patients, objective and easily measurable criteria. Today, these criteria have been accompanied by others that are more difficult to interpret, such as the increase in the period of disease-free survival, the greater residual validity of the person, the reduction in recurrence rates, or the reduction of hospital days and, in general, of the social costs of the disease. To achieve these objectives, the extraordinary technological development of the last century has come to the aid of surgeons, which has made increasingly effective, sophisticated and complex instruments available to operators; Just think of robotic surgery or the possibility of operating on a person remotely.

Innovation and Experimentation

Definition

Innovation, and therefore experimentation, are an important part of surgery, even if, contrary to what happens in the field of clinical trials of drugs, there are no certain and well-codified procedures and rules of behavior. This innovation gap in surgery has its roots in the peculiarities of surgery itself. It should be considered that, very often, a new technique is not a completely original technique, but rather is based on an old technique, which is readapted to new needs and new technologies, so it is a continuum, which develops and perfects day by day with practice and experience. The innovation or modification can also be made in urgent conditions and adapted to the specific patient. It must also be taken into account that surgery, at the time of today, is a complex act, in which different figures and specialties come into play such as the surgical, anesthesiological, nursing and clinical team and then there are factors related to the specific surgical technique, post-operative management, etc. The intrinsic difficulty of standardizing the complexity of surgical action is evident. An innovative procedure in surgery is defined as «a new or modified surgical procedure, which differs from the one currently used, the results of which have not yet been described and which may involve risk to the patient». In addition to this definition, the introduction of new technologies and biotechnologies, invasive or not, which, coming into contact with the body, can involve interactions both for the instrument-tissue interface (with the most varied exposure times: in a few moments to the perennial permanence in the organism), and by creating other interactions with the passage, for example, of electricity or other energies, must also be considered as innovative in surgery. These forms of innovation are increasingly flanked, nowadays, by the use of biotechnologies, aimed at achieving substantial therapeutic advantages. It should also be emphasized that some standardized studies, pertinent to the surgical field, extend their interest also towards 'perisurgery' aspects, such as anesthesia and postoperative management, not limiting themselves only to the actual surgical act.

Types of Innovation

According to Barkun et Al three types of innovations in surgery can be distinguished: the first is inherent in the surgical procedure with the change of part of an already known technique or with the introduction of a new surgical therapy (new intervention based on new pathophysiological knowledge) or with the experimentation of a new modality both on the technological level and on that of the pathophysiological approach (eg videolaparoscopy or robotic surgery). The second type concerns the modification of a single instrument or a specific instrumentation (e.g. from a Kocher gripper to the modification of more sophisticated devices such as stapplers or trocars for SIS). The third type, finally, concerns the change of approach, biotechnological or combined, (eg gene-chip microarrays, use of glues for tissue synthesis, for hemostasis, etc.).

Regulations

Currently in Italy there is no specific legislation on surgery experimentation, but more generally it is traced back to that on clinical trials. Not even in the Code of Medical Deontology (18.05.2014) is made a reference to this specific problem, while it speaks in article 49 of clinical trials, with reference to the medical one, but not to the surgical one, The Association of Italian Hospital Surgeons (ACOI) has included in its ethical manifesto, approved on April 4, 2009, a paragraph, inserted in section V entitled «Surgeons and Society», inherent to research in surgery, in which good rules of conduct are enunciated in the field of surgical experimentation. On the contrary, the experimentation of medical devices or devices has recently been well codified, through Legislative Decree 25.01.2010.

Animal and Cadaver Experimentation

Particular attention deserves a widespread practice in the past, namely the experimentation of surgical techniques on animals or cadavers. Cadaver experimentation has distant roots and in the past it was very common for surgeons to implement their knowledge and dexterity in the sector rooms. However, this practice is not widespread in Italy even if abroad it is increasingly increased with real cadaver surgery courses.

Transplant Surgery

A particular area of experimentation in surgery is that relating to transplant surgery. This particular branch of surgery, defined by the National Committee for Bioethics in 1991 as «a safe and irreplaceable therapeutic opportunity capable of positively resolving objective situations of danger and damage to life or individual validity, not otherwise and / or not as effectively treatable « appears more regulated, since several times the State has intervened in the regulation of the donation, removal and

transplantation of organs and tissues, however here as in the rest of the discipline there is no specific legislation on experimentation. The lack of legislation on the subject cannot, however, slow down the experimentation in surgery, which is continuous and takes place mostly empirically in all operating rooms, but always in constant compliance with the rules concerning informed consent, although they are contemplated almost exclusively in the code of professional ethics, given the continuing absence of an organic state discipline on the subject.

The Design of an Experimental Study

The design of an experimental study in surgery still remains far from what is performed in clinical trials of drugs and above all there are problems in identifying the type of study to be implemented (randomized or not, controlled or not). Randomized controlled trials (RCTs) are considered the gold standard for establishing the safety and efficacy of an intervention, as with any clinical trial. However, despite the fact that since the 70s we have tried to make surgery more rigorous, the use of randomized controlled trials has always been very low [1,2]. Randomized trials, however, are prospective, so the trial is conducted in parallel in two groups in which the patient is randomly assigned, treatment and follow-up are strictly standardized, and the results are analyzed at the end. It is evident that to have statistical significance one must have an adequate sample. To this end, it would be desirable, precisely in order to improve the statistical significance of the final data, to collaborate on shared research protocols of several teams of operators, comparing the results of the experimentation also on selected control groups. The experimental treatment is assigned to a part of the eligible patients, consecutively observed for a standard period of time, also predefined. The others are treated differently and serve as controls. The allocation of treatments is made through a lottery system that promotes comparability between groups. In this methodological context, however, there is a major and important criticality, which makes experimentation in Surgery peculiar. Specifically, it is a matter of being clear: what is meant by control cases and, conversely, by placebo surgery (sham surgery), we will talk about later.

Over the years, experimental models have been proposed, to date the most interesting is the IDEAL protocol. This protocol aims to standardize and apply the methodology of clinical trials also in surgery. The study is structured in five different phases:

a) I = Idea: in this phase the method is implemented on a single patient or on a very limited number of patients selected by very few surgeons and can constitute a case report

b) D = Development: the number of patients and surgeons involved increases slightly while remaining a very small number, in this phase we are still in a descriptive phase of the intervention and at a methodological level we can begin to develop a prospective study

c) E = Exploration: in this phase there are many patients who are subjected to the new method because the indications are enlarged and many surgeons use it, the new method is compared with others, the safety, short-term effects and feasibility of the trial by randomized controlled procedure are evaluated

d) A = Assessment: the indications for the new procedure are many and well defined, so the number of patients increases, consequently the number of surgeons who implement that method also increases. At this stage we are still looking for comparison with other methods already known, but we begin to have complete information from non-randomized studies. In addition, the medium and long-term effects and the cost impact can be assessed

e) L = Long-Term Study: in this phase the method is applied to all eligible patients, long-term effects are studied and the rarest and most unique cases are reported [3-5].

Standardization

From a point of view of methodological speculation, then, it should be considered that in the evaluation of a surgical trial, in addition to the problems attributable to factors related to the design of the study (randomized controlled trials vs non-randomized trials), there are also those related to the nature of the surgery (complexity of the intervention and factors related to the operator) [6,7]. In fact, the standardization of surgical treatment is difficult, if not impossible: surgeons have different experience, each surgeon may have preferences in performing a technique, the technique itself can be modified / evolved during the study; Consequently, the question arises as to whether it is actually preferable to involve more surgeons in the study in order to have a greater generalization or instead to limit oneself to the activity carried out by a few specialized surgeons, in order to have greater standardization [8-10]. In addition, there are undeniable problems intrinsic to the surgery itself, since surgery is in itself invasive and irreversible, problems about the long duration of studies, the huge cost and about the general medico-legal problems with particular regard among others to those concerning:

(a) The consent of the persons on whom the trial is conducted

(b) Guarantees of the safety of the trial

(c) The professional liability of the investigator [11].

Finally, the choice of control group and its implications must be assessed.

Sham Surgery

In the design of randomized clinical trials, the so-called placebo controls have been introduced in order to increase the scientific nature of the study and minimize the confounding factors related to the investigator and the patient and which, in the surgical field, as already mentioned, are numerous and very conditioning. Placebo surgery ([12] sham surgery) occurs when a subject included in the trial is subjected to a surgical procedure that apparently seems therapeutic, but during which the main therapeutic maneuvers are omitted and therefore an invasive, intrinsically dangerous and ineffective action is used as a control group of the experimentation itself. According to Heckerling, placebo surgery is a tool to measure the effectiveness of invasive procedures and, therefore, eliminate for future patients the risks of surgical procedures that do not offer benefits. The use of placebo surgery, however, has aroused considerable debate in fact we can identify elements favorable to its use and contrary elements. Among the favorable elements we can include the fact that the use of a placebo control group increases the scientific validity of the study. It must also be considered that there will be greater benefits for future patients, being able to prevent the introduction of insufficiently validated techniques and potentially risky interventions in clinical practice, in addition to the fact that, according to many authors, the risks to which these subjects are subjected are acceptable. On the other hand, according to other authors, correction of a study based on the placebo effect may not be necessary, since the extent of this effect is often magnified, and the use of the placebo control group does not increase the statistical validity of the study. The other objections that are made to the use of placebo surgery in the control groups in the surgical trial are related to the fact that the subjects included within the placebo group do not receive a substantial benefit and, therefore, are subjected to risks that cannot be accepted [13-19].

Therefore, the use of placebo control groups in the surgical trial remains debated. Although placebo-controlled trials are currently considered the gold standard in the design of a study, they require in any case the prior opinion of an Ethics Committee, specially constituted according to current regulations. (Ministerial Decree of 18 March 1998 and subsequent amendments) and with the participation, among others, of professionals who are experts in the field [20]. Hot Points. It is clear that the peculiar problems of the design of the study are flanked by some of a general nature on experimentation in surgery, and others of mainly medico-legal value including in addition to those already mentioned above: information to be given to the patient on the risks, validity and limits of the consent given, revocation of consent, position of guarantee of the doctor with regard to the protection of life and health of the patient, the compatibility of the procedure with the content of art. 5 of the Civil Code, insurance aspects. Please note that in order to obtain valid informed consent from a patient prior to surgery, consent must be conscious, i.e. informed, free, explicit, authentic, current, revocable and free from defects. However, in the case of experimentation, and in particular that in surgery, the surgeon himself cannot be aware of everything that surgery may involve.

This problem, which has unfavorable repercussions on prior information, which substantiates the validity of the consent of the person entitled, is common with that of patient safety. In fact, especially at an early stage, there is not enough data to be able to evaluate the results in the medium and long term. In studies where a placebo control group is used, it is even more difficult to obtain valid informed consent, since for subjects, randomized in the control group, the therapy carried out will be very far from what is the standard of care. As far as the learning curve is concerned, it should be noted that once performed in a pilot center, the innovation can also be performed elsewhere, by other surgeons for the first time. The «learning curve» refers to the increased risks to patients during the time the surgeon and surgical team become familiar with the new procedure. The curve can only be analyzed retrospectively, so at the time the patient is operated it is not known in which part of the learning curve the surgeon is. However, the patient must be informed about the level of practice of the surgeon with that innovative methodology [21,22].

This aspect is also much debated in surgical practice (volumes of activity) both from an ethical and professional point of view: a surgeon must necessarily have a first time in his surgical activity and, indeed, in his professional life, he will have more than one first time: they will be many, how many innovations and new approaches will be, which will have in its surgical activity as a direct consequence of its experimental activity. The management of this aspect is still crude and not codified and greatly affects research programs and, if it is not defined, it will greatly condition innovation in surgery and the new generations of surgeons, because if it is correct to inform the patient about the specific situation, it is easy to expect negative reactions from patients.

Training

An answer to such a problem could be given by the involvement of a possible animal experimentation and the use of simulators, this, more specifically for training only.

Costs

Finally, the problem of costs, new procedures often depend on a new technology that is almost always more expensive than the traditional one and on the other hand the new procedure can make bolder innovative techniques safer and expand their profitable use. It should also be remembered that the longer operating time

must also be considered among the costs [23]. This additional cost, globally, may have implications for the availability of the innovative surgical procedure for the population. More specifically, depending on the Health System, present in the various countries, the additional costs could make the new procedure available only to those, who, wealthy, can support them or the additional costs could be distributed throughout the Health System taking resources from other conventional therapies. Ultimately, the surgeon must always clearly assess the cost implications before undertaking innovative procedures.

Ethical Aspects

Whenever we talk about surgical innovation, we must not ignore, moreover, the considerable potential for conflicts of interest for innovators in their relationships with companies, which produce the technology, which makes innovation possible. The surgeon who develops a new technique is a surgeon who can increase his fame and potentially become the expert in that specific field: all this could push the surgeon to support the innovative procedure. On the other hand it is right to uphold the standards of professionalism of surgeons. The surgeon's ability must be to always objectively evaluate new techniques, always aiming at the good of the patient. Surgeons, in order to maintain their professional position in society, must not allow the recall of the new in itself and the potential financial benefit to influence their assessment of the effectiveness and validity of any surgical operation or instrumentation, whether traditional or innovative. It is widely accepted that the future progress of surgery depends on innovative solutions to contemporary problems. Yet the future of surgical innovation is fraught with ethical concerns. Thus, innovation is not only the key to surgical progress, but also the greatest challenge for the professionalism of surgeons.» Everything, therefore, leads to the centrality of the Experimenter-Surgeon and his ethical conviction, made up of non-negotiable values of Life-Health, respect for the human Person and a profound respect for all that is in Nature, starting from animals and involving all the harmony of it. The vocation of human speculation is not to leave alone any Individual, however appreciable it may be, in deciding Others and Himself: in this case the Surgeon must ask for help in bioethical reflection and this must feel the obligation to deepen, speculate and discuss the problems exposed so far, as food for thought.

Conclusion

The bioethical debate must fill the gaps and finally inspire the surgeon-actor, the scientific community and the legislator. In this perspective, it seems necessary for scientific societies to try to regulate the field of surgical experimentation, protecting the patient as much as possible from unscrupulous treatments, on the other hand allowing the surgeon to put into practice, in a short time, original ideas to improve or revolutionize a specific treatment of his branch. Finally, a correct legislative regulation of experimentation in surgery would have the double advantage of allowing the surgeon to be able to work and experiment in conscience, in full legality and in safety for himself and for the patient, and therefore for society as a whole, to benefit from the innovations that result from the brilliant idea and its correct experimentation of it.

References

1. Di Salvo E (2012) The use of technologies in medicine: problems and criticalities in surgery. In: Claudio Buccelli (Eds.)., Proceedings of the conference "Clinic and Technology in contemporary medicine", Naples 21-23.11.2012.
2. Armocida G, Dionigi R (2002) Cenni di storia della chirurgia in Chirurgia (edited by Renzo Dionigi). Milan: Masson.
3. Petrini C (2013) Surgical experimentation and clinical trials: differences and related ethical problems. Ann Ist Super Health Care 49(2): 230-233.
4. Biffl WL, Spain DA, Reitsma AM (2008) Responsible development and application of surgical innovations: a position statement of the Society of University Surgeons. J Am Coll Surg 206: 1204-1209.
5. Barbarisi A (2007) Biotechnology in Surgery. Milan: Springer-Verlag; 201110 TROUET C, GOBERT M, PODOOR M. Clinical Trials in Belgium: The Belgian Implementation of the European Clinical Trials Directives. Antwerp: Intersentia.
6. Ergina PL, Cook JA, Blazeby JM, Isabelle Boutron, Pierre-Alain Clavien, et al. (2009) Challenges in evaluating surgical innovation. Lancet 374: 1097-1104.
7. Barkun JS, Aronson JK, Feldman LS, Guy J Maddern, Steven M Strasberg, et al. (2009) Evaluation and stages of surgical innovations. Lancet 374(9695): 1089-1096.
8. McCulloch P, Altman DG, Campbell WB, David R Flum, Paul Glasziou, et al. (2009) No surgical innovation without evaluation: the IDEAL recomandations. Lancet 374(9694): 1105-1112.
9. Cook RC, Alscher KT, Hsiang YN (2003) A debate on the value and necessity of clinical trials in surgery. Am J Surg 185(4): 305-310.
10. Morreim H, MJ Mack, RM Sade (2006) Surgical innovation: too risky to remain unregulated? Ann Thorac Surg 82(6): 1957-1965.
11. Brubaker L, Nager CW, Richter HE, Dennis Wallace, Susan Meikle, et al. (2014) Effectiveness of blinding: sham suprapubic incisions in a randomized trial of retropubic midurethral sling in women undergoing vaginal prolapse surgery. Am J Obstet Gynecol 211(5): 554. e1-7.
12. Dunlop SR, McCormick M (2015) Placebo Surgery in Clinical Research Trials for Parkinson Disease. The Journal for Nurse Practitioner 11(2): 240-247.
13. Heckerling PS (2006) Placebo surgery research: a blinding imperative. J Clin Epidemiol 59(9): 876-880.
14. Albin RL (2005) Sham surgery controls are mitigated trolleys. Journal of Medical Ethics 31(3): 149-152.
15. London AJ, Kadane JB (2002) Placebos that harm: sham surgery controls in clinical trials. Stat Methods Med Res 11(5): 413-427.
16. Polgar S, Ng J Ethics (2005) methodology and the use of placebo controls in surgical trials. Brain Research Bulletin 67(4): 290-297.
17. Niemansburg SL, van Delden JJ, Dhert WJ, Annelien L Bredenoord (2015) Reconsidering the ethics of sham interventions in an era of emerging technologies. Surgery 157(4): 801-810.

18. Macklin R (1999) The ethical problems with sham surgery in clinical research. N engl J Med. Sep 341(13): 992-996.

19. Flowers A (1999) Forensic medicine of medical liability. Milan; Giuffrè Publisher.

20. Angelos P (2013) Ethics and surgical innovation: challenges to the professionalism of surgeons. Int J Surg 11(S1): S2-S5.

21. Sevladis N, Lyons M, Healey A (2009) The Observational Teamwork Assessment for Surgery (OTAS). Observational Teamwork Assessment for Surgery. Ann Surg 249(6): 1047-1051.

22. McDonald PJ, Kulkarni AV, Farrokhyar F (2010) Ethical issues in surgical research. Can J Surg 53(2): 133-136.

23. Angelos P (2013) Ethics and surgical innovation: challenges to the professionalism of surgeons. Int J Surg 11(s1): s2-s5.

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